

GENERAL DYNAMICS

F-16XL

DUAL-ROLE FIGHTER

An Illustrated History



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PREFACE

PROGRAM OVERVIEW AND ACKNOWLEDGMENTS

This book is not meant to be the definitive history of the General Dynamics (GD) F-16XL, but an illustrated history, gathering many images, graphics, and anecdotes from a variety of sources to provide a visual representation of the F-16XL design and test program. The best narrative history of the F-16XL can be found in documents such as *Elegance in Flight*, by Albert C. Piccirillo, NASA Aeronautics Book Series, available as a free download, and the F-16XL Flight Test Program Final Report prepared by General Dynamics in December 1985. The narrative presented here is a simplified overview of the entire program.

General Dynamics' winning Lightweight Fighter design, the F-16, rolled out of the factory on 13 December 1973. With its sleek design and fly-by-wire control system, the new fighter appeared to have limitless potential for upgrades. A brief, unscheduled, flight occurred on 20 January 1974, followed by the official 90-minute first flight at Edwards AFB, CA on 2 February 1974. The nimble fighter quickly began showing its lethal potential in air-to-air combat, and its versatility in carrying a variety of weapon systems.

As the F-16 Fighting Falcon (also termed Viper by crew members) role expanded, General Dynamics chief engineer and noted 'Father of the F-16', Harry Hillaker, proposed a variant to expand the aircraft's air-to-surface capabilities. Known initially as Supersonic Cruise and Maneuver Prototype (SCAMP), the new design incorporated a 'cranked arrow' wing design that provided a 115 percent increase in wing area, 83 percent increase in internal fuel capacity with 66 percent more lift. As the design became closer to being finalized, it received the designation F-16XL. An avid golfer, Harry Hillaker chose to name the aircraft after the *Top Flite XL* golf ball. In many official drawings and reports, the aircraft is also referred to as the F-16E (single seat) or F-16F (two seat), though these were never officially formalized.

General Dynamics chose two early Full-Scale Development (FSD) F-16A airframes, 75-0747 and 75-0749, for

the F-16XL modifications. 75-0747 had been involved in a landing mishap at Edwards AFB that heavily damaged the forward fuselage, while 75-0749 is noted for having performed climatic tests at Eglin AFB, FL. GD chose to replace the entire forward fuselage of 75-0747 with a two-seat segment in addition to the modifications necessary to make it an F-16XL. Once completed, the data block on the aircraft was changed from F-16A to F-16B.

Rollout of the new aircraft took place at General Dynamics' facility in Ft Worth, TX on July 2, 1982 and its first flight performed the following day on July 3. Flight number 2 came on July 9 and the new design went supersonic for the first time during the 2-hour flight around Ft. Worth, TX. After just 4 flights, the aircraft was ferried to Edwards AFB for more in-depth performance and weapons testing. The second airframe joined the test program on July 29, 1982 and ferried to Edwards AFB on November 8.

The F-16XL was not built to compete with the F-15E Strike Eagle for the Dual-Role fighter mission. According to Harry Hillaker, General Dynamics position was that the Dual-Role mission should go to the F-15 and that the F-15E should complement the F-16XL in the ground strike mission in the same manner that the F-16 complements the F-15 in air-to-air missions. It was the Air Force that created the competition between the two very capable airframes.



Noted as the 'Father of the F-16', Harry Hillaker designed the F-16XL as a natural follow-on to the F-16C/D.

Over the next 3 years, the two F-16XL aircraft were tested with many conventional weapon and external fuel tank configurations. During their 45 bomb-drop test missions, the F-16XL's released 218 Mk-82's, 18 Mk-84's, 6 CBU-58's, fired a single AGM-65 Maverick missile and the two aircraft fired a total of 7,363 rounds of ammunition. During the course of the Air Force test program, the two aircraft made a total of 798 flights; 437 for ship 1 and 361 for ship 2. At the end of the Air Force test program, both aircraft were ferried to Ft. Worth, TX and placed in flyable storage in the fall of 1985.



By the late 1980's NASA became heavily involved with the design of the High-Speed Civil Transport, an aircraft that could become the successor to the French Concorde. NASA believed the HSCT could be economically viable to fly through the use of Supersonic Laminar Flow Control (SLFC), the use of suction across the upper surface of the airfoil to smooth airflow. Both primary contractors involved in the effort, Boeing and McDonnell Douglas, chose designs utilizing a variation of the 'cranked-arrow' wing and were awarded contracts to study the effect of the SLFC idea.

NASA selected the F-16XL airframes as the best choice as subscale demonstrators. NASA and General Dynamics completed the contract for transfer of the two vehicles in 1988 and F-16XL, 75-0749 took to the air for the first time in nearly 4 years on March 9, 1989 with GD test pilot Joe Bill Dryden at the controls with the official transfer to NASA occurring the following day. NASA assigned their tail numbers to each vehicle, 75-0749 became NASA 849 (800 series denoting NASA Dryden Flight Research Center). While F-16XL ship 1 left the GD factory in its original gray paint and some new white tail art, F-16XL ship 2 was resplendent in a beautiful red, white and blue paint scheme. Rolling out of the GD paint booth, the aircraft wore tail number NASA 847, but this had been taken by an F/A-18A. Prior to the delivery flight, it was changed to NASA 846, but this too had been taken, this time by an F/A-18B. Shortly after arrival to Dryden, the tail number was changed to NASA 848, which it still carries.

NASA used both F-16XL test aircraft for use in aerodynamic laminar flow studies. Through the use of a wing glove covering approximately 50 percent of the left wing on F-16XL 849, installed in April 1990, NASA was able to test the theory of laminar flow. The glove con-

F-16XL, NASA 849, pulls in tight on F-16XL NASA 848 over Rogers Dry Lake at Edwards AFB during a test mission out of Dryden Flight Research Center. (NASA) sisted of two portions, a passive section with a smooth aerodynamic surface and a smaller active section that provided suction to keep the airflow smooth across the surface. Testing on 849 continued until November 1992, when the glove was removed, and 849 was loaned to NASA Langley Research Center the following April. While at NASA Langley, 849 received a striking new paint scheme of black, white & gray with yellow stripes. 849 returned to NASA Dryden in November 1994 and continued to support the laminar flow program as well as its use in airborne sonic boom measurement testing.

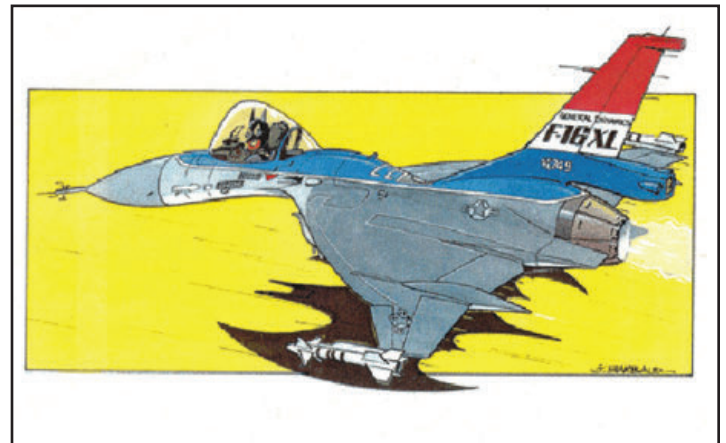
NASA continued their laminar flow work on F-16XL 848, initially modifying the right wing with a minor shape alteration and testing various wing fences on the lower left wing while construction continued on the larger laminar flow wing glove. The new glove was considerably larger than the previous one used on 849, with over 12 million, laser-drilled holes for suction. Installation of the glove altered the shape of the left wing on 848 considerably. First flight with the new Supersonic Laminar Flow Control (SLFC) wing glove took place on October 13, 1995 with NASA test pilot Dana Purifoy at the controls. F-16XL 848 flew in this configuration for just over a year, making its final flight on November 26, 1996, with the SLFC program achieving 70 to 80 percent of their test goals.

NASA 849 received a Digital Flight Control System (DFCS) upgrade in an attempt to expand its use as an airborne test vehicle, making its first test flight on December 16, 1997. F-16XL 849 soldiered on until its final, 30-minute flight at the Edwards AFB Open House

on 10 October 1999. At the end of the test programs, the two F-16XL's were simply parked outdoors and towed around the NASA facility as space requirements dictated. F-16XL 849 received a temporary reprieve in 2007 when mechanics at Dryden, working in their spare time, brought 849 up to be taxiable in the hope of acquiring a new test program. On June 29, 2007, F-16XL 849 moved under its own power up and down the Edwards AFB taxiway for the last time. The new program never materialized and 849 went back into storage.

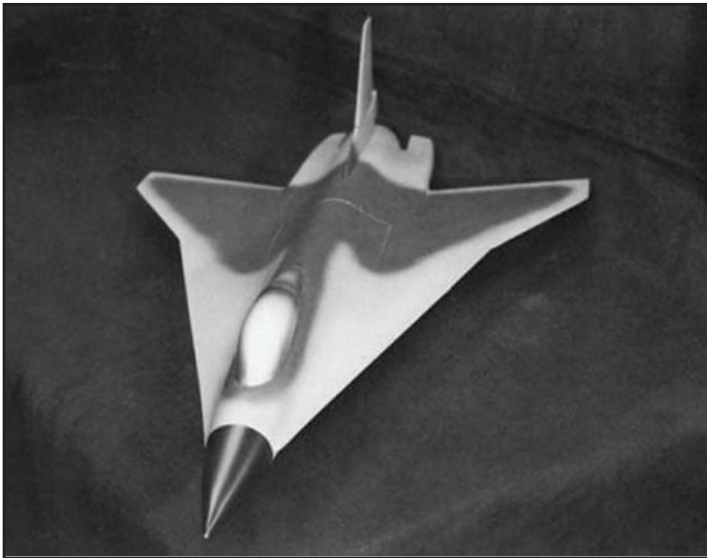


In 2009, ownership to the two F-16XL's transferred to the National Museum of the United States Air Force. F-16XL 75-0747/NASA 848 remained in outdoor storage since its last flight in 1996, and placed outside an unused hangar on Edwards AFB in 2018, hidden away from public view, missing a few panels, still with the NASA SLFC modifications. F-16XL 75-0749/NASA 849 was placed on display at the AFTC Museum on Edwards AFB in its NASA colors in August 2013. In 2019, the aircraft was towed to the Edwards AFB paint shop and given a fictitious gray paint scheme never worn by the aircraft while in service. The F-16XL represented a significant increase in capability for the F-16, it is unfortunate the Air Force chose to pit it against the F-15E in a contest for which the odds were stacked against it. It is the hope of this author that both of these elegant machines find proper indoor museum homes to preserve the legacy of the personnel involved in this achievement.

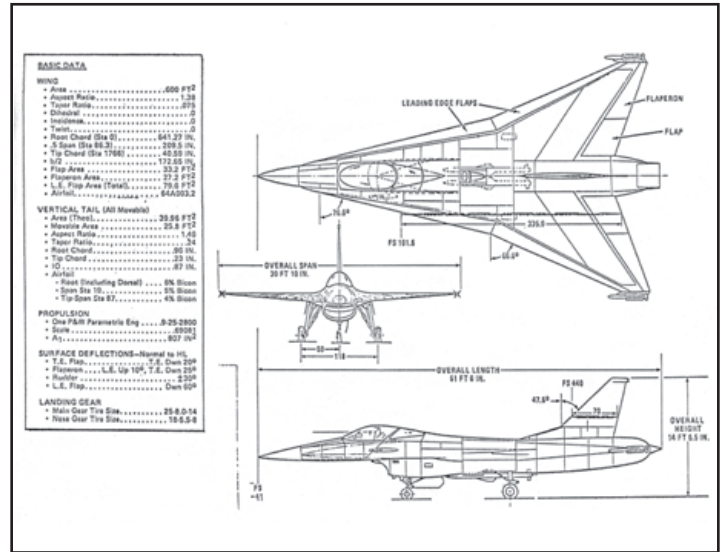


The majority of flight testing for the General Dynamics F-16XL program was performed over the various ranges around Edwards AFB, CA. (AFTC History Office)

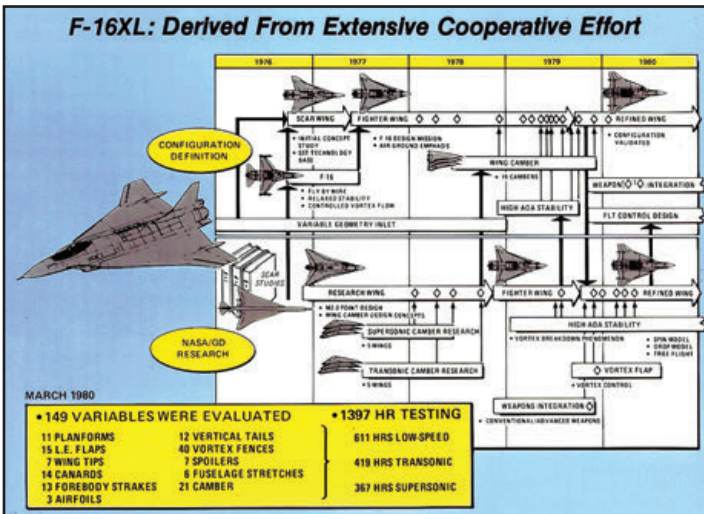
The creation of a product such as this requires the assistance of many people over the course of many years. Among those that went above and beyond in their assistance are Phillip 'Mike' Moore, Lockheed Martin Corporation who supplied much of company-related material; Keith 'Sven' Svendsen, retired U.S. Air Force Lt. Colonel, who, while assigned to the F-16XL program, made the effort to photographically document the program, and shared his amazing collection with this author; Robert Wetherall, who supplied much of the early program material; Sheryl Scott Tierney, Flight Test Engineer on the F-16XL program; and Jeannine Geiger- archivist at the Edwards AFB History Office, who scoured their archive to provide any existing documentation in their archives. The author would also like to thank Todd Amon-AFTC Museum, Robert Bradley, Anthony Chong, Mark Crowson-Archivist at Arnold Engineering Development Complex, Dryden Flight Research Center, Thomas Grindle, Michael Grove, Teresa 'Terry' Hornbuckle at the Photo Archives of NASA Langley Research Center, Craig Kaston, Stephen Landers, Scott Lowther, Liz Lutz-F-16 Communications Manager at Lockheed Martin, Yancy Mailes, Command Historian of Air Force Materiel Command, Chris Morrison, R. Ray Ortensie, Rock Roszak at Detail & Scale Publications, Kevin Rusnak-AFLCMC Historian, Mike Valdez, Allyson Vought and David Wyatt. This book would not have been possible without each of you.



Early SCAMP model created by the General Dynamics model shop showing the original planform for the Model 400 design. (Lockheed Martin)



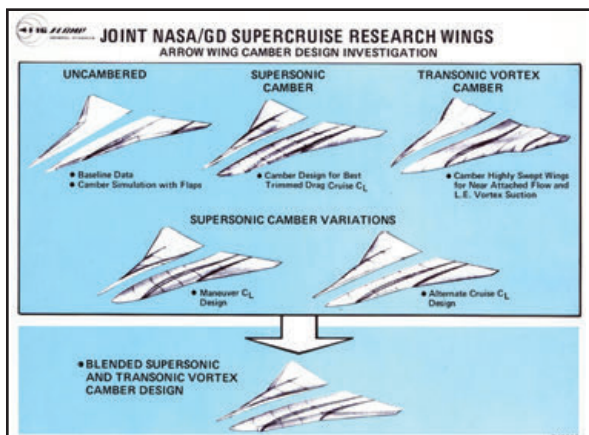
One of the Model 400 proposals incorporated a two-dimensional, thrust vectoring nozzle and wing-tip missile rails into the design. (Lockheed Martin)



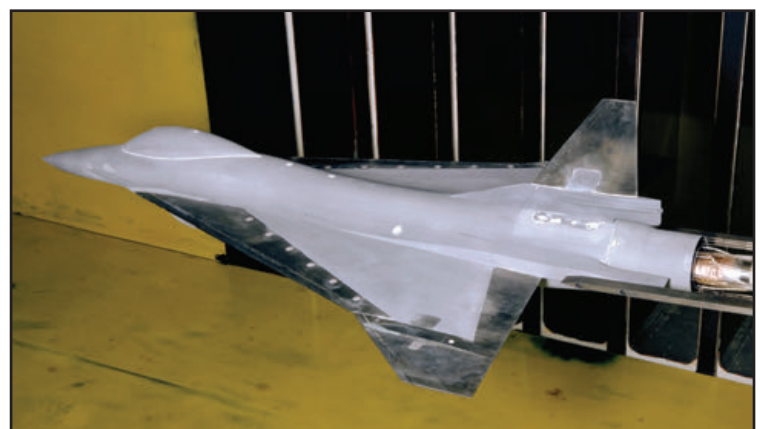
The above graphic dated March 1980, shows the design evolution of the F-16XL through a cooperative effort with NASA. (Robert Wetherall collection)

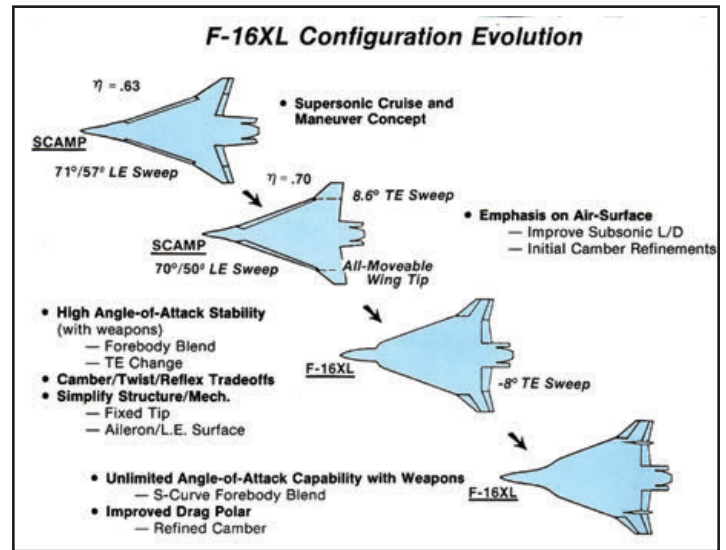
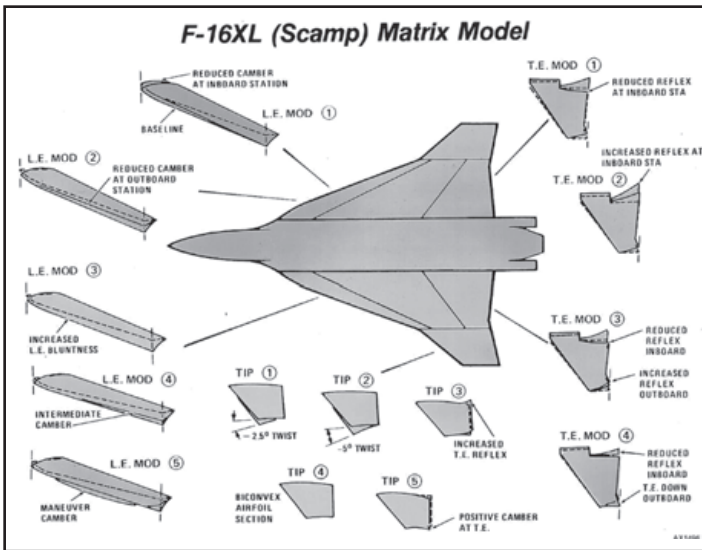


Key members of the GD SCAMP development team with a matrix model circa late 1977. From the left: Harry J. Hillaker, program manager; Andrew Lewis, aerodynamics; Kenny Barnes, stability and control lead; and Jim Gordon, lead program engineer. (Lockheed Martin via Craig Kaston collection)



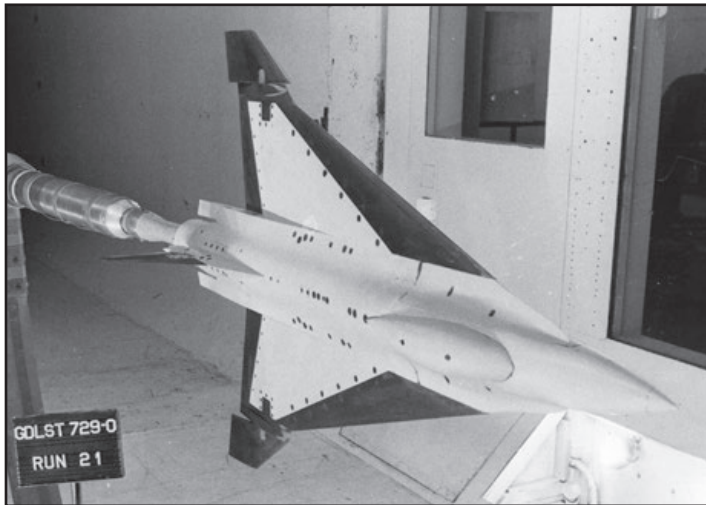
Various different wing designs tested under the NASA/General Dynamics test program as shown above. (Robert Wetherall collection). SCAMP wind tunnel model at right. (NASA Langley)



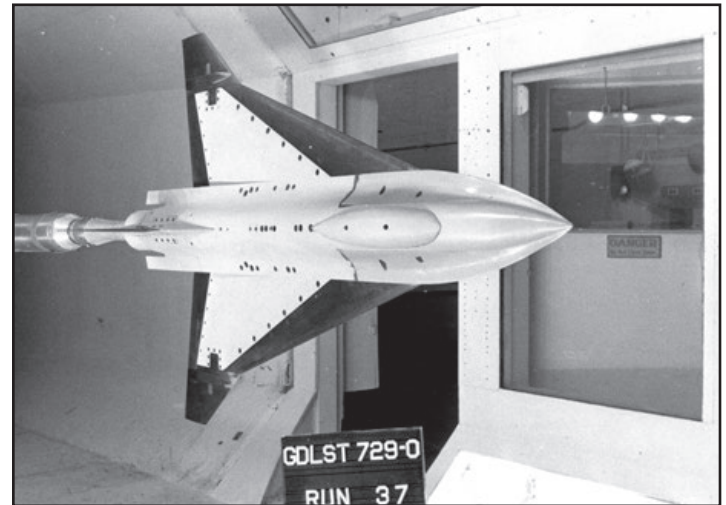


To perfect the cranked arrow wing design, GD and NASA tested a variety of wing features on the wind tunnel models. (Lockheed Martin)

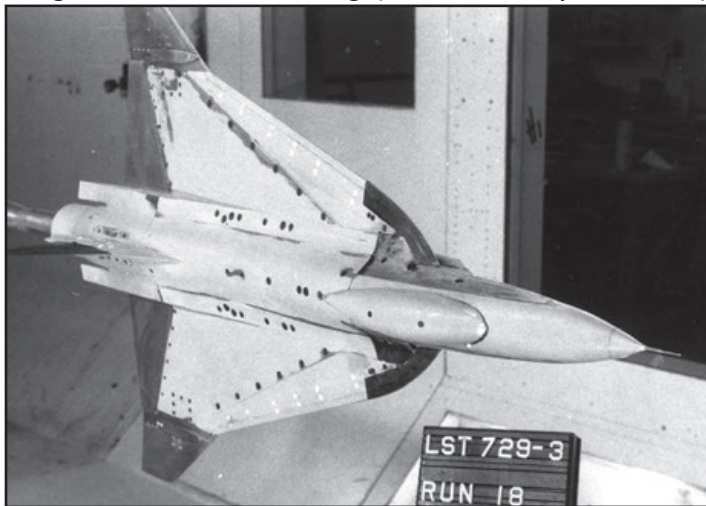
F-16XL wing evolution from the original SCAMP design to that actually constructed. (Lockheed Martin)



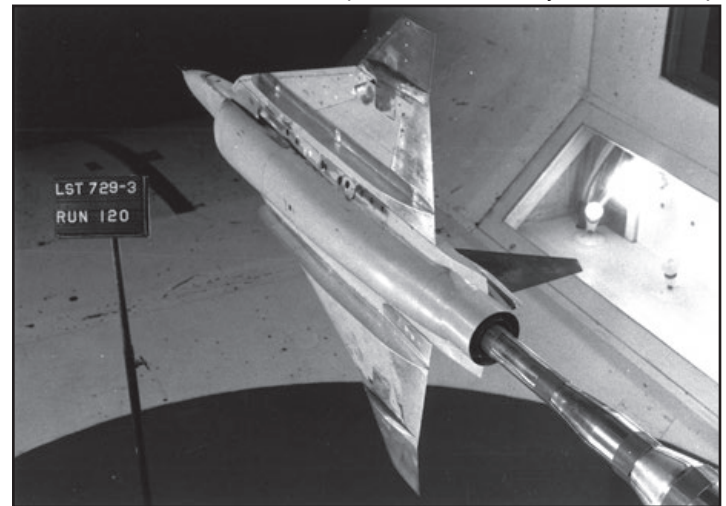
The original SCAMP design in the General Dynamics Low-Speed Wind Tunnel in San Diego, CA. The outboard wing sections are all-moving. (Robert Bradley collection)



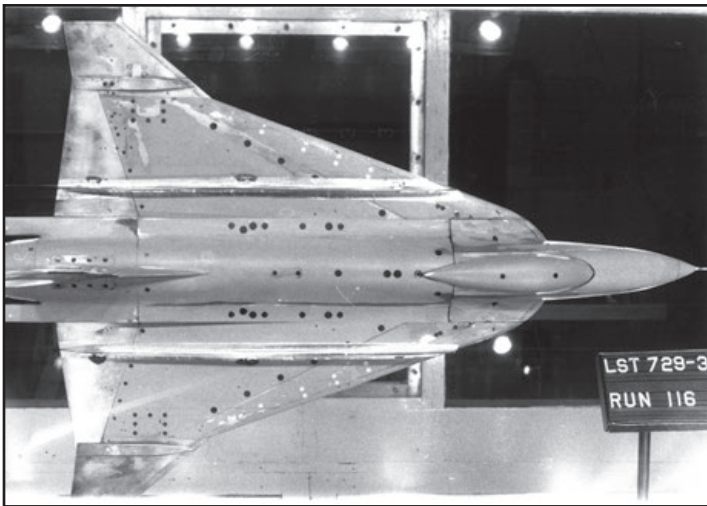
The blended chines on the nose of this wind tunnel model give it an appearance similar to the Lockheed SR-71 Blackbird. (Robert Bradley collection)



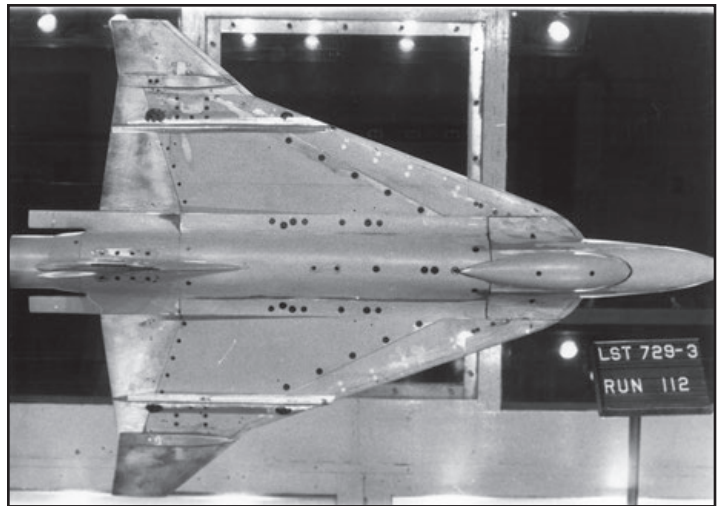
Modifications to improve the low-speed pitching moment included changing the trailing-edge sweep and modify the leading edge strake. (Robert Bradley collection)



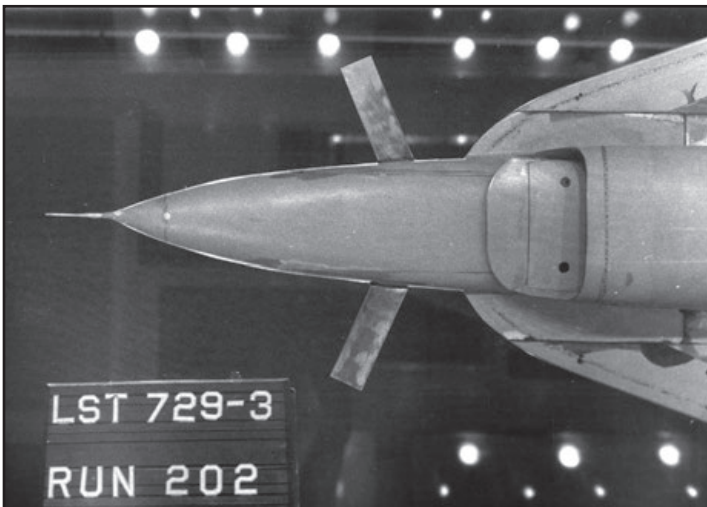
Underwing and overwing fairings were tested to control the spanwise flow on the wing at high Angle of Attack. (Robert Bradley collection)



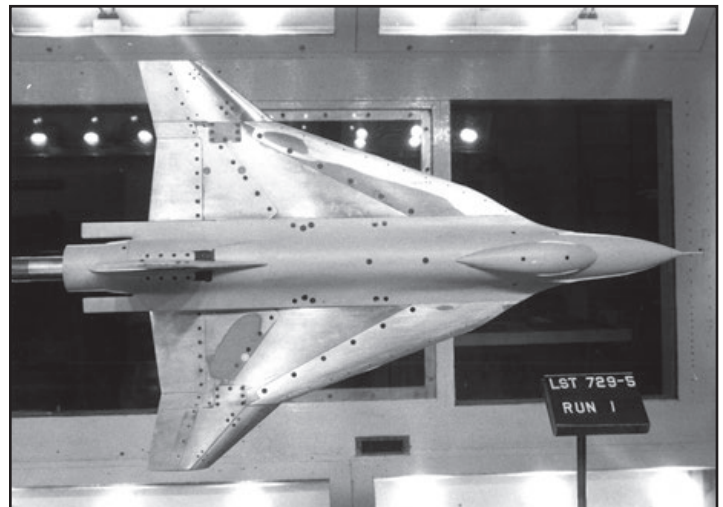
Large overwing fences in a similar wing location as the underwing fences were also tested in the wind tunnel. (Robert Bradley collection)



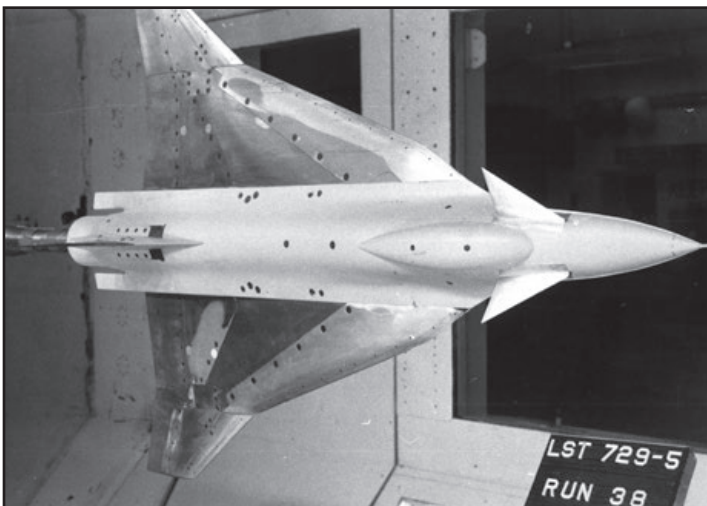
A number of wing fences were tested, including smaller versions of the wing fences mounted further outboard on the wing surface. (Robert Bradley collection)



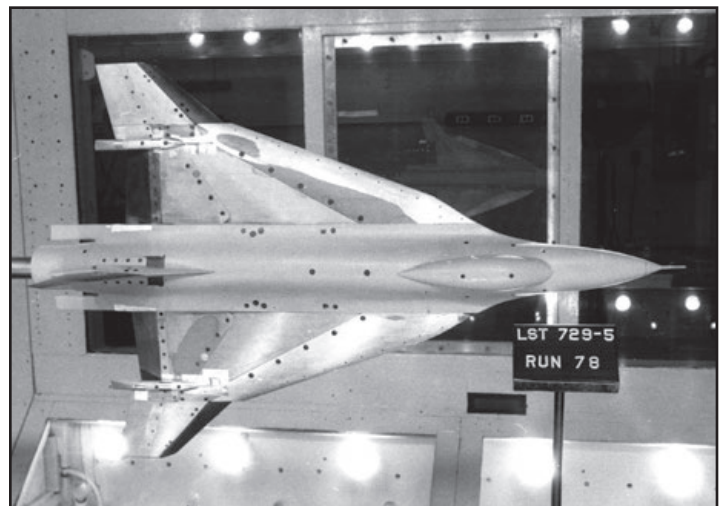
Inspired by the canard shape on the Rockwell B-1 bomber, this configuration was referred to as 'The Moustache'. (Robert Bradley collection)



