Hawker Hunter

Airworthiness Certification

AIR-230 Airworthiness Certification Branch
Federal Aviation Administration
Washington, D.C.
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LOG OF REVISIONS

Revision Number	Date	Page Item Number and Issue Description		Subject	Initials

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Federal Aviation Administration

Memorandum

Date: JAN 11 2013

To: Duane Hunter, Manager, Richmond Flight Standards District Office (FSDO)

From: James Seipel, Manager, Production and Airworthiness Division, AIR-200

Prepared by: Airworthiness Certification Branch, AIR-230

Subject: Hawker Hunter Airworthiness Certification

This memorandum provides information to assist field offices with the airworthiness review of Hawker Hunter aircraft.

Attachment 1 provides an overview of the revised airworthiness certification process. Attachment 2 contains background information on the Hawker Hunter aircraft. Attachment 3 lists historic airworthiness issues with the Hawker Hunter for your consideration as part of the airworthiness certification of these aircraft. The list is not exhaustive, but includes our current understanding of risks that should be assessed during airworthiness certification of this former military high-performance aircraft. Concerns regarding particular issues may be mitigated in various ways. Some may be mitigated via the aircraft maintenance manual(s) or the aircraft inspection program (AIP). Others may be mitigated via operating limitations, aircraft flight manual/pilot notes changes, or logbook entries. In other cases, an issue may be mitigated by the owner/operator though standard operating procedures (SOP). Not all issues in attachment 3 may apply to a particular aircraft given variations in aircraft configuration, condition, operating environment, or other factors. Similarly, circumstances with an aircraft may raise other issues not addressed by attachment 3 that require mitigation. Attachment 4 includes additional resources and references. Attachment 5 provides some relevant Hawker Hunter accident and incident data. Attachment 6 is a glossary and a listing of applicable abbreviations. Additional technical details are available upon request.

The Flight Standards Service's Aircraft Maintenance Division (AFS-300), the General Aviation and Commercial Division (AFS-800), and the Production and Airworthiness Division (AIR-200) collaborated to develop this memorandum.

Contact the Airworthiness Certification Branch, AIR-230, at (202) 385-6346 for assistance or additional information.

Attachment 1 – Overview of the Revised Airworthiness Certification Process

Purpose

The purpose of the May 21, 2012, memorandum, *Restrictions on the Issuance of Experimental Airworthiness Certificates for Sophisticated and High-Performance Former Military Aircraft,* and this document is to provide field offices safety information and guidance to help assess and mitigate safety hazards for the Hunter aircraft. The existing certification procedures in FAA Order 8130.2, Airworthiness Certification of Aircraft and Related Products, do not account for many of the known safety concerns and risk factors associated with many high-performance former military aircraft. These safety concerns and risk factors include—

- Lack of consideration of inherent and known design failures;
- Several single-point failures;
- Lack of consideration for operational experience, including accident data and trends;
- Operations outside the scope of the airworthiness certificate being sought;
- Insufficient flight test requirements;
- Unsafe and untested modifications;
- Operations over populated areas (the safety of the non-participating public has not been properly addressed in many cases);
- Operations from unsuitable airports;
- High-risk passenger carrying activities taking place;
- Ejection seat safety and operations not adequately addressed;
- Weak maintenance practices to address low reliability of aircraft systems and engines;
- Ignoring required inspection schedules and procedures;
- Limited pilot qualifications, proficiency, and currency;
- Weapon-capable aircraft not being demilitarized, resulting in unsafe conditions;
- Extensive brokering;
- Accidents and serious incidents not being reported; and
- Inadequate accident investigation data.

These safety issues and risk factors could prevent the issuance of an airworthiness certificate and/or may require additional aircraft-specific operating limitations not covered in FAA Order 8130.2. FAA field offices have asked for assistance and guidance in certificating these aircraft.

Research of Model-Specific Safety Data

The aircraft, relevant processes, and safety data are thoroughly researched and assessed. This includes—

- Aviation Safety (AVS) Safety Management System (SMS) policy and guidance;
- Historical military accident/incident data and operational history;
- Civil accident data;

- Safety risk factors;
- Interested parties and stakeholders (participating public, non-participating public, associations, service providers, air show performers, flying museums, government service providers, airport owners and operators, many FAA lines of business, and other U.S. Government entities);
- Manufacturing and maintenance implications; and
- Design features of the aircraft.

The Job Aid

The job aid is a compilation of known safety issues and risk factors identified from the above research that are relevant to civil operations. The job aid is organized into four major sections:

- General airworthiness issues (grey section),
- Maintenance (yellow section),
- Operations (green section), and
- Standard operating procedures and best practices (blue section).

The job aid also provides background information on the aircraft and an extensive listing of resources and references.

How to Use the Job Aid

These job aids are intended to assist FAA field offices in the airworthiness certification of these aircraft. Use the job aid during the airworthiness certification process to help identify any issues that may hinder the safe certification, maintenance, or operation of the aircraft. Provide the job aid to the applicant to facilitate airworthiness certification. Work with the applicant to discuss the job aid, inspect documents/records/aircraft, and mitigate any issues. Use this information to draft appropriate operating limitations.

Role of the Applicant

The applicant is responsible for providing all of the information the field inspector may need. The job aid is not a compilation of tasks to be accomplished only by the FAA. The applicant/operator should be involved in (1) consideration of specific data and knowledge of the aircraft and its operation, (2) consideration of acceptable alternatives for addressing issues, and (3) a two-way process that allows for open discussion of the safety items affecting the aircraft and its operation.

Discretion in Certification

FAA field inspectors have discretion to address other safety issues that may be encountered, whether or not they are included in the job aid. The field inspector may add any requirements necessary for safety, and the job aid provides a certain level of standardization to achieve this.

Assistance Provided by FAA Headquarters

FAA Headquarters will continue to assist field offices upon request with issues related to the job aid, or other issues that may arise during aircraft certification. This assistance includes coordination of any proposed operating limitations as required by Section 4113 of FAA order 81302. Consistent with AVS policy, inquiries should be coordinated with the regional offices or directorates.

Feedback

We welcome feedback from inspectors and applicants to continuously improve the job aid and the process. This is why the document includes a feedback form.

Temporary Extensions

The new certification process is being introduced as the aircraft are being considered for certification. Because of this, the process provides for consideration of temporary extensions of existing airworthiness certificates if additional time is required to conduct a full review with this job aid. Work with the applicant to discuss the job aid, inspect documents/records/aircraft, and mitigate any safety issues. However, any safety issues an inspector believes need to be addressed and corrected should be mitigated as part of this process. FAA Headquarters [Aircraft Certification Service (AIR) and Flight Standards Service (AFS)] will assist with any questions concerning any issue affecting the aircraft.

Attachment 2—Background Information on the Hawker Hunter Aircraft

The Hawker Hunter is a subsonic British fighter-bomber jet aircraft developed in the 1950s. Royal Air Force (RAF) service started in July 1954. Two-seat variants remained in use with RAF and Royal Navy (RN) until the early 1990s. The last RAF Hunter flew in 2001, as did the second largest Hunter operator, the Indian Air Force. The Hunter was also widely exported, serving with 21 other air forces. Operators outside the United Kingdom included Abu Dhabi, Belgium, Chile, Denmark, India, Iraq, Jordan, Kenya, Kuwait, Lebanon, the Netherlands, Peru, Qatar, Saudi Arabia, Singapore, Sweden, Switzerland, and Zimbabwe. Switzerland, one of the largest Hunter operators since 1958, retired their aircraft in 1994, while the Zimbabwe Air Force retired their remaining Hunters in 2002. Fifty years after its original introduction, the Hunter is still in active service, operating with the Lebanese Air Force.

Ex-Swiss Air Force Mk. 58 with Swedish registration SE-DXM. Source: Magnus Fridsell. Copyright © 2011. www.airliners.net.

The Hunter was a conventional all-metal monoplane with a retractable tricycle landing gear. The aircraft is equipped with various versions of the Martin-Baker ejection seat. The Hawker Hunter was designed as a single-seat fighter with swept wings, variable incidence tail plane (electrically actuated follow-up trim) powered aileron and elevator controls, and pressurized cabin. The fuselage was of monocoque construction, with a removable rear section for engine maintenance. The engine was fed through two triangular air intakes in the wing roots and had a single jet pipe in the rear of the fuselage. A single airbrake was fitted under the ventral rear fuselage on production models. The aircraft is equipped with the Rolls-Royce Avon engine, which in its Series 200, produces about 10,000 lb of thrust. Earlier versions were equipped with the less-powerful Avon 100 Series engine. As a reference, a new Hunter represented approximately 30,000 man-hours of work for the aircraft manufacturer.

Major variants of the Hunter include the F4 (Avon Mk 115 engine, increased fuel capacity), the F5 (Sapphire engine), the F6 (Avon Mk 203 engine, more fuel), T7 two-seater (mainly RAF), T8 two-seater (Royal Navy version, with a hook), the FR10 (RAF reconnaissance version), the GA11 (Royal Navy single-seat attack version), and the FGA9 (greater weapons capacity, increased thrust, strengthened fuselage for ground-attack role.) Many other sub-variants, mainly destined for export were built, including the Mk.58 and Mk.58A for the Swiss Air force.

Civil Ex-RSAF Hunter two-seater in Australia. Source: Greg Weir. Copyright © 2006. www.airliners.net.

Overall, 1,972 Hunters were produced by Hawker Siddeley and under license. Because of extensive refurbishment and resale (conversions), 2,613 Hunters saw operational service. The First Hunter to operate in the U.S. was an Ex-Danish Air Force Mk. 51 in 1980. Until the late 1990s, the Hunter population in the U.S. had been rather small (approximately 3-5 aircraft), averaging under 30 hours annually per aircraft. Their numbers increased after the influx of Ex-Swiss Air Force aircraft and the fact that it became a popular aircraft for some operators providing military support missions.

Two Ex-Swiss Air Force Hunter Mk. 58s operating from Clark AFB in the Philippines. Source: www.defenseimagery.mil.

When the Swiss AF retired the majority of their Hunters from frontline service in 1993-1995 (first aircraft began to be retired in 1989), and because Swiss laws prohibited the sale of military aircraft, approximately 70 Hunters were literally “donated” to many organizations, museums, and individuals around the World. The Swiss Air Force even flew the aircraft to their destinations within many European countries. Many of these aircraft were imported to the UK and the U.S. This is the reason why the Hunter Mk. 58 and Mk. 58A are, by far, the most popular version of the aircraft in civil use.

Civil two-seater Hunter T-7 operating in the Netherlands. Source: Tom Houquet. Copyright © 2011. www.airliners.net.

RAF crew boards a Hunter T-7. Source: M. Grosse via Ray Deacon. www.radfanhunters.co.uk

Today, approximately 18 Hunter aircraft are in the FAA’s civil registry (there were 11 in 2000). Of these, about 15-16 are estimated to be operational (flying). In the U.S., Hawker Hunters are used for exhibition purposes (Airshows), R&D, as chase aircraft, as trainers, and as platforms for military support missions, which include ACM (Air Combat Maneuvering), ECM (Electronic Counter Measures) activities, radar calibration, air-to-ground simulations, and low altitude cruise missile simulations. Hunters are also operated as civil aircraft in Australia, Brazil, Canada, England, France (French and Canadian Registry), Netherlands, New Zealand, Sweden, and Switzerland. In addition to the U.S., the other large Hunter population is found in the UK, where since 2002, at least ten have been operational at any given time. The total Hunter population worldwide is estimated at 30 aircraft. It is estimated another 114 Hunter airframes around the world could potentially be made airworthy.

There is significant data concerning the Hawker Hunter’s operational record. It started in 1954 and continues to this day. Some of the data is relevant to civil certification, especially when related to the aircraft’s accident history. The accident rate in the Royal Netherlands Air Force was 15.9 accidents per 100,000 hours. The accident rate in the Swiss Air Force was 10.5 accidents per 100,000 hours or 33 accidents in 312,900 hours. In RAF service, between 1971 and 1980, the total Hunter flight time was 202,486 hours. In that time, there were 26 ejections. Based on this, the accident rate for the aircraft was 12.8 accidents per 100,000 hours.

This does not include all of the other accidents that did not result in the loss of the aircraft or an ejection. In other words, the actual accident rate in RAF service was higher than 12.8 accidents and possibly as high as 17 accidents per 100,000 hours.

In the Royal Navy, the Hunter T8 accident rate was 17.7 accidents per 100,000 hours. These data refer to aircraft destroyed, with the actual accident arte being higher because many accidents did not result in the loss of the aircraft. An interesting safety statistic is that while in operating as an advanced trainer, RAF Hunter instructors, who flew about 250 hours annually, had a 1 in 31 chance of ejecting in any given year, and 1 in 135 chance of being killed every year. These are serious odds for any civilian application of the aircraft.

In Belgian Air Force service, the Hunter F4 and F6 attained the worst Hunter safety record of 87 accidents per 100,000 hours or 64 aircraft lost in 73,000 hours of operation. Poor mechanical reliability, maintenance deficiencies (spare parts supply), poor training, and a reticence to repair aircraft caused this unenviable record. In service with the Chilean Air Force, the Hunter's safety record was 40 accidents per 100,000 hours for data between 1968 and 1977. In terms of operational worldwide (1955-1998), the Hunter accident rate is estimated at 32.5 per 100,000 hours based on 2,000,000 hours and 650 accidents classified as Class A mishaps. The Hunter attrition rate varied and mirrored the accident rate per 100,000 hours. For example, the Swiss Air Force attrition rate was 20 percent, while the Indian Air Force and the Republic of Singapore Air Force's rates were 33% and over 50 percent respectively.

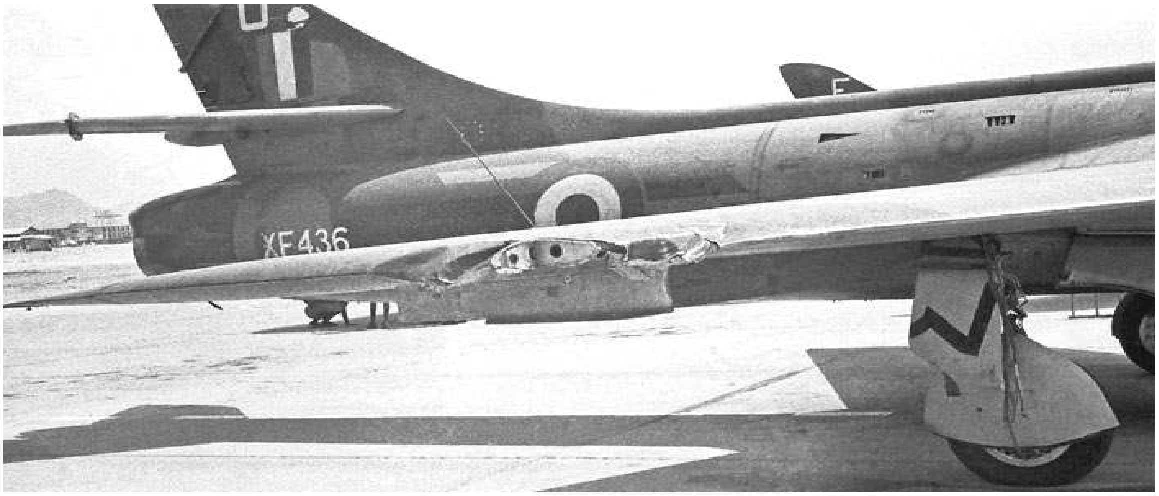
Against this background, in U.S. civilian use the accident rate of the Hunter is estimated at 60 accidents per 100,000 hours, based on a conservative 10,000 hours and 6 accidents (2 other accidents were not reported). The average utilization rate is approximately 35 hours per aircraft per year, based on U.S. and UK data. Further analysis indicates of these six accidents in the U.S four were mechanical in nature, including three engine failures. Similarly, of the eight Hunter accidents under British registry, five were related to mechanical malfunctions.

Hunter Mk. 58 gear-up landing, Pt. Mugu, California, 2012. Source: NTSB.

Hunter Mk. 58 gear-up landing, Pt. Mugu, California, 2012. Source: NTSB & FAA.

Two views of the aftermath of a fatal Hunter accident in 2012. Source: NTSB.

Typical Hunter accidents. Above, nose-gear failure. Below, external fuel tank separation. Source: Roger Wilkins via Ray Deacon. http://www.radfanhunters.co.uk.



Hunter T75 accident (landing gear failure) in Australia in 2005. Source: Greg Weir. Copyright © 2006. www.airliners.net.

Aftermath of Hunter T75 landing gear accident in Australia. Source: Greg Weir. Copyright © 2006. www.airliners.net.

The outcome of a typical Hunter accident, a runway overrun. Source: Ray Deacon. http://www.radfanhunters.co.uk.

Aftermath of two RAF Hunter engine failure accidents in the 1960s. Source: Roger Wilkins via Ray Deacon. http://www.radfanhunters.co.uk

Photos above: Belgian AF Hunter accidents 1958-1960. Source: Belgian AF.

Above and below, two photographs of the aftermath of the fatal July 2006 Hunter Mk. 58 crash (loss of engine power) in a residential area in Hillsboro, Oregon. Source: NTSB.

Above, Swedish-registered Hunter Mk.58 (SE-DXM) illustrating the Hunter's high potential for tail strikes during a landing in 2008. Source: Kurt Saxkjaer. Copyright © 2008. www.airliners.net. Below, the result of an inadvertent pull, by an airshow spectator, on the Hunter's emergency canopy release system, UK, 2004. Source: Steve Petch. Copyright © 2008. www.airliners.net.

Hunter Mk.58 G-PSST accelerating during take-off at Kemble (UK) in June 2011. A rather significant amount of fuel is leaking and seen streaming. It was the result of a sticking refueling pressure relief valve. Source: Michael Brazier-Aviation-Images. Copyright © 2011. www.airliners.net. Below, another view of the incident a few instances later. Note the origin of the fuel leak forward of the white-painted fuselage gear door. Source: Max Hawkins. Copyright © 2011. www.ailiners.net.

Above, a RAF Hunter FGA9 experiences the result of a second light-up attempt. Source: Ray Deacon. http://www.radfanhunters.co.uk. Below, a rather busy view of Royal Navy Hunters undergoing maintenance in the 1970s. Source: Mark Russell. Copyright ©2011. www.fraduhunters.co.uk.

Canadian-registered Hunter Mk.58s belonging to Northern Lights Co. seen at Brown Municipal Airport (SDM), California, in December 2003. Above, one aircraft equipped with an ALQ-167 pod on the left outboard pylon. Below, two Hunters photographed during a formation take-off at Brown Municipal Airport. Source: Tony Zeljeznjak. Copyright © 2003. www.airliners.net.

Top, an operational Royal Navy Hunter PR11 in 1990. Brian Johnstone. Copyright © 1990. www.airliners.net. Above, Hunter G-GAII, a civil Ex-Royal Navy Hunter GA11 at the Kemble Airshow in 2011. Copyright © 2011. www.airliners.net. Below, Hunter F6A registered G-KAXE (UK Registry) deploying its drag chute at Kemble in June of 2011 after landing. Dean West. Copyright © 2011. www.airliners.net.

Hunter GA11 UK-registered G-GAII (Ex-Royal Navy) seen taxing during a 2011 air show in the UK. Source: Dean West. Copyright © 2011. www.airliners.net. Below, a Lebanese Air Force Hunter Mk. 70 on approach at the Rayak AB in December 2009. The Lebanese Air Force is the last operator of the Hunter in a front-line role. Source: Vatche Mitilian. Copyright © 2009. www.airliners.net.

Civil Hunter Operators

Airborne Tactical Advantage Company:

- Based at Newport News/Williamsburg International Airport in Newport News, VA, with an additional government-owned/contractor-operated facility at Naval Base Ventura County/NAS Point Mugu, CA, ATAC operates 13 Mk.58 Hunters for tactical air and adversary training of U.S. military fighter crews.

Apache Aviation:

- Operates from Istres in southern France. Three examples (2× single-seater and 1× two-seater) contracted by French Navy. Some have Canadian registry.

Delta Jets:

- Operated between 1995 to 2010 from Kemble Airport near Cirencester, England with three operational Hunters. The company went into liquidation in 2010.

Dutch Hawker Hunter Foundation:

- Operates a Hunter T8C two-seat in classic RNLAF paint and a single-seat Hunter F6A with the original Dutch colors and markings. The Hunter T8C and the F6A are based at Leeuwarden Air Base in the Netherlands.

Embraer:

- Operates an ex-Chilean Air Force Hunter T.72 as a flight test chase plane.

Hawker Hunter Aviation:

- Based at RAF Scampton, it operates a fleet of 12 Mk 58 and three two-seaters (T7 and T8), as well as other aircraft to provide "high speed Aerial Threat Simulation, Mission Support Training and Trials Support Services".

Hunter Flying Ltd:

- Based at MOD St Athan in Wales, Hunter Flying Ltd maintain over 15 privately owned examples of the Hunter.

Lortie Aviation Inc.:

- This company, (formerly Northern Lights Combat Air Support) based in Quebec City, Canada, owns and operates 12 Hunters (mainly ex-Swiss Mk.58 variants) for military co-operation duties such as FAC (Forward Air Control) training, radar calibration, radar target facilities and missile simulation.

Thunder City:

- Seven Hunters were based at Thunder City at Cape Town International Airport in South Africa.

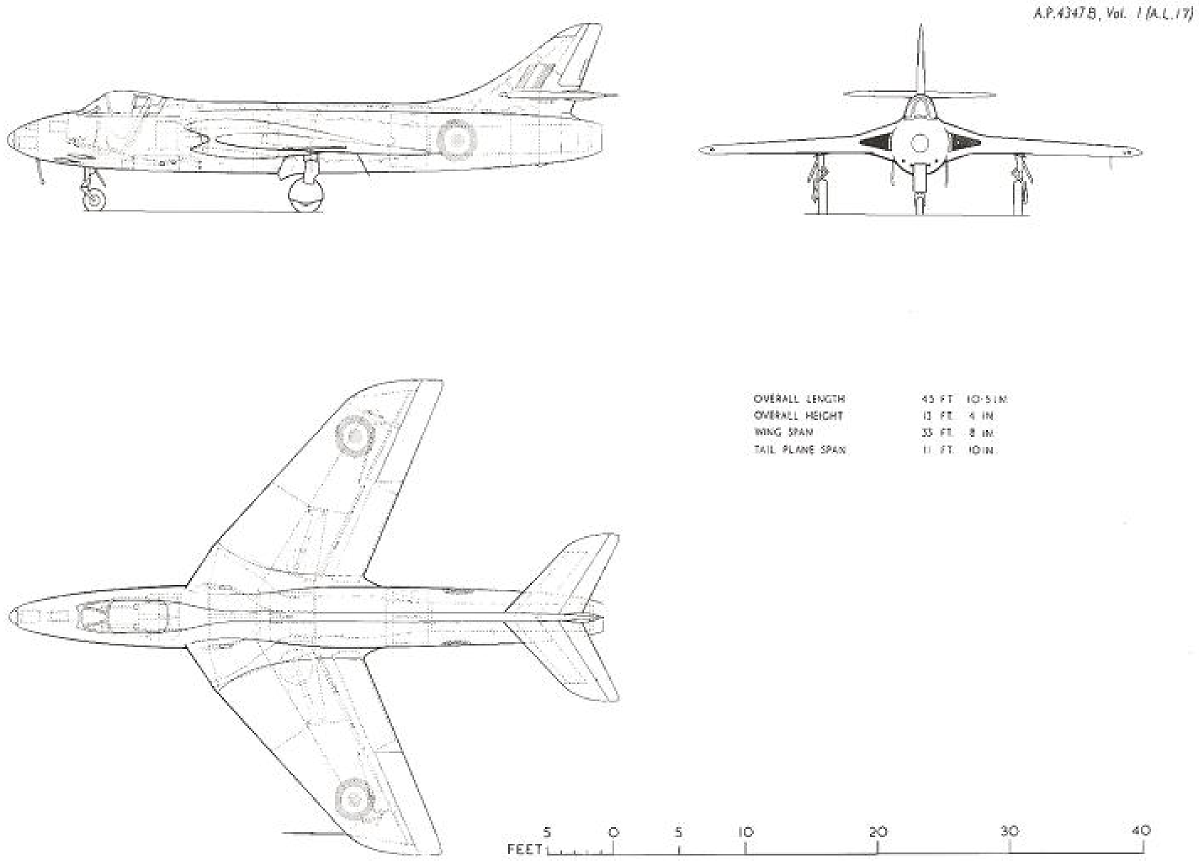
Specifications (Hunter F6)

General Characteristics

- Crew: One
- Length: 45 ft 11 in
- Wingspan: 33 ft 8 in
- Height: 13 ft 2 in
- Wing area: 349 ft²
- Empty weight: 14,122 lb
- Maximum takeoff weight: 24,600 lb
- Powerplant: Avon 207 – Thrust: 10,145 lb

Performance

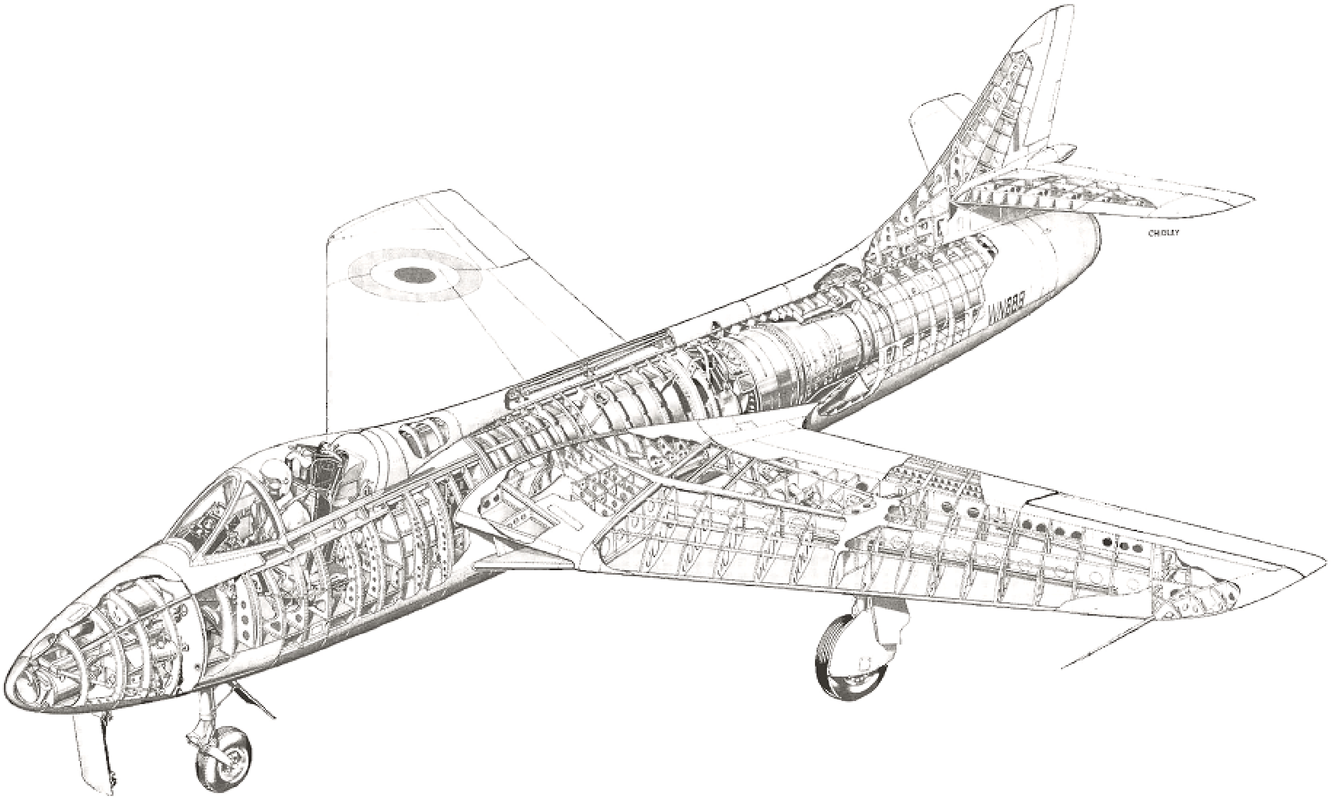
- Maximum speed: Mach 0.94, 620 knots at Sea Level
- Combat range : 385 nm
- Ferry range: 1,650 nm with external fuel
- Service ceiling: 50,000 ft
- Rate of climb: 17,200 ft/min
- Wing loading: 51.6 lb/ft²
- Thrust/weight: 0.56



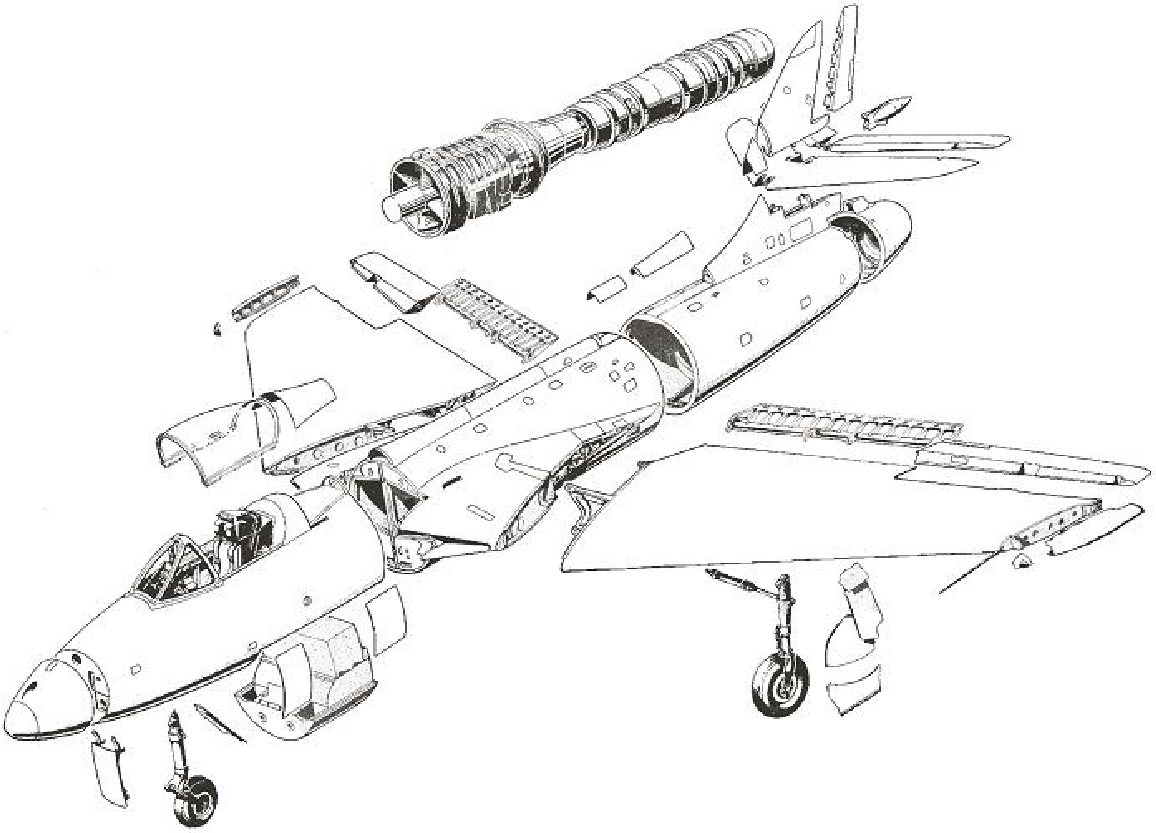
Hunter F4 three-view. Air Publication 4347B.

A view of the Hunter T7 cluttered an non-ergonomic cockpit. Source: Greg Weir. Copyright © 2006. www.airliners.net.

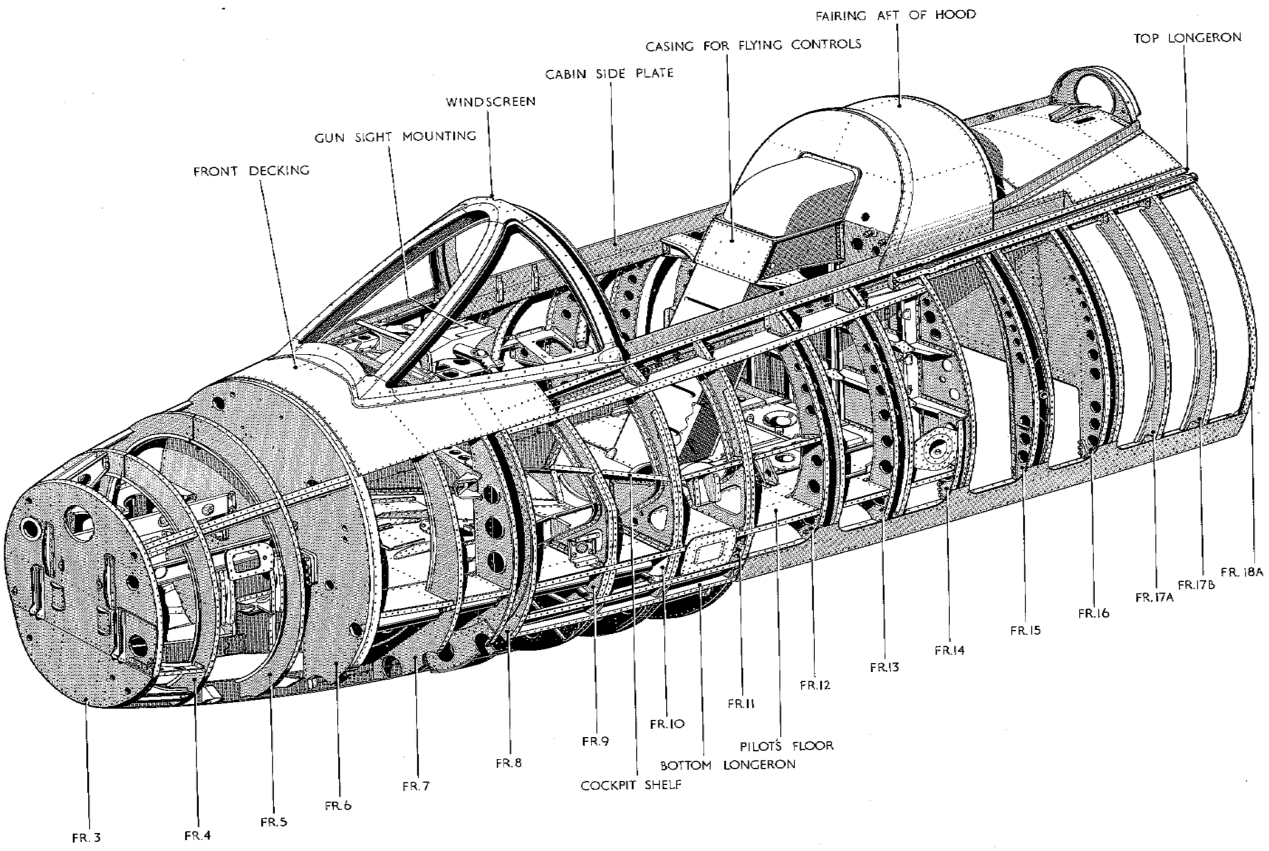
Rolls-Royce Avon 100 Series engine change on a Hunter T7 in South Africa. Source: Fanie Kleynhans. Copyright © 2003. www.airliners.net.



Hunter F4 cutaway. Source: Hunter Pilot Notes, RAF.



Hunter major components. Air Publication 4347B.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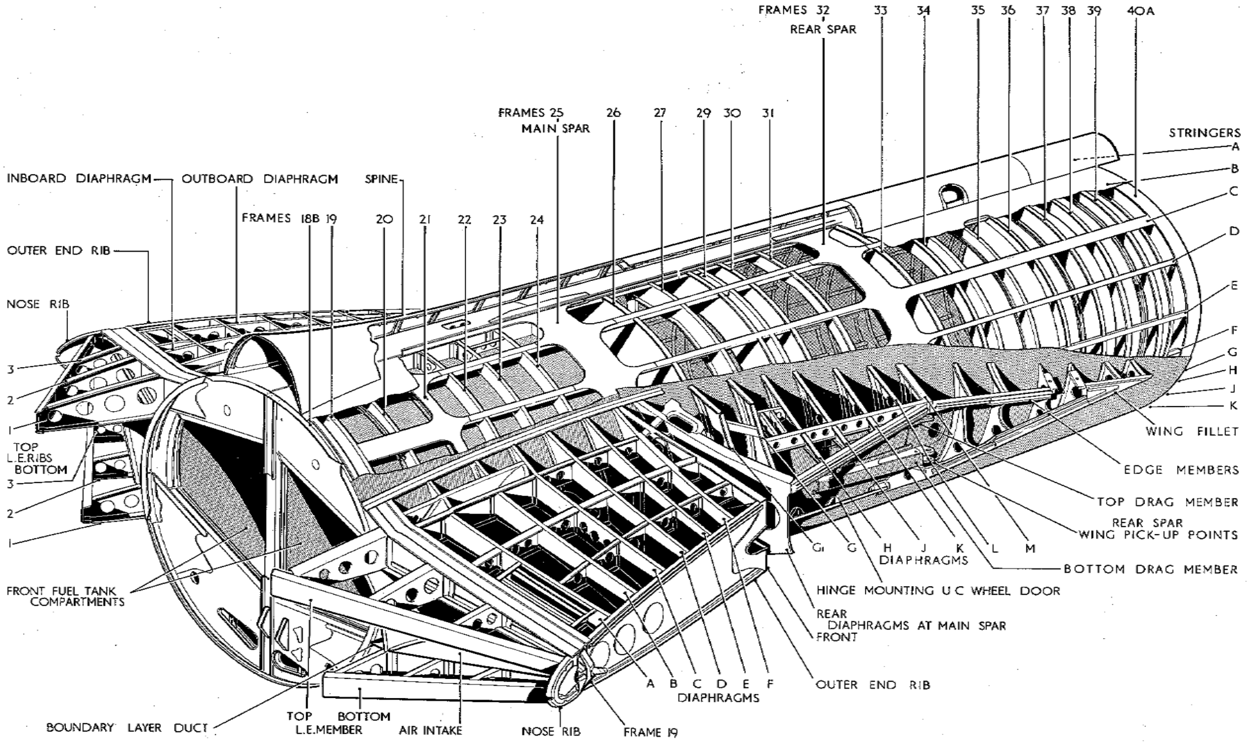
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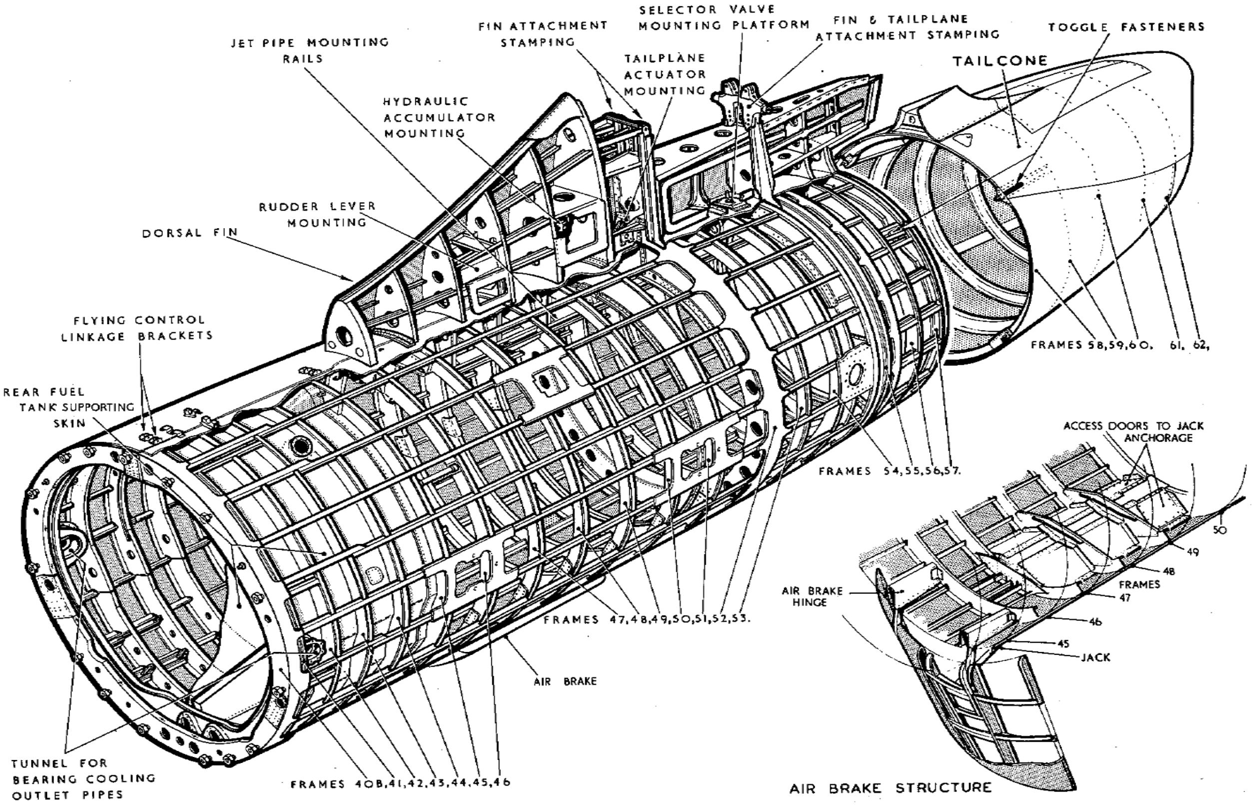
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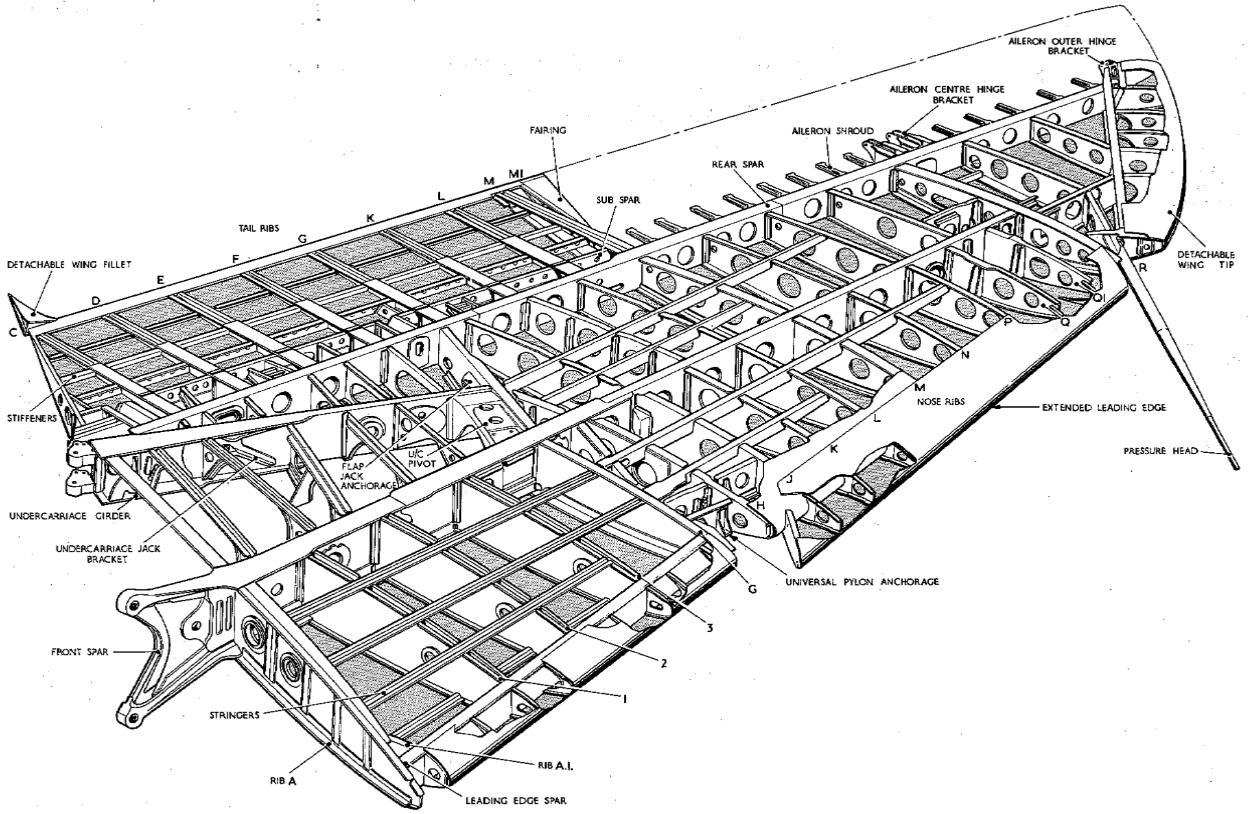
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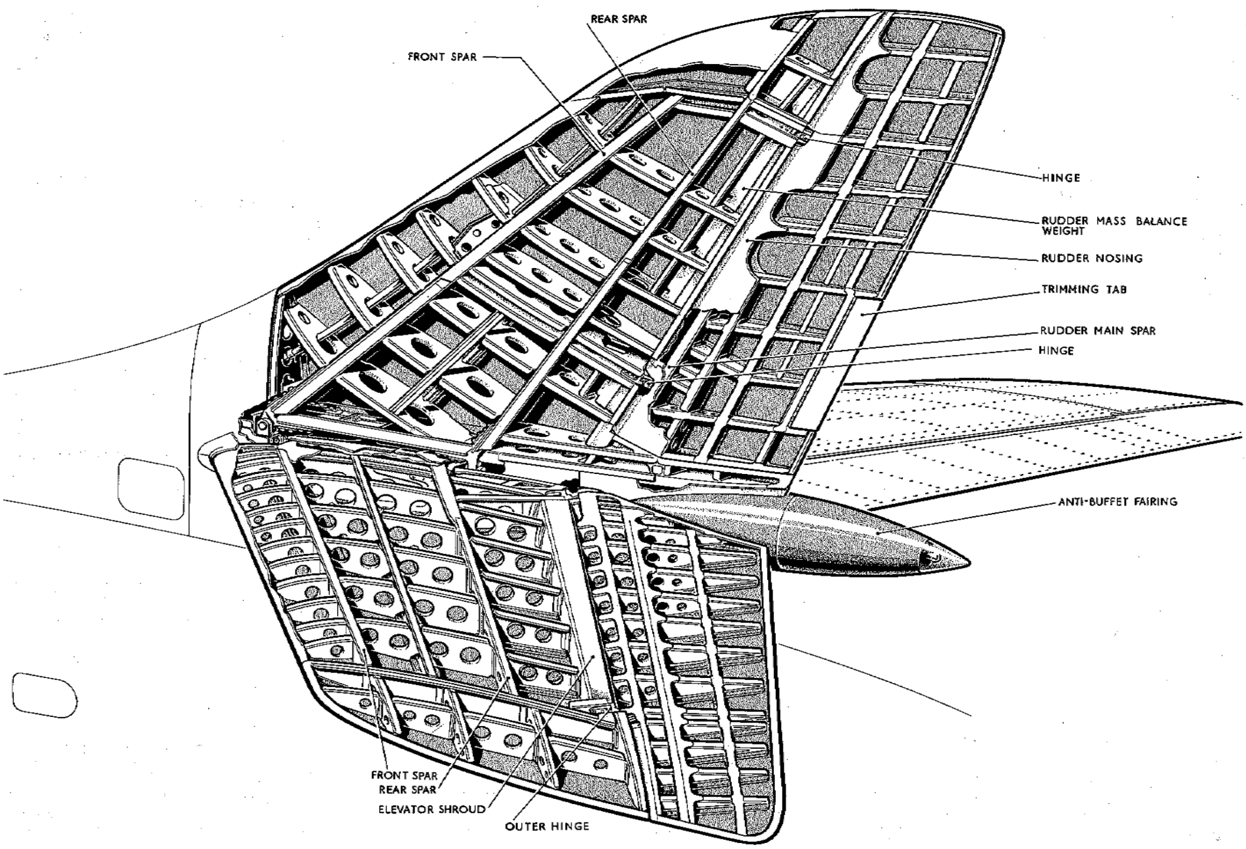
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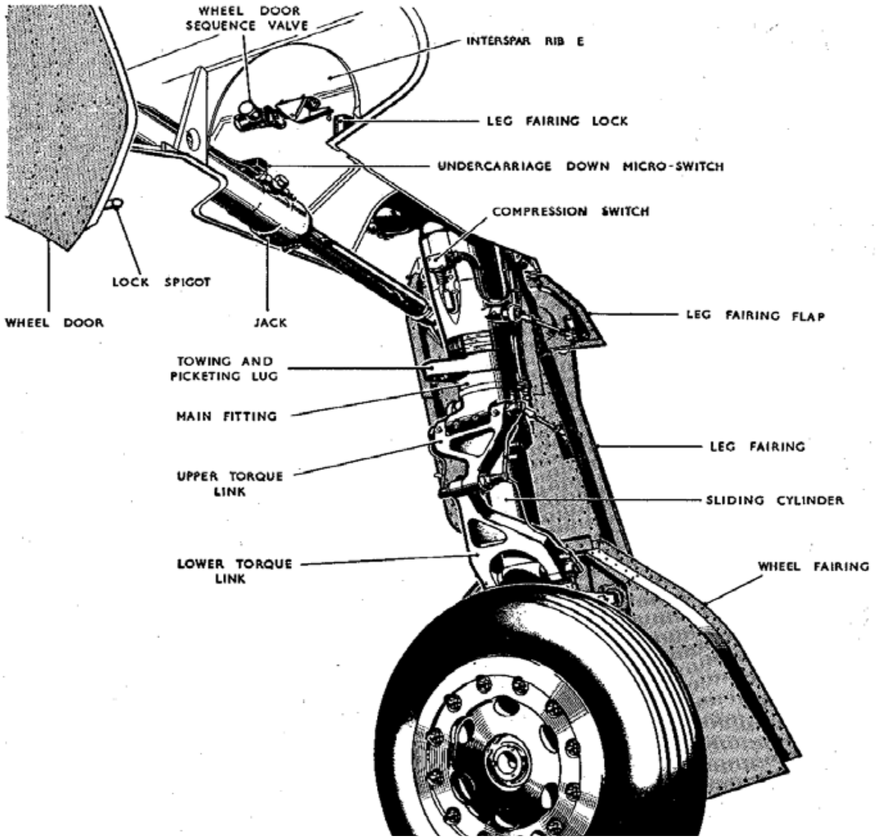
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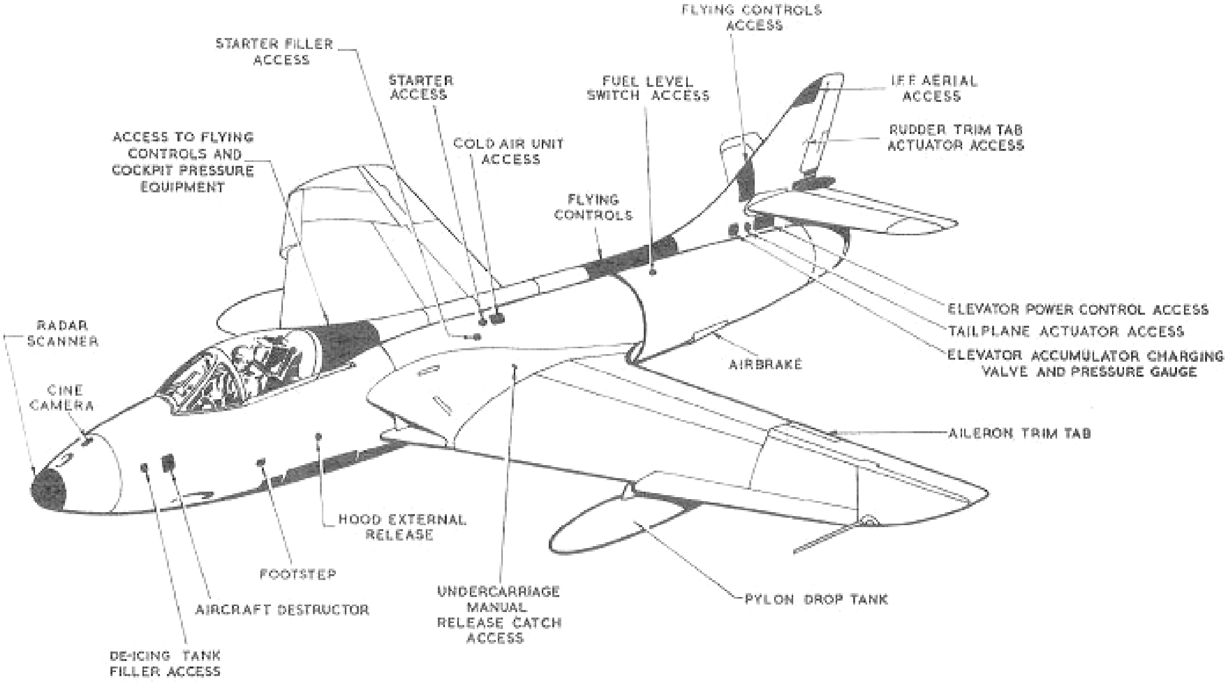
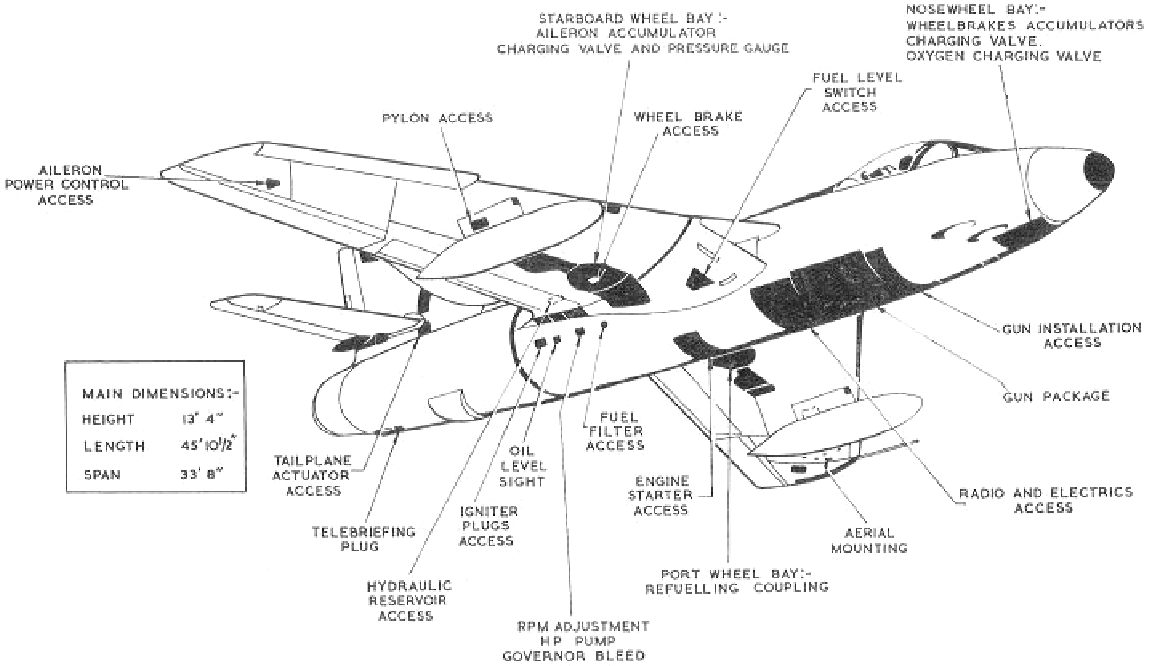
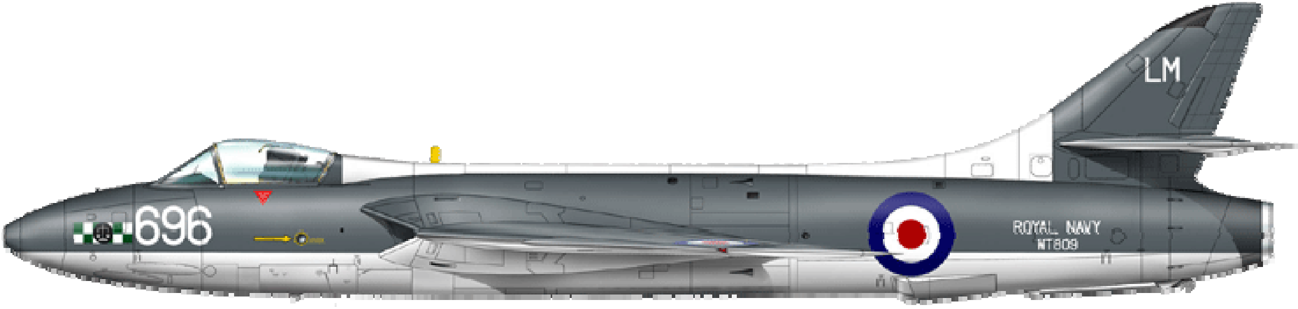




Above, two views of the many Hunter FGA9 access panels. Source: Hunter FGA9 Pilot Notes, RAF. Below, profile view of a Royal Navy Hunter GA11 in 1972. Source: Mark Russell. Copyright ©2011. http://www.fradu-hunters.co.uk.



FAA-registered Hunter Mk. 58 in the U.S. being prepared for a military support mission. Source: www.defenseimagery.mil.

Close-up of a Hunter Mk. 58 underside. Source: FAA.

Hunter Mk. 58 close-ups - cockpit and air intake. Source: FAA.

Hunter Mk. 58 close-ups - ACMI (Air Combat Maneuvering Instrumentation) pod and extra wing-mounted pylon. Source: FAA.

Hunter Production Versions and Variants

Hunter F.1: First production version, Avon 113 engine, first flight May 16, 1953, 139 built.

Hunter F.2: Sapphire 101 engine, first flight on October 14, 1953, 45 built by Armstrong Whitworth.

Hunter Mk 3: Sometimes mistakenly called F.3, but it carried no weapons. Used to raise the world's absolute air speed record to 727.6 mph off the English south coast on September, 7 1953.

Hunter F.4: Additional bag-type fuel tanks in the wings, provision for under wing fuel tanks, Avon 115 (later Avon 121) engine, blisters under the nose for ammunition links, 349 built.

Hunter F.5: F.4 with Sapphire 101 engine, 105 built by Armstrong Whitworth at Coventry.

Hunter F.6: Single-seat clear-weather interceptor fighter. Powered by one 10,150 lb Rolls-Royce Avon 203 turbojet engine, revised wing with a leading edge "dogtooth" and four hard points, and a follow-up tail plane on later aircraft, 384 built.

Hunter F6A: Modified F.6 with brake parachute and 230 gallon inboard drop tanks.

Hunter T.7: Two-seat trainer built for the RAF. A side by side seating nose section replaced the single seat nose. Engine and systems as for the F.4; six were rebuilt F4s, and 65 were new build. The dog-tooth leading edge and follow-up tail plane modifications were fitted to the T.7.

Hunter T7A: T.7 modified with the Integrated Flight Instrumentation System (IFIS). Used by the RAF as a Blackburn Buccaneer conversion training aircraft.

Hunter T.8; Two-seat trainer for the Royal Navy. Fitted with an arrestor hook for use on RN airfields but otherwise similar to the T.7, ten-built new and 18 conversions from F4s.

Hunter T8B & C: T.8 with TACAN radio-navigation system and IFIS fitted, cannon and ranging radar removed. Used by the Royal Navy as a Buccaneer conversion training aircraft, 12 aircraft built.

Hunter T8M: T.8 fitted with the Sea Harrier's Blue Fox radar, used for training Sea Harrier pilots.

Hunter FGA9: Single-seat ground-attack fighter version for the RAF, modified from the F.6. Strengthened wing, 230 gallon inboard drop tanks, tail chute, increased oxygen capacity, and bob weight in pitch control circuit to increase stick force in ground attack maneuvers, 128 converted.

Hunter FR10: Single-seat reconnaissance version; all 33 were rebuilt F.6 airframes, with 3 x F95 cameras, revised instrument panel layout, brake parachute and 230 gallon inboard drop tanks. Increased oxygen as for the FGA9, but no pitch bob weight.

Hunter GA11: Single-seat weapons training version for the Royal Navy. Forty ex-RAF Hunter F4s were converted into the Hunter GA11. The GA11 was fitted with an arrester hook.

Hunter PR11: Single-seat reconnaissance version for the Royal Navy. The nose was as on the FR10.

Two Hunter Mk.58 aircraft taxing, Brown Municipal Airport, California, 2003. Source: Tony Zeljeznjak. Copyright © 2003. www.airliners.net.

Ex-Swiss Air Force Hunter T68 (two-seater) in South Africa, as a civil aircraft (ZU-HUN), in August of 2003. Source: Fanie Kleynhans. Copyright © 2003. www.airliners.net.

Hunter Mk 12: Two-seat test aircraft for the Royal Aircraft Establishment. One built, converted from an F.6 airframe.

Hunter Mk 50: Export version of the Hunter F.4 fighter for Sweden. Swedish designation J 34, 120 built.

Hunter Mk 51; Export version of the Hunter F.4 fighter for Denmark, 30 built.

Hunter Mk 52: Export version of the Hunter F.4 fighter for Peru, 16 conversions from F4s

Hunter T.53: Export version of the Hunter T.7 trainer for Denmark, two built.

Hunter Mk 56: Export version of the Hunter F.6 fighter for India, 160 built. Brake parachute added and the provision to carry 500 lb (227 kg) bombs, minor changes to the avionic systems.

Hunter Mk.56A: Export version of the Hunter FGA9 ground-attack fighter for India.

Hunter Mk.57: Export version of the Hunter FGA9 for Kuwait, four conversions from F6s.

Hunter Mk 58: Export version of the Hunter F.6 fighter for Switzerland, 88 built and 12 conversions from F6s.

Hunter Mk 58A: Export version of the Hunter FGA9 for Switzerland. There were such 52 conversions.

Hunter Mk.59: Export version of the Hunter FGA 9 for Iraq, 24 conversions.

Hunter Mk.59A: 18 aircraft were sold to Iraq as part of a follow-on order, 18 conversions from F6s.

Hunter Mk.59B: Four aircraft were sold to Iraq as part of a follow-on order, 4 conversions from F6s.

Hunter F.60: Export version of the Hunter F.6 fighter for Saudi Arabia, 4 conversions from F6s.

Hunter T.62: Export version of the Hunter T.7 trainer for Peru.

Hunter T.66: Two-seat training version for the Indian Air Force, powered by a Rolls-Royce Avon 200-series turbojet engine, 20-built.

Hunter T66A: A composite Hunter built from a damaged Belgian F.6 bought back by the company, and a 2-seat nose. Used as a demonstration aircraft, G-APUX.

Hunter T66B: Export version of the Hunter T.66 trainer for Jordan, one-built and two-conversions.

Hunter T66C: Export version of the Hunter T.66 trainer for Lebanon, three conversions from F6s.

Hunter T66D: 12 aircraft sold to India as part of a follow-on order, converted from F6s.

Hunter T66E: Five aircraft sold to India as part of a follow-on order, converted from F6s.

Hunter T.67: Export version of the Hunter T.66 trainer for Kuwait, four conversions from F6s.

Hunter T.68: Export version of the Hunter T.66 trainer for Switzerland, 8 conversions.

Above, Swiss Air Force Hunter Mk. 58 in on static display at RAF Fairford, 1995. Source: Walter Van Bel. Copyright © 1995. www.airliners.net. Below, PH-NLH, a Netherlands-registered Hunter T7 in 1979. As a civil aircraft, PH-NLH was primarily used for experimental work. Source: Richard Vandervord. Copyright © 1979. www.airliners.net.

Hunter T.69: Export version of the Hunter T.66 trainer for Iraq, three conversions from F6s.

Hunter FGA.70 & 70A: Export version of the Hunter FGA9 for Lebanon. 4 aircraft.

Hunter T.70: This was the unofficial designation given to 2 ex-RAF Hunter T7s sold to Saudi Arabia.

Hunter FGA.71: Export version of the Hunter FGA9 ground-attack fighter for Chile.

Hunter FR.71A: Export version of the Hunter FR10 reconnaissance aircraft for Chile.

Hunter T.72: Export version of the T.66 trainer for Chile.

Hunter FGA.73: Export version of the Hunter FGA9 ground-attack fighter for Jordan.

Hunter FGA.73A: Four aircraft sold to Jordan as part of a follow-on order.

Hunter FGA.73B: Three aircraft sold to Jordan as part of a follow-on order.

Hunter FGA.74: Export version of the Hunter FGA9 for Singapore, 12 aircraft.

Hunter FR.74A: Export version of the Hunter FR10 for Singapore. 4 aircraft delivered.

Hunter FR.74B: 22 aircraft delivered to Singapore as part of a follow order, upgraded in late 1970s and re-designated as Hunter FR74S.

Hunter T.75: Export version of the Hunter T.66 trainer for Singapore, upgraded in late 1970s and re-designated as Hunter T75s. 4 aircraft were delivered.

Hunter T.75A: 4 aircraft delivered to Singapore as part of a follow-on order (A fifth aircraft was lost in an accident before delivery), upgraded in late 1970s and re-designated as Hunter T75As.

Hunter FGA.76: Export version of the Hunter FGA9 ground-attack fighter for Abu Dhabi.

Hunter FR.76A: Export version of the Hunter FR10 reconnaissance aircraft for Abu Dhabi.

Hunter T.77: Export version of the Hunter T.7 trainer for Abu Dhabi.

Hunter FGA.78: Export version of the Hunter FGA9 ground-attack fighter for Qatar.

Hunter T.79: Export version of the Hunter T.7 trainer for Qatar.

Hunter FGA.80: Ex-RAF FGA9 ground-attack fighter sold to Kenya.

Hunter T.81: Export version of the Hunter T.66 trainer for Kenya.

Above, ZZ 191 (cn 41H/697425), an ex-Swiss Air Force Hunter Mk. 58 in operational service with RAF. The aircraft is a MRCOA (Military-Registered, Civilian Owned Aircraft), owned by Hunter Team, but in service with the UK's MoD (Royal Navy). Source Chris Lofting. Copyright © 2011. www.airliners.net. Below, G-VETA, a UK-registered Hunter T7 photographed in 2005. Source: Chris Lofting. Copyright © 2005. www.airliners.net.

Above, Hunter F6A registered G-KAXE (UK Registry) taking the active during a recent airshow. Note that the aircraft is only equipped with the inboard external fuel tanks. Peter de Jong. Copyright © 2011. www.airliners.net. Below, N322AX, an ex-Swiss Air Force Mk.58 photograph while in the pattern. Note the ACMI pod mounted between the two external fuel tanks on the left wing. Gerhard Plomitzer. Copyright © 2011. www.airliners.net.

Hawker Hunters in the FAA Registry (October 2012)

Manufacturer/Model Code	Number of Aircraft Assigned	Model Name
4230122	DELAWARE – 1; SOUTH CAROLINA – 1	HUNTER T MK 7
4231010	DELAWARE – 1	HAWKER HUNTER GA11
4231004	DELAWARE – 6	HAWKER HUNTER MK.58
4231003	DELAWARE – 1	HAWKER HUNTER MK.58A
4231002	Total = 0	HAWKER HUNTER PR 11
4231005	TEXAS – 1	HAWKER HUNTER T8C
4230320	Total = 0	HAWKER HUNTER TMK75
056240Y	FLORIDA – 1	HUNTER T-MK-62
0561938	DELAWARE – 2	HAWKER HUNTER MK 58
4230304	DELAWARE – 1	HUNTER F.MK.4
4230308	TEXAS – 1	HUNTER FMK62
4230310	DELAWARE – 1	HUNTER FR 74
4230309	CALIFORNIA – 1; DELAWARE – 1	HUNTER MK 58A
4230311	SOUTH CAROLINA – 1	HUNTER T 75
4230305	Total = 0	HUNTER TMK53
4230307	Total = 0	HUNTER MK6A
Total	**18**	

Military Hawker Hunter Operators

Air Force User	Dates	Total Number	Version and Variants
Royal Air Force	1954 – 1984	1,266	F1,2,4,5,6, T.7, FGA.9, FR.10, Mk.12
Swedish Air Force	1955 – 1971	120	Mk.50
Danish Air Force	1956 – 1974	32	F.51, T.53
Belgian Air Force	1955 – 1962	256	F.4,.6
Jordanian Air Force	1958 – 1975	35	F.6, FGA.73,73A, FGA. 74, T.66
Swiss Air Force	1958 – 1995	160	F.58, 58A, T.68
Rhodesian Air Force	1963 – 1980	12	FGA.9
Zimbabwe Air Force	1980 – Unknown	19	FGA.9, T.81
Peruvian Air Force	1956 – 1979	17	F.52, T.62
Indian Air Force	1957 – 1997	252	F.56, T.66
Dutch Air Force	1956 – 1964	113	F.6, T.7
Kuwaiti Air Force	1965 – 1976	11	FGA.57, F.6, T.67
Iraqi Air Force	1963 – Unknown	64	F.6, FGA.59 FGA.59^{a},B T.69
Saudi Arabian Air Force	1966 – 1975	6	F.6
Lebanese Air Force	1965 – Still Serving	19	F.6, FGA.70, FGA70A
Chilean Air Force	1968 – 1996	42	FGA.71, FGA.71A, T.72
Singapore Air Force	1970 – 1994	44	F.74, F.74A, B, T75, T75A
Abu Dhabi Air Force	1970 – 1983	12	FGA.76, FGA.76A, T.77
Qatari Air Force	1971 – Unknown	4	FGA.78, T.79
Kenyan Air Force	1974 – 1979	6	FGA.80, T.81
Omani Air Force	1975 – Unknown	31	-
Somali Air Force.	1983 – early 1990s	9	FGA.76, 76A, T.77
Royal Navy (FRADU)	1957 – 1994	83	T.8, GA.11

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
		Hawker Hunter Preliminary and General Airworthiness Inspection Issues	
1.	Aviation Safety (AVS) Safety Management System (SMS) Guidance	As general guidance, use the AVS SMS guidance as part of the airworthiness certification process, as it supplements the existing Code of Federal Regulations (CFR). *FAA Order VS8000.367, May 14, 2008* and *FAA Order VS8000.369, September 30, 2008* are the basis for, but not limited to (1) identifying hazards and making or modifying safety risk controls, which are promulgated in the form of regulations, standards, orders, directives, and policies, and (2) issuing certificates. AVS SMS is used to assess, verify, and controls risks, and safety risk management is integrated into applicable processes, which in this case is the airworthiness certification process. Additional Information: Appropriate risk controls or other risk management responses are developed and employed operationally. Safety risk management provides for initial and continuing identification of hazards and the analysis and assessment of risk. The FAA provides risk controls through activities such as the promulgation of regulations, standards, orders, directives, advisory circulars, and policies. Such as safety risk management process (1) describes the system of interest, (2) identifies the hazards, (3) analyzes the risk, (4) assesses the risk, and (5) controls the risk.	
2.	Aircraft Familiarization	Become familiar with the aircraft before initiating the certification process. One of the first steps in any aircraft certification is to become familiar with the aircraft in question, in this case, the Hunter. Such knowledge, including technical details, is essential to establish a baseline as the certification process moves forward.	
3.	Preliminary Assessment	Conduct a preliminary assessment of the aircraft to determine condition and general airworthiness. The Aviation Safety Inspector (ASI) may visit the aircraft for a preliminary assessment of (1) type of restoration, (2) its condition, and (3) basic potential for airworthiness. Additional Information: A Manufacturing Inspection District Office (MIDO) inspector may seek Flight Standards District Offices (FSDO) support as part of this process. Coordination between the offices may be essential in ensuring adequate technical expertise. Many aircraft are imported whole while others have been extensively rebuilt from essentially hulks and conformity to the original design is compromised.	
4.	Condition for Safe Operation	This is an initial determination by an FAA inspector that the overall condition of an aircraft is conducive to safe operations. Additional Information: This refers to the condition of the aircraft relative to wear and deterioration. The FAA inspector will make an initial determination as to the overall condition of the aircraft. The aircraft items evaluated depend on information such as aircraft make, model, age, type, completeness of maintenance records of the aircraft, and the overall condition of the aircraft	
5.	Main Safety Issues	The main goal of this document is to assist the FAA in eliminating preventable accidents and those accidents and incidents caused by well-known problems that were either not fixed operationally or require specific mitigation to be contained. In other words, unnecessary risks must be mitigated. Some of the general safety that this document addresses concerning the Hunter include: ➢ Consideration of inherent and known design failures; ➢ Several single-point failures; ➢ Operations outside of the scope of the airworthiness certificate being sought; ➢ Insufficient flight test requirements; ➢ Operations over populated areas – the safety of the non-participating public has not been properly addressed in many cases; ➢ Operations from unsuitable airports; ➢ High-risk passenger carrying activities take place; ➢ Ejection seat safety and operation; ➢ Weak maintenance practices to address low reliability of aircraft systems and engines; ➢ Limited pilot proficiency in many cases; and ➢ Weapon capable aircraft are certificated by the FAA but have not been demilitarized.	
6.	Denial	If the aircraft does not meet the certification requirements and the special airworthiness certificate is denied, the FAA will provide a letter to the applicant stating the reason(s) for denial and, if feasible, identify which steps may be accomplished to meet the certification requirements. Additional Information: Should this occur, a copy of the denial letter will be attached to FAA Form 8130-6, forwarded to AFS-750, and made a part of the aircraft's record.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
7.	Potential Reversion Back to Phase I	Notify the applicant that certain modifications to the aircraft will invalidate Phase II. These include: (a) structural modifications, (b) aerodynamic modifications, including externally mounted equipment except as permitted in the limitations issued, and (c) change of engine make, model, or power rating (thrust or horse power). The owner/operator may return the aircraft to Phase I to flight test specific items as required. However, major modifications such as those listed above may require new operating limitations. The scope of the Phase I may have to be expanded as well.	
		Additional Information: In August 2012, the NTSB issued safety recommendations concerning a fatal accident of an experimental high-performance aircraft that had undergone extensive modifications. The NTSB noted that "the accident airplane had undergone many structural and flight control modifications that were undocumented and for which no flight testing or analysis had been performed to assess their effects on the airplane's structural strength, performance, or flight characteristics. The investigation determined that some of these modifications had undesirable effects. For example, the use of a single, controllable elevator trim tab (installed on the left elevator) increased the aerodynamic load on the left trim tab (compared to a stock airplane, which has a controllable tab on each elevator). Also, filler material on the elevator trim tabs (both the controllable left tab and the fixed right tab) increased the potential for flutter because it increased the weight of the tabs and moved their center of gravity aft, and modifications to the elevator counterweights and inertia weight made the airplane more sensitive in pitch control. It is likely that, had engineering evaluations and diligent flight testing for the modifications been performed, many of the airplane's undesirable structural and control characteristics could have been identified and corrected." As part of the probable cause, the NTSB stated that added "contributing to the accident were the undocumented and untested major modifications to the airplane and the pilot's operation of the airplane in the unique air racing environment without adequate flight testing." As a result of this investigation, the NTSB issued safety recommendations including requiring "aircraft owners to provide an engineering evaluation that includes flight demonstrations and analysis within the anticipated flight envelope for aircraft with any major modification, such as to the structure or flight controls." See Modifications and *Phase I Flight Test* below.	
8.	Identify Hawker Hunter Version and Sub-Variants	Identify the specific Hawker Hunter version being certificated. The most common versions and variants include the Mk. 58, F6, T7 and T8. There are major differences among Hawker Hunter aircraft, not just in terms of engines (Avon 100 vs. Avon 200 Series engines), but major systems (i.e., ejection seats, drag chute), and weapons capability (i.e., pylons).	
		Additional Information: Later Hunters had a larger wing area (350 v. 340 square ft). Earlier Hunters had fully-powered elevators with spring feel and different linkages. In 1957, production Hunter F6s started to include the "flying tail" with the power-operated elevator interconnected to change the tail plane incidence electrically. Also, the differences between the standard Swiss Air Force (SAF) Mk. 58 and an early Mk. 4 Hunter can be significant. Similarly, the differences between a single-seat type and its corresponding T or two-seat version must be considered. For example, the Hunter Mk. 58 is an export version similar to the RAF Mk 6 or Mk 9 aircraft with the more powerful Avon 207 engine and with the addition of a braking parachute contained in the tail cone (the RAF adopted this brake parachute onto their Mk 6 aircraft during the early 70's and reclassified them as Mk 6As). The Mk 58 was peculiar to the Swiss Air Force so U.K. MoD Air Publications do not refer specifically to this type. An important example of variants is the popular Ex-SAF MK. 58 and Mk. 58A. The Mk. 58 is in fact a modified F6 while the Mk. 58A is one brought up to the FGA9 standard. Note: There are no known Hunter F2s in a condition to be restored. The only F3 built is owned by the RAF museum and will not be restored to airworthy condition. Note: A total of 96 Hunter F4s were built in Holland during 1955-56 and 112 in Belgium. A further 93 Hunter F6s were produced by Fokker-Aviolanda during 1956-58 and 144 by Avions Fairey and SABCA. Many of these F6s were re-purchased by Hawker Siddeley Aviation from 1963 onwards for refurbishment and resale.	
9.	RAF Form 2110 (Data Sheet)	Ask the applicant for RAF Form 2110, the datasheet on the aircraft.	
		Additional Information: This document is helpful in identifying specifics on the aircraft and to determine basic conformity in terms of type, version, and variant. This is turn is critical for other requirements, especially the applicability of manuals.	
10.	UK (RAF) Approval Basis	Ask whether the applicant knows of the U.K.'s approval basis for the aircraft. If not, notify applicant that adherence to the U.K.'s approval basis is critical for airworthiness certification in the U.S.	
		Additional Information: The original basis of service acceptance is AvP-970, the type record exists and the design authority now rests with the RAF and support is supplied, if requested, by British Aerospace, Farnborough. Civil Aviation Authority (CAA) approval is based on the satisfactory service history of the type (accepted by precedent) and investigation carried out in accordance with policies agreed by the ARB (Airworthiness Review Board) during the meeting on April 23, 1992, appropriate to the aircraft's classification in the 'Intermediate' category.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
11.	Major Structural Components	Ask the applicant to identify and document the origin, condition, and traceability of major structural components. Additional Information: For example, documentation of an ex-SAF Hunter Mk. 58 that was imported complete and in good condition should be readily available and comprehensive when compared to an earlier ex-Belgian Air Force Hunter Mk. 4 aircraft that assembled from "museum" parts compiled over a long period of time. Additionally, because there is evidence many Hunters had their wings replaced, it important to trace that particular component to determine whether the aircraft was (1) damaged, or (2) if the wing limitations were exceeded at any time. Another relevant fact is related to a fatal Hunter T7 accident in the U.S. The accident aircraft (engine failure) had been a museum piece in the UK when it was sold to an individual in the U.S. As part of its restoration, the aircraft, which was originally an ex-Danish Air Force T7, had the aft fuselage of an ex-Swedish Air Force F4 and components from another British Hunter. Note: The manufacturer classified airframe under three major headings: discard, replace, and modify. Any reference in the aircraft records to any of these is relevant and should be noted. In addition, many of the Hunter major components were subcontracted dated and therefore, references to other manufacturers are possible. For example, Gloster produced the nose section, while Folland manufactured the tail section.	
12.	Aircraft Records	Request and review the applicable military and civil aircraft records, including aircraft and engine logbooks. Additional Information: The AP 101B-1300-5A1 *Amendment Record Certificate* is also an important record in part because it should include the chronological maintenance performed on the aircraft and the inspection schedule. For aircraft with prior foreign civil registries, those civil records should also be considered. For more details on aircraft with prior foreign registry, see *Previous U.K. CAA Registry* and *Previous Registry (Other Than U.K.).* Other documents and records are discussed below, such as the *RAF Form 700 (Serviceability Log)* below. Many others are discussed in *Adequate Hawker Hunter and Rolls-Royce Avon Manuals and Related Documentation* below. In cases involving ex-Swiss AF Hunters, ask the applicant to produce that air force's records for the aircraft.	
13.	Accident and Incident History	Ask the applicant to provide any data concerning all accidents and/or incidents involving the aircraft. Additional Information: This includes any knowledge of any such events in military service and prior civil use, in the U.S. and aboard. In the case of ex-Swiss Air Force or RAF example, these records should be available. Note: Appendix 4 of this document may be of assistance in identifying accidents and incidents.	
14.	FAA Accident and Incident Data System	Review the FAA's Accident and Incident Data System for Hunter aircraft accidents and incidents. Refer to http://www.asias.faa.gov.	
15.	FAA Records Review	Review the existing FAA airworthiness and registration files (EDRS) and search the Program Tracking and Reporting Subsystem (PTRS) for safety issue(s) and incidents.	
16.	PTRS Entries for Malfunctions and Defects Reports	If the applicant reports malfunctions and defects, make a PTRS entry accordingly. See *Reporting Malfunctions and Defects* below.	
17.	Aircraft Ownership	It is important to establish and understand the status of the ownership of the aircraft. It sets the stage for many of the responsibilities associated with operating the aircraft safely. There are many cases where Hunters are leased from other entities, and this can cloud the process. For example, if the aircraft is leased, the terms of the lease may be relevant as part of the certification because the lease terms may restrict what can be done to the aircraft and its operation for safety reasons.	
18.	FAA Form 8100-1	Use FAA Form 8100-1 to document the airworthiness inspection. Using this form facilitates the listing of relevant items to be considered, those items' nomenclature, any reference (that is, NATO manual, FAA Order 8130.2, regulations) revision, satisfactory or unsatisfactory notes, and comments. Additional Information: Items to be listed include but are not limited to— 1. FAA Form 8130-6; FAA Form 8050-1; 2. § 21.193; 14 CFR § 45.11(a); 3. FAA Order 8130.2, paragraphs 4002a(7) and (10), 4002b(5), 4002b(6), 4002b(8), 4111c, and 4112a(2); 4. 14 CFR § 91.205; 5. § 91.417(a)(2)(i), airframe records and total time, overhaul; and § 91.411/91.413, altimeter, transponder, altitude reporting, static system test.	
19.	Functionality Check	Ask the applicant to prepare the aircraft for flight, including all preflight tasks, start-up, run-up, and taxi.	
20.	FAA-G-8082-19	Recommend that *Inspection Authorization Information Guide*, FAA-G-8082-19, FAA, Flight Standards Service, 2010 be considered (as a tool) as part of the airworthiness certification process. This document includes valuable information that is relevant to an airworthiness inspection. Additional Information: This publication provides guidance for persons who conduct annual and progressive inspections and approve major repairs and/or major alterations of aircraft. This manual stresses the important role that certificated mechanics who hold an inspection authorization have in air safety.	

