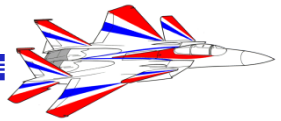


NASA #837 Tribute
The Jet with a Thousand Faces

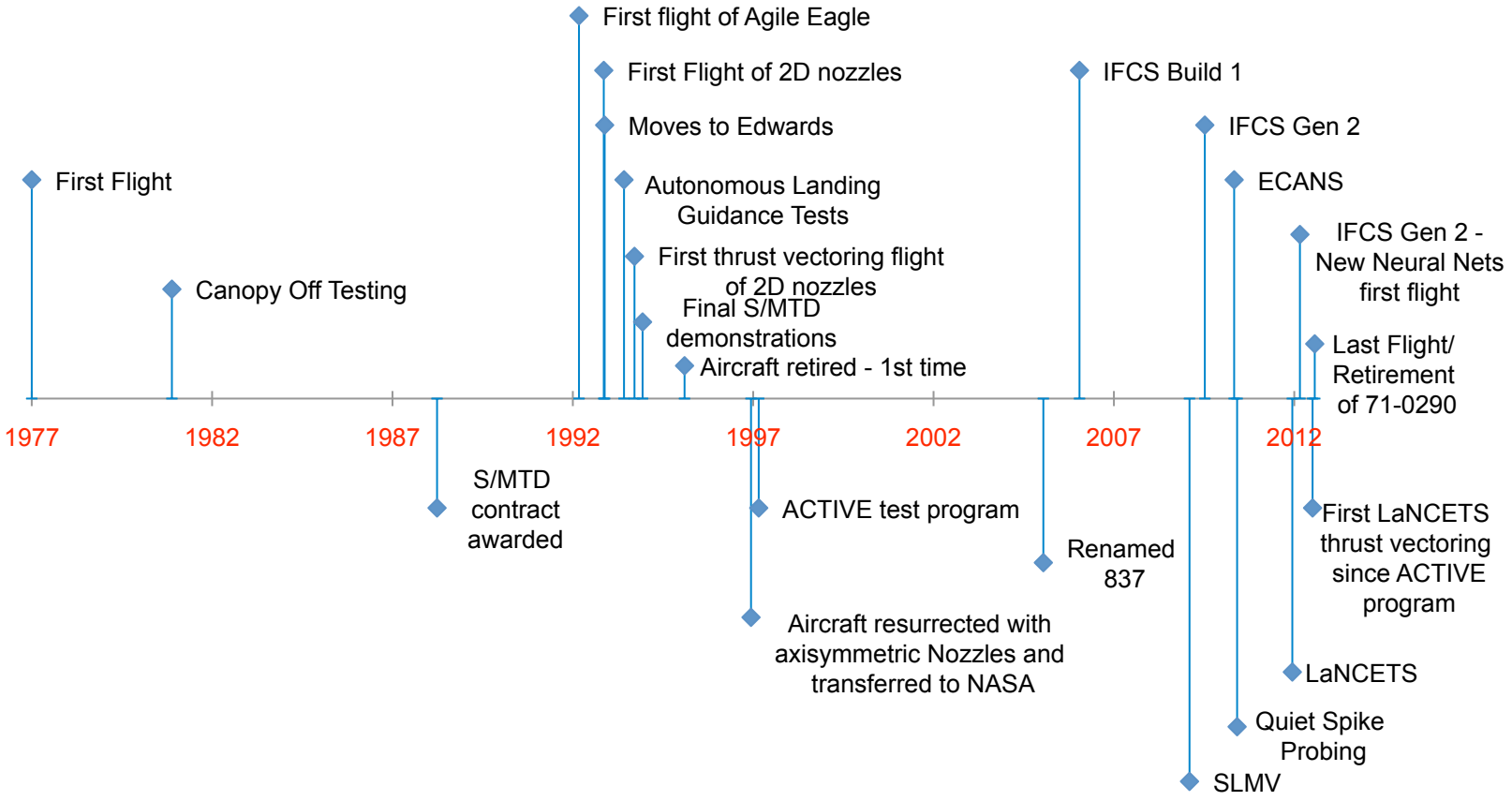
By Carrie Rhoades

NASA Dryden Flight Research Center

Oshkosh 2009



71-0290 Timeline
First Flight thru Final Retirement



First Flight
7/7/73

- Dubbed "TF#1", aircraft was delivered in air superiority blue livery as an F-15 trainer; aircraft was later re-designated as an F-15B.
- [illegible]tion



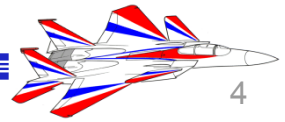
NASA 837 was McDonnell-Douglas TF-15A Eagle, 71-0290 when it performed at the November 13, 1977 Open House.



McDonnell-Douglas F-15B Eagle, 71-0290 appeared on static display at the March Air Force Base Airshow on September 16, 1978.

Canopy Off Testing 5/26/77

- Objectives
  1. Obtain subjective and objective data on the effects of windblast upon the in the event of inadvertent canopy loss.
  2. Identify and define requirements for aft cockpit windblast protection.
  3. Identify and define requirements for aircrew emergency procedures as a consequence of inadvertent canopy loss.
- Phases
  1. Taxi tests with an instrumented anthropometric dummy in the aft seat
  2. Flight test with the instrumented dummy in the aft seat.
  3. Taxi tests with a human subject in the aft seat.
  4. Flight test with a human subject in the aft seat.