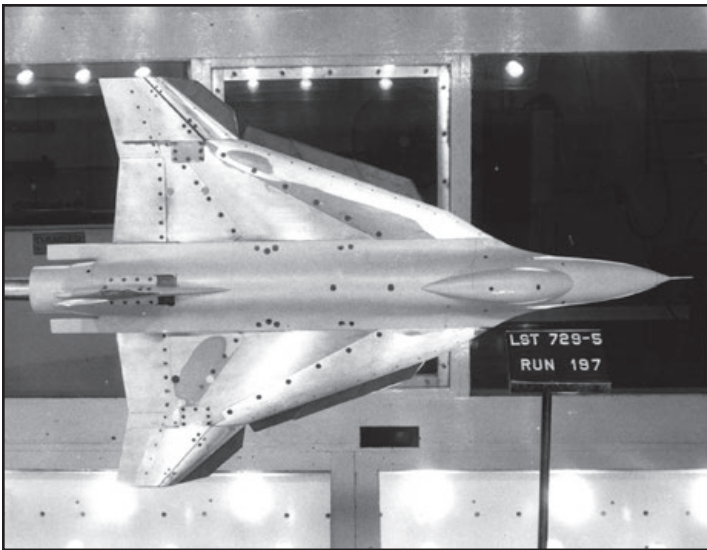
Overall wing design is close, except for the final S-Blend of the wing apex into the fuselage, during the first run of test 729-5. (Robert Bradley collection)



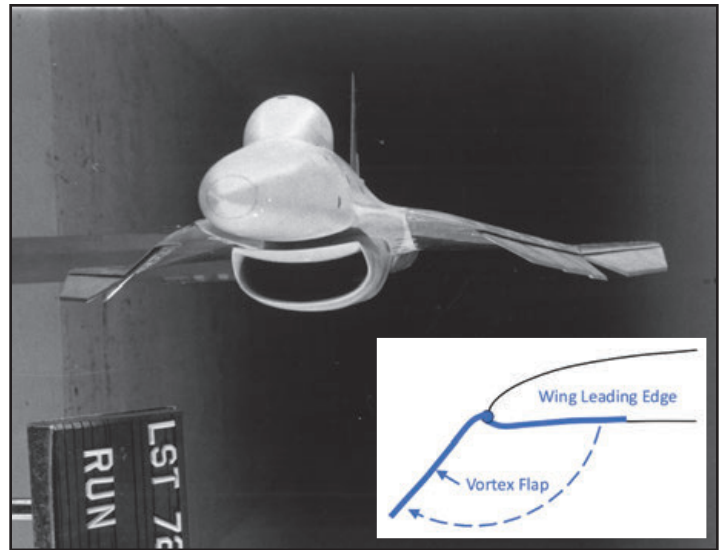
Run 38 of Low-Speed Tnnel test 729-5 added short, triangular canrds ahead of, and above the wing plane to reinforce the wing vortex. (Robert Bradley collection)



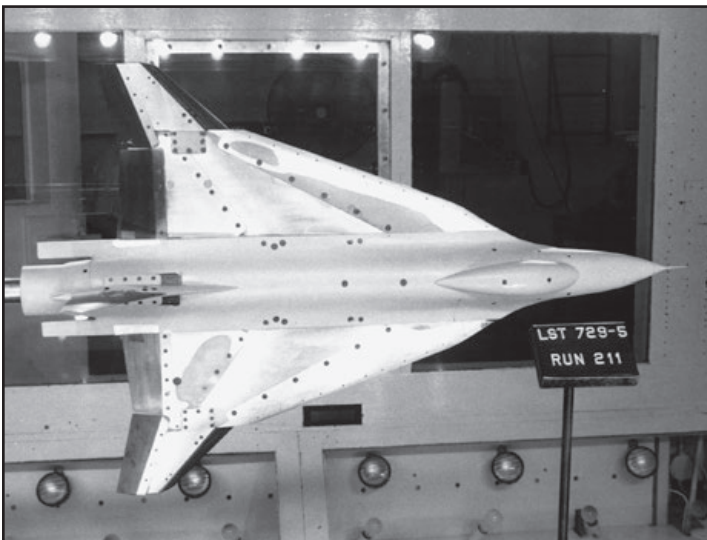
Overwing fairings for the aileron actuators are added to the SCAMP model for LST test 729-5, run number 78. (Robert Bradley collection)



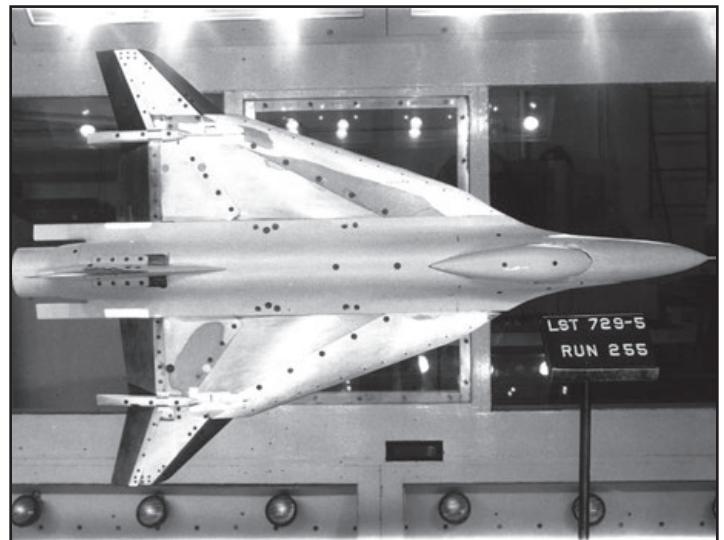
Leading edge vortex lift flaps are incorporated on the inboard and outboard wing sections prior to run 167. (Robert Bradley collection)



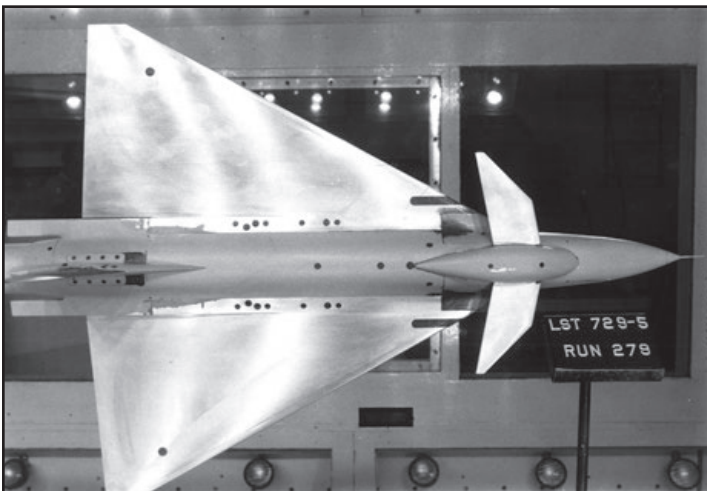
The vortex lift flaps could be deployed from beneath the wing leading edge as show in the inset illustration. (Robert Bradley collection)



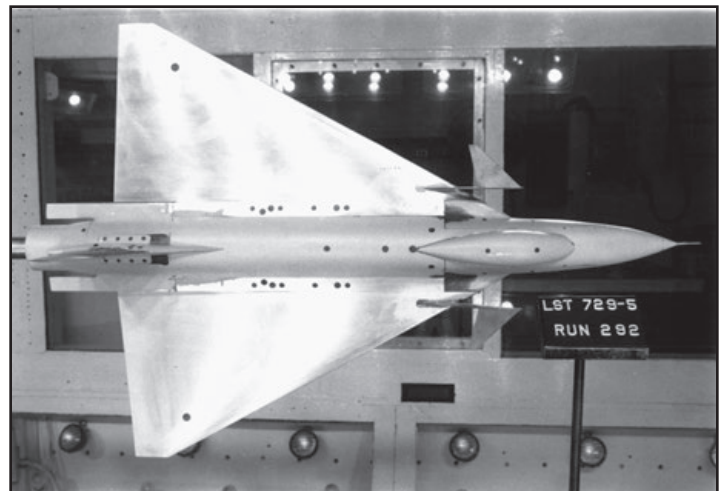
Tests with control surfaces deflected were run without actuator fairings installed. (Robert Bradley collection)



Aileron actuator fairing are installed on the test model prior to run 255. (Robert Bradley collection)



To test the effectiveness of various canard shapes with a known wing shape, the SCAMP model was given a wing similar to the B-58 Hustler. (Robert Bradley collection)



One of the many difficulties encountered during wind tunnel testing was finding a proper attachment location for the canards. (Robert Bradley collection)

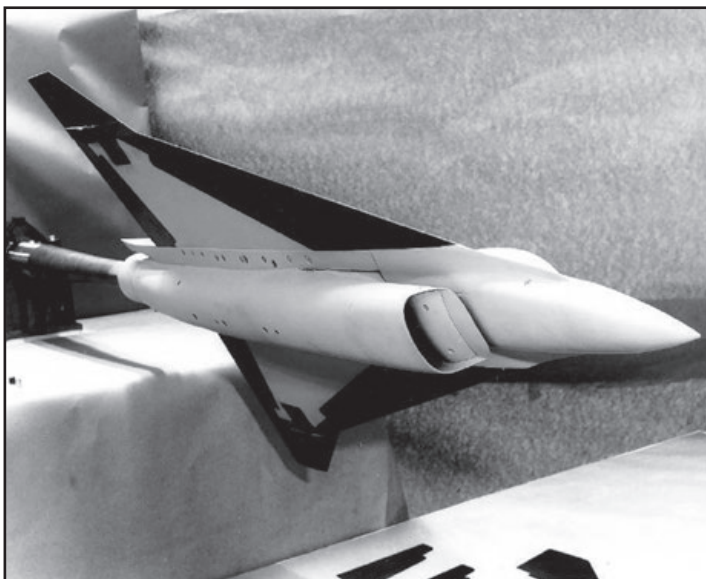
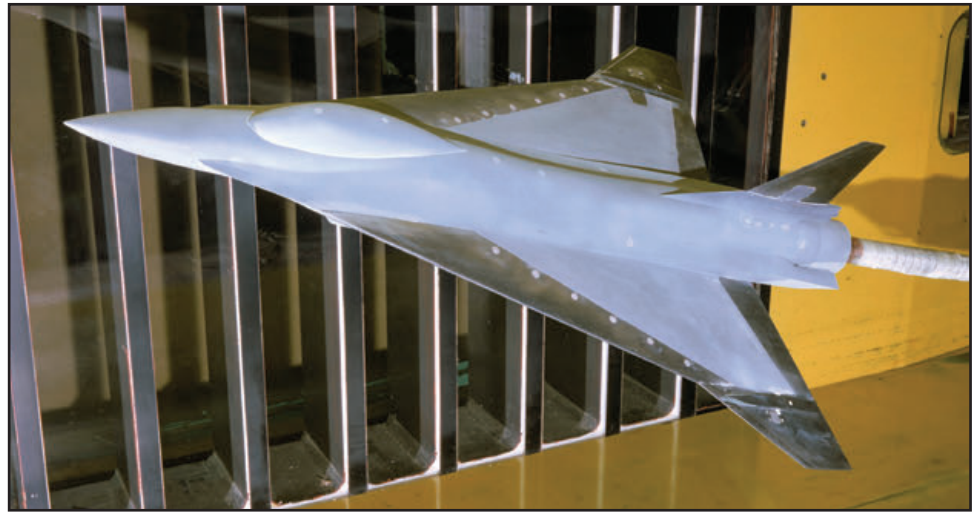


To check for power loss to control surface gaps, a gap sealer is placed on the inboard edge of the right elevon prior to run 314. (Robert Bradley collection)



A table is set up next to the wind tunnel model where the test crew could lay out various components available for configuration changes. (Robert Bradley collection)

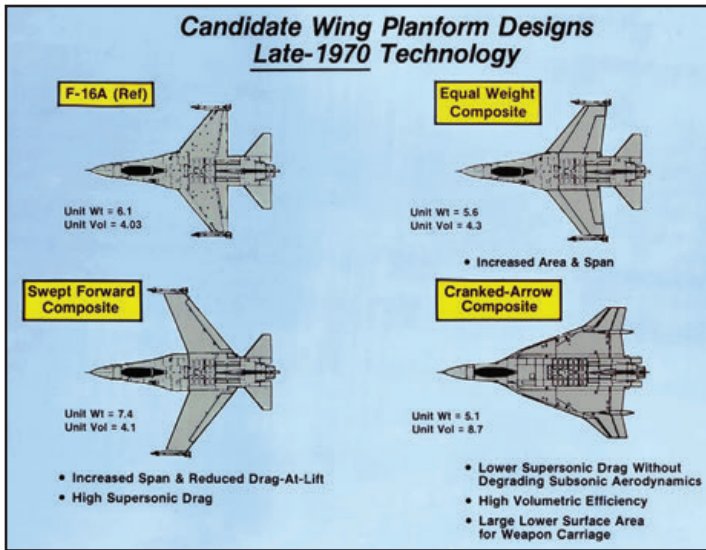
A SCAMP wind tunnel model being tested at NASA Langley Research Center in 1978. Tests were conducted with the same wind tunnel models in different facilities to verify test results. (NASA Langley)



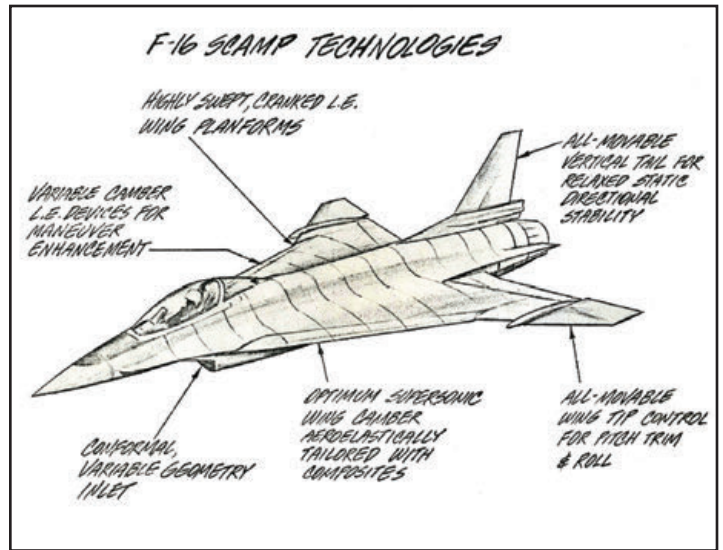
A 1/15th scale wind tunnel model of the Mod-400, F-16 SCAMP design. The highly-swept inlet is noteworthy. (Robert Wetherall collection)



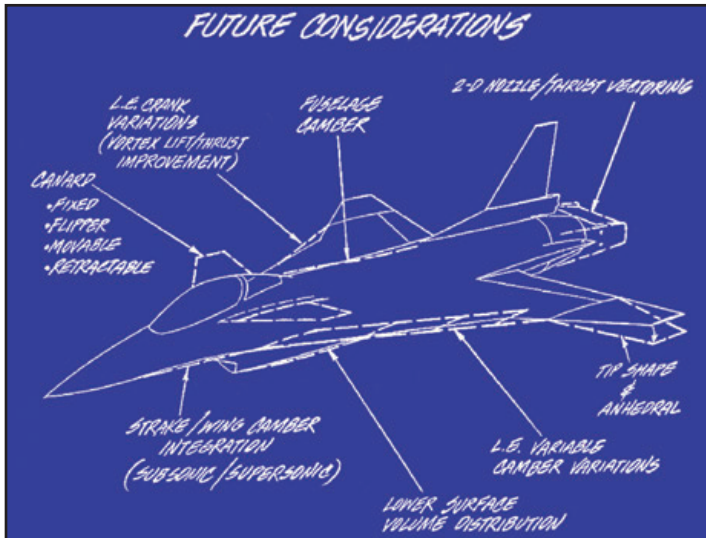
The 1/15th scale SCAMP wind tunnel model with various components changed out during wind tunnel testing. (Robert Wetherall collection)



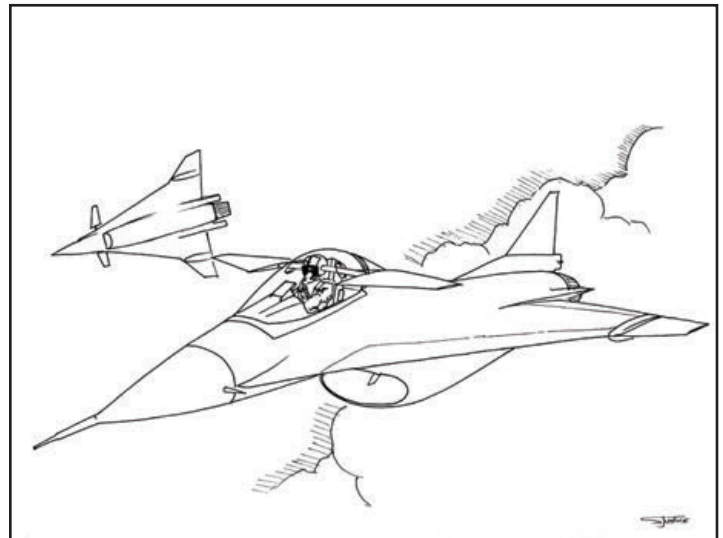
Before accepting the cranked-arrow wing for the F-16XL, GD considered many options including a swept forward wing design. (Robert Wetherall collection)



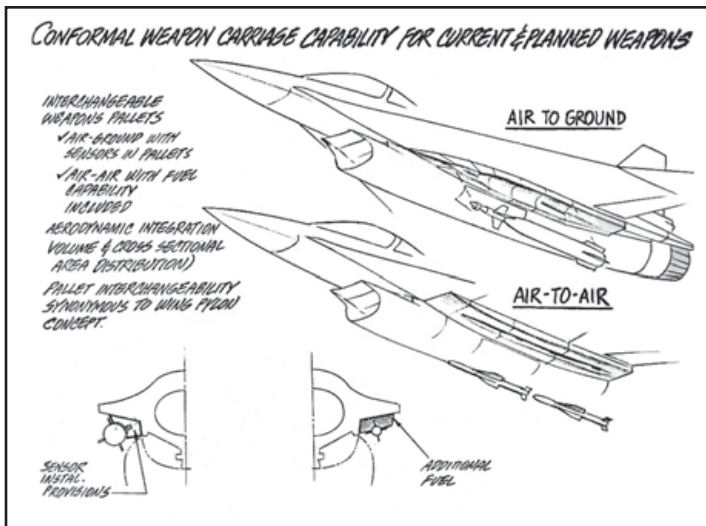
Many of the advanced technologies proposed for the new design, including an all-movable tail, are shown in the graphic above. (Robert Wetherall collection)



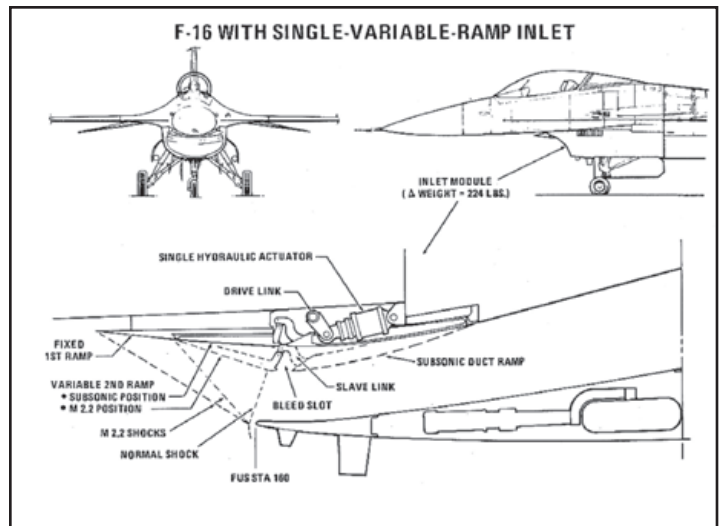
Design options including a canard and thrust-vectoring nozzle were reviewed by GD. (Robert Wetherall)



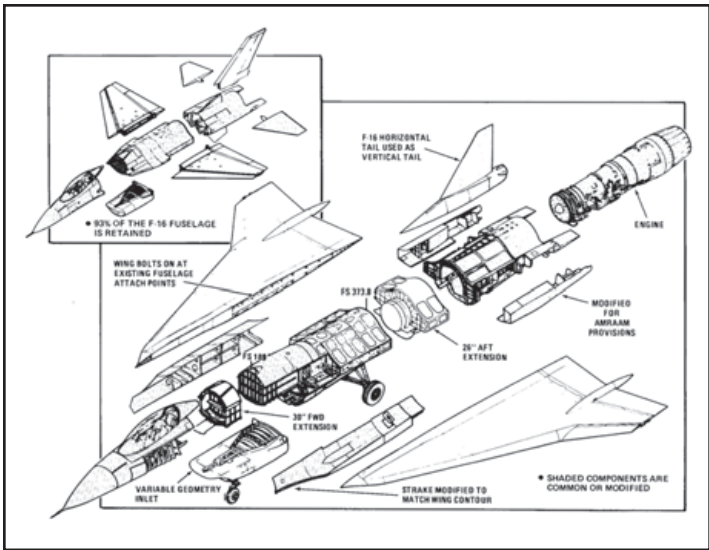
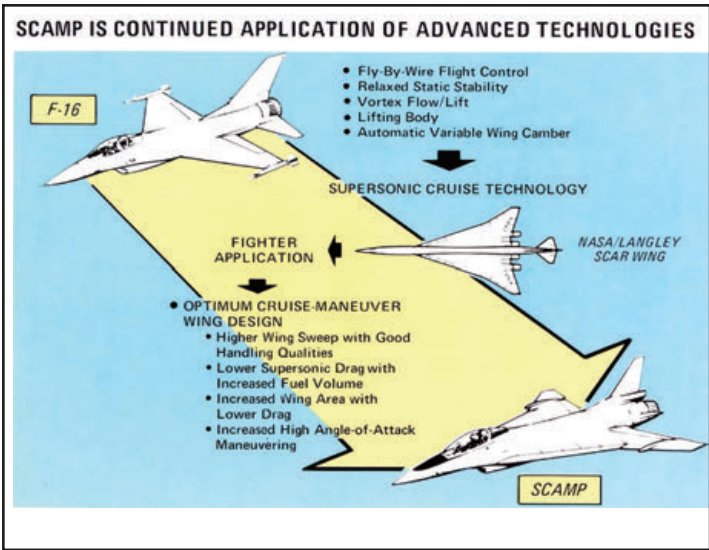
Humorous art created by Steve Justice, shows the ideal location for the canards. (Robert Wetherall)



Conformal weapons carriage for improved aerodynamics was a primary design feature. (Robert Wetherall)

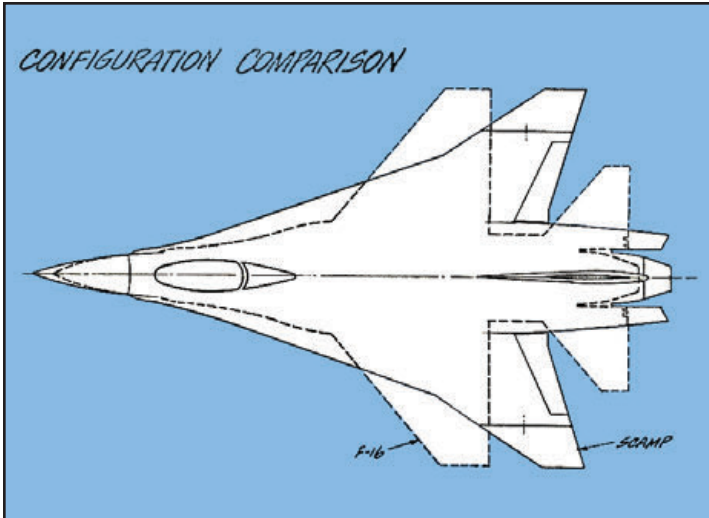


A single-variable ramp inlet had early consideration by the GD design team. (Lockheed Martin)

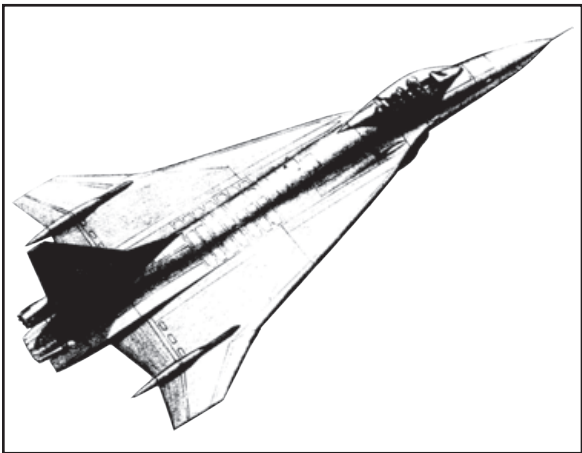


The use of the latest technological advances continued throughout the entire design process. (Lockheed Martin)

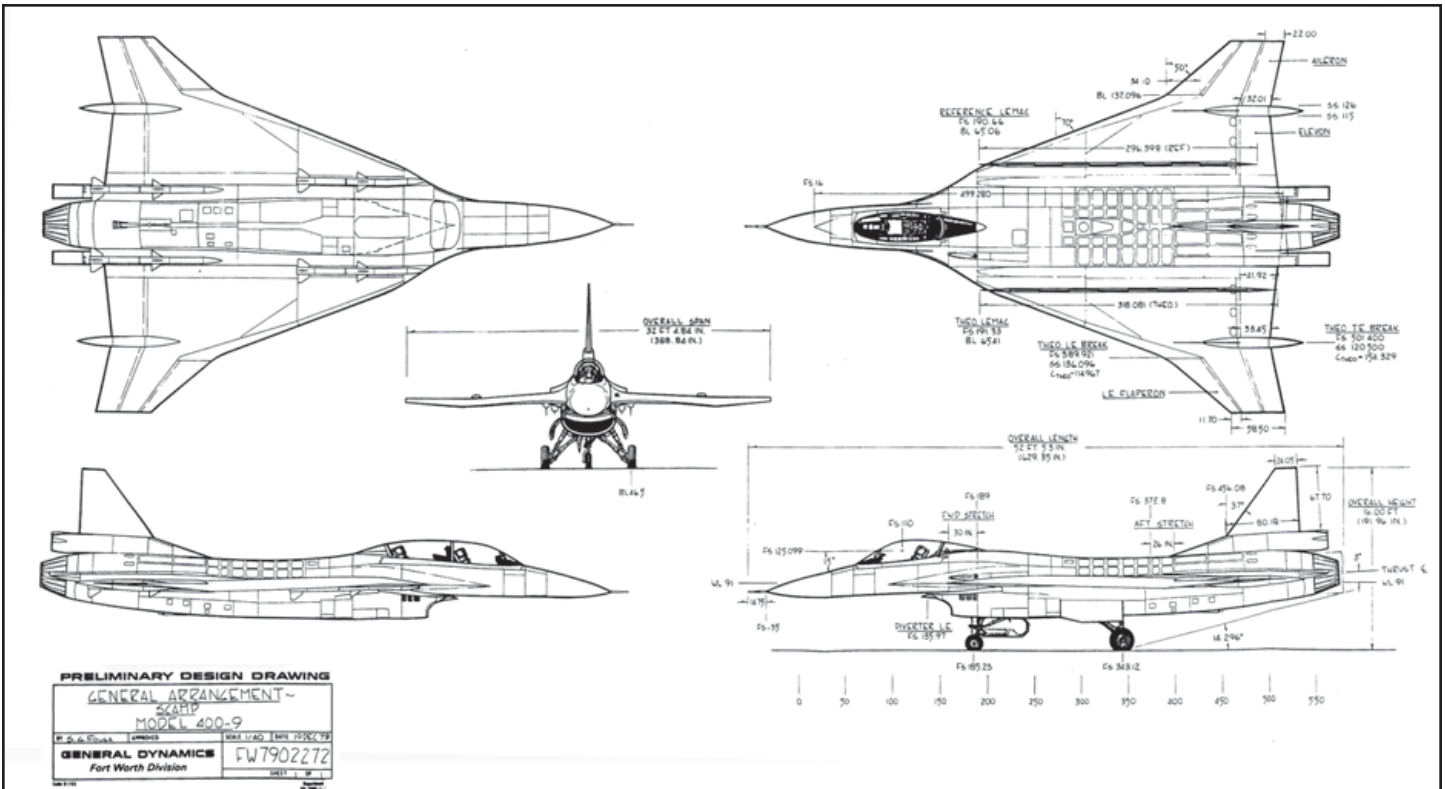
From the beginning, GD promoted the commonality aspect of the new design. (Lockheed Martin)



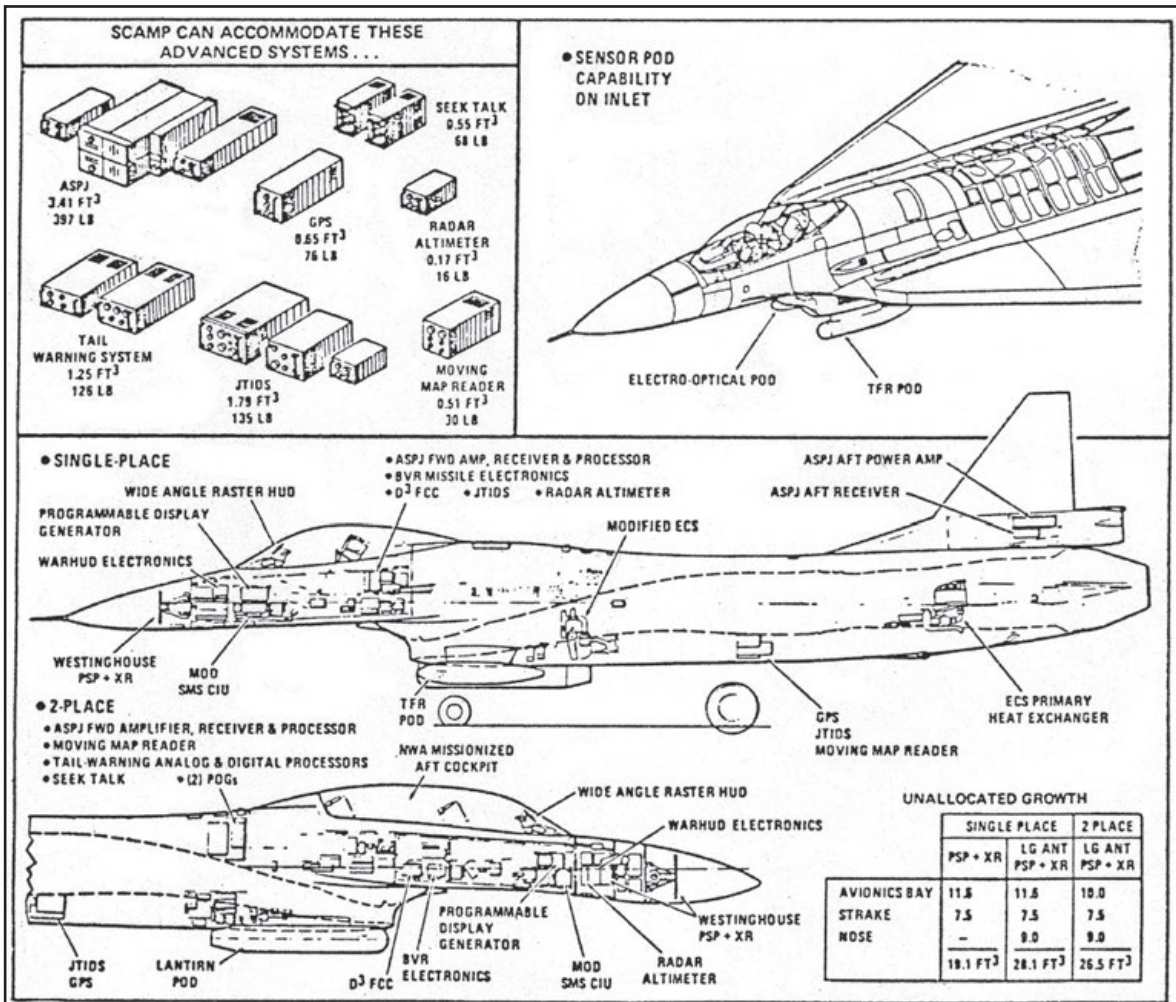
Comparison of the original F-16 layout as compared to the F-16 SCAMP design. (Lockheed Martin)