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21.	Airframe and Engine Data	Ask applicants to provide the following: Airframe: • Import country; • N-Number; • Manufacture year and serial number, i.e., 003031 or 41HRHABL003031; • Airframe time i.e. 3,000 hours limitation; • Fatigue life. Engine: • Type and variant; • Manufacture date and serial number; • Overhaul data, location, provider, and engine time & cycles.	
		Additional Information: Properly identifying the relevant and basic characteristics of the airframe and the engine are necessary in addressing the safety issues with the aircraft. The following excerpt from a NTSB report on a former military combat aircraft accident illustrates the seriousness of adequate records: "On May 15, 2005, a British Aircraft Corporation 167 Strike Master MK 83, N399WH, registered to DTK Aviation, Inc., collided with a fence during an aborted takeoff from Boca Raton Airport, Boca Raton, Florida. The airplane was substantially damaged and the commercial-rated pilot and passenger sustained minor injuries. The pilot initially stated he performed a preflight inspection of the aircraft which included a flight control continuity check. He had the passenger disable the gust lock for the flight controls. He performed a flight control continuity check before taxiing onto the runway for takeoff; no discrepancies were reported. The takeoff roll commenced and at the calculated rotation speed (70 knots), he "...began to apply pressure to stick and noticed an unusual amount of load on the controls. I made a quick trim adjustment to ensure that the forces on the stick were not the results of aerodynamic loads. When the trim changes yielded no change, I initiated an abort (at approx. Vr at 80 knots) by retarding the throttle, extending the speed brakes, and applying the wheel brakes." He notified the tower of the situation, briefed the passenger, and raised the flaps. He also opened the canopy after realizing that he was unable to stop on the runway. The airplane traveled off the end of the runway, rolled through a fence and came to rest upright. The pilot also stated that the airplane is kept outside on the ramp at the Boca Raton Airport. Examination of the airplane by an FAA operations inspector before recovery revealed the control column would only move aft between ¼ and ½ inch. No determination was made as to the position of the control lock in the cockpit. Examination of the airplane following recovery by an FAA airworthiness inspector revealed that the elevator was free to travel through the full range but was noted to be '...very stiff.' Additionally, the rudder was '...extremely hard to move in either direction." During movement of the elevator flight control surface, the rudder flight control surface was noted to move, and with movement of the rudder flight control surface, the elevator flight control surface was noted to move. A review of a United Kingdom Civil Aviation Authority (U.K. CAA) Mandatory Permit Directive (MPD) No. 2002-001 R1, issued on January 16, 2003, indicates'...partial binding or complete seizure of the elevator/rudder concentric torque tube bearings causing an interconnect between elevator and rudder control systems. This interconnection has resulted in un-commanded rudder movement with the application of elevator control inputs and vice versa. Investigation has determined that bearing seizure was due to inadequate lubrication and water ingress in the elevator torque tube bearings. Aircraft subject to external storage are particularly prone to this occurrence. A review of the airplane maintenance records revealed the airplane was last inspection on June 29, 2004, in accordance with, "...the scope and detail of the inspection program approved by the FSDO for BAC 167 Strikemaster dated 29 June 2001 and found it to be in safe operating condition at this time." The logbook entry does not indicate airplane total time; therefore, the time since the inspection was not determined. There was no record that U.K. CAA MPD No. 2002-001 R1 had been complied with."	
22.	RAF Form 700 (Serviceability Log)	Request and review the RAF Form 700 (F700) files for the aircraft.	
		Additional Information: This form contains the servicing and flying records for each aircraft. Typically, the pilot would sign for the aircraft in the F700 before walking out to check it and takeoff. The pilot signs the F700 when the flight is complete, entering the flying times and any problems he encountered. The ground crews enter the servicing they have completed on the aircraft and sign the F700. The F700 provides a very good record on the operational history of a particular Hunter.	
23.	Aircraft Discrepancies	Ask the applicant to provide all available aircraft discrepancies records. Review those records for (1) issues listed/identified, and (2) corrective action Such a review will assist in assessing not only the aircraft's condition, but also past operators and practices. See *RAF Form 700* above.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
24.	Swiss Air Force (SAF) Modifications (General)	Ask the applicant to produce data to indicate whether the aircraft (if it is an Ex-SAF Mk. 58, 58, or T68), received the SAF modifications in effect at the time of disposal (1993-1996). It is important to establish a baseline, in terms of conditions for example, at the time the aircraft as disposed.	
		Additional Information: There would be a difference if the aircraft in question was disposed as a spares source or if when disposed, it had been stored and thus, not operated to the latest standards. Note: A good reference is *Swiss Hunter Improved Store Carriage*, Hawker Siddeley, 1972, and Hunter, Jamie*, Aircraft Upgrades 2005/2006 (Jane's Aircraft Upgrades)*, May 2005.	
25.	Swiss Hunter 80 Modifications	Ask whether the aircraft was one of the Hunters modified by the Swiss Air Force to the Hunter 80 standard.	
		Additional Information: This is important because the Hunter 80 program resulted in many weapons system upgrades, (that is, RWR, AGM-65 wiring). The issue is to ensure the weapon related systems are removed or otherwise made inoperable. Refer to *Demilitarization,* below.	
26.	Swiss Maintenance	Ask whether the aircraft was one of the Hunters maintained by either Pilatus Aircraft or/and FFA (Flugzeugfabrik Altenrhein).	
		Additional Information: This is important because, until 1990, these two companies (with the direct oversight and in the case of FFA, ownership by the Swiss government) had an involvement with the maintenance and operation of the aircraft under contract with the Swiss Logistics Command. In the case of Pilatus, that company provided inspections to several civil Hunters after their disposal. As a Hunter operator noted, "the SAF standard of maintenance had been simply amazing, and every part of the aircraft was – and remains – in outstanding condition." Wheeldon, *Hunter Odyssey,* 1998. This type of information provides a better understanding of the aircraft original condition when first certificated as a civil aircraft, and, in conjunction with any other subsequent operations and related maintenance, may have an impact on the current airworthiness effort. It certainly marks a difference from many Hunters assembled from wrecks or parts.	
27.	ENAER Modifications (Chile)	Ask whether the aircraft comes from the Chilean Air Force. If so, ask if the aircraft was modified by the Chilean Air Force by ENAER under a SILOP (System Improvements in Lieu of Production) program.	
		Additional Information: These modifications, from 1989 onward, were known as Program Águila I and II, and included a re-designed cockpit, instrumentation, new wiring, electric upgrades and new engine starter. This is important because several of the ENAER updates resulted in many weapons system upgrades. The issue is to ensure the weapon related systems are removed or otherwise made inoperable. Refer to *Demilitarization,* below. Note: ENAER was also responsible for the overhaul of the Chilean AF Hunters, and thus those records may be of use in establishing a baseline for the aircraft.	
28.	Ex-Danish Air Force Hunters	Ask whether the aircraft is an Ex-Danish Air Force Hunter (i.e., Hunter Mk.51). This is relevant because when the Danish Air Force Hunters were retired, the aircraft is not in good condition due to poor maintenance and chronic lack of spares.	
		Additional Information: Their condition was the reason why the manufacturer did not purchase the aircraft back from the Danish Air Force for refurbishment and resale, which was a common practice at the time for the Hunter manufacturer.	
29.	Ex-Qatar Emiri Air Force Hunters	Ask whether the aircraft is an Ex-Qatar Emiri Air Force Hunter. This may be relevant because when these Hunters were retired (1981), they were used to generate spare parts.	
		Additional Information: The aircraft which had been in long-term storage were later sold to a UK company and their whereabouts are unknown. One of the main issues with these aircraft would be aircraft records and restoration documentation.	
30.	Ex-Oman Air Force Hunters	Ask whether the aircraft is an Ex-Oman Air Force Hunter. This would apply to Hunter T68s.	
		Additional Information: This may be relevant because after retirement, many of Oman's Hunters were used as instructional airframes and store outdoors for many years. Their condition, even after possible exportation to the UK, is questionable. In 2005, a particular Hunter T68 may have been sold to a UK company (Hunter Flying Club) and its actual condition is unknown. One of the main issues with these aircraft would be aircraft records and restoration documentation.	
31.	Ex-Australian Hunters (Civil)	Ask whether the aircraft has been imported from Australia. If so, the aircraft will likely be an Ex-RSAF (Republic of Singapore Air Force) Hunter Mk.74 and/or T75 (two-seater). If so, ask for the Australian Civil Aviation Authority (CAA) airworthiness and registration records.	
		Additional Information: This is important, especially the operating limitations, because it established a baseline for the airworthiness certification of the aircraft. In addition, these aircraft should have their RSAF records as well. Note: In Australia, Hunters are certificated in the Limited category, similar to the experimental exhibition category in the U.S. See *Previous Registry (Other Than U.K.)* below.	

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32.	Ex-New Zealander Hunters (Civil)	Ask whether the aircraft has been imported from New Zealand If so, it will likely be an Ex-RSAF (Republic of Singapore Air Force) Hunter Mk.74 and/or T75 (two-seater). If so, ask for the New Zealand Civil Aviation Authority (CAA) airworthiness and registration records. Additional Information: This is important, especially the operating limitations, because it established a baseline for the airworthiness certification of the aircraft. In addition, these aircraft should have their RSAF records as well. See *Previous Registry (Other Than U.K.)* below.	
33.	Ex-Swedish Hunters (Civil)	Ask whether the aircraft has been imported from Sweden. If so, ask for the Swedish Civil Aviation Authority (CAA) airworthiness and registration records. Additional Information: This is important, especially the operating limitations, because it established a baseline for the airworthiness certification of the aircraft. Note: There are six airworthy Hawker Hunters in Sweden. None of them are ex-Swedish Air Force although some of them are painted in a Swedish scheme. • SE-DXA Scandinavian Historic Flight, Halmstad, (J-4089) F 9 blue G (1995) Mk.58; • SE-DXA Scandinavian Historic Flight, Halmstad, (J-4089) F 9 blue G (1995) Mk.58;. • SE-DXC Västgöta Veteranflygförening, Såtenäs (from 2001), (J-4101) F 10 blue C (1995 (Eskilstuna Flygmuseum, Kjula) Mk.58A; • SE-DXD Flygvapenmuseum, Kjula (deposited with Eskilstuna Flygmuseum at Kjula) (J-4030) (1995) Mk.58; • SE-DXE Västgöta Veteranflygförening, Trollhättan (J-4076, G-HONE) F 9 red E (1996) Mk.58; • SE-DXF Västgöta Veteranflygförening, Trollhättan (J-4087, G-HTWO) F 9 blue F (1996) Mk.58; • SE-DXH Avancerad Flygträning, Hässlö (XL616, G-BWIE) (1997) Mk.7A; See *Previous Registry (Other Than U.K.)* below.	
34.	Ex-South African Hunters (Civil)	Ask whether the aircraft has been imported from South Africa. If so, ask for the South African Civil Aviation Authority (CAA) airworthiness and registration records. Additional Information: This is important, especially the operating limitations, because it established a baseline for the airworthiness certification of the aircraft. In addition, these aircraft were involved in an accident investigation which determined that there were serious maintenance deficiencies with the manner in which the operator maintenaed their aircrft, including the Hunters. See *Previous Registry (Other Than U.K.)* below.	
35.	Ex-Canadian Hunters (Civil)	Ask whether the aircraft has been imported from Canada. If so, ask for Transport Canada's airworthiness and registration records. Additional Information: This is important, especially the operating limitations, because it established a baseline for the airworthiness certification of the aircraft. Note: The certification basis for these aircraft is CAR Standard 507.03 (5)(b) *Ex-military Aircraft,* 507D, and (AMA) 507D/2 *Airworthiness Manual Advisory*. Canadian Hunters are likely to have a Special Certificate of Airworthiness – Limited. For additional details on 507, see http://www.tc.gc.ca/eng/civilaviation/regserv/cars/. Several of the Hunters operating in the US came from Canada, and specifically from two companies, Northern Lights (no longer in existence) and/or Lortie Aviation, in Quebec.	
36.	Ex-Brazilian Hunter (Civil)	Ask whether the aircraft has been imported from Brazil. If so, ask for the ANAC's (Brazilian CAA) Experimental Flight Certificate (Certificado de Autorização de Voo Experimental, Form F-100-03N) under BRAC 21.191, and consider its limitations as part of the US airworthiness certification procedures. This Flight certificate is only valid for one year. Additional Information: In 2000, ENAER also performed an overhaul on a Hunter T72 (PP-XHH) that was purchased by Embraer in Brazil and is today used as a chase and photographic platform. That aircraft has had its airworthiness certificate renewed in December 2012.	
37.	U.K. MRCOA and AvP67 Status	Ask the applicant whether the aircraft was ever operated in the United Kingdom as a MRCOA (Military-registered, Civilian Owned Aircraft). If so, ask the applicant to produce the associated maintenance, operations, SMS, and QA requirements. This is called the "AVP67 status." Additional Information: Operating Hunters as it is done under the MRCOA program incorporates a higher level of safety than most because it is based on an equivalent standard to those required by the U.K.'s MOD (Ministry of Defense) in all of the UK military aircraft fleets, RAF, Royal Navy, and Army. This is important because it will assist FAA in determining the adequate requirements and limitations in certificating the aircraft.	
38.	UK CAA Airworthiness Approval Notes	Relevant UK CAA Airworthiness Approval Notes for the Hawker Hunter are extremely important for the whole airworthiness process. The airworthiness certification of Hunter aircraft without regards to these documents would not be prudent. Additional Information: These documents, which are aircraft-specific, contain the terms and conditions for Hunter operations in the UK. They include details on the specific aircraft and detailed technical information on the different versions and variants of the Hunter. They also address major airworthiness issues, such as inspections, required documentation, relevant previous military requirements, and, in some cases, airworthiness developments since the aircraft was phased out of military service. UK CAA Airworthiness Notes can be found at http://www.caa.co.uk/application.aspx?catid=340&pagetype=65&appid=10.	

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39.	Previous U.K. CAA Registry	Ask the applicant to identify whether the aircraft was previously in the U.K. registry. This is important because safety related issues and requirements may have been identified for those aircraft in terms of airworthiness and operating limitations.	
		<u>Additional Information:</u> Known U.K. registration numbers include: 1. G-BABM HAWKER HUNTER Mk. 74 2. G-BOOM HAWKER HUNTER T7 3. G-APUX HAWKER HUNTER T66 4. G-BVGH HAWKER HUNTER T7 5. G-BVVC HAWKER HUNTER F6 6. G-BVWN HAWKER HUNTER T7 7. G-BVWG HAWKER HUNTER T8 8. G-BVYI HAWKER HUNTER T8 9. G-BVYH HAWKER HUNTER GA11 10. G-BWFR HAWKER HUNTER Mk.58 11. G-BWFS HAWKER HUNTER Mk. 58 12. G-BWFT HAWKER HUNTER T8M 13. G-BWGL HAWKER HUNTER T8C 14. G-BWGK HAWKER HUNTER GA11 15. G-BWGN HAWKER HUNTER T7 16. G-BWKC HAWKER HUNTER Mk. 58 17. G-BWOU HAWKER HUNTER Mk.58 18. G-BXFI HAWKER HUNTER T7 19. G-BXKF HAWKER HUNTER T7 20. G-BZPB HAWKER HUNTER GA11 21. G-BZPC HAWKER HUNTER GA11 22. G-BZSE HAWKER HUNTER T8B 23. G-BZSR HAWKER HUNTER T7 24. G-BZSF HAWKER HUNTER T7 25. G-BZRI HAWKER HUNTER T7 26. G-BZRH HAWKER HUNTER GA11 27. G-CGHU HAWKER HUNTER T8C 28. G-EGHH HAWKER HUNTER MK.58 29. G-ETPS HAWKER HUNTER FGA9 30. G-FFOX HAWKER HUNTER T7A 31. G-GAII HAWKER HUNTER GA11 32. G-HHAC HAWKER HUNTER MK.58 33. G-HHAF HAWKER HUNTER Ml. 58 34. G-HHAG HAWKER HUNTER Mk. 58A 35. G-HPUX HAWKER HUNTER T7 36. G-HUNT HAWKER HUNTER Mk. 51 37. G-HVIP HAWKER HUNTER Mk.50 38. G-KAXF HAWKER HUNTER F6.A 39. G-PRII HAWKER HUNTER PR11 40. G-PSST HAWKER HUNTER MK.58A 41. G-SIAL HAWKER HUNTER Mk.58 42. G-TVII HAWKER HUNTER T70 43. G-VETA HAWKER HUNTER T7 Note: Hawker Aircraft Limited (HAL) serial numbers can be used to aid in identification. An example is 41H-693751.	

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40.	Previous Registry (Other Than U.K.)	In addition to asking the applicant to identify whether the aircraft was previously in the U.K. registry (refer to above), ask whether the aircraft was registered and/or operate country.	
		Additional Information: This is important because safety related issues and requirements may have been identified for those aircraft in terms of airworthiness and operating limitations. Known civilian registration numbers include— **Registration** **Hunter Version/Variant** 1. C-FRHU HAWKER HUNTER Mk. 58 2. C-FUKW HAWKER HUNTER T68 3. C-GJMP HAWKER HUNTER Mk.58 4. C-GZIB HAWKER HUNTER Mk. 58 5. C-GZIC HAWKER HUNTER Mk. 58 6. C-GZKP HAWKER HUNTER Mk. 58 7. F-AZHS HAWKER HUNTER Mk. 58 8. HB-RVR HAWKER HUNTER T68 9. HB-RVS HAWKER HUNTER Mk. 58 10. HB-RVU HAWKER HUNTER Mk. 58 11. HB-RVQ HAWKER HUNTER Mk. 58 12. HB-RVW HAWKER HUNTER T68 13. HB-RVP HAWKER HUNTER T68 14. HB-RVV HAWKER HUNTER T68 15. LN-HNT HAWKER HUNTER Mk. 58 16. PH-NLH HAWKER HUNTER T7 17. SE-DXA HAWKER HUNTER Mk. 58 18. SE-DXE HAWKER HUNTER Mk. 58 19. SE-DXF HAWKER HUNTER Mk. 58 20. SE-DXI HAWKER HUNTER Mk. 58 21. SE-DXM HAWKER HUNTER Mk. 58 22. SE-SXM HAWKER HUNTER Mk. 58 23. VH-FRA HAWKER HUNTER Mk.74 24. VH-FRH HAWKER HUNTER Mk.74 25. VH-HMS HAWKER HUNTER T7 26. VH-RHO HAWKER HUNTER T75 27. VH-XHH HAWKER HUNTER T75 28. ZK-JIL HAWKER HUNTER Mk. 74 29. ZU-AVC HAWKER HUNTER Mk.58 30. ZU-AUJ HAWKER HUNTER F6 31. ZU-ATHG HAWKER HUNTER T8 32. ZU-HUN HAWKER HUNTER T68 33. 3D-HUN HAWKER HUNTER MK.58	
41.	Availability of Documents	Review the aircraft inspection program (AIP) to verify compliance with the applicable version of Hawker Hunter aircraft list of applicable publication manuals or equivalent document.	
		Additional Information: This document should contain the applicable SAF/NATO technical guidance. Note: Where applicable, equivalent SAF documents, such as engineering orders, are acceptable.	

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42.	Adequate Hawker Hunter and Rolls-Royce Avon Manuals and Related Documentation	Ensure the existence of a complete set of the applicable manuals (SAF or NATO), such as flight manuals, inspections and maintenance manuals, and engine manuals. An ope must have the applicable technical orders (TO) to address known issues related to airworthiness, maintenance, and servicing.	
		Additional Information: The use of and reference to SAF manuals are made in this document because they represent an equivalent to the acceptable U.S. Air Force (USAF) or NATO references. Also, in RAF parlance, the term Pilot Notes was used in lieu of Flight Manual. Examples of Hawker Hunter/Rolls-Royce Avon manuals include— • Hunter F Mk. 2 Aircraft-General and Technical Information, Air Publication 4347B; Hunter F Mk. 4 Aircraft-General and Technical Information, Air Publication 4347D. • Hunter F Mk. 4 Aircraft-General and Technical Information, Air Publication 4347F; Hawker Hunter F Mk. 2 Aircraft Maintenance Manual-General. • Flight Reference Cards (AP101B-1309-14 at AL 7). • Aircraft Repair Manual Hawker T Mk.7, Mk.7A and T Mk. 8 Variants, Royal Air Force, 1961. • Hunter T Mk. 88 and C-Illustrated Parts Catalog (IPC). Royal Air Force, September 1976. • Hawker Hunter T8 B C Aircraft Schedule of Spare Parts Manual. • Hawker Hunter F Mk. 2 Aircraft Maintenance Manual-General. • AP 4347J-PN Pilots Notes (July 1960 amended to AL7). • AP No. 5037 Ejection Seat Safety Precautions; AP No. 5673 Hood Jettison Mechanism. • AP 1095 and AP 4343 Series – Electrical Equipment Manuals. • AP No. 4282 Fuel System Components. • AP No. 4601A Fairey Powered Flying Controls. • AP No. 2306G Pressure Cabin Testing, Servicing Trolley; AP No. 4340 Pressurizing and Air Conditioning Equipment. • AP 101B-1307-1 Aircraft Servicing Manual Mk 9 (to AL27). • AP 101B-1307-2 General Orders and Modifications. • AP 101B-1300-5A1 *Master Servicing Schedule Hunters All Marks* and *Component Replacement List (Mandatory Changes) Hunters All Marks.* • AP 101B-1307-3 Pt 1 Parts Catalogue ; AP 101B-1302 -3 Pt 1 Parts Catalogue. • AP 108C-00507-1 Brake Parachute Type LB52-MK3 Repair and Packing. • AP 1108C-0128-12F Martin –Baker Parachute, General and Technical Information; AP 109B-0131-1 Martin-Baker Ejection Seats, General and Technical Information. • AP 109B-0131-15F Martin-Baker Ejection seats, Bay servicing, Type 4H; AP 109B-0117-15F Martin-Baker Ejection seats, Bay servicing, Type 3H. • AP 109B-0117-15 Issue 11-Seat Maintenance and Overhaul Manual; AP 109B-0131-15F Ejection Seat Mk 4 General and Technical. • Ejection Seats (MARTIN-BAKER), JYPE3H, (HUNTER F Mk 6, F (GA) Mk 9 and FR Mk 10 AIRCRAFT) General and Technical Information, Bay Servicing Schedule. • AP 101B-1303, Including Bay Servicing Manual. • AP 101B-1302 and 3-15 Hunter Mk T7 Aircrew Manual (amended to AL 9 December 1992). • AP 101B-1302-1 Hunter Mk T7 Aircraft Servicing Manual. • AP 101B-1302-2 General Orders and Modifications. • AP 101B-1302-6A Repair Manual. • AP 101B-1307-01 Aircraft Servicing Manual. • AP 4515C Parts 1 and 2 Schedule of Spare Parts for Dowty Equipment Fitted to Hunter Aircraft. • AP 4515P Vol. 3, Part 1, Fairy Powered Flying Control Unit and Equipment Fitted to Hunter Aircraft Schedule of Spare Parts. • AP 101B-1300-5A3A Hunter Servicing Procedure for Component Replacement. • AP 101B-1300-5A3B Hunter All Marks, Servicing Procedures for Functional Checks and Tests; • AP 101B-1300-5A3C Hunter All Marks, Servicing Procedures, Servicing Diagrams and Miscellaneous. • 6F/K-1 Hunter Illustrated Parts Catalogue. • AP 101B-1301, 1307-9-6A Aircraft Repair Manual, Major and Minor. • AP 101B-1300-5M Hunter All Marks, Flight Test Schedule. • AP 101B-1300-5A2 Hunter All Marks, Safety and Servicing Notes. • AP 4481 Schedule of Spare Parts, Avon Mark 20300 Series and Avon Mark 20700 Series Aero-Engine Change Unit. • AP 102C-1512 to 1517-1 Avon 100 series General and Technical. • AP 102C-1512 to 1517-1 Avon 100 series In-service Repairs. • AP 102C-1503, 1507-1 Avon Mk. 20300 and Mk. 20700 Engine Change Units, General and Technical Information. • AP 102C-1503, 1507-6A Avon Mk. 20300 and Avon Mk. 20700 Series Engine Change Units (ECU), Minor and In-Service Repair.	

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43.	Applicant/Operator Capabilities	Review the applicant's/operator's capabilities, manpower, general condition of working/storage areas, availability of spare parts, and equipment.	
		Additional Information: Note: In 2012, some U.K. operators state a properly operated Hunter in the United Kingdom can cost up to £4,000 (£3,000 in fuel). In addition, in 1984, the Royal Navy's Fleet Requirements and Air Direction Unit (FRADU) operated 14 Hunter GA11s and 8 Hunters T8Cs. These aircraft were supported by 200 civilian personnel employed by two companies, Air Work and Flight Refueling Aviation (FRA), and Flight Refueling Services (FRS). This is relevant because it can be used as a baseline of a civilian entity operating a significant fleet of Hunters to an acceptable standard.	
44.	Scope and Qualifications for Restoration, Repairs or Maintenance	Familiarize yourself with the scope of the restoration, repairs, and maintenance conducted by or for the applicant.	
45.	Limiting Duration of Certificate	Refer to § 21.181 and FAA Order 8130.2, regarding the duration of certificates, which may be limited.	
		Additional Information: An example would be to permit operations for a period of time to allow the implementation of a corrective action or changes in limitations. In addition, an ASI may limit the duration if there is evidence additional operational requirements may be needed at a later date.	
46.	Compliance With § 91.319(a)(1)	Inform the operator operations of the aircraft are limited under this regulation. The aircraft cannot be operated for any purpose other than the purpose for which the certificate was issued.	
		Additional Information: For example, in the case of an experimental exhibition certificate, the certificate can be used for air show demonstrations, proficiency flights, and flights to and from locations where the maintenance can be performed. Such a certificate is NOT IN EFFECT for flights related to providing military services (that is, air-to-air gunnery, target towing, ECM simulation, cruise missile simulation, and air refueling). Also refer to *Military/Public Aircraft Operations,* below.	
47.	Multiple Certificates	Ensure the applicant submits information describing how the aircraft configuration is changed from one to the other in those cases involving multiple airworthiness certificates.	
		Additional Information: This is important because, for example, some research and development (R&D, see below) activities may involve equipment that must be removed to revert back to the Exhibition configuration. Moreover, the procedures should provide for any additional requirement(s), such as additional inspections, to address situations such as high-G maneuvering that could have an impact on the aircraft and/or its operating limitations. Similarly, it should address removing R&D equipment that could be considered part of a weapon system may be required (refer to *Demilitarization* below). Recommend that FAA Order 8130.29, Issuance of a Special Airworthiness Certificate for Show Compliance and/or Research and Development Flight Testing be reviewed because there are many elements that are valuable for former military combat aircraft engaged in R&D operations.	
48.	Public Aircraft Operations, State Aircraft Operations, Military Support Missions, DOD contracts	The special airworthiness certificate and attached operating limitations for this aircraft are not in effect during public aircraft operations as defined by US Code.	
		Additional Information: They are also not in effect during state aircraft operations (typically military support missions, military contracts), as defined by Article 3 of ICAO's Convention on International Civil Aviation. *Aircraft used in military services are deemed state aircraft.*	
49.	Re-Conforming to Civil Certificate	Prior to operating this aircraft under the special airworthiness certificate issued following a public, state, or military aircraft operation, the aircraft must be returned via an approved method to the condition and configuration at the time of airworthiness certification.	
		Additional Information: This action must be documented in a log or daily flight sheet. Ensure the applicant submits information describing how the aircraft configuration is changed from public aircraft operations, state aircraft, or other non-civil operation back to a civil certificate. This is important because, for example, some military support activities may involve the use of equipment, certain maneuvers that must be removed or mitigated to revert back to original Exhibition or R&D configuration. Moreover, the procedures should provide for any additional requirement(s), such as additional inspections, to address situations such as high-G maneuvering and sustained Gs that could have an impact on the aircraft and/or its operating limitations. Similarly, it should address removing equipment that could be considered part of a weapon system may be required (refer to *Demilitarization* below).	

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50.	Restrictions on Operations Overseas	Inform the applicant/operator that operations may be restricted and permission must be granted by a foreign CAA. The applicable CAA may impose any additional limitations it deems necessary, and may expand upon the restrictions imposed by the FAA on the aircraft. In line with existing protocols, the FAA will provide the foreign CAA any information, including safety information, for consideration in evaluating whether to permit the operation of the aircraft in their country, and if so, under what conditions and/or restrictions. It is also noted any operator offering to use a U.S. civil aircraft with an experimental certificate to conduct operations such as air-to-air combat simulations, ECM, target towing for aerial gunnery, and/or dropping simulated ordinances pursuant to a contract or other agreement with a foreign government or other foreign entity would not be doing so in accordance with any authority granted by the FAA as the State of Registry or State of the Operator.	
		<u>Additional Information:</u> On the issue of operations overseas: • Under international law, the aircraft will either be operated as a civil aircraft or a state aircraft. The aircraft cannot have a combined status. If the aircraft are to be operated with civil status, then they must have FAA-issued airworthiness certificates. If the applicant/operator is seeking experimental certificates for R&D or Exhibition purposes for the aircraft, and if the FAA issues (or renews) those certificates for the aircraft, then the only permissible operation of the aircraft as civil aircraft in a foreign country, is for an R&D or Exhibition purpose. The applicant/operator cannot be allowed to accomplish other purposes during the same operation, such as performing the contract for a foreign air force. This position is necessary to avoid telling an operator that any R&D or Exhibition activity could serve as a cover for a whole host of improper activities using an aircraft with an experimental certificate for R&D or Exhibition purposes, rendering the R&D or Exhibition limitation on the certificate meaningless. • The R&D or Exhibition activity would be a pretext for the real purpose of the operation. Accordingly, in issuing experimental certificates for an R&D or Exhibition purpose, the FAA must make it clear that any other activities or purposes for the operation are outside the scope of permitted operations under the certificate. The FAA must also make clear that the operation as a civil aircraft requires the permission of the foreign civil aviation authority (CAA). In requesting that permission, the applicant/operator should advise the foreign aviation authority that the operation will be for an R&D or Exhibition purpose only and for no other purpose, including performing a contract for any foreign military organization. • The applicant/operator must understand that if the foreign CAA asks FAA about the operation, the FAA will state “that the only permissible purpose of the operation is R&D or Exhibition, and an operation for any other purpose, even when conducted in conjunction with an R&D or Exhibition purpose, is outside the scope of the operations allowed under the certificate. • If the applicant/operator operates the aircraft as state aircraft, then the national government of some country will have designated the aircraft as its state aircraft, and the host country, will have given the aircraft permission to operate through the issuance of a diplomatic clearance. That diplomatic clearance should include whatever terms and conditions that CAA deems necessary or appropriate for the operation. • The aircraft, when operated as state aircraft, does not need an FAA airworthiness certificate, and the pilots of those aircraft do not need to hold FAA-issued airman licenses. Safety oversight responsibility for aircraft designated as state aircraft rests with the country that made the state aircraft designation. • If a country issues a diplomatic clearance for the operation of the aircraft, the aircraft would be deemed to be a state aircraft of the country requesting that clearance. Safety oversight would rest with the military service that requested the diplomatic clearance.	
51.	R&D Airworthiness Certification	R&D certification requires a specific project(s). The applicant must provide detailed information such as: • Description of each R&D project providing enough detail to demonstrate it meets the regulatory requirements of §21.191(a); • Length of each project; • Provide the intended aircraft utilization to include the number of flights and/or flight hours for each project; • Aircraft configuration; • Describe the area of operation for each project; • Coordination with foreign CAA, if applicable; • Provide contact information for the person/customer we may contact to verify this activity.	
		<u>Additional Information:</u> Note: All applications for an R&D certificate should include review of FAA Order 8130.29, *Issuance of a Special Airworthiness Certificate for Show Compliance and/or Research and Development Flight Testing*.	

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52.	FAA ASI Safety Discretion	Under existing statutes, regulations and polices, FAA field inspectors have discretion to address any safety issue that may be encountered whether or not it is included in the job aid. The field inspector may add any requirements necessary for safety.	
		Additional Information: Of course, in all cases, there should be justification for adding requirements. In this respect, the job aid provides a certain level of standardization to achieve this, and in addition, AIR-200 is available to coordinate a review (with AFS-800 and AFS-300) any proposed limitations an inspector may consider adding or changing. 49 U.S.C. § 44704 states that before issuing an airworthiness certificate, the FAA will find that the aircraft is in condition for safe operation. In issuing the airworthiness certificate, the FAA may include terms required in the interest of safety. This is supported by case law. 14 CFR § 21.193 *Experimental Certificates: General* requires information from an applicant, including, "upon inspection of the aircraft, any pertinent information found necessary by the Administrator to safeguard the general public." 14 CFR § 91.319 *Aircraft Having Experimental Certificates: Operating* provides that "the Administrator may prescribe additional limitations that the Administrator considers necessary, including limitations on the persons that may be carried in the aircraft." Finally, in FAA Order 8130.2G *Airworthiness Certification of Aircraft and Related Products*, Chapter 4 *Special Airworthiness Certification*, effective April 16, 2011, also states that the FAA may impose any additional limitations deemed necessary in the interest of safety.	
53.	Demilitarization	Verify the aircraft has been adequately demilitarized. This aircraft must remain demilitarized for all operations. There have been many cases where aircraft have been certificated as experimental exhibition and R&D with active weapon systems. This includes Hunters. The Hawker Hunter is a fighter-bomber. As such, it would be equipped with weapon systems. Removal of the gun pods alone does not suffice. Wiring, switches, and other subsystems ((Master Armament Panel) must be removed or disabled as well. In the case of wiring, the firing circuitry must not have any continuity to it.	
		Additional Information: Depending on the version or variant, weapon systems installed in the Hunter include: ➢ MASB wiring and plug; ➢ Ferranti GGS Mk. 8 gyro gun sight and Sperry Mk.8S gun sight; ➢ Saab BT9K bombing computer; TABO Low Altitude Bombing System; ➢ Blue Fox radar on some Ex-Royal Navy Hunters T8; ➢ Buccaneer S2 instrumentation; ➢ Chaff and flares (i.e., Tracor AN/ALE-40 chaff and flares dispenser, ENAER Eclipse, MJU-7/B, RR-170 chaff cartridges); ➢ CFP-76 pod (SAF IR flare/chaff launcher) ➢ Radar warning receiver (RWR) such as Melpar AN/ALE-39, ENAER Calquen II RWR, AN/APR-9; ➢ 80 mm Hispano SURA rockets, SNEB rocket pod; Mk. 12, Oerlikon, Hispano, T.10 or Bofors rocket rails; ➢ Swiss 991 lbs. and BL. 755 bombs; Hunting BL-755 CBU; ➢ Paveway II Enhanced Laser Guided Training Round (ELGTR); ➢ Model 78 CBLS practice bomb launcher; BDU-57 Laser-Guided Training Round; ➢ HITS (Hunter Integrated Threat System) system; ➢ ACMI pod [AN/ASQ-T50(v2)]; AIM-9 acquisition rounds and wiring (outboard pylons); AGM-12 and AGM-65 capability; ➢ Ericsson Erijammer A-100; ➢ T-708 VISTA pod (combination ECM and chaff/flare system, VISAT IV and VISTA V); ➢ Spray tanks (chemical spraying); ➢ ALQ-167 ECM pod. See http://www.rodaleelectronics.com/products/an-alq-167/ew-training-pods/ ➢ Northrop ALQ-171(v) ECM pod. Safety issues with these systems include inadvertent discharge of flares, toxic chaff, overloads of the aircraft electric system, danger of inadvertent release, equipment fires, (gun sights) structural damage, complex flight limitations, and harmful emissions. For example, electromagnetic radiation from antennas fed by high–powered transmitters can potentially injure personnel in the vicinity of the radiating antennas. See NAVAIR's *Hazards of Electromagnetic Radiation* at http://www.navair.navy.mil/ibst/03_E3/hero_herp_herf.html. T.O. 00-80G-1, *Make Safe Procedures for Public Static Display*, dated November 30, 2002, can be used as a reference as well. In addition to Department of Defense MANUAL 4160.28, Volume 3, June 7, 2011 *Defense Demilitarization: Procedural Guidance*, the use of the Hunter's weapon manuals may be necessary to identify what components of the Hunter weapon system must be removed. To illustrate the issue, we note one December 2011 advertisement for a former military combat aircraft includes the armament and the advertisement stated the aircraft's armament and special equipment included 2 NR-23 23mm cannon. Another ad noted the aircraft overhaul included weapon "re-re-installation" and "ops check." Many advertise their aircraft provide valid fighter radar threats with "radar wielding aircraft" as well as ALQ-167, AST-6/9 and other jammer pods. In some cases, some restorers pride themselves of essentially preserving many of the aircraft weapon systems. As a reminder, it is noted that recently, a Douglas A-1 that was imported into the U.S. with some of its weapon systems was seized by the U.S. government. It resides now at the Naval Aviation Museum in Pensacola, Florida.	

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54.	Federally Obligated Airport Access	Inform the operator that Hawker Hunter operations may be restricted by airports because of safety considerations. As provided by Title 49 of the United States Code (U.S.C.) § 47107(a), a federally obligated airport may prohibit or limit any given type, kind, or class of aeronautical use of the airport if such action is necessary for the safe operation of the airport or necessary to serve the civil aviation needs of the public. Additional Information: Additionally, per FAA Order 5190.6, the airport should adopt and enforce adequate rules, regulations, or ordinances as necessary to ensure safety and efficiency of flight operations and to protect the public using the airport. The prime requirement for local regulations is to control the use of the airport in a manner that will eliminate hazards to aircraft and to people on the ground. In all cases concerning airport access or denial of access, and based on FAA Flight Standards Service safety determination, FAA airports are the final arbiter regarding aviation safety and will make the determination (Director's Determination, Final Agency Decision) regarding the reasonableness of the actions that restrict, limit, or deny access to the airport (Refer to FAA Docket 16-02/08, FAA vs. City of Santa Monica, Final Agency Decision, FAA Order 2009-1, July 8, 2009, and FAA Docket 16-06-09, Platinum Aviation and Platinum Jet Center BMI v. Bloomington-Normal Airport Authority).	
55.	Environmental Impact (Noise)	Inform the applicant/operator that Hawker Hunter operations may be restricted by airport noise access restrictions and noise abatement procedures in accordance with 49 U.S.C. § 47107. Additional Information: As a reference, refer to FAA Order 5190.6, *FAA Airport Compliance Manual*.	
56.	Overall Airworthiness and US 2003 Hunter T7 Accident	The importance of considering the issues discussed in this attachment is best illustrated by the following National Transportation Safety Board (NTSB) accident report concerning a 2003 Hunter T7 fatal accident. Additional Information: The report stated: "The pilot of the Hawker Hunter performed three aborted takeoffs in the 4 days that preceded the accident flight. A witness reported that each time, the pilot reported the brakes were dragging. The pilot also reported the engine was running "cool," but was OK. On the fourth attempted takeoff, witnesses reported the engine did not sound as loud as they expected and the airplane appeared slow. At the end of the 7,500 ft runway, the airplane abruptly pitched up, became airborne with wings rocking from side to side, and then disappeared below the level of the runway. The airplane impacted in an open field, below the level of the runway, in a nose high attitude and traveled into a wooded area. The pilot initiated ejection; however, the canopy did not separate from the airplane and the seat went through it. Three of the four canopy locks were found still locked. Water was found in the fuel filter. The airplane had received a replacement engine a month earlier, but was not signed off as airworthy. When the engine was ground run after the change, it was found to not meet two separate acceleration tests. The owner reported the maintenance records were on the airplane; however, none were found, and he never produced any documents to determine the airworthiness of the airplane. The last known annual inspection occurred 13 months before the flight. The airplane had been in non-preserved storage for over a year. The owner had de-registered the airplane with the FAA, with the intent of moving it to Canada; however, he had not applied for Canadian registration. After each aborted takeoff, the airplane was worked on by two non-certificated mechanics. The National Transportation Safety Board determines the probable cause(s) of this accident as follows: The pilot's failure to abort the takeoff, after the engine experienced a partial power loss for undetermined reasons. Factors were the pilot's improper preflight planning by his failure to determine if the airplane was airworthy, and the operators inadequate maintenance on the airplane, the use of non-certificated mechanics to perform the work on the airplane, and his failure to ensure the airplane met the minimum standards necessary for flight. See http://dms.ntsb.gov/aviation/AccidentReports/.	
57.	Overall Airworthiness and UK 1998 Hunter F4 Accident	This accident report is extremely valuable in illustrating several of the safety issues with the Hunter. Additional Information: In addition to making several important recommendations, the AAIB report discusses aircraft information, maintenance history, safety and survival aspects, previous accidents and incidents, conclusions and recommendations. See http://www.aaib.gov.uk/cms_resources.cfm?file=/dft_avsafety_pdf_502233.pdf.	
58.	2009 Crash of ZU-BEX	It is recommended that the accident report concerning the 2009 Lightning T5 ZU-BEX be reviewed in detail. Additional Information: This report, published by the South African CAA in August 2012, provides valuable insight into the consequences of operating complex and high-performance former military jet aircraft (FMJA) in an unsafe manner. The relevant issues identified in the report include (1) ignoring operational history and accident data, (2) inadequate maintenance practices, (3) granting extensions on inspections, (4) poor operational procedures, and (5) inadequate safety oversight. Many of the issues discussed and documented in the accident investigation report are directly relevant to safety topics discussed in this Hawker Hunter airworthiness review document. The South African CAA report can be found at http://www.caa.co.za/. In commenting on this accident, a South African pilot noted: "The maintenance failures which if not directly causing the crash of ZU-BEX, certainly sealed the doom of its pilot, were exactly the issues the CAA were wary of when they did all they could to prevent the aircraft's export to South Africa. It's always been a thorny issue; the desire to see these museum pieces fly, balanced against the fact that they are highly sophisticated machines operating in extreme environments, and were designed with the assumption that the full technical, legal and logistical might of a national Air Force would be behind them at all times. The "Pioneer" spirit kept ZU-BEX flying, but what's hard to ignore is that same Get it done attitude resulted in her destruction. The accident report is resplendent with violations, both small and serious, ranging from expired Ejection Seat explosive rounds to a poor Aerodrome Safety Officer. This is a supersonic interceptor over half a century old. It must be maintained meticulously, and nothing - absolutely nothing - can ever be assumed, guessed, inferred, or left to chance or something will go wrong, and someone will die. If nothing else, this report is worth its weight in gold to Restoration Efforts for XS422. This is what not to do. Hopefully, we all learn from it." http://www.facebook.com/Lightning422.	

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59.	Importation	Review any related documents from U.S. Customs and Border Protection and the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) for the aircraft. If the aircraft was not imported as an aircraft, or if the aircraft configuration is not as stated in Form ATF-6, it may not be eligible for an airworthiness certificate. Additional Information: There are many cases in which Federal authorities have questioned the origin of former military jet aircraft (FMJA) and its installed weapon system. Some have been seized. For example, in 1989, 2 A-37Bs were seized at the Canadian border by US Customs officials in 1989. As a reminder, it is noted that recently, a Douglas A-1 that was imported into the U.S. with some of its weapon systems was seized by the U.S. government. It resides now at the Naval Aviation Museum in Pensacola, Florida. See FEDERAL FIREARMS REGULATIONS REFERENCE GUIDE, ATF Publication 5300.4, Revised September 2005 for additional guidance.	
60.	Brokering	Verify the application for airworthiness does not constitute brokering. Section 21.191(d) was not intended to allow for the brokering or marketing of experimental aircraft. This includes individuals who manufacture, import, or assemble aircraft, and then apply for and receive experimental exhibition airworthiness certificates so they can sell the aircraft to buyers. Additional Information: Section 21.191(d) only provides for the exhibition of an aircraft's flight capabilities, performance, or unusual characteristics at air shows, and for motion picture, television, and similar productions. Certificating offices must verify all applications for exhibition airworthiness certificates are for the purposes specified under § 21.191(d) and are from the registered owners who will exhibit the aircraft for those purposes. Applicants must also provide the applicable information specified in § 21.193.	
61.	Initial Contact Checklist	The following is a sample of the contents of an initial contact by an FAA field office to an applicant concerning a proposed certification. It addresses many of the major safety and risk issues with the Hunter and will assist in (1) preparing an airworthiness applicant, (2) making corrections, and updating any previous application, (3) document the level of airworthiness review. Additional Information: 1. Discuss item missing from the application a. Program letter setting the purpose for which the aircraft will be used (i) exhibition of aircraft flight capabilities, performance, unusual characteristics at air shows, motion picture, television and similar productions, and maintenance of exhibition flight proficiency, including flying to and from such air shows and productions, (ii) aircraft cannot be certified if the intention is to broker or sell the aircraft, and (iii) aircraft photos. 2. Prepare aircraft and documentation for FAA inspection a. Maintenance and modification records; Aircraft history and logbooks (airframe, engine and components); b. Have the aircraft maintenance program ready for review and acceptance; c. Have operations and maintenance and supplements ; d. Have crew qualifications ready for review (pilot, mechanics, A&P, IA); e. Be prepared to show spare parts records; Be prepared to accomplish preflight, ground checks, run-up, and taxi checks; f. Be prepared to demonstrate the aircraft has been demilitarized; Have records on status of ejection seats; g. Be prepared to discuss required ground support equipment and specialized tooling for maintenance; h. Be prepared to discuss and document the airframe fatigue life program compliance; i. Be prepared to discuss engine thrust measurement process; j. Be prepared to demonstrate oxygen system checks; k. If "G" suits are used be prepared to demonstrate serviceability; l. Have records for any fabricated parts and engineering documentation if required; m. Have records on flight control balancing; Have weight and balance records and external stores; n. Be prepared to discuss Phase I test flights (recommended 10 hours); Have record of installed avionics; 3. Applicable regulations and Advisory Circulars a. §§21.93, 21.181, 21.193, 21.191(d), 23.1441, 43.3, 43.9, 45.11, 45.23(b), 45.25, 45.29, 91.205, 91.307, 91.319(a)(1), 91.407, 91.409(f)(4), 91.411, 91.413, 91.417, 91.1037, 91.1109, and AC 43-9, AC 91-79. Items to discuss with applicant: (a) recommendation of establishing a minimum equipment list; (b) recommend establishing minimum pilot experience and proficiency, including (1) FAA PIC policy, USAF training, (2) 10 to 15 hours of dual time, and (3) 3 hours per month, and 5 take-off and landings, (c) recommend establishing minimum runways length criteria for take-off and landing, and (d) discuss military use, i.e. declaration of public use operations and operating limitations.	

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Hawker Hunter Maintenance Manual(s) and Aircraft Inspection Program (AIP)			
62.	Changes to Aircraft Inspection Program (AIP)	Consider whether the FAA-accepted AIP is subject to revisions to address safety concerns, alterations, or modifications to the aircraft. Section 91.415, *Changes to Aircraft Inspection Programs,* requires, "whenever the Administrator finds that revisions to an approved aircraft inspection program under § 91.409(f)(4) or § 91.1109 are necessary for the continued adequacy of the program, the owner or operator must, after notification by the Administrator, make any changes in the program found to be necessary by the Administrator." Work with the applicant to revise the AIP as needed based on any concerns identified in attachment 2 to this document.	
		Additional Information: For example, a Hawker Hunter AIP can be modified to address or verify— ○ Consistency with the applicable military (critical changes, i.e. TCTO-like documentation) for airframe, powerplant, and systems to verify replacement/interval times are addressed; ○ List each airplane by serial number and engine type and serial number; ○ All AIP section and subsections include the proper guidance/standards (that is, Technical Orders or Engineering Orders) for all systems, groups, and tasks; ○ AIP includes the inspection cards (i.e., Cards 010228 and 010223) that are part of the RAF cards set. The AIP is not just a checklist; ○ No "on condition" for items that have replacement times unless proper technical data to substantiate the change, that is, aileron boost and oxygen regulator; ○ Ejection seat system replacement times are adhered to. No "on condition" for rocket moors and propellants. Make the distinction between replacement times, that is, "shelf life" v. "installed life limit;" ○ Any deferred log is related to a listing of minimum equipment for flight; ○ Inclusion of document revision page(s).	
63.	AIP is Not A Checklist	One of the most important issues concerning the Hunter AIP is to make sure that it is not a checklist. The over simplification of the AIP undermines the quality of the document since it leads to elimination of the proper original military guidance. In many cases, experience shows that many actual aircraft inspection program are nothing more than simple checklist and actual tasks/log book entries say little of what was actually accomplished and to what standard. This is one of the major issues with deficient aircraft inspection programs (AIP).	
		Additional Information: This stems from confusion with regards to the different nature of (1) aircraft maintenance manuals, (2) and aircraft inspection program, (3) an inspection checklist. In many cases, the actual aircraft inspection program is nothing else but a simple checklist. Unless a tasks or item points to Tech data (not just reference to a manual), it is simply a checklist, not a manual. Ensure that the inspection program directs the reader to other references such as Tech data, including references to sections and pages within a document (and revision level), i.e., AC 43-13 p.318 or inspection RAF inspection card No. 26.2. Records must be presented to verify times on airframe and engines, inspections, overhauls, repairs and in particular, time in service, time remaining and shelf life on life limited parts. It is the owner's responsibility to ensure these records are accurate. See C*JAA SAFETY OPERATIONS MANUAL*, Rev. 6/30/08.	
64.	AIP Limitations	As part of the airworthiness certification and related review of the AIP, it should not be assumed that compliance with the applicable military standards, procedures, and inspections is sufficient to achieve an acceptable level of safety for civil operations. It might be true or it may not, depending on the situation and the aircraft.	
		Additional Information: For example, an AIP that is based on 1978 RAF requirements for the Hunter is not necessarily going to address the additional concerns or issues 35 years later, such as aging, structural and materials deterioration, stress damage (operations past life-limits), extensive uncontrolled storage, and new techniques, and industry standards.	
65.	AIP Revision Records	The applicant/operator must retain a master of all revisions that can be reviewed in-accordance-with other dated material that may be require to be done under a given revision. The AIP should address revision history for manual updates and flight log history.	
		Additional Information: Operator must retain a master of all revisions that can be reviewed in-accordance-with other dated material that may require having been done under a given revision.	

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66.	Adequate Maintenance Schedule and Program (General)	Ensure the AIP follows RAF/Swiss AF/NATO requirements as appropriate concerning inspections. The guiding document for inspection schedules and replacement times is RAF AP 101B-1300-5A1 *Master Servicing Schedule Hunters All Marks* and *Component Replacement List (Mandatory Changes) Hunters All Marks* (see below). If applicable, a Swiss AF or Swiss CAA equivalent is acceptable. This is important when developing an inspection program under § 91.409. <u>The inspection program must comply with both hourly and calendar inspection schedules.</u>	
		<u>Additional Information:</u> The only modifications to the military AP should be related to the removal of military equipment and weapons. Deletions should be properly documented and justified. There should be evidence that the inspection program conforms to the specific airplane instructions for continuous airworthiness. A 100-hour, 12-month inspection program under appendix D to part 43 is not adequate for sophisticated aircraft like the Hawker Hunter.	
67.	AP 101B-1300-5A1	The main reference for the AIP is RAF AP 101B-1300-5A1 *Master Servicing Schedule Hunters All Marks* and *Component Replacement List (Mandatory Changes) Hunters All Marks.* Unless properly documented and not including weapon and military equipment, any deviations and omissions need to reference this document.	
		<u>Additional Information:</u> Major sections of RAF AP 101B-1300-5A1, include: • Amendment Record Certificate; • Index of Associated Schedule Topics; • Master Servicing Schedule; • List of Re-Issue Servicing Items; • Component Replacement List; • Component Replacement List – Mandatory Changes; • Component Life Register; • Routine and Out of Phase Servicing Register;	
68.	Maintenance Responsibilities	The AIP should address several responsibilities and functions in a very clear manner. The AIP should address the difference between the aircraft owner and operator. The AIP also needs to address any leasing arrangement where maintenance is spilt or otherwise outside of the control of the applicant, i.e., where maintenance is contracted to another party. The AIP should define the person responsible for maintenance.	
		<u>Additional Information:</u> The AIP should address qualifications, and delegations of authority, i.e., whether the person responsible for maintenance has inspection authority and airworthiness release authority, or authority to return for service. Whether the person is responsible for inspections and this inspection program is also important. In terms of inspection control and implementation, the AIP should define whether it is a delegation of authority, and if so, what authority is being delegated by the owner and operator. This has been an issue with the NTSB and the CAB before it, since 1957.	
69.	Return to Service (RTS)	The AIP should clearly define who can return the aircraft to service and provide the descriptions of minimum criteria for this authority.	
		<u>Additional Information:</u> Follow the intent and scope of § 43.5 (Approval for return to service after maintenance, preventive maintenance, rebuilding, or alteration) and §43.7 Persons authorized to approve aircraft, airframes, aircraft engines, propellers, appliances, or component parts for return to service after maintenance, preventive maintenance, rebuilding, or alteration. For additional information on return to service functions, see *Inspection Authorization Information Guide,* FAA-G-8082-19, FAA, Flight Standards Service, 2010 at http://www.faa.gov/training_testing/testing/airmen/test_guides/media/faa-g-8082-19.pdf.	
70.	Maintenance Practices	Consider AC 43.13-2B, *Acceptable Methods, Techniques, and Practices-Aircraft Alterations*, and AC 43.13-1, *Acceptable Methods, Techniques, and Practices-Aircraft Inspection and Repair,* to verify safe maintenance practices, in addition to any guidance provided by the manufacturer/military service(s). See *Inspection Guidance (General)* below.	
71.	Inspection Guidance (General)	Consider AC 43-204, *Visual Inspection for Aircraft*, as part of the AIP where appropriate, along with the proper references.	
		<u>Additional Information:</u> Other FAA advisory materials include: • AC 43-3, *Nondestructive Testing in Aircraft;* • AC 43-4, *Corrosion Control for Aircraft;* • AC 43-7, *Ultrasonic Testing for Aircraft;* • AC 43-12, *Preventive Maintenance.* For additional information on nondestructive inspections, see *NDI* below.	

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72.	Qualifications for Inspections	Ensure only FAA-certificated repair stations and FAA-certificated mechanics with appropriate ratings as authorized by 14 CFR § 43.3 perform inspections on the Hunter.	
73.	Modifications and Supporting Data	Per § 21.93, verify major alterations do not create an unsafe condition and determine whether new operating limitations will be required. The information contained in appendix A to part 43 can be used as an aid.	
		Additional Information: It should not be assumed that a missing manufacturer/military operator (SAF/RAF) time-critical requirement or a modification not performed is acceptable because the aircraft is "experimental." Non-compliance with a time-critical requirement can be a serious safety of flight issue, potentially jeopardizing the airworthiness of the aircraft. Note: Certain modifications to the aircraft will invalidate Phase II. These include: (a) structural modifications, (b) aerodynamic modifications, including externally mounted equipment, except as permitted in the limitations issued, and (c) change of engine make, model, or power rating (thrust or horse power)—refer to *Engine Upgrades,* below. If any of these modifications are made, adequate technical data must be available. Unfortunately, many modifications are made without adequate technical and validation data, thus it is necessary to verify adequate technical data, that is, engineering data and /or manufacturer. RAF/SAF guidance supports modifications such as engine upgrades, pylons, and structural reinforcements.	
74.	Manufacturer/RAF Modifications Embodied	Verify that the AIP or other documentation covers the modifications incorporated into the aircraft, named Modifications Embodied.	
		Additional Information: Modifications include: Hunter Mod 2583 plus: 615, 644, 664, 707, 729, 756, 780, 785, 789, 795, 802, 803, 804, 805, 806, 816, 876, 914, 988, 1006, 1307, 2534, 2567, 1014*, 1032*, and Hunter Mod 2583 minus 676, 772, 823, 1075, 1142, and 1159PT. The 'minus' modifications identified above arise because they have either been superseded by later modifications or are classified as C3 modifications, or are not applicable to a civilian certification. The items marked * are structural re-enforcement modifications embodied in principle. It is possible that not all modifications are identifiable as having been embodied. If that is the case, the applicant (through the AIP) needs to identify those so that a determination concerning the aircraft's flying condition can be made. In cases involving ex-Swiss Air Force, additional documentation may be needed. Also see *Hawker Modifications and Modification State* below.	
75.	Hawker Modifications and Modification State	Ask the applicant to provide data concerning the modification status of the aircraft, particularly if it is an ex-Swiss Air Force aircraft.	
		Additional Information: The applicant should compare the modification state of the aircraft in question with those required for airworthiness according to Hawker Siddeley Master Modification List/MoD AP101B-1300/AP4347 *Master Modifications List*. This ensures a satisfactory standard has been achieved. For example, Swiss Mk 58 aircraft built to Hawker modification 2379 have been accepted in the past. Another example of how to check for the modifications embodied, the Hunter T68 (two-seater) was introduced by Hawker Siddeley Aviation Ltd Modification 2583 which called up the original Hunter design plus 432 separate modifications which were listed in the Hawker Siddeley Standard Draft Modification Leaflet for Mod 2583. The manufacturer's drawing office modification chart identifies these modifications, and the applicant has sufficient supporting information to identify these, and examined the aircraft against mod 2583 to document the modification statement for the aircraft. In cases involving Hunter FGA9s, data on modifications may be available in Draft Modification Leaflets (DML) issued in AP 4347J Volume 2, and applicants may have to examine the aircraft against Hunter Modification 2561. Under U.K. CAA oversight, Hunter log books make reference to Hawker Siddeley Aviation build to modification 25-1, a later standard applicable to Mk 58A. Operators, including U.S. operators, should have the appropriate Hawker Siddeley Aviation's drawing office modification chart, which identifies all modifications together with their classification and description, for the Hunter version and variant in question. In the United Kingdom, Hunter operators are required to state whether any Hawker/RAF modification that is not embodied, the Swiss equivalent is fitted in lieu. This requirement would also be applicable in the U.S. Note: After delivery the Swiss controlled the modifications status and issued their own mod numbers.	
76.	Change in Serviceability Log	Ask applicant to keep and maintain the RAF Change in Serviceability Logs for the aircraft.	
		Additional Information: These documents are essential in determining the history of all failures, reasons for non-airworthy determinations, repairs, and deferments.	
77.	Appendix G to 14 CFR Part 23	Recommend that Appendix G to part 23 could be used as a tool (not a requirement) because it can assist in the review of the applicant's proposed AIP and associated procedures and sets a good baseline for any review. Appendix G to part 23 covers discusses instructions for continued airworthiness.	
		Additional Information: The RAF/SAF/NATO's guidance should also contain instructions for the continued airworthiness of the Hunter.	
78.	Prioritize Maintenance Actions	Recommend the adoption of a risk management system that reprioritizes high-risk maintenance actions in terms of (a) immediate action, (b) urgent action, and (c) routine action. Also refer to *Recordkeeping, Tracking Discrepancies, and Corrective Action,* below.	
79.	Lortie Aviation	If the aircraft was or is serviced by Lortie Aviation in Canada, ask for and sample the aircraft's maintenance work orders (including Components Job Cards), and compare those with the relevant AIP scope of work.	
80.	Hunter Aviation International	If the aircraft was or is serviced by Hunter Aviation International (HAI) in Delaware, ask for and sample the aircraft's maintenance work orders and compare those with the relevant AIP scope of work.	

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81.	Recordkeeping, Tracking Discrepancies, and Corrective Action	Check applicant recordkeeping. The scope and content of §§ 43.9, 43.11, and 91.417 are acceptable.	
		Additional Information: The RAF Form 700, USAF Form 781, U.S. Navy's Maintenance Action Form (MAF), or a SAF/NATO equivalent process will assist with recordkeeping and help verify acceptable levels of continued operational safety (COS) for this type of aircraft. Three types of maintenance write-ups can be found inside USAF Form 781: (1) an informational, that is, a general remark about a problem that does not require mitigation; (2) a red slash for a potentially serious problem; and (3) a red "X" highlighting a safety of flight issue that could result in an unsuccessful flight and/or loss of aircraft-no one should fly the aircraft until the issue is fixed. For more information on recordkeeping, refer to AC 43.9, *Maintenance Records.*	
82.	Qualifications of Maintenance Personnel	Check for appropriate qualifications, licensing, and type-specific training of personnel engaged in managing, supervising, and performing aircraft maintenance functions and tasks. The NTSB has found the use of non-certificated mechanics with this type of aircraft has been a contributing factor in Hawker Hunter accidents. Recommend only FAA-certificated repair stations and FAA-certificated mechanics with appropriate ratings as authorized by § 43.3 perform maintenance on this aircraft.	
83.	Ground Support, Servicing, and Maintenance Personnel Recurrent Training	Recommend regular refresher training is provided to ground support, servicing, and maintenance personnel concerning the main safety issues surrounding servicing and flight line maintenance of the Hawker Hunter.	
		Additional Information: Recurrent training should include a regular review of the warnings, cautions, and notes listed in the applicable TO describing the technical aspects of the aircraft. To illustrate the Hunter's needs in terms of ground support, it is relevant that, in civil use, to prepare for a flight, a support vehicle might be needed to provide tools, hoses, high-pressure nitrogen and oxygen bottles, start cartridges, ladders, and an infinite number of accessories that may be required to start the plane. The tires must be checked and, if needed, inflated to the proper pressure, brakes adjusted, accumulators charged (i.e. 750 psi on the brakes), battery checked, start cartridges replaced, nose gear door retracted for towing, gear box and engine oil levels services, hydraulic reservoir topped off, fuel for start (i.e., 750 lb on each side, SAF) and oxygen tank refilled. Ground crew also fuels the aircraft, which is a critical tasks because of the aircraft's fuel system complexities, prepares the cockpit, and conducts a preflight walk-around is performed. Other tasks include assisting the pilot with the ejection seat, such as helping him or her into the parachute and seat harness, making sure that the ejection seat leg restraining straps are securely fastened, oxygen and G suit tubes connected, and finally removing the ejection seat pins and handing them to the pilot. Finally, if provided for in that version of the aircraft, the drag chute must be installed and packed into the tail. In operational service, these functions should be performed by a two-man crew. Also, in post-flight, ground support (that is, crew chief) conducts an external check, which includes checking for any leaks or issues before shut-down, and safely securing several systems.	
84.	Fuel Servicing	It is imperative that all fueling operations be monitored and only conducted by trained personnel. The aircraft's complex fuel system, inability of accurately and visually checking fuel levels (especially external fuel tanks), varying fuel tank carriage options, and the need to properly understanding the left heel well fueling plate and functions, make this a necessity. Coordination with the PIC is also required.	
85.	RAF Servicing	Recommend the AIP incorporate RAF guidance concerning aircraft maintenance practices in AP 3456E part 2, section 1, chapter 1, dated February 1, 1971.	
		Additional Information: These include— ○ *Primary*. Each period of 50 flying hours or at intervals of 1 month. This servicing includes an examination of the aircraft obvious defects, together with essential functional checks, and lubrication of certain equipment. ○ *Minor*. Each period of 200 flying hours or at intervals of 4 months. This servicing includes an examination of the aircraft for defects, deterioration, corrosion, and wear, and the lubrication of certain parts to a greater degree than is normally done at a primary servicing. It affords the opportunity to carry out modifications, Special Technical Instructions (STIs) and Servicing Instructions (Sis), which may not have been implemented during the day-to-day servicing. ○ *Major*. Each period of 800 flying hours or at intervals of 12 months. This servicing includes a detailed examination of the aircraft, the changing of worn parts, and adjustment or calibration of equipment necessary to maintain the required standards, in addition to the work which is normally done at minor servicing. See AP 3456E part 2, section 1, Chapter 1, February 1971.	
86.	Parts Storage and Management and Traceability	Recommend establishing a parts storage program that includes traceability of parts.	
		Additional Information: Parts management is critical in the Hunter for several reasons. First, as with many aircraft of its age, there is no adequate OEM support. Second, although spares may have been acquired with the aircraft, they need to be properly inventoried, and documented. Third, there is evidence that the Hunter spare supply chain, at the time the aircraft was operational, especially in case involving non-ex-Swiss Air Force types, was lacking and quality was questionable. There was general lack of interchangeability. One example is the elevator hydro-boosters, where many "new" parts would not fit with the adjacent components. Note: In the case of ex-Swiss AF Hunters, it is known that the aircraft were generally disposed along with a certain quantity of spares and comprehensive set of tooling.	

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87.	General Parts Suitability	Recommend the AIP provide for the evaluation of parts, especially those used for installation on the aircraft.	
		Additional Information: In addition to reviewing applicable records, further evaluation should be performed using the following applicable methods, means, or data sources: 1. If applicable, differences between military and civil version (possible military modification, alteration, repair performed); 2. Current manufacturer's or military technical data and procedures to perform tests and inspections including current life limited parts list; 3. Comparison of military time and/or cycle count for accumulated operational time versus civil; 4. Non-destructive tests, as required; 5. Bench testing or functional test, as required; 6. Results of tests and inspection recorded; 7. Complete historical and modification/alterations/repair records; 8. Manufacturer's identification plate; 9. Flight, maintenance, and/or structural manual(s), and illustrated parts catalog; and 10. Instructions for continued airworthiness.	
88.	Maintenance Records and Use of Tech Data	Conduct a detailed inspection of maintenance records as required by FAA Order 8130.2. Verify maintenance records reflect inspections, overhauls, repairs, time-in-service on articles, and engines. Check that all records are current and appropriate technical data is referenced.	
		Additional Information: This should not be a cursory review. Maintenance records are commonly poor or incomplete for imported aircraft. Refer to *Adequate Hawker Hunter Manuals and Related Documentation,* above.	
89.	Flight Safety Critical Aircraft Parts	Recommend the Hunter AIP identify all Flight Safety Critical Aircraft Parts (FSCAP).	
		Additional Information: A FSCAP is a part, assembly, or installation containing a critical characteristic whose failure, malfunction, or absence could cause a catastrophic failure resulting in loss or serious damage to the aircraft or an un-commanded engine shutdown resulting in an unsafe condition.	
90.	"On Condition" Inspections	If "on condition" inspections are considered, these must follow the military or manufacturer program(s) and provide adequate data to justify that practice for the applicable part or component.	
		Additional Information: "On condition" is a preventive maintenance process. It requires an appliance or part be periodically inspected or checked against some appropriate physical standard/parameters to determine whether it can continue in service. The purpose of the standard is to remove the unit from service before (not after) failure during normal operation occurs. "On condition" must reference an applicable standard (that is, inspect the fuel pump to an acceptable reference standard, not just "it has been working so far"). Each "on condition" inspection must state acceptable parameters. "On condition" inspections are not appropriate for all parts and components.	
91.	Complied With Applicable STI and SI as Required by the UK CAA	Ensure the applicant and AIP show the safety issues contained in the applicable U.K.'s Special Technical Instructions (STI) and Special Instructions (SI) have been addressed.	
		Additional Information: For example, for UK civil use, a ex-Swiss AF Hunter T68 was found to have complied with the following Hunter Special Technical Instructions: • 254 255 256 258A 262 263A 266 267 272 273A 274A; 278B 281A 283 284 293B 298B 300 307 310 313 316; • 319 320 322 324 326 327B 328 329 330 332A 333; 334 337 338 343 346A 347A 350 352 355 356A 358ª; • 362 364 369B 370B 371A 372 373 374 375A 381 382; 385B 386 387 388 389 390B 393C 394 398A 401 402; • 404 405A 406 410 411A 415 416 424A 431 433. and the following Hunter Servicing Instructions have been carried out: • 54 55 58 1 63 64A 65A 72D 73 75 77ª; 78B 81 82B 83A 84B 85A 88 91A 92A 96A 98; 99 100A 101 105 106A 107A 111 112A 113 114 116; • 119B 120 121D 122 124 125 127 128B 129 130A 131ª; 132A 133 135A 137 138C.	

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92.	Airframe, Engine, and Component Replacement Intervals	Verify compliance with required replacement intervals as outlined in the appropriate and most current SAF/NATO inspection guidance, likely dated 1994.	
		<u>Additional Information:</u> If components are not replaced per the military guidance, data must be provided to justify extensions. Applicants should establish and record time in service for all life-limited components and verify compliance with approved life limits. In the Hunter, a critical component with an expired fatigue life cannot be re-introduced after an "On Condition" inspection. Set time limits for overrun of intervals (sometimes called 'Tolerance' in SAF parlance) to those approved by the SAF and track cycles as required, similar to the Rolls-Royce requirements on the engine. Evaluate any overruns of inspection or maintenance intervals. Approval of life limit extensions may be approved by the FAA only if the original manufacturer approves and provides documentation supporting the extension. In the case original manufacturer data is not available, an appropriately qualified DER may provide data to substantiate life limit extension, however, the FAA must concur with the results of the data. If inspections or maintenance are overrun, a Special Flight Permit may be requested to fly the aircraft to a location where maintenance can take place.	
93.	Hawker Hunter Maintainers Differences Training	Recommend the applicant/operator provide (in the AIP or SOPs) for differences training between Hawker Hunter models for all maintainers. Significant differences include engine, wiring, instrumentation, drag chute, CG variations, and ejection seat.	
94.	Use of Cycles (General)	Recommend that the AIP provides for tracking cycles, such as airframe and engine cycles.	
		<u>Additional Information:</u> In military jet aircraft like the Hunter, there is a relationship between failures, especially as it relates to power plants, landing gears, and other systems, and cycles. Case in point, tracking all aircraft takeoffs for full-thrust and de-rated thrust takeoffs as part of the inspection and maintenance program would be a good practice and can assist in building up reliability data. The occurrence of failures can be readily reduced to meaningful statistics, and cycles can play an important role. When rates are used in the analysis, graphic charts (or equivalent displays) can show areas in need of corrective action. Conversely, statistical analysis of inspection findings or other abnormalities related to aircraft/engine check and inspection periods requires judgmental analysis. Therefore, programs encompassing aircraft/engine check or inspection intervals might consider numerical indicators, but sampling inspection and discrepancy analysis would be of more benefit. A data collection system should be considered. This system should include a specific flow of information, identity of data sources, and procedures for transmission of data, including use of forms, computer runs, etc. Responsibilities within the operator's organization should be established for each step of data development and processing. Typical sources of performance information are as follows, however, it is not implied that all of these sources need be included in the program nor does this listing prohibit the use of other sources of information: 1. Pilot reports. 2. In-flight engine performance data. 3. Mechanical interruptions/delays. 4. Engine shutdowns. 5. Unscheduled removals. 6. Confirmed failures. 7. Functional checks. 8. Bench checks. 9. Shop findings. 10. Sampling inspections. 11. Inspection write-ups. 12. Service difficulty reports	
95.	3,000-Hour Airframe Limitation	Verify whether the AIP addresses the Hunter's 3,000-hour airframe limit and how total time is kept and the status of any extension.	
		<u>Additional Information:</u> The airframe limit is not a recommendation or suggestion by the manufacturer. It has to be addressed and any operations beyond that point must be properly mitigated, i.e., G limitations, load restrictions, additional inspections. In fact, in the Swiss AF, Hunters approaching this mark were retired and used for maintenance and combat repair training. For additional details on how this limitation interacts with fatigue life, refer to *Airframe Fatigue Life/State Tracking,* below. Note: This is an important item because in 1990, the Swiss Air Force initiated the retirement of its Hunter fleet, in great part because of fatigue cracks found in many Hunters (especially in the wing's structure), notably the refurbished Mk. 58A. In fact, as early as 1990, the Swiss AF noted structural cracks mainly due to high loads, low-altitude, and maneuvering flight. Any operation beyond 3,000 hours must include additional and adequate inspections and other verifications beyond the existing guidance, and may entail additional limitations, notably in terms of maximum loads, Gs, and type of maneuvers. Note: Many in industry make reference to "low time" Hunters having "only 2,600 hours" or "much life left," but the reality is that total times exceeding 2,500 hours are considered high times, not low. In fact, one of the highest time Hunter was an aircraft operated by the Omani AF, which, when retired, had over 4,100 hours. Some ex-Royal Navy Hunters have a higher total time (above 6,000 hours), but these are, however, exceptions, not typical cases, and special oversight existed. Note: As early as 1959, some of the refurbished Indian AF Hunters Mk.56 aircraft began to show signs of "premature fatigue," a clear indication that monitoring and a through inspection program are all that more important today.	

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96.	Combining Inspection Intervals into One	Inspection intervals for airframe items may include a provision for overrun (flex) times. For example, inspect landing gear as specified in AP 101B-1301, 1307-9-6A Aircraft Repair Manual, after 100 hours (+10) or 200 (+40) cycles. Limit all + times (overrun times), from inspections or maintenance.	
		Additional Information: For example, inspect landing gear as specified in AP 101B-1301, 1307-9-6A *Aircraft Repair Manual*, after 100 hours (+10) or 200 (+40) cycles. Limit all + times (overrun times), from inspections or maintenance.	
97.	Hawker Hunter Critical Components (CC) (General)	Verify the AIP identifies all Hunter Critical Components (CC), along with their respective limitations (that is, fatigue life) and follows the associated inspection and replacement times.	
		Additional Information: A critical component that reaches its fatigue life at 240 hours may need to be scrapped and replaced by a new one, not inspected "On Condition." Any item placed on "On Condition" must have adequate technical data to support that action. Note: if the aircraft is an Ex-Swiss Air Force aircraft, verify the Swiss AF inspection and replacement schedules are followed.	
98.	Equivalent Level of Safety	Refrain from replacing classifications and limitations such as Fatigue Life, Reconditioning Life, Bay Servicing, and Scrap, in RAF procedures with "On Condition" or "Testing" in civilian use. In the Hunter, a critical component with an expired fatigue life cannot be re-introduced after an "On Condition" inspection. If any of the RAF procedures are replaced by either "On Condition" or "Testing" there should be adequate data to show an equivalent level of safety in addition to adequate data.	
		Additional Information: Note: If the aircraft is an Ex-Swiss Air Force aircraft, verify that the Swiss inspections and replacement schedules are followed.	
99.	Inspect and Repair as Necessary (IRAN)	There is no data showing Hunters were maintained under an IRAN-type program. If IRAN is proposed, verify it is detailed and uses adequate technical data (that is, include references to acceptable technical data) and adequate sequence for its completion.	
		Additional Information: An IRAN must have a basis and acceptable standards. It is not analogous to an "on condition" inspection. It must have an established level of reliability and life extension. An IRAN is not a homemade inspection program.	
100.	U.K.'s Airworthiness Approvals, Including No. 25318, and 26172	Ensure the AIP addresses the issues contained in the U.K.'s Airworthiness Approval Note No. 25318.	
		Additional Information: Airworthiness Approval Note No. 25318 and 26172 addresses— • The safety issues in all U.K. STI's and SI's (similar to U.S. Ads); • Engine starter modification aka jet heritage modification JH 034; • Fatigue state of the aircraft; • Engine cycle usage rate; • Ejection seat safety issues; • Drop tanks and their use; • Weight and balance (each A/C is different); • Flight test requirements; and • Manuals requirements and limitations.	
101.	U.K. CAA Letter to Owners and Operators No. 2775	Recommend the applicant/operator consider LETTER TO OWNERS/OPERATORS NO 2775 issued by the U.K. CAA, dated March 10, 2005.	
		Additional Information: The Letter No 2775 makes recommendations concerning the deficiencies of maintenance performed by civilian entities concerning ex-military aircraft. It states, "following an investigation into a recent aircraft accident the CAA became aware that maintenance of ex-military aircraft of foreign manufacture is being carried out without the most recent service information being available. Owners of aircraft operating under a Permit to Fly are reminded that in order for an aircraft to be properly maintained it is essential that the latest service information, where published, is obtained and that it is taken into account during maintenance of the aircraft. Where an aircraft of foreign origin is to be operated with a Permit to Fly the associated service information must be available in the English language. Organizations that maintain ex-military aircraft and are approved in accordance with BCAR Chapter A8-20 are reminded of their particular responsibilities in this regard. BCAR Chapter A8-20 paragraph 3.8 details what publications and information are expected to be available and how they should be managed. Accountable managers are therefore requested to review their procedures and working practices to ensure that they take due account of their responsibilities in this respect before carrying out maintenance."	

