



F FIRE

DARREN HARBAR OUTLINES THE DE HAVILLAND QUEEN BEE DRONE AND ITS THREE SURVIVORS





In the aftermath of the September 11, 2001 terrorist attacks on the USA, the word 'drone' has taken on a new meaning. It now conjures up visions of remotely-piloted high-tech aircraft carrying out relentless surveillance, or unleashing precision-guided weapons.

Since the 1930s Britain's armed forces have operated a succession of drones to provide ground-to-air and, later, air-to-air target practice. Today's target drones are sophisticated, purpose-designed and high-performance.

Over 80 years ago, it was a very different story. The earliest drones were conversions of existing manned types. To distinguish such machines from their conventional versions, the Air Ministry incorporated the word 'Queen' into their designations.

As early as 1930 a float-equipped Fairey IIIE, inevitably named the Fairey Queen, had been developed by the Royal Aircraft Establishment at Farnborough, Hampshire, to fly with automatic equipment on board.

Three were built and two were issued to the battleship HMS *Valiant* for trials in April 1932. Both crashed into the sea when launched, their 'flight' time being 18 and 25 seconds respectively!

A simpler and cheaper version was required, and de Havilland came up with the Queen Bee. This was the first truly successful pilotless drone that could reliably take off, fly at altitude and land automatically.

HALF MOTH, HALF TIGER

The Queen Bee was a combination of the all-wooden fuselage of the DH.60GIII Moth Major with the wings and tail of the DH.82A Tiger Moth. Many sources refer to the type as the DH.82B, but this is erroneous – the correct designation was simply DH.82. ➔

Left
De Havilland Queen Bee LF858 is maintained in flying condition at Henlow, Bedfordshire. ALL IMAGES AUTHOR UNLESS NOTED

Below
Queen Bee K5107 of 3 Anti-Aircraft Co-operation Unit, based at RAF Kalafrana, Malta. Built in 1935, this machine crashed off the island on October 5, 1937. KEY



The reason for the use of a spruce and ply Moth Major fuselage is not entirely clear. The relative cost of the wooden box compared with the welded steel tube of the Tiger Moth could not have been great.

More likely is concern that the metal would interfere with the radio reception. Farnborough insisted on the bonding of every steel component on the 'Bee', which resulted in many yards of soldered copper strips and flexible copper braids shrouding the moving components in production examples.

The ply-covered rear fuselage top decking gave a uniform curve that was absent on the Tiger Moth. Queen Bees lacked the anti-spin strakes that were a wartime modification to the 'Tiger'.

The fuselage had to be strengthened



Right
The cockpit of the de Havilland Aircraft Museum Queen Bee. Top centre is the telephone dial supervisory unit. **INSET:** Detail of the dial - the settings read: Dive, Glide, Level, Climb, Left, Straight, Right, Spin. There were options for the pilot to select, or for the aircraft to be operated by remote control.



Above
The fuselage of LF789 at the de Havilland Aircraft Museum showing the substantial windmill that powered the air compressor.

Right
The Bee Keeper's LF858 at its Henlow home, showing its Tiger Moth twin cockpits but large centre section tank.

for catapult launching. The rear cockpit had its windscreen, controls and instruments replaced with the automatic flight control gear and it was covered over with an access hatch. The Tiger's luggage locker was also used to house other equipment.

The front cockpit retained its conventional controls so that it could be manned for transit and test flights, but there was no mixture control or tail trim. A fairing was provided for the front cockpit for unmanned flights.

On the port side was an air compressor driven by a four-bladed wooden windmill. The rudder and elevator, but not the ailerons, were actuated by air valves from this system. A trailing wire aerial automatically deployed once the drone was airborne.

The first manned flight of the prototype 'K3584' took place from Hatfield, Hertfordshire, on January 5, 1935. A year later, the then highly secret autoflight equipment was fitted at Farnborough where tests were carried out with a pilot in the front cockpit.

Between 1933 and 1943 about

"Farnborough insisted on the bonding of every steel component on the 'Bee', which resulted in many yards of soldered copper strips shrouding the moving components in production examples"



412 Queen Bees were built by de Havilland and by Scottish Aviation in a former bus garage in Glasgow. The exact number is not confirmed as the Pilotless Aircraft Unit (PAU) at Manorbier in Wales converted Tigers to Queens and this may have taken place at other venues.

Hatfield examples were fitted for float or landplane operation. Floatplane variants were launched from steam-driven catapults from land installations or ships. The Scottish Bees were pure landplanes.