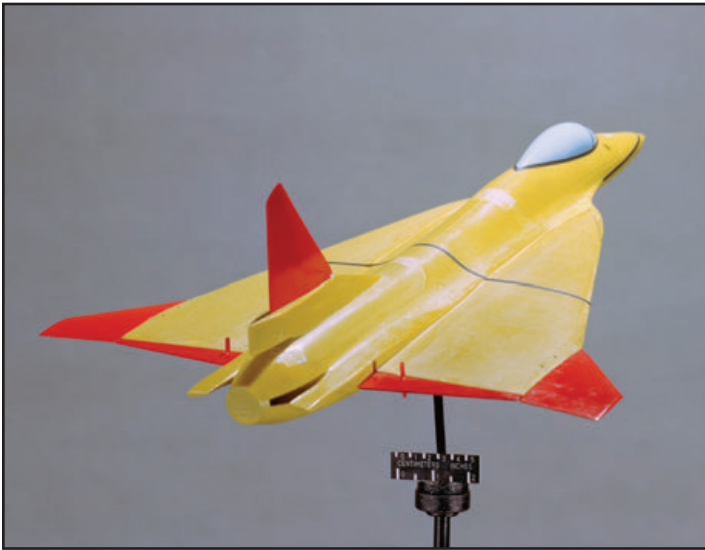


General Dynamics managers (L-R), Clarence Hart, George Hayward, Harry Hillaker and Randy Kent, look over the latest blueprints for the SCAMP vehicle. (Lockheed Martin)



Looking closer to the final design, SCAMP Model 400-9, shown in single and two-set variations, has the refined cranked arrow wing planform, yet retains the all-moving vertical stabilizer. (Lockheed Martin)

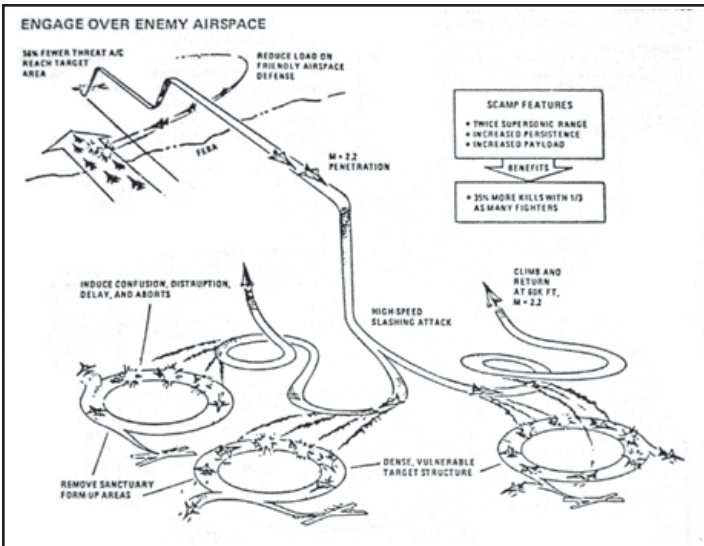




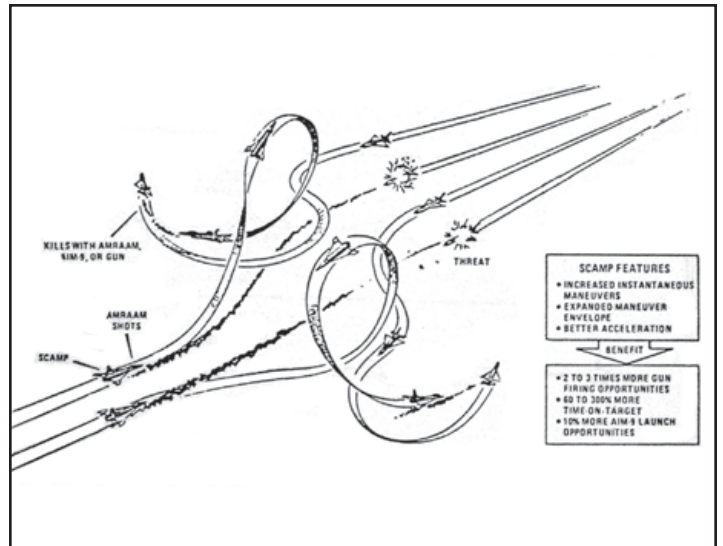
NASA Langley wind tunnel model showing the smaller flaps and all-moving wingtips. (NASA Langley)



F-16XL artist concept with a striking red, white & blue scheme similar to the YF-16. (Lockheed Martin)



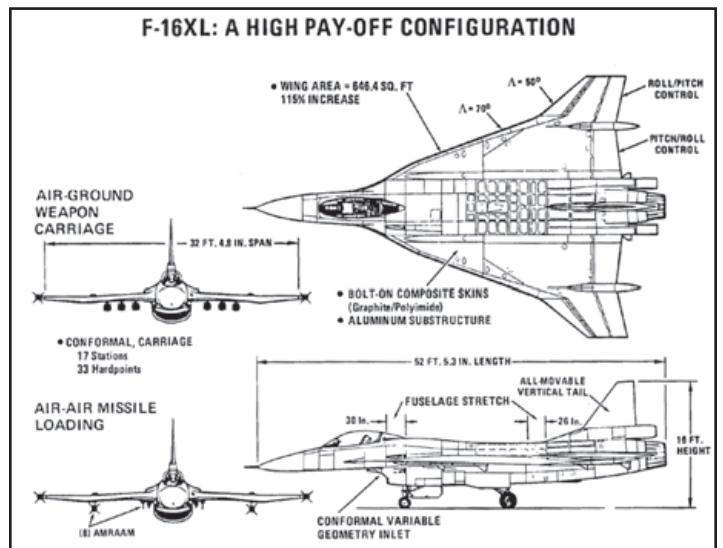
Proposed air-to-ground mission for the SCAMP with possible engagement with enemy aircraft. (Lockheed Martin)



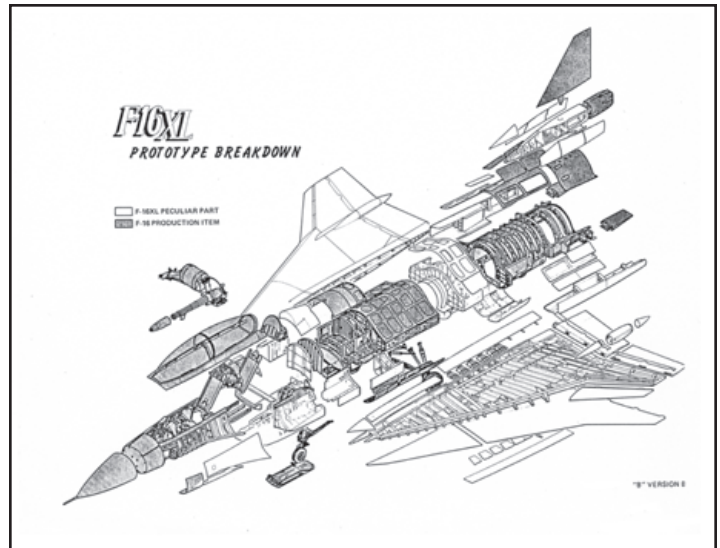
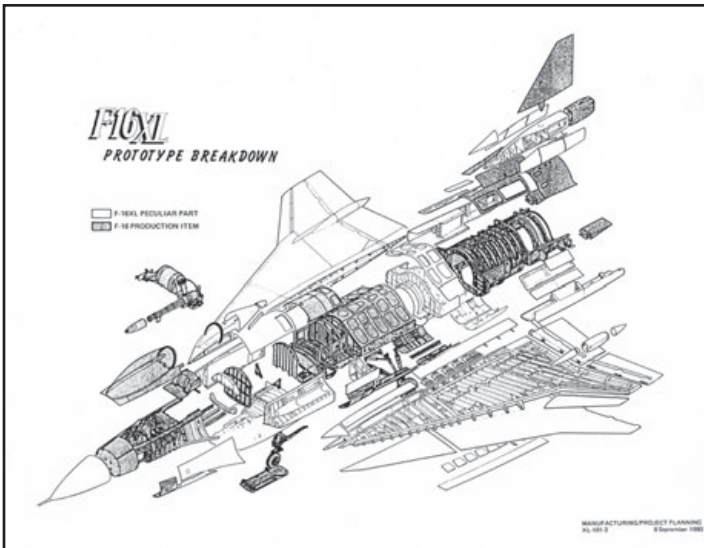
Air-to-air engagements of enemy aircraft used missiles, or 20mm gun at close range. (Lockheed Martin)



NASA Langley tested a variety of external store configurations including six AGM-65 Mavericks. (NASA Langley)



Close to the final configuration, this illustration shows aspects of the F-16XL configuration. (Lockheed Martin)



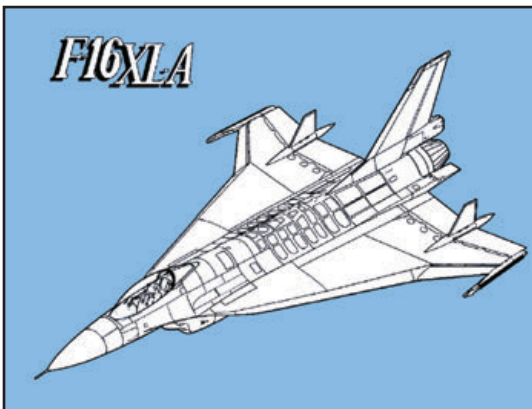
Illustrated parts breakdown of early design single seat (above, left), and two-seat (above, right) variations of the F-16XL. Similar illustrations can be found labeling the aircraft F-16E and F-16F, respectively. (Lockheed Martin)



Artist concept of two operational F-16XL aircraft during an air-to-ground bombing mission. (Lockheed Martin)

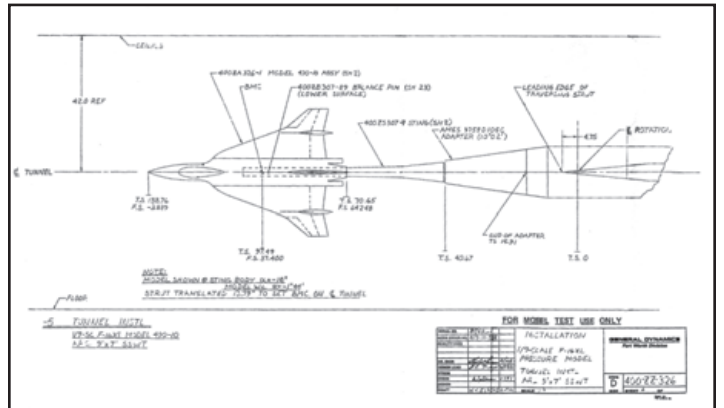
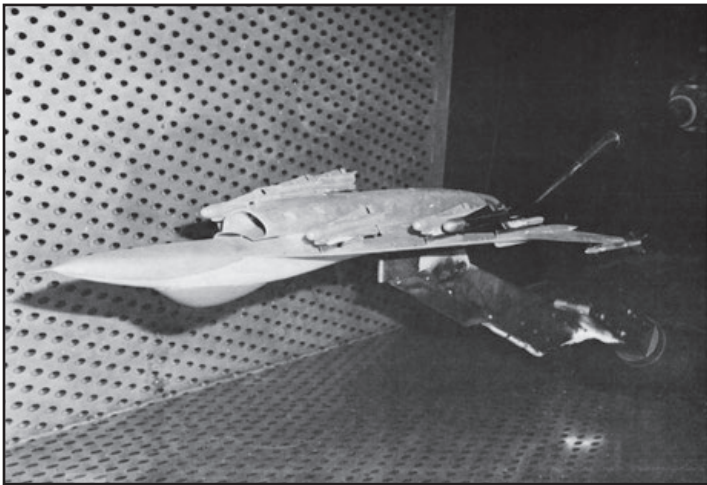
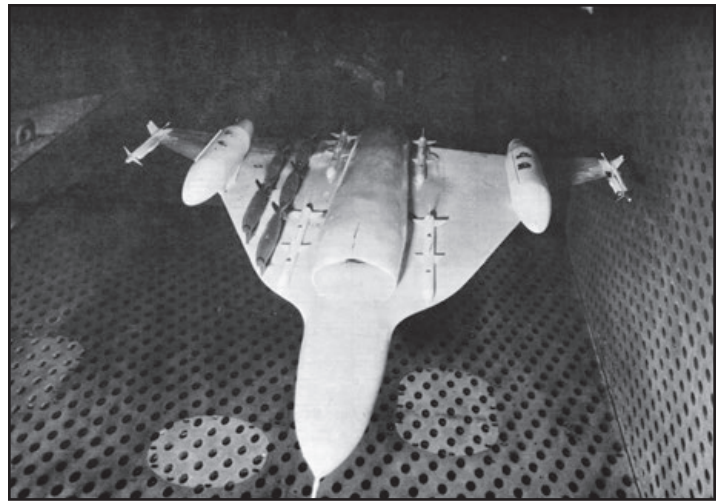
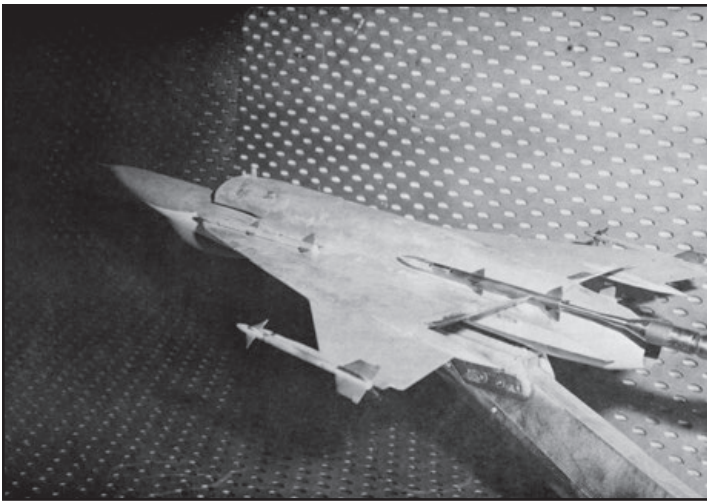


This model in the NASA Langley Research Center wind tunnel shows the change to the F-16 vertical stabilizer, minus the parachute housing. (NASA Langley)



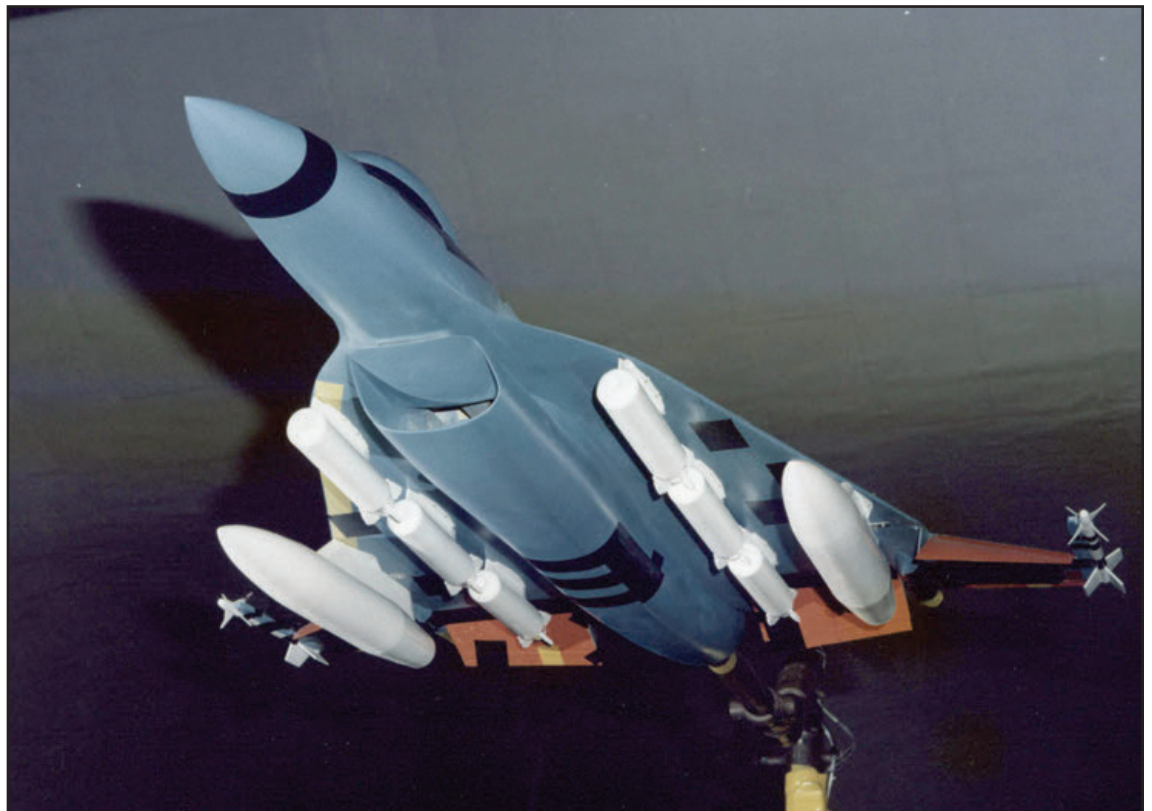
NASA Langley predicted an instability issue at high Angle-of-Attack (AoA) requiring the additional stabilizers above the actuator fairings. Additional testing revealed small wing fences added in front of the fairings would be sufficient. (NASA Langley)





Arnold Engineering Development Center, TN, performed weapon separation testing on a one-ninth scale F-16XL design noted as Model 400-10. (AEDC Archives)

The final NASA Langley wind tunnel model shown here with six cluster bomb units, two external tanks and a Sidewinder missile on each wingtip in 1982. (NASA Langley)





Testing the spin characteristics of the General Dynamics F-16XL design required the use of large scale models released from a NASA UH-1 helicopter over the Atlantic ocean and recovered via parachute at the end of each test mission. Note the model above carries an F-16F designation. (NASA Langley)



A bright yellow F-16XL spin test model is prepared for another test mission. The model has been labeled as F-16E and is equipped with AGM-65 Maverick and AIM-9 Sidewinder missiles. (Lockheed Martin)



NASA's Lewis Research Center (now Glenn Research Center) in Cleveland, OH, was responsible for propulsion and engine inlet design testing. NASA Lewis made use of the 9 x 15 foot Low-Speed Wind Tunnel. (NASA Glenn)

GENERAL DYNAMICS

F-16XL DEVELOPMENT



The first YF-16 under construction at the General Dynamics facility in Ft. Worth, TX. (Lockheed Martin)



Cockpit layout of the first YF-16 was quite simplistic compared to other fighters of that era. (USAF)



A prototype YF-16 poses next to a production representative YF-16A on the ramp at Edwards AFB, CA. More than 30 countries have operated the F-16 with over 4,600 built. (USAF)



To save cost, both F-16XL aircraft were built from existing F-16A airframes from the Full Scale Development (FSD) cycle. F-16A 74-0747 and 75-0749 were both test airframes from Edwards AFB. (USAF)



As part of the F-16 Combined Test Force, F-16A, 75-0747, was painted in a distinctive three-tone gray scheme with black radome. (AFTC History Office)



With F-16A, 75-0747, flying safety chase, YF-16A, 75-0745, is outfitted with two laser guided bombs during a sortie on 26 September 1977. (AFTC History Office)



F-16A, 75-0747, passes through some very scenic backdrops during a ferry flight to Hill AFB, UT, on 15 July 1977 in the three photos above. (AFTC History Office)



The longer days during the summertime in the desert allow the test aircraft to put in long hours of testing. F-16A, 75-0747, was flown at all hours during June and July 1977 as the photos on this page depict. (AFTC History Office)





F-16A, 75-0747, avoids a desert storm cell near Edwards AFB, CA on 9 June 1977. (AFTC History Office)

Flying low over some desert farmland, 75-0747 is seen carrying a light bomb load during a test flight. (USAF)



The sleek lines of the of the early F-16 can be seen in the bottom view of F-16A, 75-0747, on 23 June 1977, shown at left. The second of two airframes chosen for the F-16XL program, F-16A ,75-0749, is shown above during a test mission on 23 February 1978. (AFTC History Office)



With McDonnell Douglas F-4F, 72-1118, flying instrumented safety chase, F-16A, 75-0747, completes another weapons test mission over the bombing range near Edwards AFB, CA on 7 June 1978. (AFTC History Office)



Ground crewman at Edwards AFB, CA, perform final checks on 75-0747 carrying a B-61 'Sandia' bomb on the centerline station at the 'last chance' area next to the runway. With the gray radome and standardized serial number on the tail, 747 is looking closer to the operational fleet. (National Archives)



F-16A 75-0749, performs water ingestion testing behind a modified KC-135 on 19 August 1978. (AFTCHistoryOffice)



Ice build-up on the nose and front of the canopy during icing tests on 16 December 1978. (AFTC History Office)



Looking very clean during its fifth flight, F-16A 75-0749, flies over the wet desert landscape. (AFTC History Office)



The wingtip of the A-37 chase in the foreground, 75-0749 performs a test on 11 December 1978. (AFTCHistoryOffice)



F-16A 75-0749 sits on the ramp at Edwards AFB, CA awaiting its next test mission. (USAF)



Looking a bit worn from gun firing tests, 749 heads out on a mission on 27 September 1980. (AFTCHistoryOffice)



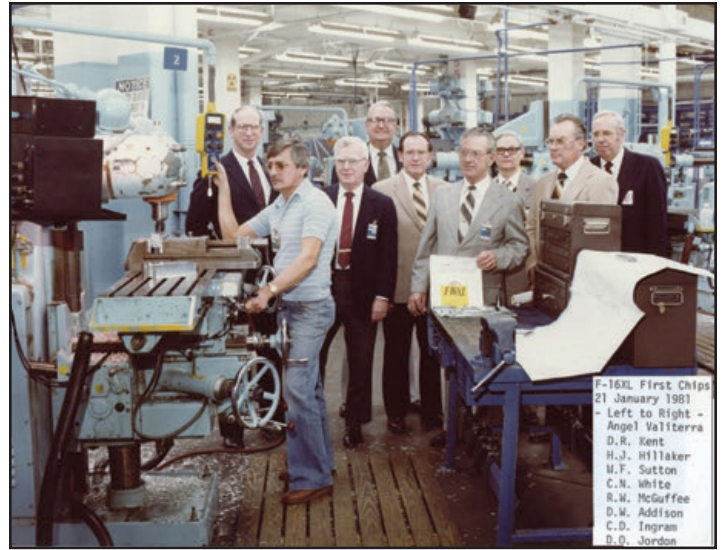
The Air Force made use of F-16A 75-0749 for early climatic testing, putting the FSD airframe through extreme heating and cold tests inside the McKinley Climatic Laboratory at Eglin AFB, FL. (USAF)



Performing during the annual open house at Edwards AFB on October 31, 1980, F-16A, 75-0747, suffered a blown nose tire on takeoff. The pilot chose to make an emergency landing on the dry lakebed and the aircraft was substantially damaged when the nose gear collapsed. The airframe was returned to General Dynamics via C-5 Galaxy and rebuilt as the two-seat F-16XL. (Lockheed Martin)



Looking close to the final design, this artist concept shows the aircraft in operational markings. (Lockheed Martin)

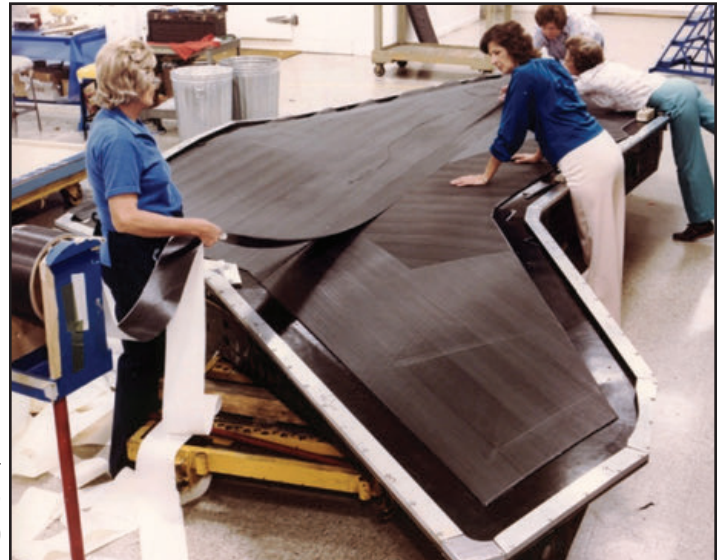


General Dynamics management oversee the cutting of first chips on 21 January 1981. (Lockheed Martin)



Internal structure of the F-16XL shown above, was quite complex, yet strong enough to hold large weapon loads.

The upper and lower wing skins made of graphite-bis-maleimide (BMI) laminate being laid up at right in the General Dynamics facility. (Lockheed Martin)



Just a year after first metal was cut, the completed right wing assembly is ready for installation on the first F-16XL, 75-0749 on 24 January 1982. (Lockheed Martin)



F-16A, 75-0749, prior to being placed in the demating jig. In addition to the new wing, two fuselage extensions were added to the fuselage structure. (Lockheed Martin)



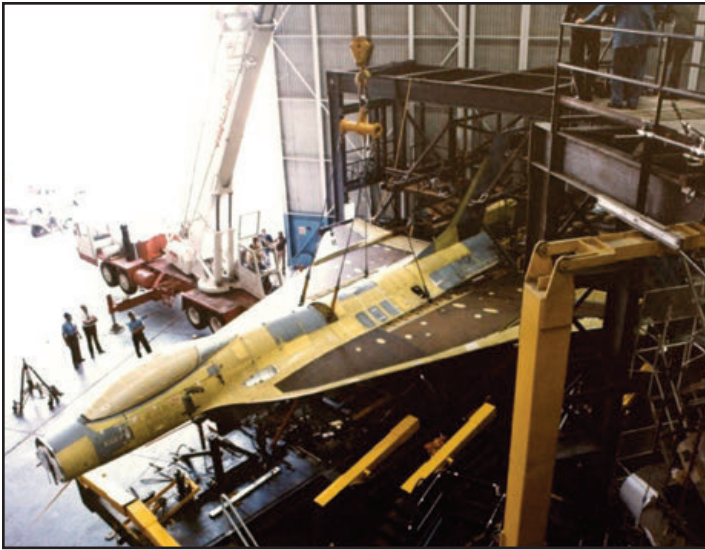
The first airframe, 75-0749, (also referred to as XL-1) is shown in the demate jig on 22 July 1981 in the photo at top left. Gaps for the fuselage extensions are easily viewed. By 23 March 1982, the modified airframe was beginning to look like the F-16XL as seen in the additional four photos on this page. (Lockheed Martin)



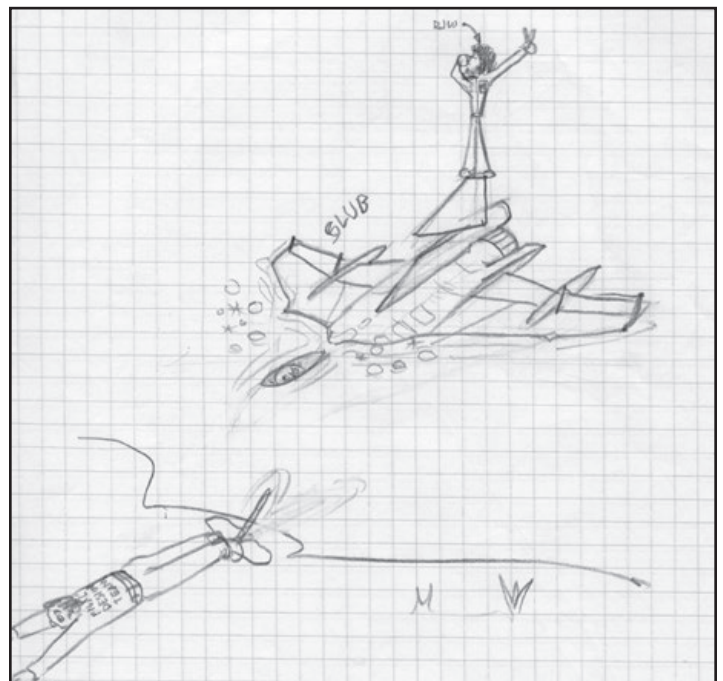
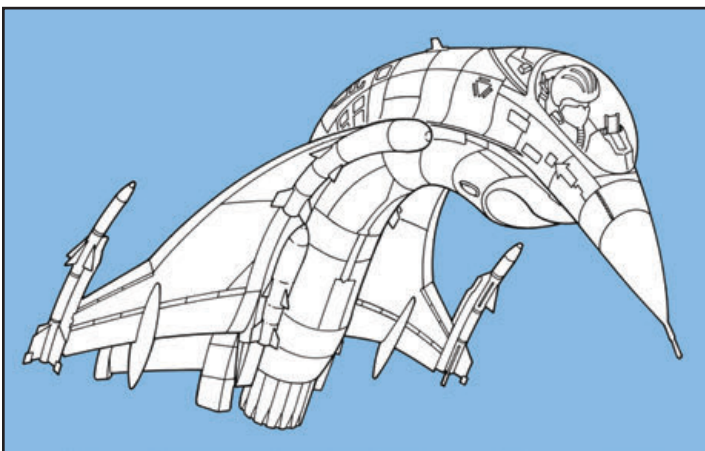
With the modifications complete, the first F-16XL is moved to the General Dynamics loads testing facility for static proof testing on 2 April 1982, as seen in the four photos above and single image below left. (Lockheed Martin)



Initial ground testing began with main fuselage loads and flexibility tests conducted in specially constructed loads test rig at General Dynamics. (Lockheed Martin)



Once fuselage testing was completed, the first F-16XL aircraft was positioned for testing of the new wing design structure on 14 April 1982. Note the many hydraulic attach points on the lower wing surface. (Lockheed Martin)



The F-16XL design team faced many challenges during the development of the aircraft, with some referring to the program as a sinking ship, as illustrated at right by Steve Justice showing design team engineer Robert Wetherall standing on the tail, while the art above makes light of the flexibility of the airframe. (Robert Wetherall)



With loads testing successfully completed, the F-16XL, went through final assembly of the air-frame having the control surfaces, landing gear, nose radome and other internal components installed. The aircraft is shown here heading to the paint shop during May 1982. (Lockheed Martin)

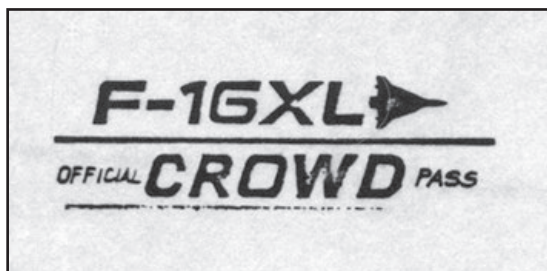




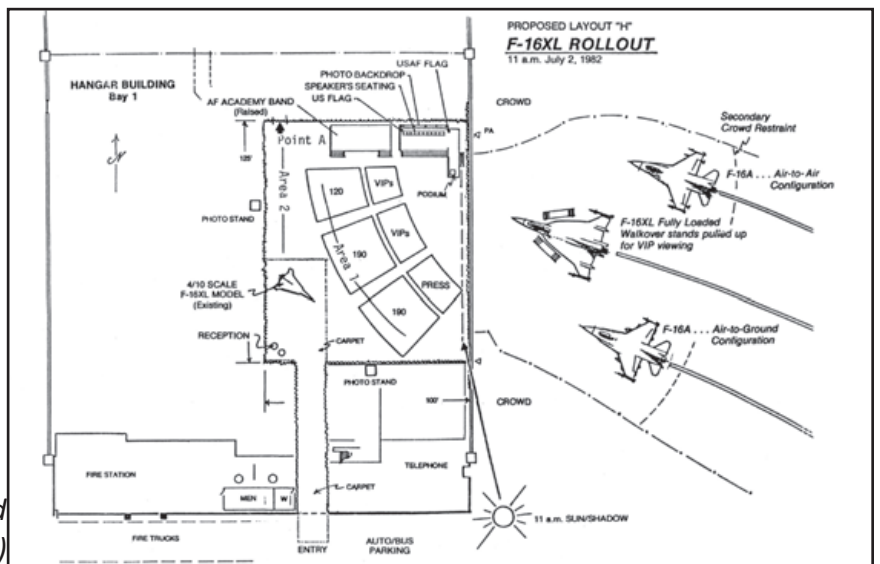
Resplendent in red, white and blue highlights over the standard three-tone F-16 gray paint scheme, the first F-16XL is placed outside on beautiful morning at General Dynamics', Ft. Worth, TX, facility for publicity photos prior to the official rollout on 2 July 1982. (Lockheed Martin)