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102.	Missing Inspection Tasks and Cards	Verify that the AIP follows RAF/Swiss AF/NATO requirements in terms of inspection tasks.	
		<u>Additional Information:</u> It is imperative that no inspection tasks required by the military standard, i.e., AP101B-1300-5A1, are removed. If they are removed, there should be adequate justification, and it cannot be just related to cost. There are been several cases where an AIP does not conform to the applicable military standard and tasks are removed without adequate justification.	
103.	960-Hour Airframe Overhaul (RAF General)	Verify the AIP covers the RAF 960-hour airframe overhaul requirement.	
		<u>Additional Information:</u> Overhaul refers to the process of disassembling, cleaning, inspecting, repairing as necessary, reassembling, and testing for approval for return-to-service within the specifications of the manufacturer's overhaul data. Also see *Maintenance Schedule (Swiss Air Force Mk. 58/58A) (General)* below.	
104.	Maintenance Schedule (Swiss Air Force Mk. 58/58A) (General)	Verify the AIP incorporates the required maintenance schedule for the aircraft as follows: 75 hour check; minor check at 150 hours; major check at 300 hours; overhaul at 600 hours. <u>After 1,500 hours total flight time, the aircraft had a major check every 300 hours.</u>	
105.	Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms) (Part I)	Ensure that the AIP includes all of the Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms) requirements. This is necessary because it represents an acceptable civil application of the Swiss Air Force requirements in terms of inspections and replacement time.	
		<u>Additional Information:</u> The Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms) include but are not limited to— 1. ENGINE ROLLS ROYCE AVON 203/207 600 Hours TBO Tolerance +50 S 2. REVIEW A/C MAINTENANCE PROGRAM FOR ACTUALITY 12 Months 3. ARC REVIEW (BIENNIAL) 24 Months 4. RECTIFICATION OF ARC COMPLAINTS 24 Months 5. 100 H / ANNUAL INSPECTION I.A.W. AMP HB-R 100 Hours/12 Months 6. 100 H ENGINE INSPECTION I.A.W. AMP HB-R 100 Hours/as Months 7. WEIGHT AND BALANCE I.A.W. TM No. 73.920-12 120 Months 8. PLACARDS INSPECTION 12 Months 9. 100 H/ANNUAL LUBRICATION SCHEDULE 100 Hours/12 Months 10. EXTERNAL CORROSION INSPECTION (EVERY 12 Months) 12 Months 11. GENERATOR LH AND RH 600 Hours TBO Tolerance +10 percent 12. LH GENERATOR INSULATION RESISTANCE CHECK 100 Hours/12 Months 13. RH GENERATOR INSULATION RESISTANCE CHECK 100 Hours/12 Months 14. GENERATOR CONTROL RACK INSTALLATION VISUAL 100 Hours/12 Months 15. BATTERY PACK No. 1 AND No. 2 SERVICE 12 Months 16. EMERGENCY BATTERY-SERVICE 12 Months 17. BATTERY PACK ELECTRO STARTER SYSTEM ICA 12 Months 18. ANNUAL ELT CHECK I.A.W. TM-W NR. F 20.140-01 12 Months 19. REFOLD STABILIZER PARACHUTE 12 Months 20. REFOLD PARACHUTE 2 Months 21. EJECTION SEAT MUNITIONS 36 Months 22. EJECTION SEAT PARACHUTE CANOPY AND HARNESS 120 Months 23. EJECTION SEAT PARACHUTE HARNESS 120 Months 24. BOTTLE ANTI-G-SYSTEM-HYDROSTATIC TEST 120 Months 25. FIRE EXTINGUISHER LARGE BOTTLE-ULTRASONIC 120 Months 26. FIRE EXTINGUISHER LARGE BOTTLE WEIGHT CHECK 24 Months 27. FIRE EXTINGUISHER SMALL BOTTLE-ULTRASONIC 120 Months 28. FIRE EXTINGUISHER SMALL BOTTLE WEIGHT CHECK 24 Months 29. FIRE EXTINGUISHER CARTRIDGE TEST 60 Months 30. LH/RH AILERON CONTROL FORKED ROD DYE CHECK 150 Hours/72 Months 31. LH/RH AILERON BRACKET DYE CHECK INSPECTION 150 Hours	

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	Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms) (Part II)	32.	FLAPS-EMERGENCY BLOWDOWN FUNCTIONAL TEST	24 Months	
		33.	EMERGENCY FLAPS BLOWDOWN BOTTLE-HYDROSTATIC	120 Months	
		34.	MICROSWITCH FOLLOW UP SYSTEM INSPECTION	300 Hours/72 Months	
		35.	RUDDER BRACKET EDDY CURRENT INSPECTION	600 Hours/120 Months	
		36.	LH/RH DROP TANK LIFTING EYE DYE CHECK INSPECTION	150 Hours/72 Months	
		37.	FLEXIBLE FUEL LINE AIRFRAME TO ENGINE REPLACEMENT	300 Hours or NDT	
		38.	ELEVATOR HYDRAULIC MICROFLITER INSPECTION	300 Hours/72 Months	
		39.	AILERON HYDRAULIC MICROFLITER INSPECTION	300 Hours/72 Months	
		40.	MAIN HYDRAULIC SYSTEM FILTER ELEMENT	300 Hours/72 Months	
		41.	HYDRAULIC PUMP DRIVE SHAFT INSPECTION	300 Hours/120 Months	
		42.	FLEXIBLE HOSES ELEVATOR SERVODYNE REPLACEMENT	96 Months	
		43.	HYDRAULIC PUMP	600 Hours TBO	
		44.	HYDRAULIC PUMP OVERHEAT INSPECTION	100 Hours/12 Months	
		45.	LH MLG ACTUATOR PISTON ULTRASONIC INSPECTION	300 Hours/ 120 Months	
		46.	RH MLG ACTUATOR PISTON ULTRASONIC INSPECTION	300 Hours/120 Months	
		47.	LH/RH MLG SUPPORT AND CASE VISUAL INSPECTION	12 Months	
		48.	LH/RH MLG SUPPORT AND CASE ULTRASONIC INSPECTION	600 Hours	
		49.	NOSE GEAR TOP CASE VISUAL INSPECTION	12 Months	
		50.	NOSE GEAR TOP CASE ULTRASONIC INSPECTION	600 Hours/120 Months	
		51.	NOSE GEAR AXLE MAGNAFLUXING INSPECTION	600 Hours/120 Months	
		52.	EMERGENCY GEAR BLOWDOWN SYSTEM-FUNCTIONAL	24 Months	
		53.	EMERGENCY GEAR BLOWDOWN BOTTLE-HYDROSTATIC TEST	120 Months	
		54.	COMPASS SYSTEM DEVIATION CHECK I.A.W. TM-W NR.	24 Months	
		55.	TRANSPONDER TEST I.A.W. TM 20.100-20	24 Months	
		56.	LH/RH ALTIMETER AND BLIND ENCODER CALIBRATION	24 Months	
		57.	PITOT/STATIC SYSTEM LEAK CHECK I.A.W. TM-W NO.	24 Months	
		58.	ANNUAL AVIONIC EQUIPMENT CHECK I.A.W. TM-R NO.	12 Months	
		59.	HB-2006-500R1 MODE “C” AND “S” TRANSPONDERS	24 Months	
		60.	OXYGEN BOTTLE NO. 1 HYDROSTATIC TEST	120 Months	
		61.	OXYGEN BOTTLE NO. 2 HYDROSTATIC TEST	120 Months	
		62.	OXYGEN BOTTLE NO. 3 HYDROSTATIC TEST	120 Months	
		63.	OXYGEN BOTTLE NO. 4 HYDROSTATIC TEST	120 Months	
		64.	OXYGEN BOTTLES (4 EA)-DRY	36 Months	
		65.	OXYGEN SYSTEM REGULATOR TEST	12 Months	
		66.	LH EMERGENCY OXYGEN BOTTLE HYDROSTATIC TEST	60 Months	
		67.	RH EMERGENCY OXYGEN BOTTLE HYDROSTATIC TEST	60 Months	
		68.	BASE OF VERTICAL STABILIZER BRACKET	600 Hours	
		69.	STABILIZER TRIM ACTUATOR	600 Hours	
		70.	CONTACTOR RELAIS STABILIZER	600 Hours	
		71.	EMERGENCY CONTACTOR RELAIS STABILIZER	600 Hours	
		72.	LH/RH WING MAIN SPAR-ULTRASONIC INSPECTION	300 Hours	
		73.	LH/RH WING NOSE BOLT-ULTRASONIC INSPECTION	300 Hours	
		74.	LH/RH WING BOLTS AND BUSHINGS-MAGNAFLUXING	300 Hours	
		75.	LH/RH FATIGUE WING SKIN ZONE INSPECTION	100 Hours	
		76.	LH/RH WING SKIN SPLICE EDDY CURRENT INSPECTION	600 hours/120 Months	
		77.	ENGINE HOT SECTION INSPECTION	300 Hours Tolerance + 100	
		78.	HIGH ENERGY IGNITION UNIT	600 Hours	
		79.	ENGINE CONTROL CABLE INSPECTION (TELEFLEX)	300 Hours	
		80.	ENGINE OIL PRESSURE FILTER INSPECTION	50 Hours	
		81.	STARTER MOTOR INSPECTION ICA DEA001 IF INSTALLED BY AIRCRAFT	24 Months	

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106.	Airframe Fatigue Life/State Tracking	Verify the applicant documents any the airframe fatigue life/state on the aircraft and that the appropriate fatigue limitations are followed.	
		Additional Information: The Hunter's fatigue life could be extended past 3,000 hours by strengthening the fuselage forward transport joint, and it was eventually accepted that the basic Hunter airframe could be refurbished and re-sold to new customers 'as new.' Even though this may have been the case, the Swiss Air Force disposed of its Hunters before reaching 3,000 hours. This is an important item because in 1990, the Swiss Air Force initiated the retirement of its Hunter fleet, in great part because of fatigue cracks found in many Hunters, especially refurbished Mk. 58A, most likely because the later refurbished aircraft had a higher fatigue state that earlier un-modified aircraft that had been acquire new. The Swiss Air Force assessed fatigue damage based on Fleet Average Spectrum Ref TA 6843, the guiding document, which was obtained from aircraft specially fitted with fatigue meters over the period 1985 to 1994. "Fatigue Life" is an important indicator of a Hunter's condition, and the Swiss Air Force used that reference. In fact, in the current after market, it is not unusual to see in advertised Hunters for sale in the UK references to the aircraft's fatigue life/state, including statements such as "aircraft has a fatigue life of 30…" characterized as low. The cumulative damage on Swiss Hunters was calculated and hence the Fatigue Index (FI) was derived using *Aircraft Fatigue Life Handbook Leaflet No 26 of 30 January 1968.* For example for a particular Hunter, the Swiss documentation (quite detailed) quotes the FI for a particular aircraft "as 69.80 at 2,407 hours. This is based on the most critical component, the steel lower wing boom. Other critical areas are the wing carry through structure and the forward fuselage transport joint. The wing FI limit is also FI 100 but can revert to zero on replacement of the lower steel boom to repair scheme D41170. STI Hunter/431 requires inspections at six FI intervals of shoulder fillets of wing spar lower lugs for those spars not conforming to D41170 Issue 2. The center fuselage (frame 25 lower tie bar) has a life of FI 100 and there is no recovery scheme. The procedures and limits of AP101B-1307-1 section 2 chapter 3C are applicable and the limit life of the aircraft is 100 FI (wings or fuselage). Until a fatigue meter is installed the fatigue is to be calculated in accordance with the unmetered flying formula as laid down in AP101B-1307-1. The FI to be used per flying hour taken from AP 101B-1307-1. They are Aerobatics: 0.077, Cross Country: 0.008, Low Level: 0.027, Gentle high level: 0.015. For any period of flying where the sortie pattern is not known the FI per flying hour may be taken as: front fuselage: 0.016, center fuselage: 0.020, and wing: 0.040. Using these figures, the FI at 2,472 hours 5 minutes is 72.40." Another example, applicable to a Hunter T68 noted "The T Mk 68 was not fitted with a fatigue meter but the Swiss assessed the fatigue damage based on a Fleet Average Spectrum ref TA 6843 which was obtained from aircraft fitted with fatigue meters over the period 1985 to 1994. The cumulative damage was calculated and hence the Fatigue Index was derived using Aircraft Fatigue Life Handbook Leaflet No 26 of 30.01.1968 published by HSA. When the aircraft was refurbished and converted to the T Mk. 68 the fatigue accumulated by the Swedish operations were assessed by HSA. The estimated flying hours were 1,500 and the associated fatigue index was passed to the Swiss Air Force. Swiss documentation confirms that the fatigue index was 71 at 1,604 hours, and this refers to the (steel lower) wing (boom) as the most critical component. The AP fatigue procedure for Mk 9 aircraft confirms that centre fuselage (HABL/003215) FI accumulation rate is in excess of that for the wings. Other fatigue critical areas are the wing carry through structure and the forward fuselage transport joint. In the conversion to the T Mk 68 modification 943, which eliminates the forward fuselage (41H/774740) from the lifed components, was embodied in principle. The applicant has also ascertained that modifications 1014 and 1032 are embodied. Of the two remaining items the wing is the more critical and this is used as the limited criterion." Since some Swiss AF Hunters were equipped with fatigue sensors to record all accelerations experienced during flight, the fatigue state could be considered satisfactory, depending on the data and analysis, and could be monitored using the system laid down in AP101B-1307-1 section 2 chapter 3C (AL 182). This could yield a known fatigue state after each day's flight.	
107.	Frame 32	The AIP must emphasize the inspection of Frame 32.	
		Additional Information: It is common for the Hunter to suffer structural cracking at Frame 32, just aft of the wing roots. This is the result of the design of the power train from the engine off-take to the hydraulic pump and the generators, which are on the front face of a turret gearbox at the base of Frame 32. A Hunter mechanic reported that "the power train consisted of a straight driveshaft from the engine, with a quick-release coupling, to the turret box. Through two right angles and lengthy shafts and casings. This seemingly flimsy arrangement vibrated and resonated enough to cause the frame to crack, which could not be tolerated because it might break up and lead to complete hydraulic and electrical failure, or worse. It was a threatening occurrence, and causes much hangar work, with many tails off, engine spot, repairs, refit engines and tails- all very time consuming." McEwen, Hunter From the Cockpit, 2009.	
108.	Cannibalization	Cannibalization is a common practice for several Hunter operators and service providers. Keeping adequate records of the transfers, uses and condition is extremely important.	
		Additional Information: In 2001, the GAO published its findings on cannibalization of aircraft by the DoD. It found that "cannibalizations have several adverse impacts. They increase maintenance costs by increasing workloads and create unnecessary mechanical problems for maintenance personnel. The services have many reasons for cannibalizing aircraft and strong incentives for continuing to do so. With the exception of the Navy, the services do not consistently track the specific reasons for cannibalizations. In addition, a Navy study found that cannibalizations are sometimes done because mechanics are not trained well enough to diagnose problems or because testing equipment is either not available or not working. Because they view cannibalization as a symptom of spare parts shortages, they have not closely analyzed other possible causes or made concerted efforts to measure the full extent of the practice. Furthermore, they cannot make sound economic decisions concerning the relative costs of alternatives, such as changes to storage levels or storage locations." *MILITARY AIRCRAFT; Cannibalizations Adversely Affect Personnel and Maintenance*, 2001.	

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109.	Bottom Main Spar Booms and Fuselage and Wings Re-Skinning	Ask whether the aircraft has had the refurbished/strengthen bottom main spar boom and fuselage and wings re-skinning. This modification was made to many Hunters that were refurbished and then resold by the manufacturer, Hawker Aircraft. It included many of the Ex-Swiss Air Force Hunters.	
		Additional Information: Note: The manufacturer kept records of each individual aircraft that described the level of rebuilding that took place.	
110.	Aircraft Storage and Returning the Aircraft to Service After Inactivity	Verify the applicant has a program to address aircraft inactivity and specifies specific maintenance actions for return to service per the applicable Hawker Hunter inspection schedule (for example, after 31 days).	
		Additional Information: The applicable RAF/SAF guidance is to be followed after a period of inactivity. For example, if the aircraft has not flown in 30 days, a daily inspection schedule may not suffice. The required inspection must be made by qualified ground personnel. The aircraft should be housed in a hangar during maintenance. When the aircraft is parked in the open, it must be protected from the elements, that is, full blanking kit and periodic anti-deterioration checks are to be carried out as weather dictates.	
111.	Specialized Tooling for Hawker Hunter Maintenance	Verify adequate tooling, jigs, and instrumentation is used for the required periodic inspections and maintenance per the Hawker Hunter maintenance manuals.	
		Additional Information: The Hunter requires specific tooling, jigs, and instrumentation to for certain activities such as removing the tail, lubricating critical areas, and ensuring the serviceability of emergency and survival equipment. Moreover, removing the tail and the engine without adequate tools and jigs can cause structural and engine damage. In the case of ex-Swiss AF Hunters, it is known that the aircraft were generally disposed along with a certain quantity of spares and comprehensive set of tooling.	
112.	Technical Changes Issued While in Service	Verify the AIP references and addresses the applicable RAF/SAF/NATO technical changes issued to the Hawker Hunter during military service to address airworthiness and safety issues, maintenance, modifications, updates to service instructions, and operations of the aircraft.	
113.	Time Critical Technical Directives and Changes or RAF/SAF/NATO Equivalent	Verify the AIP specifically accounts for, addresses, and documents the applicable time critical technical directives (i.e., applicable APs for the Hunter) issued to the Hawker Hunter while in service with the applicable Air Force and Hunter version. Compliance with these is essential for safe operations.	
		Additional Information: If the AIP only makes reference to a few such documents issued in 1978, for example, it would not be adequate. The adequate documentation for a ex-Swiss Air Force Hunter would the latest guidance issues close to the aircrafts' retirement date, 1994-1994 timeframe.	
114.	SAF/NATO Hawker Hunter Safety Supplements	Verify the applicant/operator has copies of the applicable safety supplements for the Hawker Hunter and they are incorporated into the AIP or operational guidance as appropriate. The most current version of the Airplane Flight Manual (AFM) or pilot notes usually provides a listing of affected safety supplements and this can be used as a reference.	
115.	Corrosion Due to Age and Inadequate Storage	Evaluate the adequacy of corrosion control procedures. Age, condition, and types of materials used in the Hawker Hunter may require some form of corrosion inspection control. Ask whether a corrosion control program is in place. If not, ask for steps taken or how it is addressed in the AIP. Recommend the use of TO 1-1-691, *Corrosion Prevention and Control Manual*.	
		Additional Information: Recommend the use of TO 1-1-691, *Corrosion Prevention and Control Manual*.	
116.	Aden Cannon Cradle	Verify that the AIP and associated procedures ensure that the Aden cannon cradle is properly fastened at all times. The cradle is an essential structural element. For example, the aircraft cannot be towed without risking structural damage to the fuselage. Without it, the aircraft might also be tail-heavy due to the shift in CG.	
117.	Paint and Appearance	Ensure that the AIP provides for the correct application of paint for the intended purposes, such as protecting the aircraft from weather, corrosion (see above), ease of cleaning, and aid the detection of leaks. Paint is also used to warn of danger areas. As part of an airworthiness inspection, caution is recommended in judging the aircraft's condition or the quality of the restoration by the "paint job."	
		Additional Information: Too many former military jet aircraft (FMJA) in civil hands appear pristine on the outside, and have many deficiencies on the inside. Many reviews and media refer to them as 'immaculate," when in fact, mechanically, their condition is questionable. An experiences UK Hunter operator, while inspecting a Hunter F6 for acquisition noted that "externally, it looked terrific…internally, it wasn't as good…" McLelland, *The Hawker Hunter,* 2008.	

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118.	Rolls-Royce Avon Engine Types and Maintenance Procedures	Verify the AIP adheres to the SAF/NATO/Rolls-Royce maintenance procedures requirements for the specific engine type installed, that is, Avon 113, 115, 121, 122, or 203/207. The first 159 Hunter F4s had the earlier Avon 113 engine, but starting at No. 160, the Avon 115 was incorporated. References to Avon 119 and Avon 121A are also possible because these were upgraded versions. Similarly, Avon 203 engines were, in some cases, replaced with the 207 variant. In the Swedish Air Force, the Avon engines installed in the Hunter F4 (J34, Swedish designation) was the Rolls-Royce 23M (RM5B) manufacturer in Sweden by Saab.	
		<u>Additional Information:</u> General Avon versions, variants, and designations include: • RA.3: Civil designation for the first Avon production mark-6,500 lb; • Mk.100 series: Military designation for the RA.3 Avon-6,500 lb; • RA.7: Civil designation for the upgraded version of the Avon-7,350 lb; • Mk.114: Military designation for the RA.7 Avon-7,350 lb ; • RA.14: Civil designation for the uprated version of the Avon 200 Series- > 9,500 lb; • Mk.200 series: Military designation for the uprated version of the Avon; • RA.26: Further improvements to the Avon 200 series; • RA-28: Avon 200 series installed in the Hunter FR10; • RM5: Swedish license production of the RA.3/Mk.109; Note: In terms of reliability, the Avon 115 was the first Avon engine fitted to Hunters that could truly be called operational, although it retained several of the issues that plagued its predecessors.	
119.	Rolls-Royce Avon Records Specific to the Engine Installed in the Aircraft	Ensure the applicant shows adequate records for the engine installed in the aircraft. Failure to clearly determine this has been linked to accidents.	
		<u>Additional Information:</u> For example, in a 1999 Hunter accident, the NTSB noted "according to records at Rolls-Royce, the engine was manufactured in 1954 and sent to the RAF as part of a spares contract. The engine was last in the factory overhaul facility on March 26, 1981, for overhaul at 251 hours TSO. The engine is life limited to 450 hours between overhauls. The last manufacturer's records on this engine documented its installation in another Hawker Hunter by the RAF in 1983, with 392 hours TSO. The operator's engine maintenance records began on June 27, 1990, and documented its installation in the accident airframe at a maintenance facility in Wisconsin. An unsigned handwritten note preceded this entry and stated that the engine had a total run time since overhaul of 436 hours, with 265 hours remaining to overhaul. No documentation was available to support the engine history between leaving RAF service and the installation in the accident airframe. The last entry in the records was dated July 2, 1999, and consisted of an annual inspection at a time of 548 hours since last overhaul." An example of engine records for a Hunter include: "The engine is a Rolls Royce Avon Mk 207 to Technical Certificate RRT/26 Issue 1. The RR Avon 207C, Serial No 17024 was installed in the aircraft after complete overhaul in Switzerland at 1495 airframe hours. Reference to Swiss documentation shows: • Total engine hours 1163; • Engine hours since overhaul 111.13; • Engine TBO 600 hours; Engine cycle usage rate (including ground running carried out in lieu of corrosion inhibiting) is to be accounted in accordance with Rolls Royce Manual viz. 4.0 cycles equivalent to 1 flight hour, and the engines are subject to a calendar life of 10 years between overhauls (associated with corrosion of 12% chrome steels).Fire warning and extinguisher systems are provided and operational."	
120.	Manufacturer's and/or SAF/NATO Engine Modifications	Verify the AIP addresses the incorporation of the manufacturer and RAF/SAF/NATO modifications to the Rolls-Royce Avon engine installed. This is extremely important in aircraft like the Hunter because of age and the technology involved in that generation of power plants.	
		<u>Additional Information:</u> In fact, the NTSB and some foreign civil aviation authorities have determined a causal factor in some accidents is the failure of some civil operators of former military jet aircraft (FMJA) to incorporate the manufacturer's recommended modifications to prevent engine failures.	
121.	Cycles and Adjustment Avon Engine Replacement Intervals (10 Limit Between Overhauls)	Ask if both engine cycles and hours are tracked. If not, it must be done. On Rolls-Royce Avon engines, engine cycle usage rate (including ground running carried out in lieu of corrosion inhibiting) must be accounted for in accordance with Rolls Royce Manual viz. 4.0 cycles equivalent to 1 flight hour.	
		<u>Additional Information:</u> This document also shows a calendar life of 10 years between overhauls, which is associated with corrosion of 12 percent chrome steels.	

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122.	Rolls-Royce Avon Airworthiness Directives (ADs)	Recommend the applicable ADs involving certificated versions of the Avon engine be considered as part of the AIP. These may address known safety issues that may exits in the Hunter's engine installation.	
		Additional Information: Often, an AD calls for an inspection, with a modification or inspection required at a later date. It is very important to identify, in the maintenance record entry, the portion of the AD that was considered and what action was taken. 14 CFR part 91, § 91.417(a)(2)(v) could be used as a tool to keep a record of the AD-related action(s) and status.	
123.	Rolls-Royce Avon Engine Inspections and Time Between Overhaul (TBO)	Verify the applicant has established the proper inspection intervals and TBO/replacement interval for the specific engine type (Avon 100 and 200 Series and serial number). Adhere to those limitations and replacement intervals for related components.	
		Additional Information: The TBO in an Avon 100 Series engine is limited to 450 hours. Adequate technical justification BY THE MANUFACTURER and FAA concurrence is required for an inspection and TBO above those set in the appropriate Hawker Hunter/engine inspection guidance. Clear data on TBO/time remaining on the engine at time of certification is critical as is documenting those throughout the aircraft life cycle. Because of the history of engine failures of Avon engines installed in Hawker Hunters, it is recommended that no extensions be granted. In fact, the U.K. AAIB noted after a Hunter accident that "in view of the marked reduction in flying utilization of ex- RAF Hawker Hunter jet aircraft which have been acquired for civilian use and the related greatly increased calendar time between scheduled overhaul of the fuel and air system components on their Avon turbojet engines it is recommended that the CAA, in conjunction with Rolls Royce, consider the introduction of appropriate calendar time overhaul periods for such engine systems, the serviceable condition of which can be calendar time dependent due to component material aging affects."	
124.	Engine Check	Verify that the AIP includes adequate procedures, including checks and sign-offs for returning an aircraft to service after any work on the engine.	
		Additional Information: The NTSB found as part of its investigation of a fatal Hunter T7 accident in 2004, that after an engine swap-out the week before the fatal accident, the mechanic's had warned that the newly installed engine was not operating correctly. The record also shows that the A&P mechanic who oversaw and supervised the engine change did not sign off any maintenance records to return the airplane to an airworthy status. Sadly, before the fatal flight, two engine acceleration tests failed, and multiple aborted takeoffs in the days leading up to the fatal crash had taken place.	
125.	Rolls-Royce Avon Engine Hot Section Inspection	Verify the AIP provides for the required Avon engine hot section inspection at 300 hours as per the manufacturer's requirements and inspection procedures and guidance.	
126.	High Energy Ignition Unit	Verify the AIP provides for the high energy ignition unit at 600 hours as per the manufacturer's requirements and inspection procedures and guidance.	
127.	Engine Control Cable Inspection	Verify the AIP provides for the inspection of the engine control cable (Teleflex) at 300 hours as per the manufacturer's requirements and inspection procedures and guidance.	
128.	Relight and Ignition Circuits	The AIP should specifically address the likelihood that although the engine re-light circuits are separate from the ignition circuits, frayed wiring can erode the insulation at the point where they cross and short them. This is due to engine vibration, notably with the Sapphire engine.	
129.	Avon Mk. 113 Upgrade	If the aircraft is equipped with the Avon Mk. 113 engine, ask whether the modifications to bring the engine up to the Avon Mk. 119 standards have been incorporated. These modifications are essential in addressing many safety deficiencies of the earlier versions of the engine, like the Mk. 113.	
130.	Avon 100 Series Failures	Although the Anon 200 Series has a history of failures, data indicates a higher likely hood with the 100 Series engine. See *Rolls-Royce Avon Failures* below.	
		Additional Information: In fact, between 1980 and 1992, data showed 22 cases involving the Avon Mk 122 engine where engine speed dropped and subsequent engineering investigation did not establish a clear cause. Anecdotal evidence indicated Avon Mk 122 engines suffered from unexplained power reductions from time to time during RAF service, but in most cases, the aircraft returned safely and the subsequent RAF engineering investigations, including related engine ground runs, failed to identify associated causes or reproduce the symptoms	
131.	Avon 200 Series Engine De-Rating	Verify whether the Avon 200 (that is, 203 or 207) has been de-rated from 10,500 lb to 10,000 lb. This was done to enhance the type's reliability, including fatigue cracks, causing compressor blade failures. In addition to de-rating, fatigue was tacked by the introduction of steel rotor and stator blades toward the rear of the compressor.	

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132.	Rolls-Royce Avon Failures	Verify the AIP and SOPs address and focuses on known Avon 100 and 200 Series engine failure modes and causes.	
		Additional Information: Known Avon engine failures include— ➢ Failure to inspect after engine installation in accordance with appropriate manufacturer/military operator guidance; ➢ Ruptured seals; ➢ Uncontained failure of HP and LP turbine blades; ➢ Stage 3 compressor blades due to high cycle fatigue development from corrosion pits; ➢ 2nd Stage compressor failure; ➢ Compressor blade failure, such as "11th stage compressor disc disintegrating;" Note: The Avon had 12 compressor stages; ➢ Third stage compressor blades fracture from their root fixing lugs and separated; ➢ Un-commanded over-fuelling; ➢ Corrosion pitting of the blade retention lug bores; ➢ Accelerator Control Unit (ACU), surges; ➢ P2 bleed from the compressor leaks; ➢ High pressure turbine disc failure and fracture; ➢ Booster Pump Failure, IGV failures; ➢ Water contamination of the engine fuel filter housing; ➢ Exhaust gas temperature (EGT) failure; Note: In RAF parlance, EGT are referred to a JPT or Jet Pipe Temperature; ➢ Faulty BVCU (Bleed Valve Control Unit) diaphragm, causing compressor stall as the throttle opens; ➢ High Pressure Switch and Solenoid Assembly Valve tendency to stick; ➢ Combustion chamber failure. Note: The Avon has eight (8) combustion chambers; ➢ Fouled exhaust cone aft of LP Turbine, and fuel pressure sensor failure; Note: All through its operational life, and until 1994, the Hunter experienced unexplained Avon engine vibrations. This is another cautionary factor that should be added in any deviation form any inspection. A Hunter accident report by the U.K.'s AAIB illustrates an Avon engine failure and fire: "At this stage G-HHUN was at some 500 to 700 ft AGL and a flame, estimated at some 10 ft in length, was seen emanating from the aircraft's jet pipe by several ground witnesses. A second flame was observed emanating from the side of the fuselage forward of the tail plane, at the base of the leading edge of the fin. The aircraft turned left towards Runway 25 and appeared to barely clear trees on the south-eastern boundary of the airfield before it passed over the perimeter track, at a height of some 20 ft AGL and with approximately 10° of left bank. The aircraft then struck the disused runway short of Runway 25 with its left drop tank, whilst at an angle of 40° to the runway heading, before landing heavily on its main landing gear. It then bounced back into the air and rolled left to a bank angle of some 65° before striking the ground a second time with its left wing tip, leaving a long ground mark in the grass approaching the runway. It then pitched downwards and yawed left onto its nose, impacting the runway surface before sliding laterally on its belly, at one stage. Backwards, across the runway and grass beyond. It finally came to rest in an upright attitude on the northern side of Runway 25. The pilot, who had been released from his safety harness during the impact sequence, suffered fatal injuries. During the brief period of the in-flight fire, the rear fuselage below the base of the fin leading edge had burned away around most of its circumference, and the rear fuselage had then broken away during the second ground impact. It was determined from photographs taken of the aircraft in flight just before the impact and from the condition of the tail plane flying controls afterwards that although they had been functional at the first ground impact, they would not have survived the effects of the fire for many more seconds in the air. An initial inspection of the engine on-site found evidence of pre-impact damage to the blades of both turbine stages, together with disruption of the tail cone aft of the turbines where it appeared that turbine blade material had been uncontained. The associated holed casing had allowed the combustion flame to penetrate the rear fuselage. No obvious compressor damage was apparent and the compressor and intake area was clean. The Low Pressure (LP) and High Pressure (HP) fuel cocks were found selected 'On.' The throttle lever was found positioned around 40 percent open, but could be easily moved. The filament of the fire warning lamp was found to be extensively elongated, indicating that it had been illuminated and had stretched under deceleration forces at the time of impact. The EGT gauge was badly damaged and the pointer had been broken off and was not recovered, however the face of the instrument showed some paint smearing and scuff marks which were considered to have been caused by contact with the back of the pointer. These marks indicated that the pointer had been at about full scale deflection on impact. Examination of the engine, particularly of the turbine, showed that it had suffered an uncontained failure of HP and LP turbine blades as a result of excessive turbine temperatures induced by gross over-fuelling."	

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133.	Sapphire 101 Series Engines	If applicable, the AIP and all associated issues and tasks should reflect the installation of the Sapphire engine. If applicable, verify the Sapphire oil system is inspected as per the manufacturer's or RAF's guidance. Particular emphasis is needed for the total loss oil system.	
		Additional Information: The Hunter Mk. 2 and later Hunter Mk. 5 were fitted with the Sapphire 101 series engines. The inspections must include the fuel control system, a historical failure point with the Sapphire engine. Another failure point with the Sapphire was centerline closure. Centerline closure is the term used when the compressor or turbine blades expand to the point where they scrape the inside of the engine casing. Note: The Sapphire engine was later modified in the U.S. as the J-65. In addition, because the engine oil system in the Sapphire is a non-recovery system, Further, because the engine oil system in the Sapphire is a non-recovery system (total loss oil system), oil used by the engine is ejected from a port on each side of the fuselage and shows up as smoke streaming aft when the aircraft moves at power. The oil vents from the bearing cavities at about 2 quarts per hour. It is essential to ensure the oil level is emphasized in all aspects of maintenance.	
134.	U.K. CAA Letter to Owners and Operators No. 2187 Avon Mk. 122 Series Engines	Verify the AIP addresses LETTER TO OWNERS/OPERATORS NO 2187, issued by the U.K. CAA, April 2, 2001.	
		Additional Information: Letter No. 2187 makes recommendations concerning Rolls-Royce Avon Mk. 122 Series Engines front panel TO nozzle bolt failures. It adds: "In 1999, the CAA was advised of an instance of bolts found missing from the front panel to nozzle box flange joint on an Avon Mk 122 engine. The sheared bolt heads were found in the rear fuselage. Loss of bolts in this area could, in extreme circumstances, lead to a hot gas leak. The part number of the bolts concerned was RJ5207. No further reports have been received since the original occurrence report and CAA do not propose to issue any mandatory action to address these failures. It is however recommended that at each Permit to Fly renewal the joint is visually inspected to ensure that no bolts have failed. If failed bolts are found, they should be replaced before further flight and the incident should be reported to CAA Propulsion Department. CAA will monitor any further reports of such bolt failures to determine if further action is appropriate."	
135.	U.K. CAA Letter to Owners and Operators No. 1714 Avon Mk. 122 Series Engines	Recommend the applicant/operator consider LETTER TO OWNERS/OPERATORS NO 1714, issued by the U.K. CAA, dated March 18, 1998.	
		Additional Information: Letter No. 1714 makes recommendations concerning Rolls-Royce Avon Mk. 122 Series Engines and the inspections of LP turbine blades to EWI 252 or EWI 636 standards. It states "the instructions for inspections to detect leading edge airfoil creep cracking on LP blades. The instruction also calls for repetitive inspection at 50 flying hours intervals until the engine is next returned to Rolls-Royce. Operators may find that engine log books have been endorsed to indicate that this instruction has been carried out. It has been drawn to the attention of the CAA, however, that some operators have not appreciated that the SI instructs repetitive inspections. The instruction addresses possible LP turbine blade failure mode which could lead to significant thrust loss and therefore it is recommended that operators of Avon Mk. 122 engines to carry out the specified inspection operations at the 50 hour intervals called for in the SI. Any incidents of cracking should be reported to the CAA."	
136.	Rolls-Royce MOD 5522 and MOD 5528 (Part I)	Verify the AIP incorporates the appropriate Rolls-Royce inspection of stage 3 compressor blades, including compliance with Rolls-Royce MOD 5522 and MOD 5528. The Avon 100 Series has a history of high cycle fatigue failures of stage 3 compressor blades due to corrosion pits. The NTSB accident report below, reproduced in great detail, provides the necessary background on this critical issue and the need for compliance with MOD 5522 and MOD 5528.	
		Additional Information: A NTSB accident report on a Hunter T7 (the aircraft was being re-positioned to NAS Pt. Mugu for contract work for the US Navy) explains this critical issue, and illustrates the consequences of not complying with the required modifications. The report states: On November 17, 1999, at 1649 hours mountain standard time, a Hawker Siddeley Hunter T MK 7 jet, N576NL, collided with a ditch following a complete power loss on initial takeoff at Williams-Gateway Airport, Mesa, Arizona. The airplane sustained substantial damage. The commercial pilot sustained serious injuries and his passenger received minor injuries. The flight was being conducted under 14 CFR Part 91 when the accident occurred. The purpose of the flight was to reposition the aircraft to California for training purposes. Visual meteorological conditions prevailed at the time of the accident and the airplane was on an IFR flight plan. The flight originated at the airport moments before the accident. The pilot said that the airplane was prepared for flight and serviced by his crew chief before he did a preflight on the airplane. He stated that everything appeared ok and the airplane appeared ready for flight. The pilot said the engine start was uneventful, "nice and cool," with temperatures staying below 500 degrees as the engine spooled up to idle power in less than 20 seconds. He requested and received an IFR clearance to NAS Pt. Mugu from ground control, went through the post start and taxi checks, and taxied out to runway 30C. After they reached the hold short line, they completed the takeoff checklist and called for takeoff. They were cleared for takeoff with a right turnout after departure. The pilot said they taxied out on the runway and ran the engine up to 7,200 rpm and checked the instruments and flight controls. The engine temperature, oil pressure, hydraulic pressure, and boosted flight controls were working well. He then released the brakes, pushed the throttle up to the "military power detent," and checked the instruments again as they began the takeoff roll. He stated that rpm was 8,100, temperature was 650 degrees, and oil and hydraulic pressure was good. He said the airplane accelerated nicely and he rotated at 130 knots and flew off at 140 knots after using about 3,000 feet of take-off roll. About 5-10 seconds after takeoff, the pilot said he experienced a significant compressor stall with the engine "chug" and a loud explosion. He notified the crew chief that they had just lost the engine, and that he was going to set the airplane back down. He lowered the landing gear and set up for a normal touchdown back on the runway. He extended the drag chute just before touchdown and said he felt a "good tug." Once back on the ground, he immediately began applying the brakes in an attempt to stop the airplane before they reached the flood control ditch at the end of the runway. He was unable to stop the airplane before it hit the ditch and they went into the	

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	Rolls-Royce MOD 5522 and MOD 5528 (Part II)	ditch and back out the other side. When the airplane came to rest, the pilot said he told his crew chief that he had broken his back and asked him to blow the canopy for him to get them out of the airplane. The crew chief, positioned in the right seat, stated that the preflight, start-up, run-up, and takeoff were "normal," and he did not realize that there was a problem until the pilot informed him that the engine had quit. He said he did not recall seeing any panel lights or hearing any aural warnings. An eyewitness to the crash said he was located on the south ramp at the airport and that the ramp was approximately 45-degrees to the runway. His line-of-sight had him watching the middle of the takeoff run. He said he heard a "bang" which sounded like a compressor stall and then the airplane was out of his sight. He said he heard two more compressor stalls at close to the same magnitude. He said he would estimate the airplane was at 100 feet AGL when he first noticed the takeoff. A witness, who was a pilot in an airplane behind the accident airplane, was interviewed. He stated he observed a 30-foot flame exit the engine when it was about 200 feet above the ground on the initial takeoff climb. The pilot said that he did not observe any catastrophic failure of the engine or any parts depart the engine as he observed the flames. One eyewitness who watched the airplane takeoff stated he heard a "bang" that sounded like a compressor stall after the airplane had climbed to approximately 100 feet AGL. He said the airplane continued out of his sight but that he heard at least two other loud noises very similar to the first noise after the airplane disappeared from his sight. The airplane is a two-seat ex-military jet fighter produced in the 1950's and early 1960's by Hawker for service in the United Kingdom Royal Air Force. Following the airplane's surplus from the RAF, it was imported into the United States and was being flown under a Federal Aviation Administration (FAA) special airworthiness certificate in the experimental category for the purpose of exhibition and racing. The airworthiness certificate was issued on December 12, 1994, by the Minneapolis, Minnesota, Flight Standards District Office. The airplane's logbook shows three recent flights including the ferry flight from Minnesota to Williams Gateway on November 9, 1999, for a total of 3.5 hours. The pilot of the ferry flights was also the pilot on the accident flight. According to Rolls-Royce, a review of their records indicated that the engine, serial number 5919, was manufactured in 1954 and sent to the RAF as part of a spares contract. The engine was last dispatched from their overhaul facility on March 26, 1981, following part life rework (overhaul) at 251 hours technical service order (TSO). According to Rolls-Royce, the engine is life limited (overhaul requirement) at 450 hours from parts rework and it would be life expired at 701 hours TSO. The last records on this engine documented its installation in another Hawker Hunter, serial number XL617, by the RAF on September 28, 1983, with 392 hours TSO. The engine maintenance records presented by the operator at the request of Safety Board investigators began on June 27, 1990, and documented its installation in the accident airframe at Volk Field, Wisconsin. An unsigned handwritten note preceded this entry and stated that the engine had a total run time since overhaul of 436 hours, with 265 hours remaining to life limit. No documentation was available to support the engine history between leaving RAF service and the installation in the accident airframe. The last entry in the records was dated July 2, 1999, and consisted of an annual inspection at a time of 548 hours since overhaul. Safety Board investigators and technical representatives of Rolls-Royce examined the airplane on January 11-12, 2000. The salvage operator who recovered the airplane reported that the main fuselage fuel tanks and 100-gallon tip tanks were full of fuel, with just in excess of 400 gallons pumped into barrels at the crash site. The wings were removed by the salvage operator to assist in the recovery of the airplane. The nose gear was collapsed and the nose bay was damaged. Impact damage was observed to the forward section of the fuselage. Inspection of the intake prior to the engine removal showed that the intake ducting contained a moderate amount of dirt, with heavier concentrations present in the right duct. The starter fairing was intact with no apparent damage. The left portion of the instrument panel just above the avionics rack was buckled. All circuit breakers were in. The LP and HP throttle cocks were in the aft (cutoff) position. The fuel isolation switch was guarded and in the normal position. The engine remained contained within the engine bay during the impact sequence. Further examination of the engine revealed that the forward roller track was fractured. The bottom of the exhaust duct showed upward bending. The aft portion of the tail cone contained evidence of fire damage external to the tail cone. Material burn through was evident extending from an area at the 6 o'clock position to the 3 o'clock position as viewed from the rear. The tail cone also had impact deformation. Inspection of the exhaust duct area revealed a heavy deposit of black foreign material between blades of the LP turbine. The deposit was noted to be centrifuged to the shroud ID and was brittle in nature. Additionally, the exterior contained a black brittle appearance. The deposits broke into pieces when removed with a small screwdriver. Control continuity was established to the LP and HP throttle levers at the FCU prior to engine removal. The engine accessories were found undamaged after the engine was removed from the engine compartment bay. All lines were found secure with consistent evidence of safety wire usage. The electrical connection at the fuel pressure-warning switch was found secure. The Intake Guide Vane Ram Assembly (IGV) was secure. Inspection of the air inlet showed damage to the IGV plus first and second stage compressors. The IGV showed FOD damage to the vane leading edge as well as the vane chord, pressure side. Several of the first and second stage compressor blades showed FOD damage to the leading edges, predominately mid-length to tip. The engine would not turn by hand. A partial engine disassembly was then conducted in an attempt to locate the source of the mechanical lockup. Three of the eight combustion chambers were removed and inspected. All of the chambers contained moderate concentrations of metalizing (splatter) affixed to the chamber walls adjacent to the fuel nozzle ejector exit. Small flakes of a silver material were noted lying loose in the chamber.	

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	Rolls-Royce MOD 5522 and MOD 5528 (Part III)	After removal of the combustion chambers, the leading edges of the HP Turbine was noted to contain heavy concentrations of a brittle black deposit formed around the blades. With the combustion chambers removed, the compressor outlet from the 12th stage could be viewed. Several broken pieces of what appeared to be compressor vane or blade material could be seen lodged between the outlet guide vanes. The air intake casing was removed followed by the upper compressor casing. As the upper casing was lifted by crane from the lower casing, several compressor blades/vanes fell onto the ground. Removal of the upper half of the compressor casing revealed extensive damage to the compressor. Impact damage was observed on the stage 1 to stage 4 blades. Three blades from stage 3 had fractured through the root-fixing lug. The bottom portions of the lugs were retained in position by the securing pins. The top half of the lugs and the aerofoil had been lost. All the stage 5 to 10 blades had fractured through the aerofoil just outboard of the root platforms. Two stage 11 blades and a stage 12 blade had also fractured through the aerofoil just outboard of the root platforms. The remainders of the stage 11 and 12 blades were intact but exhibited impact damage. Most of the broken blades had been retained within the compressor section. Arrangements were made to collect fractured blades and vanes for laboratory analysis. Additionally, the salvage operator cut out two portions of the third stage compressor blade lug fractures and samples of the third stage compressor blades. These samples were sent to the Air Accidents Investigation Branch (AAIB) in Farnborough, England, to be taken to the Rolls-Royce Bristol facility for analysis. According to the Rolls-Royce engine failure investigation report dated June 6, 2000, the primary failure was most likely the three stage 3 compressor blades that had failed in the root fixing lugs. The inspection also revealed extensive secondary damage to the compressor. The second stage blades exhibited extensive damage that was either FOD or secondary in nature. Examination of the fractured lug revealed that it had broken at the 3 and 9 o'clock position. According to the Rolls-Royce report, their experience shows these are generally the positions of peak steady stress. Examination of the fracture face revealed that it had failed due to high cycle fatigue development that had initiated in the bore of the pin-fixing hole. The fatigue had propagated roughly 90 percent through the lug at the 9 o'clock position prior to final "break off." There was no evidence of fatigue development in the lug at the 3 o'clock position. The rear face of the lug fragment between the 6 and 9 o'clock position exhibited extensive inter-granular cracking and pitting. Analysis using an Energy Dispersive X-ray (EDAX) technique revealed high levels of oxygen associated with the cracks and pits indicative of corrosion. At the fatigue nucleus, the corrosion had undermined a number of surface grains and at least one underlying grain of material. The grains had fallen away from the lug leaving a cavity 0.0134-inch deep at the nucleus. The report opined that the fatigue had nucleated at the inter-granular corrosion. The side faces of the fixing lug displayed a 0.118-inch wide band of heavy fretting damage located at the bottom of the lug. Similar damage was observed on the fixing lugs of the unbroken blade. The report opined that the damage was caused by excessive vibration and probably occurred after the three blades had failed. Examination of the other fractured fixing lug (blade 2) revealed that it had also failed at the 3 and 9 o'clock positions. Examination of the fracture face revealed that it had failed due to high cycle fatigue development that had initiated in the bore of the pin-fixing hole. The fatigue had propagated roughly 75 percent through the lug at the 9 o'clock position prior to final fracture. Secondary fatigue systems were observed at the 9 o'clock position in the region of final break off. The history of the stage 3 compressor blade failures was examined. There have been three other previously investigated occurrences of stage 3 blade failures resulting from fractures through the root fixing lugs. All three failures had occurred due to high cycle fatigue that had initiated at corrosion pitting and had propagated through the root-fixing lug resulting in release of the aerofoil. In addition, the laboratories at East Kilbride had examined five other occurrences of lug failures that had not been formally reported. The details of the occurrences are contained in the laboratory report. The root-fixing lug from one of the unbroken stage three blades was sectioned, mounted, and lightly polished into the front face to facilitate metallographic examination. This revealed that the bore of the pinhole had pulled away from the top of the bush. Small areas of corrosion were observed on the front face of the lug, mainly located around the blend radius between the front face of the bore of the pin-fixing hole. The examination revealed a corrosion crack 0.004 inches deep, located at the 7 o'clock position. The material exhibited a satisfactory microstructure composed of evenly distributed insoluble iron/nickel precipitates in the aluminum matrix. Hardness measurements conducted on an unbroken lug returned values between 147 and 151 Hv (10 kg), which satisfied the drawing requirement of 120 to 140 HB (132 to 153 HV 10kg). Hardness measurements on lug 1 also returned values between 145 and 150 Hv (10kg). Rolls-Royce reported that in response to the history of failures of stage 3 compressor blades due to high cycle fatigue development from corrosion pits, two modifications were introduced. MOD5522 introduced a strengthened lug and MOD5528 introduced a silicon rubber sealant to the bush bore interface. From examination of the submitted components, the metallurgist concluded that these modifications had not been incorporated on this engine. Rolls-Royce stated that the RAF had completed the introduction of MOD5522, and had probably completed the introduction of MOD5528 to their fleet by the end of 1986. The entry in the engine record sheets shows that the engine was in operation at RAF Brawdy in 1983. Rolls-Royce concluded that it might be assumed that engine 5919 left RAF service between 1983 and 1986 without incorporation of these modifications."	

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137.	Engine Modifications	Permit engine modifications only if there is manufacturer's data on the upgrade, and the related procedures, including required testing.	
		<u>Additional Information:</u> Replacing an Avon 100 Series with an Avon 200 Series engine on Hunters T7 or F4 for example, which is a complex task, is not easily managed by an operator without OEM support. For example, a number of Hunter F4s were upgraded with the Avon 203 of the Hunter F6. Because that variant of the engine was of larger diameter than the Avon 113 or 122 installed in the F4, the upgrade was a very complicated issue for the airframe and engine manufacturers. In the end, the whole engine bay had to be significantly rebuilt. Specifically, and to illustrate the major nature of this task, using F6 vertical frames, the rebuild took place from aft of the main spar (frame 25) back to a modified frame 40a, which formed the transport point joint and engine attachment point, at the rear spar station frame 32. No homemade upgrades should be permitted. There have been cases where some military surplus aircraft have being modified with larger thrust engines leading to unsafe conditions. The fact that the aircraft is experimental does not mean any and all changes or modifications are adequate or safe. If modifications outside this guidance are contemplated, adequate flight testing and recordkeeping is necessary and this may possibly include a well-documented R&D project. In any case, the cognizant FSDO must be notified, and its response received in writing, before flying this aircraft after incorporation of a major change as defined by 14 CFR § 21.93 to determine whether new operating limitations will be required. The following excerpt from a NTSB accident report concerning a former military jet illustrates the dangers of certain types of modifications and inadequate standards, technical guidance, and testing: "On June 18, 2011, the [jet aircraft] experienced the partial failure of the primary airframe structure supporting the airplane's rudder while in the air race pattern at Reno-Stead Airport, Reno, Nevada. The commercial pilot, who was the sole occupant, was not injured, but the airplane sustained substantial damage. The local 14 Code of Federal Regulations Part 91 air race qualification/training flight, which took off from the same airport about 20 minutes prior to the accident, was being operated in visual meteorological conditions. According to the Federal Aviation Administration (FAA) inspector who responded to the scene, while the airplane was in flight, part of the engine support structure that had been installed as part of a modification to install a higher thrust engine, had failed to hold the new engine in proper alignment. That failure allowed jet blast from the engine to be deflected onto a portion of the primary airframe structure. The melting of that structure affected the support and movement of the airplane's rudder. Although the failure occurred in flight, it was not detected until the pilot was operating the rudder pedals during the landing roll. Although the pilot was able to keep the airplane on the runway, she had to apply alternative/non-standard control inputs in order to do so. During the investigation it was determined that at least five other L-29 airplanes had the same type of mounts, which were all designed, welded/manufactured by the same entity. According to the FAA inspector who looked at these mounts, the welding was poor on some of them, and there was some degree of structural variation between a number of the mounts."	
138.	Bleed Valve Control Unit (BVCU) Malfunction	Verify the AIP addresses the possibility of a Bleed Valve Control Unit (BVCU) malfunction. Such a malfunction can cause compressor airflow stagnation or surge.	
		<u>Additional Information:</u> Airflow control problems could have caused the June 8, 1997 incident with a British Hunter, where combustion rumble was heard, but no cause was subsequently identified. The behavior of the BVCU during the various rig tests at the engine manufacturer and its subsequent, reasonably correct operation, could be explained by temporary obstruction effects of internal debris (associated with the piece of sealant found during strip inspection), which may have subsequently cleared due to airflow purging. Some of the unexplained power reduction incidents in RAF operation of the Avon Mk 122 engine might have also been caused by temporary blockages within BVCUs. Subsequent ground runs or adjustment could have cleared such blockages, resulting in normal operation, and leaving the engineers involved unable to reproduce or identify the problem. Over-use of sealant during overhaul of such BVCUs was a known problem when Hunter aircraft with Avon Mk 122 engines were in RAF service.	
139.	Intake Guide Vane (IGV)	Ensure the AIP addresses the IGVs in the engine.	
		<u>Additional Information:</u> The intake guide vanes are a critical safety item with the Hunter. These variable vanes between the first few stages of the compressor are there to redirect airflow. Sometimes, the pilot can hear the system from the cockpit as large power changes are made. In one U.S. Hunter accident, a cold engine was reported during one of the aborts of the aircraft before the accident. The IGVs are controlled by fuel pressure, and if there is air in the IGV governor, or in the system, the air would be compressed rather than fuel, and the IGV may work incorrectly. This can lead to a loss of thrust. This has been linked to several Hunter accidents, and is one of the likely causes of a fatal 2006 Hunter accident in the U.S. Note: If the engine has been sitting a while, bleeding the IGV system may be necessary before flight.	
140.	EGT/JPT Gage Failure	Ensure the AIP addresses the adequate inspection of the Exhaust Gas Temperature (EGT) system. In RAF parlance, EGT is referred to a JPT or Jet Pipe Temperature.	
		<u>Additional Information:</u> This is important because there have been accidents, including a 1998 Hunter accident, where a JPT gage was a contributing factor to the accident. In that particular case, a high JPT on start-up was diagnosed as an instrumentation issue, and the corrective action before the accident had been to change filaments on the voltage compensator. Rainwater can run into the rear of the fuselage and soak the asbestos-covered thermocouple cables and short out the readings of the gauge. In some cases, this was solved by sheathing all JPT cables with PVC.	

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141.	FCU P1 and P2 Pressures	Verify the AIP and engine inspection addresses the FCU pressure checks. Additional Information: Two of the vital parameters that are used to control the FCU are engine intake pressure (P1) and engine compressor pressure (P2). These two values are taken from small bleeds and are fed to the acceleration control unit section of the FCU via small diameter pipes. The two bleed pipes cross in a P1/P2 metering orifice and the highest pressure controls the initial position of the FCU. The pipe work must be leak free and clean. In one case during an inspection, a Hunter maintainer recalls that "where joints are required, dry paper gaskets are used. The engine was a newly reconditioned unit. When it was ground run at the manufacturer's factory, the P2 bleed from the compressor leaked. The gasket had to be replaced. However, access to this joint is very restricted, and this was made worse by the engine now being mounted in a cradle for ground running. A technique for holding any paper gasket in place while the flange bolts are positioned is to tack it into place with a little smear of grease. But the use of grease was specifically forbidden on P1 and P2 pipes. The faulty air bleed was successfully fixed, and the engine was re-issued to the RAF. A pilot reported that "3 hours and 40 minutes of flight time later, a small blob of grease, the size of a match head and now hardened by heat, broke free from the P2 gasket when I applied power at 525 knots behind the Hawk, and lodged in the P1/P2 metering orifice of the acceleration control unit in the FCU. The FCU immediately sensed that the compressor pressure (P2) had dropped to zero, and so responded as though I was instantly parked on the ground with the engine shut down despite being at over 500 knots. That was the moment when I thought the engine had surged, and I was right in thinking it was an unusual surge: in fact, the fuel flow had gone unstable as the blob of grease moved into the P1/P2 orifice. It then became impossible to make the engine accelerate, simply because the engine compressor was sensed as being shut down." http://www.tintagelweb.co.uk/Tintagel%20Plane%20Crash.htm.	
142.	Fuel Filters and Contamination	Ensure the AIP addresses the proper inspection and replacement of the fuel filter system. Additional Information: Hunter accidents have been related to the fuel filter system. An operator's blog concerning a Hunter accident in the U.S. noted the Rolls Royce representative reported "The engine fuel filter housing contained a mixture of fuel and a liquid consistent with the feel and appearance of water. The liquid appearing to be water was separated from the fuel and settled in the lower part of the filter housing. The engine fuel filter housing is a closed unit and the only way water or any other foreign liquid could be introduced would be through the fuel supply system. The ratio was estimated to be approximately 75 percent fuel to 25 percent foreign liquid. The effect of pumping large amounts of water through the engine could result in engine pulsations. A sample was not retained." Editorial Comment: The "pulsating," if present, could have been interpreted as the "maxaretting" reported by [the pilot] on a previous departure attempt. The fuel filter was reportedly changed when the current engine was installed, a few days before the accident. The airplane had been sitting for approximately 1 year; water could have formed from condensation, particularly if the tanks had not been kept full. Fuel system contamination was also found on the Hunter Mk 4/Mk 51 that crashed on approach to Chino a few years ago. It had also been idle a long time." www.classicjets.org/forum.	
143.	Seal Failures	Ensure the AIP addresses the proper inspection and replacement of the engine seals routinely. Additional Information: Failure of engine seals became an issue late in the Hunter's operational service. After a RAF Hunter accident in 1981, "an investigation by the manufacturer indicated that the engine has been rotating at a low RPM when the aircraft first hit the ground, and that it had flame-out shortly thereafter. An exhaustive examination of the wreckage failed to reveal any defect other than a ruptured seal in one of the components of the engine high Pressure fuel system. It was confirmed that's such a seal failure in flight would have resulted in a worsening fuel leak, a consequent decay in engine RPM and, ultimately, a flame-out. Since the symptoms correlated closely with the evidence of the pilots concerned, it was concluded that the observed fuel leak had led to a loss of engine power at a critical stage on the final approach. Pending modification, all engines of the type fitted to Hunter XG151 were subjected to a daily ground run to check the high pressure fuel control system for leaks and seal deterioration. Two interim modifications were embodied on these engines as a precautionary measure while the pipe couplings from which leaks had originated were being redesigned. One part of this latest modification to the fuel system has already been introduced into service and the other is scheduled for embodiment when the respective fuel system components are replaced during servicing." *Accident to Royal Air Force Hunter FGA9 XG151, April 3, 1981.* Ministry of Defense, Military Aircraft Accident Summaries, MAS 17/83, 14 June 1983.	
144.	Spool Down Time	Verify the AIP incorporates actions following a change in the spool down time of the Avon engine after shutdown. This is critical as it could be an indicator of an upcoming problem with the engine. In the Avon 200 Series engine, reported spool down time is usually 1 minute 25 seconds.	
145.	Use of Different Fuels	Verify the AIP addresses how the use of different fuels may require changes or additions to the Avon engine inspection and maintenance programs. Additional Information: The Avon was designed for use of the British Avtur fuel, and in cases involving fueling with other fuels, like JP-4, the engine and the fuel systems were cleaned. JP-8 is the military equivalent of Jet A-1 with the addition of corrosion inhibitor and anti-icing additives; it meets the requirements of the U.S. Military Specification MIL-DTL-83133E. JP-8 also meets the requirements of the British Specification DEF STAN 91-87 AVTUR/FSII (formerly DERD 2453). NATO Code F-34. For additional information on fuels, see *Aviation Jet Fuel Information – AVIATION TURBINE FUEL (JET FUEL)* at http://www.csgnetwork.com/jetfuel.html.	

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146.	Fuel Quality and Contamination	Verify that the AIP incorporates provisions to control fuel quality.	
		Additional Information: The Avon engine is susceptible to fuel contamination, probably more than other engines in its class. A NTSB report on a Hunter accident in the U.S. illustrates this point: "On January 8, 2000, at 1450 hours Pacific standard time, an experimental Hawker Siddeley Hunter FMK 4, N72602, collided with the ground during a forced landing while on a visual approach to the Chino Airport, Chino, California. The airplane sustained substantial damage. The airplane collided with a farm field ½ mile short of the runway after the pilot ejected from the airplane. The pilot sustained serious injuries. The airplane was operated under 14 CFR Part 91 as a ferry flight. Visual meteorological conditions prevailed and no flight plan was filed. The flight originated at Mojave, California, at 1430. The pilot reported that he had begun his turn to the base leg and had extended the flaps to 80 degrees. As he attempted to add power to account for the increased drag, the engine did not respond. While on the downwind leg the engine had been set at 6,500 rpm. The throttle was fully increased with no change in the engine power. He selected an empty field for a forced landing, leveled the wings, aimed for the field, partially raised the flaps, and continued the descent toward the field with partial engine power. As he approached the ground, within a few hundred feet, the pilot saw power lines in his path. He attempted to jettison the canopy "but the system did not work" he stated. He elected to fly under the power lines. Shortly before touchdown in the empty field, the pilot initiated an ejection. His next recollection was of being told to lie still. The ejection seat separated from the airplane and came to rest in the field near the airplane. The pilot reported that on January 6, 2000, he traveled to Mojave anticipating that the airplane would soon be ready to ferry. He stated that most of the maintenance had been done prior to his arrival. He operated the engine at high power settings for the mechanics on the 6th. The mechanics continued the inspections and servicing on the 7th and he repeated the engine runs. On Saturday, January 8, the pilot flew a local flight in the traffic pattern. He performed three touch-and-go landings exercising the flaps, landing gear, and the flight controls. The airplane was then fueled with sufficient fuel to fly to Chino, plus reserves. Following the forced landing and accident, a salvage operator subsequently moved the wreckage to Compton, California. During the post-crash examination of the airplane, pebbles and dirt were observed in the engine intake from the intake entrance to the area of the Inlet Guide Vanes (IGVs). There was no visible damage to the IGVs. The exhaust duct contained a small amount of dirt. There was continuity of the low pressure turbine to the compressor with freedom of rotation. Maintenance records for the engine were not available. A fuel sample from the left wing fuel tank was analyzed. The analysis indicated that there was particulate contamination of 11.5 mg/l. The analysis report stated that the "rule-of-thumb" industry limit for particulate contamination is about 1 mg/l."	
147.	Engine Ground Run and Engine Thrust	Verify the engine goes through a ground run and check for leaks after engine re-assembly. Confirm the engine achieves the required revolutions per minute for a given exhaust gas temperature (EGT), outside air temperature, and field elevation. Verify the AIP includes a method to measure actual thrust of the engine and tracks engine operating temperatures.	
148.	Engine Oil Pressure Filter	Verify the AIP provides for the inspection of the engine oil pressure filter at 50 hours.	
149.	Fire Detection and Suppression System (Inspection Schedules)	Verify the inspection schedule of the fire detection and suppression systems.	
		Additional Information: The fire detection and suppression systems include (1) FIRE EXTINGUISHER LARGE BOTTLE ULTRASONIC 120 Months, (2) FIRE EXTINGUISHER LARGE BOTTLE WEIGHT CHECK 24 Months, (3) FIRE EXTINGUISHER SMALL BOTTLE ULTRASONIC 120 Months, (4) FIRE EXTINGUISHER SMALL BOTTLE WEIGHT CHECK 24 Months, and (5) FIRE EXTINGUISHER CARTRIDGE TEST at 60 months. Moreover, per FAA Order 8900.1, change 124, chapter 57, Maintenance Requirements for High-Pressure Cylinders Installed in U.S. Registered Aircraft Certificated in Any Category, each high-pressure cylinder installed in a U.S.-registered aircraft must be a cylinder manufactured and approved under the requirements of 49 CFR, or under a special permit issued by Pipeline and Hazardous Materials Safety Administration (PHMSA) under 49 CFR part 107. There is no provision for the FAA to authorize "on condition" for testing, maintenance, or inspection of high-pressure under Title 49 CFR (PHMSA). The functionality of these systems in the Hunter is essential for safety because of the Rolls-Royce Avon history for fires and failure. Two fire-extinguisher bottles, stowed between the air intakes, just forward of the engine, are together connected to the engine extinguisher inlet connection. Operation of the system is either by (1) a manually-operated pushbutton in the cockpit, on the starboard coaming, or (2) two automatically-operated inertia switches, one in the gun bay and one in the radio bay connected in parallel, which operate if a crash landing occurs. Operation of these switches also causes the batteries to be isolated irrespective of the position of the battery master switch. Twelve resetting flame detector switches are situated around the engine and forward part of the jet pipe. Operation of any of the switches causes the ENGINE FIRE warning light incorporated in the pushbutton to come on, provided electrical power is available. When the button is pressed, the extinguishers discharge their contents through two spray rings, one round the engine compressor and the other round the turbine nozzle box. If the fire is extinguished, the light goes out as the flame switches cool. The warning light may be tested by operating the switch on the starboard shelf. When the battery master switch is OFF, the fire-extinguishers can be operated only by the inertia switches. The battery master switch must be ON to test the warning light or to operate the system by pushbutton.	

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150.	Fuel Tank Explosion Suppression System (Mod 582)	Verify the AIP addresses the Rear Tank Explosion Suppression System (Mod. 582).	
		Additional Information: The system provides an automatic means of suppressing an incipient explosion within a fuel tank. An explosion is not instantaneous but requires a measurable time from the moment of ignition to the development of maximum pressure of a destructive nature. In the initial stages, the rate of pressure increase is comparatively slow and hence can be suppressed in this period. The basic components of the explosion suppression system are (a) detector unit, (b) suppressor unit, and (c) power pack.	
151.	Recuperator	Verify that the AIP provides for the inspection of the fuel recuperator.	
		Additional Information: The Hunter is equipped with a recuperator reservoir pressurizing the supply of fuel for a limited degree of inverted flight. In 1995, a civil Hunter pilot, while ferrying a Hunter to South Africa describes his experience with a malfunctioning fuel recuperator: "The recuperator is a small tank split into two halves by a seal: on one side is pressurized nitrogen, on the other fuel pushed in by fuel pump pressure in normal flight. If the aircraft turns inverted, and the fuel pump gets uncovered, the recuperator nitrogen pressure forces the fuel back out to the engine and keeps it going – it's good for fifteen seconds of inverted flight at full power. In this case, the seal had split, almost certainly as a result of age and disuse (it probably wasn't ever pressurized and would never have been needed when the aircraft was run (the aircraft was used for training marshallers), together with the baking out temperatures. The fuel was then able to track through to the pressurization pipes and eventually through the vent pipes to fall out of the drain, and would continue to do so even when the aircraft was on the ground engine off, because of gravity pressure on the full tanks." McLelland, *The Hawker Hunter*, 2008.	
152.	Starter Motor Inspection	Verify the AIP provides the inspection of the starter system at 24 months per RAF/SAF guidance. This includes the bay, the firewall at frames 29 and 30. A firewall at frames 29 and 30 seals the engine bay from the engine starter bay.	
153.	Engine Start	Verify the AIP includes procedures for documenting all unsuccessful starts. Failure to take into account engine start deficiencies (including not following the applicable technical guidance) has been the cause of many Hunter engine failures.	
154.	Starter Jet Heritage Modification JH 034 aka JHL Avon Electric Start System & Upgrades	Verify whether the aircraft has the Engine Starter Modification Jet Heritage Modification JH 034 and the AIP addresses the maintenance, inspections, or replacement of the system as per the applicable UK CAA requirements.	
		Additional Information: In many Hunters, I Iso-Propyl Nitrate (Avpin) start system has been deleted (except for the tank) and replaced with a Rotax electrical starter system (also known as the JHL Avon Electric Start System based on the system fitted to RAF Hunters), together with sealed batteries and a ground supply socket located in the gun/ammunition bays. In order not to compromise the existing electrical circuits, the new system has been kept completely separate from the existing aircraft system. This has been accomplished by fitting 10 off 12v sealed gel lead acid batteries in place of the old service radios which have been removed in many Hunters in the UK. These batteries supply power to the new solid state electronic sequencing unit and the power for the starter motor. Modern solid state switching is used. Note: The JHL Avon Electric Start System were first fitted to Hunters in the UK in 1986. The system was later upgraded to a fully integrated electronic-based system. It has been fitted to many Hunters in the UK, and in 1998, it went through yet another upgrade to meet the UK's CAA requirements. See *Avpin (Isopropyl Nitrate) Starter System* above.	
155.	Avpin (Isopropyl Nitrate) Starter System	Prohibit the use of the Avpin starter system, some time referred to as Plessey liquid fuel starter.	
		Additional Information: The Avpin starter system is not safe. Even if the AIP provides for the proper maintenance of the Hunter's Avpin (Isopropyl Nitrate) starter system, and trained servicing personnel, the Avpin was very unstable and prone to explosions, many of which caused catastrophic damage to airframe components. Many Hunters were destroyed because of this system. The Avpin was supposed to eliminate the reliance of the Hunter on starter cartridges, but the onboard store of isopropyl nitrate was too small to allow more than a few starting attempts, and the Avpin is a self-oxygenating, very corrosive, and explosively unstable liquid. For example, on each start, some Avpin would be purged, the overflow, pours over the starter exhaust, and out of the bottom of the fuselage, often causing fires, despite the firewall at frames 29 and 30. In fact, and to illustrate the dangers of this system, one of the duties of ground crew was to manually (using asbestos gloves) prevent the fire entering the starter panel bay. Another issue with the Avpin system was the possibility of the fuel/air valve in the system sticking. When this occurred, boiling water had to be poured over the valve. An Avpin system failure at startup is not a minor issue, because, in addition to fire, it could collapse the air intakes and cause major structural damage to the aircraft. A RAF mechanic explains the dangers of the system: "Occasionally, the electrical starter control box would not shut down but initiate a second starting cycle and thereby feed another quart of Avpin into the already glowing starter motor, where it would ignite. At this point, and as the overheated starter began to scream in anguish, the required reaction was for the ground crew to leap outside the danger zone and gesture the pilot to shut down and vacate before any explosion. Ian Sharples would bear witness to on such incident on the line while he was seeing off a Squadron Hunter, an airframe rigger apparently bursting into flames as he went to close the aircraft's starter hatch during a faulty start." Walpole, Best of Breed, 2006.	

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156.	Methyl Bromide	Ensure the AIP addresses the safe handling and disposal of Methyl Bromide (MeBr), a toxic chemical used in the Hunter's fire extinguishing systems.	
		Additional Information: The chemical name for MeBr is bromomethane, and it is classified as an alkyl bromide. It is a colorless and odorless gas at normal temperatures and pressures, but the liquefied gas can be handled as a liquid (14.4 lb/gal) under moderate pressure. The specific gravity at 0ºC and 760 mm Hg is 1.732, with a vapor density of ~3.27, boiling point of 3.6ºC (38.5ºF), vapor pressure at 20ºC of 1400 mm/Hg (at 40ºC it is 2600 mm/Hg), and the viscosity is 0.22 centistokes at 0ºC. MeBr is readily soluble in lower alcohols, ethers, esters, ketones, halogenated hydrocarbons, aromatic hydrocarbons, and carbon disulfide. Because MeBr depletes the stratospheric ozone layer, the amount of MeBr produced and imported in the U.S. was reduced incrementally until it was phased out on January 1, 2005, pursuant to our obligations under the Montreal Protocol on Substances that Deplete the Ozone Layer (Protocol) and the Clean Air Act. Under the Montreal Protocol and the Clean Air Act, the production and import phase out for MeBr follows a specific schedule. Refer to EPA's *The Phase-out of Methyl Bromide OPP Fumigant Cluster Assessment* at http://www.epa.gov/ozone/mbr/.	
157.	Wiring Diagram and Inspection	Verify the AIP includes up-to-date wiring diagrams consistent with RAF/SAF guidance (APs) and includes the appropriate inspection procedures. Any reference to the applicable guidance must address modifications. In addition to the appropriate Hunter AP (Tech Order) on wiring, NAVAIR 01-40AVC-2-9, another reference is NA 01-1AA-505 *Joint Service General Wiring Maintenance Manual*.	
158.	Starter Engaged Warning System	Verify the aircraft is equipped with a starter engaged warning system and the AIP addresses this important item.	
		Additional Information: Many Hunter accidents, including fatal accidents, have occurred because of starter failures. Unless installed, the pilot would not be aware of over speed of the starter (and potential catastrophic failure induced by this). Note: This is one item the U.K. CAA requires be addressed in any Hunter Permit to fly renewal.	
159.	Modification 228 (Wings)	Verify whether the aircraft has the Mod 228 installed.	
		Additional Information: This modification allows the aircraft to carry a total of four 100-gallon external fuel tanks on the inboard and outboard pylons, and could also be fitted with the 230-gallon (imperial gallons) on the inboard pylons. This is important if the aircraft is to use this external fuel tank configuration. Note: There might still be pre-Mod 228 Hunters, and therefore, these have only provisions for two pylons.	
160.	Master Air Safety Break (MASB)	Verify the AIP and associated procedures address the MASB.	
		Additional Information: The MASB, located under the port wing of the Hunter, is an essential safety item, especially dealing with the demilitarization of the aircraft. By disconnecting the MASB on the ground, it ensures all weapons were disconnected electrically, and also deactivates the landing gear bottoms to prevent inadvertent retraction on the ground. One of the first things the ground crew did after engine shutdown was to disconnect the MASB break.	
161.	Electrical System Airworthiness Notices 33 and 88	Verify the AIP addresses applicability of airworthiness notices (U.K. CAA) affecting the electrical system. Some engine start modifications include a starter engaged warning light to comply with U.K. CAA Airworthiness Notice 33.	
		Additional Information: This modification does not affect the remainder of the aircraft electrical system and capacity of batteries employed for the start is not available to electrical services in the event of a double generator failure. Because there are two generators, either of which is capable of providing the entire load required and dolls-eye indicators (or warning lights), warn of failure of each, battery capacity has not been assessed against Airworthiness Notice 88. A battery master switch is to be provided. Verify the AIP provides all the electrical cables are physically inspected and particular attention is paid to known hazardous areas. Any terminations considered suspect must be cut-back and remade. The insulation must be found to be in an acceptable condition.	
162.	Electrical System and Batteries	Verify functionality of the generators and the compatibility of the aircraft's electrical system with any new battery installations or other system and component installations or modifications. Avoiding overload conditions is essential, because this is a known problem with the aircraft's electrical system.	
163.	Emergency Battery	Verify the AIP provides for the inspection and replacement of the emergency battery. In the Hunter, an emergency battery is provided to supply the emergency lamps, manual emergency selector circuit (Mod. 502) and, when Mod. 488 is embodied, the turn and slip indicator. If fully charged the battery will provide 7-20 hours of continuous use, depending on the load imposed on it.	
164.	Generators and 600-Hours TBO	Ensure the AIP specifically addresses the aircraft's two generators. Verify the generators are overhauled at 600 hours.	
		Additional Information: The aircraft has a history of generator failures, including dual generator failures. The Hunter has a 24-volt electrical system. Two 6,000-watt engine-driven generators supply the whole of the electrical system and charge two 12-volt aircraft batteries connected in series. Later aircraft may have been fitted with two 24-volt batteries connected in parallel, thus materially increasing the available reserve should generator failure occur. The generator failure warning lights situated below the center of the instrument panel, come on only when their associated generator is not supplying power. Both generators should normally cut in at 1,800 rpm and cut out at 1,600 rpm but this will depend on battery condition.	

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165.	Total Electrical Failure (Double Generator Failure)	Ensure SOPs address, in terms of inspections and replacement, the likelihood of a total electric failure, which has occurred in Hunters, including Hunters in civilian use.	
		Additional Information: Double generator failure can lead to engine failure and fuel starvation as well. An AAIB accident report explains: "The aircraft had a recent history of electrical generation problems and the risk of double generator failure had been realized the day before, but probably without completely exhausting battery power. For the accident flight, provided single generator failure was the only fault, the remaining generator should have been sufficient to supply all this aircraft's electrical needs and charge the batteries. Replacement batteries had been fitted before the flight and external power was available to support pre-start preparations so the aircraft should have had well-charged batteries and one functioning generator when it taxied. The engine ran down at some time between throttling back to descend and advancing the throttle to level off at FL180. The immediate action of trying to relight the engine was bound to fail because Hawker Hunter Mk 6A, G-BVVC there was no electricity to power the igniters. There were no mechanical failures evident within the engine which continued to windmill and plenty of fuel on board the aircraft, so it seems highly probable that the flameout occurred through temporary fuel starvation." In fact, "with no booster pumps, fuel should still transfer from the front tanks to the engine through air pressure. The electrically motored fuel sequence valves would have been at the wing transfer position when electrical power was lost so fuel from the drop tanks should still have transferred to the wing tanks and from them to the front tanks under the action of air pressure. There had been no reported problems with fuel transfer in recent flights and the pilot noticed that both drop tanks were about one third full over Wales (they have mechanical quantity indicators). Consequently, there is no reason to assume that the electrical failure was responsible for a fuel transfer failure. However, if fuel transfer from one or both side groups of wing and drop tanks into the associated front tank stopped, the engine would have flamed out when one of the front tanks emptied."	
166.	Servicing, Engine Fire Servicing Personnel	Verify the operator warns servicing personnel via training and markings of the fire hazard of overfilling oil, hydraulic, and fuel tanks. Lack of experience with Hawker Hunter servicing is a safety concern. Require supervision of servicing operations and fire safety procedures.	
167.	Coffman Cartridge Starter Fires	If the cartridge starter system is used, verify the AIP and servicing procedures provide for the correct inspection and maintenance, but also the proper safety precautions required for such a dangerous system.	
		Additional Information: Many Hunter accidents are related to the failure of the cartridge starter system. The Swedish Hunter mechanic told of the dangers of servicing Hunters when the cartridge starter system took the hand off of one of his colleagues. The first Hunters delivered to Sweden arrived with the cartridge starting system. There was a holder for three cartridges and when these were spent they had to be replaced. The cartridges were filled with cordite, which, when ignited, produced a vast amount of gas very rapidly, and it was like an explosion. When replacing the cartridges the mechanic could reach them by sticking his arm in through one of the three access panels under the aircraft. In this particular case, the cartridge fired as the mechanic was installing it. After that accident, the mechanics were briefed on this danger at routine morning briefings, especially when servicing a non-modified Hunter. Many other Hunter accidents involved the cartridge starter system and the double firing of starter cartridges during startup. The casing of the starter motor would fracture, puncturing the front fuel tank, and causing a severe fire in the engine air intake, which destroyed several aircraft. A RAF mechanic describes a starter incident: 'the Avon 100s had a cartridge starter, which when fired turned a small turbine wheel very quickly to give the impetus to run the engine over. To void accidents, the standard procedure in the vent of a misfire was to wait for thirty seconds before pressing the button again – which [the mechanic did]. Unfortunately, when he made the second selection, two cartridges fired at once, the small turbine burst, its little blades carved a track under the wing and the fuel in the wing tank caught fire…"McEwen, *Hunter From the Cockpit*, 2009.	
168.	Fire Guard	Verify maintenance, servicing, preflight, and post-flight activities always include fire guard precautions.	
		Additional Information: Fire guards are particularly important when operating Hunters because there is a high risk of fire on startup, due to of the start cartridges when they are used. A typical Hunter accident at startup was the result of a double firing of starter cartridges. The casing of the starter motor fractures, puncturing the front fuel tank, and causing a severe fire in the engine air intake which may destroy the aircraft. Moreover, when the Avon 207 fails to light up, a pool of fuel is left in the jet pipe. This would lead to a "wet start" where the next attempt could result in unusual fire pouring out of the jet pipe. For fire guard duties, the proper type and quantity of fire extinguisher material is necessary.	
169.	Rolls-Royce Avon Engine Storage	Review Avon engine storage methods and determine engine condition after storage. Evaluate calendar time since overhaul.	
		Additional Information: The use of an engine with 50 hours since a 1991 overhaul may not be adequate. A new overhaul maybe required after a specified time in storage. Engines that have exceeded storage life limits are susceptible to internal corrosion, deterioration of seals and coatings, and breakdown of engine preservation lubricants which may lead to catastrophic failure.	
170.	Engine Foreign Object Damage (FOD)	Verify adoption of an FOD prevention program (internal engine section, external, and air intake). Use air intake covers designed for the Hawker Hunter.	
		Note: FOD is any damage attributed to a foreign object that can be expressed in physical or economic terms that may or may not degrade the product's required safety and/or performance characteristics. Typically, FOD is an aviation term used to describe debris on or around an aircraft or damage done to an aircraft	

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171.	Borescope Engine	Recommend the AIP incorporate borescope inspections of the engine at 50 hours intervals per the applicable inspection procedures. AC 43.13-1, *Acceptable Methods, Techniques, and Practices-Aircraft Inspection and Repair*, can be used as a reference.	
172.	Daily First Stage Compressor Inspection	Verify that the AIP provides for the inspection of the first stage compressor the before the first flight of the day.	
173.	Engine-Starter Alignment	The AIP and related procedures must ensure the correct alignment of the engine and the starter. Unless this is done, likely after an engine change, during start, hot gases could sweep upwards into the spine area and cause an explosion.	
174.	Exhaust Pipe	Verify that the AIP and related procedures (i.e., daily inspections, pre-flight) provide for the inspection of the exhaust pipe.	
		<u>Additional Information:</u> In earlier Hunter models, the exhaust pipe could actually detach itself and hang out of the back end of the fuselage. A Hunter pilot describes such an occurrence: “this occurred to one of our pilots who was about to eject due to a fast rising JPT and a certain loss of thrust. I happened to be in his immediate area and was able to carry out a visual inspection of his aircraft. There was no sign of fire, so I suggested that he should make an attempt to recover to base…All went well and he landed successfully, though the jet pipe finished up on the runway.” Caygill, *Jet Jockey,* 2002.	
175.	Service Bay	The AIP and related SOPs should address the possibility that hot exhaust gases could enter the service bay.	
		<u>Additional Information:</u> Operationally, in the RAF, the bay was left open to reduce the likelihood of a fire. Caution is necessary if the door is either secured up or let hanging open.	
176.	Hawker Hunter Tail/Engine Separation	Verify adequate tail/engine separation by using proper support equipment to prevent structural and serious engine damage. Proper bolts and nuts are also needed.	
		<u>Additional Information:</u> The Hawker Hunter fin is held to the fuselage by four bolts, and the loss of one of these bolts requires procuring the proper factory hardware. This is a critical action in the Hawker Hunter because many maintenance tasks require the separation of the tail. This is a much more labor intense task than in other aircraft, like the F-86. The Hunter’s rear fuselage is attached with over twice as many bolts as that of the F-86. Appropriate jigs (that is, aft fuselage dolly) must be used for aircraft assembly and disassembly, such as the jig to maneuver the tail into and away from the fuselage (during engine inspections), as well as holding it. Unless properly accomplished, this task could seriously damage not only the engine but the surrounding structure. No “fork lifts” should be been used for this all-important task.	
177.	Tail Bumper	The AIP needs to incorporate the inspection of the tail bumper attached at the bottom of frame 55 and the surrounding structure, including the tail cone.	
		<u>Additional Information:</u> The Hunter has a long history of tail strikes and damage to the aft section can be catastrophic. See *Tail Strike Prevention and Inspection* below for additional insight into this issue.	
178.	Engine Condition Monitoring (SOAP)	Recommend an engine Spectrographic Oil Analysis Program (SOAP) be implemented with intervals of less than 10 hours as part of the engine maintenance schedule.	
		<u>Additional Information:</u> If baseline SOAP data exists, this can be very useful for failure prevention. If manufacturer baseline data does not exist, this may still warn of impending failure. In the SOAP program samples of used oil containing microscopic metal particles are sent periodically to an oil analysis laboratory. There, the oil and its metal particles are burned by an electric or gas flame. The wave length of the light emitted from the burning oil and metal particles is measured to determine the kind and quality of metal in the oil. The identification gives advance warning of excessive wear on particular engine parts, thereby aiding in preventing in-flight engine failures. For the latest guidance on SOAPs and military aircraft, see *Joint Oil Analysis Program Manual, Volume III: Laboratory Analytical Methodology and Equipment Criteria (Aeronautical),* (Navy) NAVAIR 17-15-50.3, (Army) TM 38-301-3 (Air Force) T.O. 33-1-37-3, and (Coast Guard) CGTO 33-1-37-3, July 31, 2012. This document presents the methodology for evaluating spectrometric analysis of samples from aeronautical equipment. The methodology enables an evaluator to identify wear metals present in the sample and their probable sources, to judge equipment condition, and to make recommendations which influence maintenance and operational decisions. Following these recommendations can enhance safety and equipment reliability and contribute to more effective and economic maintenance practices.	

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179.	Broken/Damaged Fuel, Oil, and Hydraulic Lines	Verify the AIP includes procedures for inspecting and replacing fuel, oil, and hydraulic lines according to the applicable SAF/NATO requirements; for example, MIL-DTL-8794 and MIL-DTL-8795 specifications.	
		Additional Information: In the Hunter, hydraulic lines, especially those serving the air brake, fatigue easily, producing difficult and serious flight control, and braking problems for the pilot. Oil lines are critical, and many Hunter accidents have been traced to this. Some were not mechanical, but human error. For example, a RAF Hunter T7 instructor recalls his accident: “Having described to him a practice emergency, at around 18,000 feet I said ‘Your oil pressure’s low, what are you going to do?’ Quite correctly, he brought the power back and raised the nose a bit to establish a bets gliding speed in case the engine failed. As he did so, there was a terrific grinding noise and the aircraft started to shake so much we couldn’t read the instruments. As the shaking eased I saw the engine RPM at zero (a major clue) and the jet pipe temperature rising through 1,000° (a giveaway). It was obvious we’d had a catastrophic engine failure. My first thought was that we’d have to leave the aircraft. I wasn’t very experienced in the Hunter and had never heard of anyone getting a complete engine mechanical failure, nor landing in that situation. For the time being though, we could stick with it so long as there was no fire. With no engine-driven hydraulic pumps, the powered controls failed with a clunk – it felt like they’d frozen – and flying the jet became hard work. Some slightly-built pilots actually had to use two hands on the stick if the powered controls failed. Assessing the situation, it was obvious we weren’t going to get the engine going again, so to forestall a fire, we shut off the fuel supply to it and started gliding…” This pilot and his student were able to land the aircraft at a neighboring facility. The instructor continues: “after we’d climbed out, someone in the crowd said: ‘Hey, come and have a look at this.’ There was a smell of burning and the pipe was littered with small pieces of metal…On investigation, it turned out that the engine had only done 10 or 12 hours since a major overhaul by Rolls-Royce. It seemed there had been a small piece of packaging material blocking the oil supply to one of the bearings, which eventually overheated and seized.” Gosling, *Training Times,* 2012.	
180.	Fluid Cross Reference Sheet	Ensure the AIP makes provisions for a cross reference of all applicable British Military petroleum numbers for oil, hydraulics, and grease with applicable NATO, U.S. MIL SPEC, and applicable civilian standards.	
181.	Systems Functionality and Leak Checks	Verify procedures are in place to check all major Hawker Hunter systems in the aircraft for serviceability and functionality. Verify the leak checks of all systems are properly accounted for in the AIP per the SAF/NATO requirements.	
182.	Fuel Tanks Inspections and Related Structures	Verify the AIP includes procedures for inspecting the fuel tanks, and related structures, such as the firewall at frame 38 insulating the engine from the aft fuel tank.	
		Additional Information: Maintenance and inspection of the fuel system requires specialized knowledge, and the tasks should not be performed by personnel that are thoroughly familiar with the aircraft. A RAF Hunter mechanic explains: “The Hunter’s fuel system was complicated, particularly with the number of fuel tanks involved. In addition to the four external fuel drop tanks, two 230-gallons inboard (with their own sensors) and two 100-gallons outboard (without any electronic gauging), there were twelve separate internal tanks, each with its own fuel contents sensor. An abundance of high-level float switches, ‘bingo’ light switches, ‘dolls eye’ indicators and innumerate relays, made trouble-shooting very daunting. Accessibility was also a major problem: every tank was hidden deep in the fuselage or behind the wing leading edges (involving the removal of scores of fasteners) while access of the fuel gauge amplifiers in the roof of the radio equipment bay required the removal of the bay’s cooling-air ‘Christmas tree’ of pipes. The fuel gauges themselves were nicely to hand on the starboard shelf of the cockpit, but all too vulnerable to damage by carelessly shed buckles from ejection seat harness (a protective Perspex cover eventually solved this problem). Despite the gauges readings, if maximum range was required and there was any uncertainly over the contents of the 230-gallons drop tanks, a screw would be loosened on the top of each until fuel seeped out after which the tanks were replenished. All in all, the fuel system was unreliable and often a nightmare for those who had to put it right so often, but it had to be right for mission success and flight safety…” Walpole, *Best of Breed,* 2006. Deterioration of both the bladders (aka ‘Bags’) and the sealant can pose a safety problem, especially because of the aircraft’s age and storage, as well as the difficult inspection (access) itself. Bladder-type fuel tank safety is not necessarily ensured by only “on-condition” inspections and may require more extensive processes, including replacements. In any event, adequate data must be provided for any justification to inspect rather than replacing the fuel tanks at the end of their life limit. For example, the Hunter FGA9 has four flexible bag-type tanks in the fuselage and four in each wing. Front fuselage tanks of 200-Imperial gallons capacity and rear fuselage tankage (frames 41 and 45) is 52 imperial gallons. The wing fuel tanks are carried forward of the main spar in compartment formed between nose rib A and G, the leading edge of this portion is removable for access to the tanks.	
183.	Fuel Pumps	Verify the AIP addresses the inspection of all fuel pumps (including transfer pumps) to include adequate guidance on their replacement and functionality checks by properly trained personnel. Fuel pump failures and improper installation are a known Hunter problem.	