DROP THE PILOT

Ground control of the Queen Bee was managed via an M11 mobile transmitter which was a rather large piece of kit. Alongside the control box was an aerial array that stood 250ft (76m) tall and sent the signal to the aircraft's R1088A receiver.

The ground control panel included several push buttons and switches to manage right turns, left turns, straight ahead, climb, level flight and glide. A standard General Post Office telephone mechanism generated specific command signals using a dash tone, followed by a series of dots.

There was also a telephone dial that acted as the operator's 'supervisory control' should the control buttons fail. A similar dial was mounted in the Queen Bee's cockpit, for manned flight tests.

Inside the cockpit was a launch control and the valves would be set with the controls centralised for take-off. The ailerons were locked for pilotless operation. The autopilot gyro would be spun up using a ground-based air compressor. With the engine started,

the side-mounted, windmill-driven, air compressor would take over.

Take-offs and landings were completely automatic and had no operator input once the Bee was rolling or catapulted. Once airborne a winch box would trail out an aerial behind the Queen Bee and from that moment signals from the ground transmitter could be received.

The operator could manage the rudder and elevators along with throttle and ignition. The Queen Bee was flown like a two-channel radio-controlled model with only the rudder used to make unbalanced turns.

AIM TO MISS

It was intended that gunnery students would offset their aim to miss the target so that the aircraft could be recovered to fly another day. This didn't always work out.

In the event that the Queen Bee did manage to evade the incoming shells, it was the ground controller's job to get the drone recovered. It was possible to achieve a landing by using a crude sight placed close to



the runway threshold. The sight comprised two sets of wires and an adjustable base that was set according to the wind speed. The Queen Bee would be flown into wind down to around 1,000ft and lined up for the runway using the sighting wires.

Landing on the sea was less critical on positioning and

the aircraft was simply flown into wind down to 1,000ft after which an automatic landing would be activated by selecting 'glide' on the control box.

The last moments were the same for a floatplane or landplane Queen Bee. At 50ft the trailing aerial would make contact with the sea or the runway and this would earth the magnetos, close the throttle and bring the elevators to the 'up' position. The resulting flare would be about right for touchdown. The drone would be recovered from the sea using a sling, or from the runway if on land.