With the freshly-painted F-16XL outdoors, GD took the opportunity to photograph many of the personnel involved. See Appendix A for the entire series of photos. (Lockheed Martin)



F-16XL rollout "crowd pass" (above) and proposed layout at right. (Lockheed Martin)





Official rollout for the F-16XL took place on 2 July 1982 at General Dynamics' Ft. Worth, TX, facility. Dignitaries providing remarks included Herbert Rogers, GD vice president & general manager; David Lewis, GD chairman & CEO; Senator John Tower, chairman Senate Arms Services Committee; Congressman Jim Wright, House Majority Leader and Lt. General Lawrence Skantze, Commander, USAF Aeronautical Systems Division. (Lockheed Martin)



First flight for the F-16XL took place on 3 July 1982, the day after rollout. The successful 1.1 hour flight took off at 1047 local time with General Dynamics pilot, Jim McKinney, at the controls. (Lockheed Martin)



Only a small number of still photos were taken from the chase plane on first flight, as video footage was of more importance to the GD engineers. (Lockheed Martin)



General Dynamics used a portion of the third flight on 17 July 1982 for still promotional photography. The F-16XL was photographed from a variety of angles during the course of the 1.9 hour flight around Ft. Worth. (Lockheed Martin)



F-16XL program manager, Randy Kent and chief designer, Harry Hillaker, present a custom F-16XL presentation model to first flight pilot, Jim McKinney. (Lockheed Martin)



A series of images taken during the third flight of the F-16XL on 17 July 1982. Clearly visible is the lack of ventral stabilizing fins on the lower aft fuselage of the F-16XL. With the extended fuselage and new wing design, the ventral fins were no longer required for lateral stability. (Lockheed Martin)



The clean lines of the cranked-arrow wing design applied to the F-16 show up well in this front view of the F-16XL during flight number 3 on 17 July 1982. (Lockheed Martin via Sheryl Tierney)



In addition to the 115 percent increase in wing area, the fuselage length was extended by 56 inches with a 30-inch plug added at fuselage station 189, and a 20-inch plug at fuselage station 373. (Lockheed Martin)



F-16XL, 75-0749 flew supersonic during its second flight on 9 July 1982, and required only 4 contractor check flights at Ft. Worth before its 2.3 hour ferry flight to Edwards AFB, CA during flight 5 on 18 July 1982. (Lockheed Martin)





The F-16XL performed two flights on 18 July 1982, the first being the final contractor checkout at Ft. Worth. (Lockheed Martin)
The photo at left shows the first F-16XL, 75-0749, flying into a gorgeous sunburst during flight 3 on 17 July 1982. (Lockheed Martin via Tom Grindle)



General Dynamics took time out during flight 4 to conduct some final promotional photography over the green landscape around Ft. Worth prior to sending the aircraft to California's high desert on 18 July 1982. (Lockheed Martin)



Despite often published, the F-16XL was not built to compete with the McDonnell Douglas F-15 Strike Eagle, but was a natural extension of the unique capabilities offered by the F-16 airframe design. (Lockheed Martin)



Elegant from any angle, the General Dynamics F-16XL's cranked-arrow wing design offered substantial improvements in the range and payload capacity for the F-16 family of aircraft. (Lockheed Martin)



A series of photographs taken of XL-1 prior to the delivery flight to Edwards AFB, CA. (Lockheed Martin)



Prior to the beginning of taxi testing, the two-seat F-16XL spent time in the radar testing area at General Dynamics. (Lockheed Martin)



The GD structural test crew pose for a photo with F-16XL 75-0747, (referred to as XL-2) while testing the wing structure of the two-seat aircraft. (Lockheed Martin)



Taxi testing for the second F-16XL in October 1982, slowly building up to the final high-speed taxi on 30 October. At the end of the high-speed taxi, the braking parachute deployment was tested. (Lockheed Martin)



The first flight crew for F-16XL 75-0747, Alex Wolfe (front) and Jim McKinney (rear) are all smiles prior to taking the aircraft out for its first flight on 29 October 1982. (Lockheed Martin)



The two-seat F-16XL takes to the air for the first time on 29 October 1982 flying from General Dynamics' facility in Ft. Worth. The 1-hour functional check flight (FCF) went well with no significant anomalies reported. Of the many dignitaries in attendance for this flight included General Dynamics CEO, Herb Rogers, F-16XL program manager, Randall Kent and chief designer, Harry Hillaker. (Lockheed Martin)



While the single-seat F-16XL, 74-0749, was powered by the Pratt & Whitney F100-PW-200, the two-seat aircraft, 75-0747, made use of a single General Electric F101-GE-102 powerplant. This was replaced by an F110-GE-100 'Slimline' engine in mid-July 1984. (Sheryl Tierney collection- top; Keith Svendsen collection- above)



General Dynamics allocated plenty of time for the aerial photo staff to acquire much more still photography during the first flight of the second F-16XL as shown above, and on the following page. (Lockheed Martin)



Congratulations all around following the successful completion of the first flight of the two-seat F-16XL. Program Manager, Randall Kent, in dark suit, shakes hand with GD pilot, Alex Wolfe. Harry Hillaker, with red tie, also gets in on the celebrations. GE F101 DFE engine representative, Brian Brimelow in gray suit, joins the GD crew on the group photo above. (Lockheed Martin via Robert Wetherall)



The low clouds over Ft. Worth during flights 2 and 3, conducted on 1 November 1982, provided a dramatic backdrop for the second F-16XL. Like ship 1, this aircraft required only 4 contractor flights at Ft. Worth. (Lockheed Martin)





The General Dynamics photographers captured some of the best in-flight imagery of XL-2 during customer checkout fights around Ft. Worth, TX, on 1 November 1982. (Lockheed Martin)



The F-16/79 was General Dynamics export variant of the F-16. With a different avionics package and powered by a General Electric J79 engine, it is shown in formation with the first F-16XL over the Texas landscape. (Lockheed Martin)



Prior to delivering the second F-16XL to Edwards AFB for testing, the first aircraft was ferried back to General Dynamics facility at Ft. Worth to complete specialized ground tests and instrumentation installations. General Dynamics took the opportunity to schedule a formation flight with both F-16XL's on 8 November 1982 to acquire promotional photography and video footage as shown on this, and the following 3 pages. (Lockheed Martin)







The F-16XL's had the capacity to carry up to 16-Mark 82 (Mk82) bombs as shown here, yet all in-flight weapon testing at Edwards AFB was conducted with a maximum of 12. (Lockheed Martin)



Carrying a full load of 16-Mk82 bombs, F-16XL, 75-0749, taxi's around the ramp at General Dynamics Ft. Worth facility. No records were located showing the aircraft ever flew in this configuration. (Lockheed Martin)

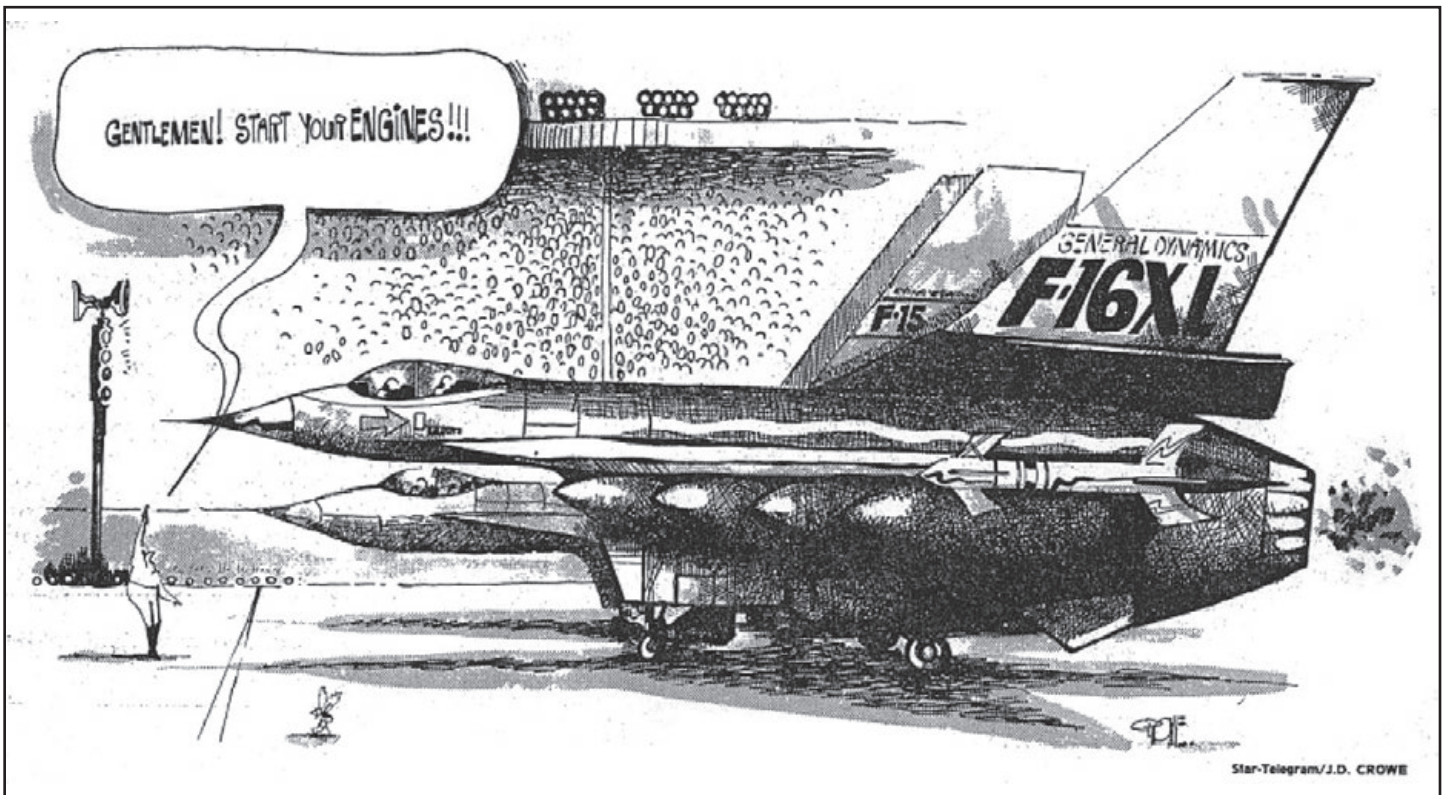


F-16XL 75-0749 is parked next to F-16A 81-0672 on the ramp in Ft. Worth. Both aircraft are configured for a typical air-to-ground mission. The F-16A required two external wing tanks and carried only 6-Mk82's, while the F-16XL could perform the same mission with twice the payload and no external tanks. (Lockheed Martin)



The first F-16XL in a standard air-to-ground configuration of 12-Mk82 bombs, 4-AIM-120 AMRAAM's and two AIM-9 Sidewinders. (Lockheed Martin)

A portrait of F-16 variants on the Ft. Worth ramp; F-16A, F-16C, F-16XL, F-16/79 and AFTI/F-16. (Lockheed Martin)



The Air Force competition between the McDonnell Douglas F-15E Strike Eagle and General Dynamics F-16XL is captured in this satirical cartoon from the 29 August 1982 Star-Telegram newspaper. (J.D. Crowe/Star-Telegram)

AIR FORCE ³ TESTING

FLIGHT TEST AND WEAPONS DEVELOPMENT



General Dynamics pilot, Jim McKinney, delivers the first F-16XL to the F-16 Combined Test Force at Edwards AFB, CA on 18 July 1982. (Keith Svendsen)



Once the F-16XL arrived at Edwards AFB, stability & control flight testing began. The standard configuration for most early flights was 2 AIM-9 Sidewinder missiles and 4 dummy AIM-120 AMRAAM missiles. (Keith Svendsen)



With a tight flight schedule, the F-16XL began flying 2 and 3 flights a day by the end of July 1982. The 3 photos above were taken during a performance test mission on 24 July 1982. (Keith Svendsen)



F-16XL, 75-0749, makes a pass over Edwards AFB with Rogers Dry Lakebed in the background during a flight on 24 July 1982. Rogers Dry Lake offers 44 square miles of unique landing surface. (Keith Svendsen)



During a test mission on 3 August 1982, the F-16XL suffered a failure of the left hand speedbrake actuator and began leaking hydraulic fluid. The pilot made a precautionary landing on the dry lakebed at Edwards. (Keith Svendsen)



Contrary to popular belief, not all days in the California desert are sunny. Despite the cloudy conditions in the above photos, Edwards AFB enjoys approximately 300 good flying days a year. (AFTC History Office)



In flight refueling expanded flight times considerably. The first F-16XL aerial refueling mission took place on 12 August 1982. (Keith Svendsen, top 2 and above; AFTC History Office at right and 2 below)





The F-16XL takes on fuel from NKC-135E, 55-3135 on 23 August 1982. The tanker was fitted with 50 small windows for nuclear readiness testing. (Keith Svendsen)

First flight of the F-16XL outfitted with 12 Mark 82 (Mk82) bombs occurred on 17 August 1982 for performance and flutter testing. (USAF)



F-16XL, 75-0749 performed 4 flights over 2 days in order to conduct performance testing with 12 Mk82 bombs prior to actual weapon release testing. (AFTC History Office, 2 at center; Keith Svendsen, above)



The first, and only, time F-16XL, 75-0749, released a load of 12 Mk82 bombs occurred during a flight on 24 August 1982 with GD pilot Alex Wolfe at the controls. All bombs separated clean and grouping remained tight until impact. (Craig Kaston collection, left; Lockheed Martin, all images below)



During late September 1982, XL-1, flew a series of flights with 12 MK82 bombs loaded for loads testing. By the end of the test program, 75-0749 made over 50 flights in this configuration. (AFTC History Office, right and bottom left; Lockheed Martin 2 center; Robert Wetherall collection, bottom right)





The F-16XL departing from, and returning to, Edwards AFB during the final mission of the loads testing series with a 12-Mk82 bomb load on 30 September 1982. (Michael Grove, Sr.)



F-16XL, 75-0749, pulls in behind the NKC-135E during a performance mission on 1 October 1982. (Keith Svendsen)

NKC-135E boomers view of the F-16XL during a loads test mission on 28 September 1982. (Keith Svendsen)



F-16XL, 75-0749, banks over Edwards AFB during a mission in October 1982. Despite the major modifications and high flight rate, the F-16XL proved to be a very reliable aircraft. (Lockheed Martin)



Beginning 13 October 1982, F-16XL, 75-0749, began a series of 11 stability & control, and weapon separation tests with 6 Mk82 bombs. The small white objects mounted on the trailing edge fairings are camera pods used for filming the bomb release. (AFTC History Office)



The series of four photos above show the F-16XL during a weapon separation practice flight with 6 Mk82 bombs on 20 October 1982. Note the weapon separation cameras have been removed. (AFTC History Office)



F-16XL, 75-0749, was placed on display at the annual Edwards AFB Open House during the weekend of 23 & 24 October 1982, with 12, freshly painted, Mk82 bombs, 4 dummy AMRAAM's and 2 Sidewinder missiles loaded. Note the custom red, white & blue inlet cover. (Keith Svendsen)



Close-up details of F-16XL, 75-0749 taken during the annual open house at Edwards AFB show aspects of the forward fuselage, Mk82 bomb & pylon, and trailing edge control surfaces. (Keith Svendsen)



General Dynamics crew, Joseph 'Joe Bill' Dryden and Alex Wolfe deliver the F-16XL, 75-0747, to Edwards AFB on 8 November 1982. Note the small Texas state flag on the forward fuselage near the pilot, and F-16XL, 75-0749, visible in the background. (Keith Svendsen-above and 4 on following page)



F-16XL, 75-0747, departs Edwards AFB on another test mission in December 1982. (Michael Grove, Sr.)



Both F-16XL's pull in behind the tanker on 3 December 1982. (USAF)



General Dynamics flight test crew, Alex Wolfe and 'Joe Bill' Dryden, take XL-2, out for stability & control flight over the damp Mojave Desert on 6 December 1982. (Keith Svendsen- 3 above)



F-16XL, 75-0749, is shown with a during a performance test mission, loaded with 12-Mk82 bombs on 10 December 1982 with General Dynamics pilot 'Joe Bill' Dryden in the cockpit. (Keith Svendsen)



F-16XL, 75-0749, performed two stability & control, and flutter test flights on 7 December 1982 loaded with 2-370 gallon wing tanks and 2-BDU-38 (simulated B61 nuclear bomb) practice bombs. (Sheryl Tierney Collection)



Taken during test missions on 13 December and 17 December 1982, the photos above, and the following page, show F-16XL, 75-0749, carrying a load of 6-CBU-58 cluster bombs and 2-370 gallon wing tanks in addition to the dummy AMRAAM's and Sidewinders. (Michael Grove, Sr.-2 at top; Keith Svendsen-3 above and 4 on following page)

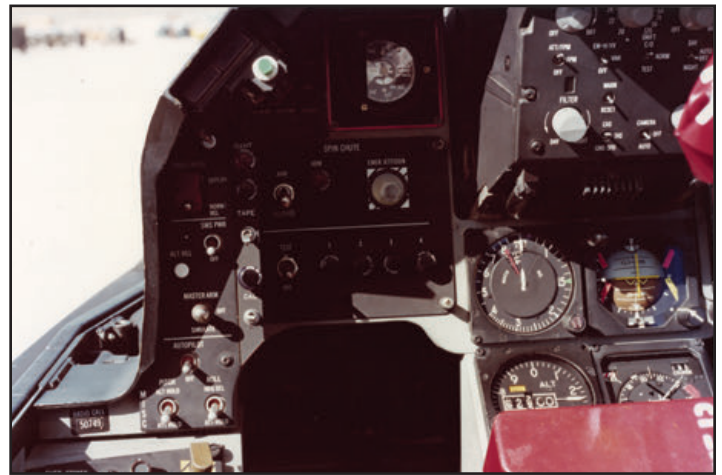


Photographer Michael Grove, Sr. captures F-16XL, 75-0747, departing, and returning to, Edwards AFB during a stability & control mission on 10 January 1983. (Michael Grove, Sr.- above and at right)





F-16XL Combined Test Force (CTF) deputy director, Lt. Col. Edwin Thomas, takes XL-1 over the Pacific Ocean during a performance check flight, carrying 6-SUU-65 cluster bombs and 370 gallon wing tanks. (Sheryl Tierney collection)



Prior to high Angle-of-Attack (AoA) testing, F-16XL, 74-0749 received a spin chute modification, which required the removal of the braking parachute housing. This mod took place at Edwards AFB during a 10-day period in January 1983. The spin chute was tested during a high speed taxi test on 22 January 1983 (top, left). The spin chute cockpit control panel in the F-16XL (above, right). (Keith Svendsen- top, right; Sheryl Tierney collection- top, right & above, right; Lockheed Martin- above, left)



F-16XL, 75-0746, performs a high Angle-of-Attack mission on 14 February 1983. (Sheryl Tierney collection)



Moving into close formation with the NKC-135E Stratotanker prior to taking on fuel, the F-16XL is shown during a 2.5 hour high AoA mission on 14 February 1983. (Sheryl Tierney collection)



Officially known as Deceptive Camouflage, or Splinter Camouflage, this particular variation, which included a false canopy and upper surface markings applied to the bottom of the aircraft, was the brainchild of aviation artist Keith Ferris. Ferris designed many variations of the Splinter scheme that were tested on various aircraft during the 1970's and 1980's. (Lockheed Martin)



The 6-tone gray paint scheme was applied to XL-2 in February 1983. Painted at the GD facility in Ft. Worth, the first flight in the new paint occurred on 22 February 1983 during the ferry flight to Edwards AFB. (Lockheed Martin)



This bottom view of F-16XL, 75-0747, taken during the ferry flight to Edwards AFB on 22 February 1983, shows the distinctive lines of the new paint scheme and special markings. (Lockheed Martin)

F-16XL, 75-0747 flies over the flooded lakebed at Edwards AFB on 23 February 1983 in the photo below and 2 images below, left. (Keith Svendsen- all)



While F-16XL, 75-0747 was off receiving a new paint scheme, 75-0749 continued performing high AoA missions, including this one on 18 February 1983 with a full bomb load. (Keith Svendsen)



Originally a single-seat F-16A, XL-2 received a two-seat modification during conversion to an F-16XL air-frame. Visible in the inset is the updated data block used on the aircraft during the F-16XL test program. Note it shows the aircraft type as an F-16B and the serial number is now 75-0747A. (Keith Svendsen- all 4 above)

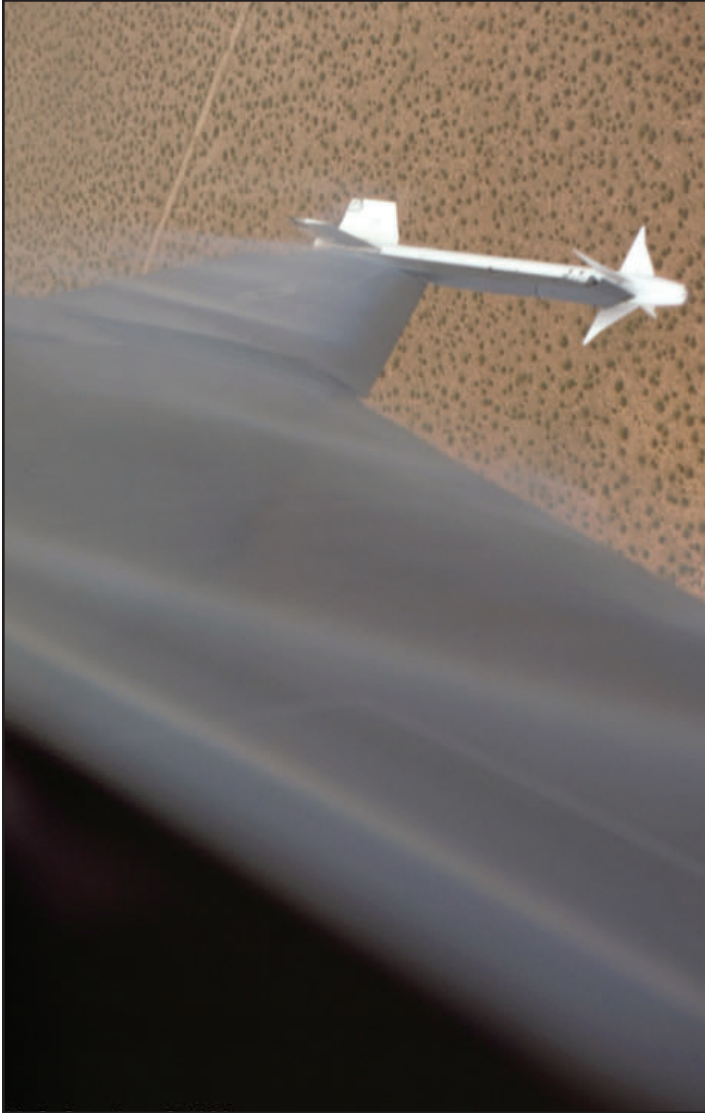


Close-up detail of the spin chute modification on F-16XL, 75-0749 on 3 March 1983. Note that the drag chute box has been blocked off and the tail of the aircraft is now overall gray with white serial number. (Keith Svendsen)



F-16XL, 75-0747 is captured departing Edwards AFB for Nellis AFB, NV to conduct Operational Utility Evaluations (OUE) on 4 March 1983. (Michael Grove, Sr.)

Both F-16XL aircraft spent numerous days flying out of Nellis AFB, NV conducting operation evaluations against dissimilar aircraft. (AFTC History Office)



The smooth airflow vortices over the upper surface of the left wing on F-16XL, 75-0747, as seen from the aft seat on 15 March 1983. (Keith Svendsen)

Lt. Col. Edwin Thomas and 'Joe Bill' Dryden pull in behind a KC-10 Extender during refueling qualification testing on 17 March 1983. (Keith Svendsen)



F-16XL, 75-0747, carrying ACMI pods on each wingtip, pulls about to receive fuel from KC-10. (Keith Svendsen)

Carrying a load of 2 BDU-38's and 370 gallon tanks, F-16XL cruises over the clouds. (Sheryl Tierney Collection)



KC-10 Extender qualification flights occurred on 17 & 18 March 1983. The 3 photos above show the latter flight with Lt. Col. Edwin Thomas and Col. Melvin Hayashi, Edwards Test Pilot School Commandant, in F-16XL, 75-0747, loaded with 2-370 gallon tanks and 2-BDU-38 practice bombs. (Sheryl Tierney Collection- 3 above)



The demonstrator markings on F-16XL, 75-0749, were painted over during March 1983 to make the aircraft look more operational. (Sheryl Tierney collection)



Both F-16XL aircraft performed test missions with wingtip fairings in place of the Sidewinder missile rails as shown in the photo above taken on 23 March 1983 of F-16XL, 75-0749. (Lockheed Martin via Mike Moore)

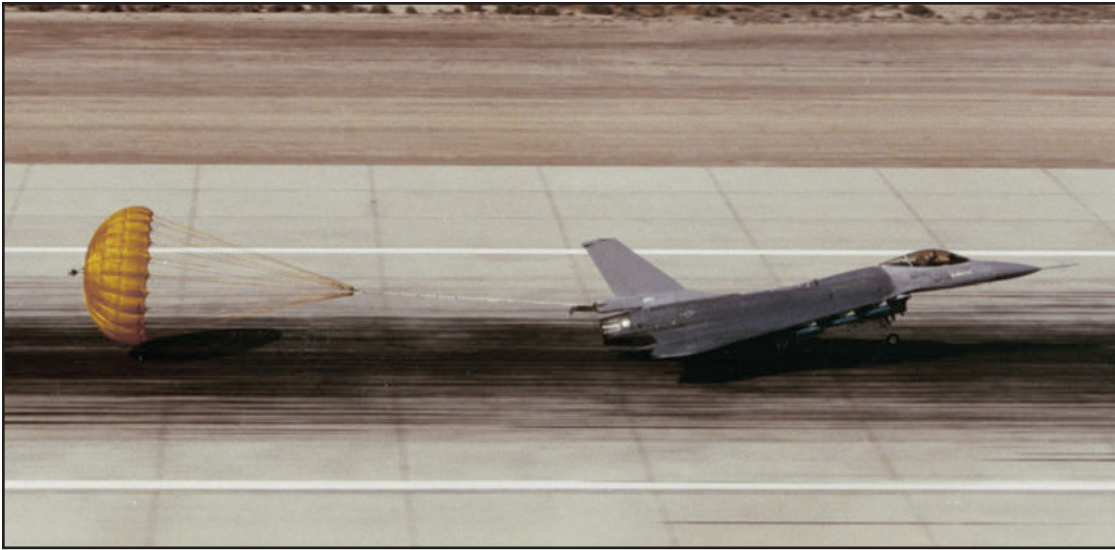


The 2 F-16XL's flew together on many occasions during the test program. During this mission on 29 March 1983, the second of three flights for both aircraft that day, the 2 F-16XL's participated in Operational Utility Evaluations. (Lockheed Martin via Mike Moore)



A few more photos from the formation flight of both F-16XL's on 29 March 1983. The third mission of that date was a ferry flight for both aircraft to Nellis AFB, NV for more dissimilar aircraft evaluations. Note that F-16XL, 75-0747, has no serial number on the tail. (Lockheed Martin via Mike Moore- top 2; Sheryl Tierney collection- left and below)





F-16XL, 75-0749, lands back at Edwards AFB at the end of an mission on 29 March 1983. (Sheryl Tierney collection)

Major John Cary takes F-16XL, 75-0749, up for another OUE test flight on 31 March 1983. (Michael Grove, Sr.)