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184.	Fuel Quantity Indicating System	Verify the AIP includes procedures to inspect the fuel indicating system. Several Hunter accidents have been the result of the system's inaccuracies.	
		Additional Information: A RAF Hunter mechanic adds that the "notoriously unreliable fuel contents gauging was considered by many instrument men to be their most demanding and unpopular challenge." Walpole, *Best of Breed,* 2006. In one 1998 Hunter accident, the NTSB noted "the vintage ex-military jet was on an airworthiness test flight after a 12-year rebuilding process. Thirty-five minutes into the flight, and while on approach to an airport, the pilot announced over the radio that he wanted to conduct multiple landings. A little over 2 minutes later, he stated that the airplane would make a full stop, and 7 seconds after that, the pilot reported that he would have to eject. The engine had flamed out, but the pilot stayed with airplane until it cleared a crowded parking lot. The pilot did not survive the low trajectory ejection. Post-accident analysis revealed that one fuel gauge was frozen around 575 pounds, while the other had a needle slap mark at 740 pounds. All four fuselage fuel tanks were found empty, while both inboard wing tanks contained some fuel. The amount of fuel in the wing tanks at the time of the accident was undetermined due to tank leakage from the impact. The National Transportation Safety Board determines the probable cause(s) of this accident as follows: Fuel exhaustion, resulting from the pilot's reliance on an inaccurate fuel quantity indicating system.	
185.	Fuel Leaks	Verify the AIP provides (specifically) for the inspection of the fuel system, in addition to servicing and preflight measures to address the potential for fuel leaks. It must make reference to the appropriate technical guidance i.e., RAF APs (Air Publication).	
		Additional Information: The Hunter was notorious for fuel leaks. This was especially true with the aft fuselage tank. Another example is the bursting of high-pressure fuel lines. For example, during a Hunter restoration in the U.K. the restorers identified the main problem area as the fuel system. In that case, having done the work necessary to get the aircraft a CAA Permit to Fly, the air tests showed problems with fuel transfers. It was concluded that although it had been frequently ground run, the taxi training environment only involved putting a limited amount of fuel into the aircraft, which meant the wings and rear fuselage tanks were rarely used. Most of the problems came from these areas, mostly related to sticking float switches, valves, and leaks. A Rhodesian Hunter pilot recounts his experience with the Hunter's fuel leak issues: "On the climb, I had just transferred from drop tanks when I was informed that my Hunter R1823 was venting fuel. I immediately turned back for Bulawayo and I could see it was going to be a race against time at the rate the fuel gauges were dropping. As the gear went down, the fuel delivery pipe and the engine parted company, everything went deathly quiet, and I reluctantly became a glider pilot." This pilot ejected and survived. Thomas, *Assegai Hunters,* 2004. Another issue concerning fuel system leaks is sticking refueling pressure relief valves. A witness to such a failure at an UK airshow recalls: "It was a display at Kemble Airshow in 2011. I can remember the aircraft taking off, and the fuel problem wasn't immediately noticeable, I think a few of us thought it was some type of smoke system. It didn't take long for the smell to hit our noses and it became obvious that it was a fuel leak. As far as I can remember, he flew for around 5-10 minutes before landing and made a normal landing. I don't think any emergency services made their way out but were most probably on standby. According to some online accounts, ATC told him to stop and if I recall correctly he didn't take part in the large Hunter formation that he was due to fly with later on in the day." Max Hawkins, 2012.	
186.	Oil, Fuel, and Hydraulic Fluids	Verify procedures are in place to identify and use a list of equivalents of materials for replacing oil, fuel, and hydraulic fluids. A good practice by many operators is to include a cross-reference chart for SAF, NATO and U.S. lubricants as part of the AIP.	
187.	Hydraulic Failures	The AIP must include the hydraulic system and its components as required by the manufacturer and military operator, that is, RAF, Swiss Air force.	
		Additional Information: The Hunter has a history of hydraulic failures. A Hunter pilot describes that "unexpected" experience: "…as I reached out for the landing gear button, there was a loud clunk, the power controls went into manual and the emergency warning panel lit up with a total failure hydraulic and electrical failure." McEwen, *Hunter From the Cockpit*, 2009. The aircraft is not equipped with a Ram Air Turbine to assist in the case of hydraulic failures. Hydraulic power is essential for safe flight. Too much is at stake including flight controls, landing gear, and brakes. The Hunter has a 3,000 psi hydraulic system. It operates the landing gear, wheel brakes, air brake, flaps, and power operation of the ailerons. The following excerpt from the Hunter MK. 6 Pilot Notes illustrates the consequence of such failures. To mitigate a "Complete hydraulic failure, it is necessary to conduct periodic checks of the triple pressure gauge should be made in flight and the central needle should normally read 2,850±150 lb/sq in. If the reading drops substantially below this figure when no service is being operated, then hydraulic failure should be suspected. The red warning light, and the audio warning when Mod 327 is fitted, should come on if the pressure falls below 600 lb/sq in. If the hydraulic supply pressure fails, there may be sufficient reserves in the power controls accumulators for a maximum of 3½ full reversals of aileron and elevator, the actual reserve depending on the state of charge of the respective accumulators at the time of failure. However, even if no control movement is made, accumulator pressure will not be maintained for a long period, due to normal hydraulic component seepage. When the accumulators are exhausted the controls will revert automatically to Manual. A failure in the power controls hydraulic circuit, as distinct from supply failure, may lead to immediate and automatic Manual reversion when the pressure at the locking pawls has fallen well below that at which the warning light becomes illuminated. The wheel brakes accumulators provide sufficient pressure for brake operation during landing down to an accumulator pressure reading of 750 lb/sq in. approximately." Note: It is possible that the electric trim on the left aileron would still functional in case of hydraulic failure, provided electric power is not compromised.	
188.	Air in Hydraulic Lines	The AIP and servicing procedures should address the chronic problem the aircraft hydraulic system had with air in the lines.	

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189.	Accessory Drive	Verify the AIP addresses the inspection of the accessory drive. Its failure can have serious consequences, especially when the aircraft's hydraulic (i.e., no RAT), and generator(s)/electric (needed for relight) limitations.	
		Additional Information: The accessory gearbox is housed in the engine bay and driven by the engine through two shafts and universal joints and a turret drive arm mounted between them.	
190.	Accumulators and Emergency Accumulator Pull Lever	Verify the AIP includes procedures for inspecting and replacing the accumulators. Verify the AIP provides for the inspection of the emergency accumulator pull lever for the landing gear.	
		Additional Information: There have been cases where the steel cable attached to the lever was corroded through within three months of replacement.	
191.	Hydraulic Pump TBO	Verify the AIP includes the 600-hour TBO for the hydraulic pump. Note: No "On Condition" unless it includes acceptable data on the actual inspection, its standards, or tolerances	
192.	Pitot/static, Lighting, and Avionics and Instruments	Verify compliance with all applicable 14 CFR requirements concerning the pitot/static system, exterior lighting (that is, adequate position and anti-collision lighting), transponder, avionics, and related instruments.	
		Additional Information: There have been reported cases that with the outboard external fuel tanks, there could be position errors in excess of 400 feet with the Mk. 19B altimeter. Some Hunters may be equipped with modern avionics including dual GPS, Electronic Horizontal Situation Indicator (EHSI), and moving maps. Accordingly, other requirements may be applicable. Some Swiss AF Hunters may be equipped with low-voltage formation lights. See http://www.astronics.com/products/aircraft-lighting/formation-lights.asp#green for details of this type of lights. If these lights are operational, and covered in the AIP, ensure they are compatible with the aircraft's other electric systems. Their functionality does not imply night operations or formation flying is permitted. See *Operating Limitations* below.	
193.	Oxygen System (Gaseous O_2 Bottles)	Emphasize in the AIP the inspection of the 2,000 psi oxygen system at the required 120 months. The emergency oxygen bottle hydrostatic test is required every 60 months. The oxygen system regulator must be inspected every 12 months. Address any modifications.	
		Additional Information: The Hunter has a 6-liter gaseous oxygen system (two tanks) providing between 100 and 150 minutes worth of compressed breathing gas at a maximum pressure of 125 kg/cm^2. Some Hunters, like the Hunter FGA9 may have 3 oxygen bottles that extends the supply to 3.5 hours. The two cylinder Mk 5D gaseous oxygen system must be fully operational and Mod 1418 must be followed. A Mk. 17 demand regulator controls the supply to the pilot. Later aircraft may be fitted with a Mk. 18 regulator, which is to be replaced at 400 hours. It is important that the AIP and SOPs ensure that, as a RAF Hunter mechanic noted that "the system is never fully exhausted and that it is recharged as soon as possible when less than full; otherwise, it has to be purged using a hygrometer and this involves a lengthy and complicated charge/discharge procedure to remove any moisture." Walpole, *Best of Breed*, 2006. Compliance with § 91.211, Supplemental Oxygen, is required. Recommend adherence to 14 CFR § 23.1441, Oxygen Equipment and Supply. Moreover, per FAA Order 8900.1, change 124, chapter 57, Maintenance Requirements for High-Pressure Cylinders Installed in U.S. Registered Aircraft Certificated in Any Category, each high-pressure cylinder installed in a U.S.-registered aircraft must be a cylinder manufactured and approved under the requirements of 49 CFR, or under a special permit issued by PHMSA under 49 CFR part 107. There is no provision for the FAA to authorize "on condition" for testing, maintenance, or inspection of high-pressure cylinders under 49 CFR (PHMSA). Non-U.S. bottles may remain installed and in use as long as they are within their hydrostatic test dates. Once the non-U.S. bottles are removed from the aircraft, they may not be reinstalled in any U.S. aircraft. Moreover, those bottles cannot be serviced (on board) after the testing date has expired. Note: Several Hunter operators note that in some cases, there have been problems, while on cross-country flights, finding adequate oxygen servicing due, in great part to system incompatibilities.	
194.	Pneumatic System Air Bottles	Emphasize the proper inspection of all air bottles and high-pressure cylinders installed in the aircraft. One such inspection is the EMERGENCY FLAPS BLOWDOWN BOTTLE-HYDROSTATIC performed at 120 months.	
		Additional Information: Many Hunters have a 2,000 psi Nitrogen system for emergency gear and flaps extension. As per FAA Order 8900.1 change 124, chapter 57 *Maintenance Requirements for High-Pressure Cylinders Installed in U.S. Registered Aircraft Certificated in Any Category*, each high-pressure cylinder installed in a U.S. registered aircraft must be a cylinder that is manufactured and approved under the requirements of 49 CFR, or under a special permit issued by PHMSA under 49 CFR part 107. There is no provision for the FAA to authorize "on condition" for testing, maintenance or inspection of high-pressure cylinders under 49 CFR (PHMSA). For example, the fire bottles are time sensitive items, and may have a limit of 5 years for hydrostatic testing. Non-U.S. bottles may remain installed and in use as long as they are within their hydrostatic test dates. Once the non-U.S. bottles are removed from the aircraft, they may not be reinstalled in any U.S. aircraft. Moreover, those bottles cannot be serviced (on board) after the testing date has expired.	
195.	Cutaway Flaps	If installed, verify the AIP provides for their inspection and maintenance. Hunter FGA9 and other upgraded Hunters have cutaway flaps to allow the attachment of the big 230-imperial gallon external fuel tanks on the inner pylons.	

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196.	Anti-G System	Verify that the AIP addresses the anti-G system, both in terms of pilot-related components (i.e., suit, valves) and the aircraft system itself.	
		<u>Additional Information:</u> The anti-G system in the Hunter includes an air bottle that must be serviced before flight. It is not engine compressor air like in many other aircraft types, and as such, its serviceability, as an independent system, is critical. The anti-G system consists of 2 high-pressure air bottles mounted side-by-side above the 2 hydraulic emergency air bottles behind the ejection seat. These operate by means of a selector valve and automatically supply air to inflate the pilot's anti-G suit when G-loads are applied, thereby raising the pilot's blackout threshold, considerably reducing fatigue under high-G conditions. The air from the bottles is fed via filter, selector valve, pressure-reducing valve and an anti-G valve, to a quick-release connector on a flexible hose attached to the pilot's seat.	
197.	Cockpit Instrumentation Markings	Verify all cockpit markings are legible and use proper English terminology. Flight instruments in metric units (that is, altimeters, airspeed indicator) must be converted to U.S. units.	
		<u>Additional Information:</u> For example, for airworthiness purposes, in ex-Swiss Air Force Hunters, the airspeed indicator, vertical speed indicator, and altimeter, which were calibrated in kilometers and meters respectively, must be replaced with units calibrated in knots and feet.	
198.	Pressurization Vessel and Environmental Control	Verify the AIP incorporates the inspection of the pressurized sections of the aircraft (cockpit, between frames 6 [solid bulkhead] and frame 14 [diaphragm]). Note pressure cycles, and any repairs in the area. Verify that the AIP incorporates related documentation and manuals such as AP No. 2306G *Pressure Cabin Testing, Servicing Trolley*, and AP No. 4340 *Pressurizing and Air Conditioning Equipment*.	
		<u>Additional Information:</u> The pressurization system in the Hunter is inadequate. The maximum pressure differential is 3.5 lb/in^2. An RAF pilot noted "it could get cold at height, and if you descended rapidly into moist atmosphere, misting or icing-up could reduce your vision at a time when fuel was low." McFewen, *Hunter From the Cockpit*, 2009. Another RAF pilot describes that one time "twenty minutes into the trip, however, my cockpit cooling system stopped coping with the moisture in the air at that height and, as a result, began to blow water over the gunsight in considerable volume. We all carried absorbent cloths to deal with the cockpit canopy misting that could occur on a rapid descent from high level, so I got that out and began wiping furiously…." White, *Lightning Up*, 2009.	
199.	Safety Markings and Stenciling	Verify appropriate safety markings required by Hawker Hunter technical manuals (that is, stenciling and "Remove Before Flight" banners) have been applied and are in English. These markings provide appropriate warnings/instructions regarding areas of the aircraft that could be dangerous. These areas include intakes, exhaust, air brakes, and ejection seats. In the case of ejections seat systems, and as noted in FAA Order 8130.2, paragraph 4074(e), "a special airworthiness certificate will not be issued before meeting this requirement."	
200.	Safety Locks and Pins	Verify appropriate Hunter-specific ground safety locks and pins are available and used per the applicable RAF/SAF/Royal Navy guidance. These devices are essential to ensure the safety of several systems and components, namely landing gear, air brake, pylons, and hook (if applicable).	
201.	Incorrect Hardware	Verify the AIP incorporates the use of the correct hardware, for example, bolts. This must be emphasized in all civil operations because (1) original hardware may be difficult to acquire, and (2) some aircraft may incorporate the non-approved items today.	
202.	Fasteners	Verify the AIP addresses inspection and replacement of airframe/panel fasteners.	
		<u>Additional Information:</u> Fasteners (that is, British Standard Fine (BSF) thread), used widely to secure aircraft panels and parts were the most-wanted items in line service because they wore out fast and were not easily obtainable.	
203.	Cockpit FOD	To preclude inadvertent ejection, flight control interference, pressurization valves clogging, and other problems, verify the AIP addresses thorough inspection and cleaning of the cockpit area.	
		<u>Additional Information:</u> This is a standard NATO/USAF/U.S. Navy practice. For example, a Hunter overrun (pilot injured) was traced back to a jammed throttle (jammed open) by a loose screwdriver left in the aircraft by one of the ground crew.	
204.	Ex-Royal Navy Hunter T7A Instrumentation	The AIP needs to address the specifics of all of the instrumentation modifications made to some Hunter T7A that were operated by the Royal Navy.	
		<u>Additional Information:</u> Some Hunters were fitted with similar cockpit instrumentation to the Buccaneer and these were known as Hunter T7As. This instrumentation is not common to other Hunters, and has been documented as creating instrumentation and electrical problems during restoring a civil certification in the UK.	

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205.	Tires and Wheels	Verify use of proper Dunlop wheels and tires and/or equivalent substitutes (including inner tubes) and adherence to any tire limitation, such as allowed number of landings, inflation requirements (that is, mains at 200 lb/sq. in. and nose wheel pressure at 115 lb/sq. in), and the use of retreaded tires. Verify proper tires are used (including inner tubes).	
		Additional Information: In the RAF, the tires had a life-limit of ten landings unless they have the inner tube base supports. Typical Hunter tires include: TIRE 29X6.25-16-14PR, TIRE 29X6.25-16-14PR, and TIRE 19X6.25-9 10PR. Cutting corners in terms of tire and brakes in the Hawker Hunter is a dangerous practice. Wheels must be properly and regularly inspected and balanced. Note: The FAA narrative of a 2002 Hunter F6 incident illustrates the result of a loss of brakes: "AIRCRAFT N587XE, S/N 41H-679948, A HAWKER SIDDELEY HUNTER MK-6A RAN OFF THE SIDE OF RUNWAY 05 AFTER LANDING AT GSO. THE PILOT REPORTED LOSS OF BRAKES. HE ATTEMPTED TO PUMP THE BRAKES AND THEY APPEARED TO GRAB ON THE LEFT SIDE. ONCE THE AERODYNAMICS STEERING WAS LOST, THE AIRCRAFT DRIFTED TO THE LEFT AND DEPARTED THE RUNWAY. THE AIRCRAFT HIT TWO RUNWAY EDGE LIGHTS BEFORE DEPARTING THE RUNWAY AND THEN CONTINUED THROUGH THE GRASS HITTING A TAXIWAY MARKER SIGN, CROSSED TAXIWAY K5 AND CAME TO REST BETWEEN TAXIWAY K AND RUNWAY 5/23. THE LEFT MAIN LANDING GEAR WAS TORN FREE ON IMPACT WITH THE SIGN FOUNDATION AND THE LEFT UNDERWING FUEL TANK WAS BENT FROM ITS UNDERWING PYLON AND LEAKED SOME FUEL INTO THE GRASS. THE PILOT WAS NOT INJURED." Note: there have been reports of rivets in the wheel assembly failing.	
206.	Main Landing Gear and Nose Wheel and Related Failures (General)	Emphasize a detailed inspection of the main landing gear and nose-wheel system and adhere to SAF/NATO inspection guidelines and maintenance requirements (that is, retraction tests) and operation requirements (that is, safety pins).	
		Additional Information: Landing gear failures in the Hunter are very common. A Hunter pilot noted that "undercarriage problems of various sorts, often involving the sequence valves, were far from uncommon on the Hunter." Walpole, *Best of Breed*, 2006. Verify the AIP incorporates proper maintenance and inspection of the nose wheel to include balancing. The following excerpt from a U.K. AAIB Hunter accident provides additional details: "On selecting the landing gear down on the normal system, the DOWN button depressed but there was no change in the status of the landing gear; all indicator lights, red and green, remained unlit and there were none of the sounds normally associated with the landing gear travelling. The hydraulic system pressure was checked and was indicating in the correct range, 2,800 to 3,000 psi. It was apparent to the pilot that there was some form of selector fault, probably electrical although all electrical system indications were normal throughout. Having cycled the landing gear selector a number of times without success, he elected to blow the landing gear down using the pneumatic emergency system. Having checked the emergency system pressure gauge, which was indicating slightly over the required 2,000 psi, the emergency selector handle was pulled. The landing gear extended quickly as is usual, except that the left main indication stayed RED as the nose and right main gear GREEN indicators illuminated. The pilot checked and he was unable to see the left main gear, confirming that it had not fully extended. Fuel was, by now, becoming a critical factor and this, the pilot [decided] to divert. Engineering examination to identify why the landing gear failed to operate on the normal system was hampered by the transient nature of the fault. Following replenishment of the hydraulic fluid and bleeding of the system, the landing gear functioned normally when first tested subsequent to the accident. It was only after a period of testing and detailed diagnostic work that an intermittent fault with the microswitch in the common earth line to the electro-hydraulic valve was identified. This fault, when active, effectively isolated the valve inhibiting it from responding to cockpit selections. Further examination of the pneumatic lines of the emergency lowering system revealed a significant leak at a pipe joint in the leftwing. The wire locking at the joint was intact but the wire had pulled through the corner of one of the joint nuts and the joint had subsequently loosened. The leak had depleted the supply of high pressure air before the emergency extend cycle was complete and also allowed the oil jettison valve to close, trapping hydraulic fluid in the left main leg retract line. The presence of trapped fluid on the retract side of the jack jammed the leg in an intermediate position." In addition, the nose gear had many failures. An account by a Hunter mechanic describes one of the issues: "We later discovered why the nose landing gears failed to extend. The simple answer was that if we allowed the pressure in the nose landing gear shock absorber to go down to the lower scale of the allowed pressure the nose wheel would end up not open and the gear stayed in. We also noted that when the pressure in the shock absorber (Dowty liquid-spring shock absorbers) came down towards the lower end of the allowed pressure limit the tire, still rotating when retracted, left a small patch of rubber on the inside of the door. Once that was understood, we never had that kind of failure again." McLelland, *The Hawker Hunter,* 2008.	
207.	Landing Gear Forward Pivot Bearing Cap	Verify the AIP, as part of the landing gear inspection(s), addresses the forward pivot bearing cap. Refer to *Undercarriage Pivot Point Reinforcement,* below.	
		Additional Information: A Hunter ground accident illustrates this failure: "After a normal startup, the pilot started to taxi out of the dispersal area. This involved a 90° turn to starboard after moving straight forward for approximately 20 ft. Once the aircraft was moving the pilot made an uneventful brake check. When he applied starboard brake to turn out of the dispersal area, the starboard undercarriage leg collapsed, causing the pylon tank to break up and flood the dispersal with fuel. Before taxiing, the undercarriage was checked as selected down and three green lights were indicated. On investigation it was found that the bolt that secures the starboard undercarriage forward pivot bearing cap had stripped threads. Although [the] investigation failed to reveal recorded evidence of a recent heavy or short landing it is considered most likely to have been caused by severe drag loads on the undercarriage such as would be imposed by a heavy landing in the undershoot or by the wheel striking the lip of the runway. Examination of the damaged parts by the manufacturer confirms this opinion." http://www.radfanhunters.co.uk/Accidents.htm	

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208.	Sequencing Valves	The AIP should provide for the specific inspection, maintenance, and replacement of the landing gear sequencing valves, which were major failure points in the Hunter. Specifically, the issue was with the sequencing of the 'D-Doors' hinged at the sides of the fuselage to cover the lower halves of the main wheels when retracted.	
		Additional Information: A typical Hunter incident was that the sequencing valves would malfunction and the landing gear doors would close before the landing gear legs had been raised and the whole assembly would jam in the half-closed position.	
209.	Undercarriage Pivot Point Reinforcement	Ask whether the aircraft has the re-skinning of the under wing surface around the undercarriage pivot point.	
		Additional Information: This is an important structural item addressing one of the aircraft's weak areas.	
210.	Landing Gear Doors	Verify the AIP incorporates adequate inspection procedures for the landing gear doors.	
		Additional Information: In the Hunter, commonly reported problems included sequencing problems with the aircraft's undercarriage, resulting in a number of door retraction failures.	
211.	Brake Selector Unit	Verify the AIP addresses the inspection of the brake selector unit (Dunlop hydraulic wheel brakes) and considers spectrographic oil analysis of the hydraulic fluid within the brake system.	
		Additional Information: Hunter accidents have occurred because of the brake selector unit. In one recent civil Hunter accident in the U.K., the right brake valve plunger within the selector unit became jammed. As a 2007 U.K.'s AAIB report notes, this resulted "in a degree of pressure being continually applied to the right wheel brake. Given that the pilot did not have any directional control issues until the nose wheel left the ground, the level of braking to the right main wheel must have been low. As the aircraft accelerated down the runway, the heat build-up within the right brake unit would have been rapid and it is likely that it was sufficient to cause the brake unit to 'seize', just as the nose wheel lifted from the ground." This lead to a loss of control at a critical time. As a result, the U.K.'s AAIB added that "the brake selector unit is not subject to a fixed life and it was not determined when this unit had been fitted to the aircraft. As a result of this event, the maintenance organization has introduced routine spectrographic oil analysis of the hydraulic fluid within the brake system to allow early identification of component deterioration." http://www.caa.co.uk/docs/224/CAP632Newsletter4Spring2008.pdf.	
212.	Maxaret System	Verify the AIP includes the inspection of the Maxaret system.	
		Additional Information: The Hunter is fitted with a Maxaret system, which is an early form of antilock braking to prevent wheel lock-up under extreme braking or during operation on slippery surfaces. Dunlop's Maxaret was the first anti-lock braking system (ABS) to be widely used. Introduced in the early 1950s, Maxaret was rapidly taken up in the aviation world, after testing found a 30% reduction in stopping distances, and the elimination of tire bursts or flat spots due to skids. The following description illustrates the Maxaret system: "Aircraft have a much lower ratio of tire contact patch to vehicle weight, and operate at much higher speeds. For these reasons, it is much easier to enter a skid in an aircraft through the over-application of brakes. In early testing on the Avro Canada CF-100, landings were safely made on runways covered in ice which would otherwise preclude flying. Since the operational requirements of most aircraft are defined by the best take-off or landing distances under all weather conditions, Maxaret allowed aircraft to operate at 15% higher all-up weights. Another benefit was initially unexpected. Braking effect is greatly reduced at high speeds; the coefficient of friction between a tire and concrete is about 0.7 to 1.0 at 30 mph, but decreases dramatically to 0.3 to 0.5 at 120 mph. This means that it is much easier to skid when first landing, a fact that led pilots to hold off on the brakes until the aircraft was firmly down, and then slowly increase pressure to avoid skids. With Maxaret, they simply applied full braking as soon as they touched down, knowing that the system would prevent skids. As a result, braking distances even in perfect conditions were greatly improved, on the order of 30%. A later modification allowed the brakes to be applied before landing, with the valve only applying the brakes when the wheel spun up at least once. When skidding occurs, the tires can be rubbed flat, or even burst. Aircraft tires have much shorter lifetimes than cars for these reasons. Since Maxaret reduced the skidding, spreading it out over the entire surface of the tire, the tire lifetime is improved. One early tester summed up the system thus: 'The runway was very wet on the first landing, and the aircraft's all up weight was at least 12 per cent above the maximum landing weight. The brakes were held on at approximately 1,200 lb/sq in pressure from a speed of 80-85 knots, until the aircraft came to rest. The braking distance was estimated at 1,200 yards. The tires were completely unmarked. Landing previously in an identical machine without Maxarets, and at approximately the same all up weight, great difficulty was experienced in stopping the aircraft in an estimated distance of 1,600 yards, with the braking parachute streamed at approximately 70 knots. On this occasion two tires were burst, and the remaining six were damaged beyond repair." Maxaret, developed by Dunlop in the UK, quickly found uses on most UK military aircraft. Many companies followed suit, both in military and civilian models." http://en.wikipedia.org/wiki/Maxaret	
213.	Explosives and Propellants	Check compliance with applicable Federal, State, and local requirements for explosives and propellants in terms of use, storage, and disposal, in addition to verifying manufacturer and service (SAF/NATO/USAF) requirements are followed. In addition, NAVAIR 11-85-1 can be used as a reference.	

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214.	Drag Chute and (Mod No 785)	Verify the AIP incorporates proper maintenance, component replacements, and packing of the drag chute, if the aircraft is equipped with a drag chute system or it is provided in the aft fuselage. The applicant has also to incorporate the drag chute in accordance with the manufacturer's modification (Mod No 785).	
		Additional Information: The drag chute system must be treated as a critical safety of flight item due to the airplane's history of frequent brake failures and overruns. In fact, RAF Hunter's were grounded at one time because of the high number of inadvertent drag chute releases. The drag chute system is not a "simple system to be merely looked at on condition." Drag chute failures can be due to age, notably broken hangers, necessitating replacements. Other issues associated with the failure of this system include excessive wear of components (that is, joints, excessive play) and cables, as well as excessive repairs (beyond tolerances) to the system's doors. In the Hunter, the drag chute is installed in a 'pen nib' fairing over the exhaust, and electrical power is used to unlatch the housing doors. In case of emergency, back up battery power can be used. Inadvertent drag chute deployments are not an issue of the past. In 2006, one occurred in the UK. The incident report explains: "During a gentle LH turn, the brake parachute 'Stream' caption illuminated and the pilot noted a tug commensurate with a parachute deployment. The LH seat pilot observed the parachute falling to the ground where it landed without incident. At no stage had the parachute switch been touched and it had been fitted normally by trained engineering staff prior to flight. The aircraft returned to base where it landed without incident. No damage was sustained to the aircraft. Inspection noted the brake parachute access doors were open, indicating that the parachute had been streamed. It was noticed that a small access panel on top of the parachute doors was missing. The reporter concludes that the 'Zeus' fastener must have broken in flight, allowing the panel to be carried away by the airstream. The missing panel enabled air flow to enter underneath the door, eventually causing the brake parachute doors to open and the parachute to be deployed. Un-commanded brake parachute deployment automatically opens the parachute retaining shackles, allowing the parachute to fall clear of the aircraft." http://www.caa.co.uk/docs/224/CAP632%20newsletter%203%20SPRING%202007.pdf.	
215.	In-Flight Canopy Separation and/or Failure	Ensure the AIP addresses the proper maintenance of canopy locks and other components, including motor, pyros, and wiring.	
		Additional Information: Many Hunter accidents, including fatal accidents, were attributed to failures of the not-so-simple canopy system. The aircraft canopy jettisoning system is as follows: the hood is jettisoned by gas pressure from the jettison gun which acts on two pistons that release the canopy rails and then push it upwards. This is initiated by pulling the handle on the left console. This action also operates a micro-switch which, if electrical power is available, automatically lowers the gun sight. An external emergency release ring is located inside a break panel on the left side of the fuselage, below the cockpit. When the release ring is pulled, the jettison gun is not fired but the canopy rails are released. The canopy can then be raised clear manually. The canopy is also jettisoned automatically whenever either the ejection seat blind handle or the seat-pan alternative firing handle is pulled. Another issue with the canopy is that it can inadvertently open in flight. There is a wiring bundle that comes from the outboard side of the throttle, controlling the throttle twist grip, manual gun sight, the R/T press-to-talk button, and the speed brake control switch. This bundle can foul the canopy selector switch when brushing past from the fully forward position. Therefore, this area should be inspected as part of the AIP. For additional safety concerns with the canopy, see *Canopy Operation on the Ground* below.	
216.	Harley Light	If installed, verify the AIP addresses any maintenance and inspection of this light system (mounted on the nose of some Ex-Royal Navy Hunters).	
217.	Inverters	Verify the AIP provides the inspection and replacement of all inverters as per the required SAF guidance. The inverters are located behind the ejection seat, and they are difficult to get to. This means that the seat and the canopy have to come off the aircraft.	
218.	Canopy Seals	Test canopy seals for leaks (that is, use ground test connection).	
219.	Autostabilizer (Yaw Damper)	Verify that the Autostabilizer or yaw damper is addressed in the AIP.	
220.	Air Conditioning and Defogging System	Verify the AIP adequately addresses the maintenance and testing of the air conditioning systems (that is, Cold Air Unit) and related systems like the de-fogging system.	
		Additional Information: The failure of the de-fogging systems is one of the Hunters weak points and several fatal accidents have resulted from its failure. In the Hunter, high-altitude misting, and icing is one of the main safety issues concerning the visibility from the cockpit. A malfunction of the air conditioning system can lead to fogging up of the windscreen and canopy and block the pilots' view, with catastrophic results. Many other frontline fighters have had this type of problem. This caused the 2011 USAF F-16 accident at Air Venture.	
221.	Emergency Canopy Jettison Mechanism	Verify the AIP includes testing the Hawker Hunter emergency canopy jettison mechanism. It must be functional and properly inspected per the applicable technical guidance.	
		Additional Information: The original canopy actuators were a major problem, and it was found that pilots could neither release nor jettison the canopy in an emergency situation.	

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222.	Brake System	Emphasize a detailed inspection of the brake assemblies, adhere to manufacturer's inspection guidelines and replacement times, and consider a more conservative schedule. Recommend brake inspection at 20 to 30 landings.	
		<u>Additional Information:</u> The Hawker Hunter has a history of brake related accidents and overruns. The Hawker Hunter is fitted with a castoring nose wheel, differential main wheel braking is used to maintain directional control. Wheel braking is controlled by the brake selector unit, which is operated through a series of levers and cams by a lever mounted on the forward face of the control column. The selector unit consists of two valves, one for each main wheel brake unit. Pulling the brake lever progressively opens both valves, allowing both main wheel brake units to be progressively pressurized. If the rudder pedals are moved during braking, a cam within the selector unit alters the position of each brake valve, thereby varying the pressure to each brake unit to provide differential braking.	
223.	External Fuel Tanks (General)	Verify the type, condition, installation, and removal of drop tanks meet requirements of the manufacturer or military operator. Only external tanks cleared for use by the aircraft manufacturer, RAF, and the SAF may be used on the aircraft.	
		<u>Additional Information:</u> The tanks must not only be approved for use, but must also match. For example, all tanks and pylons meeting the Swiss standard are not interchangeable with UK equipment. The aircraft records and the AIP must document the type of tanks that can be used on the aircraft. The Bristol 100-gallon tanks were made of phonelic asbestos plastic while the 230-gallon tanks were made of mild steel. Four 230-gallon tanks, a tank on each station is not permitted. Note: Ex-SAF tanks are identifiable because they are marked with the data of manufacturer and other data. The proper baffling is required. No homemade fuel tanks are permitted. The only modification allowed to the external tanks is to prevent jettisoning. Accidental jettisoning of the tanks is a safety hazard. Any means of releasing the tanks during aircraft operation must be disabled. For example, ex-Swiss Mk 58 aircraft can carry 150-gallon tanks on the inboard pylons and 100-gallon tanks on the outboard pylons which were jettisonable by an electromagnetic release unit. This ability must be disconnected. Also, a second jettison switch was installed in series, to provide protection against a single failure in the switch leading to un-demanded jettison (in compliance with PDC 12). Jettison, in this case, must also be prevented. Note: There have been several cases of external fuel tank separations on the ground an in flight and involving both the 100 and 230-gallon (imperial) fuel tanks.	
224.	Modifications 964 and 965 (External Fuel Tanks)	Verify the AIP addresses these two important modifications concerning the external fuel tanks.	
		<u>Additional Information:</u> A Hunter accident best illustrates the issue with the external fuel tanks. The accident aircraft's "230 gallon drop tanks, each less than half full were carried on the inboard pylons. There were no other external stores. The limitation in this configuration is 7 'g' with half lateral movement of the stick when aileron gear is normal. When [the pilot] saw the other Hunters starting their takeoff run he eased gently into a dive towards them with 6,500 rpm and allowed the speed to build up to 450 knots. XF436 was spotted by the others when they were at 1,000 ft and as it pulled up Nos. 1 and 2 to their horror, saw its starboard tank come away and hurtle towards them. Fortunately it missed and fell into the sea off the end of the runway. The equally horrified pilot of '436 saw that not only the tank, but its pylon and part of his wing tip were missing as well. A report by another pilot after an airborne inspection confirmed that this was the limit of the damage. The remaining tank was jettisoned at 250 knots in a clear area, and a low speed check down to 140 knots IAS with undercarriage and 40 degree flap down was carried out. Everything appeared normal, but all precautions were taken during the subsequent uneventful landing. Inspection showed that the thread on eleven of the twelve anchoring pylon nuts had been stripped and the twelfth bolt had sheared. Mods 964 and 965 introduce thicker nuts and correspondingly longer bolts respectively, but one is ineffective without the other. The longer bolts are easily fitted and kits were available; Mod 964, however, takes 130 man hours per aircraft. Hunters without the modification have been limited to 4 'g' when fuel is being carried in 230 gallon tanks." www.radfanhunters.co.uk/accidents.htm.	
225.	External Fuel Tank Limitations (UK CAA Modifications)	It cannot be assumed that any external fuel tank combination is acceptable. Some Hunters may only be approved to carry the 100 gallon tanks.	
		<u>Additional Information:</u> For example, Royal Navy's Hunters GA11s were cleared to carry 2 x 230 gallon tanks on the inboard pylons, but with a 4G limit with fuel in the tanks or 5Gs with tanks empty. The aircraft, at time of approval, may have been fitted with 2 x 230 gallon tanks on the inboard pylons only, but for ferry purposes. In that case, mods 697, 829, 891, 893, 934, 964, 965, 1037, 1063, 1079 and SI/Hunter/103 are applicable to such aircraft/drop tanks. Therefore, in that case, if the 230 gallon tanks are to be fitted, the above mods will need to be embodied.	
226.	External Fuel Tank Sway-Bracing Strut	Verify that the AIP, as part of the inspections concerning external fuel tanks, checks the condition of the sway-bracing on the external fuel tanks.	
		<u>Additional Information:</u> Several in-flight fuel tank separations have occurred and these structural devices are essential for safety.	

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227.	External Fuel Tanks Separation and Clamp Lock	Ensure the aircraft has the Swiss-registered Hunter (civilian operations) clamp lock around the jaws of the release unit of the external fuel tanks to prevent them from opening so the tanks cannot be jettisoned either deliberately or inadvertently.	
		Additional Information: As with many aircraft in this category, the separation (intentional or not) of the external fuel tanks is a serious safety issue. The following U.K. AAIB excerpt from a Hunter accident discusses this: "As the aircraft touched down, an external fuel tank fell from its wing, hit a runway edge light, and damaged the runway surface. The tank was held onto the wing by an electromagnetic tank release unit. The jaws of the unit opened on touchdown releasing the tank. The fuel tank was held under the wing by an electromagnetic tank release unit whose jaws closed around a lug on top of the tank. It appeared that the force on the jaws, imparted by the tank at the moment of landing, was sufficient to cause them to open and release the tank. There was no evidence that the release unit was unserviceable before the event. Similar release units were removed from the operator's other aircraft, tested for serviceability and refitted. Civil Aviation Publication (CAP) 632 details the terms under which ex-military aircraft can be operated on the U.K. register under a Permit-to-Fly. It states that 'drop tanks should only be jettisoned as a last resort and when their retention would imperil the aircraft and crew and bring increased risk to persons on the ground'. It also states that 'pilots should be aware that empty drop tanks have a negligible effect on gliding or range performance of jet aircraft. Therefore, consideration should be given to retaining them in the event of forced landing.' Anecdotal evidence from Hunter pilots suggested they concur with this advice as aircraft have landed safely on the tanks following partial lowering of the landing gear. There was also concern that asymmetric release of the tanks would make a given situation worse. A clamp lock, in use with Swiss registered Hunters, clamps around the jaws of the release unit to prevent them from opening, the tanks cannot be jettisoned either deliberately or inadvertently. The Hunter was accepted onto the U.K. register under a Permit-to-Fly based on the safety record it gained during military service. The aircraft standard accepted onto the register did not include the Swiss modification which is not, therefore, cleared for use on U.K. aircraft. Advice from the CAA suggests that to jettison empty drop tanks would be of negligible benefit to an aircraft in an emergency. Authorizing the Swiss modification for use would prevent accidental jettison such as that which occurred in this incident. However, the safety record of the aircraft standard currently cleared for flight does not give grounds for concern. The argument is finely balanced and the evidence in this report does not support any recommendations."	
228.	Pylons	Verify the AIP addresses the inspection of the aircraft's pylons as per the applicable RAF/SAF guidance, including re-alignment.	
		Additional Information: Inspection of the pylons is critical. The Hunter has a long history of in-flight external stores separation. In addition, turbulence affected the Hunter more than other aircraft, and one are where this manifested itself was in the pylons, where inspection detected deformation and misalignments, both of which can lead to failure. The brace struts were also a vulnerable item, see *External Fuel Tank Sway-Bracing Strut* below.	
229.	Hoses and Cables	Inspect and replace hoses and cables appropriately.	
		Additional Information: Due to the age of all Hunter aircraft, and in many cases, poor storage history, it is essential to ensure thorough inspections of all hoses and cables (multiple systems) and replace them in accordance with RAF/SAF guidance and requirements.	
230.	Grounding	Verify adequate procedures are in place for grounding the aircraft. See TO 00-25-172 *Ground Servicing of Aircraft and Static Grounding/Bonding,* August 2012.	
		Additional Information: Static electricity could cause a fire or explosion, set off pyrotechnic cartridges, or result in any combination of the above. In grounding the aircraft, it is essential that all electrical tools are grounded, and industry-approved explosion-proof flashlights or other lighting sources be used.	
231.	Nose Area (Cannon Areas) Structural Damage	Verify the AIP addresses the inspection of the aircraft's structure in the cannon area.	
		Additional Information: This is because this area of the aircraft was susceptible to structural damage because of the firing of the Aden 30mm cannons and damage that may have occurred before the aircraft was disposed to civilian use. Operationally, it was found that extensive fatigue-cracking occurred in the surrounding structure. The inspections must include any steel plate reinforcements added as a result of the problem.	
232.	Antennae and Avionics	Verify any original antennas are compatible with all installed electronics. In addition, verify the AIP includes the appropriate inspections of the antennae, such as the inspection of the L-Band antennas, and the 12 month inspection of the avionics (SAF).	
		Additional Information: Some new avionics may impose airspeed limitations. Over the years, and spanning the many Hunters versions and variants, many different antennae were installed in the aircraft. For the basics on this issue, see Higdon, David. Aircraft as Antenna Farm. *Avionics,* Vol. 49, No. 9 (September 2012).	
233.	Transparencies Problems	Ensure proper transparencies maintenance for safe operations. Monitor/inspect canopy for crazing after every 10 hours of flight.	
		Additional Information: The Folland manufactured canopy (Perspex) was prone to failure. Note: there have been cases of Hunter windscreen cracking and thus thorough inspections may be necessary.	

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234.	Gunsight	Verify that even if the system (i.e., GGS Mk. 8 gyro gun sight and Sperry Mk.8S gun sight) is not operational (and as part of the demilitarization process, it should be disabled), and that there is no power connected to the system.	
		<u>Additional Information:</u> There have been many Hunter accidents related to electrical fires in the system, causing smoke in the cockpit and even fires.	
235.	Hard Landings and Over G Situations	Verify hard landing and over-G inspection programs are adopted.	
		<u>Additional Information:</u> This is especially important when acrobatics are performed or when the aircraft is involved in military support missions outside the scope of its experimental certificate (that is, public aircraft operations). Failure to report a heavy or short landing or an over G situation can have serious consequences for the subsequent pilot.	
236.	Gear-Up Checks	The AIP must incorporate all of the tasks, functions and checks for a gear-up landing found in AP 101B-1302-6A Repair Manual. The AIP should also include any additional items the Swiss AF may have imposed in the last years of Hunter operations.	
		<u>Additional Information:</u> The Swiss conducted a full gear-up test with an actual Hunter, landing gear-up in 1992 to specifically document damage and necessary repairs. As a result, AP 101B-1302-6A may have been modified. This issue is important because the Hunter has a long history of gear-up landings in its operational history, and in its current civil activities, gear-up landings continue to take place (both mechanical and pilot error) at regular intervals. Moreover, some operators and indeed the FAA, have assumed that a gear-up landing in the Hunter is an incident, when in fact, in many cases, especially those documented in the Belgian AF, structural damage was not uncommon to the point of causing the aircraft to be retired rather than repaired. One of the main damage areas is the Aden cannon cradle, which is an integral part of the structure. This structure may be damaged beyond repair in what otherwise would have been a 'benign' gear-up landing.	
237.	Parts Fabrication	Verify engineering (that is, Designated Engineering Representative (DER)) data supports any part fabrication by maintenance personnel. Unfortunately, many modifications are typically made without adequate technical and validation data. AC 43.18, *Fabrication of Aircraft Parts by Maintenance Personnel,* may be used for guidance.	
238.	Wing and Tail Bolts and Bushings	Verify the AIP provides for the inspections and magnafluxing of these items every 300 hours. Recommend the AIP incorporate other commonly used and industry-accepted practices involving non-destructive inspection (NDI) if not addressed in the manufacturer's maintenance and inspection procedures.	
239.	Wing Spar Inspection and Mod ASH 1150/11	Verify the AIP provides for the required 300-hour inspection of the wing spars by an ultrasonic inspection. Also verify that the AIP includes Mod ASH 1150/11 on the wing spar booms, to give improved fatigue life.	
240.	Flight Control Balancing and Deflection	Verify flight controls are balanced per the maintenance manual(s) after material replacements, repairs, and painting. Verify proper rigging and deflection. In several former military jet aircraft (FMJA), damage to flight controls has been noticed when inadequate repairs have been performed.	
		<u>Additional Information:</u> If there are no adequate records of the balancing of the flight controls, the airworthiness certificate should not be issued. Note: There have been cases where the Hunter rudder separated in flight.	
241.	Flight Controls Failures	Verify the AIP properly addresses the required inspections to all flight controls, both manual and assisted types.	
		<u>Additional Information:</u> The Hunter has a history of accidents and incidents related to flight controls failure. In addition to loss of control due to the misuse of manual flight controls, one cause of Hunter accidents has been the inability by the pilot to raise the nose of the aircraft (leading to late aborted takeoffs and overruns) because of elevator control reverting to manual due to ruptured fuses. Note: The powered elevator system linked the tail plane and elevator controls to produce better longitudinal control. This was so after 2º of elevator movement, micro-switches were contacted to change the tail plane incidence at rate of 0.7º per second.	
242.	Modifications 390 and 629	Ask the applicant to determine whether the aircraft had the electrically actuated "follow-up" tail (Modifications 390 and 629) installed (electric trim is manually selected). These are important modifications due to the aircraft's pitch control issues.	
		<u>Additional Information:</u> The tail plane trim is electrically powered and a back-up actuator is provided in case of failure of the main system. In some Hunters, the auto-stabilizer (Mod 417) may not be installed since it was deleted by Mod 1068. Note: Several Hunter accidents have been caused by "suspected failure of tail plane actuator."	

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243.	Aileron Deformation, Failure, and Jamming	Aileron inspection must be addressed in the AIP and pre/post-flight inspections.	
		<u>Additional Information:</u> Inspect the aileron carefully before and after each flight and adequately address it in the AIP. Air loads may result in aileron deformation and structural failure. The typical damage is related to excessive Gs. The Swiss Logistics Command had to reinforce the ailerons of some Hunters, which had cracked due to shock waves generated by stores suspended beneath the outboard pylons. In fact, as far back as 1954, this issue was known. A Hunter author describes: “Airflow separation at the rear of the tanks gave rise to severe aileron buffet, resulting in local skin damage. Numerous remedies were tried to delay the flow separation, including the use of inboard pylons in the outboard position (thus canting the tank down, so delaying the point of airflow separation); extending the pylon aft in an attempt to reduce airflow instability; introducing vortex generators around the drop tank itself; extension aft of the drop tank with large cylindrical fairings; and the evolution of Bristol banana tanks, so shaped as to maintain a smooth airflow between tank and aileron. The problem was never entirely solved and it was decided simply to reinforce the aileron skins.” Mason, *Hawker Hunter*, 1985. In addition, Hunter crashes have been caused due to jammed ailerons caused by failure of a pin in the port aileron hydraulic jack. The following account of a Hunter accident illustrates the consequence of the loss of aileron control: “Approximately twenty minutes after takeoff the pilot began to experience sponginess of the aileron controls as he came out of a starboard turn. The speed of the aircraft at the time was noted as 0.75 IMN Hydraulic system pressure appeared normal, and the pilot sent a radio message to tell ground Control that he was in difficulties. He selected manual control on the ailerons, but immediately noticed starboard wing heaviness with a strong tendency to roll to starboard-he tried to re-select power control on the ailerons but this caused the control column to lock solid. Once again he switched to manual control but the control column refused to budge, the roll continued and then the Hunter went completely out of control and descended in a spiral dive.” Another Hunter accident account noted “after three [approaches] under manual control, the pilot reverted to powered control, but received false anchorage of the ailerons. Free movement of the ailerons was thus only possible in one direction, and this led to a loss of control of the aircraft” http://aviation-safety.net.	
244.	Aileron Gearing System and Aileron Hydro-Boosters	The AIP should address the inspections and maintenance of the aileron gearing system, if installed. Some Hunters, such as the FGA9, had a gearing system to dampen aileron sensitivity at high indicated airspeed. The AIP needs to address the inspection, maintenance, and replacement of the aileron hydro boosters. These can give false lock, possibly leading to restricted aileron control.	
		<u>Additional Information:</u> With the Hunter’s history of aileron-related failures and accidents, this is a critical item, especially in light of the fact that manual reversion has serious limitations.	
245.	Rivets on Load Areas and Fatigue Wing Skin Inspections	Verify the AIP incorporates the inspection of all rivets in critical load areas such as trailing edges where inspections regularly find loose rivets. Also verify the AIP incorporates (a) the inspection of the fatigue wing skin zone at 100 hours, and (b) the inspection of the wing skin splice with an eddy current inspection at 600 hours.	
246.	Air Brake	Verify air brake condition, deflection, cylinder condition, and warning signage. The Hunter air brake was known for drooping or sagging, due to leaky non-return valves in their hydraulic circuits. The AIP and SOPs should address how the air brake can pose dangers to ground personnel which can be lethal.	
		<u>Additional Information:</u> The air brake is electrically selected by means of a three-position switch positioned on the throttle lever and hydraulically operated. They are designed to be operated at any speed. However, they have a built-in safety and automatically become disabled when the landing gear is lowered. They also retract if the pilot inadvertently selects landing gear down with the air brake out.	
247.	Modification JH 037	Verify the AIP covers Modification JH 037 *Ballast In lieu of Guns on Hunter Aircraft* on the aircraft.	
		<u>Additional Information:</u> In demilitarized Hunters, JH 037 *Ballast in Lieu of Guns on Hunter Aircraft* includes the removal of the Aden cannons and introduces special cast lead blocks bolted down (16 x 7/8 HTS bolts) to the gun cradle in order to maintain the center of gravity within limits. In the UK, this modification was previously applied to both two and single-seat Hunters (see AAN 22094) although no baggage bay was fitted with this modification.	
248.	JH 037 Gun Ballast	Verify that the aircraft has the JH 037 Gun Ballast modification.	
		<u>Additional Information:</u> This modification, approved by the UK CAA, replaces the guns with ballast. If not, an alternative is necessary and it must be properly documented, especially if it involved or impacts the gun cradle. See *Aden Cannon Cradle* above.	
249.	EKCO ARI-5820 Mk1	All Hunters were equipped with EKCO ARI-5820 Mk. 1 magnetron ranging radar, which determined range to target in both SIWA and cannon firing modes. Deactivated in the early 1980s, these ranging devices were never removed from the aircraft nose so as not to disturb weight and balance. If removed, proper ballast and related documentation is necessary. This is also s CG issue.	

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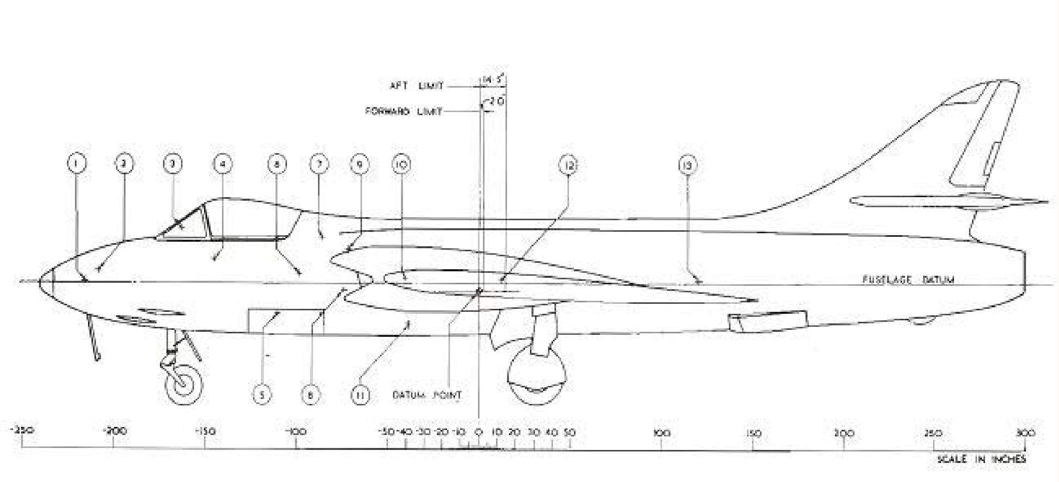
250.	Accurate Weight and Balance (W&B)	Review original W&B paperwork. Verify adherence to RAF/SAF guidance (TM NO. 73.920-12), as well as FAA-H-8083-1, *Aircraft Weight and Balance Handbook* if documentation by the applicant appears to be inadequate. <u>Additional Information:</u> In the Hunter, W&B is critical, as indicated by a CG range between aft and forward limit of 5.5 inches (see diagram below). Several former military combat aircraft accidents have been linked to center of gravity miscalculations. For example, in 1995, a U.S. registered Hunter was involved in a tail strike and it was determined that the aircraft, not fitted with its gun package/or the replacement modification suffered from an out-of-balance situation, which fortunately did not result in injury or destruction of the aircraft (see *Modification JH 037* above). Other components may have an impact on the aircraft's CG range. For example, part of the ARI 5820 ranging radar system (100 lb) and the 30 mm guns (793 lb) have been removed and 582 lb ammunition may not be carried. Removal of the three heavy Vinten F95 cameras in the Hunter FR10 (some FR10 were modified with a heavier package of KA56, KA93, 116 cameras and Red Linescan) would also be an issue, as would the replacement of the heavy radio equipment (i.e., the 56 lbs. Collins UHF) now replaced by modern and compact units, or removing the armor plating fitted to many Hunter around the cockpit area. As an example, the starter installation (upgrade from Avpin starter system) involves replacing some of this weight at the gun pack (between frames 15 and 17A). The datum was then defined as the foremost face of a spigot situated in the port wheel bay on the fuselage skin just forward of the undercarriage door hydraulic jack. This type of data is found in many U.K. Hunters, where aircraft are weighed by plane weighs. As examples, U.K.'s CAA Report 3943 dated August 27, 1996, Planeweighs Report No. 3562 dated January 11, 1996, and weight schedule JHL/H/EGH/25 dated March 7, 1996, can be consulted. This would also confirm whether the aircraft will remain within weight and CG limitation with pilots of 120 to 250 lb at any fuel state. CG to be between 1.0 inches forward of datum and 14.5 inches aft of datum. Datum is marked by a spigot in the port main undercarriage bay. Also, W&B computations must include any addition or variation of external loads mounted on the wing pylons and the data must be based on the applicable military service guidance, i.e., Swiss Air Force. For example, the Swiss Air Force permitted certain types of loads in the outboard pylons, including the large 991 lbs. bomb on outboard pylons, but because these are aft of the CG, there were tight limitations in terms of speed range. Another Swiss AF example is that in the AGM-65 configuring weight on the outboard pylons, 290 lb. are needed in the cannon area.  	
251.	"Experimental" Markings	Verify the word "EXPERIMENTAL" is located immediately next to the canopy railing, on both sides, as required by § 45.23(b). No subdued markings. It must properly contrast with any paints scheme or camouflage.	
252.	N-Number	Verify the marking required by §§ 45.25 and 45.29(b) concerning the registration number (N-number), its location, and its size are complied with. If non-standard markings are proposed, verify compliance with Exemption 5019, as amended, under regulatory Docket No. 25731, if applicable.	

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253.	Smoke System	Recommend that any smoke system be disabled or removed. If not, the AIP must provide for its specific inspection and maintenance.	
		Additional Information: As part of UK Hunter investigation, the following was stated concerning the smoke system installed in the accident aircraft: "G-HHUN had also been modified with the fitment of a smoke system. Diesel fuel, stored in the left under wing tank, can be pumped when required through an ON/OFF valve in the pylon to a spray orifice which protruded into the jet efflux at the rear of the jet pipe. The smoke system is armed by a standard toggle master switch located on the left side of the cockpit, and activated by a pushbutton on the control column. When the button was depressed, an electrical actuator opened the ON/OFF valve, the pump was energized, and a warning lamp illuminated in the cockpit. The diesel fuel was pumped through the left wing and then through an elastomeric, steel braided, fire resistant hose routed underneath the engine in the rear fuselage. Although the elastomeric material had deteriorated in the fire, there was no evidence of pre-impact damage to the steel braid, or of pre-existing deterioration of the hose. The smoke master switch was found in the 'ON' position after the accident. The smoke valve actuator in the pylon was found in the extended position, with the valve arm at the position marked CLOSED. The installation drawings confirmed that this was the 'SMOKE OFF' position. Examination of the 'SMOKE ON' indicator lamp found that the filament had suffered a brittle fracture, however the bulb holder and glass envelope had been broken, subjecting the filament to direct mechanical impact. It was considered that the condition of the filament indicated that the 'SMOKE ON' lamp had not been illuminated at impact."	
254.	Nondestructive Inspection (NDI)	Verify the AIP provides for the necessary Nondestructive Inspections (NDI) as per the applicable AP, and if the aircraft is an ex-Swiss AF aircraft, the Swiss requirements, see *Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms).* Several of these inspections are discussed in this document. NDI is the inspection of a structure or component in any manner that will not impair its future usefulness.	
		Additional Information: The purpose of the inspection may be to detect flaws, measure geometric characteristics, determine material structure or composition, or it may characterize physical, electrical, or thermal properties without causing any changes in the part. The five standard NDI disciplines include: (1) liquid penetrant; (2) magnetic particle; (3) Eddy current; (4) ultrasonic; and (5) radiography. As a reference, T.O. 33B-1-1, NAVAIR 01-1A-16-1, TM 1-1500-335-23 *Technical Manual Nondestructive Inspection Methods, Basic Theory,* October 1, 2009 can be used. This publication contains the concepts, process controls, and theory of NDI methods and can be used as a guide in development of NDI procedures and manuals. Other documents include: (1) MIL-STD-410E, Military Standard, *Nondestructive Testing Personnel Qualification and Cer*tification; (2) AIA-NAS-410, Aerospace Industries Association, National Aerospace Standard-410 *Certification & Qualification of Nondestructive Test Personnel;* and (3) Recommended Practice SNT-TC-1A: *Personnel Qualification and Certification in Nondestructive Testing* (2006). AIR-220 memorandum, *Qualification Standards for Nondestructive Testing*, June 15, 2007 can also be used as a reference since it assists FAA Aviation Safety Inspectors on how to determine if qualified personnel are performing Nondestructive Testing (NDT). Note: For ex-Swiss AF Hunters, also see *Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms)*. This document discussed several NDT items, schedule, and requirements.	
255.	Type of Ejection Seat System	Identify the type of ejection seat fitted to the aircraft. The type of seat changes many aspects of operations and maintenance.	
		Additional Information: Hawker Hunters are equipped with the Martin-Baker 2H or 3H ejector seat, while the two-seat trainer version (that is, Hunter T7 and T8) Mk 4HA ejection seats. Martin-Baker continues to support the Mk. 4. Although of an earlier generation when compared to modern ejections seat, they are still complex pieces of equipment, with many dangers, potentially fatal.	
256.	Ejection Seat System Maintenance	Utilize factory support for maintenance and inspection of the ejection seat. Alternatively, perform maintenance and inspection of ejection seat and other survival equipment in accordance with the SAF procedures or RAF/NATO applicable technical guidance, by trained personnel. Include specific inspections and record keeping for pyrotechnic devices. Ejection seat system replacement times must adhere to RAF AP 101B-1300-5A1 *Component Replacement List – Mandatory Changes.*	
		Additional Information: For a Martin-Baker type 3H seat to be fully operational, the cartridges must be replaced within a 6 years (shelf life) and 2 year installed life. Ejection seat procedures and envelope are specified in the Aircrew Manual. Also, ejection seat maintenance includes ancillary items, such as the Personal Safety pack (PSP), which is part of the seat. Proper maintenance, inspection, and testing of the all-important barostat mechanism (barostatic time-release unit) cannot be understated (see *Martin Baker Ejection Seat (Overview)* below). No "on condition" maintenance may be permitted for rocket motors and propellants. Make the distinction between replacement times, "shelf life" vs. "installed life limit." In this case, a 6-year replacement requirement is not analogous to a 2-year installed limit. If such maintenance documentations and requirements are not available, the seat must be deactivated. Another example is Martin-Baker type 4HA Mk 1 and 2 seats, that is, Serial No 19 and Serial No 20, must be serviced in accordance with AP 109B-0131-12. Note: Self life is the total period of time (beginning with the date of manufacture/cure/assembly) an item may remain in the combined wholesale (including manufacture) and retail storage system and still remain suitable for issue to and use by the end user. Shelf life is not to be confused with service life, which is a measurement of anticipated total in-use time. The parachutes and survival packs must be serviced in accordance with the relevant RAF Air Publications. Finally, in all cases, ejection procedures and envelope are specified in the Aircrew Manual. One fatal Hunter accident illustrates the consequences of an ejection seat failure: "…the jolt on hitting the airflow caused his parachute release box to operate, and when the seat operated automatically and released him from the seat, he was released from the parachute too and fell 10,000 feet or more to his death." McEwen, *Hunter From the Cockpit*, 2009. On another occasion, "during a negative G maneuver, the ejection seat was fired, having been incorrectly fitted. The parachute failed to deploy fully. Pilot, Lt. Pierre Dumoulin was killed." Griffin, *Hawker Hunter Serials,* 2006. Note: These Martin-Baker seats include a fire suppressant system with cartridges which have a 5-year installed life.	

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257.	Ejection Seat System APs	The AIP must include the appropriate AP or Air Publications (equivalent to the USAF Technical Orders or NAVAIR Technical Directives) covering all the aspects of the Martin Baker ejection system and subsystems.	
		Additional Information: It is essential to have this vital reference material on hand, as they explain the correct procedures for maintaining equipment on aircraft which, as it is the case with the Hunter, have long since been retired from military service. Also see *Ejection Seat Components Life-Limit* below. Note: In the case involving ex-Swiss AF Hunters, also see *Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms)* above.	
258.	Ejection Seat Components Life-Limit	The life-limits requirements concerning the ejections must be followed. The guidance is RAF AP 101B-1300-5A1 *Component Replacement List – Mandatory Changes.* No deviations or extensions should be permitted.	
		Additional Information: Some of the ejection seat components covered by this document (depending on the ejection seat type, 2H, #H or 4H), include: • Seat Ejection Type 3H 27L/50018 at 6 months; • Canopy Jettison and Time Delayed Firing Unit at 6 months; • Cartridges Seat Ejection Set at 2 years; • Cartridge Guillotine at 2 years. In a 2012 finding concerning a 2009 former military high-performance aircraft fatal accident, in which the pilot was killed because the ejection seat malfunctioned, it was found that "the ejection seats explosive cartridges were found to be overdue at the time of the accident. The install life and shelf life interval of the cartridges expired. The evidence found indicated that the cartridges were installed on the ejection seat for approximately 8 to 10 years at the time of the accident. The install life was approximately 5 to 8 years overdue and well over the total in service life limit." In addition, there are many cases of both inadvertent ejections and failed ejections in active military service and in civil use have involved ejection seat components out of date. Note: In the case involving ex-Swiss AF Hunters, also see *Swiss CAA Betriebszeiten (Operating Times) and Zulässige Laufzeit (Permissible Terms)* above.	
259.	Ejection Seat System Maintainers Training	Require adequate ejection seat training for maintenance crews. The manufacturer of the ejection seats on the Hunter still provides training (that is, Type 4 Martin-Baker Ejection Seat Course) and support for its seats. http://www.martin-baker.com/services/maintenance-repair-organisation.	
		Additional Information: Lack of ejection seat training can cause accidents. On May 9, 2012, an improperly trained mechanic accidentally jettisoned the canopy of a former military high-performance aircraft while performing maintenance and was seriously injured. Case in point, in 1973, during maintenance, a maintainer "was standing on the Hunter ejector seat he was servicing when the ejector cartridge fired. The seat itself went through the roof, but the [mechanic] impacted the roof and was thrown back through the overhead lights before dropping onto the concrete floor of the hangar. His injuries committed him to a wheelchair for life." Petter-Bowyer, P. J. H. 2003. A Swedish mechanic recalls his experiences of working on the Martin Baker 2H ejection seat of a Hunter Mk. 51: "…the most worrying job the engineers had to do on the Hunter was the removal and installation of the pilot's seat, the Martin baker ejection seat. I still remember the cold sweat when I faced this job for the first time. There were three cartridges to be removed before the seat was safe. And to remove one of them you had to remove the drogue chute gun that, if accidentally fires, would penetrate your chest. This did actually happen in one case in the Swedish Air Force. The engineer had installed the seat and, to make sure that it was fitted properly, he bent over it and pulled it upwards. The seat was supposed to be able to move about one-eighth of an inch. This was normal. But the engineer did this test with the wire to the drogue chute gun attached to the floor and the small movement was enough to fire the gun." McLelland, *The Hawker Hunter,* 2008.	
260.	Martin-Baker OEM Support for Hunter Ejection Seats	As part of the AIP, the assumption cannot be made that the applicant/operator may be able to safely maintain the Martin Baker ejections seats. The AIP needs to address how and what extent OEM support or other specialized companies (including companies approved by the OEM) can provide the necessary inspection requirements for the Martin Baker ejections seats fitted to the Hunter: 2H, 3H and 4H.	
		Additional Information: Martin-Baker, the manufacturer, still supports its older seats. Through its Maintenance, Repair and Overhaul (MRO) program and facilities, Martin-Baker can carry out maintenance if a customer requested this service. The company now offers a dedicated MRO service, including a facility by one of its subsidiary, Martin-Baker America, in Johnstown, Pennsylvania. In addition, specialized companies, including those approved by the OEM can be of assistance. Two such companies are Survival Equipment Services Ltd, in the UK (http://www.ses-safety.com/), and Seastar. Other companies, many of which are connected to ejection seat subsystems include: Irvin Aerospace, GQ Parachute, and Beaufort Air Sea Equipment. For additional information on how such companies can assist, see Cotter, Jarrod. Safety First. *Flypast,* No. 238 (May 2001), and Ellis, Ken. Passion for Escape. *Flypast*, No. 290 (September 2005).	
261.	Martin Baker Mod 491/610 and Ejection Seat System Modifications	Very whether Martin Baker Mod 491/610 has been incorporated in the ejection seat. This modification changed minimum ejection altitude and thus is a critical safety item. Prohibit ejection seat modifications unless directly made by the manufacturer.	

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<tr><th>Issue#</th><th>Issue(s)</th><th>Recommended Review, Action(s), and Coordination with Applicant</th><th>Notes, Action(s) Taken, and Disposition</th></tr>
<tr><td rowspan="2">262.</td><td rowspan="2">Crew Harnesses</td><td>Verify the harness used by the crew is compatible with the type of ejection seat used and associated survival equipment. Hunter accidents have been fatal because of harness issues.</td><td rowspan="2"></td></tr>
<tr><td>Additional Information: For example, strapping into a Hunter is not an easy thing to do. There are two sets of harnesses. One is for the parachute, while the other is for restraining. In the ex-Swiss Air Force Hunter Mk.58/A, a Swiss parachute harness was installed, but because the Swiss Air Force did not use Mea West equipment (life jackets), they were different than those used by the RAF. The result is there is a central chest strap which conflicts with wearing a Mea West. This is an important issue if, in fact, Hunter crews adapt a “homemade” Mea West installation. If the two systems are not compatible, the straps could cause more injury to the crew than they would have otherwise received. Note: In the 1970s, the RAF also modified some of the Martin baker seats to a different system of straps and center QRB, Quick Release Box.</td></tr>
<tr><td>263.</td><td>Modification 1129</td><td>Verify the AIP or related documentation incorporates Mod 1129 (strengthening of the seat pan) if the aircraft is equipped with a Martin-Baker 2H ejection seat. This is important because the ejection seat pan of the Mark 2H seat can collapse, compromising a safe ejection.</td><td></td></tr>
<tr><td rowspan="2">264.</td><td rowspan="2">Martin Baker Mk. 4
Ejection Seat
(Overview)</td><td>Although the ejection seats fitted to the Hunter, Martin Baker 2H, 3H and 4H, are of an earlier generation, they are still complex pieces of equipment.</td><td rowspan="2"></td></tr>
<tr><td>Additional Information: As an example, on the Martin Baker 4 seat (fitted to Hunters T7 and T8s), is operated by either the seat pan or face blind firing handles initiating the canopy jettison. Then, the main gun located at the rear of the seat then fires, the main gun is a telescopic tube with two explosive charges that fire in sequence. As the seat moves up its guide rails an emergency oxygen supply is activated and personal equipment tubing and communication leads are automatically disconnected, leg restraints also operate. A steel rod, known as the drogue gun, is fired and extracts two small drogue parachutes to stabilize the seat’s descent path. A barostat mechanism prevents the main parachute from opening above an altitude of 10,000 ft. A time delay mechanism operates the main parachute below this altitude in conjunction with another device to prevent the parachute opening at high speed. The seat then separates from the occupant for a normal parachute descent, a manual separation handle and ripcord is provided should the automatic system fail. Its specifications are as follows:
<table>
<tr><td>Operating Ceiling</td><td>50000+ ft (15,250m)</td></tr>
<tr><td>Minimum height/Speed</td><td>Zero/90 KIAS</td></tr>
<tr><td>Crew boarding mass range</td><td>70.4 to 101.7kg</td></tr>
<tr><td>Crew size range</td><td>5th to 95th percentile</td></tr>
<tr><td>Maximum Speed for ejection</td><td>600+ KIAS</td></tr>
<tr><td>Parachute type</td><td>Irvin I 24</td></tr>
<tr><td>Parachute deployment</td><td>Drogue assisted</td></tr>
<tr><td>Drogue parachute type</td><td>Duplex drogues 22in. and 5ft</td></tr>
<tr><td>Drogue deployment</td><td>Drogue gun. Cartridge generated gas. Initiated by 0.5 sec clockwork time-delay, tripped during ejection sequence</td></tr>
<tr><td>Harness type</td><td>Combined</td></tr>
<tr><td>Ejection seat operation type</td><td>Ejection gun</td></tr>
<tr><td>Ejection gun</td><td>80 ft/sec One primary cartridge, two secondary cartridges, 72 in. stroke</td></tr>
<tr><td>Ejection initiation</td><td>Face screen or seat pan firing</td></tr>
<tr><td>Barostatic time-release unit</td><td>Yes, tripped during ejection sequence, g-restrictor</td></tr>
<tr><td>Manual override handle and Guillotine</td><td>Yes</td></tr>
<tr><td>Timers</td><td>Time-release unit for man/seat separation</td></tr>
<tr><td>Seat adjustment</td><td>Up/down, manual operation</td></tr>
<tr><td>Arm restraints</td><td>No</td></tr>
<tr><td>Leg restraints</td><td>Yes, two garters</td></tr>
<tr><td>Oxygen supply</td><td>Bottled oxygen</td></tr>
<tr><td>Personal survival pack</td><td>Yes with life raft</td></tr>
<tr><td>Aircrew services</td><td>Personal equipment connector (PEC) provides connections for oxygen, air ventilation, anti-g suit.</td></tr>
<tr><td>Canopy jettison</td><td>Yes, aircraft variant dependent</td></tr>
<tr><td colspan="2">Source : h ttp://www.martin-baker.com/products/ejection-seats/mk1-9/mk4</td></tr>
</table></td></tr>
<tr><td>265.</td><td>Aircraft Explosive Record
RAF Form 6581 and Form 701ES</td><td>Ask applicant/operator to provide RAF Form 6581 Aircraft Explosive Record for all explosives incorporated in the aircraft. RAF Form 701Es <i>Ejection Seat and Components Log</i> Card should also be requested. In addition, both forms should be used and incorporated as part of the aircraft’s records.</td><td></td></tr>
<tr><td>266.</td><td>Ground Support
Equipment Maintenance</td><td>Verify the AIP provides for the proper maintenance of all required ground support equipment.</td><td></td></tr>
</table>

Hawker Hunter Operating Limitations and Operational Issues

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
267.	AIP and Related Documentation	Require adherence to the AIP and related documentation as part of the operating limitations.	
268.	Understanding of the Operating Limitations	Require the applicant to sign the *Acknowledgment of Special Operating Limitations* form.	
269.	Hawker Hunter Pilot in Command (PIC) Requirements	Ensure the operating limitations address PIC requirements. Refer to the appropriate plot training and checking requirements are in FAA order 8900.1, Volume 5 Chapter 9, Section 2.	
		Additional Information: Direct transition from a modern corporate jet to the Hunter with minimum training is not a safe practice. In addition to holding the required Experimental Authorization, the PIC should have (1) 20 hours dual training in the Hunter T7 or T8 (other two seat versions include the T68 and T75) in preparation for pilot authorization flight check, (2) a structured ground school (similar to an RAF Short Course), (3) 500 hours in high performance fighter/fighter bomber experience, (4) proficiency and currency of 3 5 hours per month and 5-6 takeoffs and landings (refer to Hunter Recent Flight Experience, below), and (5) follow standard RAF/SAF proficiency standardization check procedures. Transition from a Big Bore T68 of a T75, are more adequate for transitioning to a single-seat Mk. 58 for example. Hunter aircraft have certain characteristics not familiar to other civilian aircraft, including most corporate jets. These include ejection seats, high-speed flight, aerobatic capability, 40º swept wings, and complex systems that may be unfamiliar to many. The long spool time of the Avon engines is also an important issue. Note: In RAF service, Hunter training included ground school, cockpit familiarization, and 20 hours of flight training. The first 6 hours were dedicated to aircraft handling, power control, including power control effect, and fuel management. In the Belgian Air Force, Hunter training included 17 hours of simulator and 10 in the aircraft. The RAF Hunter "Long Course" in Operational Conversion Unit (OCU) lasted about 4 months and involved 60-70 flight hours. The Tactical Conversion Unit (TWU) was primarily responsible for handling crew weapon use and other combat related functions. In the Swiss Air Force, Hunter pilot training involved 70 hours in type. RAF Hunter IP course lasted two weeks. In Brazil, the PIC of the only civil Hunter there, a T72, is required to hold Test Pilot qualifications as per Brazil applicable regulations (BRAC).	
270.	Royal Navy Hunter Qualification	Recommend that Hunter flight training and currency use as a reference the RAF Hunter Qualification requirements.	
		Additional Information: A Royal Navy Hunter pilot explains: "In the early 1970s, special rules were introduced to register Hunter Qualifications, laying down specific regular practice requirements for Hunter currency and captaincy (PIC). These rules were implemented to eliminate the tendency of disembarked pilots to sign off for Hunters on training lights on their Phantom or Buccaneer tickets whilst being significantly out of practice on the Hunter. A very real danger – and the cause of a number of accidents- was engine failure. However, while a single or double engine failure on a twin jet like the Buccaneer and Phantom dictated either a well-rehearsed single-engine landing or aircrew ejection, engine failure in a Hunter presented the pilot with the most demanding challenge – that of a dead stick landing and manual control forced landing. The level of skill required to guarantee success in such an event could best be ensured only by those with good practice in the type." McEwen, *Hunter From the Cockpit*, 2009.	
271.	Hunter Recent Flight Experience	Recommend proficiency and currency of 3 hours per month and 5-6 takeoffs and landings.	
		Additional Information: The RAF's target for a Hunter pilot was 20 per month. The typical general experience of "at least three takeoffs and three landings within the preceding 90 days" is not sufficient for the safe operation of the Hunter. Note: Some flexibility could be provided in addressing this issue such as combining hours and landings (that is, 1 hour and 3 landings) and interjecting (but not replacing all Hunter flights with the specified period) certain high-performance flight profiles in another high-performance military jet.	
272.	Hunter PIC Annual Training	Recommend any Hunter PIC take an annual recurrent training/ride in the aircraft. As a reference, the Swiss CAA (OFAC Office Fédéral de L'Aviation Civile) requires all civil Hunter pilots take an annual check ride.	
273.	RAF/SAF Hunter Checkout Procedures and HSE Course	Recommend the establishment of Hunter pilot check out certification process similar to the RAF's, as part of the Experimental Authorization.	
		Additional Information This grounds school process and documentation covered the operation of the aircraft with an emphasis on emergency procedures. In addition, in RAF service, the Hunter Simulator and Emergencies (HSE) course included seven hours flying the simulator for a week covering many emergencies.	

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274.	Cockpit Familiarization	Recommend training similar to the military-style “blindfold cockpit check with boldface items” conducted in a cockpit or cockpit simulator to ensure adequate cockpit familiarization for the PIC. Additional Information: The Hunter’s cockpit is rather populated and complicated when compared to a modern aircraft. A civil Hunter pilot states that the cockpit layout is disorganized, even for a jet designed at the beginning of the turbine era. He also stated that the ergonomics engineers at Hawker “grabbed a handful of instruments, levers, switches, and dials, threw them up in the air, and left them wherever they fell in the cockpit.” A Hunter pilot characterized the Hunter cockpit as “an ergonomic nightmare of haphazard instrumentation, illogical positioning of booster switches, UHF radio, G4 compass, inverter circuit breaker…” (Robert Prest, 1979). This complexity has been linked to accidents and thus the PIC must be thoroughly familiar with the layout and switch functions. In fact, a Hunter FR10 pilot noted that “the cockpit layout of all RAF FR10 was the same, a boon to flight safety while lessening the risk of selecting the wrong switch (Switchery pigs) – an all too common problems in other marks of the aircraft. McEwen, Hunter From the Cockpit, 2009. Note: Some Hunters were fitted with similar cockpit instrumentation to the Buccaneer and these were known as Hunter T7As. This instrumentation is not common to other Hunters.	
275.	PIC Currency in Number of Aircraft	Recommend the operator limit the number of tactical jets the Hunter PIC stays current on. The USAF restricted the number of aircraft types a pilot could hold currency on to two or three different aircraft. This should be considered by operators who have several aircraft types in their inventory. Additional Information: A recent Hunter incident in the U.S. (2010) was partly related to the PIC being current on too many aircraft. Refer to *Landing Gear Extension,* below.	
276.	Flight Manuals	Ensure the PIC operates the aircraft as specified in the most current version of the flight manual (SAF/NATO manuals -1) for the Hawker Hunter version being flown. Additional Information: A RAF Hunter Mk. 4 manual is not suitable for operations of an ex-SAF Hunter Mk. 58 aircraft. Similarly, a 1964 version of a Swiss Air Force Hunter MK. 58 manual will not incorporate the recent and needed safety information. Refer to U.K. CAA’s Change Sheets and Supplements for Approved Flight Manuals, below. A Hunter pilot in training noted “I am the owner of Ex Swiss Mk.58 J-4082. I have started flying T.7 and hope to go Solo on my own Hunter this fall. I only have an Mk.58 manual in German. Can anyone lend me for copying / trade me an Mk.58 Flight Manual and possibly checklist in English…” www.classicjets.org/forum/.	
277.	U.K. CAA’s Change Sheets and Supplements for Approved FM	Ask the applicant/operator to identity any applicable U.K. CAA *Change Sheets and Supplements for Approved Flight Manuals* for the Hunter version and variant being certificated. These documents provide a good reference for the latest and update flight manual for civil use.	
278.	Hawker Hunter Differences Training	Recommend the applicant/operator provide for differences training between Hawker Hunter models. Additional Information: If a pilot has had recent experience in an F4, transitioning to the GA11 or T8 should include some training in the differences between these aircraft. Such differences may include engine, instrumentation and switches, CG variations (and their implications, i.e., pitch-up), aircraft weight (i.e., 17,000 lb. on the Hunter F4 and 24,400 lb. in the Hunter FR10), external stores, and ejection seat. One of the big differences is there is a mismatch in engine power between the single-seaters (i.e., F4, F6, Mk. 58) with the larger Avon 200 Series (aka ‘Big Bore’ engine) and the trainer version (i.e., T7) with the smaller 100 Series Avon. Another example is with the Hunter FGA9’s higher sensitivity to pitch-up. This is because it is 600 lb lighter on the nose. As a result, the aircraft’s center of gravity is located further aft, near the rear end of the range, making the aircraft more subject to Dutch-roll if the hydraulics failed in manual control at slow speed on final approach. In addition, earlier Hunters had fully-powered elevators with spring feel and different linkages. In 1957, production of Hunter F6s started to include the “flying tail” with the power-operated elevator interconnected to change the tail plane incidence electrically. Note: The Hunter has hydraulically actuated elevators, and to improve the aircraft’s behavior in the transonic range, an electrical system automatically adjust the angle of the tail plane as a function of the elevator deflection.	
279.	TO 00-25-172	TO 00-25-172 *Ground Servicing of Aircraft and Static Grounding/Bonding,* August 2012 should be used as the baseline for all servicing functions. Additional Information: This manual describes physical and/or chemical processes which may cause injury or death to personnel, or damage to equipment, if not properly followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment. Recommend a Flight Servicing Certificate (used in the RAF) or similar document be used by the ground crew to attest to the aircraft’s condition (that is, critical components such as tires) before each flight to include the status of all servicing (that is, liquid levels, fuel, oil, hydraulic fluid, and oxygen).	
280.	Adequate Annual Program Letter	Verify the applicant’s annual program letter contains sufficient detail and is consistent with applicable regulations and policies. The program letter is specific to the aircraft and related to the aircraft’s airworthiness certificate. It is not a blank document to be “attached” to any aircraft the applicant or operator chooses at a later date. Many applicants/operators submit inadequate and vague program letters and fail to submit them when on an annual basis, if required. Also verify the proposed activities (for example, an air show at a particular airport) are consistent with the applicable operating limitations (for example, avoiding populated areas) and do not pose a safety hazard, such as the runway being too short. See *Additional Program Letter Guidance* below.	