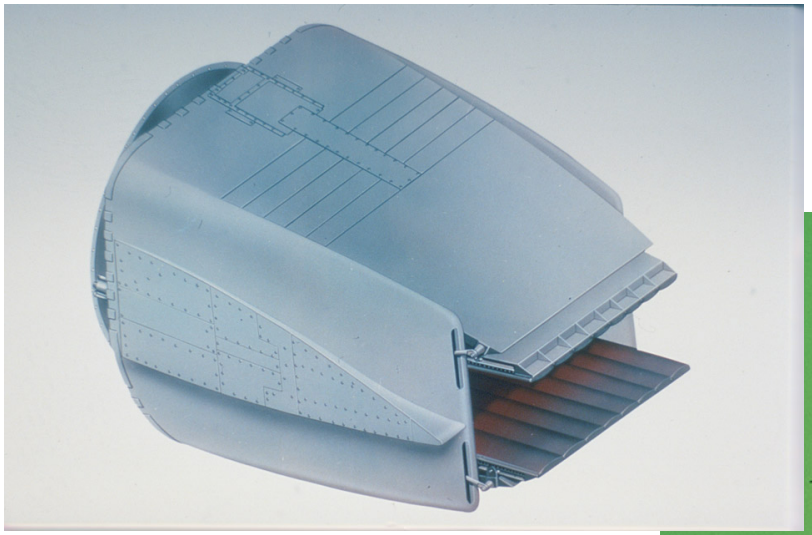
S/MTD Contract Awarded 10/1/84

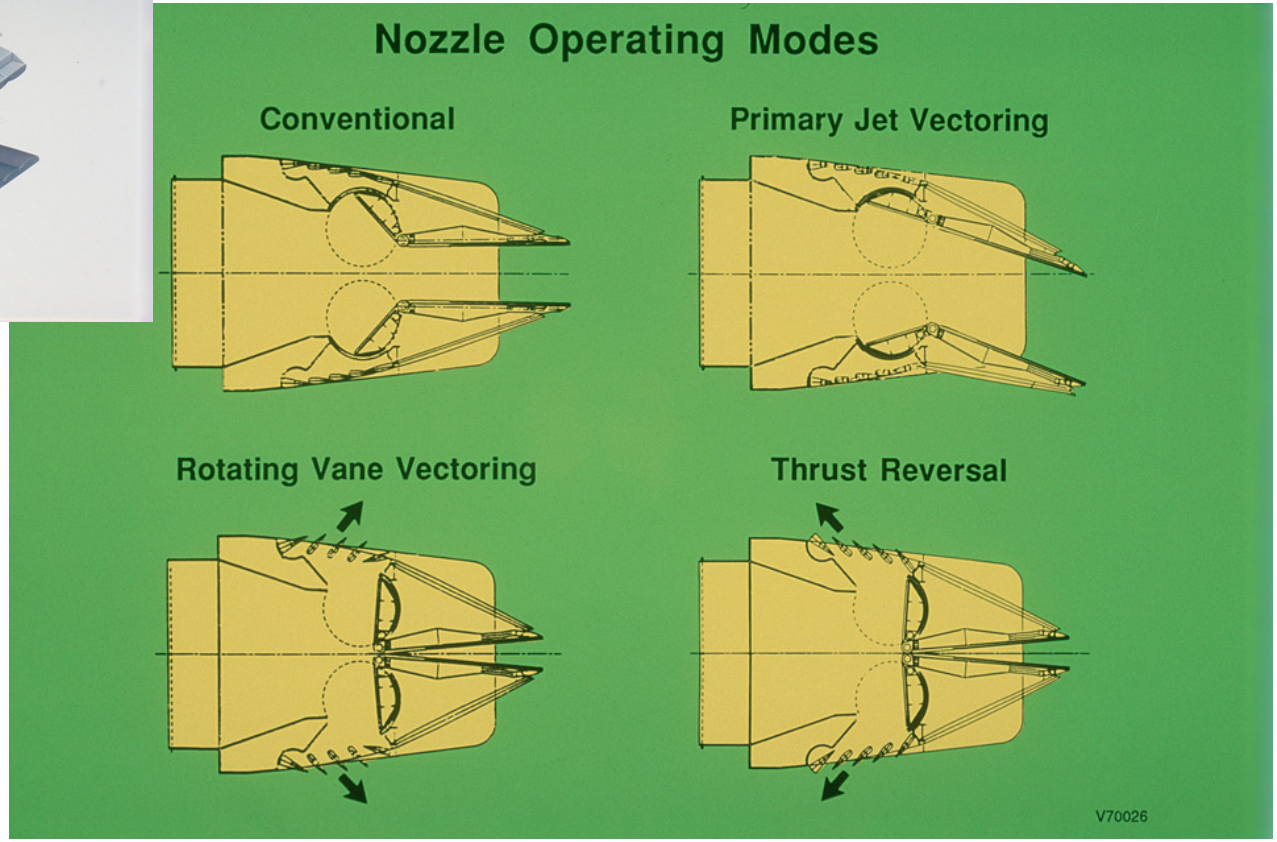
- STOL and Maneuvering Technology Demonstrator (S/MTD) aka Agile Eagle
- Program consisted of 2D Thrust Vectoring/Thrust reversing Nozzles, a fly-by-wire Integrated Flight/Propulsion Control System, movable Canards, and improved F-15E style cockpit displays, and modified landing gear capable of higher sink rate landings on rough fields.



Aircraft before STOL Modifications

2D Nozzle




Nozzle Operating Modes
Conventional
Primary Jet Vectoring
Rotating Vane Vectoring
Thrust Reversal
V70026

First Flight of 2D Nozzles 5/16/89

- First flight of the rectangular thrust-vectoring, thrust-reversing (2D TV/TR) noz