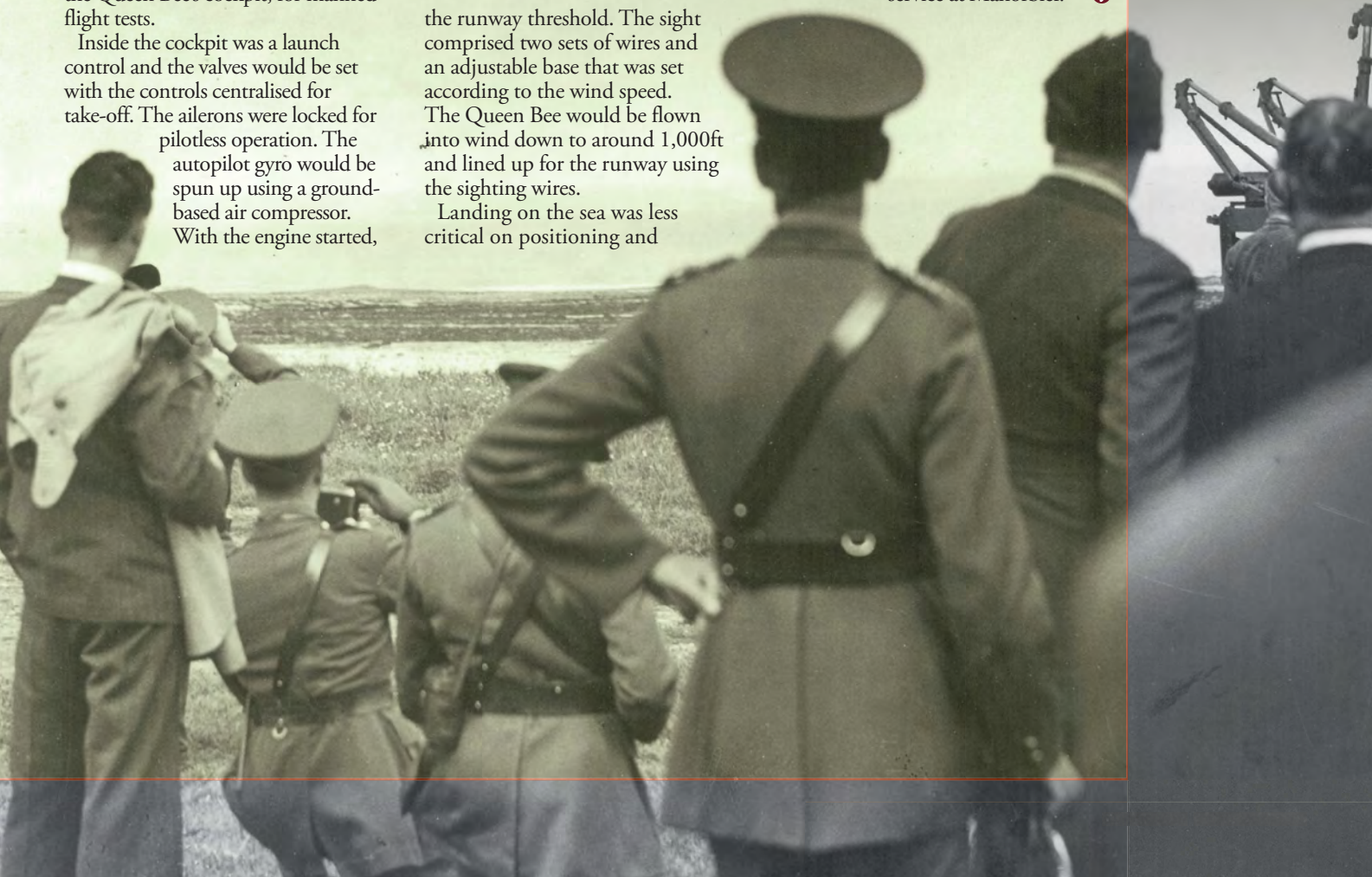
BEEKEEPERS

For an aircraft that was intended to be shot at, it's hardly surprising that just three Queen Bees are known to survive. There's one airworthy in the UK (as a piloted aircraft), another under rebuild to fly in the USA and a composite reconstruction at the de Havilland Aircraft Museum at London Colney, Hertfordshire. At the end of World War Two virtually all the remaining Queen Bees were stripped of useful Tiger Moth components for re-use. The fuselages were burned.

As the youngest of the survivors, LF858 is a regular airshow performer, often as part of 'Captain Neville's Flying Circus'. Built by Scottish Aviation in 1944, it saw service at Manorbier. ➔



Below
A Queen Bee leaving the catapult watched by army officers in September 1938. Note the wooden propeller used to drive the air compressor and the enlarged centre section fuel tank in the upper wing. KEY COLLECTION



It passed through a series of owners post war and by the early 1980s was in store at the Shuttleworth Collection, Old Warden, Beds. It was acquired by Hertford-based Barrie Bayes who organised its four-year restoration.

Civil registered as G-BLUZ, the Queen Bee was returned to hybrid Tiger Moth/Moth Major configuration as the rear cockpit and dual controls were reinstated, along with a more traditional Tiger front cockpit layout.

Several of the Queen Bee features were retained, including the larger fuel tank and the accumulator access hatch in the front decking. It is finished in authentic Queen Bee markings, complete with the red panels on the undersides of the top wing tips.

Since 1996 *Uniform-Zulu* has been owned by the appropriately named Bee Keepers Group and based at Henlow, Beds.

and the Queen Bee put down automatically. It was sent to the de Havilland repair shop at Witney, Oxfordshire and was back at St Athan by August 1941. This posting was to last just a few weeks as V4760 had a new role.

It was sent to nearby Cardiff where the personnel of 52 Maintenance Unit crated it for a sea voyage. Avoiding the U-boat 'Wolf Packs' the Queen Bee crossed the Atlantic. It was re-assembled and tested for a total of 23 hours by the USAAF at Wright Field, Dayton, Ohio. Under 'Reverse Lend-Lease' there had been a scheme to supply the Americans with 50 Queen Bees, but this did not materialise.

After a period of storage, V4760 was passed to the Hershey Industrial School, Pennsylvania, in April 1944 as a training aid for aircraft mechanics. There followed a succession of owners before the Queen Bee was purchased by Warner



Above
A replica of the landing sight alongside the London Colney Queen Bee.

Above right
Queen Bee V4760 during its days with the Hershey Industrial School. Note that the rear cockpit has been reinstated. VIA IAN GRACE

The other British survivor is 1943-built LF789, also a Scottish Aviation product and flown in front of the guns at Manorbier. The fuselage was restored using the original forward section of LF789 and fitted with a number of replica items including an air compressor on the side of the fuselage and fuel tank. Despite its composite build and lack of wings, it provides a valuable representation of the original Queen Bee specification.