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281.	Additional Program Letter Guidance	Program letters accompanying an application for an experimental airworthiness certificate must meet the requirements of 14 CFR 21.193. The letter must be detailed enough to permit the FAA to prescribe the conditions and limitations necessary to ensure safe operation of the aircraft. Additional Information: The letter must include: 1. The purpose for which the aircraft is to be used (R&D, crew training, exhibition, etc.); 2. The purpose of the experiment. The letter must describe the purpose of the experiment, the aircraft configuration or modifications, and outline the program objectives; 3. The estimated number of flights or total flight hours required for the experiment and over what period of time (e.g. days, months); 4. The areas over which the experiment will be conducted. A written description or annotated map is acceptable. Specifically describe the area. Describing the operating area as “the 48 states,” is not acceptable. The FAA may establish boundaries of the flight test area, including takeoff, departure, and landing approach routing to minimize hazards to persons, property, and other air traffic. However, it is the responsibility of the operator to ensure safe flight of the aircraft; 5. Unless converted from a type certificated aircraft, three-view drawings or three-view dimensioned photographs of the aircraft; 6. Any pertinent information found necessary by the FAA to safeguard the general public. The letter must also include any exemptions that may apply to the aircraft, such as non-standard markings or using an experimental aircraft for hire; 7. If using the aircraft for multiple purposes or roles the program letter must (a) document all operations for each purpose, (b) describe any configuration changes that will occur between each purpose to include adding or removing external stores and enabling or disabling systems, and (c) have a separate section for each purpose. For example, an aircraft could have an experimental airworthiness certificate for the purposes of R&D and exhibition. The same aircraft may also conduct military / state / public aircraft operations (PAO). In this example, the program letter must describe all three roles with the same level of detail. While the airworthiness certificate is not in effect, nor can the FAA prescribe limitations for PAO, the FAA cannot determine the appropriate certification for the aircraft without knowledge of how the aircraft is used. **SAMPLE— Research and Development / Exhibition - Applicant Program Letter for a Special Airworthiness Certificate** • Registered Owner (as shown on Certificate of Aircraft registration): N*AME: Brand X Support Services, Inc., ADDRESS: 123 Airport Street, Any Town, USA 00010.* • Aircraft Description: Registration Marks: i.e., *N12345,* Aircraft Yr. Mfg.: *1965,* Aircraft Serial No. 452*,* and Aircraft Model Designation: Northrop T-38. R&D • Describe program purpose for which the aircraft is to be used (14 CFR 21.193(d)(1)), i.e., *R&D providing chase for Major Airplane Manufacturer for certification testing of their next business jet. Aircraft Certification Office X is the project office. The assigned project number is ACOXzzz;* • Provide the following information as it pertains to your Program Letter (a) List estimated flight hours required for program, i.e. 75 hours, (b) List estimated number of flights required for program, number of flights, i.e. *50,* (d) List estimated duration for programs (14 CFR § 21.193(d)(2)), i.e. *150 days;* • Describe the areas over which the flights are to be conducted, and address of base operation (14 CFR 21.193(d)(3)), i.e., *the flights will take place within 150 nm of airport KAAA, excluding the airspace over City-X. The maximum altitude is FL240. The base of operations is Major Airplane Manufacturer Hangar, 12345 Tower Drive, City, etc.;* • Describe the aircraft configuration (attach three-view drawings or three-view dimensioned photographs of the aircraft (14 CFR 21.193(d)(4) and include a description of how the configuration is different from the other purposes listed). *See attached.* Exhibition • Describe program purpose for which the aircraft is to be used (14 CFR 21.193(d)(1)) such as e*xhibition at the following events over the next 8 months, i.e., AirVenture, August 1, 2013;* • Provide the following information as it pertains to your Program Letter (a) list estimated flight hours required for program, i.e., *13 hours exhibition, including the flights to and from the events. 10 hours for crew training; (*b) list estimated number of flights required for program, and (c) list estimated duration for programs (14 CFR § 21.193(d)(2)), i.e. *8 months;* • Describe the areas over which the flights are to be conducted, and address of base operation (14 CFR 21.193(d)(3)), i.e. *crew training flights will take place within 125 nautical miles of Any Town, USA airport with a maximum altitude of 10,000 feet. The base of operations is the address listed above;* • Describe the aircraft configuration (attach three-view drawings or three-view dimensioned photographs of the aircraft (14 CFR 21.193(d)(4) and include a description of how the configuration is different from the other purposes listed). *See attached;* • Date, Name and Title (Print or Type), and Signature.	

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282.	Hawker Hunter Flight Manual Warnings, Cautions, and Notes	Consider requiring review (before flight) of all Hawker Hunter flight manual warnings, cautions, and notes. Such a review will greatly enhance safety, especially in those cases where the PIC does not maintain a high level of proficiency in the aircraft.	
		<u>Additional Information:</u> Warnings are explanatory information about an operating procedure practice, or condition, etc., that may result in injury or death if not carefully observed or followed. Cautions are explanatory information about an operating procedure, practice, or condition, etc., that may result in damage to equipment if not carefully observed or followed. Notes are explanatory information about an operating procedure, practice, or condition, etc., that must be emphasized.	
283.	Formation Takeoffs and Landings	Prohibit all formation takeoffs and landings. There is no civil use, including display, to justify the risks involved.	
284.	SAF Aircraft Particularities and Restrictions	Verify whether an aircraft includes aircraft-specific restrictions in the form of “flight permit” and/or “difference data sheet” restrictions if the aircraft is an ex-SAF Hawker Hunter. If those restrictions exist, the operator must understand those restrictions before flight, especially any post-restoration flight.	
285.	Maintenance and Line Support	Verify the aircraft is operated with qualified crew chief/plane captains, especially during preflight and post-flight inspections, as well as assisting the PIC during startup and shutdown procedures. The Hunter is not a “one man” aircraft. In addition to being properly trained, two support personnel should, be used in all operations.	
286.	Ejection Seat System PIC Training	Require adequate ejection seat training for PIC and crew (FAA approved), if applicable, for the type of seat installed.	
		<u>Additional Information:</u> The record shows the safety record of attempted ejections in civilian in civilian former military combat aircraft is poor, typically indicating poor training leading to ejections outside of the envelope. The ejection envelope is a set of defined physical parameters within which an ejection may be successfully executed. It is primarily an interaction of two independent sets of parameters—the physically designed characteristics of the particular ejection system, and the dynamics of the aircraft flight profile at the moment of ejection. As an example, the U.S. Navy requires check-outs for every ejection seat, and this is for a reason. No two ejection seat systems are the same. Experience with one does not translate in safe operations of another. This is especially true in the case of the Hunter where a Martin Baker 3H seat, vintage 1955, is vastly different from a NACES or an ACES ejection seat a current F-18 pilot or an USAF F-15 pilot would be familiar with. That is why seat-specific training is a must. It is necessary to establish an adequate training program or (recommended) to seek training from companies that specialized in such services. The fact of the matter is that ejection seat are dangerous by definition even when they are properly maintained (discussed above) and when used by trained personnel. Survival rates of civilian ejections are poor. A simple briefing or a general familiarization course is not acceptable. Part of the problem lies in misperceptions by the industry. For example, statements or claims like “going flying…after an hour instruction on the use of the ejector seat” clearly show the problem. Many aspects of ejection seat operations are dangerous. For one, fitness is important, and weight and height limitations apply; see Medical Fitness for Ejection Seats below. The complexity of the seat itself is another issue, as shown in Martin Baker Mk. 4 Ejection Seat (Overview) above. For valuable information on the use of ejection seats, see Donaldson, W. S. Ejection Planning, Approach (April 1980).	
287.	Type of Ejection Seat System	The type of seat changes many aspects of operations. For example, Hawker Hunters are typically equipped with the Martin-Baker 2H or 3H ejector seat, while the two-seat trainer version (that is, Hunter T7 and T8) Mk 4HA ejection seats. Martin-Baker continues to support the Mk. 4.	
		<u>Additional Information:</u> To illustrate the differences between ejection seats fitted to the different Hunter models, the following accident account is valuable: “Having made an emergency call and jettisoning the canopy, he then ejected at a height of around 22,000 ft. Unfortunately, due to the lack of leg restraints on the type of ejector seat installed (the Martin Baker 2H seat) he suffered serious leg injuries due to his lower limbs flailing but at least he survived! The Hunter struck the ground at very high speed…” http://aviation-safety.net. Moreover, the minimum height for a “safe” ejection with the 2H is 400 ft. However, if equipped with the Duplex drogue, the minimum altitude goes down to 125 ft. Some 2H ejection seats were also brought up to the 3H standard with a higher ejection speed. Another difference concerning the ejection seat system is in some Hunters, canopy separation may not be connected to the seat’s face curtain. In any event, regardless of the type of seat, 2H, 3H, or 4H, these seats are very different from the newer ejection seats many Hunter pilots may be used to in modern aircraft, including the Martin Baker 10, ACES or NACES seats. Consequently, it is imperative that the true ejection envelope of the seats installed in the Hunter is properly understood, as well as their working mechanism. Finally, the level of injury even during a successful ejection may be lethal when compared to newer seats.	

<table>
<tr><th>Issue#</th><th>Issue(s)</th><th>Recommended Review, Action(s), and Coordination with Applicant</th><th>Notes, Action(s) Taken, and Disposition</th></tr>
<tr><td rowspan="2">288.</td><td rowspan="2">Ejection Seat System Ground Safety</td><td>Verify the safety of ejection seats on the ground. This is a major issue, especially if the aircraft is being displayed. Recommend oversight during static displays for example.</td><td rowspan="2"></td></tr>
<tr><td><u>Additional Information:</u> Verify ejection seats and related systems (i.e., canopy) cannot be accidentally fired. Do not allow untrained personnel to sit on the seats. A Swedish Air Force mechanic recalls: “There was way to confirm that the seat had been fasten properly, as trying to pull the seat upwards automatically fired the drogue chute gun. On the ground, and soon as the engine had stopped, it was the engineer’s duty to make the seat safe. This was done by locking the firing handle with a safety pin. This pin was attached to a large red disc so that it could be easily detected from the ground if the seat was safe or not. Handing over the aircraft to the pilot, the very last thing the engineer did was to remove the safety pin and show it to the pilot, then place it in its parking position.” McLelland, <i>The Hawker Hunter</i>, 2008. Note: In 2004, at an airshow in the UK, a spectator inadvertently pulled the canopy jettison handle on a Hunter. Specifically, Phoenix's ex Swiss Hunter had its canopy blown away “courtesy of a member of public pulling the emergency canopy release at a previous outing...” http://www.airliners.net/photo/Switzerland---Air/Hawker-Hunter-F58/0643502/&sid=f675b4b49774db6492965c2a8d97ab0b.</td></tr>
<tr><td rowspan="2">289.</td><td rowspan="2">Ejection Seat System Safety Pins</td><td>Require the PIC to carry the aircraft’s escape systems safety pins on all flights and high-speed taxi tests.</td><td rowspan="2"></td></tr>
<tr><td><u>Additional Information:</u> As a recommendation stemming from a fatal accident, the UK CAA may require “operators of civil registered aircraft fitted with live ejection seats to carry the aircraft’s escape systems safety pins (a) on all flights and high speed taxi tests (b) in a position where they are likely to be found and identified without assistance from the aircraft’s flight or ground crews.”</td></tr>
<tr><td>290.</td><td>Parachutes</td><td>Comply with § 91.307, <i>Parachutes and Parachuting.</i> This regulation includes parachute requirements:

(1) The parachute must be of an approved type and packed by a certificated and appropriately rated parachute rigger, and
(2) If of a military type, the parachute must be identified by an NAF, AAF, or AN drawing number, an AAF order number, or any other military designation or specification number.

The parachute must also be rated for the particular ejection seat being used.</td><td></td></tr>
<tr><td>291.</td><td>Fatigue Life Monitoring</td><td>The applicant needs to show that the aircraft is conforming to all modifications relating to fatigue lives, and that these have been embodied and the fatigue life for this aircraft is considered satisfactory and is to be monitored using the system laid down in AP101B-1302 Section 2, Chapter 3. Mod Form 725 (Hunter) revised February 1994 will be used to monitor the fatigue state on a daily basis. See <i>Airframe Fatigue Life/State Tracking</i> above for additional details.</td><td></td></tr>
<tr><td rowspan="2">292.</td><td rowspan="2">Engine Operating Limits and Spool Time</td><td>Adhere to all engine limitations in the applicable SAF/NATO flight manuals. Airframe and engine limitations are given in the AP4347J-PN <i>Aircrew Manual</i>, except those that are employed where they are different, that is, to be placarded or otherwise marked on gauges.</td><td rowspan="2"></td></tr>
<tr><td><u>Additional Information:</u> For example, some of the engine limitations of the Avon 203 are as follows:
<table>
<tr><th>Power rating</th><th>Time limit</th><th>RPM</th><th>JPT °C</th></tr>
<tr><td>*Takeoff and Operational Necessity</td><td>10 minutes (combined)</td><td>8,000±50</td><td>685</td></tr>
<tr><td>Intermediate</td><td>30 minutes</td><td>7,800</td><td>660</td></tr>
<tr><td>Maximum continuous</td><td>Unrestricted</td><td>7,600</td><td>630</td></tr>
<tr><td>Approach idling</td><td>-</td><td>4,500 (minimum)</td><td>-</td></tr>
<tr><td>Ground idling</td><td>Unrestricted</td><td>AL.1
2,500 ±200</td><td>-</td></tr>
</table></td></tr>
</table>

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
293.	External Stores (Pylons and Equipment)	Prohibit the installation of external stores (pylon, racks, and other equipment) to the wing that were not approved by the manufacturer or the military operator, that is, the SAF. No "homemade" installations. In the Swiss Hunters, this includes attaching equipment on the FFA Auxiliary pylons that was not approved by the Swiss AF. These pylons were designed for the use of small 26 lb. air-to-ground rockets, not heavier loads.	
		Additional Information: Examples of loads that should not be used include, ECM pods not used by the RAF or the SAF (i.e., 236 lb. ALQ-167), non-conforming fuel tanks, leaflet containers, and travel pods. See *Additional External Loads Data* below. The Hunter has a long history of inadvertently releasing both fuel tanks and other external stores and ordinance, including bombs, and, as in other cases involving jettison capability, the problem is compounded by common malfunctions. A RAF Hunter pilot recalls that "…unfortunately, the bomb-release button was the means by which the drops tanks could be jettisoned and away went one of my tow tanks. Oddly, the other one failed to release thereby giving me a minor asymmetric problem and a bit of a worry that it might drop off somewhere on the way back to base, or a result of being jolted on landing." White, *Lightning Up*, 2009. In addition, many loads in the Hunter, even as small as 50 kg can produce unwanted vibrations at speeds as low as 0.73 Mach. No external stores may have an in-flight release mechanism (refer to External Fuel Tank Limitations, below, for the clamp lock on the external fuel tanks) or ERUs (Explosive Release Unit). See *Pylon Ejectors-ERUs (Explosive Release Unit) and Electro-Magnetic Release Units* below. In FAA Order 8130.2, only aircraft certificated for the purpose of R&D may be eligible to operate with functional jettisonable external fuel tanks or stores. In those cases, through operating limitations, operational safety must be addressed, especially in terms of emergency procedures and restricting all flights to only over non-populated areas. Flight over populated areas is critical. As the NTSB stated in 2012 following the fatal accident of a high-performance experimental aircraft, "the fine line between observing risk and being impacted by the consequences when something goes wrong was crossed." In many cases, and although "the pilots understood the risks they assumed; the spectators [or those on the ground] assumed their safety had been assessed and addressed," and it was not.	
294.	Changes in Approved External Aircraft Configuration	Any change in external loading for the aircraft (e.g., a change in a pylon, rack, or external store) from configurations previously approved by the RAF/SAF should be justified via analyses, test, and data. Safe operation with any new external load is not assured by merely flight testing a configuration on one flight or two.	
		Additional Information: Analyses should include worst-case static and dynamic loads for static, aeroelastic, flutter, and fatigue analysis for both the changed and effected structure. Flight testing needs to demonstrate a change is safe throughout the operational envelope of the aircraft. Aircraft limitations such as airspeeds, G loading, and operating areas should be supported by the results of these analyses and tests. Authorization for new external loads may include additional restrictions, such as speed, G loading, and revised operating areas	
295.	Outboard Pylons Limitations	The only external loads permitted on the outboards pylons are the 100 Imperial gallon fuel tanks (not gauged), and with the applicable limitations, including imbalance limits. Fuel transfer is by means of air pressure from outboard to inboard and then to the wing tanks. See *Known Fuel Imbalance* and *External Fuel Tank Limitations* below.	
296.	Emergency Stores Release Handle	The Emergency Stores Release Handle (ESRH) must be disabled.	
297.	Master Armament Switch	The Master Armament Switch (MAS) must be disabled and disconnected to any system. Weapon related buttons (bomb/rocket button, trigger) on the control stick grip must also be disabled and disconnected from all systems.	
298.	CAA Project Department Circular No: PDC 012 (External Fuel Drop Tanks)	In order to prevent inadvertent jettison in flight of the external fuel tanks, and to satisfy the requirements of a UK CAA Project Department Circular No PDC 012, some Hunters may be equipped with an additional 'Master Arm' switch inserted in the electrical system.	
		Additional Information: Specifically, the master arm switch, usually located within the cockpit above the two guarded jettison buttons, must also be disabled because it still permits on-command jettison.	
299.	Known Fuel Imbalance	The aircraft is prohibited to be operated with a known fuel imbalance (including fuel transfer problems), and if one occurs in flight, the aircraft and the issues can not be corrected in flight, the aircraft is to land as soon as practicable and following the guidance in the Pilot Notes. A maximum of 100 lb differential may be acceptable, but not more.	
		Additional Information: A recent NTSB preliminary finding notes that "on May 18, 2012 at 1212 pacific standard time, a Hawker Hunter Mk 58, single-seat turbojet fighter type aircraft, registration N329AX, operated by Airborne Tactical Advantage Company (ATAC) under contract to Naval Air Systems Command (NAVAIR) crashed while on approach to Naval Air Station Point Mugu, California. The sole occupant pilot aboard was killed, and the airplane was substantially damaged by impact forces and fire. The pilot reported a fuel transfer problem prior to the accident" and a fuel imbalance is suspected. Note: To illustrate this, in the Swiss AF, when AGM-65 Maverick training missions were used in training, the opposite pylon had to be ballasted.	

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300.	External Fuel Tank Limitations (Gs and Flight Controls)	Ensure the aircraft is operated within the specified limitations if external fuel tanks are mounted. Additional Information: For example, load factor is limited to +5/-3.75 g until 10 minutes after takeoff and, unless otherwise restricted, revert to +7.0/-3.75 g thereafter. The Swiss Air Force warning was during the first 10 minutes of a flight with external fuel tanks on the inboard pylons, a Hunter pilot must be careful not to pull more than 5 positive G's. Also, with load on the outboard pylons (i.e., a 462–670 lb AGM-65 training round, 800 lb for a full 100-Imp gallon tanks), and to minimize stress on the ERU hard points, rolls were restricted to half-deflection of the ailerons, at no more than 3.75Gs. A Hunter pilot notes that before displaying the aircraft, and "with the external 100-gallon wing tanks fitted, [he] made sure the tanks were empty before throwing the aircraft around." McLelland, *The Hawker Hunter*, 2008. Additionally, until the under wing tanks are completely empty, aileron deflection is limited to half the full travel for banking maneuvers. There are also CG limitations concerning the fuel tanks. Note: Fuel sloshing can also be a problem in some external fuel tanks. In other words, maneuvering a Hunter hard with external loads is not a good idea.	
301.	Pylon Ejectors-ERUs (Explosive Release Unit) and Electro-Magnetic Release Units	Prohibit explosive pylon charges (ejectors) known as Explosive Release Units (ERUs) or electro-magnetic release units. The related pylon/ejector assemblies, including the pylon ejector gun mechanism in the wing-tip fairing, cannot be functional. Additional Information: Later Hunters were equipped with the ERUs in the inboard pylons while earlier models had the electro-magnetic release units installed.	
302.	Mach Meter and Airspeed Calibration	Require the installation and calibration of a Mach meter or verify the PIC makes the proper Mach determination before flight. Unless the airspeed indicator(s) is properly calibrated, transonic range operations may have to be restricted. Additional Information: In RAF parlance, the Mach meter was commonly referred to as the MNI or Mach Number Indicator.	
303.	Accelerometer	Ensure the aircraft's accelerometer is functional. This is a critical instrument to remain within the required G limitation of the aircraft	
304.	G Limitations	Consider limiting Gs to 5 Gs, and 2.5/-0G with fuel in outboard drop tanks. Negative 'G' is limited to 10 seconds duration only. Several G related issues exist concerning the Hunter. Despite of the fact that the airframe was originally designed to rather high G limits (7.5G to distortion and 11.25G to structural failure), all of the Hunter airframes are over 50 years old, and therefore, there is no justification to take the aircraft anywhere near its original limitations. The fact that the aircraft could be loaded to 7 Gs does not mean that such performance should be attempted or that they are inherently safe.	
305.	Restrict Acrobatics	The number of Hunter accidents due to loss of control is significant. This is major risk. Accordingly, there should be restrictions on acrobatics at all altitudes, more restrictive than the limitations in the appropriate flight manual (Pilot Notes). Additional Information: Examples may include snap rolls, high G barrel rolls, diving spirals, and low-speed scissors, the latter can diverge into a partial spin. Although the roll rate can be increased with the use of the rudder, in the RAF snap rolls were prohibited because of the potential for loss of control. Another example of the aircraft's particularities is, as an RAF pilot noted "it is essential to raise all flaps before attempting any rolling maneuver, otherwise the aircraft tended to dish out…" McLelland, *The Hawker Hunter*, 2008. For the purpose of Hunter airworthiness certification [and not as a requirement for a parachute under §91.307I] acrobatics are those maneuvers where a turn bank is over 60° and pitch over 30°. Certainly, acrobatic limitations should include a minimum altitude, such as 15,000 ft, for vertical maneuvers. There is precedent for this. In military use, and in order to preserve tactical applications (not needed in civil use); there are restrictions on tactical jet maneuvering. For example, NAVAIR restricts as follows: "No sustained maneuvering shall occur below a 5,000-foot hard deck above the terrain or undercast (e.g., over 4,000-foot terrain or a 4,000-foot undercast, the hard deck shall be adjusted to 9,000 feet). If the terrain or undercast is not of uniform height in the area of engagement, the deck shall be adjusted to reflect the highest terrain/undercast. Aircrew shall also brief that visual altitude and attitude cues are not accurate under these circumstances." For additional information and guidance, see NATOPS General Flight and Operating Instructions, OPNAVINST 3710.7U, November 23, 2009.	
306.	Stalls	The aircraft must not be deliberately fully stalled in flight. Prohibit stalling practice beyond the buffet stage because the rate of descent is very high and it is possible to induce an inadvertent spin when the aircraft is fully stalled. All practice must take place above 25,000 ft. In certain conditions the elevator is relatively ineffective and response is slow. Additional Information: A Hunter pilot describes his training: "As part of the aerodynamics instruction, it was firmly emphasized that a major hazard for such aircraft was getting too slow, as , instead of resulting in a nose-down stall, it would instead pitch-up as the wing tips stalled and the center of lift moved forward and further reduce the airspeed. Therefore, stalls- and, more importantly, spins – were a big no-no." McEwen, *Hunter From the Cockpit*, 2009. In addition, large deflections of the ailerons near the stall will cause the aircraft to yaw in the direction of the down going aileron and will increase the possibility of a spin or spiral developing. Note: Outboard stores seriously affect the stall characteristics, particularly the time taken for recovery after initiating recovery action. This feature is aggravated if inboard stores are also carried. Refer to the appropriate Flight Manual/Pilot Notes for additional information.	

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307.	Spins	Prohibit intentional spinning. The only place where Hunters were regularly spun was at Boscombe Down as part of the course at the Empire Test Pilot's School.	
		Additional Information: The Hunter can spin against the direction of the applied rudder, so normal spin recovery could worsen a spin situation and make irretrievable. The rate of descent in a spin was 24,000 ft per minute. The Hunter also had a tendency to go into inverted spin rather easily. A Hunter author noted "intentional Spins were prohibited during the Hunter's service in the RAF, although Pilot's Notes did contain information on what could be expected should a spin occur and the action that was necessary for recovery." Those for the Hunter F.4 were as follows: "The behavior varies between spins to the left and spins to the right. The aircraft is reluctant to spin to the left unless pro-spin controls are applied at the stall, in which case the nose will rise, the left wing drop, and the aircraft will hesitate before falling into a spin in an attitude approximately 40° nose down. The first one or two turns may be steady, but during succeeding turns the rate of rotation, which is slow, becomes unsteady, and there is marked pitching and rolling. Periodically, the nose rises and the rate of rotation momentarily ceases, the aircraft then falls and rotates rapidly through approximately 60° before nosing up and hesitating again. In comparison the aircraft spins more readily to the right. The attitude is steeper and the rate of rotation, through faster, is steadier. When spinning in either direction, the ailerons should be held neutral as out-spin aileron will cause the spin to become erratic." And this from a young student pilot on his 4th solo flight… "I climbed to a height of 40,000 ft, accelerated to 0.94 Mach, and pulled the aircraft into a high-g turn. It shuddered and then pitched up violently, full forward stick failed to move the nose down and the airspeed decrease to below the first marking on the airspeed indicator. The aircraft then rolled to the right and entered a fast and uneven spin, the roll rate and pitching moment changing all the time. The standard recovery drill I had been taught in the Vampire did not appear to work, so for some reason I cannot understand, I put the stick and rudder into a position to make the aircraft follow it erratic path, that is stick forward and to the right, plus right rudder. I then moved the controls back to the central position and the aircraft immediately recovered. I later realized that the reason for the recovery was because I had unwittingly done the right thing by applying in-spin aileron. The Hunter had very large ailerons and the smallest amount of control movement in the wrong direction would keep the wig stalled and prevent recovery from a spin. I had lost 25,000 ft before regaining level flight and at the stage I realized that the engine had flamed out. I relist the engine, flew back to base and told no one of my problems. I took some time as a Hunter pilot before I could take the aircraft to its limits in high-level practice combat." www.rafjever.org. An experienced Hunter pilot explained that "on one occasion, the aircraft entered a spin following a hard turn at 160 knots IAS at 36,000 feet with full nose-up trim. During the turn, heavy buffet had been experienced together with longitudinal porpoising and lateral rocking. Standard recovery techniques over five turns had no effect, as did subsequent use of in-spin aileron. The hood was jettisoned at 18,000 feet and the aircraft came out of the spin at 10,000 feet apparently of its own accord. Over the years, there have been several similar incidents leading to the assumption that turbulence from the open cockpit affects airflow over the tail so as to aid recovery." Caygill, *Jet Jockey*, 2002. Note: Some RAF Hunters had a white datum spot painted on the instrument panel to show 'stick neutral' as being the first part of the recovery from any spin. It was there to assist the pilot regain orientation while in a disorientating spin.	
308.	Avpin (Isopropyl Nitrate) Starter System	Prohibit the use of the Avpin starter system, some time referred to as Plessey liquid fuel starter. It is not safe to use in civilian operations.	
309.	Supersonic Flight	Supersonic flight (true flight Mach number greater than 1) is prohibited for all operations, even if authorized under 14 CFR §91.817(a) by the FAA Office of Aviation Policy Planning and Environment (AEP).	
		Additional Information: The Hunter's marginal characteristics at high Mach number in combination with a necessary steep dive, make any supersonic attempt a practice, that for civil use, does not justify the risks. The Hunter is marginally supersonic, to about Mach 1.04 (like the F6), and it is achieved at great risks. There is little data on the impact on the aircraft of such flights. For example, as it approaches that speed, a Swiss AF pilot noted that the airframe enters into resonance/vibrations, clearly indicating that it is operating at the edge of its envelope. Even pilots accustomed to supersonic flight in more modern aircraft are not prepared for the aircraft's behavior in the high Transonic range and certainly above Mach 1, which includes the deceleration, which is an issue by itself.	
310.	"Mini Sonic Boom"	The operation of the air brake for 'effect,' that is a noticeable a localized sonic boom, is prohibited.	
		Additional Information: A RAF pilot noted that it is "possible to create a mini sonic boom by extending the Hunter's airbrake at or about 590-600 knots. You had to touch the airbrake test switch a couple of times first, so that you could do it instinctively when you wanted to. You couldn't always plant it accurately, but if you flicked your airbrake, the sheer speed of that going down into the airstream (30 degrees on 'test') it would produce a satisfying sonic boomlet that didn't break windows, so at least part of the Hunter could be supersonic in level flight." Pollock, *Wings Swept,* 2012. In addition, the potential changes in pitch on the aircraft are a concern. See *Air Brake* below.	
311.	450-Knots Limit Below 10,000 Feet	There should be a 450-knot speed limit below 10,000 feet.	
		Additional Information: This was a common RAF operating restrictions. As an experience Hunter pilot notes, "this restriction was due to instances of runaway tail-trim which had resulted in accidents and deaths…" Caygill, *Jet Jockeys,* 2002. In the UK, the maximum speed for manual controls below 15,000 ft is 0.75 Mach (0.85M above 15,000 ft).	

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312.	High-Speed Limitation	Recommend limiting transonic operations by 10 percent below MMO. This provides a good safety margin and could be addressed in the operating limitations, AFM, and related standard operating procedures (SOP).	
		Additional Information: The Hunter had generally poor longitudinal control at high mach numbers, above 0.96. One of Hawker's chief test pilot noted that "on the subject of longitudinal control, some pilots felt a bit light especially the Mk.6 at high IAS. At high Mach, the rate of G application left a lot to be desired…" Braybrook, *Hunter*, 1987. Another Hunter pilot added that the Hunter had poor elevator control at high mach number and lacked available G compared to stab-tailed fighters. Caygill, *Jet Jockeys,* 2002. A Flight Manual/Pilot Notes WARNING states that "care must be taken to ensure that the stick force is never completely trimmed out when G is being applied at high mach numbers because, as speed falls through 0.91M when the trim changes to nose-up and the elevator and tail plane become more effective, a sudden increase in G may result. This is particularly important below 10,000 ft when maneuvering near limiting G and/or "blackout threshold." Moreover, when flying at high IAS all control movements must be smooth and progressive to avoid over controlling, particularly when flying at aft CG and/or in turbulent air. The tail plane trimmer should be used carefully. As an example, the Hunter 4 was not very responsive on the elevator above 350 knots and pilots had to use the trimmer to pull out above that speed. Its characteristics were commonly referred to as "most unpleasant above 350 knots." To illustrate this point, a Hunter pilot notes that if the is pulled back in a 600 knots pass without the tail plane moving, the aircraft you be 6 miles away before the nose reaches the vertical. Note: In addition to the longitudinal stability, flap use at high-speed, and pitch-up issues, severe rudder vibration, and airframe buffeting can be pronounced as the speed approaches 0.97 Mach. Note: MMO (MACH; maximum operation) is an airplane's maximum certificated MACH number. Any excursion past MMO, whether intentional or accidental, may cause induced flow separation of boundary layer air over the ailerons and elevators of an airplane and result in a loss of control surface authority and/or control surface buzz or snatch. The issues related to the tail trim a malfunction, which have speed and altitude implications, is covered above in *450-Knots Limit Below 10,000 Feet*.	
313.	Phase I Flight Testing and Flight Test Schedules	Ensure all flight tests and flight test protocol(s) follow the AP101B-1300-5A3B *Hunter All Marks, Servicing Procedures for Functional Checks and Tests*, as part of Phase I flight testing. In the case of the Hunter, the test flights should also follow RAF Schedule Ref AP101B-1302-5M AP101B-1300-5M *Hunter All Marks, Flight Test Schedule* or as modified by the Swiss AF, if the aircraft in question is a MK. 58 Hunter.	
		Additional Information: U.K. CAA schedule HO/FTR/8403, which is based on RAF Schedule Ref AP 101B-1302-5M, modified and agreed by the U.K. CAA, is also acceptable. The aircraft needs detailed Phase I flight testing for a minimum of 10 hours. Returning a high-performance aircraft such as the Hawker Hunter to flight status after restoration cannot be accomplished by a few hours of "flying around." Safe operations also require a demonstrated level of reliability. Phase 1 means: The initial flight testing period for a newly assembled aircraft, not newly manufactured or newly built.	
314.	Post-Maintenance Check Flights	Recommend post maintenance flight checks be incorporated in the maintenance and operation of the aircraft. Follow the AP101B-1300-5A3B *Hunter All Marks, Servicing Procedures for Functional Checks and Tests.* In addition, TO 1-1-300*, Maintenance Operational Checks and Flight Checks*, June 15, 2012, can also be used as a reference.	
315.	Rolls-Royce Letter to Owners and Operators No. 2070 (HPPIS)	Verify the applicant addresses and reviews the *Rolls-Royce Letter to Owners and Operators No. 2070*, July 17, 2000. This document was issued to ensure operators are aware of the appropriate warnings that should be incorporated in aircrew manuals and flight reference cards associated with the use of the HPPIS ('Isolate' system) on Hawker Hunter aircraft powered by Rolls-Royce Avon Mk 122 Series engines.	
		Additional Information: The document notes "experience has shown that incorrect use of this system can lead to severe over temperature and failure of the turbine and it is therefore appropriate that the pilot's attention is drawn to the importance of the correct use of the system. The exact position of these warnings in aircraft documentation will vary from mark to mark. Appropriate warnings are considered to be in: 1) Flight Reference Cards (Relating to Engine Failures): 'Warning: If the HP pump isolating switch is set to ISOLATE when the throttle is in any position other than closed, over fuelling is likely to cause surge and overheating and may lead to engine failure, and 2) Aircrew Manuals/Pilots Notes (In the description and management of engine systems): 'Warning: To avoid over fuelling, the throttle must be closed before selecting ISOLATE. The BPC and ACU are ineffective with ISOLATE selected; all throttle movements must be made with care to avoid the possibility of engine surge or excessive JPT. Amendments to introduce this wording were introduced on active marks in 1984. Operators should ensure that the above wording is included in the appropriate sections of the Flight Reference Cards and Pilot's Notes. Any notes being used which do not include these amendments should be altered. Any instructions which refer to use of the HP pump isolation switch but which do not stress the need to close the throttle before switch selection should be replaced with the appropriate warnings above."	
316.	Visual Meteorological Condition (VMC) and Instrument Flight Rules (IFR) Operations	Allow only daytime VMC operations. No Instrument Meteorological Conditions (IMC) or night operations should be permitted. No known icing conditions.	
		Additional Information: Civil night operations carry unnecessary risks. Comply with 14 CFR § 91.205. Note: Certain cockpit set-ups (instrumentation) in the Hunter were not a good night/IMC platform. This was one of the reasons the SAF restricted night operations and, when permitted, the aircraft had to have certain modifications, such as improved cockpit lighting, which is something that some RAF Hunters may have had installed.	

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317.	Flight Over Populated Areas	Prohibit flights over populated areas, including takeoffs and landings.	
		Additional Information: The consequences of a Hunter accident in a populated area would be devastating. Strict operating areas must be established for the Hunter. While the experimental category may allow a reduced level of safety for the aircraft when compared to a standard category aircraft, an equivalent level of safety for the public must be maintained. Consider restricting the aircraft to blocks of airspace removed from populated areas, not just over flight of such areas. In all instances, there must be adequate and detailed egress and ingress routes in and out of all airports that are used to avoid flights over and near populated areas. Recommend the general avoidance of populated areas be accomplished by keeping the aircraft a certain distance away from those areas (that is, 2 nautical miles), not just “clear underneath” and not to direct energy at those areas such as keeping the populated areas behind the forward 180° quadrant in relation to the aircraft’s flight path. This requires rigorous flight planning. To address this, any airport used must be evaluated as part of the program letter. As the NTSB stated in 2012 following the fatal accident of a high-performance experimental aircraft, “the fine line between observing risk and being impacted by the consequences when something goes wrong was crossed.” In many cases, and although “the pilots understood the risks they assumed; the spectators assumed their safety had been assessed and addressed,” and it was not. The 2006 crash of a Hunter into a neighborhood in Hillsboro, Oregon, is a clear message. Specifically tailor geographic proficiency areas, not just in terms of distance, but also taking into account specific populated areas. It is necessary to review egress and ingress routes in detail. Rigorous flight planning is needed from the PIC. Simply flying a route that is not “directly” over populated areas but that near such areas may not provide an adequate level of safety. Ejecting from an aircraft that is not directly over a populated area is not enough to prevent the aircraft from impacting people and property on the ground a short distance away. Case in point, in many military aircraft like the Hunter, the loss of hydraulic power (not uncommon) can lead to a severe if not a total loss of control, even with manual reversion. Therefore, the pilot becomes unable to further direct the aircraft and the aircraft “will choose its own impact point.” If the loss of control occurs at a certain altitude, it is actuality possible (if not highly likely) that the probability of the aircraft impacting an area away from the intended rather than directly underneath the flight path is actually greater. Thus, it is important to remember that the applicant that the PIC is responsible for complying with the operating limitation restricting flights over populated areas. The PIC must be aware of the areas above which the flight is taking place and coordinate with ATC accordingly. Regardless, the very nature of this type of aircraft dictates that the operator must be the one to find a way to avoid the populated areas, and if in some cases, their overfly cannot be avoided, then it is incumbent upon the operator, as per the limitations, to find an alternate airport from which operate of transit in and out of.	
318.	Carrying of Passengers, § 91.319(a)(2)	Prohibit the carrying of passengers (and property) for compensation or hire at all times.	
		Additional Information: For hire flight training is permitted only in accordance with an FAA-issued letter of deviation authority (LODA). FAA LODA policy limits training to pilots eligible for Hawker Hunter experimental aircraft authorization. Note: The May 18, 2012, fatal former military combat aircraft accident was one of many flights where “rides” were being offered to “a group of eight people had paid for [the] flight package.”	
319.	Passenger Training and Limitations	If a passenger [refer to *Carrying of Passengers, § 91.319(a)(2)*, above for limitations under § 91.319(a)(2)] is permitted in the right seat of a Haunter T7 or T8, adequate training requirements and testing procedures must be implemented to allow the performance of that crew’s position responsibilities per the applicable Crew Duties section of the Flight Manual/Pilot Notes. Ejection seat training is critical.	
		Additional Information: This training should not be a simple check out, but rather a structured training program (for example, ground school on aircraft systems, emergency and abnormal procedures, “off-limits” equipment and switches, and actual cockpit training). A passenger on a Hunter flight illustrates the lack of training in some cases: “the safety harness alone was so complicated that I had to be helped in and out of it. It doesn't bode well in the seemingly certain event that I'm forced to eject from a crashing jet…If the pilot does say, "Eject, eject, eject", continues the briefing, 'you'll only hear the first one. Pull the yellow-and-black cord, which you won't be able to see, and keep your elbows tight, or they will be smashed. If you eject over water, inflate your life jacket just before you hit. But don't confuse the life-jacket toggle with the parachute release.” http://www.dailymail.co.uk. The back seat qualification should also include (1) ground egress training (FAA approved ejection seat training), (2) ejection seat and survival equipment training, (3) abnormal/emergency procedures, and (4) normal procedures. In addition to any aircraft specific (that is, systems and related documentation) training, we recommend the *Naval Aviation Survival Training Program* **(**Non-aircrew NASTP Training) or/and *the United States Air Force Aerospace Physiology Program* (AFI 1 I-403, Aerospace Physiological Training Program) be used in developing these programs. In addition, passenger physiological and high-altitude training should be implemented for all operations above 18,000 ft. This issue can be addressed as part of the operating limitations by requiring the right seat training and incorporating the adequate reference (name) of the operator’s training program.	
320.	PIC/Passenger Aeromedical Training	Ensure any passenger carried in the aircraft, in addition to the PIC, is properly trained.	
		Additional Information: Such training should familiarize passengers with potential Aeromedical problems, which may occur during the flight. As an example in the USAF, passenger training is a one day course and includes approximately 6 hours of academic and chamber training. Passenger training academic requirements include: physiological effects of altitude; human performance; oxygen equipment; cabin pressurization and decompression; pressure breathing; noise and vibration; acceleration; physiological aspects of ejection seat; parachute training, and FAA approved ejection seat training. For additional information, refer to *USAF Aerospace Physiology Program* at http://ftp.rta.nato.int and Naval Aviation Survival Training Program (NASTP) at http://www.med.navy.mil/sites/nmotc/nsti/Pages/NASTPOverview.aspx.	

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321.	Minimum Equipment for Flight	Ask the applicant to specify minimum equipment for flight and develop such a list consistent with the applicable military guidance (that is, SAF) and § 91.213.	
322.	Preflight Inspection	Verify an extensive preflight inspection per SAF/NATO procedures is in place for each flight. This may include the RAF F700 form.	
		Additional Information: For example, a complete Hunter preflight inspection would take approximately 35 minutes by a properly trained and current ground and flight crew.	
323.	Takeoff and Landing Data (TOLD)	Recommend the use of minimum TOLD requirements. These include: acceleration check speed, refusal/maximum abort speed (dry/wet), rotation speed, takeoff speed and distance, and normal and heavyweight (landing immediately after takeoff) landing speeds and distances (dry/wet).	
324.	Post-Flight and Last Chance Check Procedures	Recommend the establishments of post flight and last chance inspection per U.S. Navy/USAF guidance. Note: Last chance checks may include coordination with the airport and Air Traffic Control (ATC) for activity in the movement areas.	
325.	Acceleration Check and Takeoff Computations	Recommend computation of a 2,000 ft acceleration check speed anytime the computed takeoff roll exceeds 2,500 ft. When the computed takeoff roll is 2,500 ft or less, use the actual takeoff distance versus the computed takeoff distance to evaluate aircraft performance. Compute a refusal speed for all takeoffs.	
		Additional Information: This is a standard USAF practice. Practically, this involves an acceleration check speed, which is using a ground reference during the take-off run to check for a pre-calculated speed.	
326.	MA-1A Barrier	Recommend procedures for the use of a barrier (MA-1A) system where available. Note: Serious damage and/or injury are possible as a result of a MA-1 arrestment. Refer to AC 150/5220-9 *Aircraft Arresting Systems on Civil Airports*, December 20, 2006.	
327.	Minimum Runway Length	Recommend a minimum runway length of 8,000 ft. In addition, the PIC must verify, using the appropriate aircraft performance charts (for example, the "-1-1" Performance Supplement equivalent), sufficient runway length is available considering field elevation and atmospheric conditions.	
		Additional Information: To add a margin of safety, use the following: For Takeoff • No person may initiate an airplane takeoff unless it is possible to stop the airplane safely on the runway, as shown by the accelerate-stop distance data, and to clear all obstacles by at least 50 ft vertically (as shown by the takeoff path data) or 200 ft horizontally within the airport boundaries and 300 ft horizontally beyond the boundaries, without banking before reaching a height of 50 ft (as shown by the takeoff path data) and after that without banking more than 15°. • In applying this section, corrections must be made for any runway gradient. To allow for wind effect, takeoff data based on still air may be corrected by taking into account not more than 50 percent of any reported headwind component and not less than 150 percent of any reported tailwind component. For Landing • No person may initiate an airplane takeoff unless the airplane weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance in the AFM for the elevation of the destination airport and the wind conditions expected there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 ft above the intersection of the obstruction clearance plane and the runway. For the purpose of determining the allowable landing weight at the destination airport, the following is assumed: ○ The airplane is landed on the most favorable runway and in the most favorable direction, in still air. ○ The airplane is landed on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics of that airplane, and considering other conditions such as landing aids and terrain. A 6,000-ft runway is not be adequate for Hunter operations. It is too short. Pook, *Flying Freestyle,* 2009. RAF references note that "1,600 yards" was not adequate for Hunter operations, while 2,800 yards or 8,400 feet, was comfortable. In fact, a Hunter expert notes that "the somewhat short runway, 1,600 yards in total, was the reason for a number of landings terminating with burned-out brakes and tires." McLelland, *The Hawker Hunter*, 2008. For many Hunter types, including the F6, in order to be able to conduct an acceptable-length sortie of around fifty minutes and to land with sufficient diversion fuel, the aircraft had to be modified to carry 230 gallon drop tanks. Unfortunately this extra weight then led to stopping problems on a 6,000 ft runway, especially when wet, so a brake chute was also necessary.	
328.	High-Altitude Training	Recommend the PIC complete an FAA-approved physiological training course (that is, altitude chamber). Refer to FAA Civil Aerospace Medical Institute (CAMI) Physiology and Survival Training website for additional information.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
329.	Runway Considerations	Consider accelerate/stop distances, balanced field length, and critical field length in determining acceptable runway use per Classic Jet Aircraft Association (CJAA) guidance.	
		<u>Additional Information:</u> To enhance Hawker Hunter operations, it is recommended takeoff procedures similar to the USAF minimum acceleration check speed (using a ground reference during the takeoff run to check for a pre-calculated speed) be adopted. For landing, procedures similar to those described in § 91.1037 to allow a full stop landing within 60 percent of the effective length of each runway should also be used. A Hunter accident illustrates these issues. In that accident, the pilot "was taking off in the maximum all-up weight configuration with an experienced Hunter pilot on the port side as his No. 2. Half way along the 8,000 ft runway, No. 1 had no airspeed indication, so his takeoff was abandoned, engine stop-cocked and braking chute streamed. No. 2 who was indicating 145 knots at this time continued to takeoff. The emergency stopping capability of the Hunter in this configuration is not good, being assessed as about 5,000 ft. The pilot was aware that the barrier was inoperative and, to avoid a possibility of going into the sea, swung the aircraft to port. It struck the partially erected barrier (standby position) which was being adjusted, and came to rest with undercarriage leg collapsed." www.radfanhunters.co.uk/accidents.htm. See *Minimum Runway Length* above.	
330.	Runway Safety Areas (RSA) and Runway Protection Zones (RPZ)	Recommend restricting use to airports with appropriate RSA and Runway Protection Zones (RPZ) to add a margin of safety.	
		<u>Additional Information:</u> A RSA is defined as the surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. The RPZ is to protect people and property on the ground. The RSA and RPZ standards are part of FAA's airport design standards. Refer to FAA AC 150/5300-13, *Airport Design*. In addition, where possible, recommend standard USAF Potential Loss of Aircraft Zone (PLAZ) standards be used.	
331.	Drag Chute Use	In addition to the minimum runway length of 8,000 ft discussed above, the use of the drag chute is required for all operations if the installation was provided fro that Hunter versions and variant (most operational civil Hunters do have it). Note: For safe Hunter operations, the drag parachute must be used if field length is less than 7,150 ft for single seat Hunters (that is, F6 and Mk.58), and 8,800 ft for the two seat version, such as the T7, and T66/68. This was a RAF minimum. In the Swiss AF, the requirement was for 6,560 and 8,880 feet respectively. Because 8,000 feet is the minimum discussed above under *Minimum Runway Length* above, these RAF and SAF numbers are provided as a reference only.	
		<u>Additional Information:</u> However, this does not mean it can be used to reduce the needed landing distance. In other words, it cannot be used as part of any landing distance calculation. In addition, to be effective, the drag chute cannot be deployed until touchdown and the braking action is most effective between 118-124 knots. Note: The operation of the drag chute requires proper procedures, starting on the ground. For example, pre-start requires checking the brake chute switch in neutral before switching on the battery master. Failure to do this will result in the drag chute being activated. The following 2011 incident involving a Hunter in the US illustrates this: "[The pilot] was the Pilot-in-Command, and sole occupant, of N327AX, a Hawker Siddeley Hunter MK 58A on the afternoon of October 20, 2011. [The pilot] departed PHF on or around 18:30 EDT, with another aircraft to conduct training operations over the Atlantic with the U.S. Navy. Upon returning to the Newport News airport, [The pilot] elected conducted 4 touch-and-go landings. On short final of the 4th one, he decided to make a full stop because the weather was deteriorating. When the aircraft touched down, Mr. James applied wheel brakes and deployed the drogue chute. During deceleration, a gust of wind from the left pulled the drogue chute to the right side and caused the aircraft nose to the left. [The pilot] reacted by applying right rudder and brake to correct. He also was in the process of selecting the drogue chute release when the aircraft departed the runway to the left side. The aircraft became stuck in the soft soil and required a crane to remove it. There was very minimal damage to the aircraft. (2 brake lines needed to be replaced.)." Morley B. English IIC, Aviation Safety Inspector. Note: The drag chute is important in the operation of the aircraft, especially during landing sequences. It is an integral part of the aircraft to ensure safe landing. The implication of not having a brake parachute installed may affect the safe operation of the aircraft. The possible risks factors outweigh any decision to operate the aircraft without it. The aircraft may sustain other defects and/or damage as a result of the brake parachute not being deployed.	
332.	Suitable Airport	Ensure all airports to be used are properly vetted in terms of suitability (that is, runway length, RSAs, emergency equipment). See *Coordination with Airport* below.	
333.	Coordination with Airport	The applicant must provide objective evidence that the airport manager of the airport where the aircraft is based has been notified regarding both the presence of explosive devices in these systems and the planned operation of an experimental aircraft from that airport.	
		<u>Additional Information:</u> Requiring Prior Permission Required (PPR) would not be unreasonable in some cases. If this is contemplated, coordination with the Appropriate FAA Airports District Office (ADO) and FAA's Airports Compliance Division, ACO-100, is required to ensure compliance with the applicable 49 USC airport access requirements as outlined in FAA Order 5190.6 *FAA Airport Compliance Program.* This order sets forth policies, procedures, interpretation, and the administration of the various federal requirements associated with FAA airport funding, which includes requirements for safe operations and terms and conditions for airport access at federally obligated airports.	
334.	Jet Exhaust Dangers	Establish adequate jet blast safety procedures per the SAF/NATO -1 Flight Manual/Pilot Notes.	
		<u>Additional Information:</u> The CJAA Jet Manual can be used as reference. The Hunter's Avon engine is powerful and jet blast damage is a serious matter. The jet blast area (jet efflux cone) is 300 ft long and 150 ft wide, and thus the aircraft must be located adequately before operations begin and end. As an example, a Hunter mechanic recalls that "on one occasion, a Sergeant was walking behind the line of Hunters without concentrating and stepped directly into the jet blast of a Hunter that was about to taxi out. The force tossed him across the pan, which in itself did not cause any injury, but the side of his face quickly began to redden and blister…" McLelland, *The Hawker Hunter,* 2008.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
335.	Aircraft Destructor	Any such device must be removed. Some Hunters were quipped with an aircraft destructor mechanism. Access to this was gained through a quick release panel on the fuselage port side, level with the cockpit.	
336.	Servicing Safety	Ensure the applicant verifies ground personnel are trained for Hawker Hunter operations with an emphasis on the potential for fires during servicing. Prohibit non-trained personnel from servicing the aircraft.	
337.	Fuel Units	Ensure all maintenance, servicing and operational data refers to the proper "gallon," either Imperial or U.S. gallon.	
		Additional Information: Some Hawker Hunter may be instrumented for liters. Unless addressed, this is serious safety issue.	
338.	Ground Support Equipment and Related Tasks	Verify all required ground equipment is available and in a serviceable condition. This includes ancillary equipment such as ladders, intake covers, safety flags, canopy hold bar (two-seat Hunters), rudder and elevator clamps. Another important item is to prevent rain from entering the engine vents when and if the aircraft is park outside.	
339.	Aerial Target Towing	Restrict all towing. Notwithstanding the standard language in the FAA Order 8130.2 limitations concerning towing, in civil use, the Hawker Hunter is not to be used for towing targets because such operations pose a danger to property and people on the ground and endanger the aircraft.	
		Additional Information: A Hunter pilot provides this example: "Sometimes the nylon tow rope would be cut and the flag would fall off. If the pilot was attacking from above, that was not a problem, but if he was coming from slightly low, the flag could hit him, and it had a solid metal spreader bar at the front weighing several pounds. Flying Officer Newton suffered this on a low-level flag sortie one day, and sticking the spreader bar at 400 knots or so caused his tail plane and rudder to come off. He ejected…" McEwen, *Hunter From the Cockpit*, 2009. Note: Some Hunters may be equipped with target towing equipment such as the TRX 9 system and RM 30A targets. In their system, the Swiss AF used the Swedish-made MBV-2 S winches.	
340.	Hot and Pressure Refueling	Recommend that pressure refueling be restricted in terms of equipment, training, and emergency procedures. There are too many dangers with these types of operations, especially with regards to fuel leaks.	
		Additional Information: Pressure fueling systems can be hazardous in former military combat aircraft like the Hunter because the system may not include (1) system fuel manifold connection may not have a means to prevent the escape of hazardous quantities of fuel from the system if the fuel entry valve fails, (2) it may not have an automatic shutoff to prevent the quantity of fuel in each tank from exceeding the maximum quantity approved for that tank, (3) may not have a means to prevent damage to the fuel system in the event of failure of the automatic shutoff, (4) the airplane pressure fueling system may not be able to withstand an adequate ultimate load in terms of pressures, including surge, and (5), the defueling system may not be able to withstand an ultimate load in terms of maximum permissible defueling pressure (positive or negative) at the airplane fueling connection. However, if done, extreme caution is required as is proper training and supervision. The following from the Hunter Mk. 6 pilot notes illustrate the issue: "The aircraft's refueling is via a connection in the port wheel bay. As each set of tanks is filled, refueling valves automatically cut off the fuel being supplied to them. During refueling the L.P. cock must be OFF, the transfer selector cock switch at AUTO and the defueling cock OFF. A time switch adjacent to the coupling must be ON to energize the refueling circuit. Defueling is via the same coupling. During defueling the L.P. cock must be OFF, the transfer selector cock switches at AUTO and the defueling cock ON. An air pressure of 10 lb/sq in is necessary to transfer fuel to the front tanks whence it is either sucked out by the bowser pump or pumped out by the booster-pumps. The air pressure connection is on top of the centre fuselage."	
341.	Personal Flight Equipment	Recommend the operator use the adequate personal flight equipment and attire to verify safe operations.	
		Additional Information: This includes helmet, oxygen mask, fire retardant (Nomex) flight suit, gloves (that is, Nomex or leather), adequate foot gear (that is, boots), and clothing that does not interfere with cockpit systems and flight controls. Operating with a live ejection seat requires a harness. Therefore, recommend only an approved harness compatible with the ejection seat be used.	
342.	ATC Coordination	Coordinate with ATC before any operation that may interfere with normal flow of traffic to ensure the requirement to avoid flight over populated areas is complied with.	
		Additional Information: ATC does not have the authority to waive any of the operating limitations or operating rules. See *Flight Over Populated Areas* above.	
343.	Reduce Vertical Separation Minimums (RVSM)	Prohibit operations above RVSM altitudes (FL290).	
344.	Class B Airspace	Prohibit operations in Class B airspace.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
345.	ARFF Coordination	Coordinate with Aircraft Rescue and Fire Fighting (ARFF) personnel at any airport of landing.	
		<u>Additional Information:</u> A safety briefing should be provided and include: (a) Ejection seat system, overview, making ejection seat safe, including location and use of safety pins; canopy jettison; fuel system, fuel tanks; intake dangers, engine shut-off – throttle, fuel, batteries; flooding the engine; fire access panels; hot exhaust ports; hook dangers (arrestor hook in Royal Navy parlance); crew extraction – harness, oxygen, communications, PEC, and forcible entry. ARFF personnel should be provided with the relevant sections of the aircraft Pilot Notes and associated references like AP No. 5037 Ejection Seat Safety Precautions, AP No. 5673 Hood Jettison Mechanism. There are several RAF training films that can be used to assist in briefing ARFF personnel. They include: (a) Rescue From Crashed Aircraft – Part 1: Fighters and Trainers, AF/9094, RAF, 1987; (b) Rescue From Crashed Aircraft – Interceptors, Strike and Training Aircraft, 14L/7444, RAF, March 1970, and (c) Rescue From Crashed Aircraft, 14L/6377, RAF, 1957. Additional references should be used such as Fire Fighting and Aircraft Crash Rescue, Vol. 3, Air University, Maxwell AFB, 1958. There is additional documentation to address the issues associated with the potential crash of an aircraft like the Hunter. An additional reference is *NATOPS U.S. NAVY Aircraft Firefighting and Rescue Manual*, NAVAIR 00-80R-14, October 15, 2003. The Federal Aviation Administration (FAA) maintains a series of Advisory Circulars that provide guidance for Crash Fire Rescue (CFR) personnel. See AC 5210-17B *Programs for Training of Aircraft Rescue and Firefighting.* Note: On November 1, 2012, the National Transportation Safety Board (NTSB) issued NTSB Safety Recommendation A-12-64 through -67. The NTSB recommends that FAA require the identification of the presence and type of safety devices (such as ejection seats) that contain explosive components on the aircraft. It further stated that that information should be readily available to first responders and accident investigators by displaying it on the Federal Aviation Administration's online aircraft registry and that the FAA should issue and distribute a publicly available safety bulletin to all 14 Code of Federal Regulations Part 139-certificated airports and to representative organizations of off-airport first responders, such as the International Association of Fire Chiefs and the National Fire Protection Association, to (1) inform first responders of the risks posed by the potential presence of all safety devices that contain explosive components (including ejection seats) on an aircraft during accident investigation and recovery and (2) offer instructions about how to quickly obtain information from the Federal Aviation Administration's online aircraft registry regarding the presence of these safety devices that contain explosive components on an aircraft.	
346.	TO 00-80G-1 and Display Safety	Recommend the use of TO 00-80G-1, *Make Safe Procedures for Public Static Display, dated* November 30, 2002, in preparing for displaying of the aircraft.	
		<u>Additional Information:</u> This document addresses public safety around aircraft in the air show/display environment. It covers hydraulics, egress systems, fuel, arresting hooks, electrical, emergency power, pneumatic, air or ground launched missiles, weapons release (including inert rounds), access panels, antennae, and other equipment that can create a hazard peculiar to certain aircraft. The following account at an Airshow illustrates this concern: "I was standing at ease in front of my [aircraft]. The sun was hot, and the heat waves were coming up from the ramp. Next to me was an easel with a large poster containing all the statistics about my [aircraft]? No one ever read it as far as I could tell. They would walk up to me, look at the airplane, and then start asking me questions. One kid asked me what I thought was a strange question, until I looked back over my shoulder where he was looking. His question was, "will that tail (arrestor) hook come down if the safety pin is in it?" As I started to answer him, I turned around to see another kid swinging on the tail hook. It wasn't supposed to come down, but with a three-thousand pound pressure charge on it, I didn't want to let him test it. It would have driven him right into the ramp if it had actuated. I politely got the kid away from the hook and became somewhat more vigilant for the rest of the day." Cook, Jerry W., 1996. Based on this account, the Hunter hook presents a great safety issue while on the ground and it must be secured after flight.	
347.	Military/Public Aircraft Operations	Some Hawker Hunter operators may enter into contracts with the U.S. Department of Defense (DOD) to provide military missions such as air combat maneuvering (ACM), target towing, and electronic counter measures (ECM). Such operations constitute public aircraft operations (PAO), not civil operations under FAA jurisdiction.	
		<u>Additional Information:</u> The operator is required to obtain a declaration of PAO from the contracting entity or risk civil penalty for operating the aircraft outside the limits of the FAA experimental certificate. Verify the operator understands PAO vs. operations under a civil certificate. For example, the purpose of an airworthiness certificate in the exhibition category is limited to activities listed in § 21.191(d). Note: The following notice, which was issued by AFS-1 in March 2012, must be communicated to the applicant: "Any pilot operating a U.S. civil aircraft with an experimental certificate while conducting operations such as air-to-air combat simulations, electronic counter measures, target towing for aerial gunnery, and/or dropping simulated ordinances is operating *contrary* to the limits of the experimental certificate. Any operator offering to use a U.S. civil aircraft with an experimental certificate to conduct operations such as air-to-air combat simulations, electronic counter measures, target towing for aerial gunnery, and/or dropping simulated ordinances pursuant to a contract or other agreement with a foreign government or other foreign entity would not be doing so in accordance with any authority granted by the FAA as the State of Registry or State of the Operator. These activities are not included in the list of experimental certificate approved operations and may be subject to enforcement action by FAA. For those experimental aircraft operating overseas *within* the limitations of their certificate, FAA Order 8130.2, section 7, paragraph 4071 (b) states [that] if an experimental airworthiness certificate is issued to an aircraft located in or outside of the United States for time-limited operations in another country, the experimental airworthiness certificate must be accompanied by appropriate operating limitations that have been coordinated with the responsible [civil aviation authority] CAA *before* issuance." For additional information on public aircraft status, refer to 76 FR 16349, *Notice of Policy Regarding Civil Aircraft Operators Providing Contract Support to Government Entities (Public Aircraft Operations),* dated March 23, 2011. Note: For public aircraft operations, refer to 49 U.S.C. Sections 40102 and Section 40125. See *Public Aircraft Operations, State Aircraft Operations, Military Support Missions, DOD Contracts* above.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition

Hawker Hunter Aircraft Flight Manual (AFM), Pilot Notes, SOPs, and Best Practices

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
348.	System Safety MIL-STD-882B	Recommend the use of *System Safety Program Requirements* – MIL-STD-882B in the operation of Hunter aircraft.	
		Additional Information: This guidance is also useful in the maintenance and operation of former military combat aircraft. It covers program management, risk identification, audits and other safety related practices.	
349.	Operational Risk Management (ORM)	Recommend an ORM-like approach be implemented by the Hawker Hunter owner/operator.	
		Additional Information: ORM employs a five-step process: (1) Identify hazards, (2) Assess hazards, (3) Make risk decisions, (4) Implement controls, and (5) Supervise. The use of ORM principles will go a long way in enhancing the safe operation of Hunter aircraft. Operational-Risk Management (ORM) is a systematic, decision making process used to identify and manage risks. ORM is a tool used to make informed decisions by providing the best baseline of knowledge and experience available. Its purpose is to increase safety by anticipating hazards and reducing the potential for loss. The ORM process is utilized on three levels based upon time and assets available. These include: (1) Time-critical: A quick mental review of the five-step process when time does not allow for any more (i.e., in-flight mission/situation changes), (2) Deliberate: Experience and brain storming are used to identify hazards and is best done in groups (i.e. aircraft moves, fly on/off), (3) In-depth: More substantial tools are used to thoroughly study the hazards and their associated risk in complex operations. The ORM process includes the following principles: Accept no unnecessary risk, anticipate and manage risk by planning and make risk decisions at the right level. See OPNAVINST 3500.39C, *Operational Risk Management (ORM)*, July 2, 2010. The following Air Force press release is a good ORM-based analysis of a 2011 T-38 accident: "Investigators found that crash landing at Ellington Field, Texas, resulted from a series of mistakes by a fatigued pilot during landing, and they admonished the pilot's squadron for creating a 'culture of risk tolerance.' The pilot became disoriented and misjudged the landing runway, lost altitude too quickly and allowed his airspeed to fall below a safe level, according to the Air Education and Training Command accident investigation report. This resulted in catastrophic damage to the landing gear and right wing. The mishap occurred during the fourth sortie of the day as a night solo continuations-training mission into Ellington Field, near Houston, on a squadron cross-country sortie. The pilot safely departed the aircraft when it came to rest on the ground, and he sustained only minor injuries. In addition to the culture of risk tolerance, the report cited inadequate operational risk management of the cross-country weekend plan. 'Inappropriate supervisory policy, combined with inadequate ORM, led to the mishap pilot flying a high-risk mission profile,' the report said. The board further found that the pilot's fatigue, resulting from the aggressive flight plan approved by his squadron, substantially contributed to the mishap. 'Outside of these cross-country weekends, it was rare for an (instructor pilot) to fly four sorties in one day. There was a mindset that a day consisting of four continuation training sorties was generally less risky than a day consisting of three student pilot instructional sorties,' the report said. 'The sortie was (the mishap pilot's) fourth sortie of the day and was flown entirely at night... This mishap was caused by the authorization and execution of a mission having an unnecessarily high level of risk relative to the real benefits.' Damage to the aircraft -- landing gear, engines, right wing, and tail section -- was assessed at $2.1 million. The impact also caused minor damage to the runway, but no damage to private property, the report said. Risk mitigations were put in place to address the issues outlined in the accident investigation report." See http://www.torch.aetc.af.mil/news/story.asp?id=123277394.	
350.	Cockpit Resource Management (CRM) and SRM Single-Pilot Resource Management (SRM)	Recommended that the applicant and operator adopt a CRM-type program for Hunter operations. While CRM focuses on pilots operating in crew environments, many of the concepts apply to single-pilot operations. Many CRM principles have been successfully applied to single-pilot aircraft, and led to the development of SRM.	
		Additional Information: SRM is defined as the art and science of managing all the resources (both on-board the aircraft and from outside sources) available to a single pilot (prior and during flight) to ensure that the successful outcome of the flight. SRM includes the concepts of Risk Management (RM), Task Management, Automation Management (AM), Controlled Flight Into Terrain (CFIT) Awareness, and Situational Awareness (SA). SRM training helps the pilot maintain situational awareness by managing the automation and associated aircraft control and navigation tasks. This enables the pilot to accurately assess and manage risk and make accurate and timely decisions. Integrated CRM/SRM incorporates the use of specifically defined behavioral skills into aviation operations. Standardized training strategies shall be used in such areas as academics, simulators, and flight training. Practicing CRM/SRM principles will serve to prevent mishaps that result from poor crew coordination. At first glance crew resource management for the single pilot might seem paradoxical – but it is not. While multi-pilot operations have traditionally been the focus of CRM training, many elements are applicable to the single pilot operation. Aircraft owners and Pilots Association's (AOPA) Flight Training described single-pilot CRM as to be "found in the realm of aeronautical decision making, which is simply a systematic approach that pilots use to consistently find the best course(s) of action in response to a given set of circumstances." Wilkerson, Dave. September 2008. From a U.S. Navy stand point, OPNAVINST 1542.7C *Crew Resource Management Program,* dated October 12, 2001, can be used as guidance. Also see CRM For the Single Pilot. *Vector* (May/June 2008). FAA guidance includes: Summers, Michele M., Ayers, Frank Ayers, Connolly, Thomas Connolly, and Robertson, Charles. *Managing Risk through Scenario Based Training, Single Pilot Resource Management, and Learner Centered Grading*, 2007, and Chapter 17, *Airplane Flying Handbook,* FAA-H-8083-3A.	

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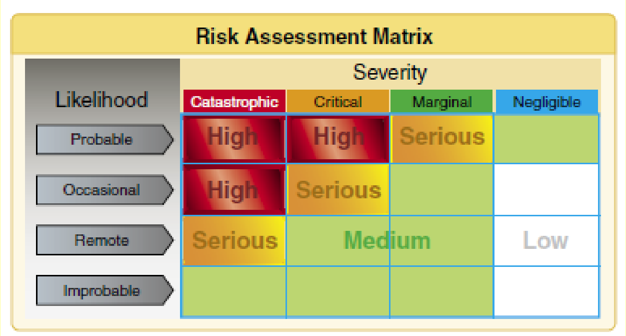
<tr><th>Issue#</th><th>Issue(s)</th><th>Recommended Review, Action(s), and Coordination with Applicant</th><th>Notes, Action(s) Taken, and Disposition</th></tr>
<tr><td>351.</td><td>Risk Matrix and Risk Assessment Tool</td><td>Recommend the use of a risk matrix in mitigating risk in Hunter operations. A risk matrix can be used for almost any operation by assigning likelihood and severity. The pilot assigns a likelihood of occasional and the severity as catastrophic.
<u>Additional Information:</u> The risk assessment tool in Figure 17-5, Chapter 17, <i>Airplane Flying Handbook,</i> FAA-H-8083-3A can also be used.

Risk Assessment Matrix
<table>
<tr><th></th><th>Severity</th><th></th><th></th><th></th></tr>
<tr><th>Likelihood</th><th>Catastrophic</th><th>Critical</th><th>Marginal</th><th>Negligible</th></tr>
<tr><td>Probable</td><td>High</td><td>High</td><td>Serious</td><td></td></tr>
<tr><td>Occasional</td><td>High</td><td>Serious</td><td></td><td></td></tr>
<tr><td>Remote</td><td>Serious</td><td>Medium</td><td></td><td>Low</td></tr>
<tr><td>Improbable</td><td></td><td></td><td></td><td></td></tr>
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Source: FAA</td><td></td></tr>
<tr><td>352.</td><td>AFM (Pilot Notes) Addendums</td><td>Consider additions or restrictions to the AFM. Operational restrictions should be also addressed in the AFM. If a format issue arises, use <i>GAMA Specification No. 1</i>.</td><td></td></tr>
<tr><td>353.</td><td>Engine Failure, Flame-Out, and Relight Procedures</td><td>SOPs and training must emphasize the high likelihood of an engine failure and the associated emergency procedures, including relight, and controlling the aircraft. This is applicable to all Hunters, Avon 100 and Avon 200 Series engines. Procedures need to clearly address and ensure that following an engine failure or flame-out, persons and property on the ground are not endangered.
<u>Additional Information:</u> A Royal Navy Hunter pilots recounts: “After lifting off at full power, I selected ‘Undercarriage Up’, but as the last wheel clunked home, there was a loud whoompf accompanied by heavy vibration and a complete loss of thrust. It was obvious to me that the aircraft had suffered catastrophic engine failure, and whilst I was in good practice at turning back to the runway, in this instance, with little height and speed, such an option was out of the question. I could only lower the nose to prevent an immediate stall and ordered my student to “Eject! Eject’ Thankfully, he did so without hesitation. The heavy canopy jettisoned and, one second later away, he went up on his Type 4H Martin baker seat. I then pulled my top handle and, again, one (very long) second later, I was gunned out of the aircraft.” McEwen, <i>Hunter From the Cockpit</i>, 2009. An experienced RAF Hunter pilot described the aftermath of a flame-out “after a short pause one would press the relight button for a hot start and the engine would usually catch and perform as normal. If the initial relight action failed, the HP fuel cock would be turned off and after a short period of time to allow any excess of fuel that might have accumulated in the engine/jet pipe areas to drain away, the HP cock would be turned on and the relight pressed.” Caygill, <i>Jet Jockeys,</i> 2002.</td><td></td></tr>
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Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
354.	In-Flight Canopy Separation	Revise the pilot checklist and right-hand seat occupant (in Hunters T7 and T8s) briefing to emphasize (that is, "warning/caution") the proper closing of the canopy. Also, recommend the implementation of SOPs to address in-flight canopy separation.	
		<u>Additional Information:</u> The two-seater Hunter's (that is, T7, T8, T66, and T68) cockpit canopy is hinged at the dorsal ridge and is opened by an electro hydraulic system. The canopy must never be opened completely while taxiing, because it could be damaged or even torn off by the airstream.	
355.	V_{ne} of 10 percent Under MMO and Transonic Operations	Recommend limiting transonic operations by 10 percent below MMO. This provides a good safety margin and could be addressed in the operating limitations, AFM, and related SOP.	
		<u>Additional Information:</u> Aircraft of the generation of the Hunter could be classified as "barely supersonic," and as such, had undesirable characteristics at high-speed, which are generally not found in more modern types. Supersonic experience in aircraft like the T-38 for example does not necessarily apply to the Hunter's transonic flight characteristics. Caution is advised. On the issue of flying at high Mach number, the Flight Manual/Pilot Notes add "the maximum speed in level flight at full throttle is 0.94M. The aircraft will reach sonic speed in a 30° to 40° dive at full throttle. Transonic dives must not be started below 25,000 ft. Note: MMO is the maximum operating limit speed (V_{MO} / M_{MO} airspeed or Mach Number, whichever is critical at a particular altitude) is a speed that may not be deliberately exceeded in any regime of flight.	
356.	Avon 100 Series Surges	Adopt SOPs to prevent encountering engine surges, particularly in Avon 100 Series engines.	
		<u>Additional Information:</u> Overall, the Avon engine was not well matched to the air intakes, and was prone to surges, especially under rapid acceleration and high Gs, and abrupt throttle movements. This was related to the variable swirl-vane system on the Avon engine. The Hunter F1 and F4 with the early Rolls-Royce Axial flow engines, (Avon 100 engine) was susceptible to surge, a phenomenon that was characterized by a violent breakdown of airflow in the compressor, which could lead to a reversal of flow and the engine flaming out. Note: The Avon surging was more pronounced at high rpm (i.e., full throttle), under Gs, at altitude, and cold temperatures, OAT below -56°C. In the end, the Avon's tendency to surge at high AOA was somewhat mitigated by de-rating the engine. As part of a description of a demonstration flight in a Hunter, a current U.K. pilot explained that as he leveled off, he checked the speed at 300-330 knots, and applied almost full power checking the JPT. He did whenever he moved from a low power setting to check that the compressor did not stall. He also stated that this is a real possibility in the small Avon 1—Series powered Hunters but that it was rare [it could still happen] in the Avon 200 Series. Finally, he added that high angles of attack and going from idle to full power are ideal conditions to initiate compressor stall. Note: The first Avon 100 Series engine equipped with the fuel-dipping system to alleviate the surge problem was the Avon 121.	
357.	HP (Fuel) Pump Isolation Switch (HPPIS)	Ensure SOPs thoroughly address the use of the HPPIS (Isolate System), if installed.	
		<u>Additional Information:</u> Only momentary selection of the HPPIS with the throttle unclosed is required to destroy the engine turbine. A pilot's lack of experience on the Hunter will likely result in insufficient knowledge of the fuel system to appreciate that the operation of the HPPIS switch with the throttle not closed would lead to massive over-fuelling and a turbine burnout. Although a pilot may be aware of the switch, he or she may only have a limited appreciation of its function, because the pilot's notes may not truly emphasize the HPPIS and the dangers of its operation. As a result of a U.K. Hunter accident, the U.K. CAA, in conjunction with Rolls Royce, reevaluated the safety benefit of the emergency use, by civilian pilots, of the HPPIS system on such aircraft	
358.	Use of Flaps at High-Speed	Ensure SOPs address and, if necessary, restrict, the use of flaps at certain speeds, such as during maneuvering.	
		<u>Additional Information:</u> This is because at high mach numbers, as speed is increased from 0.9M to 0.94M, a marked nose-down in change occurs. Lowering flaps also produces a marked nose-down change of trim, the degree of out-of-trim increases with the amount of flap selected and with speed. As the mach number is increased beyond 0.92, elevator and tail plane effectiveness decreases. If 0.9M is exceeded inadvertently with flap lowered, or if flap is lowered inadvertently at high speeds in excess of 0.9M longitudinal control will be very substantially reduced and in the worst condition may be lost completely. Hunters have crashed as a result of this. Note: If control is lost with any degree of flap lowered, the flap should be raised. A Hunter author describes this: "On at least 5 occasions, Hunter aircraft entered steep dives during ACM and were unable to recover with any control inputs or nose-up trim resulting in multiple fatal accidents. A test program was carried out which highlighted the problem of elevator-jack stall and tail plane actuator clutch slip, which had been introduced to prevent overloading of the electric motor. In such a situation it was possible to experience catastrophic tail plane runaway which made recovery impossible and it was recommended that the flaps should be modified to retract automatically at 0.87 Mach. However, it was concluded that the cost of modification would be too high and Pilot's Notes were merely amended to include a limitation on the use of flaps of 300 knots IAS/0.90 Mach. At first it appeared that the message had got through, but eventually more flap-related accidents began to occur. In 1969 two pilots were killed in similar incidents. More incidents followed even as late as 1980, when an aircraft was lost when a student pilot performing aerobatics had lowered 23° of flap and subsequently forgotten to raise them. He survived by ejecting before impact." http://www.radfanhunters.co.uk/Accidents.htm. Another Hunter pilot explained that during ACM, "any attempt to use a notch of flap to cut the corner would lead to disaster as we cruised at 0.9 mach. At that speed any use of flap would cause an instant, uncontrollable nose-down pitch, the Hunter diving out of control tens of thousands of feet until you re-entered thicker air." Pook, *Flying Freestyle,* 2009.	

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359.	Take-Off Flaps	Recommend that SOPs and training emphasize the flap setting requirement for take-off, as per the Pilot Notes, i.e., 38°.	
		Additional Information: There have been many Hunter accidents related to the improper setting of flaps for take-off, including failure to use them at all.	
360.	Spool Down Time	Ensure SOPs incorporate noting the spool down time of the Avon engine after shutdown.	
		Additional Information: This is critical as it could be an indicator of an upcoming problem with the engine. In the Avon 200 Series engine, the spool down time is reported as 1 minute and 25 seconds.	
361.	High Speed Stalling	Ensure SOPs address and, if necessary, restrict high speed stalling.	
		Additional Information: For example, high speed stalling is subject to the overriding restriction whereby pilots must not exceed +7G. In addition, at airspeeds above 0.9M between 10,000 and 30,000 ft, unless Mod 533 is fitted, an accelerometer reading +4G must not be exceeded. At airspeeds below 0.9M in that height band, there would also be a G limitation that not be applied beyond the buffet stage. During turns and pull-outs adequate stall warning is given by buffeting at all heights. If the backward pressure is continued inadvertently after the stall warning, wing drop or a momentary pitch-up and sudden increase in G may occur. Note: Late Hunter models incorporated a wing leading edge extension called “Dog Tooth” (mod 533) fitted to alleviate pitch up caused by tip stall at high Mach numbers. An experience Hunter pilot noted that at high altitude, the “leading edge extension delayed onset of buffet by 0.2G, but increased buffet thereafter meant that there was no apparent increase in useable G.” Caygill, *Jet Jockey*, 2002. A June 1976 NATO *Advisory Group for Aerospace Research and Development (AGARD)* report on stall/spin in military aircraft states illustrates the aircraft’s particularities. It states: “From about 1955 till 1965 the Hunter was part of The Netherlands Air Force inventory. Intentional spinning was prohibited. During maneuvering in air combat the pilot could look outside the cockpit almost continuously. Especially in high angle of attack flight the aerodynamic behavior of the aircraft told the pilot to what extent he had penetrated the stall region. If too far, lost control could quickly be recovered with a minimum loss in height and relative position to the opponent. But if this was done too roughly the odds of entering a spin were increasing and personally I know of two occasions where the spin fully developed. In one case the aircraft recovered at lower altitude by releasing the controls and in the other by normal controls when the selected flaps were retracted according to the spin recovery procedures.”	
362.	Cutaway Flaps	If installed, recommend SOPs address this installation may have an impact on aircraft handling qualities.	
		Additional Information: Hunter FGA9 and other upgraded Hunters have cutaway flaps to allow the attachment of the big 230-Imperial gallon external fuel tanks on the inner pylons.	
363.	Trim Reversal at High-Speed	SOPs and training should note the Hunter’s tendency to pitch-up is pronounced in reducing speed from high Mach numbers.	
		Additional Information: Operationally, pilots had to anticipate the strong nose-up trim reversal which occurred as the speed reduces. A Hunter pilot noted that ‘with the elevator ineffective, recovery from high-speed dives had to be made by the tail plane trimmer, although care had to be taken due to trim reversal as speed decreased.” Caygill, *Jet Jockey*, 2002.	
364.	Elevator Stick Forces and Related Maneuvers	Recommend that SOPs and training emphasizes the variations in flight controls forces.	
		Additional Information: In the Hunter, at low airspeeds and very high mach numbers the stick forces are relatively heavy. The Flight Manual adds “at high airspeeds however since only small deflections are usually required the stick forces are light. The control is light, effective and should be used cautiously until its characteristics are known and its effectiveness appreciated. However, elevator effectiveness is somewhat limited by jack stalling which occurs when the air load on the elevator equals the jack output force and restricts movement of the control column rearwards. Depending on the tail plane angle and C.G. position, jack stalling may occur when maneuvering above 0.93 Mach; if it occurs the tail plane must be used as a means of control. Note: A clear understanding of the elevator “zero load” position is essential.” Note: The powered elevator system linked the tail plane and elevator controls to produce better longitudinal control. This was so that after 2º of elevator movement, micro-switches were contacted to change the tail plane incidence at rate of 0.7º per second. A Hunter expert describes the basic development of the aircrafts’ elevator, its intricacies, and its limitations: “…in the case of the elevators, these surfaces were also later to be fully powered. But their effectiveness decreased markedly above about 0.95, hence high speed maneuverability was at this stage (early marks) still significantly inferior to that of the F-86. A ‘poor man’s flying tail’ was therefore produced by sensing elevator position with micro switches, and suing the signal generated to drive the tail plane by means of the electric trim motor in a follow-up mode. Artificial feel was provided in the form of a three-gradient spring, with the later addition of a bob weight on the FGA9. A stab tail was flown experimentally, but never became a production item.” Braybrook, *Hunter,* 1987. See *Fairey Powered Flight Controls Units (PFCU), Manual Reversion, and Speed Limit* below.	