Moves to Edwards 5/25/89

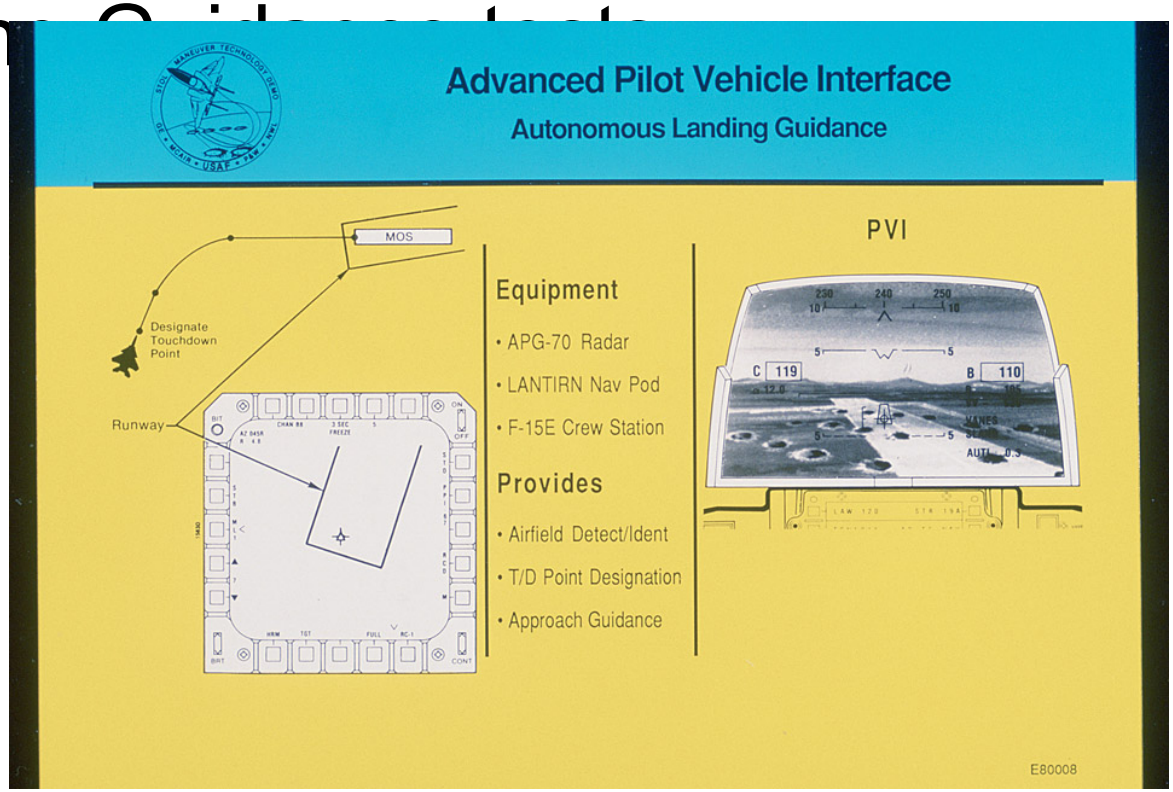
- Test program moved to Edwards AFB for thrust vectoring and thrust reversing envelope expansion, and for demonstration tests.





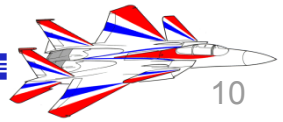
Autonomous Landing Guidance Tests 12/7/89

- 2D nozzles removed and axisymmetric nozzles reinstalled for Autonomous Landing Guidance tests



First Thrust Vectoring Flight of the 2D Nozzles 3/23/1990

- Taxi and flight tests commenced of the 2 D thrust-vectoring and thrust-reversing nozzles
- demonstrated vectored takeoffs with rotation at speeds as low as 29 knots
- a 25-percent reduction in takeoff roll
- landing on just 1,650 ft (500 m) of runway
- thrust reversal in flight to produce rapid decelerations
- controlled flight at angles of attack up to about 35 deg without vertical-tail surface inputs



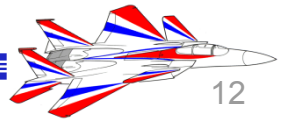
Final S/MTD Demonstrations 6/13/90

- Shortest landing – 1,350 feet
- Wet runway landings – 2,600 feet
- Autonomous landing guidance demonstrated at night with all runway lights