Carrying 2-BDU-38 practice bombs and 2-370 gallon wing tanks, Jim McKinney and Major Sidney Gutierrez take XL-2 out on a performance test mission on 18 March 1983. (Keith Svendsen)



F-16XL, 75-0747, during a performance test mission over the Mojave Desert on 18 March 1983. (Keith Svendsen)



F-16XL, 75-0747, with wingtip fairings in place of the Sidewinder missile rails. (Keith Svendsen)



Springtime in the high desert can be wet at times as seen in this photo taken 7 April 1983. (Keith Svendsen)



Color variations of the Edwards AFB lakebed surface show up well in this 19 April 1983 photo. (Keith Svendsen)



Maj. John Cary and Lt. Col. Marty Bushnell perform an Operational Utility Evaluation mission in F-16XL, 75-0747, on 19 April 1983. (Keith Svendsen)



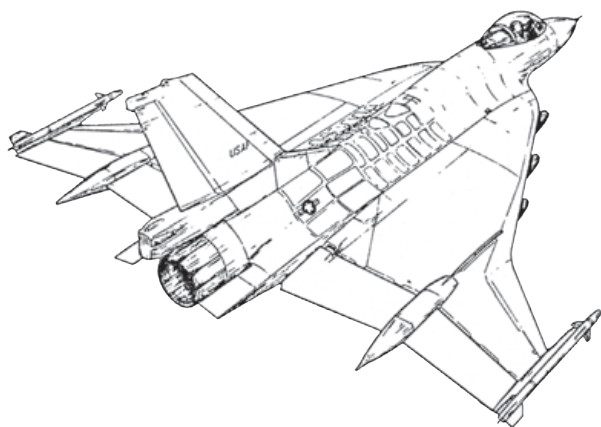
F-16XL, 75-0747, turning final for Runway 22 at Edwards AFB on 19 April 1983. (Keith Svendsen)



With a beautiful high cloud layer as a back drop, F-16XL, 75-0747 takes on fuel from the NKC-135 instrumented tanker aircraft during a May 1983 mission out of Edwards AFB. (Keith Svendsen)



The F-16XL CTF pilot holds formation behind the tanker aircraft to allow the Air Force photographer to grab a few photos. (Walter Boyne collection- above; AFTC History Office- right)





F-16XL Combined Test Force director, Lt. Col. Marty Bushnell conducts a performance test mission in F-16XL, 75-0749, loaded with 6 Mk82 bombs on 13 May 1983. (Keith Svendsen- both above)



Inboard fences were added to F-16XL, 75-0749, for single flight on 7 July 1983 in an attempt to address a minor pitch gallop anomaly. (Keith Svendsen) *Lt. Col. Marty Bushnell and Alex Wolfe bring F-16XL, 75-0747, back from high-speed envelope expansion mission on 26 May 1983. (Michael Grove, Sr.)*



For most of the F-16XL test program, F-16XL, 75-0747, bore no serial number on the vertical stabilizer. The gray Splinter paint scheme gave the aircraft a very operational look. (Keith Svendsen)



One of many different weapon load configurations tested on the two F-16XL aircraft during the test program, F-16XL, 75-0747, is carrying 4-Mk84 bombs during a mission on 13 July 1983. Crew members are Lt. Col. Ed Thomas and Capt. Keith Svendsen. (Lockheed Martin- both above)



Carrying a weapon compliment of 2 Sidewinder missiles, 4 dummy AMRAAM's, and 4-Mk84 bombs, F-16XL, 75-0747, cuts through the clear blue skies over Edwards AFB. (Lockheed Martin)



F-16XL CTF crew, Lt. Col. Ed Thomas and Capt. Keith Svendsen perform a flutter test mission in F-16XL, 75-0747, on 7 July 1983. (Sheryl Tierney collection- 2 above)



F-16XL, 75-0749, carried a weapon configuration of 6-AGM-65 Maverick missiles on multiple occasions during the test program to perform stability & control as well as flutter testing. An actual AGM-65 missile firing took place only a single time. (Sheryl Tierney collection)



F-16XL, 75-0747, flew 2 missions on 14 July 1983 with a weapon load of 12-Mk82 bombs, 5 under each wing and 2 mounted on the centerline station, along with 2-370 gallon fuel tanks. (Lockheed Martin)



Loaded with 12-Mk82 bombs, F-16XL performs a photo mission on 27 July 1983 with Lt. Col. Ed Thomas and Capt. Keith Svendsen in the cockpit. (Lockheed Martin)



Clean bottom view of F-16XL, 75-0749, taken on 20 July 1983 during a performance test mission out of Edwards AFB while carrying 6-SUU-65, free-falling cluster bombs. Note the missing control tabs on the aft fins of the dummy Sidewinder missiles. (Sheryl Tierney collection)



In an effort to reduce the drag created by the SUU-65 weapon load, General Dynamics created a streamlined fairing that was test flown on 2 September 1983. It was found to show little benefit and not adopted for production. (AFTC History Office- above left; Keith Svendsen- above right)



F-16XL, 75-0747, performed a series of stability & control, and flutter test flights during September 1983. The aircraft carried 4-Mk84 bombs in a tandem configuration, with 2 on each wing. (Sheryl Tierney collection- above and right)





During March 1983, F-16XL 75-0749, had its demonstrator markings painted over to give it a more operational appearance. A slight difference in the shade of gray is apparent in many photos during this timeframe. By October 1983, the fuel spray from numerous air refueling missions began to strip the gray from the upper fuselage and tail of the aircraft. It would be another year before the aircraft would receive a complete repaint. (Keith Svendsen)



The soft, feathered edge of each shade of gray in the Splinter paint scheme is easily discernible in these images of 75-0747 taken in October 1983. (Keith Svendsen- above both)



F-16XL, 75-0749, departs and returns to Edwards AFB during 1 of 3 brief, performance test flights on 28 October 1983 with 2-370 gallon wing tanks, and 6-SUU-65 weapon stores. (Keith Svendsen- both above)



Streaming its distinctive gold braking parachute, F-16XL, 75-0749, comes in to land at Edwards AFB after a brief test mission on 28 October 1983. (Keith Svendsen)



One of the many unique test aircraft on display at the annual Open House at Edwards AFB in October 1983 was F-16XL, 75-0747. (Tony Landis)



Lt. Col. Marty Bushnell and General Dynamics pilot, Kevin Dwyer, performed 3 test flights on F-16XL, 75-0747, between 14 and 16 December 1983 with an F-16 Forward Looking Infrared (FLIR) demonstration pod attached to the left side of the inlet. Only XL-2 was equipped with load stations on each side of the inlet and this was the only time an F-16XL carried a store in this location. (Sheryl Tierney collection)



F-16XL, 75-0749, taxi's out for another test mission from Edwards AFB. The difference in gray paint over the original demonstrator scheme shows up well. (Sheryl Tierney collection)



Sporting a fresh coat of paint, F-16XL 75-0749 is equipped with the spin chute assembly for additional high AoA testing on 7 August 1984, piloted by Lt. Col. Edwin Thomas. (Keith Svendsen- both above)



Overhead view of F-16XL 75-0749 after receiving new paint. Note the walkway striping is more subdued and the refueling receptacle striping has been removed. (Sheryl Tierney collection)

XL-2 over the barren Mojave Desert during a test mission out of Edwards AFB. (Tom Grindle collection)



Climbing like a homesick angel, F-16XL 75-0749 pushes through the high cloud deck above Edwards AFB during a Winter 1984 test mission. (Sheryl Tierney collection)



F-16XL 75-0749 passes low through a snow-capped mountain range around Edwards AFB during a Winter 1984 mission. (Sheryl Tierney collection)



The 3 photos on this page show F-16XL 75-0749 performing an AGM-65 Maverick missile firing rehearsal flight on 26 March 1985. (AFTC History Office- top 2; Sheryl Tierney collection- above)

Opposite page, the single missile firing of a Maverick missile on 29 March 1985. (Lockheed Martin- all)



F-16XL, 75-0747, is captured by the wing camera on an opposing F-16B during an Operational Utility Evaluation flight. (Robert Wetherall collection- right; Craig Kaston collection- 2 below)



Advertising road sign along Highway 14 heading towards Edwards AFB in 1983. (Lockheed Martin)





The two-seat F-16XL was returned the General Dynamics on 28 January 1985 for installation of the Large Normal Shock Inlet (LNSI). While there, cracks were discovered in the base of the rear spar of the vertical stabilizer requiring its removal. With modifications complete, the aircraft received a fresh coat of paint and was ferried back to Edwards AFB on 28 June 1985. (Lockheed Martin)



With both F-16XL's parked together at Edwards AFB, a good comparison can be made between the standard inlet on 75-0749 (left) and the LNSI on 75-0747 (right). (Sheryl Tierney collection)



14 August 1985 was the beginning of the end for the Air Force test program on the F-16XL. Prior to the ferry flight to send XL-1 back to General Dynamics at Ft. Worth for placement into flyable storage, both aircraft were flown in formation around the skies of Edwards AFB. (AFTC History Office- all)



By the time F-16XL 75-0747 flew to General Dynamics for storage, the two aircraft had a combined total of 798 flights for 939.7 hours; XL-1 had flown 437 times for 532.6 hours while XL-2 made 361 flights for 407.1 hours. (AFTC History Office)





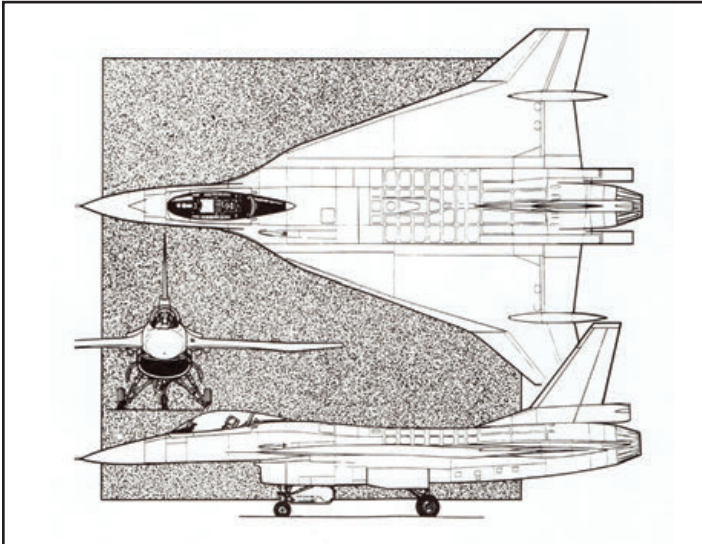
Prior to being placed in flyable storage, a Modular Reconnaissance Pod, designed for the F-16 fleet, was mounted on the centerline station of XL-2. It appears the aircraft was taxied in this configuration, but no record was found of it being flown. (Lockheed Martin via Mike Moore- all)



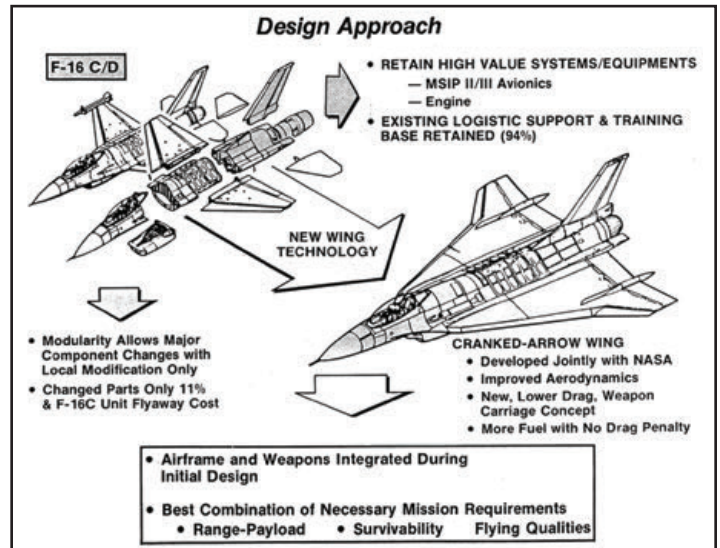
TECHNICAL 4 DETAILS

ALL THE GOOD STUFF

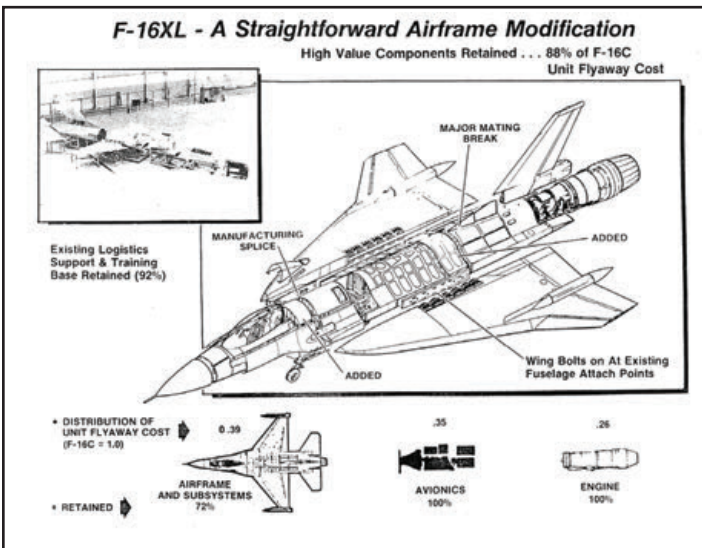
AIRFRAME



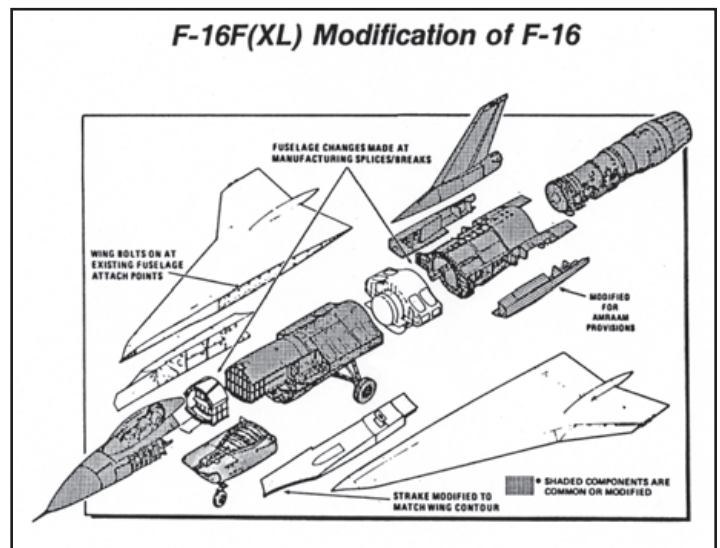
Basic 3-view illustration of a single-seat F-16XL minus the wingtip missile rails. (Lockheed Martin)



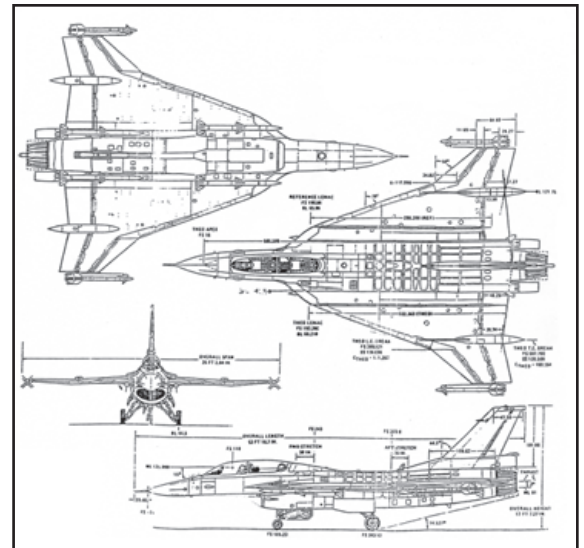
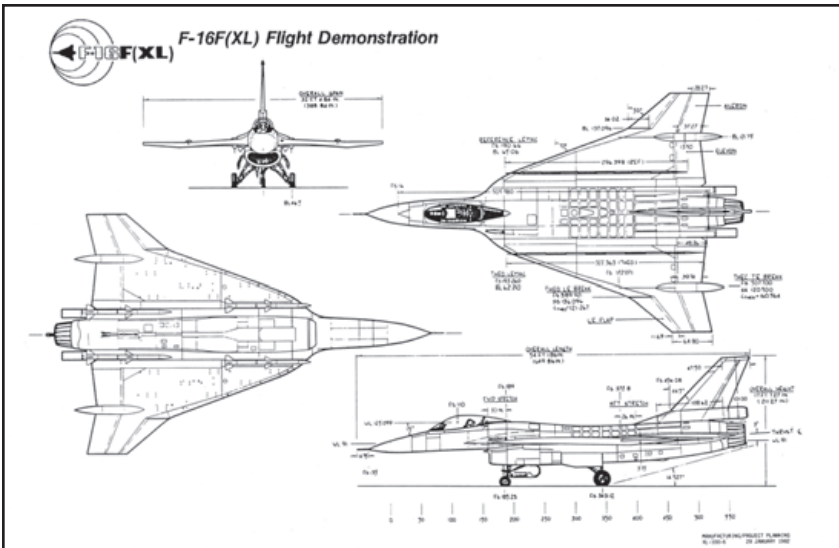
Designed early as a modular system, the F-16XL made use of many F-16C/D components. (Lockheed Martin)



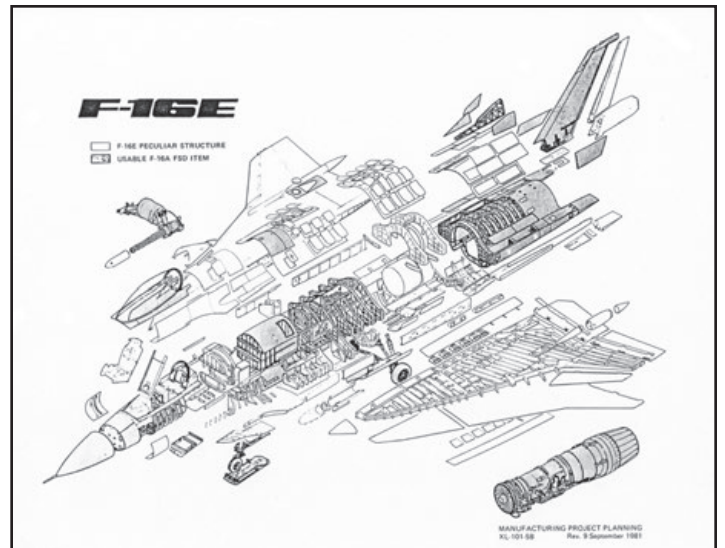
The F-16XL used 72 percent of the F-16C/D airframe and 100 percent of the avionics. (Lockheed Martin)



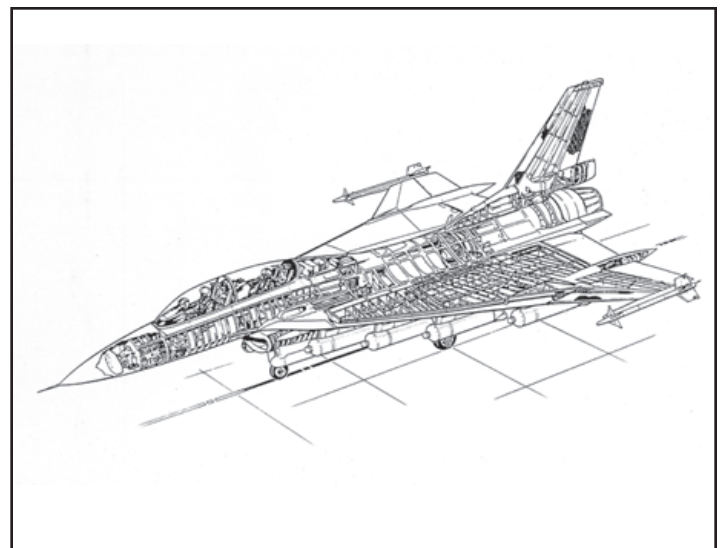
Major component breakdown showing the 2 spliced sections and new XL wing design. (Lockheed Martin)



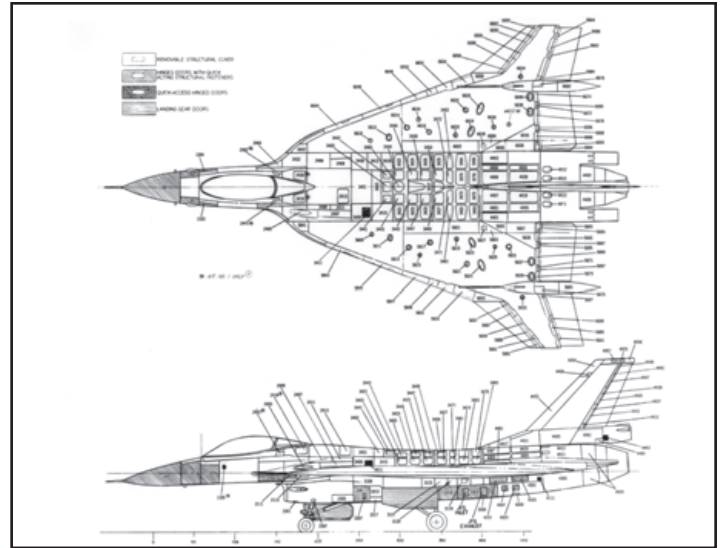
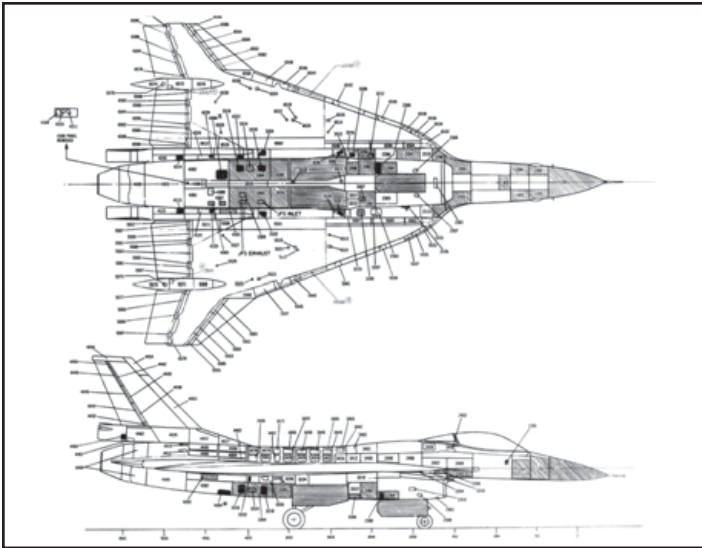
Dimensional illustrations for the single-seat (above, left) and dual-seat (above, right) F-16XL designs. Note the illustration above left has the single seat design labeled as an F-16F. (Lockheed Martin)



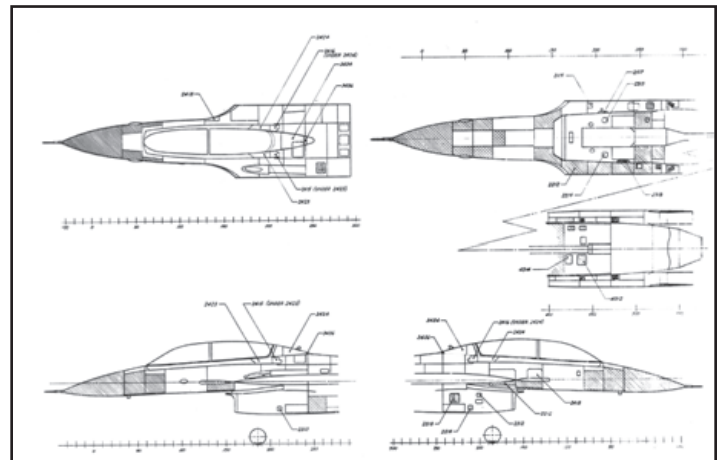
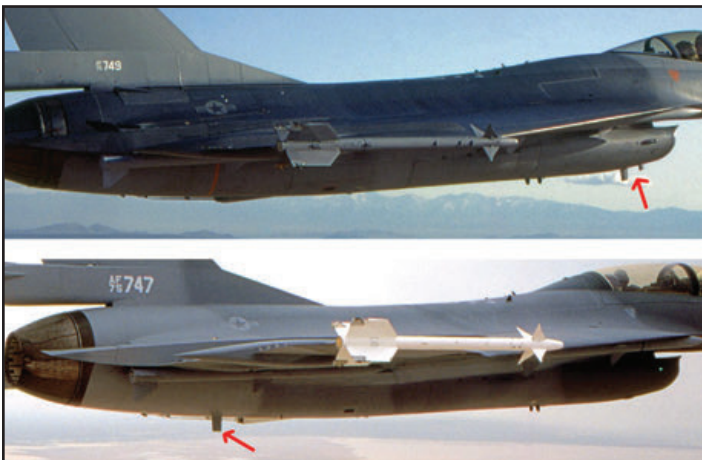
Parts breakdown of the single-seat F-16XL design showing much of the internal design structure. Note this illustration has the single-seat design as the F-16E. (Lockheed Martin)



This parts breakdown of the two-seat F-16XL shows the aircraft with a full load of cluster bombs, AM-RAAM and Sidewinder missiles, as well as LANTIRN pods on the intake stations. (Lockheed Martin)

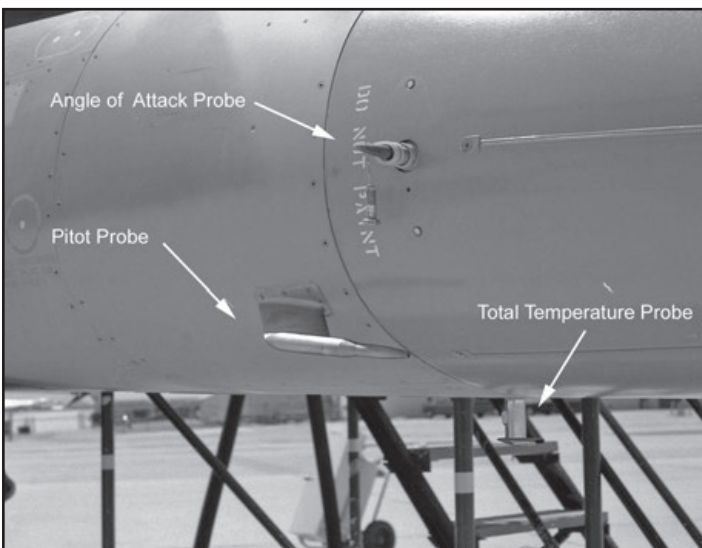


Numerous removable access panel were built into the XL design for ease of maintenance. Locations on the single-seat aircraft are shown with their panel numbers, and types, in the illustrations above. (Lockheed Martin)



Lower antenna placement differed between the two aircraft. XL-1 (top) retained the blade antenna beneath the inlet while XL-2 (above) was moved aft near the tail hook to prevent LANTIRN interference. (Keith Svendsen)

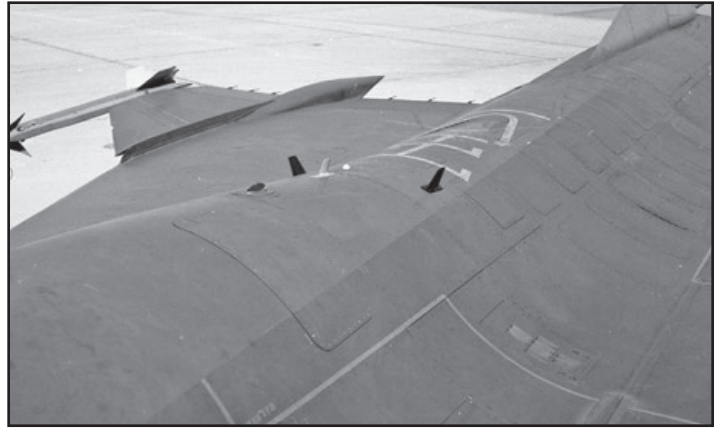
The two-seat F-16XL has access panels on the fore and aft fuselage that are specific to that airframe as shown in the illustration above. (Lockheed Martin)



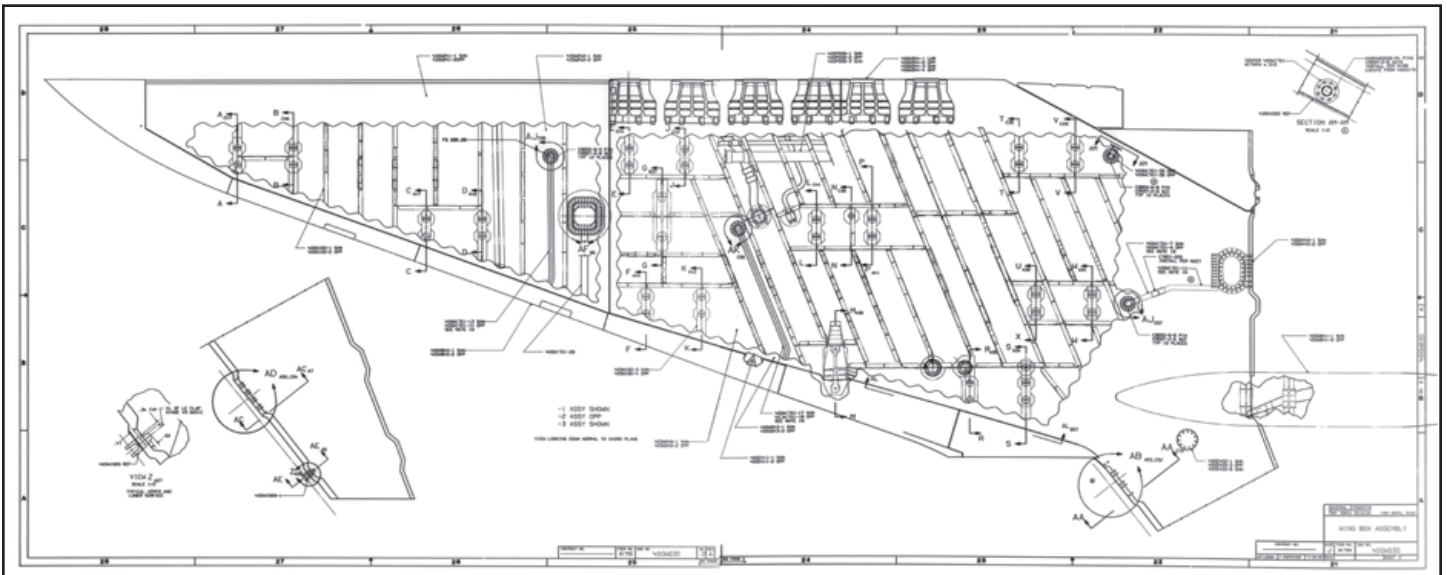
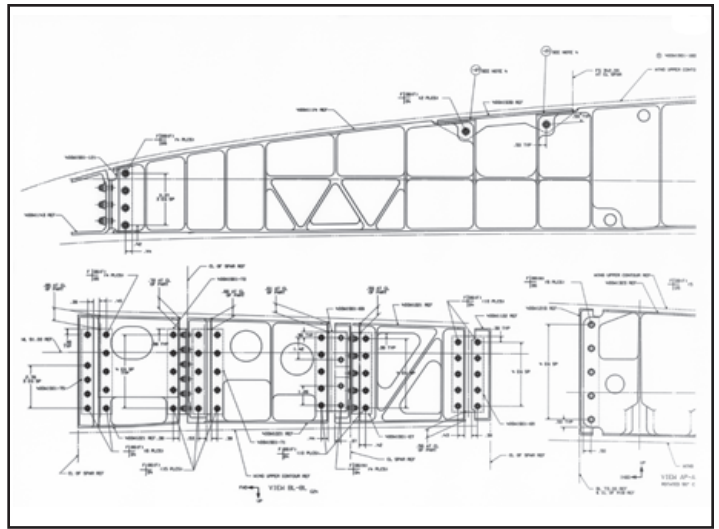
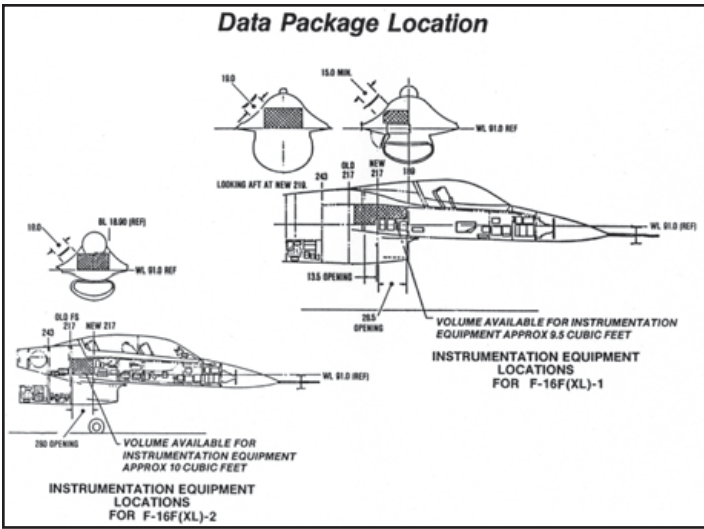
Various probes located on the left and right sides of the forward fuselage on the F-16XL include Angle-of-Attack, Total Temperature and Pitot probe. Note 'Do Not Paint' stencil on radome. (Keith Svendsen- both)



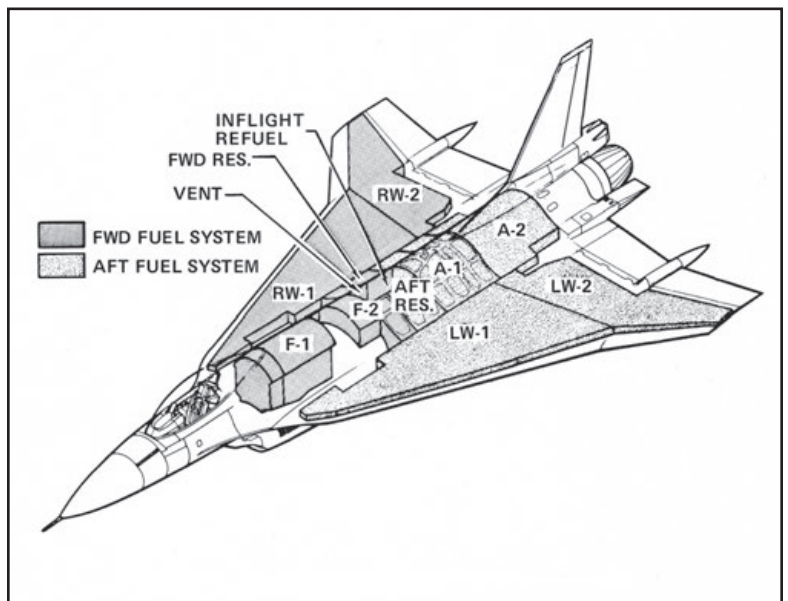
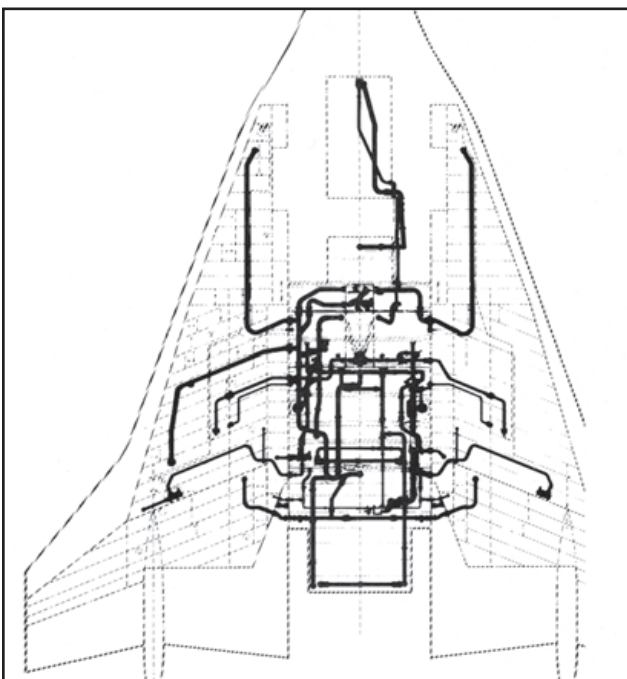
Walk-around detail imagery of both F-16XL aircraft showing external surfaces and access panels in good detail above and the following 2 pages. (Tony Landis- color photos; Keith Svendsen-black & white photos)