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365.	Tail Plane Control Switch and Trimmer	Ensure SOPs address the use of the tail plane control switch and trimmer.	
		Additional Information: On this, the flight manual notes the aircraft should not be flown with the thumb on the tail plane control switch as this may cause intermittent making and breaking of the contacts which may damage the switch. In addition, care must also be taken not to operate the switch inadvertently during maneuvers as this may result in excessive Gs being applied. The trimmer motor can ran away to full travel. The tail plane trimmer should be used in the normal manner; the angle is usually between ½° and 1½° nose-down. When maneuvering, the stick forces are light and little use of the trimmer is required. However, the full-power elevator tends to mask any out-of-trim forces which may be present. During sustained flying the stick forces should always be trimmed out. If this is not done and an inadvertent manual reversion occurs, the stick force may be too heavy for the pilot to hold. If the normal tail plane trimmer fails the standby control should be used this operates at about one-third the speed of the normal control. If both trimmers fail, the aircraft can be flown throughout its speed range with the trim at full nose-down, but at full nose-up the elevator is not sufficiently powerful to stop the nose rising at speeds in excess of approx. 420 knots. Another Hunter accident provides additional insight. The RAF report noted "the pair [of Hunters] dived at 0.98M, reduced speed and increased the angle of dive as planned and at 7,000 ft started pulling out from the 45 degree dive. During the pull out the leader did no exceed 3 Gs. [The] No.2 never fully recovered from the dive and struck the ground at an angle of about 25°. The force of the explosion destroyed the majority of the evidence that might have proved the cause of the accident. However, the tail plane actuator ram was recovered and indicated that, at the time of impact, the aircraft had a 2° 15' nose down trim. The recovery of an elevator hydraulic jack showed that the main hydraulic supply had not failed. The briefing was that the tail plane interconnection should be on. Subsequent flight tests along a similar profile with the interconnection ON showed that during pull-out the tail trim was between zero and ½° nose up. Tests also showed that at 0.95M with full nose down trim, an aircraft remained in the dive with the control column held fully back and that at 0.95M with 2¼° nose down trim, a slow recovery was possible. The Board examined a number of possible causes of the crash ranging from structural failure to hyperventilation. The only theory consistent with the facts was that the tail trim ran fully nose down during the dive which would become apparent to the pilot at or about the time the pull-out commenced (7,000 ft). He would find that he could not trim back on the main trim and would use the standby trim. Due to its slower motoring rate insufficient nose up change of trim could be made to effect the pull-out, but sufficient recovery would be made to lead the pilot to think that he might make it, hence no attempt at ejection." http://www.radfanhunters.co.uk/Accidents.htm	
366.	Fairey Powered Flight Controls Units (PFCU), Manual Reversion, and Speed Limit	Ensure SOPs address the manual reversion of the Fairey Powered Flying Control Units (PFCU) or flight control system.	
		Additional Information: The system in the Hunter was known for its problems. Extreme caution should be taken when and if manual reversion is purposely engaged. This manual reversion is not recommended. If controls revert to manual it may not be possible to re-engage boost, or if re-selected it may engage suddenly and generate large transient trim changes-this should not be attempted and a placard warns the pilot not to attempt this. A Hunter pilot explains: "It should be explained that to select 'power' for the flying controls after flying in 'manual,' a pawl in the release unit adjacent to the PFCU had to engage in a groove in the hydraulic ram. Successful engagement was indicated to the pilot by a slack 'doll's eye.' If the pawl did not enter the groove (i.e., in the event of a false 'lock'), the pilot had to move the controls column vigorously until engagement was effected, otherwise the aircraft remains in manual." Braybrook, *Hunter,* 1987. In addition, although the Pilot Notes refer to a limiting speed of Mach .75, manual reversion should always either take place below 250 knots, or, if inadvertent, a speed below that number should be attained. The applicant should insert a warning of this in flight manual and/or checklists. Hawker's Chief test pilot noted "manual really does not mean manual and it is the emergency means of control should the normal system be lost. This manual control, plus the all moving trimming tail plane, which had inadequate trim range for landing, resulted in a very considerable two-handed heave-to-round-out for the first landing." (McClelland, 2008). Another RAF Hunter pilot tells his experience on this matter: "I had an accessory drive failure at Leuchars in not so good weather, thereby losing generator and hydraulic pump, the controls reverting to manual. I remember well doing a straight-in approach with my forehead on the Gunsight pad, hunched over, the stick gripped with both hands braced, snatching a hand off to adjust the throttle. I was bushed on landing – never had to work so hard in all my life. At higher speeds the ailerons would float up and the loads were very heavy." Caygill, *Jet Jockeys*, 2002. See AP No. 4601A Fairey Powered Flying Controls for additional details on this system. See Elevator Stick Forces and Related Maneuvers above.	
367.	Restricting Aileron Movement With External Fuel Tanks	Ensure SOPs address flying with drop tanks on inboard and outboard pylons.	
		Additional Information: For example, at speeds below the permitted maximum the handling characteristics are similar to those for clean aircraft, and with fuel in the drop tanks rolling maneuvers must not exceed 360°, i.e., no second roll. Also, during maneuvers with fuel in the tanks it is recommended that aileron movement is restricted to half of full movement to avoid an excessive rate of roll.	
368.	Aileron Sensitivity and Aileron Jack-Stall	SOPs and training should emphasize the Hunter's aileron's effectiveness. Aileron control in the Hunter is extremely light and effective, and this caused pilots new to the aircraft to over-control at first, producing slight wing rocking, especially after take-off.	
		Additional Information: The Hunter has a roll rate of 270º per second. Although rates of roll is good through the speed range, the faster the aircraft goes the faster it rolls, until at very high speed, it is possible to jack-stall the ailerons. This is a safety feature to ensure that the hydraulic actuators come to a limit to prevent the ailerons from being over-stressed, that is, the hydraulic jacks were designed to 'stall' within a safe aileron load.	

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369.	Modification 907 (Standby Trim Switch Cover)	If applicable, ensure SOPs address the potential dangers of Modification 907. Unless altered or addressed, it could cause a trim-related loss of control.	
		Additional Information: A Hunter accident illustrates this. On that flight, "while in a nose down attitude at 28,000 ft at an estimated speed of M.7, [the pilot] felt the aircraft become nose heavy. He pulled the control column back without effect. He throttled back and noticed that the tail trim needle was showing 2° nose down and was moving further down. The aircraft was by this time in a steep dive. The pilot checked that the flaps were up, lifted the standby trim switch cover, and selected standby nose up trim for an estimated 2 seconds. This had no apparent effect. In a near vertical position at an estimated M0.9 and 20,000 ft and when experiencing strong negative 'g' effects the pilot tried both hands on the control column without effect on the aircraft's attitude. He placed both hands and feet on the control column and pushed which brought the aircraft into a horizontal inverted position at about 4,000 ft. He then rolled the aircraft and achieved a gentle climbing attitude which he was able to hold. He again tried the standby trim and was able to trim the aircraft. The aircraft had been exposed to plus 4½ 'g' and negative 'g' in excess of 5. The pilot stated that the aircraft started a diving maneuver without conscious assistance from himself and that the tail trim indication needle was moving to the nose down position, leading to the obvious conclusion that the diving maneuver was initiated by movement of the variable incidence tail plane. Inadvertent trim selection by the pilot was rejected in view of the continued movement of the indicator needle after he took action to regain control. However, technical investigation reveals that tail plane runaway is most likely to be initiated, in the first place, by a trim selection. It is very easy during a tail chase, when pushing the aircraft over the top of a 'switchback' to exert negative 'g'. If the pilot's thumb happens to be near the trim switch it is possible to trim nose down inadvertently. However, it is not implied that such a possible action accounted for all the nose-down trim experienced, only that this may have been the initiating action to a runaway. The initial factor in the chain of events was, without doubt, a main tail trim running away to the nose down position. The second factor was the lifting of the standby trim switch cover by the pilot. This action should have operated the main tail trim circuit breaker. The pilot states that it did not do so. The technical investigation eliminated un-serviceability of practically every component of the tail plane variable incidence assembly except the reversing contactor. This showed definite evidence of a momentary tack weld. It is also technically possible that should tack welding occur a trim selection in the opposite direction will unstick the welding. This pilot did not attempt to trim back on the main trim as part of his actions to correct the dive. Investigation also revealed that welding of the reversing contactor will short out the limit switches thereby allowing the tail plane to overrun the normal nose down limit set by these switches. It was established that this overrun amounted to some 23 minutes of angular movement or 1.6 divisions on the trim indicator. The aerodynamic effects of such excessive tail plane incidence have not, so far as is known, been investigated. The likely result, however, is a very strong nose down movement at high IAS, making recovery virtually impossible by backward movement of the control column. Examination of the standby trim switch cover (post mod 907) revealed it to be very stiff to move. The tripping of the main tail trim circuit breaker took place in the last few degrees of movement when the cover was lifted. This is in contrast to the operation of the circuit breaker on pre-mod 907 standby trim covers which takes place early in the angular movement of the cover. Examination of the circuit breaker on this aircraft revealed that it was serviceable. In view of the circumstances described by the pilot, the fact that his arm was at full stretch and the stiffness of the standby trim cover, it is likely that the cover was not opened sufficiently to trip the main circuit breaker when he first attempted to use the standby trim. With the cover about fully opened the circuit breaker can remain un-operated and can be tripped thereafter by a minimal movement of the cover. This fact was not widely known by pilots at the time. Such a movement would explain the apparent rehabilitation of the standby trim when the pilot tried it a second time. Although mod 907 is considered an asset in that it reduces the action required by the pilot in the event of a main actuator runaway, it is considered unsatisfactory in its present forms. The cover is difficult to move and does not trip the circuit breaker until very late in its movement. In these circumstances it is possible to motor the standby trim in opposition to the main trim motor. The cover on post Mod 907 Standby Trim Switch needs to be stiffer to move than on the pre-mod type in order that it does not inadvertently fly open under negative 'g' during maneuvers and thereby cut the main trim circuit power supply. A reasonable amount of stiffness is acceptable providing the Standby Trim Switch Toggle cannot be operated before the cover has cut off the main supply. It has been recommended that (a) Mod 907 be altered to eliminate its shortcomings, (b) Technical investigation be initiated to establish whether the reversing contactor can be modified, to reduce the possibility of tack welding, (c) Technical investigation of the possibility of preventing the tail-plane from overrunning the limit set by the limit switches." http://www.radfanhunters.co.uk/Accidents.htm.	
370.	High-Altitude Flame-Out or Loss of Power	Recommend that SOPs provides for the likelihood of a flame-out or power loss at high-altitude when the power is retarded to idle.	
		Additional Information: This was not uncommon in Avon 100 Series Hunters. The Avon could either be "locked" at idle, in which case the pilot still had some hydraulics but little power or the engine could outright flame-out, which resulted in no hydraulics and reversion to manual control and emergency gear extension.	
371.	Pressure Errors	Address the issue of pressure errors.	
		Additional Information: In the Hunter, the presence of drop tanks on the outboard pylons has a material effect on pressure error at high speeds, resulting in under-reading of the airspeed and Mach meter as compared with clean aircraft. This is related to the Mach meter calibration issue discussed above.	

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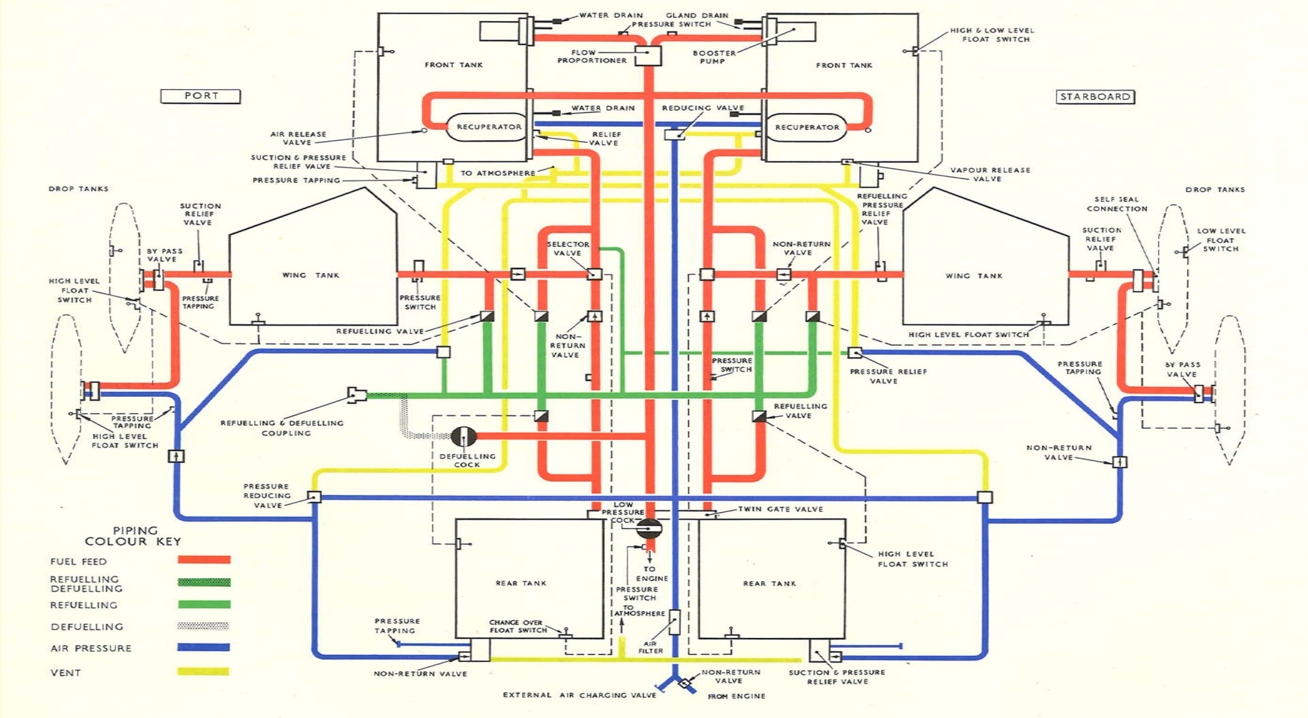
372.	Fuel Mismanagement (General)	Ensure SOPs emphasize on fuel management and fuel starvation. The Hunter has a very complicated fuel system, and it has been implicated in many accidents.	
		Additional Information: For example, the Hunter FGA9 has four flexible bag-type tanks in the fuselage and four in each wing. Front fuselage tanks of 200-Imperial gallons capacity and rear fuselage tankage is 52 Imperial gallons. There are issues with the fuel system, including determining total fuel, quantity remaining, fuel transfer/boost pumps, and fuel in external tanks. Several Hawker Hunter accidents, including a recent one in the U.S., were related to fuel mismanagement. A common Hunter fuel mismanagement accident would read the engine flamed out due to mismanagement of the fuel booster pump switches following fuel transfer failure. A British Hunter pilot describes the reason for a flameout on the aircraft: "…the reason for the flameout was also discovered. On the right-hand side of the cockpit were two switches and two 'doll's eye' indicators. The switches were to feed fuel from the wing tanks to the engine, and they were both found to be selected off" (Mercer, 2006). Hunter experts note one of the "most important skill that the new students had to learn was to understand and manage the Hunter's low fuel reserves. Managing the aircraft's fuel state was vital, and a great deal of attention was given to this aspect of instruction; indeed, most training sorties even required to radio fuel state reminders to each pilot as they flew their sorties." In the case of the Hunter Mk. 6, a detailed review and understanding of *Part III Handling of A.P.4347F-PN Pilot's Notes* is critical for safe flight. Boost pump failure is also an issue. A RAF Hunter pilot described a case where "one of the two boost pumps situated in the main fuselage tank had failed. This necessitated [the] switching off the working pump and accepting the fuel feed provided by tank pressurization and gravity. Normally, a booster pump failure represented no great problem. Pilot's Notes recommended that the engine be throttled back to about 80% of maximum engine RPM and this was fine for level flight below 20,000 feet. It was a bit dicey for overshooting [go-around] from a baulked approach, and was certainly not good enough for take-off – that last 20% of engine speed represented an important slice of power." White, *Lightning Up*, 2009.  Fig. 2 Fuel system diagram	

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373.	Fuel Transfer	Within the context of fuel mismanagement, give special interest to the fuel transfer system in the Hunter. SOPs should emphasis this.	
		Additional Information: A civilian Hunter pilot wrote that "the Hunter has a somewhat complex fuel system composed of six internal fuel tanks and an automatic fuel transfer system. The first two tanks (in the rear of the fuselage) are emptied soon after takeoff. Sometimes the automatic transfer lags, and you simply override it to the proper tank." Fortin, *Back to Basics*, 2004. The following excerpt from the Hunter Mk.6 Pilot Notes is provided to illustrate the complexity of the Hunter's fuel transfer system: "Air pressure for the transfer system is taken from a tapping on the engine compressor and is separately fed to the fuselage rear tanks, to the recuperators in the front tanks, and to the drop tanks or the wing tanks, if the drop tanks are not fitted. When drop tanks are fitted, fuel transfer is from outer tank to inner tank to wing tank. When Mod. 574 is embodied two magnetic indicators, one for each *outboard* wing tank, are situated aft of the fuel gauges. Each shows white when all fuel has transferred from its associated *outboard* drop tank. Control of the system is by two TANK SELECTOR switches, one for each side of the system. Each switch has three positions, AUTO (forward), REAR (central), and WING (aft). When the switches are set to AUTO the air pressure forces fuel from the rear tanks to the front tanks. When each rear tank is empty a float switch in the tank operates to alter the setting of the transfer cock, shutting off the rear tank and allowing the drop tanks to feed to the wing tanks and the wing tanks to feed to the front tanks. At the same time, the WING/REAR tank indicator operates to show that this is happening. Setting either control switch to WING or REAR causes transfer to take place from the respective tank. When changeover from either wing or rear tanks is taking place the indicator shows yellow and the action of the selector cock motoring over is audible over the R/T. Although all internal tanks are gauged, and the contents reading should fall when fuel from those tanks is being used, when transfer from the drop tanks (which are un-gauged)is taking place the fuel contents gauge should show a constant reading. Should the air pressure fail, very little fuel will transfer from the drop, wing, or rear tanks and TRANS. PRESS indicators will indicate failure by showing cross-line. At the same time the contents gauge transmitters in the rear and wing tanks will become inoperative and the gauges will only indicate the contents of the front tanks, that is, the amount of fuel available to the engine. If only one side of the air pressure system fails, the appropriate indicator will show cross-line and the associated gauge will indicate the available fuel contents."	
374.	Wet Runway	Recommend the applicant/operator restraint from operating the aircraft on any runway that has standing water.	
		Additional Information: The RAF leaned that the Hunter, with its 180 psi high-pressure tires was very susceptible to aquaplaning, and there cases of stopped tires while the aircraft was traveling during landing at 90 knots. As a Hunter pilot noted, "braking action was extremely powerful and it was relatively easy to lock a wheel when landing on a wet runway." Caygill, *Jet Jockeys,* 2002.	
375.	Runway Condition Reading (RCR) and Runway Surface Condition (RSC)	Recommend that the Hunter applicant/operator consider using Runway Condition Reading (RCR) numbers in their SOPs to mitigate some of the aircraft's overrun risks.	
		Additional Information: RCR is a measure of tire-to-runway friction coefficient. RCR is given as a whole number. This value is used to define the braking characteristics for various runway surface conditions. The reported RCR is therefore a factor in determining any performance involving braking, such as critical engine failure speed and refusal speed. Some airfields report runway braking characteristics in accordance with International Civil Aviation Organization (ICAO) documents, as good, medium, and poor. These can be related to ICAO categories. Similarly, Runway Surface Condition (RSC) can also be used. RSC is the average depth covering the runway surface measured to 1/10 inch (1 inch is equivalent to a RSC of 10). RSC types include: wet runway, standing water, slush on runway, and loose snow on runway. Refer to FAA Order JO7110.65, February 2012 and applicable military guidance.	
376.	Command Ejection	If the aircraft is a two seater Hunter T7 or T8, and the right seat is occupied, the SOPs need to address, before flight, the command ejection issue, that is, who initiates the ejection and under what circumstances.	
377.	Canopy Operation on the Ground	SOPs and training, for both pilots and ground crew must cover the dangers of the canopy operation on the ground.	
		Additional Information: In the Hunter, the canopy is powered. It has a switch that allows it to be powered or "free." There have been accidents where the inadvertent operation of the canopy's motor proved fatal to ground crew. The following account illustrates this"… the canopy clutch was set to 'free' and the master armament safety break plug was removed. The canopy clutch switch may not seem important, but all the checks were there for a reason…Flight Lieutenant Kearton, one of the early Hunter flight commanders, had good cause to regret that a pilot on his first solo had not operated the clutch properly. The latter got the engine started all right, but appeared not to be able to shut the canopy. Kearton knew a few things about the Hunter, and came to the conclusion that the microswitch to the rear of the canopy must have tripped out. Rather than shout complicated instructions to the first solo pilot, he climbed up the ladder and reached past him to the back of the cockpit to reset the switches. He found that they had not tripped after all, however, and on pulling his hand back he must have moved the clutch to the locked position (where it should have been selected by the pilot anyway) and selected the canopy to 'close.' The noise of the engine drowned out the hum of the canopy motor, which closed on to the [assisting] pilot's midriff and began to squeeze. The motor was very powerful, and a ground crewman had been killed in a similar situation once, so he knew that he had to extract himself quickly and he squirmed backwards in some alarm. He got his torso and shoulders out successfully, but his cranium became trapped between the front windscreen strut and the canopy itself…[he] wrenched his head free, but as he did so the leading edge of the canopy tore most of his right ear off…" McFewen, *Hunter From the Cockpit*, 2009.	

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378.	Drag Chute Failures	Ensure the PIC trains and assumes drag chute failure for all flights when applicable, that is, in the Hunter F6 and T8, and because of the very high number of drag chute failures. Recommend the establishments of training and SOPs to address this.	
		Additional Information: Effectively, the aircraft should not be operated with total dependence on the drag chute system to stop on available runway. The brake parachute is not to be relied upon to enable planned landing at a field shorter than that which would be required without this parachute. The brake parachute is to be employed only to save wear on the undercarriage, tires and brakes. It is not to be streamed before touchdown and limit speed for streaming is 160 knots. Note: It was not uncommon, in some cases, that the drag chute could be inadvertently deployed on the ground if the pilot mistakenly selects the three-position drag chute switch to 'deploy' instead of to 'test' on the pre-taxi checks. Note: In 1975, many Hunter Mk.6 aircraft were modified into As and one of the modifications was the installation of a drag chute.	
379.	Tail Strike Prevention and Inspection	Recommend the vulnerabilities of the aircraft to tail strikes be considered, and appropriate training and SOPs adopted. Prevention and post-accident/incident inspections ought to be considered. Holding off on landing could result in a steep nose-up attitude with the danger of a tail strike. It needs to be a pre and post-flight inspection item.	
		Additional Information: A 1999 U.K. AAIB accident report expands this concern: "…a surface wind of 330°/15 to 18 knots with gusts. As he approached his touchdown point and retarded the throttle, the aircraft speed was close to the pilot's target of 135 knots. However, as he was about to commence the flare, the aircraft suddenly developed a sudden and rapid sink rate. The pilot applied full power and some aft stick but was unable to prevent the tail from contacting the runway at the same time as the main gear. On touchdown, the aircraft pitched forward rapidly. The pilot had the impression that the nose wheel oleo had collapsed and he streamed the brake parachute. The pilot subsequently stated that he considered that he had experienced some wind shear as he flared for landing. The pilot contacted the chief engineer of the maintenance to report the damage and to discuss which areas to inspect for structural damage. Inspection of the aircraft by the pilot revealed that the tailskid had been pushed into the rear fuselage and had punctured the jet pipe; the rear jet pipe tail cone had slightly distorted and the tail cone fairing was severely distorted." A second accident in the United Kingdom adds another related issue, the tail plane interconnection. The AAIB report states: "The aircraft was fitted with 150 gallon drop tanks on the inboard under wing stations and had approximately 1700 to 2200 lb of fuel on board, giving an approach speed of 135 knots which was maintained throughout the final approach. In a Hunter aircraft the approach angle during the latter stages of a visual approach is usually less than 3° but in this instance the pilot elected to fly a steeper approach (approximately 3.5°) …After touchdown the braking parachute was streamed as usual, but the pilot thought that the tail may have contacted the runway at the same time as the main undercarriage. An external inspection confirmed this, revealing damage to the tail cone and jet pipe, which had been punctured when the tailskid detached from the tail cone. The pilot stated that he had landed with the tail plane interconnect switched 'ON' which made the aircraft more sensitive in pitch during the flare maneuver. This was the normal position of the switch during an air display and whilst maneuvering at high speeds. Although he had landed in this configuration before and without difficulty, he had intended to place the tail plane interconnect switch 'OFF' and, temporarily forgetting the status of the system, had not made due allowance in his landing technique. The pilot also stated that he had deliberately aimed for a smooth touchdown to reduce wear on the tires. The Aircrew Manual for the type states that 'holding off may result in an excessive nose-up attitude (particularly in the case of a flapless landing or when carrying outboard stores) with the likelihood of scraping a tail cone and/or dropping a wing.' An electrical interconnection enables the variable-incidence tail plane to follow elevator movements automatically, a function designed to give greater maneuverability at high Mach numbers. The interconnection provides a pre-determined tail plane and elevator movement for a given control column deflection, and may be switched 'ON' or 'OFF' by a switch in the cockpit. A spring loaded telescopic strut is incorporated in the linkage so that full and unrestricted stick movement is always available. Use of the tail plane interconnection can make the aircraft more sensitive in pitch, which is most noticeable at aft centre of gravity. An aft centre of gravity is most likely to occur at very low or very high fuel loads or with outboard wing stores, although neither of these cases applied in this instance. For reasons of control sensitivity, the Aircrew Manual for the type recommends that the interconnection be switched 'OFF' for takeoff and landing." http://www.radfanhunters.co.uk/Accidents.htm.	
380.	Asymmetric Wing Mounted Stores	Prohibit asymmetric wing mounted equipment regardless of the applicable manuals. No deviations.	
381.	Fuel Servicing	It is imperative that all fueling operations be monitored and only conducted by trained personnel and coordinated with the PIC.	
		Additional Information: The aircraft's complex fuel system, inability of accurately and visually checking fuel levels (especially external fuel tanks), varying fuel tank carriage options, and the need to properly understanding the left heel well fueling plate and functions, make this a necessity.	

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382.	Inverted Flight	SOPs and training should address inverted flight. <u>Additional Information:</u> The Hunter is equipped with a recuperator reservoir pressurizing the supply of fuel for a limited degree of inverted flight. Sometimes, this can surprise the pilot. An RAF pilot recalls that “the engine flame out as I pushed up at 600 feet for an inverted loop. Everything went quiet. Fortunately, the engine responded immediately after I rolled upright and pressed the relight button, but from the on, I made a point of checking each aircraft at a safe altitude before using it for display.” McLelland, *The Hawker Hunter*, 2008. In 1995, a civil Hunter pilot, while ferrying a Hunter to South Africa describes his experience with a malfunctioning fuel recuperator: “The recuperator is a small tank split into two halves by a seal: on one side is pressurized nitrogen, on the other fuel pushed in by fuel pump pressure in normal flight. If the aircraft turns inverted, and the fuel pump gets uncovered, the recuperator nitrogen pressure forces the fuel back out to the engine and keeps it going – it’s good for fifteen seconds on inverted flight at full power. In this case, the seal had split, almost certainly as a result of age and disuse (it probably wasn’t ever pressurized and would never have been needed when the aircraft was run for used for training marshallers), together with the baking out temperatures…The fuel was then able to track through to the pressurization pipes and eventually through the vent pipes to fall out of the drain, and would continue to do so even when the aircraft was on the ground engine off, because of gravity pressure on the full tanks.” McLelland, *The Hawker Hunter*, 2008. In 2008, the UK CAA published the following report concerning an engine flame-out in Hunter during inverted flight: “Following a series of inverted flight runs, the engine of the Hunter flamed out. A successful relight was obtained and the aircraft was landed without further incident. The aircraft was being flown in a racetrack pattern, with inverted runs being conducted on the straight legs followed by 60º AOB left turns at either end of the racetrack. On the third inverted run, the port “Tank Fail” light and the fuel “Low Pressure” light illuminated. The aircraft was rolled erect immediately, the lights extinguished, but the engine flamed out. As the aircraft was positioned for a forced landing at Kemble, an immediate relight was carried out. Some 30-40 seconds later, the engine relit. The engine was proven over all power settings and no further inverted or negative g flight was carried out. Extensive investigation was carried out including examination of the aircraft’s fuel system, deep study of the publications relating to the fuel system and consultation with other Hunter operators and Test Pilots. The Booster pumps sit in negative G traps and, under normal erect flight, supply pressurized fuel to the proportioner and thence to the engine. It is essential that both sides of the proportioner are fed with fuel otherwise a risk of flame out exists. Inverted, there is sufficient fuel for 15 seconds of inverted flight at full power at sea level. Fuel is admitted into the negative G trap through 2 Flapper Valves positioned at the top and to the side of the negative G trap. Fuel is admitted through the top and side Flapper valves. Fuel feeds to the booster pump through the lower filters and downwards to the fuel system. The top Flapper (now at the bottom) closes and prevents fuel loss back to the tank. The side Flapper opens by gravity. Fuel is fed to the Booster Pump through the top of the assembly and upwards to the engine. It is important to remember that in inverted flight, only fuel that is in the Negative G trap is available to supply the booster pump. It is considered that since little or no time was available between inverted runs to replenish the used fuel. It is likely that the series of left hand turns could have caused the top Flapper Valve to only open normally, but the bottom Flapper Valve to remained closed or partially closed due to bank angle and the downwards g component. This configuration would have reduced the Negative G trap refill rate by up to 50%. By the third inverted flight, the Negative g trap would have been close to empty, explaining the fail light sequence and the subsequent flame out. It is considered that the Pilot allowed insufficient time, either in wings level flight or under sufficient positive G, to fully open the both Flapper Valves and fully replenish the port Booster Pump fuel supply. Further training has been implemented to all company staff and student pilots covering forced landings and relight drills. ttp://www.caa.co.uk/docs/224/CAP632Newsletter4Spring2008.pdf.	
383.	Turbulence	SOPs should address flight in turbulent air. This is because the Hunter poor directional stability was notable in turbulence, and the yaw damper has little effect.	
384.	Accurate Weight and Balance (W&B)	SOPs and training should emphasize the importance of CG movement, and be addressed on each flight. <u>Additional Information:</u> As an example, any loads on the outboard pylons move the CG aft and make the aircraft tail heavy. This is important since the aircraft is inherently instable and sensitive in the pitch axis.	
385.	External Fuel Tanks During Air Display Demonstrations	Recommend that external fuel tanks not be used during air display demonstrations. If used, procedures should be in place to ensure that any fuel transfer problem does not jeopardize the aircraft’s flight stability.	
386.	Speed Limitations Due to Avionics and Other Equipment	Verify the speed limit of the aircraft. Some Hawker Hunter operators may install certain types of avionics such as the Aspen EFD-1000 PFD Pro system. However, it is important to note the top speed of this installation is 450 knots. With some luggage carriers, the aircraft is limited to 325 knots.	

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387.	External Tank(s) Failure	Restrict external tanks to only those cleared by the manufacturer, with the appropriate modifications and upgrades. Adhere to the drop tank limitations related to (1) takeoff and landing performance, (2) G limits, (3) airspeed, and (4) fuel in the tanks. There should not be any means of jettisoning these tanks while on the ground or in flight. There should not be any modifications to the drop tanks.	
		<u>Additional Information:</u> A fatal Hunter accident illustrates the catastrophic results of an in-flight external fuel tanks separation: "as [the pilot] pulled out, his aircraft rolled very rapidly to the right and dove into the ground. I noticed what appeared to be smoke (probably fuel vapour) coming from the right wing during this time and saw no sign of Martin ejecting. As I flew over the crash site, debris from the aircraft was flying forward covering a sizeable area. Subsequent to the crash my cine film was developed and I believe that the film was of great help to the investigators in establishing the cause of the crash. The aircraft were fitted with 230-gallon drop tanks and I do not believe at that time that they had been modified with the re-enforcing lateral bracing strut. Also it was worked out that we would not have burned-off enough fuel to empty the drop tanks. There were no baffles in the tanks at that time to prevent the fuel sloshing forward in the dive. It appeared that the fuel had moved forward and in the pull out Martin had put such a load on the tanks that one had come off the pylon, gone under the wing, and the rear of the tank had flown up hitting the right aileron forcing it fully up, causing the aircraft to roll violently to the right. At the height the aircraft was above the ground (less than 500 ft) the aircraft was put in an irrecoverable position with no time or height to eject." http://www.radfanhunters.co.uk/Accidents.htm. Note: As early as 1958, the 230-gallon tanks have had a history of in-flight separation.	
388.	Brake Use	Establish SOPs to address the proper use and condition of the brake system.	
		<u>Additional Information:</u> The Hunter should not be taxied at a speed which requires excessive use of the brakes as this causes overheating of the tires and reduces their life. If the brakes do not hold at 6,800 rpm they should be considered unserviceable and the aircraft should not be flown.	
389.	Power Control Indicators	Establish SOPs to address the proper use and condition of the power control system.	
		<u>Additional Information:</u> For example, the Flight Manual notes a check that the power control indicators are black must always be made immediately before takeoff at not less than 4,500 rpm. Also, "at any stage of a flight, if either automatic Manual reversion or any form of stick jamming occurs with POWER selected ON, immediately switch Power OFF. Do not attempt to re-engage Power Return to base and land in Manual."	
390.	Rudder Effectiveness	Training should note that in the Hunter, the application of rudder produces a strong rolling tendency.	
391.	Pitch-Up Tendencies	Recommend SOPs in training to emphasize the Hunter's propensity to pitch-up, particularly in high G situations.	
		<u>Additional Information:</u> This characteristic can surprise a pilot, notably when the nose rises alarmingly despite full forward pressure on the stick. Although later models have the pitch-up issue somewhat addressed by fitting extended and dropped leading edges in the outer wings (Dog Tooth), the aircraft's pitch-up tendencies may still surprise the non-initiated pilot. The Dog Tooth extension reduced the amount of Center of Pressure (CP) movement forward and thus reduces, but does not eliminate, the pitch-up tendency. An experienced Hunter pilot noted that "approach to the pitch-up point was accompanied by very heavy airframe buffet, an extremely rapid reduction in airspeed, together with an apparent lightening of the pull force just before the pitch-up occurred." Caygill, *Jet Jockey*, 2002.	
392.	Specific Range	Recommend SOPs addressing minimum landing fuel. Verify actual aircraft-specific range (nautical air miles traveled per pound of fuel used). This is a critical safety items, especially in an aircraft like the short-legged Hunter.	
		<u>Additional Information:</u> Unfamiliarity with the aircraft's specific range and endurance data (estimated v. actual) has led to accidents, especially when combined with the use of external fuel tanks – fuel transfer.	
393.	Landing Pattern Fuel	Ensure SOPs require at least 600 lb of fuel be allowed for a circuit landing and possible overshoot.	
		<u>Additional Information:</u> Some references mention a minimum of 80 Imperial gallons to rejoin the pattern.	
394.	Landing Pattern Checks	Recommend the operator consider incorporating "status checks" in the pattern to verify the status of several items that could indicate a failure, such as hydraulic pressure.	
		<u>Additional Information:</u> For example, it was an SOP in the RAF for Hunter pilots to make a "cockpit check" when on downwind at 200 knots which included "airbrake in, flaps forty, undercarriage down and three greens, brakes off (check pressure), and harness tight." Caygill, *Jet Jockeys,* 2002. It cannot be underemphasized that many Hunter accidents, including recent ones in the US in 2010 and 2012, have been the result of pilot error in this regard. As a result, SOPs and training must emphasize the issue beyond the normal before landing checklist, i.e., gear specific check.	

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395.	Bingo and Minimum Landing Fuel	Comply with § 91.167 to add a safety margin. In addition, a “Bingo” fuel status (a pre-briefed amount of fuel for an aircraft that would allow a safe return to the base of intended landing) should be used in all flights.	
		Additional Information: Bingo is the NATO code word for the fuel level at which a pilot calls “Bingo” to indicate they have reached a pre-briefed minimum fuel level. On the Hunter, there were two orange lights (bongo Lights), one for each fuel system on either side, that indicated 650 lb of fuel remaining in that side. This may or not be the “Bingo” call for a particular mission but is a reminder. They are independent from the fuel gages. Note: As a reference, in the Hunter T8, fuel consumption at low altitude is about 450-500 gallons per hour. At altitude, the burn could be about 1 gallon per nautical mile at 450 to 480 knots. For flight planning purposes, some operators use 40 lb per minute at 420 knots. Note: In RAF parlance, the word JOKER fuel was used as the minimum fuel state to get back to base. A 2009 Hunter incident in the UK illustrates the potential consequences of fuel mismanagement below minimum fuel: “…aircraft landed with less than minimum landing fuel and engine flamed out due to fuel starvation following 10 minute wait to cross main runway. Fuel gauges later checked and found accurate. Appropriate action taken by operator with regard to future fuel planning and flight management. CAA Closure: The pilot did not consider the lengthy hold and route re-plan as justifying a top up of fuel before take-off. A routing for separation near Waddington resulted in the aircraft being below minimum landing fuel by the time it landed. The investigation concluded poor flight planning and management.” http://www.caa.co.uk/docs/224/CAP632Newsletter6Spring2010.	
396.	Final Approach Speed	Recommend that SOPs and training emphasize the correct final approach speed. As an experienced Hunter pilot recalls, “under normal conditions, the boundary was crossed at 120-135 knots with 5 knots added for every 100 gallons (Imperial) of fuel carried above the normal landing figure of 100 gallons.” Caygill, *Jet Jockeys,* 2002.	
397.	Acceleration Check and Takeoff Computations	Additional Information: Recommend computation of a 2,000 foot acceleration check speed anytime the computed takeoff roll exceeds 2,500 ft. When the computed takeoff roll is 2,500 ft or less, use the actual takeoff distance versus the computed takeoff distance to evaluate aircraft performance. Compute a refusal speed for all takeoffs. This is a standard USAF practice. Practically, this involves an acceleration check speed, which is using a ground reference during the takeoff run to check for a pre-calculated speed. A Hunter accident illustrates these issues. In that accident, the pilot “was taking off in the maximum all-up weight configuration with an experienced Hunter pilot on the port side as his No. 2. Half way along the 8,000 feet runway, No. 1 had no airspeed indication, so his take-off was abandoned, engine stop-cocked and braking chute streamed. No. 2 who was indicating 145 knots at this time continued to take-off. The emergency stopping capability of the Hunter in this configuration is not good, being assessed as about 5,000 feet. The pilot was aware that the barrier was inoperative and, to avoid a possibility of going into the sea, swung the aircraft to port. It struck the partially erected barrier (standby position) which was being adjusted, and came to rest with undercarriage leg collapsed.”	
398.	Landing Gear Extension	Ensure SOPs address the undercarriage extension time, which is too slow. In the Hunter, it takes longer than other fighters and varied considerably depending on power.	
		Additional Information: With 6,000 rpm the sequence took 11 seconds, at 4,500 rpm it took 15 seconds, and 20 seconds at idle. In addition, because many Hunter accidents have been caused by gear-up landings, SOPs should emphasize this in training. A recent Hunter gear-up landing in the U.S. illustrates the aircraft propensity to such incidents. The FAA inspector wrote: “ON MAY 6, 2010, N330AX, A HAWKER HUNTER, LANDED GEAR-UP ON THE RUNWAY AT NAS VENTURA COUNTY. AFTER THE PATTERN WORK WAS COMPLETED. THE MISHAP AIRCRAFT CALLED MID-FIELD ABEAM TO THE TOWER REPORTING GEAR DOWN. THE AIRCRAFT TURNED BASE TO FINAL AND TOUCHED DOWN ON THE RUNWAY ON THE EXTERNAL TANKS. HUMAN FACTORS, THE HAWKER HUNTER AIRCRAFT DOES NOT HAVE A LANDING GEAR HANDLE WITH LIGHTS INSTALLED. ADDITIONALLY THE AIRCRAFT DOES NOT HAVE A LANDING GEAR CONFIGURATION WARNING SYSTEM. THE LANDING GEAR EXTENSION SYSTEM CONSISTS OF A PUSH-PULL BUTTON LOCATED ON THE LOWER LEFT SIDE OF THE COCKPIT JUST FORWARD OF THE THROTTLES. ALSO, THE LANDING GEAR POSITION INDICATING SYSTEM IS BELOW AND TO THE LEFT OF THE LANDING GEAR ACTUATION SWITCH. THE SYSTEM CONSISTS OF THREE SMALL PEANUT LIGHTS AND VISIBILITY OF THESE LIGHTS TO THE PILOT CAN BE OBSCURED. THE MISHAP PILOT IS A FULL TIME EMPLOYEE OF UPS AS A CAPTAIN QUALIFIED IN THE B-757. ADDITIONALLY, THE MISHAP PILOT IS A PART TIME PILOT EMPLOYED BY ATAC. HE IS QUALIFIED IN THE A-4 AND HAWKER HUNTER. THE FOLLOWING FACTORS CONTRIBUTED TO THIS INCIDENT: (1) THE DESIGN OF THE AIRCRAFT’S LANDING GEAR SYSTEM; (2) THE PILOT BEING QUALIFIED IN THREE DIFFERENT TYPES OF AIRCRAFT THAT WERE BUILT BY THREE DIFFERENT MANUFACTURERS.”	
399.	Cross Wind Operations and Limitation	Ensure SOPs and training address the aircraft’s crosswind characteristics. It is recommended that a maximum crosswind component of 15 knots be used. The main issues are the aircraft is sensitive to crosswinds and the crosswind impacts drag chute operations. In both cases, loss of control is possible	
		Additional Information: A 2011 FAA investigation into a Hunter incident noted, “when the aircraft landed, a gust of wind from the side pulled the drag chute to the left side and caused the aircraft nose to the left and caused the aircraft to depart the runway to the left side.” A particular problem with the Hunter is “with crosswinds in excess of twenty knots, practically full rudder was required to kick the aircraft straight for touch down and nearly all braking had to be accomplished with the downwind brake to overcome the Hunter’s strong tendency to weathercock into the wind. When operating from flooded or icy runways relatively small crosswind components were likely to be unacceptable and provision of a braking parachute was strongly recommended and was eventually incorporated in the F6A and FGA9 aircraft” A current Hunter pilot in the United Kingdom notes “in a crosswind, the aircraft uncontrollably weathercocks and departs the runway heading for the nearest countryside…” An experienced RAF Hunter pilot explains that “it was found that with crosswinds in excess of twenty knots practically full rudder was required to kick the aircraft straight for touch down, and nearly all braking had to be accomplished with the downwind brake to overcome the Hunter’s strong tendency to weathercock into the wind.” Caygill, *Jet Jockeys*, 2002.	

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400.	Hydraulic Limitations	SOPs should address the limitations of the Hunter's 3,000 psi hydraulic system. Additional Information: For example, the Flight Manual/Pilot Notes state "do not select more than one hydraulic service at a time and allow the cycle of each hydraulic operation to be completed before the next service is operated. The undercarriage should only be selected down with the wings laterally level."	
401.	Fuselage Air Brake	The Hawker already slightly tail-heavy with a narrow CG range, and thus the airbrake (67º of travel) must not be deployed during high positive G, because this could create a severe pitch-up moment. Additional Information: The Hunter's airbrake is only marginally effective, so the aircraft picks up speed rapidly in a dive even with the airbrake deployed. It cannot be deployed with the landing gear down and thus of no use for airspeed control on final approach. Moreover, inadvertent extensions were not uncommon, so much so that when flying formation aerobatics, RAF pilots would remove the air brake fuse. A Hunter pilot discusses the air brake intricacies and adds that "despite the fact tat the air brake now extended to 67 º (earlier Hunters had less deflection), this made little difference to deceleration times below 40,000 feet but there were noticeable trim changes which, in conjunction with the sensitivity of the elevators, could lead to over-controlling at high IAS. The change in trim was nose down initially, becoming nose-up during the last few degrees of extension." Caygill, *Jet Jockeys,* 2002.	
402.	Oxygen Check	If a pressure oxygen system is installed, it is recommended that SOPs and training require, prior to every flight, the pilot to perform the "PRICE" check on the oxygen equipment (PRESSURE, REGULATOR, INDICATOR, CONNECTIONS and EMERGENCY. Additional Information: The acronym PRICE is a checklist memory-jogger that helps pilots and crewmembers inspect oxygen equipment. Mix and match components with caution. When inter-changing oxygen systems components, ensure compatibility of the components- storage containers, regulators, and masks. This is a particularly important issue since all Hunter's old age may very well require the use of modern equipment, at least some components.	
403.	Suspected Flight Control Failure	Recommend establishing SOPs for troubleshooting suspected in-flight control failures (common in the Hunter), including checklist procedures, altitude, and clear location.	
404.	Rejected Take-Off	Recommend that SOPs and training address the abort decision. Many Hunter accidents have been caused by inappropriate procedures during an abort.	
405.	High-G Training	Recommend that the PIC and any occupants received training, including techniques to mitigate the potential effects of [high-G] exposure for operations above 3Gs.	
406.	Negative G Flight	Ensure SOPs address the negative G limitation. The negative G: fuel traps provide capacity for "approximately 15 seconds" of negative "G" flight.	
407.	FAA AC 91-79	Recommend the use of FAA AC 91-79, *Runway Overrun Prevention.* This is an important issue with Hunter due to its history of runaway overruns and excursions. Additional Information: Adhering to SOPs and best practices for stabilized approaches will always be the first line of defense in preventing a runway overrun. This advisory circular (AC) provides ways for pilots and operators of turbine-powered airplanes to identify, understand, and mitigate risks associated with runway overruns during the landing phase of flight. It also provides operators with detailed information that may be used to develop company SOPs to mitigate those risks. According to Federal Aviation Administration (FAA) and National Transportation Safety Board (NTSB) information, runway overruns during the landing phase of flight account for approximately 10 incidents or accidents every year with varying degrees of severity, with many accidents resulting in fatalities. The FAA is working to develop strategies to reduce the number of landing overrun incidents/accidents. A review of runway overrun events indicates that most occur due to either a lack of or non-adherence to SOP. The Hunter is no exception. These events continue to occur despite efforts by the FAA and industry to ensure that operators develop SOPs and that flight crewmembers are properly trained and operate in accordance with the SOPs. Therefore, an emphasis on SOP development and a risk mitigation approach is employed in this AC. Focused training of crewmembers along with practical planning tools are the keys to avoiding runway overrun events. This emphasis on training and checking should be targeted at initial pilot certification as well as recurrent training and checking events. The training should not be merely academic in nature. These events should emphasize real world aeronautical decision making and use scenario based presentations in order to increase pilot recognition of high risk landing operations.	
408.	FAA AC 61-107	Recommend the use of FAA AC No. 61-107 *Operations of Aircraft at Altitudes Above 25,000 ft MSL and/or Mach Numbers (MMO) Greater Than 0.75.* Additional Information: This AC can be used to assist pilots who are transitioning from aircraft with less performance capability to complex, high-performance aircraft that are capable of operating at high altitudes and high airspeeds (like the Hunter). It also provides knowledge about the special physiological and aerodynamic considerations involved in these kinds of operations.	

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409.	360º Overhead Pattern Technique	Recommend the operator consider implementing SOPs to refrain from 360-degree overhead patterns. There is no civil application of this technique.	
410.	Low Approaches, High Speed, Low-Altitude Passes	Recommend no impromptu "low approaches" be permitted in normal operations outside the approved air show routine and during the exhibition of the aircraft in that context. Impromptu low approaches are contrary to §91.119. An exhibition airworthiness certificate is for exhibition purposes only.	
		Additional Information: In many cases, operators engage in "spur of the moment home air shows." Conducting such operations with an aircraft like the Hunter is not only inconsistent with the operating limitations typically issued, but also a potentially dangerous activity because of (1) lack of planning and coordination these operations entail, and (2) the inherent dangers of maneuvering this aircraft at a low level. Note: In a 2011 decision, the NTSB found high speed, low-altitude operations were intentional fly-bys, rather than go-arounds.	
411.	End of Runway (EOR) Check	Recommend that SOPs and training emphasize the importance of an End of Runway (EOR) check, a standard USAF procedure.	
		Additional Information: Basic USAF EOR guidance includes: • Ensure all flight crew checklist items through —Before Takeoff completed; • Review takeoff procedures as well as how to handle serious emergency procedures during and immediately after takeoff; • Review your go/no-go criteria; • When inspecting the flight control surfaces during the before-takeoff checks, there are two separate tasks. The first task is to visually confirm free and proper movement of the flight control surfaces. The second task is to check for rudder and aileron neutrality. With the stick and rudder pedals in the neutral position, check that all surfaces are approximately flush with the surface of the wing and the vertical stabilizer. It is crucial that this final surfaces check occurs as close as possible to takeoff; • The final check of aileron and rudder neutrality should occur no earlier than arriving at the EOR/hold short area and no later than taking the active runway;. • Check other aircraft for leaks, loose panels, proper configuration, streamers, FOD, etc. If able, make sure their stabilator is properly trimmed for takeoff by inspecting the alignment marks; • Alert the aircrew if anything looks abnormal.	
412.	Profile Drag	Recommend that the PIC maintain a clear understanding of the aircraft's gliding capabilities depending on all of the external stores combinations.	
		Additional Information: This is important because of changes on profile drag. A Hunter expert explains the issue with the example of the different fuel tanks: "…comparing these big tanks with the standard 100 Imp Gallon Bristol plastic tanks, it was reckoned at the time that on the inboard pylons, the small tanks added 1 per cent to profile drag while the big tanks added 3 per cent. The outboard station created a great deal of drag for various reasons that were probably never fully understood. Four small tanks were estimated to add 15 per cent to the profile drag of the basic aircraft, and the combination of big tanks inboard and small tanks outboard added 25 percent." Braybrook, *Hunter,* 1987.	
413.	USAF Phase Training (Format)	Recommend that SOPs and training consider, from a procedural standpoint, the current USAF Phases of Training for advanced aircraft.	
		Additional Information: These include: • Initial Qualification Training (IQT). This training is necessary to qualify aircrew for duties in the Hunter; • Mission Qualification Training (MQT). This training is necessary to qualify aircrew for specific unit mission or local area requirements; • Continuation Training (CT). This training is necessary for qualified aircrew to maintain their assigned level of proficiency and/or increase flight qualifications. It provides minimum ground and flight training event requirements;	
414.	Outdoors Exposure	Recommend establishing SOPs to address the aircraft's sensitivities to rainy weather, including hydraulic seal failures and leakages, freezing moisture, and water entering engine vents and shorting JPT thermocouple cables.	
		Additional Information: Other serious issues caused by moisture include shorting the trimmer causing runaway situations, and shirting ERU or ejector units causing in-flight inadvertent external fuel tank separations. A Royal Navy T8 incident investigation noted the cause as "short circuit due to ingress of moisture caused controls run away after take-off…" Sturtivant, *Fleet Air Arm Fixed Wing Aircraft Since 1946*, 2004. Also, transparencies, air intake and exhaust protection is necessary. See *Ground Support Equipment* above.	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
415.	Coordination for Use of MA-1A Barrier BAK-6 and BAK-9 Cable Arresting Systems	Recommend the Hawker Hunter applicant/operator become familiar with these systems and coordinate (ahead of time) with the appropriate military entities (USAF, ANG, U.S. Navy) who own these systems if any of these systems are located at any airport where operations are to take place or consider as divert airports.	
		Additional Information: While the barrier can be used by any Hunter, the arresting cable can only be used by those Hunter equipped with an arresting hook, such as the T8 and the GA11 versions of the Hunter. However, DOD may not permit the use of the cable arresting system. In the UK, the arrester gear is not approved for civil operation.	
416.	Reporting Incidents, Malfunctions, and Defects	Ask the applicant/operator to report (to the FSDO or MIDO) incidents, malfunctions, and equipment defects found in maintenance, preflight, flight, and post-flight inspection. This would yield significant safety benefits to operators and the FAA. All malfunctions or defects should be reported on FAA Form 8010-4.	
		Additional Information: A 2011 study for the U.S. Navy points to the effectiveness of such practices. It stated: "The data analysis carried out was a comprehensive attempt to examine the strength of the link between safety climate and mishap probability. Our findings would seem to support the premise that safety climate and safety performance are, at best, weakly related. Mishaps are rare events, and they describe only part of the spectrum of risks pertaining to a work system. We suggest that measuring workers' self-reported safety attitudes and behavior is an alternative way to assess the discriminate validity of safety climate." O'Connor, October 2011. In other words, reporting safety issues, such as malfunctions, go a long way in preventing an accident. Ask applicant/operator to report malfunctions and equipment defects found in maintenance, preflight, flight, and post-flight inspection. This would yield significant safety benefits to operators and the FAA.	
417.	49 CFR Part 830	Ask applicant/operator to adopt open and transparent SOPs that promote the use and requirements of 49 CFR Part 830, *Notification and Reporting Of Aircraft Accidents or Incidents and Preservation of Aircraft Wreckage, Mail, Cargo, and Records.*	
		Additional Information: Occurrences, which are events, other than an accident or incident (that requires investigation by the Flight Standards Service for its potential impact on safety) should also be reported. This is because there have been many instances where Hunter accidents and incidents are not reported, which hinders safety. Occurrences include the following when no injury, damage, or 49 CFR § 830.5 reporting requirements are involved: (1) aborted takeoffs not involving a runway excursion, (2) air turn backs where the aircraft returns to the departure airport and lands without incident, and (3) air diversions where the aircraft diverts to a different destination for reasons other than weather conditions. Reference should be made of FAA Order 8020.11 Aircraft Accident and Incident Notification, Investigation, and Reporting.	
418.	NATO Aviation Safety Guidance	Recommend the relevant sections of *Aviation Safety* AFSP-1(A), NATO, March 2007, be incorporated into the appropriate operational aspects of the Hunter operations to enhance overall safety.	
		Additional Information: This document, which incorporates many safety issues concerning the safe operation of combat aircraft, sets out aviation safety principles, policies and procedures-in particular those aimed at accident prevention. This document is a basic reference for everybody involved in aviation safety, both in occurrence prevention-starting from the development, testing, and introduction of material and procedures-and in its aftermath-the determination of the causes of an occurrence and the implementation of measures to prevent its recurrence. It is also recommended this process include internal safety audits. Safety audits help identify hazards and measure compliance with safety rules and standards. They assist in determining the adequate condition of work areas, adherence to safe work practices, and overall compliance with safety-based and risk-reduction procedures.	
419.	Aircrew Records	It is recommended that the applicant/operator establish and maintain process to address aircrew qualifications and records.	
		Additional Information: This could include: • Pilot Certification and competency; • Ground and Flight Training: records; instructors; conversion training; command training; and proficiency; • Medical; Duty Time; and flight time records; • Initial Qualification Training (IQT); • Mission Qualification Training (MQT); • Continuation Training (CT);	

Issue#	Issue(s)	Recommended Review, Action(s), and Coordination with Applicant	Notes, Action(s) Taken, and Disposition
420.	Medical Fitness for Ejection Seats	Recommend that applicant/operator consider aircrew medical fitness as part of flight qualifications and preparation.	
		Additional Information: In addition to meeting any ejection seat limitations (i.e., weight and height), and seat-specific training, relevant US military medical fitness standards could be used to ensure that survival after ejection is maximized and injuries minimized. Ejection records show that when survivable, many ejections inflict serious injuries. For example, the Martin Baker 3H seat fitted to the Hunter has an initial ejection velocity of 53 ft/sec and a maximum acceleration of 19Gs. Examples of Aeromedical guidance include *Medical Examinations and Standards,* Aerospace Medicine, Air Force Instruction 48-123, 22 May 2001 *and Standards of Medical Fitness*, Army Regulation 40-501, 14 June 1989. See Also see Defense and Civil Institute of Environmental Medicine, Department of National Defense, Canada. *Ejection Systems and the Human Factors: A Guide for Flight Surgeons and Aeromedical Trainers*, May 1988.	
421.	Emergency Planning and Preparedness	It is recommended that the applicant/operator institute emergency plans and post-accident management SOPs that ensure that the consequences of major incidents and accidents are dealt with promptly and effectively.	
422.	Insurance	It is recommended that the applicant/operator acquire the adequate type of insurance coverage. This is, and continues to be, an issue for many operators. However, the important role of insurance as part of an overall safety culture should not be underestimated.	
		Additional Information: For example, EAA's Warbirds of America's insurance program "emphasizes *SAFETY,* utilizing various training syllabuses and safety forums," and includes "discounts available for participation in approved ground and flight safety programs." The adequate type of insurance coverage will greatly contribute to the safe operation of the aircraft because it involves an additional level of safety oversight that complements both the operator's and the FAA's.	
423.	New Ejection Seat	Recommend that the operator consider the installation of a new type of ejection seat. This, although very involved and costly, would significantly increase the level of safety of Hunter operations, for both crew and those on the ground, if the ejection seat is active.	
		Additional Information: There are some indications that the installation of a newer type of seat in the Hunter is feasible. In the 1980s, there were some consideration for the Mk. 10 installation, but the upcoming retirement (perceived) at the time, prevented that from being considered by the RAF.	
424.	TSA Publication A-001	Recommend that operator become familiar with the Transportation Security Administration's (TSA) *Security Guidelines for General Aviation Airports*, Information Publication A-001, May 2004.	
		Additional Information: This guidance document was developed by TSA, in cooperation with the General Aviation (GA) community. It is intended to provide GA airport owners, operators, and users with guidelines and recommendations that address aviation security concepts, technology, and enhancements. The recommendations contained in this document have been developed in close coordination with a Working Group comprised of individuals representing the entire spectrum of the GA industry. This material should be considered a living document which will be updated and modified as new security enhancements are developed and as input from the industry is received. To facilitate this, TSA has established a mailbox to collect feedback from interested parties. Persons wishing to provide input should send Email to General.Aviation@dhs.gov and insert "GA Airport Security" in the subject line.	
425.	Type Clubs or Organizations	Recommend the applicant/operator join a Hunter type club or organization. This facilitates safety information collection and dissemination.	
426.	National Warbird Operator Conference	Recommend the Hunter applicant/operator participate at the National Warbird Operator Conference (NWOC).	
		Additional Information: Founded in 1993, "the annual NWOC event brings together warbird owners, operators, and museum directors to address particular events facing warbird owners and to discuss common goals related to the ever-changing economics, operations, and regulations pertaining to flying ex-military aircraft. NWOC focuses on the exchange of ideas and information concerning the safe operation and restoration of warbird aircraft. This unique educational conference offers programs to enhance pilot skill and knowledge, expand aircraft maintenance technician and restorer knowledge, develop awareness of medical and insurance facts, and address aircraft-specific topics to ensure continued flight for these unique historic aircraft." http://www.warbirdconference.com/.	

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Attachment 4 - Additional Resources and References

Additional Resources

- RAF and Royal Navy Hawker Hunter accidents (Ministry of Defense – Military Accident Summaries).
- RAF Hunter Special Occurrence Reports (SOR).
- *CAP 632 News,* Civil Aviation Authority, UK.
- Hawker Hunter accident reports issued by the NTSB in the United States, other foreign investigative agencies (that is, AAIB in the United Kingdom, AAIB in Australia.), and foreign air forces. Examples of the Hunter accident investigations conducted by the NTSB in the United States and the United Kingdom's AAIB include:

    1. Hawker Hunter Mk. 58A, N329AX, May 18, 2012;
    2. Hawker Hunter T7, N576Nl, November 17, 2012;
    3. Hawker Hunter, T8, N745WT, June 18, 1998;
    4. Hawker Hunter T7, G-BTYL, June 11, 1993;
    5. Hawker Hunter T7, G-BVGH, May 22, 2007;
    6. Hawker Hunter F6. G-KAXF, October 18, 2008;
    7. Hawker Hunter Mk. 58A May 30, 2004;
    8. Hawker Hunter Mk. 58A, G-PSST, June 20, 1999;

- UK CAA Airworthiness Approval Notes for Hawker Hunter.
- UK CAA Airworthiness LTOs (Letter to Owners/Operators) for Hawker Hunter aircraft.
- Aircraft Accident Report, ZU-BEX, SACAA, November 14, 2009.
- Aviation Safety Reporting System (ASRS).
- Australia's CAAP 30-3(0), *Approved Maintenance Organization (AMO) — Limited Category Aircraft*, Civil Aviation Advisory Publication, December 2001. This publication addresses the restoration and maintenance of ex-military aircraft and is an excellent guide for developing adequate aircraft maintenance and inspection programs.
- *Aviation Safety* AFSP-1(A). NATO, March 2007.
- CAP 632, *Operation of Permit to Fly Ex-Military Aircraft on the U.K. Register*. This is a comprehensive source of information and guidance on topics like technical requirements, specialist equipment and systems, pilot/crew qualification, operational requirements, records and oversight procedure, and safety management.
- Chamberlain, H. Dean. FAA News, *Armed and Dangerous,* November/December 2003.
- *CJAA Safety Operations Manual*. June 30, 2008.
- Colavita, M. Chemistry Dept. of CSV, Italian Air Force. *Occurrence of Corrosion in Airframes.* RTO AVT Lecture Series on "Aging Aircraft Fleets: Structural and Other Subsystem Aspects," November 2000.
- COMNAVAIRFORINST 4790.2A, Chapter 16, *Intermediate Level (I-Level) Maintenance Data System (MDS) Functions, Responsibilities, and Source Document Procedures*, CH-2 10, November 2009.
- Defense and Civil Institute of Environmental Medicine, Department of National Defense, Canada. *Ejection Systems and the Human Factors: A Guide for Flight Surgeons and Aeromedical Trainers*, May 1988.
- *Dictionary of Military and Associated Terms.* Department of Defense, JCS Pub. 1, September 1974.
- Drury, Colin G. and Watson, Jean (FAA). *Human Factors Good Practices in Borescope Inspection*, 2001.

- FAA. AC 5220-9, *Aircraft Arresting Systems.*
- FAA. AC 150/5300-13, *Airport Design*.
- FAA. AC 150/5220-22, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*.
- Morris, Greg. EAA Warbirds of America. Warbirds (magazine), *Warbird Airmanship*, March 2009.
- NATOPS. OPNAVINST 3710.7U, *General Flight and Operating Instructions*, November 23, 2009.
- NATOPS. NAVAIR 00-80R-14, *U.S. Navy Aircraft Firefighting and Rescue Manual,* October 15, 2003.
- NAVAIR 00-80R-20, *Aircraft Crash/ Salvage Operations Manual,* March 15, 1994.
- NAVAIR 00-80T-109, *Aircraft Refueling NATOPS Manual*, June 15, 2002.
- *Naval Aviation Maintenance Program Standard Operating Procedures* (NAMPSOPs), chapter 10.
- NAVPERS 00-8-T-80, *Aerodynamics for Naval Aviators*, January 1965.
- New Zealand Civil Aviation Authority. AC 43-21, *Escape and Egress Systems*, December 25, 1997.
- Penrice, Craig. *Ejection from Hunter G-BVVC*. http://www.ejection-history.org.uk
- RAF Fighter Command Flight Safety magazines.
- Safety Regulation Group, Civil Aviation Authority (U.K.). CAA Document No. 743, *Civil Air Displays: A Guide for Pilots*, 2003.
- System Safety Program Requirements – Military Standard – MIL-STD-882B. AMSC No. F3329, DOD, Washington, D.C., June 28, 1977.
- USAF T.O. 1-1-691, *Corrosion Prevention, and Control Manual.*
- USAF T.O. 1-1A-1, *Engineering Handbook Series for Aircraft Repair, General Manual for Structural Repair*, November 15, 2006.
- T.O. 1-1-300, *Maintenance Operational Checks and Flight Checks*, June 15, 2012.
- Transport Canada. *Maintenance and Manufacturing Staff Instructions, MSI 52, Issuance of Special Certificate of Airworthiness-Limited*, March 31, 2006.
- U.S. Department of Defense. Manual 4160.28 (volume 3), *Defense Demilitarization: Procedural Guidance,* June 7, 2011.
- USAF. AFP 127-1 and NAVAIR 00-80T-116-2*, Technical Manual Safety Investigation, Volume II Investigative Techniques*, July 31, 1987.

References and Bibliography

Published Sources

2010 Nall Report, AOPA Air Safety Institute. Frederick, Maryland, 2010.
49 U.S.C.
A Farewell to Arms. *World Air Power Journal*, Vol. 20 (Spring 1995).
Adams, Harold W. *Aircraft Hydraulics.* McGraw-Hill Book Company, Inc., New York, 1943.
AC 43.18 *Fabrication of Aircraft parts by Maintenance Personnel*.
Accident Reports. *Air Forces Monthly*, No. 251 (February 2009).
Accident Reports. *Air Forces Monthly*, No. 244 (July 2008).
Accident to Royal Air Force Hunter FGA9 XG151, April 3, 1981. Ministry of Defense, Military Aircraft Accident Summaries, MAS 17/83, 14 June 1983.
Advisory Circular AC 120-17A *Maintenance Control by Reliability Methods*. FAA, March 27, 1978.
Aerodynamics for Naval Aviators. NAVPERS 00-8-T-80, Revised January 1965.
Aeronautical Material Shelf Life Program. *Mech (*Winter 1974).
Airscene – Chile. *Air International* (August 1982).
Airscene – Chile. *Air International* (November 1982).
Airscene – Jordan. *Air International* (September 1974).
Airscene – Kenya. *Air International* (August 1974).

Airscene – Switzerland. *Air International* (October 1976).

Airscene – United Kingdom. *Air International* (August 1975).

Airscene – Zimbabwe. *Air International* (August 1984).

Allport, Dave. 1991 Write-Offs Review. *Air Forces Monthly*, No. 53 (August 1992).

Andrade, John M. *Latin-American Military Aviation.* Midland Counties Publications, Leicester, England, 1982.

Angelucci, E. and Matricardi, P. *Les Avions 5 – L'Ere des Engins à Réaction*. Elsevier, Bruxelles, 1979.

Ashley, Glenn. *Hawker Hunter in Action*. Squadron Signal Publications, Carrolton, Texas, 1992.

Attrait et Promesses de L'Aviation. Société des Produits Nestlé S.A. Vevey, Suisse, 1963.

Aviação Militar na América Latina. *Flap International,* Vol. 42, No. 394 (Julho 2005).

Aviation Machinist's Mate 1 & Chief (Assignment Booklet). Bureau of Naval Personnel, NAVPERS 91599, 1959.

Bain, Chris J. *Cold War Hot Wings.* Pen & Sword Aviation, South Yorkshire, England, 2007.

Bargain Hunters. *Aircraft Illustrated*, Vol. 31, No. 1 (January 1998).

Barker, Des. *Zero Error Margin: Airshow Display Flying Analyzed.* African Aviation Series No. 18, Freeworld Publications, South Africa, 2004.

Beedle, J. *43 Squadron.* Beaumont Aviation Literature. London, 1966.

Beedle, Jimmy. *The Fighting Cocks – 43 (Fighter) Squadron*. Pen & Sword Aviation, Barnsley, South Yorkshire, England, 2011.

Bennett, James (Ed.). Flying the World's Greatest Aircraft. Fall River Press, New York, 2009.

Bergman, Bill and Svensson, Artur. *Ett År I Luften: Flygets Årsbok 1960-61.* Förlag, Allhems, Aktiebolaget Allhems Tryckerier, Malmö, Sverige, 1961.

Bergman, Bill and Svensson, Artur. *Ett År I Luften: Flygets Årsbok 1960-62.* Förlag, Allhems, Aktiebolaget Allhems Tryckerier, Malmö, Sverige, 1962.

Black Arrows. *Air Forces Monthly,* No. 40 (July 1991).

Black, Ian. RAF Phantom Salute. *Classic Aircraft,* (December 2012).

Bodemer, Alfred. *Les Turbomachines Aeronautiques Mondiales*. Éditions Larivière, Paris, 1989.

Boot, Roy. *From Spitfire to Eurofighter: 45 years of Combat Aircraft Design.* Airlife, Shrewsbury, England, 1990.

Boult, Richard. *The Flying Years.* Merlin Massara Publishing, London, 2005.

Bowman, Martin W. *Fast Jet Fighters 1948-1978*. MBI Publishing Company, Osceola, Wisconsin, 2001.

Bowman, Martin W. Hurrah for the Hannas! *Warbirds International*, Vol. 15, No. 7 (October 1996).

Bowman, Martin W. *Hunters: The Hawker Hunter in British Military Service*. Sutton Publishing, Gloucestershire, England, 2002.

Boymans, Gerard, and Skeet, Tim. Martin Baker. *Air Fan*, No. 325 (December 2005).

Bowman, Martin W. Jet Heritage. Wingspan, (May 1994).

Brackx, Daniel. *Blu Crash Archief*. Flash Luchvaart Winkel, Eindhoven, Netherlands, 2004.

Bradley, Paul. *The Hawker Hunter: A Comprehensive Guide.* SAM Publications, Bedford, UK, 2009.

Braybrook, Ray. Fighters in the RAF – Part II. *Air Enthusiast* (November 1971).

Braybrook, Ray. *Hunter: Personal View of the Ultimate Hawker Fighter*. Osprey Publishing Limited, London, 1987.

Brent, Winston. *African Air Forces.* Freeworld Publications, South Africa, 1999.

Bridgewater, Steve. Hunter Flight Academy. *Jets Monthly*, (May 2012).

Bridgewater, Steve. The Tower Bridge Incident. *Jets Monthly*, (July 2011).

British Classics at South African Show. *Aeroplane*, Vol. 27, No. 1 (January 1999).

Broad, Brad. Hunter Heresy. *Air International,* (September 1979).

Brookes, Andrew. *Crash! Military Aircraft Disasters, Accidents and Incidents.* Ian Allan, London, 1991.

Brown, Eric. *Wings on My Sleeve*. Weidenfeld & Nicolson, London, 2006.

Bucc Fleet Grounding Led to Rare Hunters PIC. *Flypast,* No. 240 (July 2001).

Busy Year Ahead for Hunter Club. *Fly Past,* No. 287 (June 2005).

CAP 6–2 – Operation of 'Permit-to-fly' Ex-Military Aircraft on the UK Register. UK CAA, 2009.

CAR/CAM 1.73-1(a), Experimental Airworthiness Certificates: Type of Operations, CAR/CAM 1.74, Experimental Certificates, Requirements for Issuance, and CAR/CAM 1.75-1, Experimental Certificates: Duration.

Carlson, Ted. Need for Speed. *Fly Past*, No. 225 (April 2000).

Carter, Nick. *Meteor Eject: Adventures of a Cold War Fighter Pilot*. Woodfield Publishing, West Sussex, England, 2000.

Castro, Raoul. *Corporate Aviation Management.* Southern Illinois University Press, Carbondale, Illinois, 1995.

Casualties. *Aircraft Illustrated*, Vol. 31, No. 10 (October 1998).

Caygill, Peter. *Jet Jockeys: Flying the RAF's First Jet Fighters*. Airlife, Shrewsbury, England, 2002.

Caygill, Peter. *Lightning Eject: The Dubious Safety Record of Britain's Only Supersonic Fighter*. Sword & Pen, Barnsley, South Yorkshire, England, 2012.

CJAA Annual Convention 2011 Safety Review. (March 19, 2011).

Clark, Hunter Made for Two. Scale *Aviation Modeler International*, Vol. 4, Issue 4, 1998.

Classic Jet Company. *Aircraft Illustrated*, Vol. 31, No. 2 (February 1998).

Classic Jet Prepares for the 50th. *Flypast,* No. 239 (June 2001).

Classic Jet to Mark Hunter's 50th in Fine Style. *Flypast*, No. 234 (February 2001).

Clayton, and Knight, K. S. *Plane Crash.* Greenberg, New York, 1958.

Chant, Chris (Ed.) *The World's Air Forces*. Chartwell Books, Inc., Secaucus, New Jersey, 1979.

Coles, Bob, and Calvert, Denis J. Brawdy's Gunfighters. *Air Combat,* Vol. 7 No. 3 (May 1979).

Colorful Hunters. Scale *Aviation Modeler International*, Vol. 3, Issue 12, 1997.

Cook, Jerry W. (Brig. Gen. USAF, Retired). *Once a Fighter Pilot.* McGraw-Hill, New York, 1996.

Cooper, Peter J. 100 Years of Farnborough. *Aircraft Illustrated,* Vol. 39, No. 8 (August 2006).

Cooper, Tom. Iraqi hunters at War. *Classic Aircraft* (April 2012).

Conditional Donation of an F-4D Aircraft. Audit Report, DOD Office of the Inspector General, Report No. 97-222, September 30, 1997.

Conroy, Gavin. Warbirds Over Wanaka 2012. *Classic Wings*, Vol. 19, No. 2, Issue No. 58, 2012.

Cotter, Jarrod. Martin-Baker's Meteors. *Flypast*, No. 290 (September 2005).

Cotter, Jarrod. Safety First. *Flypast*, No. 238 (May 2001).

Cotter, Jarrod. WB 188 Flies Again. *Flypast*, No. 242 (September 2001).

Cotter, Jarrod. WB 188 Has Landed! *Flypast*, No. 241 (August 2001).

Croft, John. RVSM Non-Compliance Alarming FAA. *Flight International*, Vol. 181, No. 5325 (7-13 February 2012).

Crosnier, Alain. La Troupe D'Aviation Suisse (Part 1). *Air Fan*, No. 133 (Décembre 1989).

Crosnier, Alain. La Troupe D'Aviation Suisse (Part 2). *Air Fan*, No. 134 (Janvier 1990).

Crosby, Chester G. (Dr.) *Readings in Aircraft Maintenance Management, MAS 609-2.* Embry-Riddle Aeronautical University, Daytona Beach, February 1991.

Crosby, Francis*. A Handbook of Fighter Aircraft*. Hermes House, London, 2002.

CRM for the Single Pilot. *Vector* (May/June 2008).

Crusius, Timothy and Channell, Carolyn E. *The Aims of Argument*. McGraw-Hill, New York, 2003.

Da Oliveira, Manuel. La Fuerza Aérea de Chile. *Air Fan,* No. 115 (Juin 1988).

De Narbonne, Roland. La Naissance du Hawker Hunter. *Le Fanatique de L'Aviation*, No. 490 (Septembre 2010).

Dean, Rod. Hunter Display. *Flypast,* No. 2009 (December 1998).

Debacker, Paul. *La Reconstruction de la Force Aérienne Belge, 1945-1970*. Éditions L'Officine, Paris, France, 2004.

Delta Jets. *Aircraft Illustrated,* Vol. 32, No. 3 (March 1999).

Department of Defense MANUAL 4160.28, Volume 3, June 7, 2011 *Defense Demilitarization: Procedural Guidance.*

Deteriorated Parts Blamed for Reno Crash. *General Aviation News,* Vol. 64, No. 17 (September 7, 2012).

Dibbs, John. Living Heritage. *Aircraft Illustrated*, Vol. 32, No. 3 (March 1999).

Donald, David and Lake, Jon. *The Encyclopedia of Word Military Aircraft.* Barnes & Noble Books, New York, 2000.

Donaldson, T. S. and Poggio, E.C. *Depot Inspection and Repair Capability: Unique or Redundant?* USAF, Rand Corporation, November 1974.

Donnet, Christophe. *Hunter Fascination.* Schück Verlag, Adliswil, Switzerland, 1997.

Downing, Mike, and Bond, Steve. Strategic Singapore. *Air Forces Monthly,* No. 36 (March 1991).

Doyle, Tony. *Flying at the Edge: 20 Years of Front Line and Display Flying in the Cold War* . Pen & Sword, Barnsley, South Yorkshire, England, 2010.

Duke, Neville. *Test Pilot.* Grub Street, London, 1953.

Dunsford Hunter Accident Report Published. *Flypast,* No. 221 (December 1999).

Dwiggins, Don. *The Complete Book of Cockpits.* TAB books, Inc. Blue Ridge Summit, Pennsylvania, 1982.

Eden, Paul and Moeng, Soph. *Modern Military Aircraft Anatomy.* Metro Books, Aerospace Publishing Ltd., London, 2002.

Ellis, Ken. Danish Invaders: Esk 724's Hunters – In Service and Retirement. *Air Enthusiast*, No. 62 (March/April 1996).

Ellis, Ken. Passion for Escape. *Flypast*, No. 290 (September 2005).

Ellis, Paul. *Aircraft of the Royal Navy.* Jane's Publishing Company, London, 1982.

Elvington Extravaganza. *Flypast*, No. 280 (November 2004).

Engineering Handbook Series for Aircraft Repair, General Manual for Structural Repair, NAVAIR 01-1A-1.

English, T. Malcolm. FRADU. *Air Fan,* No. 131 (Octobre 1989).

Evans, Clive. *Through the Barrier: Flying Fast Jets in the RAF and USAF*. Pen & Sword, Barnsley, South Yorkshire, England, 2012.

Evans, Don. *The Long Dart: A Short History of British Target Towing.* Flight Recorder Publications, East Yorkshire, England, 2004.

FAA-H-8083-1 *Aircraft Weight and Balance Handbook.*

Farnborough Hunter Up for Sale. *Aeroplane,* Vol. 27, No. 5 (May 1999).

Fiddian, Paul. Camm's Most. *Classic Jet.* Classic Aircraft (June 2012).

Fighters A-Z: Hawker Hunter. *Air International* (August 1982).

First and Last Within Weeks! *Flypast*, No. 244 (November 2001).

Flintham, Victor. *Air Wars and Aircraft: A Detailed Record of Air Combat, 1945 to the Present.* Facts on File, New York, 1990.

Fixed Gun-Sight Installation in Hunter Aircraft. RAF Fighter Establishment Report No. 259, December 1954.

Fixed Wing Aircraft Structural Life Limits, NAVAIRINST 13120.1.

Fortin, Daniel. Back to Basics: Solo in a Hawker Hunter Reinforces Flight Basics. *Warbirds,* Vol. 27, No. 3 (April 2004).

Fox One Flying. *Aircraft Illustrated*, Vol. 31, No. 12 (December 1998).

Fuel Facts: Safe Handling of JP Fuels. *Approach* (November 1962).

Full Cry: Hunters at the Gallop. *Flight* (June 22, 1956).

G-HUNN History. *Aeroplane Monthly*, Vol. 26, No. 8, Issue No. 304 (August 1998).

Gander, Terry. *Encyclopedia of the Modern Royal Air Force.* Guild Publishing, London, 1984.

Gardner, Bob. The Cutting Edge. *Aeroplane* Vol. 35, No.8 (August 2007).

Gasztych, Christophe. Les Souciers Des Alpes. *Air Zone*, No. 31 (Janvier-Février 2001).

Gero, David. *Military Aviation Disasters: Significant Losses Since 1908*. Haynes Publishing, Somerset, England, 2010.

Gosling, Stewart. Training Times. *Classic Aircraft,* (March 2012).

Goyer, Robert. Safety Against the Odds. *Flying,* Vol. 137, No. 5 (May 2010).

Grattoni, Federico, Toselli, Claudio, and Vigna, Achille. Au Pays du Cèdre: La Force Aérienne Libanaise. *Air Fan*, No. 387 (Février 2011).

Green, William and Swanborough, Gordon. *Flying Colors*. Salamander Books, Ltd., London, 1981.

Griffin, David J. *Hawker Hunter Serials 1951-2006 in UK and Foreign Service.* Lulu Entreprises, Morrisville, North Carolina, 2006.

Grolleau, Henri-Pierre. FRADU : Les Aggressors de la Royal Navy. *Air Fan*, No. 258 (Mai 2000).

Guevara, Iñigo, Moyano. *Latin American Fighters: A History of Fighter Jets in Service With Latin American Air Arms.* Harpla Publishing, Houston, Texas, 2009.

Guhl, Jean-Michel. La Patrouille Suisse a 20 Ans. *Air Fan*, No.72 (Octobre 1984)

Gunti, Peter. Hunter: Portrait Suisse d'un Vieux Chasseur Toujours Jeune. *Air Action,* No. 9 (Juillet 1989).

Gysin-Aegerter, Werner. L'Aviation Militaire Suisse. *Air Fan*, No. 12 (Octobre 1979).

Hagedorn, Dan. *Latin American Air Wars,* Hikoki Publications Ltd.: 2006.

Haig-Thomas, Tony. High Times & Hunters. Aeroplane, (September 2008).

Hall, Åke, and Lindquist, Per. *F 9 Kungl.Göta Flyflottilj.* Förlag Air Historic Research AB, Värnamo, Sweden, 2005.

Hall, Nick. Crash Alert: Fire Service Central Training Establishment at RAF Manton. Air Forces Monthly, No. 115 (October 1997).

Halley, James J. *Broken Wings: Post-War Royal Air Force Accidents*. Air-Britain Ltd., Tunbridge Wells, Kent, England, 1999.

Hamlin, Fred, and Miller, Eleanor Thayer (Eds.). *The Aircraft Year Book 1955.* Lincoln Press Inc., Washington, DC, 1956.

Happy Four! Flypast, No. 273 (April 2004).

Harder, Robert O. *Flying From the Black Hole.* Naval Institute Press, Annapolis, Maryland, 2009.

Hardest Hitter - Hawker Hunter. *Flight and Aircraft Engineer,* Vol. 74, No. 2582 (July 18, 1958).

Harding, Richard M. and Mills, F. John. *Aviation Medicine.* British Medical Association, London, 1988.

Hardy, M. J. *Hawker Hunter Super Profile.* Winchmore Publishing, London, 1985.

Hawker Hunter Aviation. 2003 Air Show. Key Publishing, Lincolnshire, England, 2003.

Hawker Hunter Jets. *Aircraft Illustrated*, Vol. 30, No. 2 (February 1997).

Heard, John. Alpine Hunters. *Flypast* No. 328 (November 2008).

Higdon, David. Aircraft as Antenna Farm. *Avionics,* Vol. 49, No. 9 (September 2012).

Hobbs, David. *Aircraft of the Royal Navy Since 1945.* Maritime Books, Liskeard, Cornwall, England.

Home is the Hunter. *Flypast,* No. 290 (September 2005).

Honour, Walt. Lt. Cdr. Spin/Departure Training: A Must! *Approach* (April 1976).

Hünecke, Klaus. *Jet Engines: Fundamentals of Theory, Design and Operation*. Motorbooks International, Osceola, Wisconsin, 2000.