REVERSE LEND-LEASE

The American survivor, V4760, was built as catapult floatplane and it managed to depart Hatfield just before the factory was bombed on October 3, 1940. It was allocated to the PAU at St Athan in South Wales.

Operating from Aberporth in West Wales V4760 was launched by ground catapult on May 8, 1941. Trainee gunners shot away the trailing antenna and ground control was lost.

It was flying over Cardigan Bay

Brothers in 1955. It was painted in a black and silver finish and sported Pathé News titles and the bogus US civil registration 'NC726A' on the fuselage.

In 1957 it was used as a camera platform for the film *Spirit of Louis*, starring James Stewart. The movie studio sold the drone on in October 1962.

The Queen Bee was eventually donated to the Port Townsend Aero Museum in Washington State in 2002. The institution specialises in providing young people with aircraft engineering work experience by working on older aircraft. The wooden fuselage was not a great teaching aid and was swapped for one from a Tiger Moth.

HANGAR SWEEPINGS

Thankfully the museum hung on to the original Queen Bee fuselage and in 2013 it was acquired by Ian Grace as a pattern for his own Gipsy Moth restoration. Ian: "I just happened

to be in the right place at the right time before they [Port Townsend] destroyed the original fuselage.

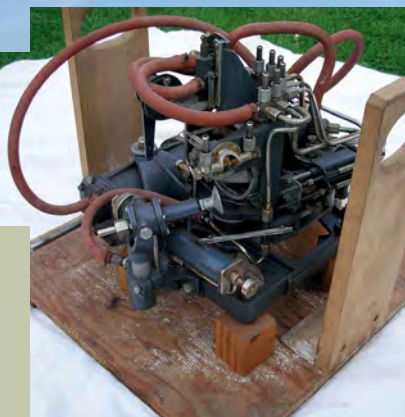
"Unfortunately, I was too late to stop them removing virtually every steel fitting from the wooden structure, but was lucky enough to recover all of them from the 'hangar sweepings' before they had a clean-up. I also recovered the original [and complete] control box which is very different to the Tiger Moth unit."

Ian began to research the Bee's history and realised how significant it was. He decided that it deserved to be restored in its own right.

Since then Ian has been: "gathering parts to complete the airframe, including all of the flying surfaces, struts, new engine bearers, and original Queen Bee tank and of course an autopilot which was a tremendous find. Luckily, I was also able to recover the original and unique instruments which had been removed from the front cockpit, and the panel itself was still in the aircraft.



Left
LF858 is owned by the appropriately named Bee Keepers Group.



Above, left to right
Short Brothers-built floats ready for fitting to V4760.
IAN GRACE

Queen Bee rudder control unit, part of Ian Grace's growing cache of original parts. IAN GRACE

The fuselage of Queen Bee V4760 in its current state. IAN GRACE

"I am actively gathering everything I need. My plan is to restore it as closely to its original spec as possible, as a single-seater with the autopilot in the back cockpit and all its original grappling and handling lines"

"I continue to scour the world for any original Queen Bee autoflight components, including the missing relay box, radio receiver, 'windy' pneumatic pump and the 'telephone dial' supervisory unit for the front cockpit.

"The fuselage itself is incredibly complete and original, including the relay box and accumulator trays in the luggage locker, the front accumulator tray and all its fittings in the front decking. I also have all the fuselage metal fittings, many unique to the Bee, including the original water rudder pulleys.

"The Canadian Museum of Flight has generously donated an original pair of Short Brothers floats of the correct type. I am working with an

Australian museum to copy a set of original Moth float struts that they have."

CAT'S CRADLE

Ian is passionate about the Queen Bee and admits that V4760 has been the catalyst for much research into the type. Tracking down original fittings is a never-ending task: "I have not come across even a rumour of any other surviving Bees or even major components out there.

"It's interesting that in a truck load of Tiger spares I acquired a few years ago, I'm discovering quite a few Bee items. These include a set of wing internal bracing wires that are bonded together where they cross – the Bee became a cat's cradle of bonding strips

in response to an adverse report by the Farnborough 'boffins'. I have miles of copper strip all over the wooden fuselage and all through the control box.

"I am actively gathering everything I need. My plan is to restore it as closely to its original spec as possible, as a single-seater with the autopilot in the back cockpit and all its original grappling and handling lines. I have also sourced most of the rest of the aircraft – wings, tail 'feathers', struts, landing gear plus the floats, so there's plenty to be getting on with."

The author wishes to thank Ian Grace for his invaluable Queen Bee knowledge. ●