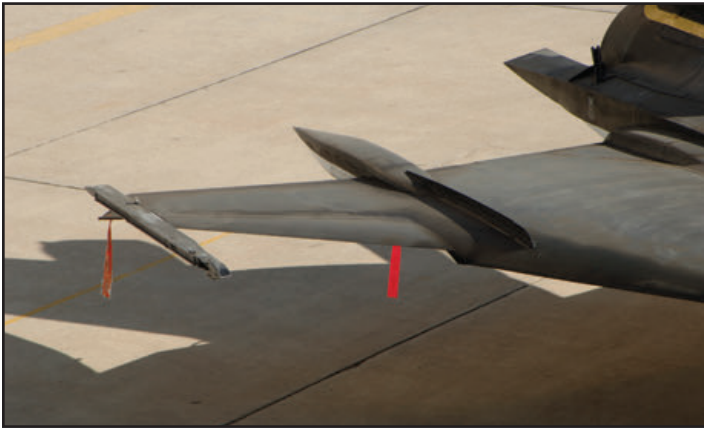




The illustration at top left shows internal instrumentation locations. Note both variants referred to as F-16F. The internal wing structure of the F-16XL is shown in the illustrations above and top right. (Lockheed Martin)



The 10 internal fuel tank locations are shown above and fuel tank plumbing illustration at left. (Lockheed Martin)



The wing is made up of graphite polyimide composite skins attached to an aluminum under-structure, each incorporating independently-actuated elevon and aileron for pitch and roll control. Leading edge flaps are installed outboard on leading edge sweep break. (Tony Landis)



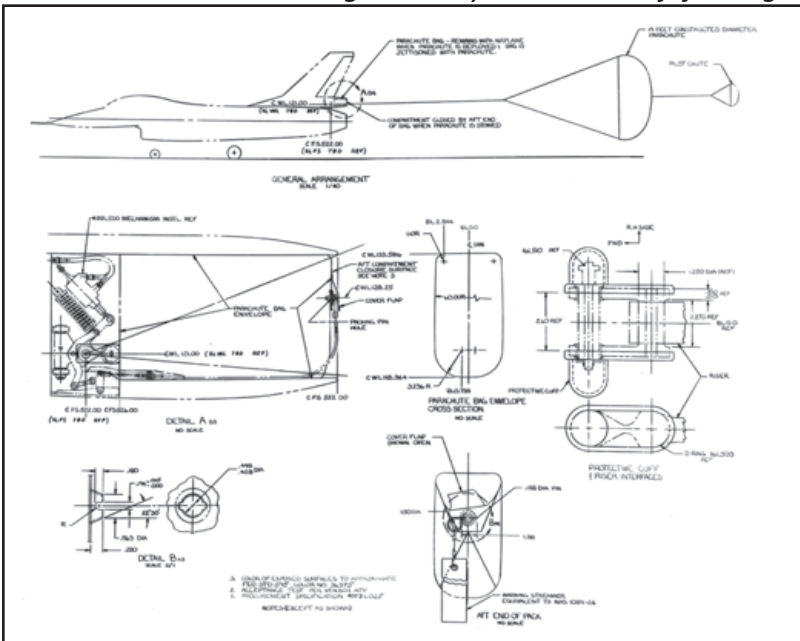
Wing hardpoints were built into the underside of the wing for the carriage of additional weapons or fuel tanks, while the fuselage is modified to allow for semi-submerged AMRAAM missiles. (Tony Landis)

Unique to both F-16XL's is the 'throttle bump' on the left side of the forward fuselage. This bump allows clearance for the throttle rotation connection, which is covered on standard model F-16's by the wing leading edge chine. (Mike Valdez)

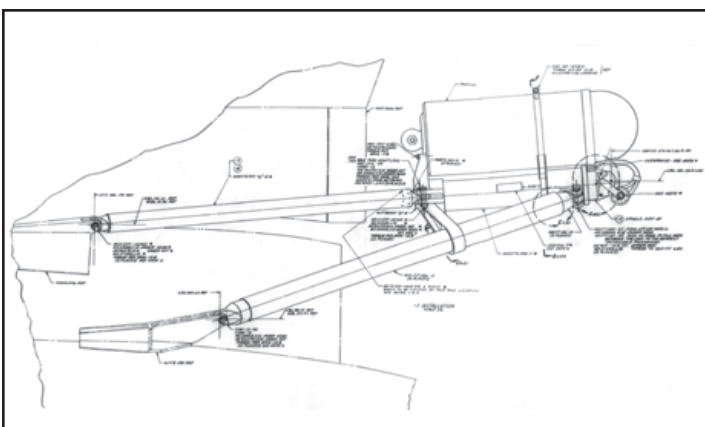




The 2 ventral fins carried by standard F-16's were not required on the F-16XL due to the lengthened fuselage. Standard F-16 tail hook arresting assembly is located in aft fuselage. (Keith Svendsen- above, left; Tony Landis- 2 above)

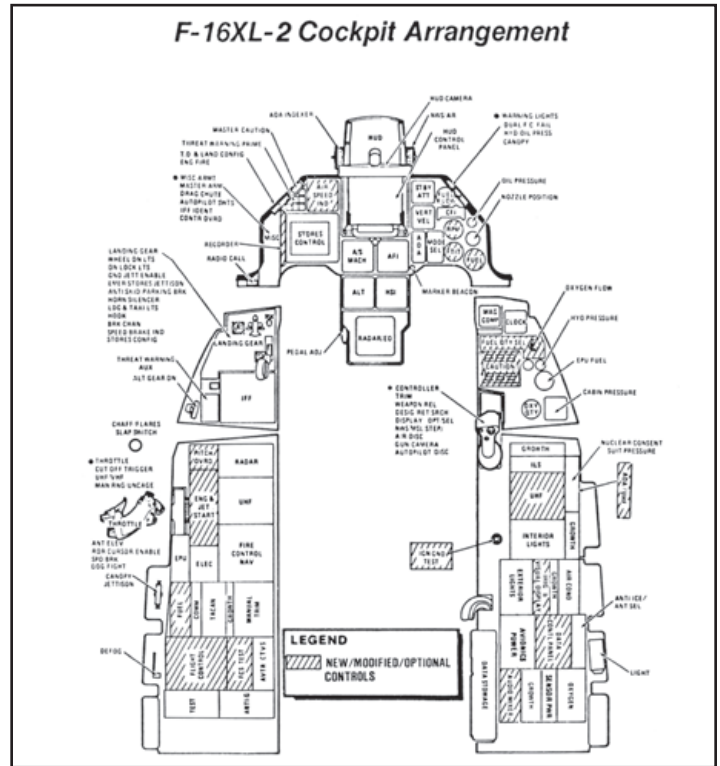
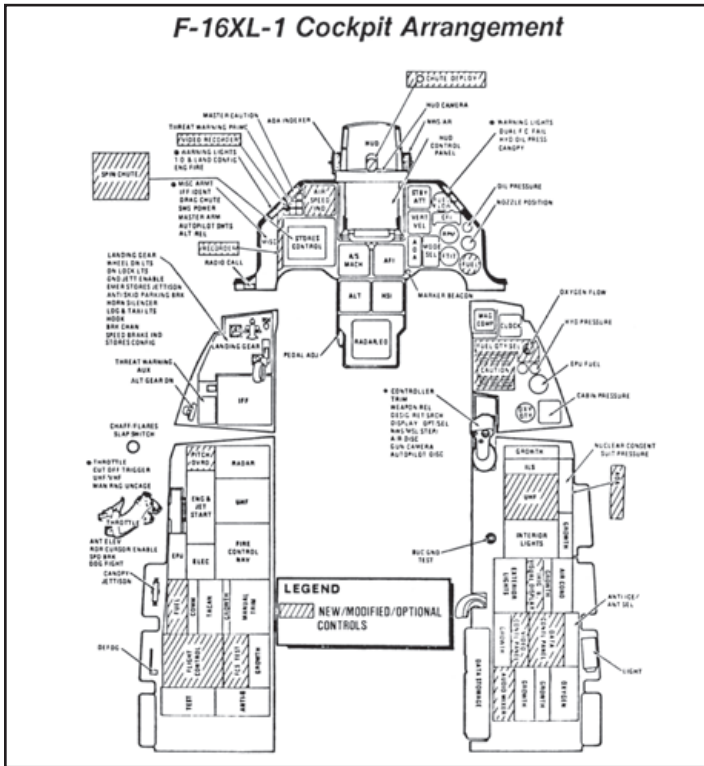


The dorsal fairing of the vertical stabilizer contained a Norwegian-type drag chute system with an increased area of 19-foot diameter, gold-color canopy. (Lockheed Martin- above left; Tony Landis- 2 above)

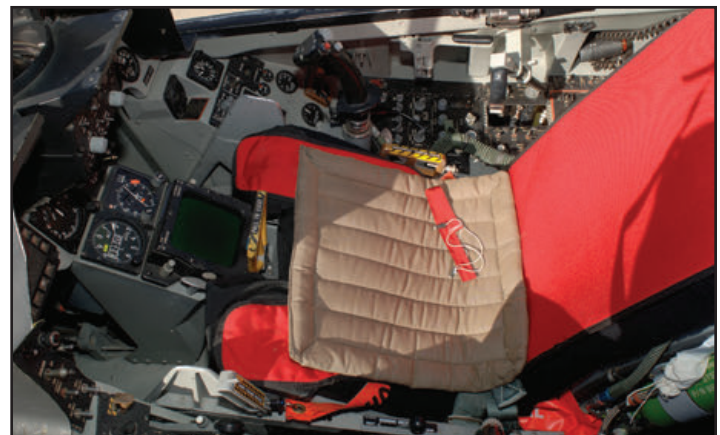


F-16XL, 75-0749, was taken out of service for 10 days in late January 1983 for installation of a spin chute assembly prior to high AoA testing. (Lockheed Martin- above; Tony Landis- 2 at right)

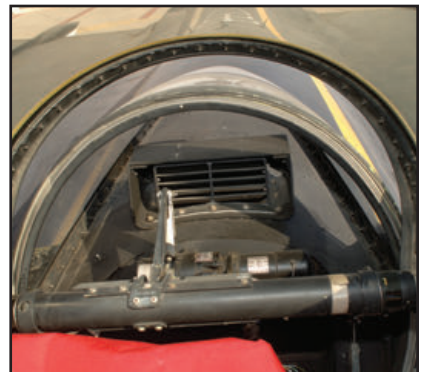
COCKPIT AND EJECTION SEAT



The pilot's cockpit on both F-16XL prototypes was similar in arrangement to production F-16A with only minor changes for test instrumentation and weapon controls as noted in the illustrations above. (Mick Roth collection)



Instrument panel and Heads-Up Display (HUD) details of F-16XL, 75-0749, at the end of the NASA flight test program show little has changed from the initial cockpit arrangement. (Tony Landis)



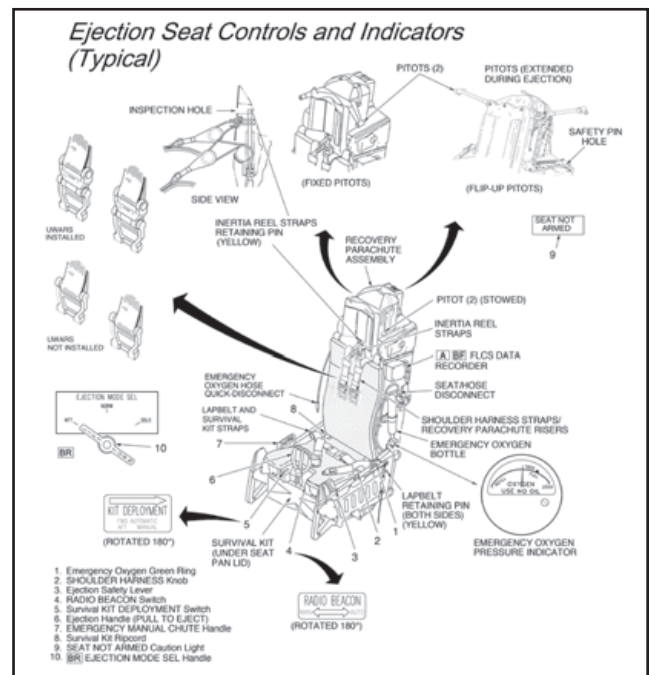
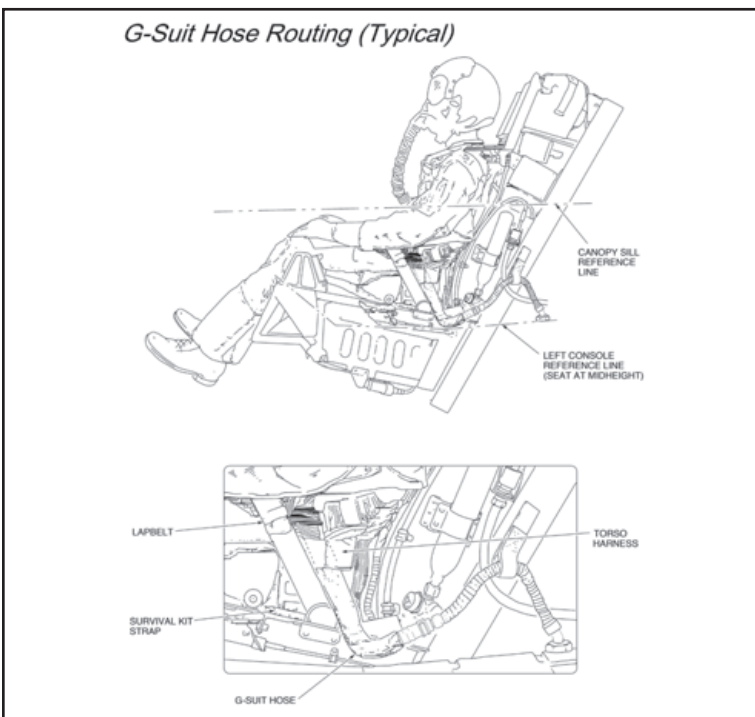
Left and right side cockpit consoles, Aces II ejection seat and aft cockpit area details of F-16XL, 75-0749. The custom red cover, and black, sheep skin padding on the seat were unique to the NASA flight test program. (Tony Landis)

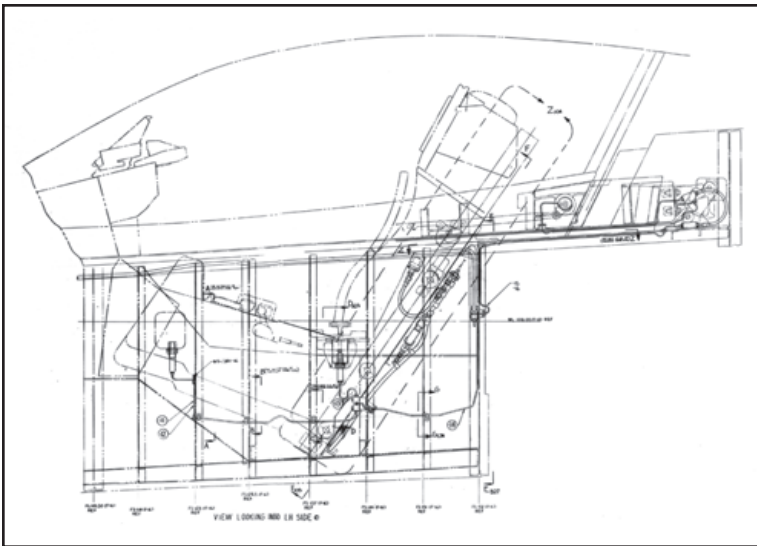


McDonnell Douglas ACES II zero/zero ejection seats were used in both F-16XL test aircraft. These are the same seats used in the standard F-16A/B. (McDonnell Douglas)

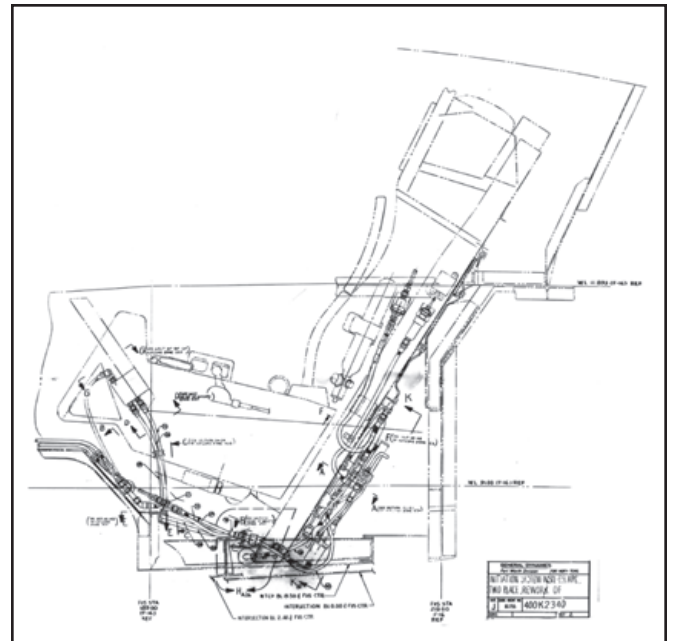


Rocket-propelled F-16 ejection seat test of the McDonnell Douglas ACES II ejection seat at the High-Speed Test Track, operated by the 846th Test Squadron at Holloman AFB, New Mexico. (USAF Photo)

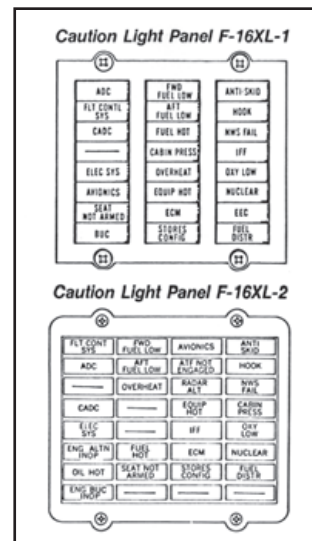
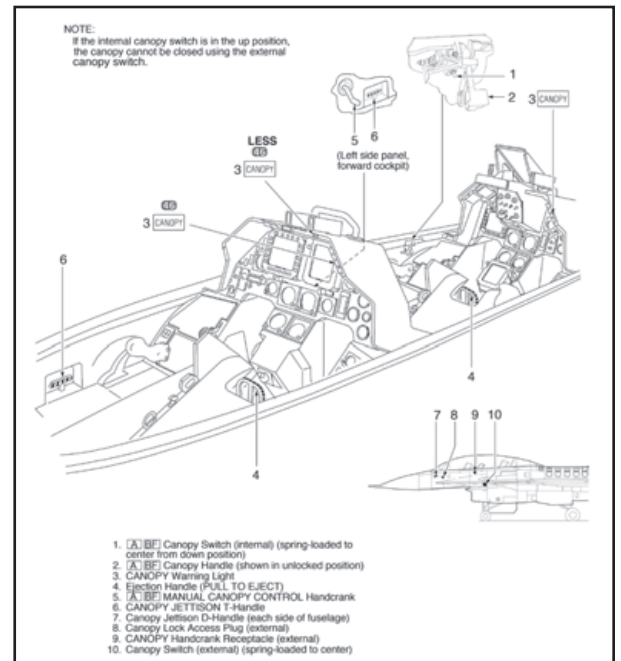




Just like production F-16 aircraft, the ACES II ejection seats in both F-16XL prototypes were angled back 30 degrees to mitigate the effect of high G-forces. (Lockheed Martin)



The two-piece plastic canopy used on the F-16XL was identical to those on the standard F-16A/B models. An inflatable pressurization seal on the cockpit sill mates with the edge of the movable canopy, while a non-inflatable rubber seal on the canopy prevents water entry. (Tony Landis)

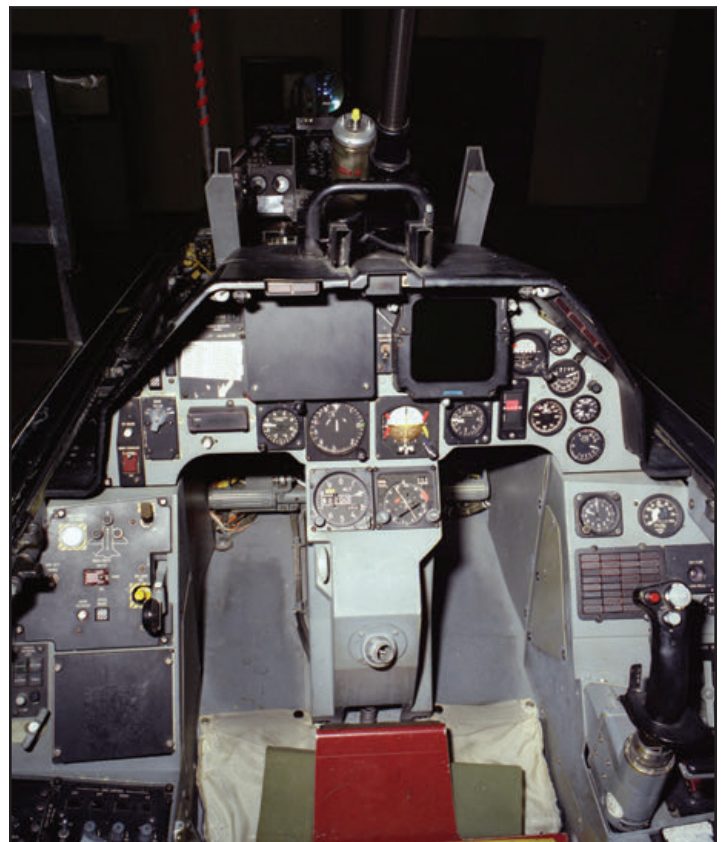


Canopy control locations for XL-2 were the same as those for the F-16B. (Mick Roth collection)

Comparison of the pilot cockpit caution light panels for both F-16XL aircraft. (Mick Roth collection)



Forward and aft cockpits of F-16XL, 75-0747 as they looked shortly after delivery to NASA Dryden Flight Research Center at Edwards AFB, CA in February 1991. (NASA)



The same views taken in September 1993 show very little change in the overall arrangement. (NASA)

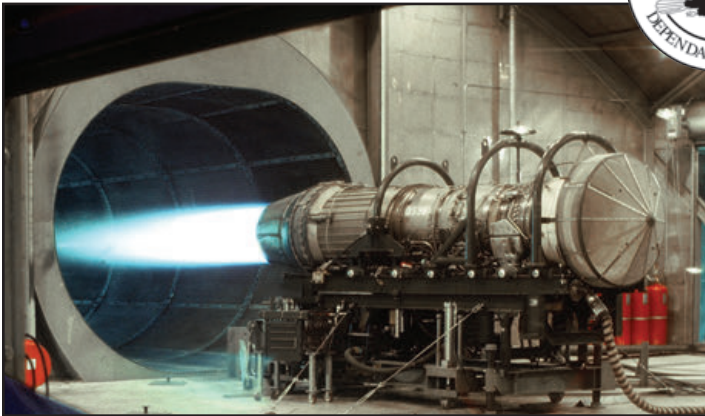
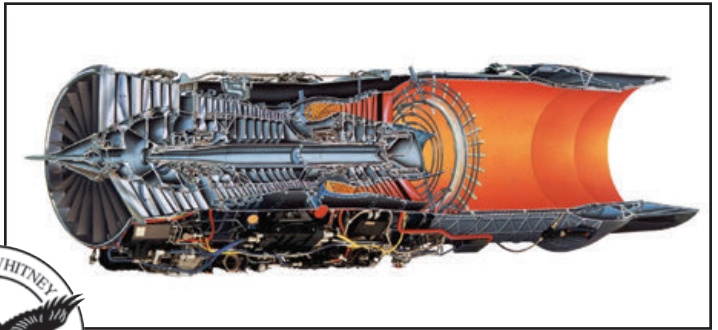
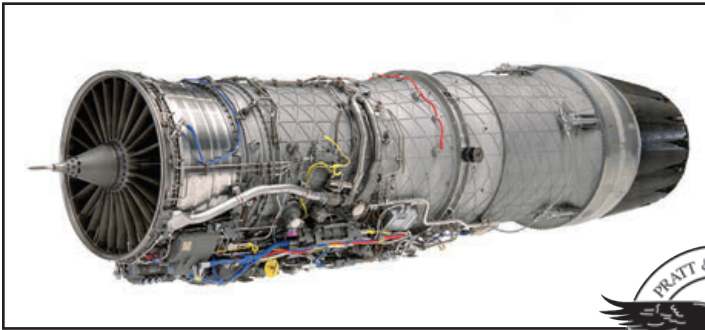


The series of images on this page and the following page show the front and aft cockpits of XL-2 in July 1996, near the end of the NASA test program. Note the addition of the white GPS antenna in front of the HUD, and controls for the Supersonic Laminar Flow experiment in the aft cockpit. (Tony Landis)

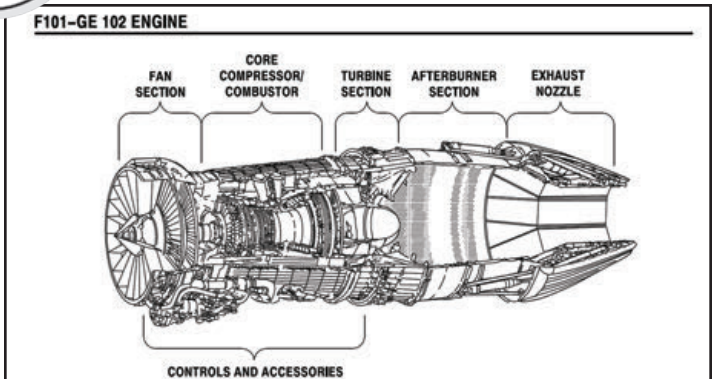
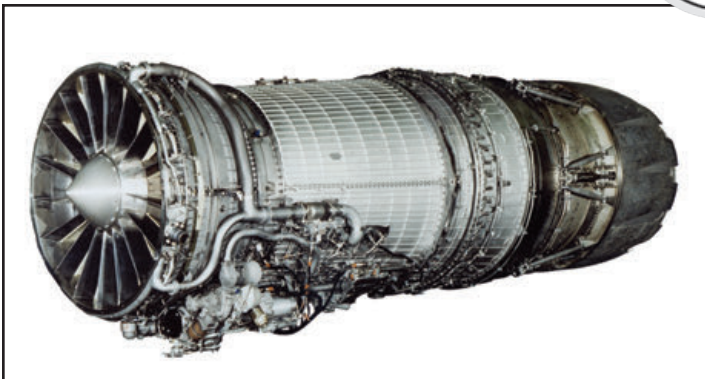




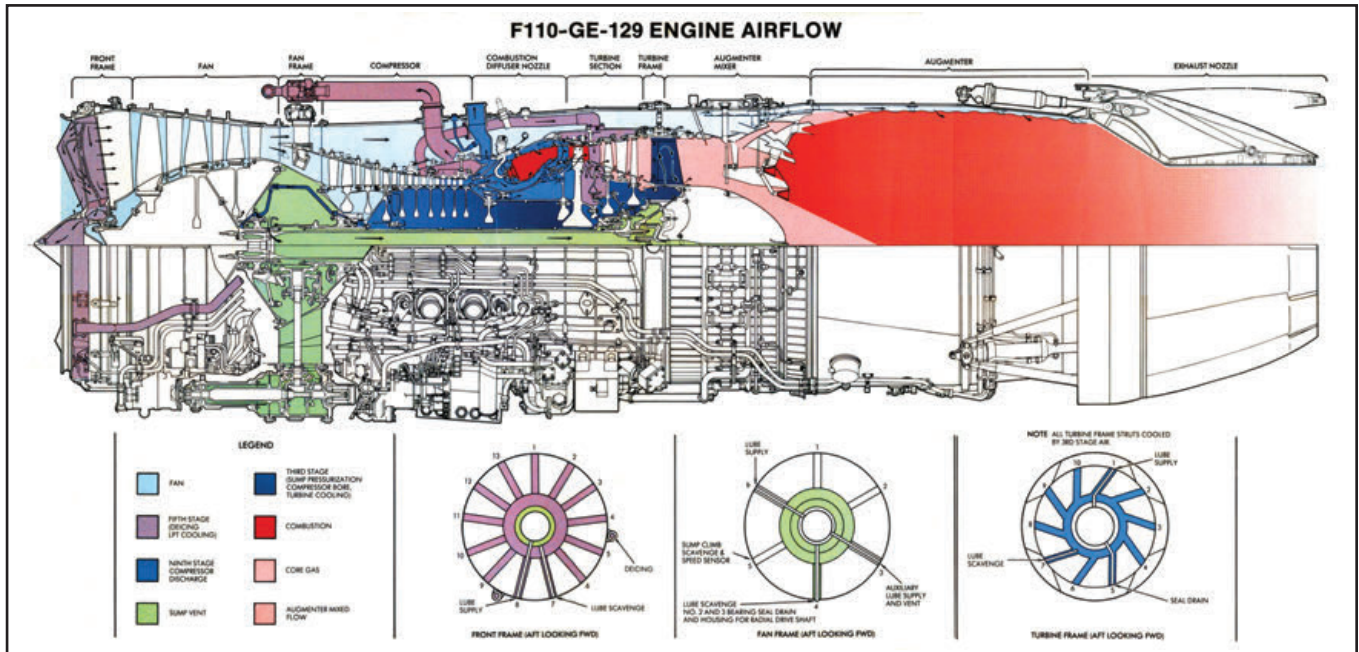
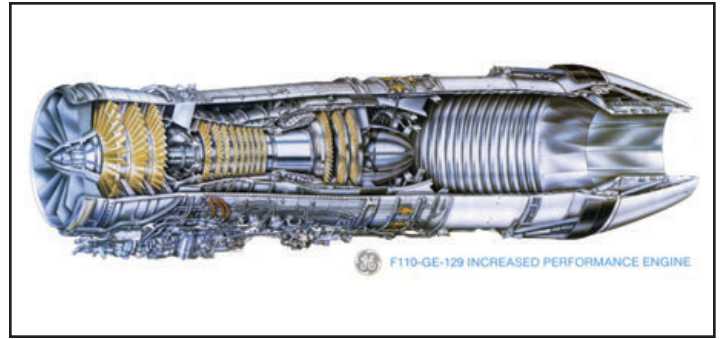
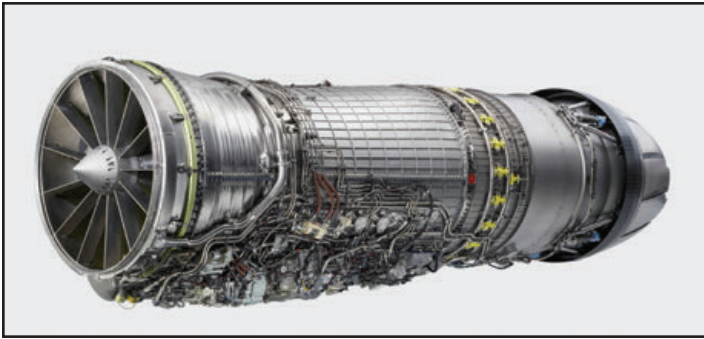
PROPULSION AND LNSI



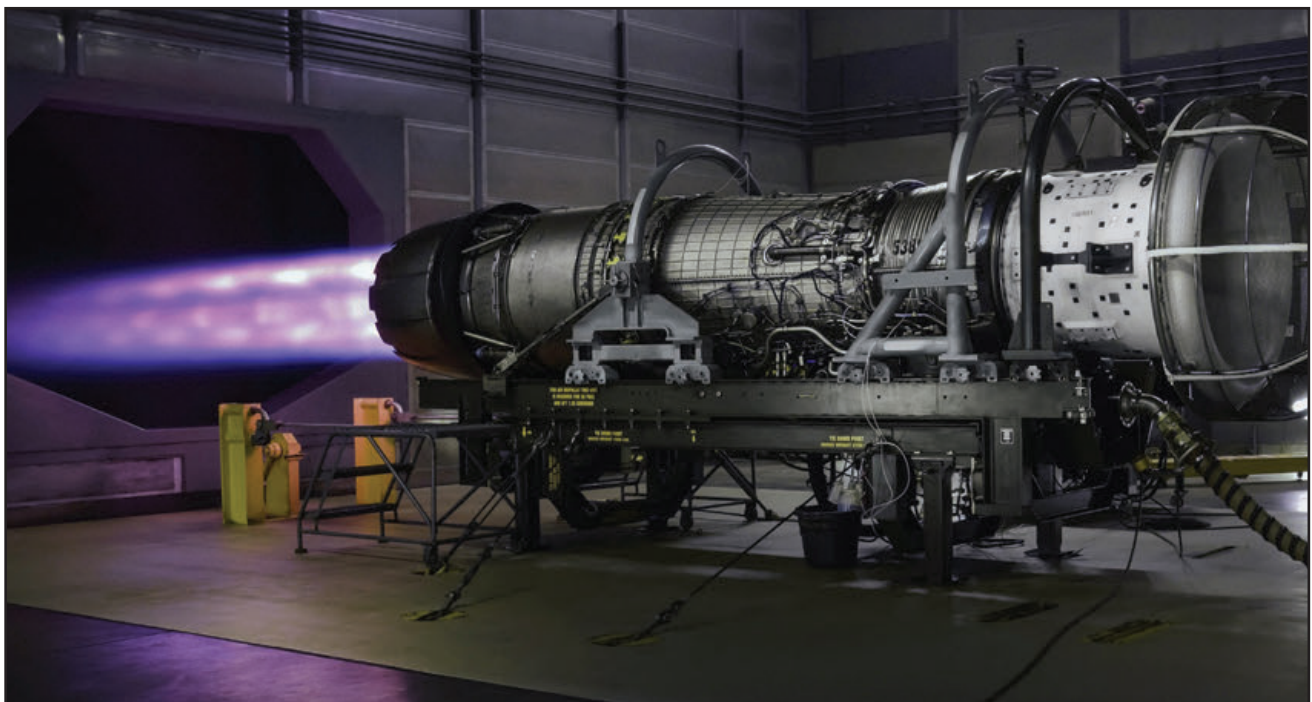
Powering F-16XL, 75-0749, throughout the entire test program was a Pratt & Whitney, F100-PW-200 afterburning turbofan engine capable of providing approximately 24,000 lbs maximum thrust, similar to those used in the basic F-16. (Pratt & Whitney- Top 2; USAF- above left; Keith Svendsen- above right)