Hunter 50 Not Out. *Flypast,* No. 240 (July 2001).

Hunter Airborne. *Flypast*, No. 280 (November 2004).

Hunters and Bulldogs Go Under the Hammer. *Flypast*, No. 234 (February 2001).

Hunters Back at Yeovilton. *Air International*, Vol. 82, No. 6 (June 2012).

Hunter Cockpit Saved. *Flypast,* No. 251 (June 2002).

Hunter Chase Being Used for SJ30. *Air International*, Vol. 64, No. 1 (January 2003).

Hunter Crash – Flaps Down, Pitch Down. *Flight International,* Vol. 120, No. 3774 (September 3, 1981).

Hunter Departs*.* *Flypast*, No. 221 (December 1999).

Hunter F6. *Flight* (May 9, 1958).

Hunter Flies in Australia. *Flypast,* No. 247 (February 2002).

Hunter Flying Club Gears Up for Another Busy Year. *Flypast*, No. 253 (August 2002).

Hunter Flying Move Complete. *Flypast,* No. 370 (May 2012).

Hunter for Solway. *Flypast*, No. 331 (February 2009).

Hunter Heresy. *Air International,* Vol. 17, No. 3 (September 1979).

Hunter – Hawker Hunter F Mk. 6/T Mk. 7 (Aeroguide No. 9). Aeolus Publishing, Ltd., Vista, California, 1985.

Hunters, Hunters! *Flypast*, No. 238 (May 2001).

Hunter Lost. *Air Forces Monthly*, No. 128 (November 1998).

Hunter Moves from Cottesmore. *Flypast,* No. 370 (May 2012).

Hunter on the Move. *Flypast,* No. 279 (October 2004).

Hunters on the Up-and Down*. Flypast*, No. 303 (October 2006).

Hunter's Pedigree Uncovered. *Flypast,* No. 316 (November 2007).

Hunter Restored. *Flypast*, No. 340 (November 2009).

Hunter Shining Bright. *Flypast,* No. 338 (September 2009).

Hunters Star at Al Ain. *Aircraft* (April 2011).

Hunter Update. *Air Classics*, Vol. 34, No. 10 (October 1998).

Hypoxia: The Aviator's Constant Enemy. *Approach* (September 1978).

Indian Air Power. *World Air Power Journal,* Vol. 12 (Spring 1993).

Jackson, Robert. *Hawker Hunter: The Operational Record.* Smithsonian Institution Press, Washington, DC, 1989.

Jackson, Robert and Winchester, Jim. *Military Aircraft: 1914 to the Present Day.* Barnes & Noble, New York, 2007.

Jackson, Robert and Winchester, Jim. *Military Aircraft Compared and Contrasted.* Barnes & Noble, New York, 2006.

Jackson, Paul. *Belgian Military Aviation 1945 – 1977*. Midland Counties Publications, Leicester, England, 1977.

Jackson, A. Paul. *Dutch Military Aviation 1945 – 1978*. Midland Counties Publications, Leicester, England, 1978.

James, Derek N. Frontiers of Flight. *Wingspan*, No. 48 (October 1988).

Jefford, C. G. *The Flying Camels: The History of No. 45 Squadron RAF.* The Gresham Press, Surrey, England, 1995.

Jensen, Terry L. Eject! Eject! *Air Classics Quarterly Review* (Summer 1976).

Jet Heritage. *Aircraft Illustrated*, Vol. 30, No. 2 (February 1997).

Jet Heritage Hunter Crashes at Dunsfold. *Aeroplane Monthly*, Vol. 26, No. 8, Issue No. 304 (August 1998)

Jet Trainers: Part 1 – The Brits. *Today's Pilot,* (April 2002).

Jones, Barry. *Hawker Hunter.* The Crowood Press, Wiltshire, England, 1998.

Jørgensen, Jan. *Flyvevåbnet: Scenes From Danish Military Aviation History*. Nordic Airpower 2010, Denmark, 2010.

Kamine, Milton. *Jet Fighter Accident/Attrition Rates in Peacetime: An Application of Reliability Growth Modeling.* RAND Corporation, Memorandum RM-5563-PR, Prepared for the USAF, March 1968.

Kappas, Joanna. *Review of Risk and Reliability Methods for Aircraft Gas Turbine Engines*. DSTO-TR-1305, DSTO Aeronautical and Maritime research Laboratory, Victoria, Australia, May 2002.

Kay, Antony L. *Turbojet: History and Development 1930-1960*. Crowood Press, Wiltshire, England, 2007.

Kipp, Gunther. *RAF Hunters in Germany: Front Line Defenders in the Cold War.* Roger Lindsay, 2003.

La Troupe D'Aviation Suisse. *Carnets de Vol*, No. 44 (Mai 1988).

Lake, Jon. Hawker Hunter. *Wings of Fame*, Vol. 20, (2000).

Lal, P. C. *My Years with the IAF.* Lancer Publishers, New Delhi, India, 2008.

Laming, Tim. *Buccaneer*. Patrick Stevens Limited, Somerset, England, 1998.

Lazik, George. Capre Diem Hunter. *EAA Warbirds,* (March 16, 1996).

Laureau, Patrick. Le Hunter Au Chili (1st Part). *Jets,* No. 21 (Septembre 1997).

Laureau, Patrick. Le Hunter Au Chili (2nd Part). *Jets,* No. 21 (Septembre 1997).

Le Dernier Envol Des Faucons. *Air Zone,* No. 13 (Juillet 1996).

Lebanon Regains Fixed-Wing Combat Capability. *Combat Aircraft*, Vol. 10, No. 1 (February-March 2009).

Les Avions en Vol et au Combat. Editions Atlas, Paris, France, 1982.

Lewis, Peter. Tiger Hunter. *Aircraft,* Vol. 42, No. 10 (October 2009).

Lightning Crash Report Published. *Classic Aircraft* (October 2012).

Lister, Pete. Maintenance Control: Keystone of Squadron Ops. *Naval Aviation News,* (March/April 1986).

Lebanese Hunters Back in Action. *Air Forces Monthly,* No. 250 (January 2009).

Lednicer, David. *Airfoils.* Analytical Methods, Inc.

Loveless, Antony. The Bang Seat! *RAF Magazine*, Issue 3 (Winter 2005).

Maintenance and the Aircraft Accident Rate. *Approach* (May 1962).

Makana, Philip. Ghosts Over Wanaka. *Warbirds International*, Vol. 31, No. 6 (September/October 2012).

Malloy, Alfred M. Corrosion Control in Naval Aircraft. *Naval Aviation News* (May 1975).

March, Peter R. Canadian Hunters. *Aircraft Illustrated,* Vol. 36, No. 11 (November 2003).

March, Peter R. Hunter Re-Enactment. *Aircraft Illustrated,* Vol. 36, No. 11 (November 2003).

March, Peter R. Spirit of 5 MU. *Aircraft Illustrated,* Vol. 32, No. 3 (March 1999).

March, Peter R. Welcome to Thunder City. *Aircraft Illustrated,* Vol. 35, No. 6 (June 2002).

Mason, Francis K. *Archive – Hawker Hunter Mk. 1-5.* Shalmead Limited, Oxford, England, 1975.

Mason, Francis K. *Hawker Hunter: Biography of a Thoroughbred*. Patrick Stephens, Wellingborough, England, 1985.

Mason, Francis K. *Hawker Aircraft Since 1920.* Naval Institute Press, Annapolis, Maryland, 1991.

Mason, Francis K. *Hawker Hunter F.1/T.66 in Royal Air Force & Foreign Service.* Osprey Publications Limited, Kent, England, 1971.

Mason, Francis K. *The Hawker Hunter Two-Seaters*. Profile Publications, Ltd., Surrey, England, 1973.

Matricardi, Paolo. *The Great Book of Combat Aircraft.* Vmb Publishers, Vercelli, Italia, 2006.

Méal, Xavier. Les Troupes d’Aviation Suisses Ont Donné 70 Hunter Aux Collectionneurs. *Le Fanatique de L’Aviation,* No. 309 (Août 1995).

Memory Lane. *Jets Monthly* (July 2012).

McClelland, Tim. *The Hawker Hunter*. Crecy Publishing Ltd, England, 2008.

McEwen, Mac. *Hunter from the Cockpit*. Ad Hoc Publications, Suffolk, England, 2009.

Memories from the Logbook. *Flypast,* No. 228 (August 2000).

Memory Lane. *Jets Monthly*, (July 2011).

Mercer, Brian. *Black Arrow Blue Diamond.* Pen &Sword Aviation, South Yorkshire, England, 2006.

Middleton, Donald. *Test of Character: Epic Flights by Legendary Test Pilots*. Airlife, Shrewsbury, England, 1995.

Midland Hunter Dedicated. *Aeroplane,* Vol. 34, No. 8 (August 2006).

Miyashita, T. Rebuilt Aircraft Tires Are as Good or Better Than New Tires. *Mech* (Winter 1974).

More Sea Harriers. *World Air Power Journal*, Vol. 18 (Fall 1994).

Moreman, Glen. Hunter Fest. *Jets Monthly*, (July 2011).

Newdick, Thomas, and Cooper, Tom. *Modern Military Airpower 1990-Present.* Amber Books, London, 2010.

Nowlan, F. S. *Reliability-Centered Maintenance.* United Airlines, San Francisco, California, December 1978.

Nylén, Anders, and Jørgensen. *Flygvapnet: Scenes From Swedish Military Aviation History*. Nordic Airpower 2011, Denmark, 2011.

O'Connor, Paul, Buttrey, Samuel E., O'Dea, Angela, and Kennedy, Quinn. *An Assessment of the Relationship Between Safety Climate and Mishap Risk in U.S. Naval Aviation.* Defense OSD Readiness Programming and Assessment, Defense Safety Oversight Council, Washington, D.C., October 2011.

O'Connor, William B. *Stealth Fighter*. Zenith Press, Minneapolis, Minnesota, 2012.

Omani Acquisitions. *Aircraft Illustrated*, Vol. 38, No. 2 (February 2005).

Operation of Warbirds at Bankstown. *Flight Safety Australia* (March-April 2000).

Parrish, Robert L. Maintenance Records and Compliance. *Business & Commercial Aviation*, March 1989.

Paver, Richard. Jubilee Hunter. *Flypast,* No. 373 (August 2002).

Petter-Bowyer, P. J. H. *Winds of Destruction*. Trafford, Victoria, Canada, 2003.

Price, Nigel. Hunters Galore! *Flypast*, No. 243 (October 2001).

Price, Nigel. UK 2002 Jet warbirds. *Flypast*, No. 250 (May 2002).

Pollock, Alan. Wings Swept. *Classic Aircraft* (September 2012).

Pook, Jerry. *Flying Freestyle: An RAF Fast Jet Pilot's Story.* Pen & Sword Aviation, Barnsley, South Yorkshire, England, 2009.

Pope, Alan. *Aerodynamics of Supersonic Flight.* Pitman Publishing Corporation, New York, 1950.

Pure Adrenaline*.* *Flypast*, No. 274 (December 2004).

Punter, H. An Arabian Magic Carpet. *Air International*, Vol. 15, No. 4 (October 1978).

Record-Breaking Hunter Engine Removed. *Flypast,* No. 373 (August 2002).

Republic of Singapore Air Force – RSAF. *World Air Power Journal*, Vol. 41 (Summer 2000).

Richardson, Doug. *The Illustrated Encyclopedia of Modern Warplanes.* Crescent Books, New York, 1982.

Ripley, Tim. Saddam's Air Power. *Air Forces Monthly,* No. 176 (November 20020.

Robinson, AVM. Flying to Paradise. *Flypast,* No. 248 (March 2002).

Rogoway, Tyler. On the ATAC! *Combat Aircraft,* Vol. 12, No. 7 (July 2011).

Round the Patch. *Aeroplane,* Vol. 40, No. 10 (October 2012).

Royal Jordanian Air Force Historic Flight. *Aircraft Illustrated,* Vol. 32, No. 3 (March 1999).

Sadik, Ahmad and Cooper, Tom. *Iraqi Fighters 1953-2003: Camouflage & Markings.* Harpla Publishing, Houston, Texas, 2008.

Safety Investigation, Volume 1: Investigative Techniques. AFP 127-1, Department of the Air Force, Washington, DC, May 29, 1987.

Safety Investigation, Volume 2: US Air Force Guide to Mishap Investigation, Volume 1. AFP 127-1, Department of the Air Force, Washington, DC, May 29, 1987.

Salt, Beryl. *A Pride of Eagles: The Definitive History of the Rhodesian Air Force 1920-1980.* Covos Day, Johannesburg & London, 2001.

Scandinavian Hunters. *Flypast*, No. 207 (October 1998).

Scandinavian Hunter Arrives at Kemble. *Flypast,* No. 306 (January 2007).

Scandinavians Invade North Weald. *Flypast,* No. 230 (October 2000).

Schlesinger, Robert J. *Principles of Electronic Warfare.* Peninsula Publishing, Los Altos, California, 1961.

Scott, Richard. Hunters and the Hunted. *Classic Jet.* Classic Aircraft (June 2012).

Seytre, Jean Sébastien. Apache's Reserve. *Air Forces Monthly,* No. 295 (October 2012)

Siegrist, Martin. La Carrière Helvétique du Hawker Hunter. *Le Fanatique de L'Aviation,* No. 303 (Février 1995).

Simpson, Bill. Life as a Target. *Flypast*, No. 346 (May 2010).

Skeet, Tim. Keep Them Flying. *Aeroplane*, Vol. 40, No. 8 (August 2012).

Skeet, Tim. Join the Classic Jet Set. *Aeroplane*, Vol. 37, No. 1 (January 2009).

Smart Scheme for Hunter. *Flypast*, No. 332 (March 2009).

South African Classics. *Aircraft Illustrated,* Vol. 32, No. 1 (January 1999).
Spick, Mike. *The Great Book of Modern Warplanes.* Salamander Books Limited, London, 2000.
Stafrace, Charles. *Arab Air Forces.* Squadron Signal Publications, Carrolton, Texas, 1994.
Stall/Spin Problems of Military Aircraft. AD-A029 071, ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, JUNE 1976.
Stopper in the Baltic – Royal Danish Air Force: Guardian of the Baltic Straits. *Air International* (October 1979).
Steinemann, Peter. Fuerza Aérea de Chile. *World Air Power Journal*, Vol. 1 (Spring 1990).
Steinemann, Peter. Qatar Emiri Air Force. *World Air Power Journal*, Vol. 4 (Winter 1990/1991).
Stickney, Christopher and Ratté, Paul. Runway Excursions: Make It Stop. *Premium on Safety*, Issue 9, 2012.
Stoll, Laurence W. *Analysis of Operations and Support Cost Trends or Why do Aging Aircraft Cost so Much. Briefing for Ageing Aircraft Forum*, October 6-8, 2004 (Power Point Presentation).
Stuart-Paul, Ronald. *The Royal Saudi Air Force*. BAe Systems, 2001.
Sturgeon, W. R. *Canadian Forces Aircrew Ejection, Descent and Landing Injuries, 1 January 1975- 31 December 1987.* Defense and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada, December 1988.
Sturtivant, Ray, Burrow, Mick, and Howard, Lee. *Fleet Air Arm Fixed-Wing Aircraft Since 1946*. Air-Britain Ltd., Tunbridge, Kent, England, 2004.
Supermarine 510 and Hawker P. 1052…Their Lives and Violent Times. *Air Enthusiast Fifteen.* Fine Scroll Publications, London, 1981.
System Safety Program Requirements – Military Standard – MIL-STD-882B. AMSC No. F3329, DOD, Washington, D.C., June 28, 1977.
Swaine, Liz. *NTSB Reveals Error Chain in Hawker Hunter Fatality.* AvWeb, May 9, 2004.
Switzerland: Kommando der Flieger – und Fliegerabwehrtruppen. *World Air Power Journal,* Vol. 5 (Spring 1991).
Swiss Hunter Order Approved. *Flight and Aircraft Engineer,* Vol. 73, No. 2559 (February 7, 1958).
Tangmere Hunter's Engine Inspection. *Flypast,* No. 368 (March 2012).
Taylor, Bill. *Royal Air Force Germany*. Midland Publishing, Hinckley, England, 2003.
Taylor, Michael J. H. *Jet Warplanes.* Gallery Books, New York, 1984.
Taylor, Peter. Unforgettable Years. *Flypast*, No. 240 (July 2001).
Team Viper Disbands. *Classic Aircraft,* (March 2012).
Testing Time for Hunter. *Flypast,* No. 370 (May 2012).
The Aircraft Gas Turbine Engine and Its Operation. United technologies, Pratt & Whitney, August 1988.
The Civil Aeronautics Act of 1938, as Amended. Revised September 1, 1948, Washington, DC.
The Indian Air Force and Its Aircraft. Pilot Press Ltd., Kent, England, 1982.
The Jets Are Gathering! *Fly Past,* No. 206 (September 1998).
The Waddington Effect. The Bulletin of Military Operational Research (September 2010).
The Waddington Effect. *Sport Aviation* (March 2011).
Thomas, Andrew. Assegai Hunters: Hawker Hunter in Rhodesian Service Part One. *Air Enthusiast*, No. 110 (March/April 2004).
Thomas, Andrew. Assegai Hunters: Hawker Hunter in Rhodesian Service Part Two. *Air Enthusiast*, No. 111 (May/June 2004).
Thoroughbred Hunter. *Flying Review International*, Vol. 19, No. 7 (April 1964).
Treister, Suzanne. *NATO: The Military Codification System for the Ordering of Everything in the World.* Black Dog Publishing, London, 2008.
Trevor, Hugh. Classic Hunters. *Flypast*, No. 241 (August 2001).

Tuttle, Jim. *Eject! The Complete History of US Aircraft Escape Systems.* MBI Publishing Company, St. Paul, Minnesota, 2002.
Twenty Year Hunting. *Aircraft Illustrated,* Vol. 7, No. 9 (September 1974).
Two-Seat Hunter Debuts at Kemble. *Flypast,* No. 250 (May 2002).
Un Nouveau Hawker Hunter Vole en Grande-Bretagne. *Le Fanatique de L'Aviation,* No. 504 (November 2011).
USAF Test Pilot School Flying Qualities, Volume II. USAF-TPS-CUR-86-03, Edwards AFB, California, April 1986.
Van Haute, André. Belgian Spearhead. *Air Enthusiast,* No. 76 (July/August 1998).
Van Haute, André. *Hawker Hunter en Service à la Force Aérienne Belge*. Uitgeverij De Krijger, Editions De Kreijger, Erpe, Belgique, 1996.
Verier, Mike. *Yeovilton: Defenders of the Fleet*. Osprey Aerospace, London, 1991.
Wade, Harold. *Cold War Fighter Pilot.* Trafford, Victoria, British Columbia, 2004.
Wainwright, Marshall. Scandinavian Hunter. *Warbirds International*, Vol. 29, No. 1 (January/February 2010).
Wagner, Paul J. *Air Force Tac and Recce Aircraft*. Rose Dog Books, Pittsburgh, Pennsylvania, 2009.
Walpole, Nigel. *Best of Breed: The Hawker Hunter FR10*. Pen & Sword, Barnsley, South Yorkshire, England, 2006.
Walpole, Nigel. *Devon's Fast-Jet Cradle.* Royal Air Force Salute. Key Publishing Company, Lincolnshire, England, 2009.
Walpole, Nigel. On Time, On Target. *Classic Aircraft* (October 2012).
Ward, Richard L. *Hunter Squadrons of the Royal Air Force and Fleet Air Arm*. Linewrights Ltd., Essex, England, 1985.
Watson, Simon and Camp, Phil. Still Going Strong: India's Hunters. *Flypast,* No. 240 (July 2001).
Weiss, Arturo. *SJ30-2 Reaches Mach .83 in Test Flight.* November 29, 2002.
Wells, Alexander T. *Introduction to Aviation Insurance.* Robert E. Krieiger Publishing Company, Malabar, Florida, 1986.
West, Pete. Tora! Tora! Tauranga! *Flypast*, No. 371 (July 2012).
Whalley, Jonathan. Hunter from the Cockpit. *Aircraft,* Vol. 43, No. 5 (May 2010).
Whalley, Jonathan. Miss Demeanor. *Jets Monthly*, (July 2011).
Wheeldon, Ron. Hunter Odyssey. *Aeroplane Monthly,* Vol. 28, No. 8, Issue No. 304 (August 1998).
White, Alan. *Lightning Up.* Pen & Sword, Barnsley, South Yorkshire, 2009.
Wilkerson, Dave. CRM and ADM. *Flight Training, (*September 2008).
Wilkinson, Paul H. *Aircraft Engines of the World 1957*. Paul H. Wilkinson, Washington, D.C., 1957.
Williams, Ray. *Fly Navy: Aircraft of the Fleet Air Arm Since 1945.* Airlife Publishing Ltd., Shrewsbury, England, 1989.
Winchester, Jim (Ed.) *American Military Aircraft*. Barnes & Noble Publishing, 2005.
Young, John W., and Hansen, James R. *Forever Young: A Life of Adventure in Air and Space.* University Press of Florida, Gainesville, Florida, 2012.

Audiovisual Sources

AIR 04 – Payerne. Aviation Video, 2005 (DVD).
AIR 04 – Payerne. Lionel Charlet Films, 2004.
Display Teams of the Royal Air Force. DD Home Entertainment, UK, 2003 (DVD).
Hawker Hunter. Black Eagle Aviation Series, South Africa, 2008 (DVD).
Kemble Hunter 50th Anniversary Airshow. DD Video, Middlesex, UK, 2001 (DVD).
Klu in Koude Oorlog: Hawker Hunter. Centerline. Rotterdam, Netherlands, 2004 (DVD).

Rescue From Crashed Aircraft – Part 1: Fighters and Trainers, AF/9094, RAF, 1987.
Rescue From Crashed Aircraft – Interceptors, Strike and Training Aircraft, 14L/7444, RAF, March 1970.
Rescue from Crashed Aircraft, 14L/6377, RAF, 1957.
Rolling in the Sky: Patrouille Suisse. Pioneer LDC, 1990 (DVD).
The Hawker Hunter. Delta, Kent, England, 2012 (DVD).
When Pilots Eject. Discovery Channel, 2003 (DVD

Organizations

Air Investigation Branch (UK).
Aircraft Accident Investigation Board (AAIB), UK.
Air Force Safety Center.
Aircraft Owners and Pilots Association.
Australia Civil Aviation Safety Authority (CASA).
Australia Warbirds Association, Ltd.
Belgian Wings – Military Aircraft Database.
Defense Technical Information Center (DTIC).
Dutch Aviation Society.
European Air Show Council.
Experimental Aircraft Association (EAA).
Flight Safety Foundation.
Hawker Hunter Appreciation Society.
International Fire Training Centre.
National Lucht – En Ruimtevaarlabiratorium (Netherlands).
Naval Safety Center.
National Transportation Safety Board (NTSB).
OFAC (Office Fédéral de L'Aviation Civile (Swiss CAA).
Royal Air Force (RAF).
Royal Air Force Museum.
San Diego Air & Space Museum.
Smithsonian Air and Space Museum.
South African Civil Aviation Authority.
Transport Canada.
UK Ministry of Defense – Military Aviation Authority (MAA).

Web Sources

http://8squadron.co.uk/history_hunter.php
http://aircraft.net.nz/post/34262687203/hawker-hunter-at-warbirds-over-wanaka-type
http://aviation-safety.net/index.php
http://aviationintel.com/2012/05/23/adversary-news/
http://belmilac.wetpaint.com
http://classicjets.org
http://editorialmanutara.blogspot.com/search/label/hawker%20hun
http://en.wikipedia.org/wiki/Hawker_Hunter_in_service_with_Swiss_Air_Force
http://en.wikipedia.org/wiki/Rolls-Royce_Avon
http://flymuseum.dk/fly/216-hawker-hunter-fmk51
http://forum.keypublishing.com

http://forum.keypublishing.co.uk/archive
http://forum.scramble.nl
http://hawkerhuntersreborn.blogspot.com/
http://ivansiminic.blogspot.com/2005/05/hawker-hunter-fach-736.html
http://jcenglishcorner.overblog.com/archive/2012-03/
http://kw.jonker.co/index.php/en/?option=com_content&view=article&id=368:hawker-hunter-fmk4-fmk6-en-tmk-7-&catid=56:h&Itemid=184&lang=en&showall=1
http://lebaneseairforce.info/news.htm
http://nzcivair.blogspot.com/2010/08/withdrawn-from-register-zk-jil.html
http://orion3.blogzine.jp/blog/atac_hunter_hawker/
http://portlandtribune.com/forest-grove-news-times-news/
http://nzcivair.blogspot.com/2012/01/hunter-back-in-sky.html
http://rafforum.activeboard.com/t15465363/hawker-hunter/
http://rnzaf.proboards.com/index.cgi?board=experimental&action=display&thread=15237
http://saairforce.co.za/forum
http://seawavesmagazine.blogspot.com/2012/05/pilot-killed-in-mk-58-hawker-hunter.html
http://sgforums.com/forums/12/topics/81216
http://safetycenter.navy.mil/
http://www.1fsa.org/
http://www.aaib.gov.uk
http://www.aaib.gov.uk/cms_resources.cfm?file=/Hawker%20Hunter%20F6.A%20Hunter,%20G-KAXF%2005-09.pdf
http://www.abpic.co.uk/photo/1186692/
http://www.acc.af.mil/shared/media/document/AFD-110616-066.pdf
http://www.aeroflight.co.uk/waf/aa-africa/zim/af/types/hunter.htm
http://www.aer.ita.br/~bmattos/mundo/fighter/hunter.htm
http://www.aero-news.net
http://www.africanpilot.co.za/african-pilot-newsletter-no-38-2008-302.aspx
http://www.aircrashed.com
http://www.airliners.net
http://www.airventure.org
http://www.airwarriors.com
http://www.amicidellhunter.ch/
http://www.apache-aviation.fr/anglais/flotte.htm
http://wwwapps2.tc.gc.ca/Saf-Sec-Sur/2/ccarcs/aspscripts/en/current.asp
http://www.arribasiemprearriba.com/Articulos/HawkerHunter/ArticuloHH.htm
http://www.astronics.com/products/aircraft-lighting/formation-lights.asp#green
http://www.atacusa.com/atac_resources.html
http://www.aviation-history.com
http://www.avweb.com/avwebflash/briefs/187264-1.html
http://www.australianwarbirds.com.au
http://www.bharat-rakshak.com/IAF/Today/Unit-Articles/390-TTF.html
http://www.caa.govt.nz/Script/Accident_Details.asp ?Oc=01/1109
http://www.caa.co.uk/application.
http://www.caa.co.uk/docs/224/CAP632%20Newsletter%202004%20-%20FINAL%20VERSION.pdf
http://www.caa.co.za/
http://www.caa.co.za/publications_files/Safety%20Link/SafetyLinkJuly10.pdf
http://www.csgnetwork.com/jetfuel.html

http://www.classicflyersnz.com/What+We+Do/Aviation+Museum.html
http://www.classicjets.co.uk/nav.htm
http://www.clubhyper.com/reference/somalihuntersmt_1.htm
http://www.controller.com
http://www.cnapg.net/hunter.htm
http://www.dailymail.co.uk/home/moslive/article-1033837/Now-thats-beach-holiday-The-ultimate-adrenaline-tour.html
http://www.designation-systems.net/usmilav/jetds/an-asq.html
http://www.dutchhawkerhunter.nl/dhhf/Foundation.html
http://www.enginehistory.org
http://www.ejection-history.org.uk
http://www.ejectionsite.com
http://www.faa.gov/data_research/accident_incident/preliminary_data/
http://www.faa.gov/regulations_policies/advisory_circulars
http://www.fach.cl/hunter/index4.htm
http://www.faqs.org/docs/air/avhunt2.html
http://www.fliegermuseum.ch/
http://www.flightglobal.com
http://www.flightglobal.com/blogs/graham-warwick/2007/09/a-thing-of-beauty-embraers-haw-1.html
http://www.fradu-hunters.co.uk/
http://www.qab.co.jp/news/200804192265.html
http://www.hawkerhunter.com/5312/
http://www.historyofwar.org/articles/weapons_hawker_hunter_56.html
http://www.huntertheaircraft.co.uk/
http://www.hunterflight.com/
http://www.hunterteam.com/main.htm
http://www.huntythejetfighter.com/Reborn/hunters-database.html
http://www.kiwiaircraftimages.com/hunter.html
http://www.lortieaviation.com/aircraft.htm
http://www.lw.admin.ch/inter⍰uftwaffeaffe/en/home/themen/history.html
http://www.martin-baker.com/products
http://www.martin-baker.com/products/ejection-seats/mk1-9/mk4
http://www.milavia.net/airforces/reports/lebanese-air-force/
http://www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/AirSafetyandAviation/MilitaryAircraftAccidentSummarymaas.htm
http://www.mod.uk/NR/rdonlyres/1F32B4C0-95D4-4BF3-85F1-13644AED059C/0/maas82_16_hunter_tmk7_xl593_5aug82.pdf
http://www.kiwiaircraftimages.com/hunter.html
http://www.peakdistrictaircrashes.co.uk/pages/peakdistrict/peakdistrictG-BTYL.htm
http://www.pictaero.com/fr/pictures/picture,87998
http://www.pprune.org/archive/index.php/t-487661.html
http://www.nzwarbirds.org.nz/hunterfr74.html
http://www.qinetiq.com
http://www.radfanhunters.co.uk
http://www.rhodesianforces.org/AircraftIncidents.htm
http://www.rodaleelectronics.com/products/an-alq-167/ew-training-pods/
http://www.ruudleeuw.com/rem-soesterberg.htm
http://www.sbap.be/archivalia/pictures/picturesbaf.htm

http://www.scramble.nl
http://www.ses-safety.com/
http://www.sicuropublishing.com
http://www.spyflight.co.uk/fr10.htm
http://www.sunlive.co.nz/news/21314-keeping-hawker-hunter-flying.html
http://www.sunnersberg.com/flygplan/j-34_hunter.htm
http://www.strijdbewijs.nl/top/o/hunter.htm
http://www.swisshunters.info/
http://www.teamviperdisplay.com/
http://www.theaviationindex.com/publication/jets-magazine/issue-1-novemberdecember-1998
http://www.thunder-and-lightnings.co.uk/hunter/history.php
http://www.thunder-and-lightnings.co.uk/hunter/survivor.php?id=264
http://www.thunder-and-lightnings.co.uk/hunter/survivor.php?id=498
http://www.ukserials.com/losses-1956.htm
http://www.youtube.com/watch?v=LXYRDa3vfh4
http://www.youtube.com/watch?v=_RiFKizcwmE
http://www.warbirdalley.com/hunter.htm
http://www.warbirdconference.com/
http://www.warbirds.in/westbengal/kalaikunda/87-hawker-hunter-ba207.html
http://www.wealdaviation.com/sales
http://www.x-plane.org/home/urf/aviation/text/swaf_warbirds.html

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Attachment 5 - Partial Listing of Hunter Accidents and Relevant Incidents

#	Date	Version	Operator	Severity	Probable Cause and Remarks
1.	November 5, 2012	Hunter Mk.58	N327AX	Nonfatal	Gear-Up Landing – Pt. Mugu, CA
2.	May 18, 2012	Hunter Mk.58	N329AX	Fatal(1)	Fuel System/Mechanical/LOC – Point Mugu, CA
3.	August 20, 2011	Hunter T7	SE-DXM	Nonfatal	Overrun – Aborted Take-Off
4.	August 19, 2011	Hunter Mk. 58	N327AX	Nonfatal	Runway Excursion – Crosswind - Drag Chute Use
5.	June 19, 2011	Hunter Mk.58A	G-PSST	Nonfatal	Fuel Leak on Take-Off (AND)
6.	June 2011	Hunter FGA9	G-RTPS	Nonfatal	Engine Malfunction (AND)
7.	May 6, 2010	Hunter T58/66	N330AX	Nonfatal	Gear-Up Landing – Pt. Mugu, CA
8.	July 3, 2009	Hunter Mk.58	G-XXXX	Nonfatal	Fuel Starvation After Landing While Taxing (AND)
9.	October 18, 2008	Hunter F6	G-KAXF	Nonfatal	External Fuel Tank Separated on Landing
10.	April 19, 2008	Hunter Mk. 58	N332AX	Nonfatal	Brake Malfunction – Overrun – Atsugi, Japan
11.	May 22, 2007	Hunter T7	G-GVBH	Nonfatal	LOC on TO – Brake Malfunction – Runway Excursion
12.	September 29, 2006	Hunter Mk.58	G-XXXX	Nonfatal	Inadvertent In-Flight Drag Chute Deployment (AND)
13.	July 16, 2006	Hunter Mk.58	N58MX	Fatal(1)	Loss of Power – Hillsboro, OR
14.	June 18, 2006	Hunter Mk.58	G-XXXX	Nonfatal	Engine Flame-Out During Inverted Flight (AND)
15.	November 1, 2005	Hunter T75	VH-RHO	Nonfatal	Gear-Up Landing – Main Landing Gear Failure to Extent
16.	March 2, 2005	Hunter Mk.58	C-GJMO	Nonfatal	Runway Excursion- Failed Brake Test on the Runway (AND)
17.	July 11, 2004	Hunter Mk.58	J-4091	Nonfatal	Inadvertent Pull of the Canopy Jettison System by Spectator (AND)
18.	May 30, 2004	Hunter Mk.58	G-PSST	Nonfatal	Tail Strike on Landing (2nd time)
19.	July 22, 2003	Hunter T7A	NONE	Fatal(1)	Engine Failure – Pittston, PA
20.	June 1, 2003	Hunter F6	G-BVVC	Nonfatal	Dual Generator Failure – Engine Failure
21.	August 18, 2002	Hunter Mk.58	N58WJ	Nonfatal	Failure to Rotate – Abort – Runway Excursion (AND)
22.	July 5, 2002	Hunter F6	N587XE	Nonfatal	Runway Excursion – Brake Failure/LOC – Greensboro, NC
23.	April 5, 2001	Hunter FR74	ZK-GIL	Nonfatal	Landing Gear Failure (AND)
24.	January 8, 2000	Hunter F Mk 4	N72602	Nonfatal	Engine Failure – Chino, CA
25.	November 17, 1999	Hunter Mk 7	N576NL	Nonfatal	Engine Failure – Overrun – Williams Gateway, AZ
26.	July 25, 1999	Hunter F6	G-KAXF	Nonfatal	Gear-Up Landing – Gear Failure to Extent
27.	June 20, 1999	Hunter Mk.58	G-PSST	Nonfatal	Tail Strike on Landing
28.	August 6, 1998	Hunter T7	RAF	Nonfatal	Throttle System Failure
29.	June 18, 1998	Hunter T Mk 8	N745WT	Fatal(1)	Fuel Starvation/Fuel System – Manchester, NH
30.	June 5, 1998	Hunter F4	G-HHUN	Fatal (1)	Engine Failure
31.	February 26, 1996	Hunter Mk. 58	ZU-AVC	Nonfatal	Power Control Failure After Take-Off – Overrun
32.	September 11, 1995	Hunter Mk. 58	N58MX	Nonfatal	Tail Strike (AND)
33.	February 19, 1995	Hunter FGA9	Zimbabwe AF	Fatal (1)	Unknown
34.	July 14, 1994	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
35.	1994	Hunter T66	Lebanese AF	Nonfatal	Landing Accident
36.	June 13, 1993	Hunter T7	G-BTYL	Fatal (1)	LOC in Weather
37.	March 16, 1993	Hunter Mk. 58	Swiss AF	Nonfatal	Fuel Leak – Engine Flame-Out
38.	January 1993	Hunter Mk.58	Swiss AF	Nonfatal	Drag Chute Failure – Barrier (AND)
39.	July 9, 1992	Hunter T72	Chilean AF	Nonfatal	Engine Failure – Crash Landing

40.	February 17, 1992	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
41.	February 15, 1992	Hunter T8	Royal Navy	Nonfatal	Engine Failure/Fire
42.	October 9, 1991	Hunter Mk. 58	Swiss AF	Nonfatal	Overrun
43.	September 30, 1991	Hunter T8	Royal Navy	Nonfatal	Overrun (AND)
44.	September 16, 1991	Hunter FGA74	Singapore AF	Nonfatal	Mechanical Failure
45.	August 12, 1991	Hunter Mk. 58	Swiss AF	Nonfatal	Bird Strike
46.	June 27, 1991	Hunter Mk. 58	Swiss AF	Nonfatal	Collision With Trees (AND)
47.	May 13, 1990	Hunter T7	G-BOOM	Nonfatal	Elevator Malfunction - Emergency Landing/Gear Failure (AND)
48.	April 7, 1991	Hunter FGA73	Oman AF	Unknown	Unknown
49.	March 23, 1991	Hunter Mk. 72	Chilean AF	Unknown	Unknown
50.	April 10, 1990	Hunter T8	Royal Navy	Nonfatal	Jammed Aileron (Pin Failure in Hydraulic Jack)
51.	February 21, 1990	Hunter T8	Royal Navy	Nonfatal	Landing Gear Failure on Landing (AND)
52.	January 16, 1990	Hunter T66	Oman AF	Nonfatal	Engine Failure
53.	October 20, 1989	Hunter Mk. 58	Swiss AF	Fatal (1)	Hit Mountain During Maneuvering
54.	September 14, 1989	Hunter Mk. 58	Swiss AF	Nonfatal	Mid-Air With Model Aircraft (AND)
55.	September 8, 1989	Hunter FGA9	Zimbabwe AF	Unknown	Unknown
56.	June 19, 1989	Hunter FGA9	Zimbabwe AF	Fatal (1)	Unknown
57.	September 18, 1988	Hunter FGA76	Somalia AF	Nonfatal	Engine Failure
58.	August 25, 1988	Hunter FGA73	Oman AF	Nonfatal	Engine Failure
59.	August 16, 1988	Hunter FGA73	Oman AF	Unknown	Unknown
60.	June 14, 1988	Hunter GA11	Royal Navy	Nonfatal	Engine Failure
61.	May 25, 1988	Hunter FGA74	Singapore AF	Nonfatal	Unknown
62.	April 28, 1988	Hunter FGA76	Somalia AF	Nonfatal	Landing Gear Door Failure (Did not Extend)
63.	July 21, 1987	Hunter Mk. 58	Swiss AF	Nonfatal	Engine Failure
64.	March 31, 1987	Hunter T7	RAF	Nonfatal	Technical Malfunction – Emergency Landing (AND)
65.	March 26, 1987	Hunter Mk. 58	Swiss AF	Nonfatal	LOC (Maneuvering)
66.	July 2, 1986	Hunter Mk. 58	Swiss AF	Nonfatal	LOC (Maneuvering)
67.	April 29, 1986	Hunter T7	G-BOOM	Nonfatal	Overrun (AND)
68.	April 27, 1986	Hunter FGA73	Oman AF	Fatal (1)	Hit the Ground at Low Level
69.	April 23, 1986	Hunter Mk. 58	Swiss AF	Fatal (1)	Hit Mountain During Maneuvering
70.	January 18, 1986	Hunter GA11	Royal Navy	Nonfatal	In-Flight Separation of Radio Panel (AND)
71.	November 29, 1985	Hunter GA11	Royal Navy	Nonfatal	Birds Strike
72.	June 7, 1985	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
73.	May 25, 1985	Hunter Mk. 51	G-HUNT	Nonfatal	Brake Failure – Burst Tire – Runway Excursion (AND)
74.	May 3, 1985	Hunter T8	Royal Navy	Nonfatal	Tail Strike (AND)
75.	January 11, 1985	Hunter Mk. 58	Swiss AF	Fatal (1)	LOC on Go-Around
76.	October 31, 1984	Hunter T8	Royal Navy	Fatal (1)	Hit the Sea – Pilot Disorientation
77.	October 17, 1984	Hunter Mk. 58	Swiss AF	Fatal (1)	Mid-Air (1st Aircraft)
78.	October 17, 1984	Hunter Mk. 58	Swiss AF	Fatal (1)	Mid-Air (2nd Aircraft)
79.	October 1, 1984	Hunter GA11	Royal Navy	Nonfatal	Overrun (AND)
80.	July 27, 1984	Hunter T7	RAF	Nonfatal	Gear-Up Landing
81.	June 11, 1984	Hunter T7	G-BOOM	Nonfatal	Landing Gear Leg Damaged on Landing (AND)
82.	June 3, 1984	Hunter Mk. 51	G-HUNT	Nonfatal	Bird Strike (AND)
83.	March 8, 1984	Hunter Mk. 58	Swiss AF	Nonfatal	Mid-Air (1st Aircraft)

84.	March 8, 1984	Hunter Mk. 58	Swiss AF	Nonfatal	Mid-Air (2nd Aircraft)
85.	March 7, 1984	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
86.	February 28, 1984	Hunter T7	RAF	Nonfatal	Landing Accident
87.	August 9, 1983	Hunter T68	Swiss AF	Fatal (2)	LOC on Final
88.	July 23, 1983	FGA71	Chilean AF	Nonfatal	Landing Gear Failure – Runway Excursion
89.	June 24, 1983	Hunter Mk. 51	G-HUNT	Nonfatal	Lightning Strike – ASI Failure (AND)
90.	June 16, 1983	Hunter GA11	Royal Navy	Nonfatal	Engine Failure on Final
91.	May 16, 1983	Hunter GA11	Royal Navy	Nonfatal	Engine Failure
92.	May 17, 1983	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
93.	December 16, 1982	Hunter T8	Royal Navy	Fatal (1)	LOC at Low Altitude (Possible Flight Control Failure)
94.	December 15, 1982	Hunter T8	Royal Navy	Nonfatal	Tail Strike (AND)
95.	August 23, 1982	Hunter Mk.58	Swiss AF	Fatal (2)	Engine Failure – Two Children Killed on the Ground
96.	August 19, 1982	Hunter GA11	Royal Navy	Nonfatal	Nose-Gear Failure
97.	August 5, 1982	Hunter T7	RAF	Nonfatal	Engine Failure (Compressor Blade Separation)
98.	July 27, 1982	Hunter FGA80	Kenyan AF	Nonfatal	Unknown
99.	July 25, 1982	Hunter FGA9	Zimbabwe AF	Unknown	Unknown
100.	May 20, 1982	Hunter FGA9	Chilean AF	Unknown	Unknown
101.	May 13, 1982	Hunter FGA9	RAF	Nonfatal	Engine Failure and Fire (Turbine Failure)
102.	March 17, 1982	Hunter T12	RAF	Nonfatal	Engine Failure (Exploded on Take-Off)
103.	December 1, 1981	Hunter T7	RAF	Nonfatal	Engine Failure (Engine Loss Power on Take-Off)
104.	October 21, 1981	Hunter T7	RAF	Nonfatal	Spin
105.	August 16, 1981	Hunter Mk. 51	G-HUNT	Nonfatal	Brake Failure – Overrun (AND)
106.	August 14, 1981	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
107.	July 10, 1981	Hunter Mk. 58	Swiss AF	Fatal (1)	Collision with Trees and Terrain on Approach
108.	April 3, 1981	Hunter FGA9	RAF	Nonfatal	Fuel Leak – Engine Flame-Out (Ruptured Seal)
109.	March 17, 1981	Hunter GA11	RN	Nonfatal	Engine Failure
110.	March 10, 1981	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
111.	February 23, 1981	Hunter FGA9	RAF	Fatal (1)	LOC – Maneuvering
112.	January 12, 1981	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
113.	August 18, 1980	Hunter GA11	Royal Navy	Nonfatal	Bird Strike – Emergency Landing
114.	August 7, 1980	Hunter Mk. 58	Swiss AF	Nonfatal	Engine Failure (AND – Dead Stick Landing)
115.	May 29, 1980	Hunter T7	RAF	Nonfatal	Engine Failure – Fuel System Malfunction
116.	May 28, 1980	Hunter T7	RAF	Nonfatal	LOC (Incorrect Use of Flaps at High-Speed)
117.	March 26, 1980	Hunter T72	Chilean AF	Unknown	Gear-Up Landing
118.	March 20, 1980	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
119.	February 12, 1980	Hunter FGA9	RAF	Fatal	Flew Into Mountain in Cloud
120.	November 17, 1979	Hunter GA11	Royal Navy	Nonfatal	In-Flight Fire
121.	November 1, 1979	Hunter FGA9	Rhodesian AF	Fatal (1)	Flew Into the Ground
122.	October 3, 1979	Hunter FGA9	Rhodesian AF	Unknown	Unknown
123.	July 6, 1979	Hunter F6	RAF	Nonfatal	Engine Failure
124.	July 3, 1979	Hunter FGA9	RAF	Fatal (1)	LOC at Low Altitude
125.	May 11, 1979	Hunter Mk. 58	Swiss AF	Fatal	Crashed Into Lake During low Altitude Flight
126.	March 14, 1979	Hunter FGA9	RAF	Nonfatal	Engine Failure
127.	November 16, 1978	Hunter FGA9	RAF	Nonfatal	Bird Strike *AND)

128.	May 24, 1978	Hunter T8	Royal Navy	Nonfatal	Engine Exploded After Take-Off
129.	December 15, 1977	Hunter Mk. 58	Swiss AF	Nonfatal	LOC Due to Jet Wash
130.	September 18, 1977	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
131.	September 8, 1977	Hunter T7	RAF	Nonfatal	Engine Failure
132.	October 25, 1976	Hunter FGA9	RAF	Nonfatal	Engine Failure
133.	September 21, 1976	Hunter T8	Royal Navy	Nonfatal	Engine Failure
134.	August 16, 1976	Hunter F6	RAF	Fatal (1)	LOC
135.	June 22, 1976	Hunter T7	RAF	Nonfatal	Engine Failure (FOD)
136.	June 13, 1976	Hunter T8	Royal Navy	Nonfatal	Barrier Arrestment – Landing Gear Torn Off (AND)
137.	April 29, 1976	Hunter Mk.58	Swiss AF	Unknown	Unknown (Crashed)
138.	April 21, 1976	Hunter F6	RAF	Nonfatal	In-Flight Fire (Wing Root)
139.	May 4, 1976	Hunter FGA9	RAF	Fatal (1)	LOC in Weather
140.	May 13, 1977	Hunter FGA9	RAF	Nonfatal	Engine Fire
141.	1977	Hunter Mk. 78	Qatari AF	Unknown	Unknown
142.	October 25, 1976	Hunter FGA9	RAF	Fatal (1)	Engine Fire on Take-Off (Failed Ejection)
143.	September 30, 1976	Hunter T66	Oman AF	Fatal (2)	Brake failure – Drag Chute Failure – Ejection Seat Failure
144.	September 21, 1976	Hunter T8	Royal Navy	Nonfatal	Engine Failure
145.	September 21, 1976	Hunter T8	Royal Navy	Nonfatal	Engine Failure After Take-Off
146.	August 16, 1976	Hunter F6	RAF	Fatal (1)	LOC
147.	June 22, 1976	Hunter T7	RAF	Nonfatal	Engine Failure
148.	May 4, 1976	Hunter FGA9	RAF	Fatal (1)	LOC in Weather
149.	April 26, 1976	Hunter Mk. 58	Swiss AF	Nonfatal	Hydraulic/Fuel Fire In-Flight
150.	April 22, 1976	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
151.	April 22, 1976	Hunter FGA71	Chilean AF	Nonfatal	Unknown
152.	April 21, 1976	Hunter F6	RAF	Nonfatal	Engine Fire Propagated to Left Wing Root
153.	January 28, 1976	Hunter T8	Royal Navy	Nonfatal	Landing Gear Collapse (AND)
154.	January 22, 1976	Hunter T7	RAF	Nonfatal	Engine Failure on Approach
155.	November 17, 1975	Hunter FGA73	Oman AF	Nonfatal	Engine Failure – Fire
156.	September 30, 1975	Hunter FGA71	Chilean AF	Nonfatal	Unknown (AND)
157.	June 1, 1975	Hunter Mk. 80	Kenyan AF	Fatal (1)l	LOC at Low Altitude (Acrobatics)
158.	June 1, 1975	Hunter T81	Kenyan AF	Nonfatal	Unknown
159.	September 1974	Hunter FGA9	RAF	Nonfatal	Fuel Leak (AND)
160.	July 4, 1974	Hunter FGA71	Chilean AF	Nonfatal	Gear-Up Landing (AND)
161.	June 17, 1974	Hunter FGA9	RAF	Nonfatal	Weather (Ejection)
162.	June 7, 1974	Hunter FGA9	RAF	Nonfatal	LOC in Weather
163.	February 19, 1974	Hunter FGA71	Chilean AF	Fatal (1)	Unknown (1st Aircraft)
164.	February 19, 1974	Hunter FGA71	Chilean AF	Fatal (1)	Unknown (2nd Aircraft)
165.	February 4, 1974	Hunter F6	RAF	Fatal (1)	Possible LOC in ACM
166.	November 2, 1973	Hunter T7	RAF	Fatal (2)	Low on Final
167.	October 22, 1973	Hunter FGA71	Chilean AF	Nonfatal	Unknown (AND)
168.	July 23, 1973	Hunter Mk. 56	Indian AF	Nonfatal	Engine Failure
169.	July 27, 1973	Hunter F6	RAF	Nonfatal	Engine Failure (Possible False Warning)
170.	July 7, 1973	Hunter F6	RAF	Nonfatal	Spurious Fire Warning
171.	June 5, 1973	Hunter FGA9	RAF	Nonfatal	Engine Failure

172.	April 6, 1973	Hunter FGA9	RAF	Nonfatal	In-Flight Fire
173.	April 4, 1973	Hunter FGA9	RAF	Nonfatal	Hit TV Antennae
174.	March 8, 1973	Hunter Mk. 51	Danish AF	Nonfatal	Unknown
175.	January 29, 1973	Hunter FGA71	Chilean AF	Nonfatal	Unknown (AND)
176.	January 24, 1973	Hunter FGA71	Chilean AF	Nonfatal	Mechanical Failure
177.	1973	Hunter FGA9	Rhodesian AF	Nonfatal	Accidental Ejection Ground (Seriously Injuring Mechanic)
178.	1973	Hunter FGA9	Rhodesian AF	Nonfatal	Accidental Avpin (Starter) Ignition
179.	November 28, 1972	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
180.	November 28, 1972	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
181.	November 17, 1972	Hunter FA9	RAF	Nonfatal	Unknown
182.	November 15, 1972	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
183.	November 1, 1972	Hunter GA11	Royal Navy	Fatal (1)	Failed to Become Airborne on Take-Off – Overrun
184.	November 1972	Hunter Mk.74	Singapore AF	Unknown	Unknown
185.	October 17, 1972	Hunter T8	Royal Navy	Nonfatal	Engine Failure on Take-Off Run – Abort – (AND)
186.	October 10, 1972	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Failure (AND)
187.	October 2, 1972	Hunter GA11	Royal Navy	Nonfatal	Compressor Stall (AND)
188.	August 10, 1972	Hunter F6	RAF	Fatal (2)	Mid-Air (1st Aircraft) – Pilot and Person on the Ground
189.	August 10, 1972	Hunter F6	RAF	Nonfatal	Mid-Air (2nd Aircraft)
190.	July 20, 1972	Hunter T8	Royal Navy	Nonfatal	Tail Strike (AND)
191.	July 5, 1972	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Manual Reversion (AND)
192.	June 29, 1972	Hunter T8	Royal Navy	Nonfatal	Inadvertent Drag Chute Release After Take-Off – (AND)
193.	June 21, 1972	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
194.	June 19, 1972	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
195.	June 13, 1972	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (FCU) (AND)
196.	June 12, 1972	Hunter FGA71	Chilean AF	Nonfatal	Engine Failure
197.	June 6, 1972	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
198.	June 6, 1972	Hunter T8	Royal Navy	Nonfatal	Inadvertent in-Flight Dreg Deployment (AND)
199.	May 22, 1972	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Manual Reversion (AND)
200.	May 19, 1972	Hunter GA11	Royal Navy	Nonfatal	Engine Flame-Out (AND)
201.	May 11, 1972	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
202.	May 9, 1972	Hunter Mk. 58	Swiss AF	Nonfatal	Damaged in Emergency Landing (AND)
203.	May 9, 1972	Hunter T8	Royal Navy	Nonfatal	Engine malfunction on Take-Off Run – Abort (AND)
204.	May 9, 1972	Hunter GA11	Royal Navy	Nonfatal	ASI Malfunction (AND)
205.	May 8, 1972	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction – Overweight – Barrier (AND)
206.	April 26, 1972	Hunter T8	Royal Navy	Nonfatal	Inadvertent Hook Release on Take-Off (AND)
207.	April 12, 1972	Hunter Mk. 58	Swiss AF	Nonfatal	Mid-Air
208.	April 1, 1972	Hunter Mk.56	Indian AF	Nonfatal	Crashed on Final
209.	March 22, 1972	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
210.	March 17, 1972	Hunter T8	Royal Navy	Nonfatal	LOC Immediately After Take-Off (Suspected Aileron) (AND)
211.	March 14, 1972	Hunter T7	Royal Navy	Nonfatal	Engine Power Loss – Emergency Landing (AND)
212.	March 6, 1972	Hunter T8	Royal Navy	Nonfatal	Loss of Oil Pressure (AND)
213.	March 6, 1972	Hunter FGA71	Chilean AF	Nonfatal	Unknown (AND)
214.	February 11, 1972	Hunter T8	Royal Navy	Nonfatal	Aileron Malfunction (Restricted Movement) (AND)
215.	February 3, 1972	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)

216.	February 2, 1972	Hunter T8	Royal Navy	Nonfatal	Aileron Icing (AND)
217.	January 21, 1972	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (AND)
218.	January 19, 1972	Hunter GA11	Royal Navy	Nonfatal	Possible Engine FOD (AND)
219.	January 12, 1972	Hunter T8	Royal Navy	Nonfatal	Lateral Control Oscillations (AND)
220.	December 4, 1971	Hunter Mk. 56	Indian AF	Unknown	Unknown
221.	December 4, 1971	Hunter Mk. 56	Indian AF	Unknown	Unknown
222.	December 10, 1971	Hunter Mk. 56	Indian AF	Unknown	Unknown
223.	December 10, 1971	Hunter Mk. 56	Indian AF	Unknown	Unknown
224.	December 12, 1971	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
225.	December 12, 1971	Hunter Mk. 56	Indian AF	Unknown	Unknown
226.	November 23, 1971	Hunter GA11	Royal Navy	Nonfatal	Smoke in the Cockpit (AND)
227.	November 18, 1971	Hunter T8	Royal Navy	Nonfatal	Loss of Engine Power on Climb - (AND)
228.	November 8, 1971	Hunter T7	RAF	Fatal (2)	Possible CFIT
229.	October 19, 1971	Hunter FGA71	Chilean AF	Fatal(1)	Unknown
230.	October 9, 1971	Hunter FGA9	RAF	Fatal (1)	Landing With One Main Retracted – Overrun
231.	September 16, 1971	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
232.	September 14, 1971	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Low rpm) (AND)
233.	August 31, 1971	Hunter GA11	Royal Navy	Nonfatal	Engine Loss of Power in Dive (AND)
234.	August 27, 1971	Hunter F6	RAF	Nonfatal	Jammed Ailerons
235.	July 6, 1971	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (Leak) (AND)
236.	July 5, 1971	Hunter GA11	Royal Navy	Nonfatal	Inadvertent In-Flight External Fuel Tank Separation (AND)
237.	June 7, 1971	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
238.	May 24, 1971	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
239.	May 17, 1971	Hunter T7	RAF	Fatal (2)	Possible CFIT
240.	May 6, 1971	Hunter GA11	Royal Navy	Nonfatal	Oil Leak on Take-Off (AND)
241.	April 28, 1971	Hunter T8	Royal Navy	Nonfatal	Throttle Failure (AND)
242.	April 27, 1971	Hunter GA11	Royal Navy	Nonfatal	Mechanic Severely Injured by Closing Canopy (AND)
243.	April 24, 1971	Hunter T8	Royal Navy	Nonfatal	Flight Control Malfunction (AND)
244.	April 19, 1971	Hunter FGA71	Chilean AF	Fatal (1)	Possible LOC
245.	March 23, 1971	Hunter GA11	Royal Navy	Nonfatal	Flight Control Malfunction During Dive (AND)
246.	March 19, 1971	Hunter F6	RAF	Fatal (1)	In-Flight Explosion
247.	February 23, 1971	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
248.	February 17, 1971	Hunter T8	Royal Navy	Nonfatal	Flight Control Malfunction (AND)
249.	February 16, 1971	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Vibrations) Bird Strike (AND)
250.	February 15, 1971	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction – Vibration (AND)
251.	February 8, 1971	Hunter T8	Royal Navy	Nonfatal	Landing Gear Failure (Sheared Off) (AND)
252.	January 29, 1971	Hunter T8	Royal Navy	Nonfatal	Fuel Leak (AND)
253.	January 27, 1971	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
254.	January 25, 1971	Hunter GA11	Royal Navy	Nonfatal	Instrumentation Failure (Pitot) (AND)
255.	January 20, 1971	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
256.	January 15, 1971	Hunter GA11	Royal Navy	Nonfatal	PIO on Landing (Flaps Up) (AND)
257.	January 15, 1971	Hunter GA11	Royal Navy	Nonfatal	Fast Landing – Barrier (AND)
258.	January 8, 1971	Hunter GA11	Royal Navy	Nonfatal	Jammed Aileron (AND)
259.	1971	Hunter FGA76	Abu Dhabi AF	Unknown	Unknown

260.	December 19, 1970	Hunter T66	Indian AF	Nonfatal	Engine Failure on Go-Around
261.	November 19, 1970	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
262.	November 13, 1970	Hunter T8	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
263.	October 28, 1970	Hunter FGA9	Rhodesian AF	Nonfatal	Engine Failure – Broken Fuel Line
264.	October 28, 1970	Hunter T8	Royal Navy	Nonfatal	Aileron Malfunction (Stiffened) - (AND)
265.	October 19, 1970	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction – Vibration (AND)
266.	September 22, 1970	Hunter GA11	Royal Navy	Fatal (1)	Pilot Disorientation in Weather – Crashed Into a Hillside
267.	September 15, 1970	Hunter Mk. 51	Danish AF	Nonfatal	Unknown (1st Aircraft)
268.	September 10, 1970	Hunter T8	Royal Navy	Nonfatal	LOC on Landing – Crosswind (AND)
269.	September 10, 1970	Hunter T8	Royal Navy	Nonfatal	Tail Plane Trim Failure (AND)
270.	July 30, 1970	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
271.	July 13, 1970	Hunter T72	Chilean AF	Fatal (2)	Mid-Air (1st Aircraft)
272.	July 13, 1970	Hunter FGA71	Chilean AF	Fatal (1)	Mid-Air (2nd aircraft)
273.	July 13, 1970	Hunter FGA71	Chilean AF	Fatal (1)	Unknown
274.	July 13, 1970	Hunter Mk. 56	Indian AF	Fatal (15)	Crashed Into Train Station – Killed 15 on the Ground
275.	July 2, 1970	Hunter T8	Royal Navy	Nonfatal	In-Flight Panel Separation (AND)
276.	June 30, 1970	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
277.	June 24, 1970	Hunter GA11	Royal Navy	Nonfatal	In-Flight External Fuel Tank Failure (AND)
278.	June 16, 1970	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
279.	May 13, 1970	Hunter T8	Royal Navy	Nonfatal	Both Main Tires Burst (AND)
280.	May 4, 1970	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction (AND)
281.	April 29, 1970	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
282.	April 24, 1970	Hunter T8	Royal Navy	Nonfatal	Aborted Take-Off (Oil Pressure Drop) (AND)
283.	March 19, 1970	Hunter FR10	RAF	Nonfatal	Engine Failure
284.	March 19, 1970	Hunter T8	Royal Navy	Nonfatal	Loss of Engine Power – Emergency Landing (AND)
285.	March 16, 1970	Hunter GA11	Royal Navy	Nonfatal	Engine Flame-Out (AND)
286.	March 16, 1970	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (1st Aircraft)
287.	March 16, 1970	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (2nd Aircraft)
288.	March 11, 1970	Hunter T7	Royal Navy	Nonfatal	Wheel Separated In-Flight – Gear-Up Landing (AND)
289.	February 16, 1970	Hunter GA11	Royal Navy	Nonfatal	LOC on landing – Burst Tire (AND)
290.	February 12, 1970	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction on Take-Off – Abort (AND)
291.	February 9, 1970	Hunter Mk.58	Swiss AF	Nonfatal	Gear-Up Landing
292.	February 2, 1970	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
293.	1970	Hunter Mk.57	Kuwait AF	Unknown	Unknown
294.	November 29, 1969	Hunter FR10	RAF	Nonfatal	Landing Accident (AND) (1st Aircraft)
295.	November 29, 1969	Hunter FR10	RAF	Unknown	Landing Accident (AND) (2nd Aircraft)
296.	November 27, 1969	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
297.	November 24, 1969	Hunter T7	Royal Navy	Nonfatal	Major Fuel Leak While Refueling (AND)
298.	November 20, 1969	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
299.	November 13, 1969	Hunter GA11	Royal Navy	Nonfatal	Jumped Chocks on Run-Up – Injured Ground Crew (AND)
300.	November 1969	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
301.	October 31, 1969	Hunter T8	Royal Navy	Nonfatal	Engine Failure/Fire
302.	October 27, 1969	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
303.	October 15, 1969	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)

304.	October 14, 1969	Hunter GA11	Royal Navy	Nonfatal	Inadvertent External Tank Separation (Maintenance) (AND)
305.	October 6, 1969	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (1st Aircraft)
306.	October 6, 1969	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (2nd Aircraft)
307.	October 6, 1969	Hunter FR10	RAF	Nonfatal	Engine Malfunction (AND)
308.	September 29, 1969	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
309.	September 25, 1969	Hunter T8	Royal Navy	Nonfatal	Engine Failure on Take-Off Run – Abort (AND)
310.	August 15, 1969	Hunter F6	RAF	Fatal (1)	After Take-Off Crash
311.	July 11, 1969	Hunter Mk. 56	Indian AF	Nonfatal	Engine Explosion on Take-Off
312.	June 16, 1969	Hunter FGA	RAF	Unknown	Unknown
313.	June 5, 1969	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
314.	May 21, 1969	Hunter FGA9	RAF	Fatal (1)	Dived into the Sea at Low
315.	May 20, 1969	Hunter Mk. 58	Swiss AF	Fatal (1)	LOC
316.	May 9, 1969	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Manual reversion (AND)
317.	May 1, 1969	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
318.	April 9, 1969	Hunter FGA9	RAF	Nonfatal	Nose Gear Failure (AND)
319.	April 2, 1969	Hunter FGA9	RAF	Nonfatal	Engine Failure – Loss of Hydraulics on Approach
320.	March 31, 1969	Hunter T8	Royal Navy	Nonfatal	Engine Failure – Compressor Failure
321.	March 24, 1969	Hunter T8	Royal Navy	Nonfatal	Engine Vibrations (AND)
322.	March 21, 1969	Hunter T8	Royal Navy	Nonfatal	Wheel Separated From landing Leg After Landing (AND)
323.	March 3, 1969	Hunter GA11	Royal Navy	Fatal (1)	Flew Into the Ground at Low Level
324.	March 1, 1969	Hunter Mk. 56	Indian AF	Nonfatal	Landing Accident
325.	February 25, 1969	Hunter T8	Royal Navy	Nonfatal	Drogue Chute Fired Through Canopy on the Ground (AND)
326.	February 4, 1969	Hunter FGA9	RAF	Nonfatal	Hydraulic Failure – Engine Loss of Power
327.	February 3, 1969	Hunter FGA9	RAF	Unknown	Spurious Fire Warning
328.	January 31, 1969	Hunter T8	Royal Navy	Nonfatal	Loss of Engine Power (AND)
329.	January 30, 1969	Hunter T8C	Royal Navy	Nonfatal	Engine FOD – (Weapons Related)
330.	January 20, 1969	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction (AND)
331.	January 15, 1969	Hunter FGA9	RAF	Fatal (1)	LOC (Incorrect Use of Flaps at High-Speed)
332.	1969	Hunter FR10	RAF	Nonfatal	Engine Fire After Take-Off (AND)
333.	1969	Hunter FR10	RAF	Nonfatal	Ground Crew Injured by Closing (De-Clutched) Canopy (AND)
334.	1969	Hunter F6	Saudi AF	Unknown	Unknown
335.	1969	Hunter FR10	RAF	Nonfatal	Engine Failure (Compressor Blades) (AND)
336.	1969	HunterFR10	RAF	Nonfatal	Multiple Bird Strikes (AND)
337.	December 6, 1968	Hunter FGA9	RAF	Nonfatal	Brake Failure Overrun on Landing
338.	November 28, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (1st Aircraft)
339.	November 28, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (2nd Aircraft)
340.	November 6, 1968	Hunter T8	Royal Navy	Fatal (1)	Low Altitude Aerobatics
341.	September 27, 1968	Hunter GA11	Royal Navy	Nonfatal	Damaged by Arresting Cable (AND)
342.	September 27, 1968	Hunter GA11	Royal Navy	Nonfatal	LOC on Wet Runway – Arresting Cables (AND)
343.	September 16, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
344.	September 6, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (1st Aircraft)
345.	September 6, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND) (2nd Aircraft)
346.	September 5, 1968	Hunter GA11	Royal Navy	Nonfatal	Inadvertent Canopy Closure Injuring Ground Crew (AND)
347.	August 27, 1968	Hunter GA11	Royal Navy	Nonfatal	In-Flight Canopy Disintegration (AND)

348.	August 24, 1968	Hunter FGA71	Chilean AF	Nonfatal	External Fuel Transfer Problem (AND)
349.	August 3, 1968	Hunter T72	Chilean AF	Nonfatal	Tire Burst on Landing – Gear Failure (AND)
350.	August 1, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
351.	August 1968	Hunter T7	RAF	Nonfatal	Engine Flame-Out (AND)
352.	July 22, 1968	Hunter FGA9	RAF	Nonfatal	Hydraulics – Landing Gear Failure/Flight Controls
353.	July 17, 1968	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
354.	July 15, 1968	Hunter T7	RAF	Nonfatal	Spin (Inverted Spin)
355.	July 12, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
356.	July 7, 1968	Hunter T8	Royal Navy	Nonfatal	Inadvertent Partial Ejection in Cockpit (AND)
357.	June 27, 1968	Hunter T8	Royal Navy	Nonfatal	Throttle Failure on Landing (Will Not Retard) (AND)
358.	June 26, 1968	Hunter FGA9	RAF	Nonfatal	Engine Failure (1st Aircraft)
359.	June 26, 1968	Hunter FGA9	RAF	Nonfatal	Engine Failure (2nd Aircraft)
360.	June 12, 1968	Hunter T8	Royal Navy	Nonfatal	Loss of Engine Power on take-Off – Abort (AND)
361.	June 11, 1968	Hunter T72	Chilean AF	Nonfatal	Gear-Up Landing
362.	June 10, 1968	Hunter T8	Royal Navy	Nonfatal	Smoke in the Cockpit (Electric) (AND)
363.	May 29, 1968	Hunter T8	Royal Navy	Nonfatal	Engine Gage Failure (Disconnected Tach Generator) (AND)
364.	May 28, 1968	Hunter GA11	Royal Navy	Nonfatal	Inadvertent External Fuel Tank Separation (Ground) (AND)
365.	May 23, 1968	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
366.	May 22, 1968	Hunter T8	Royal Navy	Fatal (1)	Engine Failure – Failed Arrestment – Overrun
367.	May 22, 1968	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (AND)
368.	May 14, 1968	Hunter T7A	RAF	Fatal (2)	Dived Into the Ground After Take-Off
369.	May 6, 1968	Hunter FGA9	RAF	Nonfatal	Hit Radio Antennae
370.	April 19, 1968	Hunter GA11	Royal Navy	Nonfatal	Nose Wheel Shimmy – Tire Burst (AND)
371.	April 18, 1968	Hunter Mk. 58	Swiss AF	Fatal (2)	Hit Terrain – Person Killed on the Ground
372.	March 18, 1968	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure – Landing Gear (AND)
373.	March 12, 1968	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
374.	March 11, 1968	Hunter GA11	Royal Navy	Nonfatal	Fouled Exhaust Cone Aft of LP Turbine (AND)
375.	March 5, 1968	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
376.	March 5, 1968	Hunter GA11	Royal Navy	Nonfatal	LOC – Smoke in the Cockpit (Gunsight) – Barrier (AND)
377.	February 8, 1968	Hunter T8	Royal Navy	Nonfatal	Lightning Strike (AND)
378.	January 26, 1968	Hunter T8	Royal Navy	Nonfatal	Engine Failure on Take-Off
379.	January 22, 1968	Hunter T8	Royal Navy	Nonfatal	Engine Failure on Take-Off Run (FOD) – Abort (AND)
380.	January 3, 1968	Hunter T8	Royal Navy	Nonfatal	Compressor Stall on Go-Around (AND)
381.	1968	Hunter FR10	RAF	Nonfatal	Engine FOD (AND)
382.	December 15, 1967	Hunter T8	Royal Navy	Nonfatal	Mid-Air (1st Aircraft)
383.	December 15, 1967	Hunter T8	Royal Navy	Nonfatal	Mid-Air (2nd Aircraft)
384.	December 13, 1967	Hunter T8	Royal Navy	Nonfatal	Throttle Failure on Go-Around (AND)
385.	December 13, 1967	Hunter GA11	Royal Navy	Nonfatal	Tire Failure (AND)
386.	December 5, 1967	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
387.	November 28, 1967	Hunter T8	Royal Navy	Nonfatal	Total Hydraulic Failure on Approach
388.	November 27, 1967	Hunter GA11	Royal Navy	Nonfatal	Brake Failure – Barrier (AND)
389.	November 22, 1967	Hunter T8	Royal Navy	Nonfatal	Inadvertent In-Flight Drag Chute Deployment (AND)
390.	November 21, 1967	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
391.	November 20, 1967	Hunter FGA9	RAF	Fatal (1)	Flew Into the Ground at Low Level

392.	November 3, 1967	Hunter T8	Royal Navy	Nonfatal	Loss of Hydraulic Fluid – Drag Chute Streamed (AND)
393.	November 1, 1967	Hunter GA11	Royal Navy	Nonfatal	Severe Rudder Vibrations (AND)
394.	October 6, 1967	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Vibrations) (AND)
395.	September 27, 1967	Hunter T8	Royal Navy	Nonfatal	In-Flight Inadvertent Drag Chute Release (AND)
396.	September 7, 1967	Hunter T8	Royal Navy	Nonfatal	LOC While Taxing (AND)
397.	September 4, 1967	Hunter F6	RAF	Fatal (1)	Dove Into the Ground
398.	September 1, 1967	Hunter GA11	Royal Navy	Nonfatal	Elevator Malfunction (AND)
399.	August 25, 1967	Hunter T8	Royal Navy	Nonfatal	Fast on Touchdown – Drag Chute Failure – Overrun (AND)
400.	August 3, 1967	Hunter F6	RAF	Unknown	Engine Failure at Night During Emergency Approach
401.	July 21, 1967	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
402.	July 21, 1967	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure on Take-Off – Abort – Barrier (AND)
403.	July 19, 1967	Hunter T8	Royal Navy	Unknown	Spin at 18,000 Feet
404.	July 17, 1967	Hunter Mk.51	Swedish AF	Unknown	Unknown
405.	June 23, 1967	Hunter F8	Royal Navy	Nonfatal	Heavy Landing (AND)
406.	June 13, 1967	Hunter T8	Royal Navy	Nonfatal	Engine Flame Out (AND)
407.	June 12, 1967	Hunter GA11	Royal Navy	Nonfatal	Tail Strike (AND)
408.	June 10, 1967	Hunter FR10	RAF	Nonfatal	Loss of Engine Power on Take-Off (AND)
409.	June 8, 1967	Hunter GA11	Royal Navy	Nonfatal	Inadvertent Jettison of External Fuel Tanks (Run-Up) (AND)
410.	June 5, 1967	Hunter FGA9	Iraqi AF	Fatal	Take-Off Accident
411.	May 15, 1967	Hunter F6	RAF	Nonfatal	Mid-Air (1st Aircraft)
412.	May 15, 1967	Hunter F6	RAF	Nonfatal	Mid-Air (2nd Aircraft)
413.	May 9, 1967	Hunter GA11	Royal Navy	Nonfatal	Smoke in the Cockpit (AND)
414.	May 5, 1967	Hunter T8	Royal Navy	Nonfatal	Failure to Rotate – Aborted Take-Off (AND)
415.	May 1967	Hunter T7	RAF	Nonfatal	Wheel Separation During Landing - Runway Excursion (AND)
416.	April 28, 1967	Hunter T8	Royal Navy	Nonfatal	Brake Failure on Landing (AND)
417.	April 27, 1967	Hunter FGA9	RAF	Fatal (1)	LOC at Night
418.	April 18, 1967	Hunter Mk.50	Swedish AF	Unknown	Unknown
419.	April 18, 1967	Hunter FGA9	RAF	Nonfatal	Mid-Air (1st Aircraft)
420.	April 18, 1967	Hunter FGA9	RAF	Nonfatal	Mid-Air (2nd Aircraft) (AND)
421.	March 31, 1967	Hunter GA11	Royal Navy	Fatal (1)	Unknown (AND)
422.	March 29, 1967	Hunter T8	Royal Navy	Nonfatal	Throttle Failure (AND)
423.	March 29, 1967	Hunter T8	Royal Navy	Nonfatal	FOD Damage on Engine Ground Run (AND)
424.	March 23, 1967	Hunter GA11	Royal Navy	Fatal (1)	Pilot Disorientation
425.	March 23, 1967	Hunter FGA9	RAF	Nonfatal	Engine Failure – Overrun
426.	March 1, 1967	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
427.	February 23, 1967	Hunter FGA9	RAF	Nonfatal	Engine Failure on Approach – Overrun
428.	February 20, 1967	Hunter FGA9	RAF	Nonfatal	Engine Failure
429.	February 20, 1967	Hunter FGA9	RAF	Nonfatal	Ground Fire – Starter Motor Failed to Disengage
430.	February 6, 1967	Hunter FGA9	RAF	Nonfatal	Damaged (Unknown) (AND)
431.	February 6, 1967	Hunter T8	Royal Navy	Nonfatal	ASI Failure (AND)
432.	February 1967	Hunter Mk.59	Iraqi AF	Nonfatal	Mid-Air (AND)
433.	January 23, 1967	Hunter FR10	RAF	Fatal (1)	CFIT
434.	January 12, 1967	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
435.	January 10, 1967	Hunter T8	Royal Navy	Nonfatal	Inadvertent Hook Release – Engaged Cable on TO (AND)

436.	1967	Hunter Mk. 71	Chilean AF	Nonfatal	Engine Failure
437.	1967	Hunter T7	RAF	Nonfatal	Landing Gear failure (One Main Retracted)
438.	December 30, 1966	Hunter FGA9	RAF	Nonfatal	Engine Failure in the Pattern – Crashed Into House
439.	December 30, 1966	Hunter T8	Royal Navy	Nonfatal	Fuel System Malfunction After Take-Off (AND)
440.	December 12, 1966	Hunter T8	Royal Navy	Nonfatal	Landing Gear Doors Failure During Ground Test (AND)
441.	December 12, 1966	Hunter GA11	Royal Navy	Nonfatal	ASI Failure on Take-Off – Abort (AND)
442.	December 8, 1966	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
443.	November 28, 1966	Hunter T8	Royal Navy	Nonfatal	Tail Strike (AND)
444.	November 25, 1966	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
445.	November 24, 1966	Hunter GA11	Royal Navy	Nonfatal	Inadvertent External Stores Release (AND)
446.	November 22, 1966	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
447.	October 26, 1966	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
448.	October 25, 1966	Hunter GA11	Royal Navy	Nonfatal	Throttle Malfunction (AND)
449.	October 24, 1966	Hunter T8	Royal Navy	Nonfatal	Loss of Engine Power (AND)
450.	October 23, 1966	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
451.	October 16, 1966	Hunter GA11	Royal Navy	Nonfatal	ASI Failure on Take-Off Abort (Static Leak) (AND)
452.	October 12, 1966	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Severe Vibration) (AND)
453.	October 7, 1966	Hunter Mk.50	Swedish AF	Unknown	Unknown
454.	October 5, 1966	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
455.	October 3, 1966	Hunter Mk.50	Swedish AF	Unknown	Unknown
456.	September 29, 1966	Hunter T8	Royal Navy	Fatal(1)	Engine Fire – Failed Ejection
457.	September 27, 1966	Hunter T8	Royal Navy	Nonfatal	Elevator Failure (AND)
458.	September 8, 1966	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction – Low Pressure Turbine Blade (AND)
459.	September 3, 1966	Hunter FR10	RAF	Nonfatal	Heavy landing – Brake Failure – Overrun (AND)
460.	August 29, 1966	Hunter	Kuwait AF	Fatal (1)	Unknown
461.	August 23, 1966	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Vibrations) (AND)
462.	July 28, 1966	Hunter T8	Royal Navy	Nonfatal	Throttle Failure – Aborted Touch-and-Go Take-Off (AND)
463.	July 25, 1966	Hunter T8	Royal Navy	Nonfatal	Panel Separation on the Ground – FOD Engine – (AND)
464.	July 21, 1966	Hunter T7	RNAF	Nonfatal	Unknown
465.	July 12, 1966	Hunter FGA9	RAF	Nonfatal	Engine Explosion on Start-Up
466.	July 12, 1966	Hunter T8	Royal Navy	Nonfatal	Failed to Rotate – Abort (AND)
467.	June 16, 1966	Hunter F6	RAF	Fatal	LOC – Dove
468.	June 14, 1966	Hunter Mk.51	Danish AF	Nonfatal	Unknown
469.	May 24, 1966	Hunter T8	Royal Navy	Nonfatal	Engine Compressor Stall (AND)
470.	May 20, 1966	Hunter GA11	Royal Navy	Nonfatal	Powered Elevator Failure (Broken Line) (AND)
471.	May 18, 1966	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (Broken Line) – Manual Reversion (AND)
472.	May 12, 1966	Hunter FR10	RAF	Nonfatal	Engine Loss of Power (FCU)
473.	May 9, 1966	Hunter FR10	RAF	Nonfatal	Bird Strike
474.	May 7, 1966	Hunter FGA9	RAF	Nonfatal	Fuel Starvation
475.	May 6, 1966	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
476.	April 21, 1966	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (Fluid Leak) (AND)
477.	April 21, 1966	Hunter T8	Royal Navy	Nonfatal	Inadvertent External Fuel Tanks Separation (Water) (AND)
478.	April 5, 1966	Hunter FGA9	RAF	Nonfatal	Overrun – Fuel Leak
479.	March 30, 1966	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (Cracked Line) (AND)

480.	March 28, 1966	Hunter T8	Royal Navy	Nonfatal	Total Hydraulic failure – Dual Generator Failure (AND)
481.	March 17, 1966	Hunter GA11	Royal Navy	Nonfatal	Throttle Malfunction (AND)
482.	March 15, 1966	Hunter T8	Royal Navy	Nonfatal	Bird Strike and Ingestion (AND)
483.	March 15, 1966	Hunter GA11	Royal Navy	Nonfatal	Defective Fuel Pressure Switch (AND)
484.	March 15, 1966	Hunter T8	Royal Navy	Nonfatal	Sequencer Valve Malfunction (AND)
485.	March 14, 1966	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (Leak on Elevator Control Unit) AND)
486.	March 8, 1966	Hunter GA11	Royal Navy	Nonfatal	Fire Warning on Take-Off – Abort (AND)
487.	March 7, 1966	Hunter T8	Royal Navy	Nonfatal	Complete Hydraulic Failure (AND)
488.	February 25, 1966	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
489.	February 10, 1966	Hunter T8	Royal Navy	Nonfatal	Flight Control Runaway (TO) (Moisture in the System) (AND)
490.	January 28, 1966	Hunter GA11	Royal Navy	Nonfatal	Throttle Malfunction – Abort – Barrier (AND)
491.	January 20, 1966	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
492.	January 18, 1966	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
493.	January 14, 1966	Hunter GA11	Royal Navy	Nonfatal	Brake Failure – Overrun (AND)
494.	January 12, 1966	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
495.	December 14, 1965	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Manual Reversion (AND)
496.	December 12, 1965	Hunter GA11	Royal Navy	Nonfatal	Wake Turbulence on Landing – Tail Strike (AND)
497.	December 7, 1965	Hunter GA11	Royal Navy	Nonfatal	Tire Burst on Wet Runway (AND)
498.	November 23, 1965	Hunter T8C	Royal Navy	Fatal (1)	Engine Fire
499.	November 19, 1965	Hunter Mk.50	Swedish AF	Unknown	Crash on Take-Off
500.	November 11, 1965	Hunter T8	Royal Navy	Nonfatal	Engine malfunction – Compressor Damage (AND)
501.	November 10, 1966	Hunter GA11	Royal Navy	Nonfatal	LOC on Landing (Aquaplaning) (AND)
502.	November 5, 1965	Hunter T8	Royal Navy	Nonfatal	In-Flight Panel Separation (AND)
503.	November 2, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
504.	October 25, 1965	Hunter GA11	Royal Navy	Nonfatal	Mid-Air (1st Aircraft)
505.	October 25, 1965	Hunter GA11	Royal Navy	Nonfatal	Mid-Air (2nd Aircraft)
506.	October 21, 1965	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Vibrations) (AND)
507.	October 21, 1965	Hunter Mk. 58	Swiss AF	Fatal (1)	Canopy Misted
508.	October 14, 1965	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
509.	October 11, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
510.	October 1, 1965	Hunter GA11	Royal Navy	Nonfatal	Tire Burst – Runway Excursion (AND)
511.	September 28, 1965	Hunter GA11	Royal Navy	Nonfatal	Birds Strike (AND)
512.	September 21, 1965	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
513.	September 22, 1965	Hunter Mk. 56	Indian AF	Unknown	Unknown
514.	September 21, 1965	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
515.	September 21, 1965	Hunter GA11	Royal Navy	Nonfatal	Fuel Leak on Take-Off – Abort (AND)
516.	September 20, 1965	Hunter Mk. 56	Indian AF	Unknown	Unknown
517.	September 18, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
518.	September 14, 1965	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
519.	September 14, 1965	Hunter Mk. 56	Indian AF	Nonfatal	Unknown
520.	September 9, 1965	Hunter Mk. 56	Indian AF	Nonfatal	Mid-Air (1st Aircraft)
521.	September 9, 1965	Hunter Mk. 56	Indian AF	Fatal (1)	Mid-Air (2nd Aircraft)
522.	September 9, 1965	Hunter Mk. 56	Indian AF	Nonfatal	Engine Failure – Booster Pump Failure
523.	September 7, 1965	Hunter Mk.56	Indian AF	Nonfatal	Fuel System Failure – Flame-Out