Aircraft's First Retirement 8/12/91

- Aircraft put into storage in St Louis; engines and nozzles removed



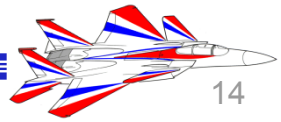
Aircraft transferred to NASA 6/15/93

- NF-15 NF-1 resurrected with axisymmetric nozzles and transferred to NASA



ACTIVE Test Program 9/1/93

- Advanced Control Technology for Integrated Vehicles (ACTIVE)
  - Pratt & Whitney F100-229 engines with Pitch/Yaw vectoring nozzles.
  - Flight control system upgrade: 2 nozzle controllers, 2 inlet controllers, 2 flight control computers, 2 engine controllers (DEECs), the VMSC and the aircraft's central computer
  - Instrumented with strain gages. Total of 3,377 parameters were recorded and telemetered.



ACTIVE Photos



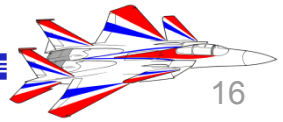






Other Projects under ACTIVE Program

- ACTIVE Phase 2 – validation and gather data on performance
- HISTEC (High Stability Engine Control)
- AdAPT (Adaptive Aircraft Performance Technology)
- IFCS (Intelligent Flight Control System)
- Range Extension and High Speed Acoustics Research
- ACTIVE Phase 3 – Inner-loop thrust vectoring



Re-named 837
7/23/01

- NASA registered it as N837NA



IFCS Build 1
7/24/02

- Intelligent Flight Control System (IFCS)
  - Neural nets "learned " how to fly a partially failed or battle damaged airplane



EM-0076-01.mov

EM-0076-02.mov

SLMV
8/11/05

- Structural Loads Model Validation (SLMV) flight conducted to validate the Loads Mod



IFCS Gen 2
1/13/06

- Second Generation Neural Network tes



ECANS
11/6/06

- Enhanced Communication and Navigation System (ECANS)









QuietSpike Probing 12/6/06

- Gulfstream's QuietSpike program support







Anechoic Chamber testing of ECANS Antennas at Edwards AFB BAF 2/2/07



LaNCETS data flights 6/17/08

- Lift and Nozzle Effects on Tail Shocks (LaNCETS)



IFCS Gen 2 New Neural Nets 9/2/08

- Return to flight test after some delays



LaNCETS first thrust vectoring flight since ACTIVE program 1/8/09





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Last Flight of 71-0290 1/30/09

- 837 Performed an aerial show and fly-by



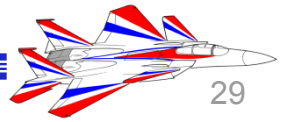
EM-0076-04.mov

837 2nd Retirement 1/30/09



Special Thanks

- Larry Walker
- Wilton Lock
- Jim Stewart
- Everyone who contributed to this presentation in one form or another



Special Note

- Please Note that not all pictures are chronologically correct. Author tried to keep as accurate as possible, but some testing photographs could not be located for.

References

- **Information from Lawrence Walker in the form of emails, presentations, videos, and papers.**
- **F-I5/16 CANOPY OFF TESTING** by IVAN J. SINGLETON (M) and WAYNE F. KENDALL, JR., M.D.
- **F-15 STOL/Maneuvering Technology Demonstrator Initial Flight Test Results** by Laurence A. Walker (AF) MCAIR SMTD Project Pilot and LCol William R. Neely, USAF (M) USAF SMTD Program Manager
- http://www.air-and-space.com/20051022%20Edwards%20page%201.htm
- http://www.nasa.gov/centers/dryden/news/FactSheets/FS-048-DFRC.html
- The Story of Self-Repairing Flight Controls System by James E. Tomayko
- Nose Up by Lane Wallace