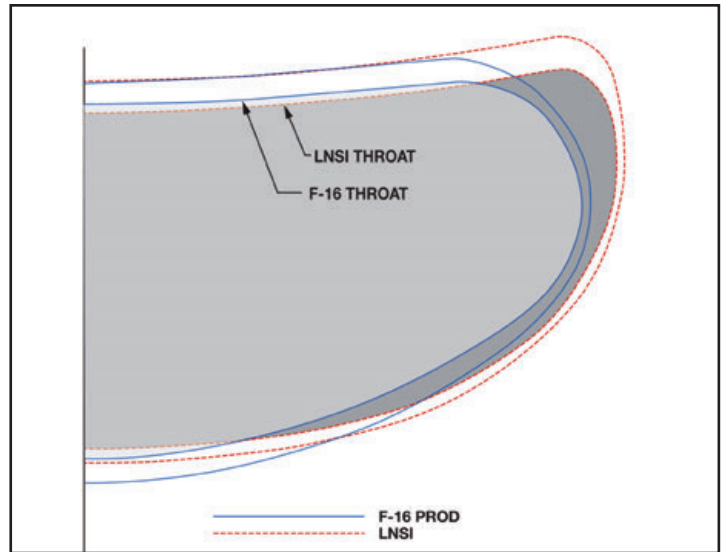
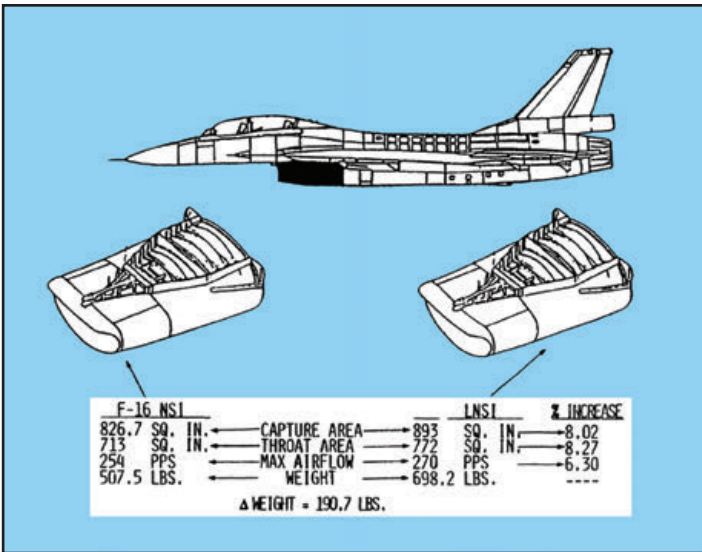


Initially powering F-16XL, 75-0747, was a General Electric F101-GE-102 afterburning turbofan similar to those used in the B-1B Lancer. (USAF- middle left; Keith Svendsen- middle right; GE- 2 above)



During June and July 1984, XL-2 was back at General Dynamics for installation of the GE F110-GE-100 'Slimline' engine. This prototype version of the F110 provided additional thrust to the aircraft, but engine issues during the test program required at least 2, unscheduled, emergency landings on the lakebed at Edwards AFB. Prior to delivering the aircraft to NASA, the F110-GE-100 was replaced with the F110-GE-129. (GE-top 2 and above, right; USAF-above, left)

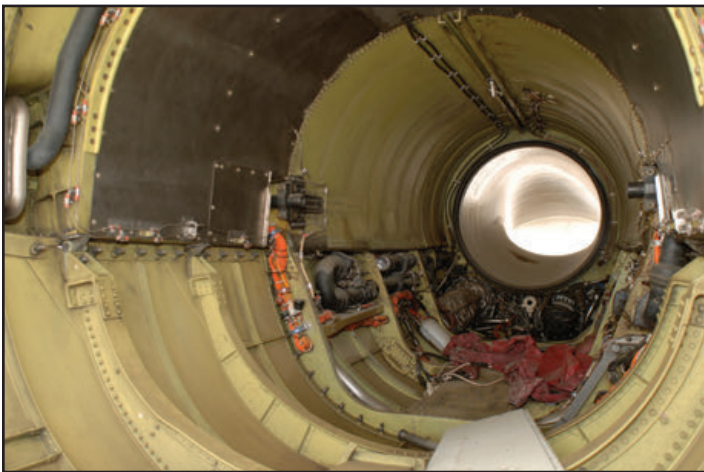




The final significant modification to the F-16XL occurred during the first half of 1985, when General Dynamics technicians installed the Large Normal Shock Inlet (LNSI). The LNSI provided an 8 percent increase in the throat area of the inlet. The combination of F110 engine and LNSI gave XL-2 the ability to 'Super-cruise' (continuous supersonic flight without the use of afterburner), though the Air Force requested GD to keep that information quiet as to not affect the upcoming Advanced Tactical Fighter program. (Tony Landis)



There was no discernible external difference in the engine exhaust nozzle of the GE F110 'Slimline' and F110-GE-129 engines. (Keith Svendsen- top left; NASA- top right)



The empty engine compartment of F-16XL, 75-0747, after the end of the NASA flight test program. (Tony Landis)

It can fly anywhere in the flight envelope with no throttle restrictions whatever. And for good reasons.

In its flight-test program, the General Dynamics F-16XL has proved that flawless operability and the highest standards of durability can go hand-in-hand. The General Electric F110 engine makes all the difference. **The engine a fighter pilot would have designed himself**

Everything about the F110 says "exceptionally operable." Just like in its F-16 and F-14 flight-test programs, the F110 (formerly F101 DPE) had no throttle restrictions at all in F-16XL flight testing. Even during extreme maneuvers at the far edges of the flight envelope. What's more, trim runs were totally unnecessary. **Ready to fly at a moment's notice**

Record-breaking 5,000-TC-cycle AMT testing confirms it. The F110 is one tough engine. Demonstrated hot section life is equivalent to 2,500 flight hours. That's more than twice the life of current fighter engines in the same class. And because of this rugged durability testing, the F110 promises to enter U.S. Air Force service with a first-hand-time removal requirement of approaching 2,000 hours. Result: a higher state of mission readiness. **All this plus lower operating costs**

Why? Higher reliability. Simpler, more durable parts that will keep USAF fighters in the air. Fewer and less expensive maintenance actions. And components that are easily accessible and quickly serviced. **The right engine for the Tomcat, too**

What the F110 offers the Air Force's F-16 and F-15, it can also bring to the Navy's F-14: demonstrated operability, durability and reliability advantages. Plus the superior performance the F-14 needs.

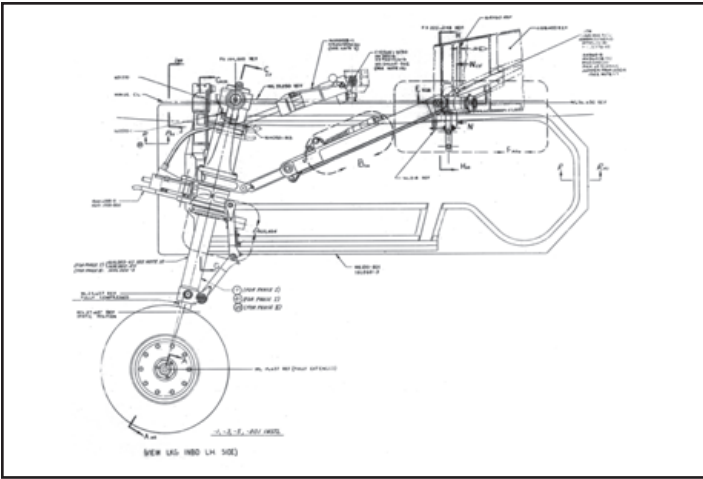
That's no coincidence. Sharing common technology with GE's F101, F404 and CFM56 engines, the F110 is ready to do what's expected of it. And more. **Engines that set new standards**

The GE philosophy is simple: develop military engines that surpass previous standards and exceed customer requirements. That's what the F110 offers the F-16, F-15 and F-14. And what other GE engines—the F404, F101, T700 and CFM56—are doing for aircraft as diverse as the F/A-18, the B-1B, the Black Hawk and the KC-135R. For lots of good reasons.

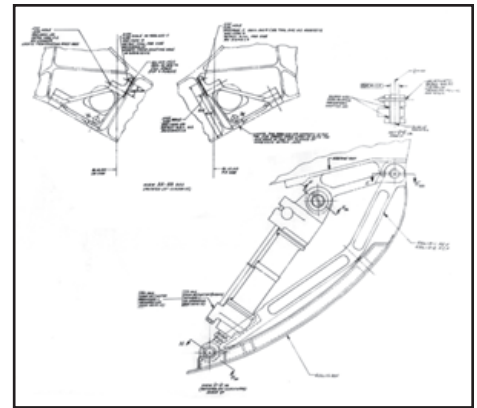
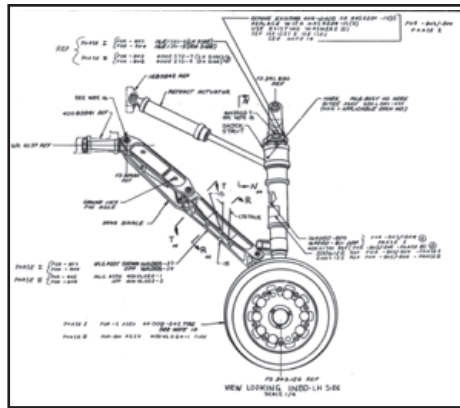
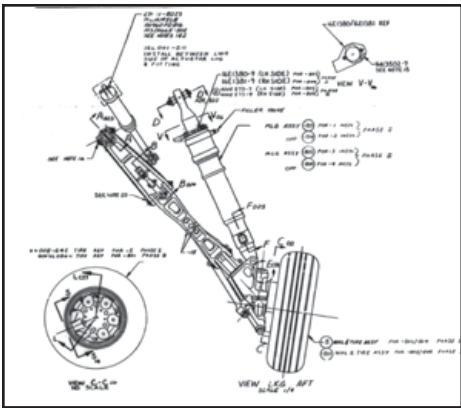
GENERAL ELECTRIC

General Electric took out a two-page ad featuring the F-16XL for their new F110 engine in the November 1983 issue of Air Force Magazine. (GE)

LANDING GEAR



The nose landing gear on both F-16XL aircraft was the same as that utilized by the F-16A/B. The nose gear retracts aft with a 90-degree mechanical wheel twist into the wheel well. The torque arm can be disconnected so that the nosewhell can be turned beyond the steerable range for towing. (Tony Landis- all)



Initially, the main landing gear on both F-16XL's was weight-limited to 36,000 pounds, but received an upgrade to 48,000 pound capacity within 6 months of the beginning of flight testing. (Lockheed Martin)



During the Air Force test program, the main wheels were painted black, except for the delivery to Edwards AFB when only the left wheel of XL-1 was white. (Keith Svendsen- above left; AFTC History Office- above right)

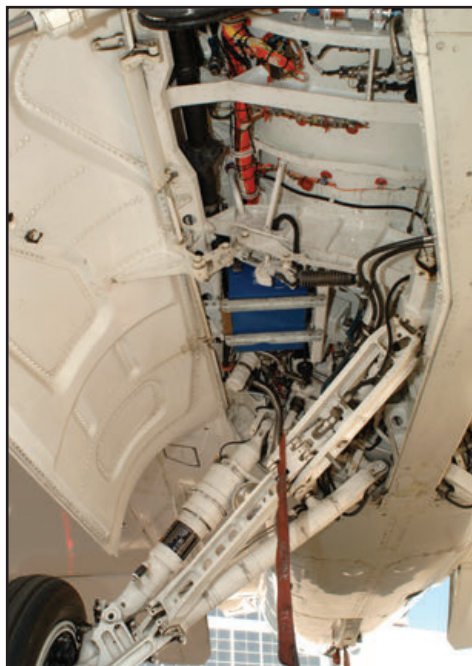


NASA retained the black wheels for a short time but eventually changed to white wheels on F-16XL, NASA 849 in April 1992, and F-16XL, NASA 848 in February 1993. (NASA- 2 above; Tony Landis- 2 below)





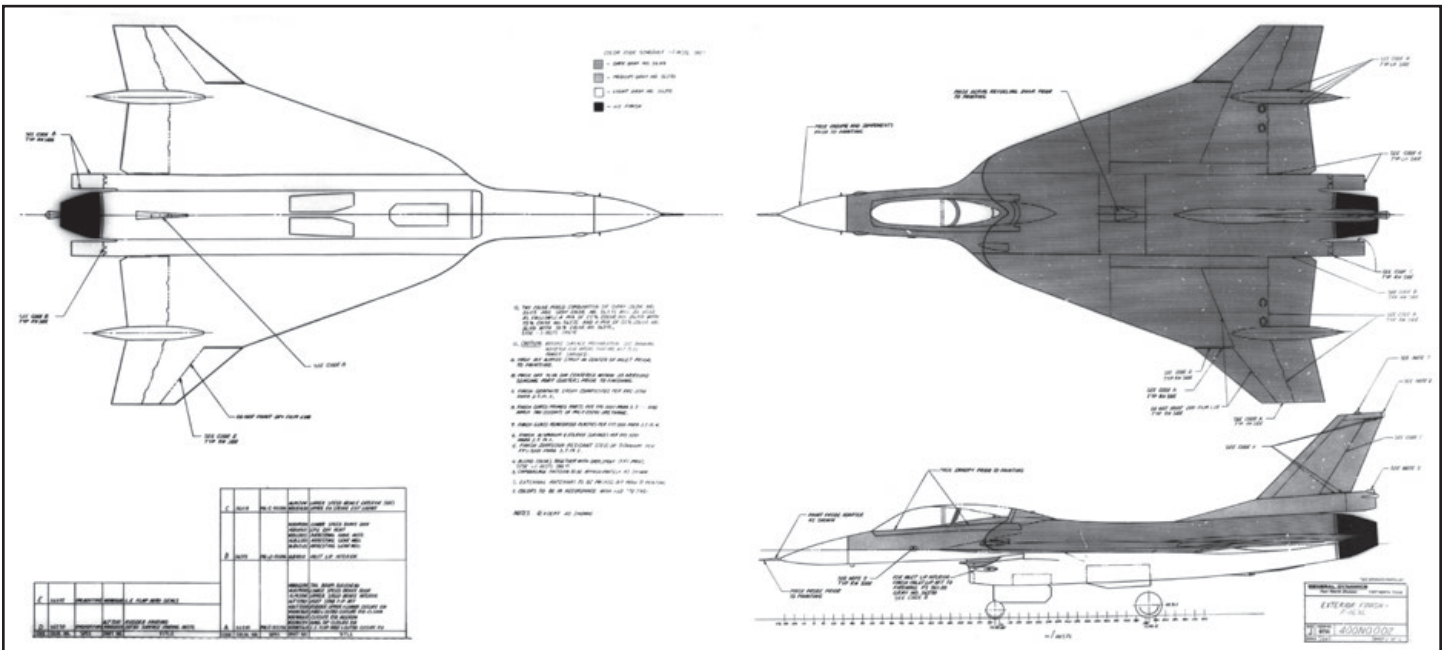
One system that required on-going modifications throughout the test program was defining a suitable wheel, brake, and tire combination. This system went through numerous iterations prior to finding the correct combination prior to the end of the Air Force test program. (Tony Landis- all)



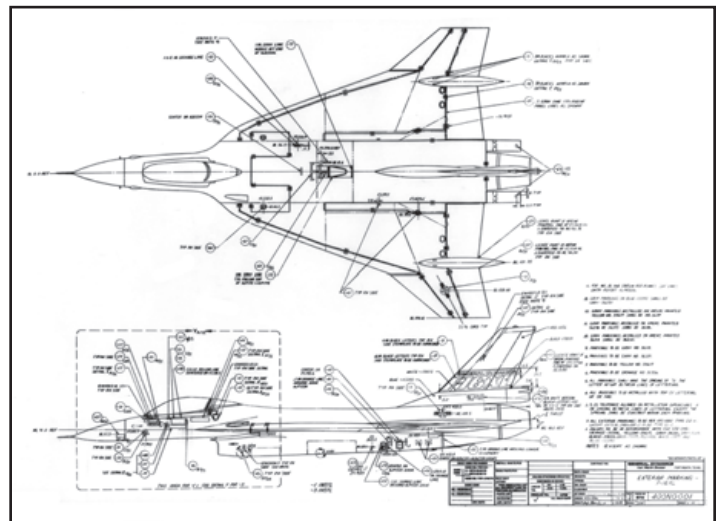
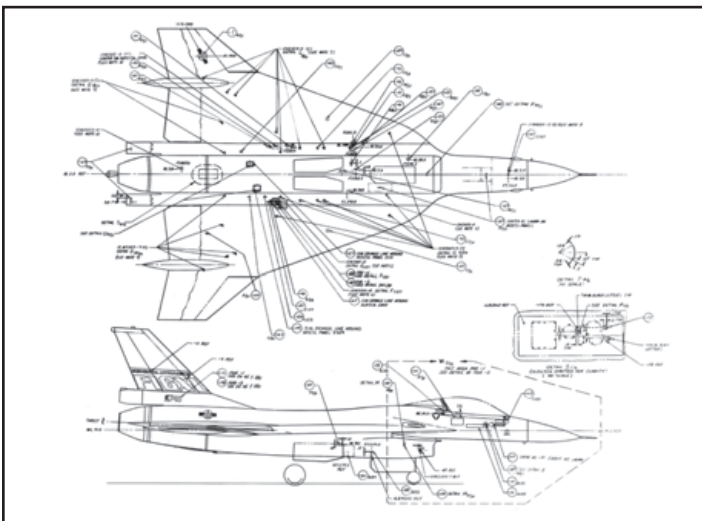


The main landing gear on XL-2 went through the same modifications as XL-1. (Tony Landis- all)

PAINT AND MARKINGS



The paint scheme used on F-16XL, 75-0749, was similar to standard F-16A's of FS36375 light gray bottom, FS36270 gray upper forward fuselage and FS36118 dark gray upper aft fuselage with the addition of red, white & blue demonstrator markings. F-16XL 75-0747 was painted with FS36375 on the bottom while the top was a custom mix of 75 percent FS36375 and 25 percent FS36118.



Both F-16XL aircraft initially carried red, white & blue demonstrator markings and custom tail art on both sides. (Keith Svendsen- right)



The dedicated walkway striping and aircraft stenciling are shown in the 2 illustrations above. (Lockheed Martin- 2 above)



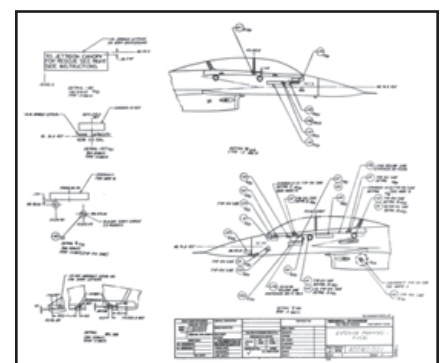
The gray walkway striping and other stenciling applied over the FS36118 dark gray and blue were FS36231 gray. When the demonstrator markings were painted over in March 1983, the vertical stabilizer received a coat of FS36270 gray. (Lockheed Martin- top, left; Keith Svendsen- top, right)

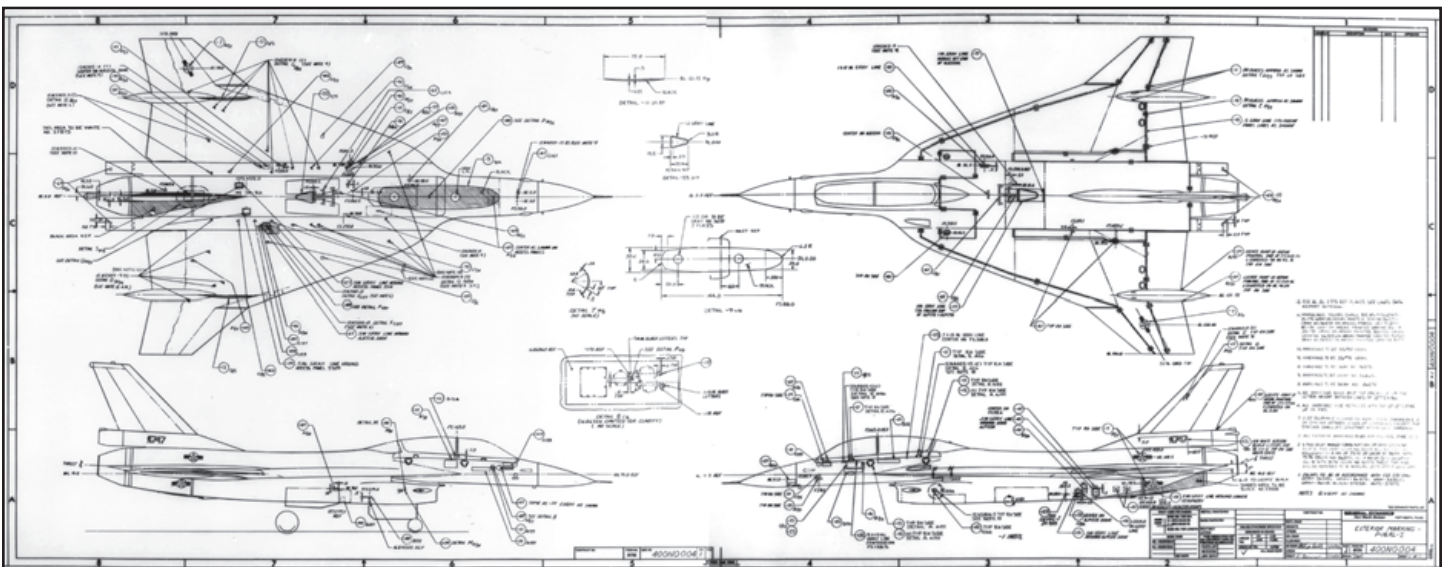
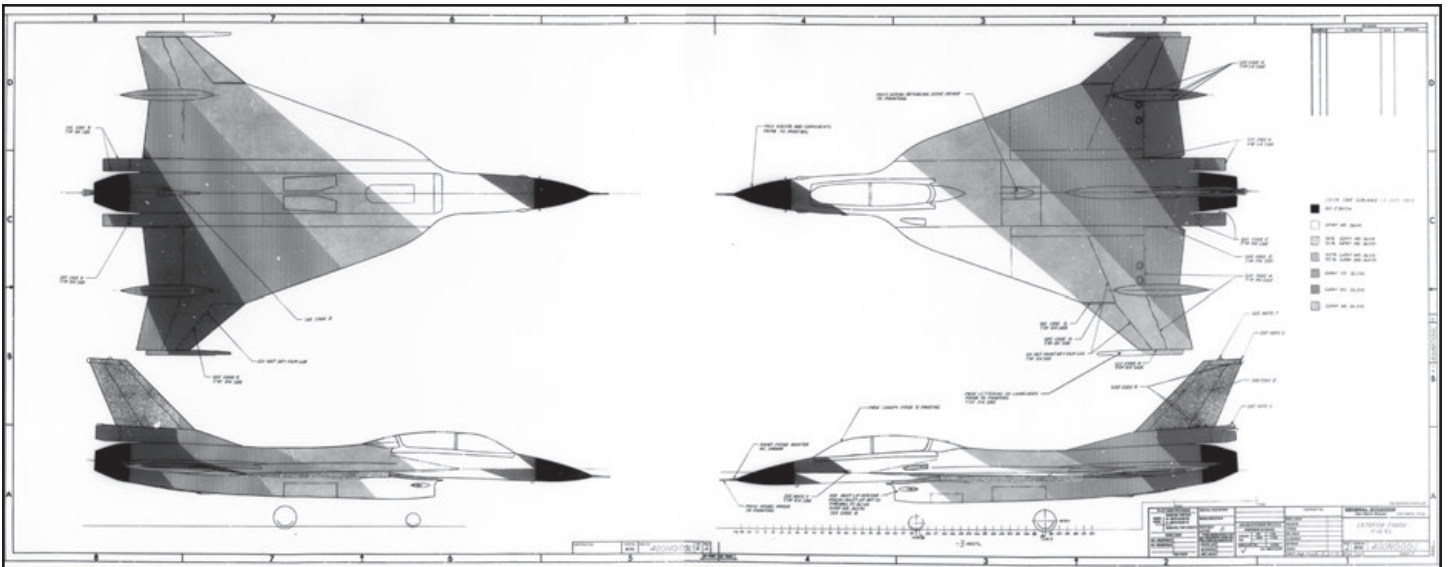


From mid-February to mid-March 1983, XL-1 carried Pratt & Whitney emblems on the lower aft fuselage near the engine exhaust. (Keith Svendsen- 2 at left)



All walkway striping and stenciling on XL-2 was painted in FS36118 dark gray. The demonstrator tail art differed from XL-1 by having smaller General Dynamics text. (Lockheed Martin- above & lower right; Keith Svendsen- above, right)





The Splinter Camouflage, or 'Ferris Scheme', applied to F-16XL, 75-0747, consisted of 6 distinct shades of gray with false canopy and tail painted in white and black. The grays consisted of FS36118, 36270, 36320, 36375 and custom mixed 50/50 of 36118 & 36375, and 25/75 of 36118 & 36375. (Lockheed Martin- all)



Upon receiving the Splinter Camouflage, F-16XL, 75-0747 wore a light gray serial number on the tail. The tail number went to a darker gray for a while, but back to light gray after receiving new paint in June 1985. In addition to the tail number, national insignia and engine warning stripe were added to the bottom of XL-2. (Keith Svendsen- all)



XL-2 was repainted after receiving the LNSI modification and a gray stripe was added to the lip of the intake to designate the modified structure. (Keith Svendsen- left)



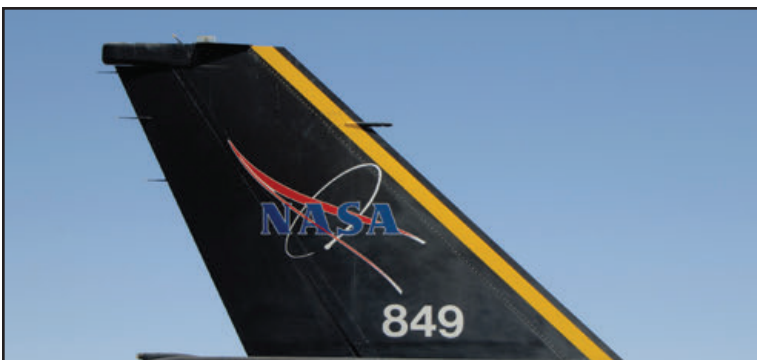
General Dynamics delivered F-16XL 75-0749 to NASA with white F-16XL tail art applied. NASA promptly removed the art and replaced it with the NASA 'worm' and new '849' tail number in red. A small 'Looney Toons' Tasmanian Devil adorned the nose gear door for a short time after delivery to NASA. (NASA- 3 above)



General Dynamics repainted XL-2 in a fanciful red, white & blue scheme prior to turning the aircraft over to NASA. Upon receiving the aircraft, NASA changed the tail number to 'NASA 848' and added the Tasmanian Devil mascot logo to both sides of the intake. (NASA- all)

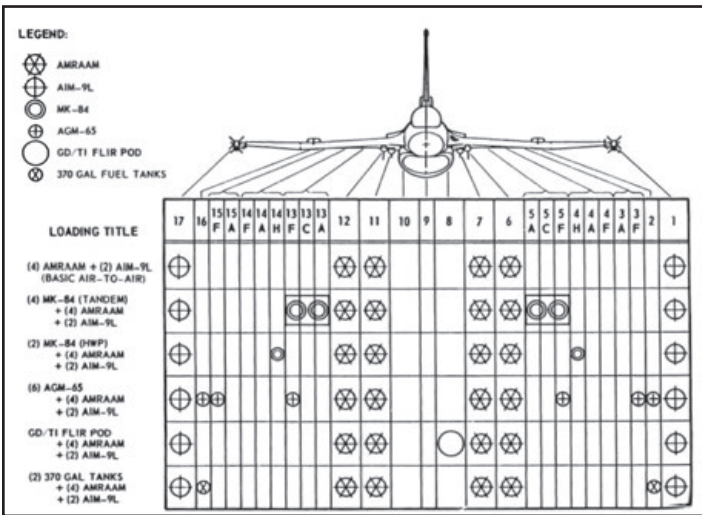


Coming out of the paint shop at General Dynamics (top), the F-16XL bore serial number 847, which was already in use. Then changed it to 846 for the delivery flight (middle), before becoming NASA 848. (NASA- all)



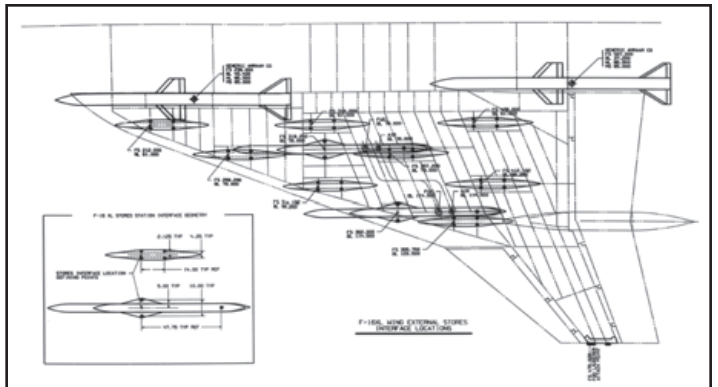
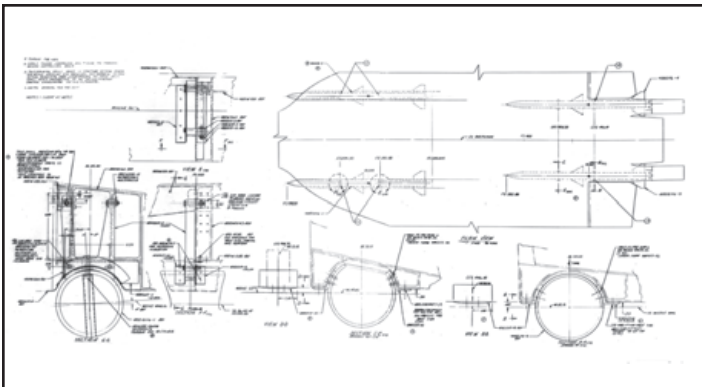
NASA Dryden loaned XL-1 to NASA Langley Research Center in Virginia for a year. While there, it received a striking black, yellow, white & gray paint scheme with NASA 'Swoosh' on the tail (top left). Just prior to returning to Dryden, the yellow stripes along the wing leading edge were painted over (top right). During separate tours of NASA Dryden, Apollo 11 astronauts Neil Armstrong and Buzz Aldrin autographed the aircraft. (NASA- 2 at top; Tony Landis- 4 in middle; Mike Valdez- bottom, right)