524.	September 6 ,1965	Hunter Mk. 56	Indian AF	Unknown	Unknown
525.	September 6, 1965	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (AND) (1st Aircraft)
526.	September 6, 1965	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (AND) (2nd Aircraft)
527.	August 31, 1965	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
528.	August 15, 1965	Hunter T66	Jordanian AF	Unknown	Unknown
529.	August 5, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
530.	August 1, 1965	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction – Abort (AND)
531.	July 29, 1965	Hunter T8	Royal Navy	Nonfatal	LOC on the Ground – Brake Failure (AND)
532.	July 28, 1965	Hunter GA11	Royal Navy	Nonfatal	ASI Malfunction (AND)
533.	July 14, 1965	Hunter Mk.51	Danish AF	Nonfatal	Unknown
534.	July 8, 1965	Hunter T8	Royal Navy	Nonfatal	Brake Failure – Overrun (AND)
535.	July 6, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
536.	July 1, 1965	Hunter GA11	Royal Navy	Nonfatal	Tail Strike (AND)
537.	June 22, 1965	Hunter GA11	Royal Navy	Nonfatal	Flame-Out (AND)
538.	June 16, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
539.	June 10, 1965	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
540.	June 1, 1965	Hunter F6	RAF	Fatal (1)	Dived From Cloud Into the Sea
541.	May 25, 1965	Hunter T8	Royal Navy	Nonfatal	Inadvertent Canopy Jettison on TO – Abort – Cable (AND)
542.	May 25, 1965	Hunter T8	Royal Navy	Nonfatal	Brake Failure – Arrested Landing (AND)
543.	May 25, 1965	Hunter GA11	Royal Navy	Nonfatal	Hit on Take-Off by Canopy of Another Hunter (AND)
544.	May 18, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
545.	May 13, 1965	Hunter T8	Royal Navy	Nonfatal	Failed Cable Engagement – Overrun (AND)
546.	May 10, 1965	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction (AND)
547.	April 14, 1965	Hunter Mk.58	Swiss AF	Fatal (1)	Inadvertent Ejection Seat Firing – Killed Mechanic
548.	April 9, 1965	Hunter GA11	Royal Navy	Nonfatal	Wheel Separated on Landing (AND)
549.	April 6, 1965	Hunter T8	Royal Navy	Nonfatal	Hydraulics – Inadvertent Drag Chute Deployment (AND)
550.	April 2, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
551.	April 1, 1965	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (AND)
552.	April 1965	Hunter F6	Jordanian AF	Unknown	Unknown
553.	March 29, 1965	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Manual Reversion (AND)
554.	March 29, 1965	Hunter GA11	Royal Navy	Nonfatal	Throttle Malfunction (AND)
555.	March 29, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
556.	March 26, 1965	Hunter T8	RN	Nonfatal	Engine Failure on Take-Off
557.	March 25, 1965	Hunter Mk. 58	Swiss AF	Nonfatal	Ground Fire During Engine Run – Mechanic Injured
558.	March 24, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
559.	March 17, 1965	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Manual Reversion (AND)
560.	March 9, 1965	Hunter T8	Royal Navy	Nonfatal	Tire Burst on Landing (AND)
561.	March 5, 1965	Hunter Mk.51	Swedish AF	Unknown	Emergency Landing (New Engine Testing)
562.	February 18, 1965	Hunter T8	Royal Navy	Nonfatal	In-Flight Canopy Disintegration (AND)
563.	February 18, 1965	Hunter GA11	Royal Navy	Nonfatal	Hydraulic Failure (AND)
564.	February 16, 1965	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
565.	February 15, 1965	Hunter T8	Royal Navy	Nonfatal	In-Flight Fire After Take-Off
566.	February 10, 1965	Hunter T8	Royal Navy	Nonfatal	Brake Failure After Landing (AND)
567.	1965	Hunter FR10	RAF	Nonfatal	Engine Failure (AND)

568.	December 8, 1964	Hunter GA11	Royal Navy	Nonfatal	LOC While Taxing (AND)
569.	December 1, 1964	Hunter GA11	Royal Navy	Nonfatal	Undershoot - Tail Strike (AND)
570.	November 29, 1964	Hunter T8	Royal Navy	Nonfatal	Smoke in the Cockpit (AND)
571.	November 13, 1964	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
572.	November 12, 1964	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
573.	November 11, 1964	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
574.	October 29, 1964	Hunter T8	Royal Navy	Nonfatal	LOC During Taxing (AND)
575.	October 23, 1964	Hunter GA11	Royal Navy	Nonfatal	Burst Tire on Wet Runway (AND)
576.	October 23, 1964	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Malfunction (AND)
577.	October 19, 1964	Hunter FGA9	RAF	Fatal (1)	Spin
578.	October 16, 1964	Hunter FGA9	RAF	Fatal (1)	Flew Into the Sea
579.	October 1964	Hunter F6	RAF	Nonfatal	Overrun (AND)
580.	September 30, 1964	Hunter T8	Royal Navy	Nonfatal	Drag Chute Caught Fire on Landing (AND)
581.	September 20, 1964	Hunter Mk. 56	Indian AF	Nonfatal	Engine Failure
582.	September 19, 1964	Hunter FGA9	RAF	Fatal (1)	Flew Into the Sea in Low Visibility
583.	September 15, 1964	Hunter Mk.56	Indian AF	Nonfatal	Engine Flame-Out
584.	August 31, 1964	Hunter GA11	Royal Navy	Nonfatal	Engine Failure During Inverted Flight
585.	August 11, 1964	Hunter FGA9	RAF	Nonfatal	Engine Failure
586.	August 3, 1964	Hunter MK.50	Swedish AF	Unknown	Unknown
587.	July 29, 1964	Hunter F6	RNAF	Nonfatal	Bird Strike
588.	July 24, 1964	Hunter F6	RNAF	Nonfatal	Bird Strike
589.	July 16, 1964	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
590.	July 15, 1964	Hunter T7	Royal Navy	Nonfatal	Fuel Starvation (AND)
591.	July 10, 1964	Hunter GA11	Royal Navy	Nonfatal	Landing Gear Failure – Gear-Up (AND)
592.	July 9, 1964	Hunter T8	Royal Navy	Nonfatal	Throttle Malfunction (AND)
593.	June 30, 1964	Hunter FGA9	RAF	Nonfatal	Mid-Air (1st Aircraft)
594.	June 30, 1964	Hunter FGA9	RAF	Nonfatal	Mid-Air (2nd Aircraft)
595.	June 28, 1964	Hunter GA11	Royal Navy	Nonfatal	Fractured Static Line During Dive (AND)
596.	June 24, 1964	Hunter T7	RAF	Fatal (1)	Engine Flamed-Out (Fuel Mismanagement)
597.	June 24, 1964	P.1101	RAF	Fatal (1)	Hit Trees on High Ground
598.	May 19, 1964	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
599.	May 15, 1964	Hunter T8	Royal Navy	Nonfatal	Tail Strike (AND)
600.	May 13, 1964	Hunter GA11	Royal Navy	Nonfatal	Tire Burst (AND)
601.	April 21, 1964	Hunter FGA9	RAF	Nonfatal	Engine Failure (Fuel System)
602.	April 17, 1964	Hunter FGA9	RAF	Fatal (1)	In-Flight Drop Tank Separation – LOC
603.	April 16, 1964	Hunter T7	RAF	Fatal (1)	LOC at Low Altitude (Airshow Preparation)
604.	April 14, 1964	Hunter T8	Royal Navy	Nonfatal	Compressor Stall (AND)
605.	March 10, 1964	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
606.	March 1, 1964	Hunter FGA9	RAF	Fatal (1)	Aft Fuselage Fire
607.	February 27, 1964	Hunter Mk.50	Swedish AF	Unknown	Unknown
608.	February 17, 1964	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
609.	February 17, 1964	Hunter F6	RAF	Fatal (1)	Possible Pilot Disorientation
610.	February 9, 1964	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
611.	February 4, 1964	Hunter Mk. 51	Danish AF	Nonfatal	Unknown

612.	February 4, 1964	Hunter T8	Royal Navy	Nonfatal	LOC During Night Taxing (AND)
613.	January 28, 1964	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
614.	January 22, 1964	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
615.	January 19, 1964	Hunter GA11	Royal Navy	Nonfatal	Loss of Oil Pressure (AND)
616.	January 14, 1964	Hunter GA11	Royal Navy	Nonfatal	Ground Towing Accident (AND)
617.	January 10, 1964	Hunter GA11	Royal Navy	Nonfatal	Flight Control Failure (AND)
618.	January 8, 1964	Hunter GA11	Royal Navy	Nonfatal	Tail Strike (AND)
619.	December 17, 1963	Hunter T8	Royal Navy	Nonfatal	Tail Strike – Undershoot (AND)
620.	December 5, 1963	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
621.	December 4, 1963	Hunter T8	Royal Navy	Nonfatal	Inadvertent Release of External Stores In the pattern(AND)
622.	November 27, 1963	Hunter Mk. 58	Swiss AF	Nonfatal	Pilot Disorientation
623.	November 27, 1963	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
624.	November 26, 1963	Hunter GA11	Royal Navy	Nonfatal	Tail Strike (AND)
625.	November 25, 1963	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
626.	November 22, 1963	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction During High G (FCU) (AND)
627.	November 15, 1963	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
628.	October 23, 1963	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
629.	October 22, 1963	Hunter T8	Royal Navy	Nonfatal	Tail Strike (AND)
630.	October 16, 1963	Hunter Mk. 58	Swiss AF	Nonfatal	Hit Trees on Low Visibility – Ejection
631.	October 15, 1963	Hunter F4	RNAF	Unknown	Unknown
632.	October 9, 1963	Hunter T8	Royal Navy	Nonfatal	Tire Failure on Take-Off Main (AND)
633.	September 23, 1963	Hunter GA11	Royal Navy	Nonfatal	Over G During ACM (AND)
634.	July 31, 1963	Hunter GA11	Royal Navy	Nonfatal	Tire Burst (Hit Arresting Cable) (AND)
635.	July 26, 1963	Hunter T8	Royal Navy	Nonfatal	Landing Gear Failure (Failure to Retract) (AND)
636.	July 17, 1963	Hunter GA11	Royal Navy	Nonfatal	Inadvertent External Stores Release (AND)
637.	July 4, 1963	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
638.	June 25, 1963	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
639.	June 25, 1963	Hunter GA11	Royal Navy	Nonfatal	Canopy Separation on Take-Off (AND)
640.	June 24, 1963	Hunter FGA9	RAF	Fatal (1)	LOC at Low Altitude
641.	June 21, 1963	Hunter GA11	Royal Navy	Nonfatal	Brake Failure (AND)
642.	June 19, 1963	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
643.	June 6, 1963	Hunter F6	RAF	Nonfatal	Caught Fire Taxing (Fuel Leaking Into Starter B)
644.	May 30, 1963	Hunter T8	Royal Navy	Nonfatal	Double Generator Failure & Hydraulic Failure (AND)
645.	May 28, 1963	Hunter GA11	Royal Navy	Nonfatal	Throttle Jammed on Take-Off (AND)
646.	May 20, 1963	Hunter GA11	Royal Navy	Nonfatal	Engine Flame-Out During Pull-UP (AND)
647.	May 16, 1963	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
648.	May 14, 1963	Hunter F6	RNAF	Nonfatal	Undershoot
649.	April 24, 1963	Hunter FGA9	RAF	Fatal (1)	Possible Pilot Incapacitation
650.	April 17, 1963	Hunter Mk.50	Swedish AF	Unknown	Unknown
651.	April 10, 1963	Hunter T7	RAF	Fatal (1)	Pilot and Seat Departed Aircraft During Inverted Flight (AND)
652.	April 9, 1963	Hunter T8	Royal Navy	Nonfatal	Engine failure on Take-Off Run – Abort – (AND)
653.	April 6, 1963	Hunter GA11	Royal Navy	Nonfatal	Inadvertent External Fuel Tank Separation (Ground) (AND)
654.	April 1, 1963	Hunter F6	Belgian AF	Nonfatal	Brake Failure – Burst Tire (AND)
655.	March 29, 1963	Hunter F6	Belgian AF	Nonfatal	Ground Collision (AND)

656.	March 29, 1963	Hunter F6	Belgian AF	Nonfatal	Bird Strike (AND)
657.	March 28, 1963	Hunter Mk.51	Danish AF	Nonfatal	Unknown
658.	March 28, 1963	Hunter GA11	Royal Navy	Nonfatal	Loss of Engine Power on Take-Off (AND)
659.	March 27, 1963	Hunter F4	Belgian AF	Nonfatal	Overrun – Barrier (AND)
660.	March 27, 1963	Hunter F6	Belgian AF	Nonfatal	Bird Strike (AND)
661.	March 26, 1963	Hunter Mk.50	Swedish AF	Unknown	Unknown
662.	March 23, 1963	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Drag Chute Failure on Landing (AND)
663.	March 19, 1963	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
664.	March 17, 1963	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure (AND)
665.	March 12, 1963	Hunter GA11	Royal Navy	Nonfatal	ASI Failure (AND)
666.	March 7, 1963	Hunter F6	RAF	Nonfatal	Mid-Air (1st Aircraft)
667.	March 7, 1963	Hunter F6	RAF	Nonfatal	Mid-Air (2nd Aircraft)
668.	March 7, 1963	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
669.	March 6, 1963	Hunter GA11	Royal Navy	Nonfatal	In-Flight External Fuel Tank Separation (AND)
670.	March 5, 1963	Hunter F4	RNAF	Unknown	Unknown
671.	March 5, 1963	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (AND)
672.	March 1, 1963	Hunter F4	RNAF	Unknown	Unknown
673.	February 20, 1963	Hunter F6	RAF	Nonfatal	Engine Failure on Final – Undershoot
674.	February 8, 1963	Hunter Mk.50	Swedish AF	Unknown	Unknown
675.	January 8, 1963	Hunter GA11	Royal Navy	Nonfatal	Engine FOD on Start-Up (AND)
676.	February 8, 1963	Hunter T8	Royal Navy	Nonfatal	In-Flight Canopy Failure (Cracks) (AND)
677.	February 8, 1963	Hunter GA11	Royal Navy	Nonfatal	Tire Burst (AND)
678.	February 6, 1963	Hunter T8	Royal Navy	Nonfatal	Tire Burst on Landing (AND)
679.	January 31, 1963	Hunter GA11	Royal Navy	Nonfatal	In-Flight Pitot Tube Failure (AND)
680.	January 24, 1963	Hunter T8	Royal Navy	Nonfatal	ASI Failure After Take-Off (AND)
681.	December 28, 1962	Hunter FGA9	RAF	Fatal (1)	CFIT
682.	December 10, 1962	Hunter F6	Belgian AF	Nonfatal	Engine Failure on Take-Off Run – Abort – Barrier
683.	November 27, 1962	Hunter GA11	Royal Navy	Nonfatal	Burst Tire on Landing (AND)
684.	November 27, 1962	Hunter GA11	Royal Navy	Nonfatal	Overrun (Night) (AND)
685.	November 26, 1962	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Surge) (AND)
686.	November 23, 1962	Hunter T8	Royal Navy	Nonfatal	Hydraulic failure- Drag Chute Inadvertently Deployed (AND)
687.	November 23, 1962	Hunter GA11	Royal Navy	Nonfatal	Tire Burst (AND)
688.	November 22, 1962	Hunter T8	Royal Navy	Nonfatal	Runway Contamination – Cable Arrestment (AND)
689.	November 22, 1962	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction – Abort – Barrier (AND)
690.	November 19, 1962	Hunter F4	Belgian AF	Nonfatal	Ground Collision – Jumped Chocks (AND)
691.	November 14, 1962	Hunter GA11	Royal Navy	Nonfatal	Burst Tire on Landing (AND)
692.	November 12, 1962	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
693.	November 12, 1962	Hunter GA11	Royal Navy	Nonfatal	Taxing Accident (AND)
694.	November 8, 1962	Hunter GA11	Royal Navy	Nonfatal	Smoke in the Cockpit – Gunsight Overheated (AND)
695.	October 30, 1962	Hunter T8	Royal Navy	Nonfatal	Over G (AND)
696.	October 28, 1962	Hunter FGA9	RAF	Nonfatal	Engine Failure (Oil Loss)
697.	October 3, 1962	Hunter GA11	Royal Navy	Nonfatal	Engine Malfunction (Vibrations) (AND)
698.	October 2, 1962	Hunter T8	Royal Navy	Nonfatal	Gear-Up Landing (AND)
699.	September 17, 1962	Hunter FGA9	RAF	Nonfatal	Engine Failure – Tire Burst – Runway Excursion

700.	September 11, 1962	Hunter T8	Royal Navy	Nonfatal	Tire Burst on Landing (AND)
701.	September 6, 1962	Hunter T8	Royal Navy	Nonfatal	Over G (AND)
702.	September 4, 1962	Hunter T8	Royal Navy	Nonfatal	Main Wheel Separation on Landing – LOC (AND)
703.	August 20, 1962	Hunter F4	RNAF	Nonfatal	Unknown
704.	August 17, 1962	Hunter FGA9	RAF	Nonfatal	Aborted Take-Off –Pitot Tube Cover Left On
705.	August 15, 1962	Hunter T8	Royal Navy	Nonfatal	Inadvertent Drogue Gun Firing on the Ground (AND)
706.	August 13, 1962	Hunter F4	RNAF	Nonfatal	Unknown
707.	August 13, 1962	Hunter GA11	Royal Navy	Nonfatal	Throttle Malfunction After Touchdown (AND)
708.	August 8, 1962	Hunter F4	RNAF	Nonfatal	Crashed Into the Sea
709.	August 8, 1962	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
710.	August 4, 1962	Hunter T7	Royal Navy	Nonfatal	Hydraulic Failure – No Flaps – Drag Chute Failure (AND)
711.	August 1, 1962	Hunter GA11	Royal Navy	Nonfatal	Fire Warning System Malfunction (AND)
712.	July 30, 1962	Hunter GA11	Royal Navy	Nonfatal	Throttle Malfunction After Touchdown (AND)
713.	July 26, 1962	Hunter GA11	Royal Navy	Nonfatal	Bird Strike (AND)
714.	July 25, 1962	Hunter GA11	Royal Navy	Nonfatal	Engine Surge (AND)
715.	July 20, 1962	Hunter F6	RAF	Unknown	Landing Accident
716.	July 20, 1962	Hunter T8	Royal Navy	Nonfatal	Engine Flame-Out During Taxing (AND)
717.	July 18, 1962	Hunter GA11	Royal Navy	Nonfatal	ACU Failure (AND)
718.	July 17, 1962	Hunter T8	Royal Navy	Nonfatal	Multiple Tire Burst (Excessive Pressure) (AND)
719.	July 7, 1962	Hunter T8	Royal Navy	Nonfatal	Inadvertent Release External Fuel Tanks (Ground) (AND)
720.	July 12, 1962	Hunter F6	RAF	Nonfatal	Engine Failure – Overrun – Barrier
721.	July 11, 1962	Hunter F6	Belgian AF	Nonfatal	Starter Motor Fire
722.	July 6, 1962	Hunter T8	Royal Navy	Nonfatal	Landing Gear Jammed Up (AND)
723.	July 5, 1962	Hunter GA11	Royal Navy	Nonfatal	Structural Failure (AND)
724.	July 3, 1962	Hunter T8	Royal Navy	Nonfatal	Inadvertent Release of External Stores (AND)
725.	July 2, 1962	Hunter F6	Belgian AF	Nonfatal	Mid-Air (1st Aircraft) (AND)
726.	July 2, 1962	Hunter F6	Belgian AF	Nonfatal	Mid-Air (2nd Aircraft) (AND)
727.	July 1962	Hunter F4	Belgian AF	Nonfatal	Starter Explosion
728.	June 27, 1962	Hunter F4	RAF	Nonfatal	Tire Burst on Take-Off – Hydraulic Brake Lines – Overrun
729.	June 25, 1962	Hunter FGA9	RAF	Fatal (1)	Stall at Low Altitude
730.	June 20, 1962	Hunter FGA9	RAF	Nonfatal	In-Flight External Fuel Tank Separation
731.	June 13, 1962	Hunter T8	Royal Navy	Nonfatal	Gear-Up Landing (Pilot) – Overrun (AND)
732.	June 12, 1962	Hunter F6	RAF	Nonfatal	Overrun – Fire Warning
733.	June 7, 1962	Hunter T7	RAF	Fatal (2)	Stall
734.	May 24, 1962	Hunter F6	Belgian AF	Nonfatal	Lightning Strike (AND) (1st Aircraft)
735.	May 24, 1962	Hunter F6	Belgian AF	Nonfatal	Lightning Strike (AND) (2nd Aircraft)
736.	May 14, 1962	Hunter Mk.50	Swedish AF	Unknown	Unknown
737.	May 8, 1962	Hunter F6	Belgian AF	Nonfatal	Bird Strike
738.	April 24, 1962	Hunter F4	RNAF	Nonfatal	Engine Failure
739.	April 24, 1962	Hunter Mk.50	Swedish AF	Nonfatal	Fire on Start-Up
740.	April 9, 1962	Hunter Mk.58	Swiss AF	Nonfatal	Hit Crane Tower (AND)
741.	March 30, 1962	Hunter FGA9	RAF	Fatal	LOC – High-Speed Dive at Airshow (Trim)
742.	March 28, 1962	Hunter F6	Belgian AF	Nonfatal	Accident/Corrosion Problems
743.	March 26, 1962	Hunter Mk.70	Lebanese AF	Fatal (1)	Cause Unknown- Failed Ejection

744.	March 20, 1962	Hunter T8	Royal Navy	Nonfatal	Inadvertent Canopy Jettison on the Ground (AND)
745.	March 16, 1962	Hunter Mk.50	Swedish AF	Fatal (1)	Mid-Air
746.	March 15, 1962	Hunter Mk.56	Indian AF	Nonfatal	Mid-Air (1st Aircraft)
747.	March 15, 1962	Hunter Mk.56	Indian AF	Nonfatal	Mid-Air (2nd Aircraft)
748.	March 15, 1962	Hunter Mk.56	Indian AF	Nonfatal	Mid-Air (3rd Aircraft)
749.	February 6, 1962	Hunter T8	Royal Navy	Nonfatal	Fuel System Malfunction (AND)
750.	January 30, 1962	Hunter FR10	RAF	Fatal (1)	Stall – Crashed Into House
751.	January 19, 1962	Hunter T8	Royal Navy	Nonfatal	Loss of Engine Power at Altitude (Throttle) (AND)
752.	January 18, 1962	Hunter F6	Belgian AF	Nonfatal	Collided With Tow Target (AND)
753.	January 16, 1962	Hunter F6	RAF	Nonfatal	Rejected Take-Off (Fuel System Failure)
754.	December 29, 1961	Hunter F6	Belgian AF	Nonfatal	Brake Failure – Overrun
755.	December 12, 1961	Hunter FGA9	RAF	Nonfatal	Trim Malfunction (AND)
756.	December 11, 1961	Hunter F4	RNAF	Nonfatal	Overrun
757.	December 9, 1961	Hunter FGA9	RAF	Nonfatal	Engine Failure – Aborted Take-Off – Gear-Up Damage
758.	November 30, 1961	Hunter T8	Royal Navy	Nonfatal	Loss of Engine Power – Aborted Take-Off (AND)
759.	November 22, 1961	Hunter FGA9	RAF	Fatal (1)	Flight Control Failure (Elevators)
760.	November 20, 1961	Hunter F6	Belgian AF	Nonfatal	Tail Strike (AND)
761.	November 19, 1961	Hunter F6	Belgian AF	Nonfatal	Tire Burst on Landing
762.	November 16, 1961	Hunter Mk.50	Swedish AF	Nonfatal	Engine Failure
763.	November 16, 1961	Hunter T8	Royal Navy	Nonfatal	Inadvertent Manual Reversion – Drag Chute Failure (AND)
764.	November 1, 1961	Hunter Mk.50	Swedish AF	Nonfatal	Engine Failure
765.	November 1, 1961	Hunter T8	Royal Navy	Nonfatal	Gear-Up Landing (AND)
766.	November 2, 1961	Hunter T8	Royal Navy	Nonfatal	Inadvertent Drag Chute Deployment in Flight (AND)
767.	November 1961	Hunter F6	Belgian AF	Nonfatal	Tail Strike (AND) (1st Aircraft)
768.	November 1961	Hunter F6	Belgian AF	Nonfatal	Tail Strike (AND) (2nd Aircraft)
769.	October 19, 1961	Hunter F6	Belgian AF	Nonfatal	Bird Strike
770.	October 13, 1961	Hunter F4	RAF	Nonfatal	Fuel Starvation
771.	October 9, 1961	Hunter F6	Belgian AF	Nonfatal	Mid-Air (1st Aircraft)
772.	October 9, 1961	Hunter F6	Belgian AF	Nonfatal	Mid-Air (2nd Aircraft)
773.	October 9, 1961	Hunter F6	RNAF	Nonfatal	Overrun – Barrier
774.	October 1961	Hunter F4	Belgian AF	Nonfatal	Tail Strike (AND)
775.	September 29, 1961	Hunter F6	Belgian AF	Nonfatal	Fire on Start-Up (Starter Explosion)
776.	September 26, 1961	Hunter T8	Royal Navy	Nonfatal	Severe Engine Vibration – Emergency Landing (AND)
777.	September 20, 1961	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Emergency Landing A(ND)
778.	September 18, 1961	Hunter Mk. 50	Swedish AF	Nonfatal	Turbine Failure During Start-Up (Starter)
779.	September 14, 1961	Hunter T7	Royal Navy	Nonfatal	Spin – In-Flight Fuel Tank & Pylon Separation (AND)
780.	September 12, 1961	Hunter Mk. 50	Swedish AF	Nonfatal	Engine Failure
781.	September 12, 1961	Hunter F6	RAF	Fatal (1)	LOC at Low Altitude (Acrobatics)
782.	September 12, 1961	Hunter FGA9	RAF	Nonfatal	Landing gear Collapse While Taxing
783.	September 12, 1961	Hunter Mk. 51	Danish AF	Fatal (1)	LOC at Low Altitude (Acrobatics)
784.	August 23, 1961	Hunter T7	RN	Fatal (1)	Mid-Air – Inadvertent Ejection
785.	August 23, 1961	Hunter T8	RN	Fatal (1)	Mid-Air (2nd Aircraft)
786.	August 8, 1961	Hunter FR10	RAF	Fatal (1)	Flew Into the Ground
787.	July 20, 1961	Hunter T8	Royal Navy	Nonfatal	Total Hydraulic failure – Drag Chute Streamed- (AND)

788.	July 13, 1961	Hunter FGA9	RAF	Nonfatal	Rejected Take-Off – Flight Controls- Overrun
789.	July 12, 1961	Hunter F6	Belgian AF	Nonfatal	Ground Accident
790.	July 11, 1961	Hunter FGA9	RAF	Fatal (1)	Flew Into the Ground
791.	June 17, 1961	Hunter F6	Belgian AF	Nonfatal	Bird Strike (AND)
792.	June 16, 1961	Hunter T8	Royal Navy	Nonfatal	Inadvertent Drag Chute Deployment During Take-Off (AND)
793.	June 12, 1961	Hunter T8	Royal Navy	Nonfatal	In-Flight Windscreen Disintegration (AND)
794.	June 2, 1961	Hunter T8	Royal Navy	Nonfatal	Inadvertent Drag Chute Deployment in-Flight AND)
795.	June 2, 1961	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction (AND)
796.	May 20, 1961	Hunter F6	Belgian AF	Nonfatal	Tire Burst on Landing – Runway Excursion (AND)
797.	May 18, 1961	Hunter Mk. 50	Swedish AF	Fatal (1)	Mid-Air
798.	May 15, 1961	Hunter F6	RAF	Nonfatal	Spin During ACM
799.	May 4, 1961	Hunter F6	RAF	Fatal (1)	Likely Engine Failure/Fire
800.	April 27, 1961	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction (AND)
801.	April 21, 1961	Hunter T8	Royal Navy	Nonfatal	Engine Flame-Out in the Pattern (AND)
802.	April 13, 1961	Hunter F6	RNAF	Nonfatal	Mid-Air
803.	April 6, 1961	Hunter F6	Belgian AF	Nonfatal	Unknown (AND)
804.	March 24, 1961	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
805.	March 14, 1961	Hunter F4	RAF	Nonfatal	Fire Damage – Jumped Chocks During Engine Run
806.	March 10, 1961	Hunter Mk.50	Swedish AF	Nonfatal	Mid-Air
807.	March 10, 1961	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
808.	March 6, 1961	Hunter Mk.50	Swedish AF	Unknown	Unknown
809.	March 8, 1961	Hunter F6	RAF	Nonfatal	Jammed Throttle (Cockpit FOD) – Overrun – Barrier
810.	March 6, 1961	Hunter Mk.50	Swedish AF	Fatal (1)	Unknown
811.	March 3, 1961	Hunter F6	Belgian AF	Nonfatal	Structural Damage – Excessive Gs
812.	March 2, 1961	Hunter FGA9	RAF	Fatal (1)	Stall
813.	March 1, 1961	Hunter MK.50	Swedish AF	Unknown	Unknown
814.	February 27, 1961	Hunter F6	Belgian AF	Nonfatal	Unknown (AND)
815.	February 25, 1961	Hunter F4	RNAF	Nonfatal	Mid-Air (1st Aircraft)
816.	February 24, 1961	Hunter F4	RNAF	Nonfatal	Mid-Air (2nd Aircraft)
817.	February 10, 1961	Hunter T8	Royal Navy	Nonfatal	Landing Gear Failure – Landing on One Main (AND)
818.	February 3, 1961	FGA9	RAF	Fatal (1)	Stall During Maneuvering
819.	January 23, 1961	Hunter F6	RAF	Nonfatal	Fire and Explosion on Start-Up
820.	January 13, 1961	Hunter FGA9	RAF	Fatal (1)	Flew Into High-Ground
821.	January 19, 1961	Hunter Mk.56	Indian AF	Fatal (1)	Engine Failure After Take-Off
822.	January 4, 1961	Hunter F6	Belgian AF	Nonfatal	Brake Failure – Overrun (AND)
823.	1961	Hunter FR10	RAF	Nonfatal	In-Flight Canopy Separation (AND)
824.	1961	Hunter FGA9	RAF	Nonfatal	Undershoot (AND)
825.	1961	Hunter FR10	RAF	Nonfatal	Inadvertent In-Flight Drag Chute Deployment (AND)
826.	December 27, 1960	Hunter F6	Belgian AF	Nonfatal	Landing Gear Failure (Landing on One Main and Nose) (AND)
827.	December 9, 1960	Hunter T8	Royal Navy	Nonfatal	Severe Engine Vibration – Emergency Landing (AND)
828.	December 6, 1960	Hunter F6	RNAF	Nonfatal	Collision on the Runway During Landing (1st Aircraft)
829.	December 6, 1960	Hunter F6	RNAF	Nonfatal	Collision on the Runway During Landing (2nd Aircraft)
830.	November 26, 1960	Hunter F6	Belgian AF	Nonfatal	Landing Gear Failure on Landing
831.	November 25, 1960	Hunter F6	Belgian AF	Nonfatal	Mid-Air (AND)

832.	November 25, 1960	Hunter F6	Belgian AF	Nonfatal	Mid-Air
833.	November 24, 1960	Hunter T8	Royal Navy	Nonfatal	Aborted Take – Off ASI Failure – Cable (AND)
834.	November 24, 1960	Hunter T8	Royal Navy	Nonfatal	Flight Control Failure on Take-Off –Abort (AND)
835.	November 16, 1960	Hunter T8	Royal Navy	Nonfatal	Aborted Take-off – Flight Control Failure- Overrun (AND)
836.	November 9, 1960	Hunter F6	RAF	Nonfatal	Bird Strike
837.	November 4, 1960	Hunter T8	Royal Navy	Nonfatal	Runway Tail Plane Trim (Stand By Trim Used) (AND)
838.	November 9, 1960	Hunter T8	Royal Navy	Nonfatal	Hydraulic Failure – Manual Reversion (AND)
839.	November 9, 1960	Hunter Mk. 51	Danish AF	Nonfatal	Crashed During Take-Off
840.	October 26, 1960	Hunter F6	Belgian AF	Nonfatal	Wheel Separation on Landing – Runway Excursion (AND)
841.	October 25, 1960	Hunter Mk. 58	Swiss AF	Fatal	Engine Failure – Hydraulic Failure – Drag Chute Failure
842.	October 24, 1960	Hunter F6	Belgian AF	Nonfatal	Unknown
843.	October 19, 1960	Hunter Mk. 51	Danish AF	Nonfatal	Unknown
844.	October 3, 1960	Hunter F6	RAF	Nonfatal	Gear-Up Landing
845.	September 1, 1960	Hunter Mk.52	Peruvian AF	Nonfatal	Unknown
846.	August 2, 1960	Hunter Mk.50	Swedish AF	Fatal	LOC (Maneuvering)
847.	August 2, 1960	Hunter T7	Royal Navy	Nonfatal	Jammed Aileron (AND)
848.	July 28, 1960	Hunter F6	RNAF	Unknown	Unknown
849.	July 27, 1960	Hunter T8	Royal Navy	Nonfatal	Engine FOD on Start-Up (Ground Crew Equipment) (AND)
850.	July 12, 1960	Hunter F6	Belgian AF	Nonfatal	Ground Accident While Towed (AND)
851.	July 7, 1960	Hunter F4	RNAF	Nonfatal	Bird Strike
852.	July 1, 1960	Hunter F6	Jordanian AF	Unknown	Unknown
853.	June 23, 1960	Hunter F4	Belgian AF	Nonfatal	Mid-Air
854.	June 23, 1960	Hunter F6	Belgian AF	Nonfatal	Failed to Take-Off (Parking Brake Seized) – Abort – Fire
855.	June 16, 1960	Hunter F4	RNAF	Nonfatal	In-Flight Fire
856.	June 12, 1960	Hunter F6	Belgian AF	Nonfatal	Ground Collision
857.	June 10, 1960	Hunter F6	RAF	Fatal	Mid-Air (360° Break) (1st Aircraft)
858.	June 10, 1960	Hunter F6	RAF	Fatal	Mid-Air (360° Break) (2nd Aircraft)
859.	June 7, 1960	Hunter F4	RNAF	Fatal (1)	Unknown
860.	Jun 1, 1960	Hunter T7	RAF	Fatal (2)	CFIT
861.	June 1, 1960	Hunter F6	RNAF	Nonfatal	Crashed on Take-Off
862.	May 30, 1960	Hunter F6	RAF	Fatal	LOC (Incorrect Use of Flaps at High-Speed)
863.	May 30, 1960	Hunter F6	Belgian AF	Nonfatal	Engine Failure
864.	May 27, 1960	Hunter T8	Royal Navy	Nonfatal	Complete Hydraulic Failure (AND)
865.	May 20, 1960	Hunter T8	Royal Navy	Nonfatal	Severe Engine Vibrations – Emergency Landing (AND)
866.	May 17, 1960	Hunter F6	RAF	Nonfatal	Engine Failure – Rejected Take-Off – Overrun – Fire
867.	April 28, 1960	Hunter F6	Belgian AF	Fatal	Mid-Air (1st Aircraft)
868.	April 28, 1960	Hunter F6	Belgian AF	Nonfatal	Mid-Air (2nd Aircraft)
869.	April 28, 1960	Hunter F6	Belgian AF	Fatal (1)	LOC – Spin – Low Ejection
870.	April 21, 1960	Hunter F6	Belgian AF	Nonfatal	Unknown (AND)
871.	April 15, 1960	Hunter F6	Belgian AF	Nonfatal	Mid-Air With Dassault Super Mystère
872.	April 12, 1960	Hunter F6	Belgian AF	Nonfatal	In-Flight External Fuel Tanks Separation (AND)
873.	April 9, 1960	Hunter F6	RAF	Nonfatal	Engine Failure
874.	April 6, 1960	Hunter F6	Belgian AF	Nonfatal	Brake Failure – Overrun (AND)
875.	April 5, 1960	Hunter F4	RNAF	Nonfatal	Engine Failure – Overrun

876.	March 29, 1960	Hunter FGA9	RAF	Nonfatal	Bird Strike
877.	March 15, 1960	Hunter Mk. 50	Swedish AF	Nonfatal	Explosion on Start-Up (Turbine Failure/Starter)
878.	August 2, 1960	Hunter T7	Royal Navy	Nonfatal	Jammed Aileron (AND)
879.	February 8, 1960	Hunter T7	Royal Navy	Nonfatal	Aileron Jammed From Manual to Powered (AND)
880.	February 4, 1960	Hunter F6	Belgian AF	Nonfatal	Engine Malfunction (AND)
881.	January 25, 1960	Hunter F6	Belgian AF	Fatal (1)	LOC in Weather
882.	January 19, 1960	Hunter Mk. 51	Danish AF	Nonfatal	Engine Failure on Approach (AND)
883.	January 11, 1960	Hunter T8	Royal Navy	Nonfatal	Engine Vibration (AND)
884.	January 8, 1960	Hunter F6	RAF	Nonfatal	Fuel Mismanagement – Crashed Into Houses
885.	January 6, 1960	Hunter F6	RNAF	Fatal (1)	Runaway Elevator Trim
886.	January 6, 1960	Hunter F6	Belgian AF	Nonfatal	Cracked Windshield in Flight (AND)
887.	December 15, 1959	Hunter F4	RNAF	Nonfatal	Engine Failure on Approach – Crash Landing
888.	December 14, 1959	Hunter T8	Royal Navy	Nonfatal	Engine Failure – Emergency Landing A(ND)
889.	December 12, 1959	Hunter F6	Belgian AF	Nonfatal	Landing Gear Failure – Runway Excursion
890.	November 30, 1959	Hunter F4	RNAF	Fatal (1)	Runaway Aileron Trim
891.	November 25, 1959	Hunter Mk. 50	Swedish AF	Fatal (1)	Engine Fire During Ground Test – Killed Mechanic
892.	November 19, 1959	Hunter F6	RNAF	Nonfatal	Landing Accident
893.	November 11, 1959	Hunter F6	RAF	Fatal (1)	Suspected CFIT
894.	November 11, 1959	Hunter F6	RNAF	Fatal (1)	In-Flight Emergency – Flew Into the Sea in Weather
895.	November 10, 1959	Hunter F4	RAF	Nonfatal	Bird Strike
896.	November 6, 1959	Hunter Mk.50	Swedish AF	Nonfatal	Landing Accident
897.	November 5, 1959	Hunter F6	Belgian AF	Nonfatal	In-Flight Separation of “Sabrina” Pod
898.	November 4, 1959	Hunter F6	Belgian AF	Nonfatal	In-Flight Separation of Radio Panel (AND)
899.	November 1959	Hunter T7	RAF	Nonfatal	Undershoot
900.	October 29, 1959	Hunter F6	Belgian AF	Nonfatal	Fire on Start-Up (AND)
901.	October 12, 1959	Hunter F6	Belgian AF	Nonfatal	Tire Burst (AND)
902.	October 9, 1959	Hunter F6	Belgian AF	Nonfatal	Both Main Tires Burst (AND)
903.	October 6, 1959	Hunter Mk. 50	Swedish AF	Nonfatal	Unknown
904.	September 30, 1959	Hunter F4	RNAF	Nonfatal	Crashed Into the Sea
905.	September 30, 1959	Hunter F6	Belgian AF	Nonfatal	Tire Burst (AND)
906.	September 30, 1959	Hunter Mk.50	Swedish AF	Unknown	Unknown
907.	September 28, 1959	Hunter F6	Belgian AF	Nonfatal	Refueling Accident (AND)
908.	September 23, 1959	Hunter Mk. 56	Indian AF	Nonfatal	Engine Failure (Compressor)
909.	September 21, 1959	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
910.	September 17, 1959	Hunter F6	Belgian AF	Nonfatal	Landing Gear Failure (Wheel Separation)
911.	September 16, 1959	Hunter T8	Royal Navy	Nonfatal	Engine FOD on Start-Up (AND)
912.	September 15, 1959	Hunter F6	RNAF	Nonfatal	Engine Failure
913.	September 14, 1959	Hunter F6	Belgian AF	Nonfatal	Fire on Landing (Fuel Leak)
914.	September 11, 1959	Hunter F6	Belgian AF	Nonfatal	Engine Fire (Fuel Line) – Landed – Destroyed
915.	September 10, 1959	Hunter F6	Belgian AF	Nonfatal	Engine Failure – Crash Landing – Gear Failure
916.	September 9, 1959	Hunter F6	RAF	Nonfatal	Brake Failure –Gear Retracted – Overrun
917.	September 7, 1959	Hunter T8	Royal Navy	Nonfatal	Engine Surge (AND)
918.	September 6, 1959	Hunter F4	Belgian AF	Nonfatal	In-Flight Canopy Separation
919.	September 4, 1959	Hunter F6	Belgian AF	Nonfatal	Brake Hydraulic Failure – Tire Failure on Landing

920.	September 1, 1959	Hunter F6	Belgian AF	Nonfatal	Engine Failure – Fuel System –Landing Gear Failure
921.	August 31, 1959	Hunter F6	Belgian AF	Nonfatal	Runway Excursion (AND) (1st Aircraft)
922.	August 31, 1959	Hunter F6	Belgian AF	Nonfatal	Runway Excursion (AND) (2nd Aircraft)
923.	August 28, 1959	Hunter F6	Belgian AF	Nonfatal	Engine Failure (Compressor Blade) – Landed (AND)
924.	August 25, 1959	Hunter F6	RAF	Fatal (1)	Mid-Air After Take-Off (1st Aircraft)
925.	August 25, 1959	Hunter F6	RAF	Fatal (1)	Mid-Air After Take-Off (2nd Aircraft)
926.	August 10, 1959	Hunter F4	RNAF	Nonfatal	Unknown
927.	August 7, 1959	Hunter F4	RAF	Nonfatal	Spin
928.	August 7, 1959	Hunter Mk.51	Swedish AF	Unknown	Mid-Air
929.	August 6, 1959	Hunter F6	Belgian AF	Nonfatal	Bird Strike on Take-Off
930.	August 4, 1959	Hunter F4	Belgian AF	Nonfatal	Engine Fire
931.	July 29, 1959	Hunter F6	Belgian AF	Nonfatal	Landing Gear Failure to Extend (AND)
932.	July 24, 1959	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction – HP Turbine Blade Failure (AND)
933.	July 21, 1959	Hunter T7	RNAF	Nonfatal	Engine Failure – Turbine Blade Failure
934.	July 18, 1959	Hunter F4	Belgian AF	Nonfatal	Bird Strike (AND)
935.	July 16, 1959	Hunter T8	Royal Navy	Nonfatal	Bird Strike (AND)
936.	July 14, 1959	Hunter F6	Belgian AF	Nonfatal	Hydraulic Failure (Brakes) – Runway Excursion (AND)
937.	July 10, 1959	Hunter F6	Belgian AF	Fatal (2)	Engine Failure – Killed Person on the Ground
938.	July 2, 1959	Hunter T8	Royal Navy	Nonfatal	Severe Engine Vibration (AND)
939.	June 10, 1959	Hunter Mk.51	Swedish AF	Nonfatal	Engine Failure
940.	June 9, 1959	Hunter F6	Belgian AF	Nonfatal	Canopy Separation at Take-Off – Damaged Fuselage
941.	June 6, 1959	Hunter F6	Belgian AF	Nonfatal	Collided With Tow Target
942.	June 1, 1959	Hunter F6	Belgian AF	Nonfatal	Inadvertent External Fuel Tank Separation on Take-Off (AND)
943.	June 1, 1959	Hunter F6	Jordanian AF	Nonfatal	Landing Gear Failure (AND)
944.	June 1959	Hunter Mk. 50	Swedish AF	Unknown	Overrun – Barrier
945.	May 13, 1959	Hunter F6	Belgian AF	Nonfatal	Ground Collision While Taxing (AND)
946.	May 8, 1959	Hunter Mk. 50	Swedish AF	Fatal (1)	Engine Failure (Surge) – Failed Ejection
947.	May 6, 1959	Hunter F4	RAF	Nonfatal	Jammed Aileron
948.	May 2, 1959	Hunter F6	Belgian AF	Nonfatal	Brake Failure on Landing – Barrier (AND)
949.	April 30, 1959	Hunter F6	Belgian AF	Nonfatal	Unknown
950.	April 28, 1959	Hunter F6	Hawker	Nonfatal	Ground Fire (Aft Fuselage)
951.	April 25, 1959	Hunter F6	Belgian AF	Nonfatal	Collided With Towed Target (AND)
952.	April 11, 1959	Hunter F6	Belgian AF	Nonfatal	Landing Gear Failure on Landing (AND)
953.	March 30, 1959	Hunter F6	Belgian AF	Nonfatal	Unknown
954.	March 24, 1959	Hunter F6	RAF	Nonfatal	Engine Flame-Out During Acrobatics
955.	March 21, 1959	Hunter F6	Belgian AF	Nonfatal	Mid-Air With Towed Target
956.	March 20, 1959	Hunter F4	RAF	Nonfatal	Overrun
957.	March 20, 1959	Hunter T8	Royal Navy	Nonfatal	Ailerons to Manual on Take-Off After Gear Retraction (AND)
958.	March 20, 1959	Hunter F4	Belgian AF	Unknown	Unknown
959.	March 18, 1959	Hunter F4	Belgian AF	Nonfatal	Engine Failure
960.	March 9, 1959	Hunter T8	Royal Navy	Nonfatal	Engine Malfunction (AND)
961.	March 4, 1959	Hunter F6	Belgian AF	Fatal (1)	PIO – Hard Landing – Fatal Level Ground Ejection
962.	February 27, 1959	Hunter Mk.56	Indian AF	Fatal (1)	Attempt at Manual Landing
963.	February 26, 1959	Hunter F4	Belgian AF	Fatal (1)	Hard Landing – LOC – Ejection

964.	February 23, 1959	Hunter F4	RAF	Nonfatal	Gear-Up Landing (Pilot Error)
965.	February 20, 1959	Hunter F6	RNAF	Nonfatal	Engine Failure
966.	February 20, 1959	Hunter F6	Belgian AF	Nonfatal	Burst Tire- Landing Gear Collapse on Take-Off
967.	February 17, 1959	Hunter F6	RAF	Nonfatal	Hit Trees on Approach – Crash Landing
968.	February 3, 1959	Hunter F6	Belgian AF	Nonfatal	Flight Control Failure – LOC/Recovered – Over G
969.	January 31, 1959	Hunter T8	Royal Navy	Nonfatal	In-Flight Canopy Separation (AND)
970.	January 29, 1959	Hunter F6	Belgian AF	Nonfatal	Electrical/Starter Fire on the Ground
971.	January 19, 1959	Hunter F6	Belgian AF	Nonfatal	Tail Strike (AND)
972.	January 20, 1959	Hunter F4	Belgian AF	Nonfatal	Engine Failure – Landed Short – Accelerator Control Unit
973.	January 6, 1959	Hunter T8	Royal Navy	Nonfatal	Excessive Engine Vibrations (AND)
974.	January 5, 1959	Hunter F6	Belgian AF	Nonfatal	Ground Collision While Taxing (AND)
975.	1959	Hunter Mk.56	Indian AF	Unknown	Unknown
976.	1959	Hunter F6	Jordanian AF	Fatal (1)	Low Altitude Maneuvering (AND)
977.	December 29, 1958	Hunter F6	Belgian AF	Nonfatal	Tail Strike (AND)
978.	December 22, 1958	Hunter F6	RAF	Fatal (1)	Crashed Into the Sea – Cause Unknown
979.	December 22, 1958	Hunter F6	Belgian AF	Nonfatal	Stall on the Flare – LOC on Runway
980.	December 18, 1958	Hunter F6	Belgian AF	Nonfatal	In-Flight Fuel Tank Structural Failure (AND)
981.	December 11, 1958	Hunter F6	Belgian AF	Fatal (1)	Pilot Disorientation – CFIT
982.	December 8, 1958	Hunter Mk. 51	Danish AF	Unknown	Unknown
983.	December 4, 1958	Hunter Mk. 51	Danish AF	Nonfatal	Crashed on Approach
984.	December 3, 1958	Hunter F6	Belgian AF	Nonfatal	Inadvertent Ejection on the Ground During Maintenance (AND)
985.	November 28, 1958	Hunter F4	Belgium AF	Nonfatal	Engine Failure
986.	November 27, 1958	Hunter F4	Belgian AF	Nonfatal	Engine Explosion and Flame-Out
987.	November 24, 1958	Hunter Mk.56	Indian AF	Fatal (1)	Inadvertent Drag Chute Deployment on Take-Off
988.	November 21, 1958	Hunter F4	RNAF	Fatal (1)	CFIT – Formation Flying
989.	November 18, 1958	Hunter F6	Belgian AF	Nonfatal	Night Aborted Take-Off – Runway Excursion – Fire
990.	November 4, 1958	Hunter F6	Belgian AF	Nonfatal	In-Flight Separation of “Sabrina” Pod
991.	November 4, 1958	Hunter F6	Belgian AF	Nonfatal	Landing Gear Failure on Landing (AND)
992.	October 8, 1958	Hunter Mk. 58	Swiss AF	Nonfatal	Engine Failure
993.	October 8, 1958	Hunter F6	Belgian AF	Nonfatal	Mid-Air (AND)
994.	October 3, 1958	Hunter F4	Iraqi AF	Fatal (1)	Hydraulic Failure
995.	October 3, 1958	Hunter F6	Belgian AF	Fatal (1)	Inadvertent Ejection During Negative G Maneuver
996.	September 26, 1958	Hunter Mk.50	Swedish AF	Unknown	Unknown
997.	September 25, 1958	Hunter T7	RAF	Fatal (2)	Ditched After Take-Off
998.	September 25, 1958	Hunter F6	Belgian AF	Nonfatal	Gear-Up Landing (Failure) (AND)
999.	September 17, 1958	Hunter F6	Belgian AF	Nonfatal	Engine Flame-Out
1000.	September 7, 1958	Hunter F6	RAF	Fatal (1)	Stall After Take-Off
1001.	September 2, 1958	Hunter F4	RNAF	Nonfatal	Crashed After Overshoot
1002.	August 28, 1958	Hunter F6	Belgian AF	Nonfatal	Engine Failure (Compressor Failure) (AND)
1003.	August 27, 1958	Hunter F6	Belgian AF	Nonfatal	Overrun (AND)
1004.	August 27, 1958	Hunter F5	RAF	Nonfatal	Engine Failure
1005.	August 27, 1958	Hunter F6	RAF	Nonfatal	Brake Failure – Overrun – Fire
1006.	August 21, 1958	Hunter F6	RAF	Fatal (1)	LOC at Low Altitude (Acrobatics)
1007.	August 21, 1958	Hunter F6	Belgian AF	Nonfatal	Overrun (AND)

1008.	August 21, 1958	Hunter F6	RAF	Fatal (1)	LOC (Incorrect Use of Flaps at High-Speed)
1009.	August 21, 1958	Hunter Mk.51	Swedish AF	Unknown	Unknown
1010.	August 20, 1958	Hunter F6	RAF	Fatal (1)	Flew Into the Sea
1011.	August 13, 1958	Hunter F6	Belgian AF	Nonfatal	Bird Strike (AND)
1012.	August 10, 1958	Hunter F4	Belgian AF	Unknown	Unknown
1013.	August 8, 1958	Hunter F6	RNAF	Nonfatal	In-Flight Canopy Separation (AND)
1014.	August 7, 1958	Hunter F4	Belgian AF	Nonfatal	Flight Controls Failure (Locked Controls)
1015.	August 6, 1958	Hunter T8	Royal Navy	Fatal (1)	LOC at Low Altitude (Rolling Maneuver) (Acrobatics)
1016.	August 1, 1958	Hunter F4	Belgian AF	Nonfatal	Hard Landing
1017.	July 29, 1958	Hunter F4	RNAF	Nonfatal	Engine Failure After Take-Off – Overrun
1018.	July 27, 1958	Hunter F6	RAF	Nonfatal	Collided With Ground Vehicle
1019.	July 23, 1958	Hunter F6	Belgian AF	Nonfatal	Mid-Air
1020.	July 16, 1958	Hunter F6	Belgian AF	Nonfatal	Mid-Air (1st Aircraft)
1021.	July 16, 1958	Hunter F6	Belgian AF	Nonfatal	Mid-Air (2nd Aircraft)
1022.	June 28, 1958	Hunter F4	Belgian AF	Fatal (1)	G LOC (Pattern)
1023.	June 27, 1958	Hunter F6	Belgian AF	Fatal (3)	G-LOC – Killed 2 on the Ground
1024.	June 5, 1958	Hunter F4	RAF	Fatal (1)	Stall on Approach
1025.	June 5, 1958	Hunter F4	RAF	Fatal (1)	Stall on Approach
1026.	June 4, 1958	Hunter Mk.56	Indian AF	Unknown	Unknown
1027.	June 4, 1958	Hunter Mk.56	Indian AF	Unknown	Flame-Out
1028.	June 3, 1958	Hunter Mk.56	Indian AF	Nonfatal	Aborted Take-Off
1029.	May 28, 1958	Hunter F6	Belgian AF	Nonfatal	Gear-Up Landing – Failure
1030.	May 23, 1958	Hunter F4	RNAF	Nonfatal	Aborted Take-Off – Overrun
1031.	May 21, 1958	Hunter F6	Belgian AF	Nonfatal	Brake Failure – Runway Excursion (Side)
1032.	May 14, 1958	Hunter Mk.56	Indian AF	Unknown	Aborted Take-Off – Engine Loss of Power
1033.	May 13, 1958	Hunter Mk. 50	Swedish AF	Nonfatal	Engine Failure
1034.	May 5, 1958	Hunter F4	RNAF	Nonfatal	Take-Off Accident
1035.	May 5, 1958	Hunter F5	RAF	Fatal (1)	Mid-Air (1st Aircraft)
1036.	May 5, 1958	Hunter F5	RAF	Fatal (1)	Mid-Air (2nd Aircraft)
1037.	May 1, 1958	Hunter T8	RN	Unknown	Low level Flight
1038.	April 25, 1958	Hunter Mk.51	Swedish AF	Nonfatal	Gear-Up Landing
1039.	April 24, 1958	Hunter F5	RAF	Nonfatal	In-Flight Canopy Separation – Aircraft Not Repaired
1040.	April 21, 1958	Hunter F4	Belgian AF	Fatal (4)	LOC During ACM – Spin – Hit House on the Ground
1041.	April 18, 1958	Hunter F6	RAF	Nonfatal	Engine Failure
1042.	April 17, 1958	Hunter F6	Belgian AF	Nonfatal	Runway Excursion on Landing
1043.	April 17, 1958	Hunter F6	Belgian AF	Nonfatal	Fuel Starvation – Overrun (AND)
1044.	April 15, 1958	Hunter F6	Belgian AF	Nonfatal	Hit Aerial Target (AND)
1045.	April 14, 1958	Hunter F4	Belgian AF	Nonfatal	Aborted Take-Off – Overrun
1046.	April 14, 1958	Hunter F4	Belgian AF	Unknown	Unknown
1047.	April 4, 1958	Hunter F4	Belgian AF	Nonfatal	Overrun
1048.	April 3, 1958	Hunter F1	RAF	Unknown	Unknown
1049.	March 29, 1958	Hunter F4	Belgian AF	Fatal (1)	Mid-Air (1st Aircraft)
1050.	March 29, 1958	Hunter F4	Belgian AF	Fatal (1)	Mid-Air (2nd Aircraft)
1051.	March 29, 1958	Hunter F4	RAF	Nonfatal	Aborted Take-Off – Overrun

1052.	March 29, 1958	Hunter Mk.56	Indian AF	Nonfatal	Mid-Air (1st Aircraft)
1053.	March 29, 1958	Hunter Mk.56	Indian AF	Nonfatal	Mid-Air (2nd Aircraft)
1054.	March 21, 1958	Hunter F4	Belgian AF	Nonfatal	Engine Flame-Out
1055.	March 15, 1958	Hunter F5	RAF	Nonfatal	Landing Gear Failure on Landing
1056.	March 6, 1958	Hunter F6	RNAF	Nonfatal	Runway Excursion (AND)
1057.	February 20, 1958	Hunter F4	Belgian AF	Fatal (1)	LOC during ACM – Misuse of Flaps at High-Speed
1058.	February 14, 1958	Hunter F6	RAF	Fatal (1)	LOC (Incorrect Use of Flaps at High-Speed)
1059.	February 10, 1958	Hunter F4	Belgian AF	Unknown	Unknown
1060.	January 27, 1958	Hunter F4	Belgian AF	Nonfatal	Engine Failure on Take-Off
1061.	January 20, 1958	Hunter F4	Belgian AF	Nonfatal	Landing Accident
1062.	January 11, 1958	Hunter F6	RAF	Nonfatal	Rejected Take-Off – Gear Retracted – Fire
1063.	December 20, 1957	Hunter F4	Belgian AF	Nonfatal	Fuel Starvation – Landed Short
1064.	December 13, 1957	Hunter F6	RAF	Nonfatal	Engine Failure
1065.	November 29, 1957	Hunter F6	RAF	Nonfatal	Hydraulic Failure– Aborted Take-Off – Overrun
1066.	November 14, 1957	Hunter F4	RAF	Nonfatal	Bird Strike (AND)
1067.	November 9, 1957	Hunter F6	RAF	Nonfatal	Spin (Incorrect Technique) – Unable to Jettison Canopy
1068.	November 7, 1957	Hunter F4	RAF	Fatal (1)	Engine Fire
1069.	November 7, 1957	Hunter F6	RAF	Fatal (1)	Fuel Starvation
1070.	November 6, 1957	Hunter F4	RAF	Nonfatal	Jammed Landing Gear – LOC After Landing
1071.	November 5, 1957	Hunter F6	RAF	Fatal (1)	LOC – Dove Into the Ground
1072.	October 29, 1957	Hunter F4	Belgian AF	Fatal (1)	Hydraulic Failure
1073.	October 23, 1957	Hunter F4	RAF	Nonfatal	Landing Gear Failure During Taxiing
1074.	October 16, 1957	Hunter F4	RAF	Nonfatal	Collision With Target Banner
1075.	October 10, 1957	Hunter Mk.51	Swedish AF	Fatal (1)	Possible LOC
1076.	October 4, 1957	Hunter F4	Belgian AF	Nonfatal	Landing Accident
1077.	October 1957	Hunter F4	Belgian AF	Fatal (1)	Possible Disorientation
1078.	September 26, 1957	Hunter F4	Belgian AF	Nonfatal	Overrun (AND)
1079.	September 26, 1957	Hunter F4	Belgian AF	Nonfatal	Burst Tire (AND)
1080.	September 26, 1957	Hunter F4	Belgian AF	Nonfatal	Durst Tire – Runway Excursion (AND)
1081.	September 25, 1957	Hunter F4	Belgian AF	Nonfatal	Engine Failure – Overrun
1082.	September 16, 1957	Hunter F4	Belgian AF	Fatal (1)	LOC during ACM – Possible Use of Flaps at High-Speed
1083.	September 11, 1957	Hunter F4	Belgian AF	Nonfatal	Landing Gear Failure (Heavy Landing)
1084.	September 10, 1957	Hunter F5	RAF	Nonfatal	Mid-Air With Helicopter
1085.	September 10, 1957	Hunter F4	RAF	Nonfatal	Damage Due Battery Burst (Acid Spill)
1086.	September 5, 1957	Hunter F4	RAF	Nonfatal	Fire During Start-Up
1087.	September 3, 1957	Hunter F5	RAF	Nonfatal	Landing Gear Failure – Runway Excursion
1088.	September 2, 1957	Hunter F4	Belgian AF	Nonfatal	Engine Failure
1089.	September 2, 1957	Hunter F5	RAF	Nonfatal	Fuel Leak – Aborted Take-Off – Overrun (1st Aircraft)
1090.	September 2, 1957	Hunter F5	RAF	Nonfatal	Fuel Leak – Aborted Take-Off – Overrun (2nd Aircraft)
1091.	August 30, 1957	Hunter F4	Belgian AF	Nonfatal	Unknown
1092.	August 30, 1957	Hunter F5	RAF	Nonfatal	Fire During Start-Up
1093.	August 21, 1957	Hunter F4	Belgian AF	Nonfatal	Ground Fire on Start-Up
1094.	August 7, 1957	Hunter F4	Belgian AF	Nonfatal	Hydraulic Failure – LOC
1095.	August 2, 1957	Hunter F6	RAF	Nonfatal	Inverted Spin

1096.	August 1957	Hunter F4	Belgian AF	Nonfatal	Ground Fire on Start-Up
1097.	July 30, 1957	Hunter F6	RAF	Fatal (1)	Engine Failure in the Pattern (Failed Ejection)
1098.	July 26, 1957	Hunter F6	RAF	Nonfatal	Failure to Rotate – Overrun
1099.	July 25, 1957	Hunter F4	Belgian AF	Nonfatal	Hydraulic Failure
1100.	July 25, 1957	Hunter F6	Belgian AF	Nonfatal	Fire on Start-Up (AND)
1101.	July 16, 1957	Hunter F4	RAF	Nonfatal	Engine Failure – Overrun
1102.	July 9, 1957	Hunter F6	Belgian AF	Nonfatal	Ground Collision (AND)
1103.	July 3, 1957	Hunter Mk.50	Swedish AF	Nonfatal	Landing Accident
1104.	July 1957	Hunter F4	Belgian AF	Nonfatal	Engine Fire on the Ground
1105.	June 28, 1957	Hunter F4	RAF	Nonfatal	Bird Strike
1106.	June 20, 1957	Hunter F1	RAF	Fatal (1)	LOC at Low Altitude
1107.	June 13, 1957	Hunter F4	Belgian AF	Nonfatal	Landing Gear Collapse on Landing
1108.	June 7, 1957	Hunter F1	RAF	Nonfatal	Engine Failure
1109.	June 7, 1957	Hunter F6	RAF	Fatal (1)	Mid-Air (1st Aircraft)
1110.	June 7, 1957	Hunter F6	RAF	Nonfatal	Mid-Air (2nd Aircraft)
1111.	June 7, 1957	Hunter F5	RAF	Nonfatal	Engine Failure
1112.	May 31, 1957	Hunter F6	RAF	Nonfatal	Engine Failure – Canopy Failed to Jettison
1113.	May 25, 1957	Hunter F4	RAF	Nonfatal	Inadvertent Manual Control Reversion – Overrun
1114.	May 25, 1957	Hunter F4	RAF	Nonfatal	Mistaken Engine Shutdown – Landing Gear Collapse
1115.	May 22, 1957	Hunter F1	RAF	Nonfatal	Bird Strike
1116.	May 17, 1957	Hunter F6	RAF	Fatal (1)	Hit the Ground – Acrobatics
1117.	May 10, 1957	Hunter F4	Belgian AF	Nonfatal	Autopilot Failure
1118.	April 30, 1957	Hunter F6	RAF	Nonfatal	LOC on Landing – Overrun –Inadvertent Ejection
1119.	April 25, 1957	Hunter Mk.50	Swedish AF	Nonfatal	Engine Failure
1120.	April 17, 1957	Hunter Mk.50	Swedish AF	Nonfatal	Engine Failure (2nd Stage Compressor Failure)
1121.	April 11, 1957	Hunter F2	RAF	Nonfatal	Ground Accident
1122.	April 9, 1957	Hunter F2	RAF	Nonfatal	Wing/Flap Damage – FOD
1123.	April 8, 1957	Hunter Mk. 50	Swedish AF	Fatal	Engine Failure – Failed Ejection
1124.	April 5, 1957	Hunter F4	RAF	Fatal (1)	Engine Flame-Out – Fuel Starvation – Failed Ejection
1125.	April 4, 1957	Hunter F4	Belgian AF	Fatal (1)	Crashed at Sea – Hypoxia
1126.	April 3, 1957	Hunter F4	Belgian AF	Nonfatal	Damaged During Ground Run (Scrapped)
1127.	April 2, 1957	Hunter F1	RAF	Nonfatal	Landing Gear Door Failure
1128.	March 29, 1957	Hunter Mk.51	Swedish AF	Fatal (1)	Uncontrolled Dive
1129.	March 25, 1957	Hunter F4	RAF	Fatal (1)	Pilot Disorientation
1130.	March 22, 1957	Hunter F1	RAF	Nonfatal	Landing Gear Failure – LOC After Touchdown
1131.	March 15, 1957	Hunter F4	RAF	Nonfatal	Battery Leak – Acid Spill
1132.	March 13, 1957	Hunter F6	RAF	Fatal (1)	PIC Incapacitation (Possible Hypoxia)
1133.	March 5, 1957	Hunter F4	Belgian AF	Nonfatal	Ground Fire on Start-Up (Starter Explosion)
1134.	February 28, 1957	Hunter F5	RAF	Nonfatal	Unknown
1135.	February 18, 1957	Hunter Mk.50	Swedish AF	Unknown	Landing Accident
1136.	February 4, 1957	Hunter F5	RAF	Nonfatal	Engine Failure (Catastrophic Disintegration)
1137.	January 22, 1957	Hunter Mk.51	Swedish AF	Fatal (1)	Unknown
1138.	January 11, 1957	Hunter F4	RAF	Nonfatal	Fire on Start-Up – Simultaneous Starter Cartridges Firing
1139.	December 27, 1956	Hunter F4	RAF	Nonfatal	Hydraulic Failure – Brake Failure – Overrun

1140.	December 18, 1956	Hunter Mk.50	Swedish AF	Nonfatal	Overrun
1141.	December 9, 1956	Hunter F4	Belgian AF	Nonfatal	Unknown (AND)
1142.	December 5, 1956	Hunter F4	RAF	Fatal (1)	LOC
1143.	December 4, 1956	Hunter F4	RAF	Fatal (1)	Engine Explosion (Ejection Failed)
1144.	November 28, 1956	Hunter F4	RAF	Nonfatal	Ground Fire on Start-Up (Cartridges)
1145.	November 20, 1956	Hunter F4	Iraqi AF	Fatal	Stall
1146.	November 18, 1956	Hunter F4	RAF	Nonfatal	Engine Failure
1147.	November 15, 1956	Hunter F6	RAF	Nonfatal	Flight Controls Failure (High-Altitude- Icing)
1148.	November 10, 1956	Hunter F1	RAF	Fatal (1)	LOC in Weather
1149.	November 1, 1956	Hunter F1	RAF	Nonfatal	Bird Strike
1150.	October 29, 1956	Hunter F5	RAF	Nonfatal	Engine Failure/Landing Gear Failure
1151.	October 24, 1956	Hunter F4	RAF	Fatal (1)	Flight Controls Failure
1152.	October 19, 1956	Hunter Mk. 51	Danish AF	Nonfatal	Unknown
1153.	October 3, 1956	Hunter F4	RAF	Nonfatal	Bird Ingestion - Overrun
1154.	September 26, 1956	Hunter F2	RAF	Nonfatal	Engine Failure
1155.	September 21, 1956	Hunter F4	RAF	Nonfatal	Engine Failure on Take-Off
1156.	September 18, 1956	Hunter F1	RAF	Nonfatal	Landing Gear Failure
1157.	September 13, 1956	Hunter F4	RAF	Nonfatal	Engine Failure in the Pattern
1158.	September 12, 1956	Hunter F4	Belgian AF	Nonfatal	Fire on Start-Up
1159.	September 10, 1956	Hunter F4	RAF	Nonfatal	Landing Gear Failure
1160.	September 2, 1956	Hunter F5	RAF	Nonfatal	LOC in Weather
1161.	August 31, 1956	Hunter F1	RAF	Nonfatal	Engine Failure – Crash Landing
1162.	August 29, 1956	Hunter F5	RAF	Nonfatal	Brake Failure – Overrun
1163.	August 29, 1956	Hunter F4	Belgian AF	Nonfatal	Engine Failure – Crash Landing
1164.	August 28, 1956	Hunter F1	RAF	Nonfatal	Inspection Panel Separation
1165.	August 25, 1956	Hunter F4	Belgian AF	Nonfatal	Engine Failure – Crash Landing
1166.	August 24, 1956	Hunter F2	RAF	Nonfatal	Mid-Air
1167.	August 20, 1956	Hunter F1	RAF	Nonfatal	LOC on Landing
1168.	August 20, 1956	Hunter F4	RNAF	Unknown	Unknown
1169.	August 14, 1956	Hunter F4	RAF	Nonfatal	Engine Failure After Take-Off
1170.	August 13, 1956	Hunter F1	RAF	Nonfatal	Engine Failure on Final
1171.	August 9, 1956	Hunter F4	RNAF	Fatal	Crashed at Sea
1172.	July 28, 1956	Hunter F4	RAF	Nonfatal	Unknown (AND)
1173.	July 25, 1956	Hunter F4	RNAF	Unknown	Unknown
1174.	July 17, 1956	Hunter F4	RAF	Nonfatal	Engine Failure
1175.	June 21, 1956	Hunter F5	RAF	Nonfatal	Engine Failure/Overrun
1176.	June 5, 1956	Hunter F1	RAF	Nonfatal	LOC – Low on Approach
1177.	June 4, 1956	Hunter Mk. 51	Danish AF	Fatal (1)	LOC at Altitude (Hypoxia)
1178.	May 13, 1956	Hunter F1	RAF	Nonfatal	Engine Failure/Hydraulic Failure
1179.	May 6, 1956	Hunter F5	RAF	Nonfatal	Engine Failure on Final
1180.	May 1, 1956	Hunter F4	RAF	Nonfatal	Engine Failure
1181.	April 17, 1956	Hunter F2	RAF	Fatal(1)	Engine Failure
1182.	April 17, 1956	Hunter F5	RAF	Fatal (1)	LOC
1183.	April 17, 1956	Hunter F1	RAF	Nonfatal	Engine Failure

1184.	April 10, 1956	Hunter F1	RAF	Fatal (1)	Stall on Final
1185.	March 23, 1956	Hunter F1	RAF	Nonfatal	Inadvertent Ejection in Flight
1186.	March 22, 1956	Hunter Mk.51	Swedish AF	Nonfatal	Engine Failure
1187.	March 6, 1956	Hunter F2	RAF	Fatal(1)	Possible CFIT (Night)
1188.	February 23, 1956	Hunter F5	RAF	Nonfatal	Engine Failure
1189.	February 8, 1956	Hunter F1	RAF	Nonfatal	Fuel Starvation
1190.	February 8, 1956	Hunter F1	RAF	Nonfatal	Fuel Starvation
1191.	February 8, 1956	Hunter F1	RAF	Fatal (1)	Fuel Starvation
1192.	February 8, 1956	Hunter F1	RAF	Nonfatal	Fuel Starvation
1193.	February 8, 1956	Hunter F1	RAF	Nonfatal	Fuel Starvation
1194.	February 8, 1956	Hunter F1	RAF	Nonfatal	Fuel Starvation
1195.	February 8, 1956	Hunter F1	RAF	Nonfatal	Fuel Starvation
1196.	February 8, 1956	Hunter F1	RAF	Nonfatal	Fuel Starvation
1197.	January 25, 1956	Hunter F4	RAF	Nonfatal	Fire on Start-Up – Starter Cartridges Caught Fire
1198.	January 25, 1956	Hunter F5	RAF	Nonfatal	Engine Failure
1199.	January 24, 1956	Hunter F1	RAF	Nonfatal	LOC on Landing (Contaminated Runway)
1200.	January 19, 1956	Hunter F1	RAF	Fatal(1)	Unknown
1201.	January 13, 1956	Hunter F1	RAF	Nonfatal	Landing Gear Failure – Runway Excursion
1202.	January 13, 1956	Hunter F4	RAF	Nonfatal	Landing Accident (AND)
1203.	December 10, 1955	Hunter F5	RAF	Nonfatal	Fire During Engine Start-Up
1204.	December 8, 1955	Hunter F5	RAF	Fatal (1)	Flight Controls Failure – Ailerons – LOC
1205.	December 6, 1955	Hunter F1	RAF	Fatal (1)	Overshoot
1206.	December 5, 1955	Hunter F5	RAF	Nonfatal	Hydraulic Failure – Flight Controls – Ailerons – LOC
1207.	November 26, 1955	Hunter F5	RAF	Nonfatal	Engine Failure After Take-Off
1208.	November 3, 1955	Hunter F4	RAF	Nonfatal	Fuel Starvation in Weather
1209.	October 24, 1955	Hunter F1	RAF	Fatal (1)	Dived Into the Sea
1210.	October 22, 1955	Hunter F4	RAF	Fatal (1)	Hit the Ground At Low Level (LOC)
1211.	October 21, 1955	Hunter F1	RAF	Fatal (1)	Unknown
1212.	October 20, 1955	Hunter F4	RAF	Fatal (1)	Mid-Air (1st Aircraft)
1213.	October 20, 1955	Hunter F4	RAF	Fatal (1)	Mid-Air (2nd Aircraft)
1214.	October 15, 1955	Hunter F5	RAF	Nonfatal	Unknown
1215.	October 12, 1955	Hunter F5	RAF	Nonfatal	Fire on Start-Up
1216.	October 11, 1955	Hunter F1	RAF	Nonfatal	Crashed on Approach
1217.	September 29, 1955	Hunter F5	RAF	Nonfatal	Engine Failure
1218.	September 22, 1955	Hunter F1	RAF	Fatal (1)	Mid-Air (1st Aircraft) (360° Overhead Pattern)
1219.	September 22, 1955	Hunter F1	RAF	Fatal (1)	Mid-Air (2nd Aircraft) (360° Overhead Pattern)
1220.	August 18, 1955	Hunter F4	RAF	Fatal (1)	Mid-Air (1st Aircraft)
1221.	August 18, 1955	Hunter F4	RAF	Nonfatal	Mid-Air (2nd Aircraft)
1222.	August 14, 1955	Hunter F1	RAF	Fatal (1)	CFIT
1223.	August 6, 1955	Hunter F1	RAF	Nonfatal	Engine Failure – (Turbine Disk) Crash Landing (Neville Duke)
1224.	August 3, 1955	Hunter F5	RAF	Nonfatal	Steep Dive – Flap Use at High-Speed
1225.	July 22, 1955	Hunter F4	RAF	Fatal (2)	Stall on Final – Hit Vehicle Near Runway
1226.	July 18, 1955	Hunter F1	RAF	Nonfatal	Engine Failure
1227.	July 12, 1955	Hunter F1	RAF	Fatal (1)	Fuel Starvation – Engine Out on Final – Low Ejection

1228.	July 7, 1955	Hunter F4	RAF	Fatal (1)	Engine Failure After Take-Off – Low Ejection
1229.	July 7, 1955	Hunter F1	RAF	Fatal (1)	Powered Control Lost – Rolled - Failed Ejection
1230.	June 14, 1955	Hunter F1	RAF	Fatal (1)	LOC on Final
1231.	May 12, 1955	Hunter F5	RAF	Nonfatal	Jammed Aileron
1232.	May 2, 1955	Hunter F1	RAF	Nonfatal	Fire During Engine Start-Up
1233.	January 25, 1955	Hunter F4	RAF	Fatal (3)	Engine Failure – Boost Pump – 3 Killed on the Ground
1234.	January 21, 1955	Hunter F1	RAF	Fatal	LOC During Acrobatics
1235.	December 20, 1954	Hunter F2	RAF	Nonfatal	Engine Fire During Start-Up
1236.	December 6, 1954	Hunter F1	RAF	Nonfatal	Post-Overhaul Crash (Mechanical)
1237.	November 16, 1954	Hunter F1	RAF	Nonfatal	Engine Failure
1238.	October 22, 1954	Hunter F1	RAF	Fatal (1)	Engine Failure
1239.	September 9, 1954	Hunter F1	RAF	Nonfatal	After Take-Off Crash (Post Maintenance Flight)
1240.	August 14, 1954	Hunter F2	RAF	Nonfatal	In-Flight Partial Landing Gear Separation
1241.	February 28, 1954	Hunter F6 (P)	RAF	Nonfatal	Engine Failure (AND)
1242.	February 20, 1954	Hunter F6 (P)	RAF	Nonfatal	Crash Landing (AND)
1243.	July 8, 1951	WB188	RAF	Nonfatal	Brake Failure During Taxi Test
1244.	April 3, 1951	P. 1081	RAF	Fatal	Unknown
1245.	1951	P. 1072	RAF	Nonfatal	In-Flight Engine Explosion

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Attachment 6 – Glossary and Abbreviations

°	Degrees
#	Pounds
AAIB	Aviation Accident Investigation Board (UK)
A&P	Airframe & Powerplant (Mechanic)
AAM	Air-to-Air Missile
ABO	Aviator's Breathing Oxygen
AC	Advisory Circular
ACES	Modern Ejection Seat Fitted to many US Combat Aircraft
ACMI	Air Combat Maneuvering Instrumentation
AD	Airworthiness Directive
ADM	Aeronautical Decision Making
AFM	Airplane Flight Manual
AFS	Flight Standards
AGC	FAA's Office of the Chief Counsel
AIM	Air Intercept Missile
AIP	Aircraft Inspection Program
AIR-200	FAA – Production & Airworthiness Division
AIR-230	FAA – Airworthiness Branch
AloS	Acceptable Level of Safety
ALQ	ECM Pod(s), i.e., ALQ-167
AOA	Angle of Attack
AND	Aircraft Not Destroyed
AP	Air Publication
ARB	Airworthiness Review Board (UK CAA)
ASI	Aviation Safety Inspector
ATC	Air Traffic Control
ATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
Avon	Hunter Rolls-Royce Engine
AVS	FAA Aviation Safety (Line of Business Designator)
Avpin	Liquid Fuel Starter System Installed in the Hunter
Boscombe Down	RAF Flight Test Facility
CAA	Civil Aviation Authority
CAR	Civil Air Regulations
CAS	Close Air Support
CFIT	Control Flight Into Terrain
CFR	Code of Federal Regulations
CG (c.g.)	Center of Gravity
CJAA	Classic Jet Aircraft Association
Class A	Accident Classification Used by USAF and U.S. Navy
COS	Continued Operational Safety
CP	Center of Pressure
DAR	Designated Airworthiness Representative
DER	Designated Engineering Representative
DHS	Department of Homeland Security
DOD	Department of Defense

EAA	Experimental Aircraft Association
ECM	Electronic Counter Measures
EEJ	Experimental Exhibition Jets
EHSI	Electronic Horizontal Situation Indicator
EO	Engineering Order
EPR	Engine Pressure Ratio
FAA	Federal Aviation Administration
FBO	Fixed Base Operator
FL	Flight Level
FOD	Foreign Object Damage
Form 700	Aircraft Record (RAF)
Form 781	Aircraft Flight Data Record
FSIMS	Flight Standards Information Management System
FSDO	Flights Standards District Office
Ft	Feet
GA	General Aviation
HB	Swiss Registration
Hg	Mercury
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organization
IMC	Instrument Meteorological Conditions
INM	Indicated Mach Number
INOP	Inoperative
IRAN	Inspect and Repair as Necessary
JATO	Jet Assisted Take-Off (aka RATO – Rocket Assisted Take-Off)
JH	Jet Heritage
JP-4/JP-5	Military Designations for Jet Fuels
LABS	Low Altitude Bombing System
Lb.	Pounds
LOC	Loss of Control
LOX	Liquid Oxygen
LTO	Letter to Operators
Mach	Speed of Sound
Martin Baker	Manufacturer of Ejection Seats Fitted to the Hunter
MEL	Minimum Equipment List
MIDO	Manufacturing Inspection District Office
mm	Millimeters
Mod	Modification to Hunter Aircraft by Hawker (Manufacturer) and/or RAF
MTBF	Mean Time Between Failure
MTBO	Mean Time Between Overhauls
NACES	Modern Ejection Seat Fitted to Many U.S. Navy Aircraft
NATO	North Atlantic Treaty Organization
NDI	Non-Destructive Inspection
NDT	Non-Destructive Testing
NTSB	National Transportation Safety Board
O_2	Oxygen
OEM	Original Equipment Manufacturer
ORM	Operational Risk Management
PAO	Public Aircraft Operations

PFCU	Powered Flight Control Unit
PIC	Pilot in Command
Pilot Notes (PN)	RAF Designation for Aircraft Flight Manual
PIO	Pilot Induced Oscillations
PPH	Pound per Hour
Psi	Pounds per Square Inch
PSP	Personal Survival Pack
QRB	Quick Release Box
R&D	Research and Development
RAT	Ram Air Turbine
RCR	Runway Condition Reading
RM	Risk Management
RN	Royal Navy
RPZ	Runway Protection Zone
RSA	Runway Safety Area
RSC	Runway Surface Condition
RSAF	Republic of Singapore Air Force
MA-1A	USAF Arresting Barrier
MAF	Maintenance Action Form (U.S. Navy)
Major Service	RAF Equivalent of U.S. Depot Level Inspection
Mk.	Mark
MRO	Maintenance, Repair, and Overhaul
NAS	National Airspace System
SAF	Swiss Air Force
SMS	Safety Management Systems
SOAP	Spectrometric Oil Analysis Program
SRM	Single Pilot Resource Management
T7 & T8	Two Seat version of the Hunter
TBO	Time Between Overhauls
TO	Take-Off
TSA	Transportation Safety Administration
UHF	Ultra High Frequency
UK	United Kingdom
USAF	United States Air Force
USN	United States Navy
VFR	Visual Flight Rules
VT	US Navy Training Squadron
W&B	Weight and Balance
ZU-BEX	South African Civil Registration for a Lightning T5

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