WEAPONS



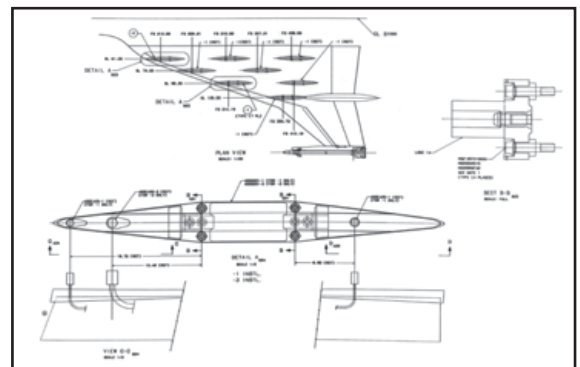
The F-16XL aircraft were designed to carry a variety of air-to-air and air-to-ground weapons as shown in the illustration above. (Lockheed Martin)

The primary air-to-air mission load consisted of an AIM-9 Sidewinder on each wingtip and 4 dummy AIM-120 AMRAAM missiles. (Keith Svendsen)

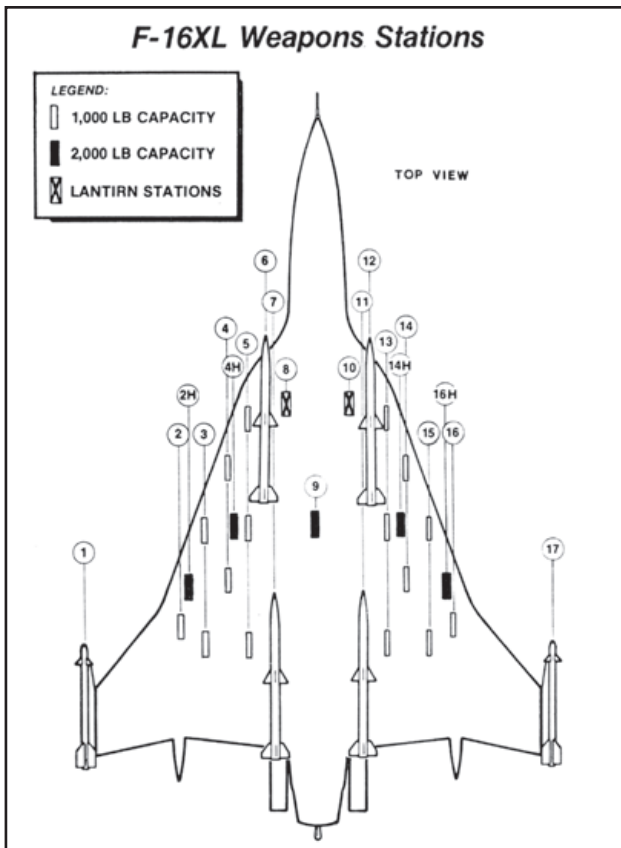


AMRAAM missiles were carried in conformal stations built into the lower fuselage. (Lockheed Martin)

Each wing had provisions for up to 8 single-load pylons or two tandem-load pylons. (Lockheed Martin)



A typical air-to-ground mission load consisted of 12-Mk82, 500 pound, free-fall, gravity bombs attached to Lode 14 wing pylons. (Lockheed Martin- above; Keith Svendsen- right)



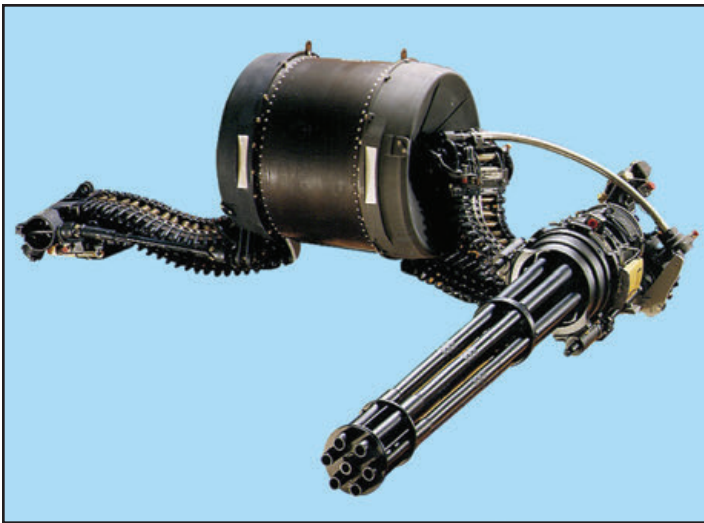
Weight limitations of each hard-point are noted in the illustration at left. (Lockheed Martin)



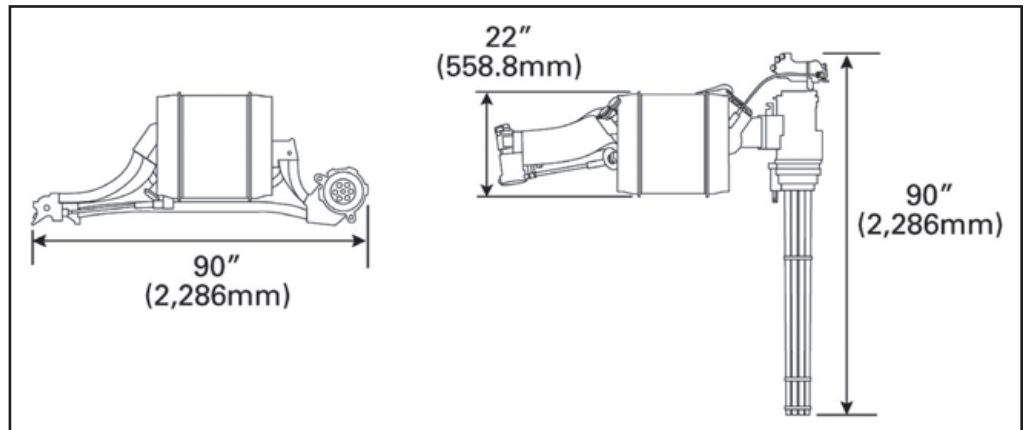
Both F-16XL aircraft performed test missions with wingtip fairings replacing the Sidewinder missile launch rails. (Lockheed Martin- both)



Air Combat Maneuvering Instrumentation (ACMI) pods were carried by both aircraft during Operational Utility Evaluation (OUE) missions. The pods were borrowed from Nellis AFB, NV, as Edwards AFB often had none available. (Keith Svendsen- 2 at left)



Like the rest of the F-16 fleet, the F-16XL was equipped an M61A1, six-barrel, Gatling gun capable of firing up to 6,000 rounds per minute. (General Dynamics)

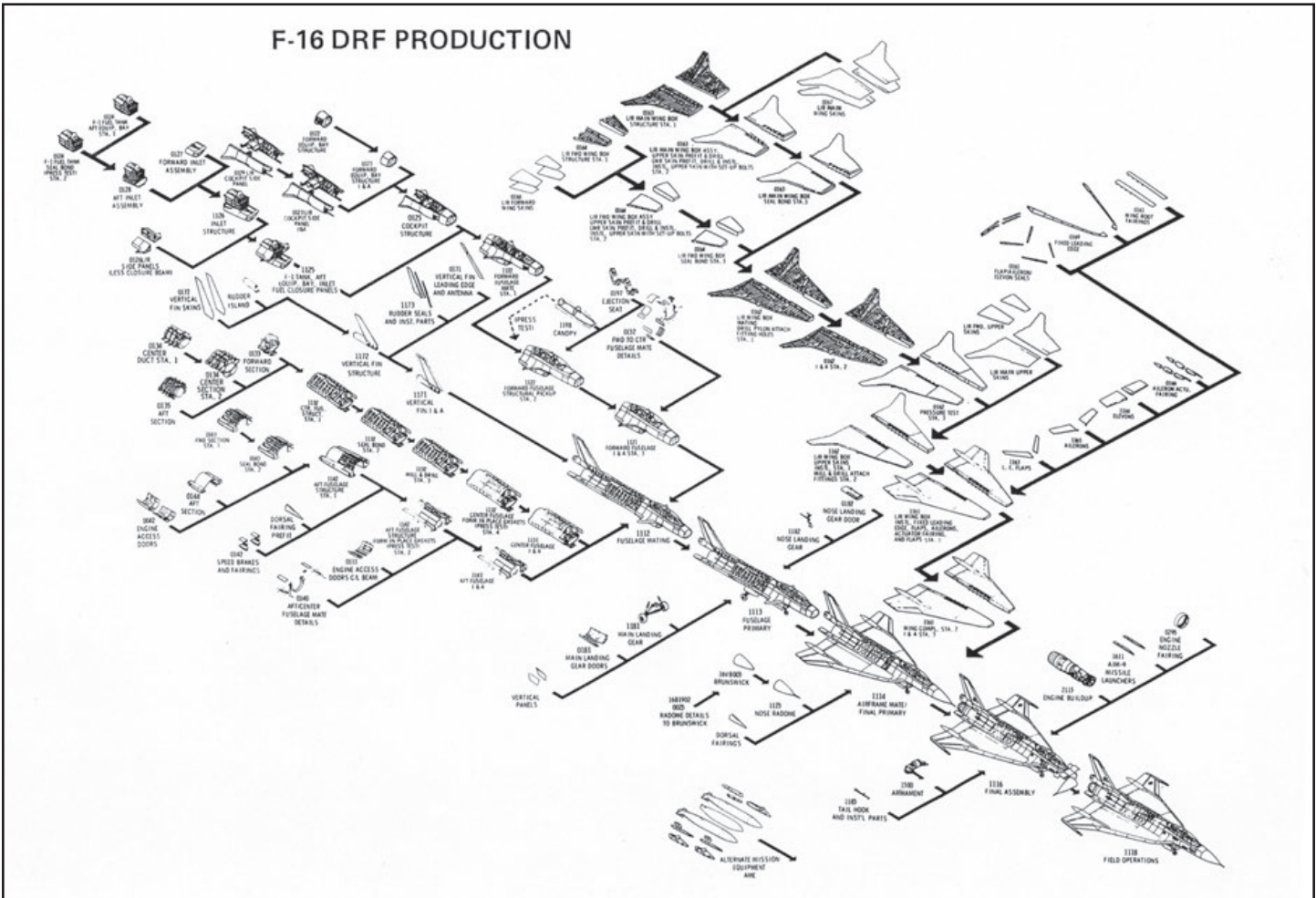


F-16F(XL) Test Store Loadings

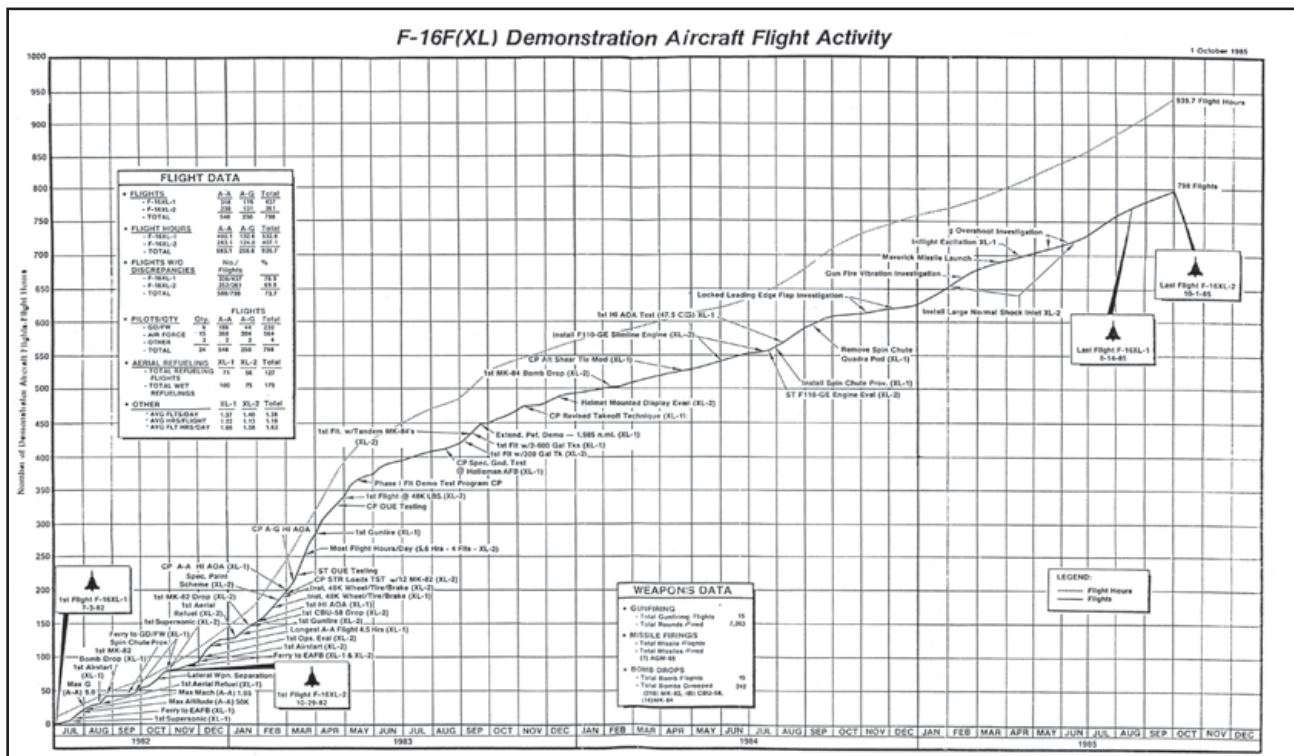
LOADING TITLE	LOADING NUMBER	17	16	16H	15F	15A	14F	14A	14H	13F	13C	13A	12	11	9	7	6	5A	5C	5F	4H	4A	4F	3A	3F	2H	2	1
Air-to-Air	1	AIM 9L											AMRAAM		AMRAAM													AIM 9L
Air-to-Air + Tanks (370)	2	AIM 9L	370 TK										AMRAAM		AMRAAM											370 TK		AIM 9L
Ferry (600) Tanks	3	LCHR											AMRAAM		AMRAAM						600 TK							LCHR
(12) MK-82	4	AIM 9L		MK 82			MK 82	MK 82		MK 82	MK 82	MK 82	AMRAAM		AMRAAM	MK 82	MK 82	MK 82	MK 82			MK 82	MK 82			MK 82		AIM 9L
(10) MK-82 + Tanks	5	AIM 9L	370 TK				MK 82	MK 82		MK 82	MK 82	MK 82	AMRAAM		AMRAAM	MK 82	MK 82	MK 82	MK 82			MK 82	MK 82			370 TK		AIM 9L
(2) MK-84	6	AIM 9L						MK 84					AMRAAM		AMRAAM							MK 84						AIM 9L
(6) MK-20 + Tanks (370)	7	AIM 9L	370 TK						MK 20	MK 20	MK 20							MK 20	MK 20	MK 20						370 TK		AIM 9L
Air-to-Air + 2 Pylons (heavy) + Tanks (empty)	8	AIM 9L	370 TK						PYLON													PYLON				370 TK		AIM 9L
6 Pylons + Tanks	9	AIM 9L	370 TK						PYLON	PYLON									PYLON	PYLON						370 TK		AIM 9L
6 AGM-65	10	AIM 9L	AGM 65		AGM 65				AGM 65				AMRAAM		AMRAAM										AGM 65		AGM 65	AIM 9L
Air-to-Air + (2) AMRAAM	11	AIM 9L	AMR AAM										AMRAAM		AMRAAM												AMR AAM	AIM 9L
Air-to-Air + (2) MK-84 + Tanks (370)	12	AIM 9L	370 TK					MK 84														MK 84				370 TK		AIM 9L
Air-to-Air + Hvy Pylon + (1) MK-84	13	AIM 9L						MK 84														MK 84						AIM 9L
Air-to-Air + Hvy Pylon + (1) MK-84 + Tanks (370)	14	AIM 9L	370 TK					MK 84					AMRAAM		AMRAAM							MK 84				370 TK		AIM 9L
Air-to-Air + (1) AMRAAM + (1) AMRAAM Launcher (MRL)	15	AIM 9L	MRL										AMRAAM		AMRAAM												AMR AAM	AIM 9L
Air-to-Air + (6) MK-82 + (2) 370-Gallon Tanks	16								MK 82	MK 82	MK 82							MK 82	MK 82	MK 82								AIM 9L
Air-to-Air + (2) AIM-9L + (2) AMRAAM	17	AIM 9L											AMR AAM		AMR AAM													AIM 9L

MISCELLANEOUS

F-16 DRF PRODUCTION



General Dynamics proposed production layout showing the modular assembly process required to set up the dual-role fighter production line at General Dynamics facility in Ft. Worth, TX. (Lockheed Martin)



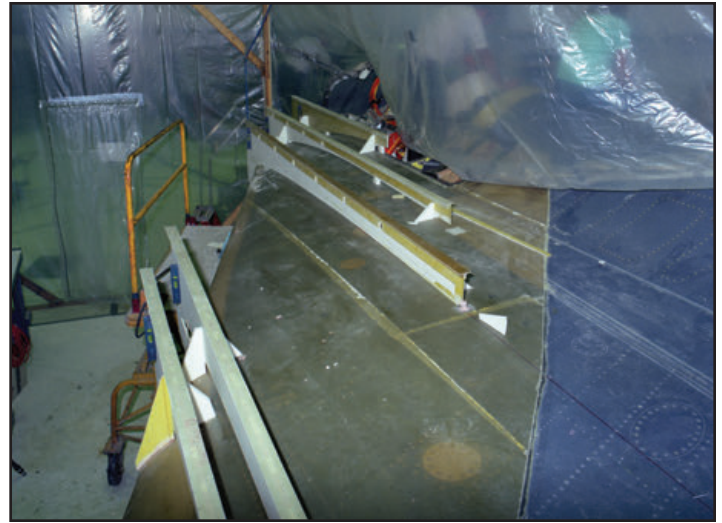
NASA ⁵ RESEARCH

FOLLOW-ON TESTING

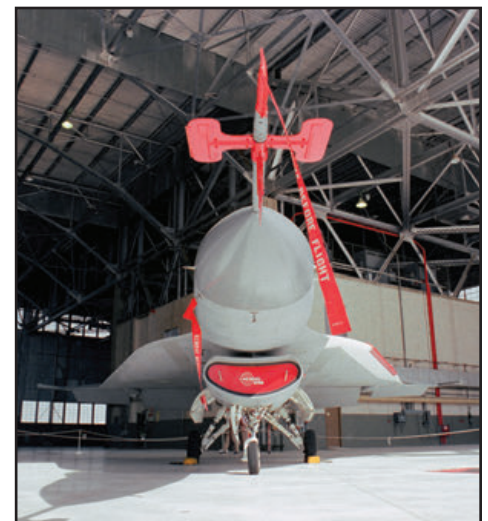


After spending 4 years in storage, F-16XL 75-0749 required only a single Functional Check Flight (FCF) at General Dynamics before making the NASA delivery flight the following day on 10 March 1989. (NASA- all)





As seen in these images taken on 21 July 1989, NASA technicians immediately went to work installing the small laminar flow wing glove on the left wing of XL-1, soon to be bearing serial number NASA 849. (Lockheed Martin)



Though undergoing modifications, NASA took time out to button up XL-1 and place it on static display at the annual Edwards AFB Open House during October 1989. (Keith Svendsen- above, left; Tony Landis- above, right)



F-16XL, NASA 849 was, once again, placed on indoor display at Edwards AFB on 5 July 1990. (Keith Svendsen)

The cockpit of F-16XL NASA 849 as it looked on 6 November 1989 during wing glove install. (Lockheed Martin)

The active glove manifolds and plumbing (right) and overall view of outboard static orifice row of NASA 849 on 13 November 1989. (NASA- 2 at right)



With the laminar flow wing glove installed, NASA 849 undergoes ground instrumentation checks inside hangar 4826 at NASA Dryden Flight Research Center in April 1990. (NASA- 2 above)



Technicians cover the wing glove during early morning ground testing of NASA 849 on 10 April 1990. (NASA)



Ground crews tow NASA 849 back to its hangar after testing. Note wheel chocks hanging from left wing. (NASA)



NASA test pilot Steven Ishmael takes F-16XL, NASA 849 up on its first Functional Check Flight (FCF) on 3 May 1990. While adding the laminar flow glove, the small strakes on the wing upper surface were removed. The medium gray panel in front of the in-flight refueling receptacle covers the suction pump assembly for the wing glove. (NASA- all)



F-16XL NASA 849 during its first FCF on 3 May 1990, after the supersonic laminar flow control (SLFC) wing glove modification. Note the aircraft retains the spin chute mounting assemblies. (NASA)



NASA Dryden family portrait on 28 September 1990 includes: McDonnell Douglas F/A-18 HARV, Grumman X-29A, McDonnell Douglas F-15A, General Dynamics F-16XL, 3- McDonnell Douglas F/A-18's, Northrop T-38A, Lockheed F-104G, Orbital Sciences Pegasus rocket, Boeing NB-52B, Lockheed SR-71A and Boeing 747 Shuttle Carrier. (NASA)



The two-seat F-16XL is rolled out of the paint hangar at General Dynamics after receiving a flashy, new NASA paint scheme and NASA tail art. The GD text on the tail would be painted over shortly after delivery. (NASA)



On this page and the following, the second F-16XL is ferried from Ft. Worth, TX, to NASA Dryden Flight Research Center, CA on 12 February 1991 by 'Joe Bill' Dryden, who retired from the Air Force and became a pilot for General Dynamics. Note the aircraft carries only 2 dummy AMRAAM missiles for CG ballast, also painted blue. (NASA- all)

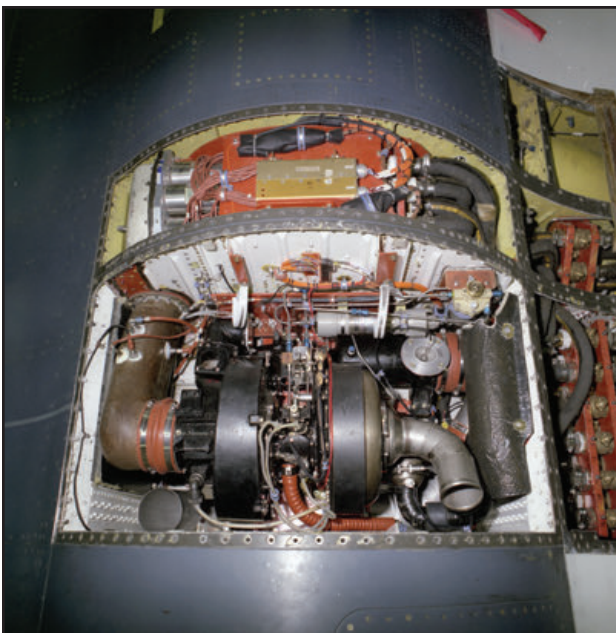




A series of beauty shots taken of F-16XL, NASA 848 on 14 February 1991, prior to the beginning of a series of modifications for the supersonic laminar flow control program. (NASA)



Inside NASA hangar 4826, the process of installing instrumentation begins on NASA 848 on 18 April 1991. Note the M2-F1 lifting body in the background (above, left) and F-16XL NASA 849 (above, right). (NASA)



SLFC turbo-compressor and orange test instrumentation installation in F-16XL, NASA 849 on 17 May 1991. (NASA)



F-16XL NASA 849 high over the Mojave Desert during an SLFC test mission on 23 August 1991. (NASA)



Some SLFC test missions were extended through the use of in-flight aerial refueling as shown in the middle photo, as F-16XL NASA 849 takes on fuel from a KC-135 flying out of Beale AFB, CA. (NASA)



With its speed brake partially open, a safety chase F/A-18A, NASA 841, pulls in close to F-16XL NASA 849 during a test mission near Edwards AFB on 11 September 1991. (NASA)



The front and aft cockpits of F-16XL, NASA 848, on 18 October 1991, show some instrument changes required for the Supersonic Laminar Flow Control program. Note the weapon control panel has been removed from the front instrument panel (above left). (NASA)



F-16XL NASA 848 performs an instrumentation checkout flight near Edwards AFB on 27 October 1991. (NASA)



When NASA received the Lockheed SR-71 Blackbirds for testing, the 2 F-16XL's were relocated from hangar 4826 to hangar 4801. Note the difference between the two 8's on the tail of XL-2. (Tony Landis)



NASA maintenance technicians and instrumentation personnel inside hangar 4801 are busy preparing the F-16XL's for their next research mission during May 1992. (Tony Landis)



F-16XL NASA 849 parked on the ramp at NASA DFRC with an F/A-18 and F-104 (above, left) prior to being towed back to its hangar at the end of the day. (Tony Landis)



With a bright red, Dynamic Engineering Inc. (DEI) flutter exciter mounted on the left Sidewinder missile rail, NASA 848 performs another test mission from Edwards AFB on 27 February 1992. (NASA)



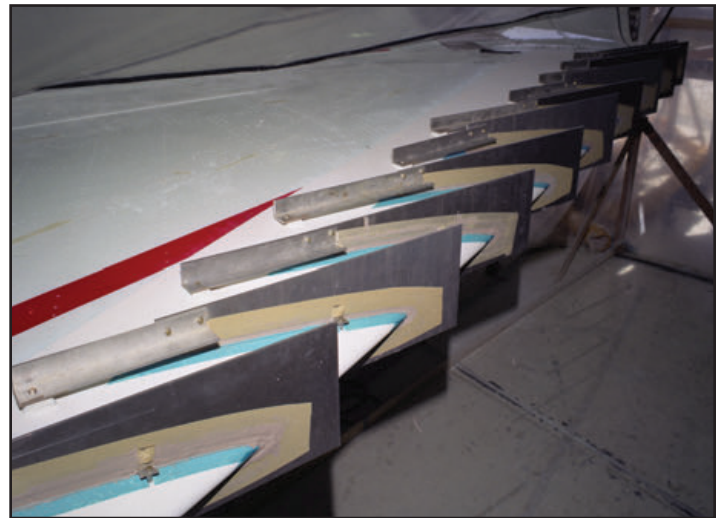
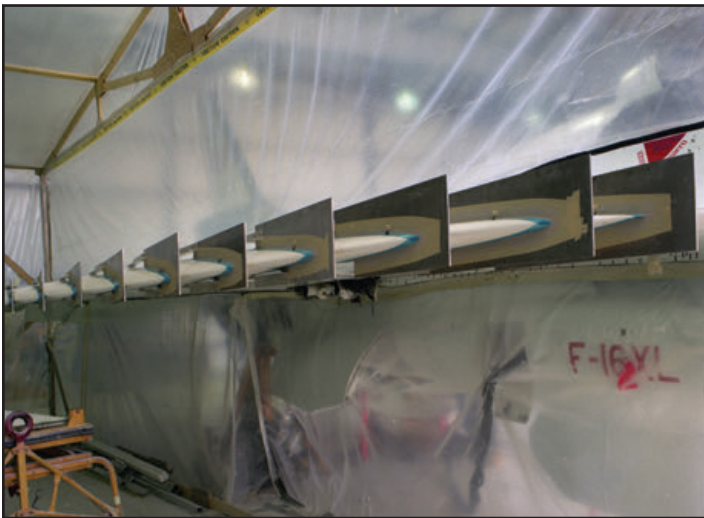
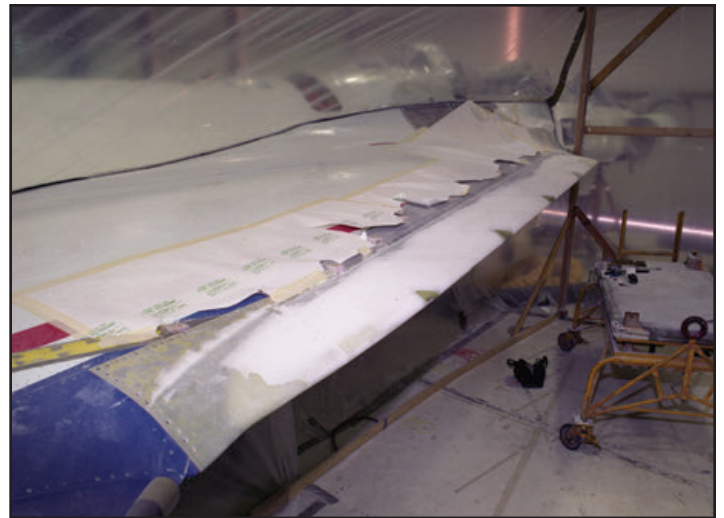
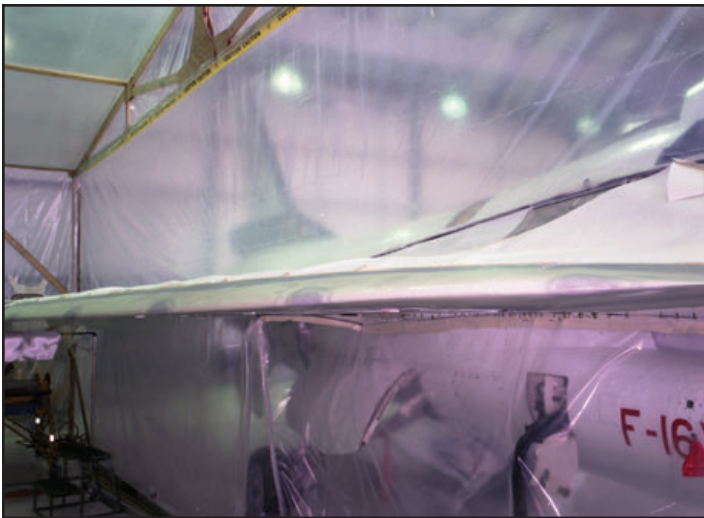
The use of the DEI flutter exciter on the wingtip of the F-16XL's, provides dynamic force input to stimulate structural vibration modes. (NASA)



F-16XL NASA 848 on the Edwards AFB engine test stand on 6 March 1992. (NASA)



F-16XL NASA 848 during a test mission on 9 March 1992. Note the forward canopy section is clear while the aft canopy section is gold-tinted. A common practice on early two-seat F-16's. (NASA)



In the 5 photos above, NASA 848 receives a passive wing glove modification and associated instrumentation during July & August 1992. (NASA)

Active SLFC wing glove on F-16XL NASA 849 with instrumented strip tubes installed on 28 August 1992. (NASA)



F-16XL NASA 849 performs a pass over Rogers Dry Lake at Edwards AFB and NASA Dryden Flight Research Center during a research flight on 3 September 1992. (NASA)



F-16XL NASA 849 receives fuel from a visiting KC-135E during another flight on 14 September 1992. (NASA- all)

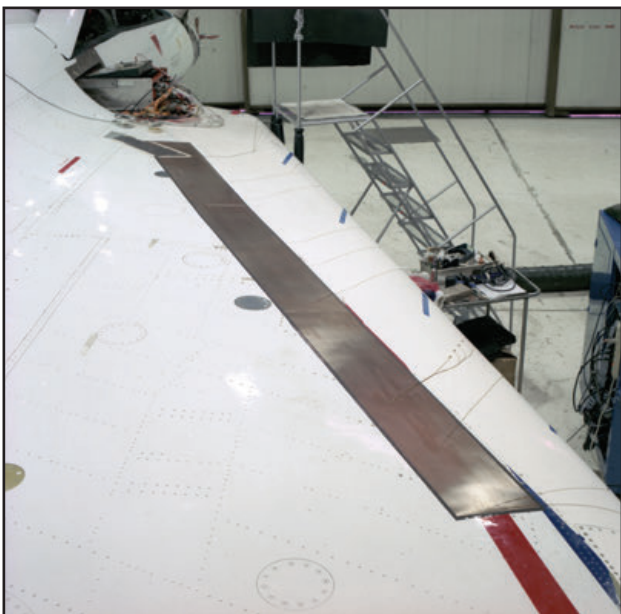


NASA removed the wing glove assembly and associated instrumentation from NASA 849 between September and November 1992. (NASA- 5 above)

In this artwork by Judy Fulks Sjogren, the F-16XL morphs into the High Speed Civil Transport (HSCT) to show the direct contributions to the HSCT program. (NASA-5 above)



F-16XL NASA 849 was loaned to NASA Langley Research Center in Hampton, VA from April to November 1994. While there, it received a striking black, yellow, gray and white paint scheme. (NASA Langley)



Lead sheet instrumentation strip on modified wing of NASA 848 taken 15 January 1993. (NASA)



F-16XL NASA 848 takes on fuel from a KC-135 Stratotanker during a research mission on 21 January 1993. (NASA)



The clean lines of XL-2 show up well in this side view taken on 21 January 1993. (NASA)



The all-black main wheels are notable as NASA 848 lines up on final approach on 21 January 1993. (NASA)



With its gold parachute streaming and speedbrakes deployed, F-16XL NASA 848 comes in to land on Edwards AFB runway 22 at the end of a test mission on 21 January 1993. (NASA)



Heavy rains in 1993 flooded the normally dry lakebeds around Edwards AFB rendering them unusable for several months. (NASA)



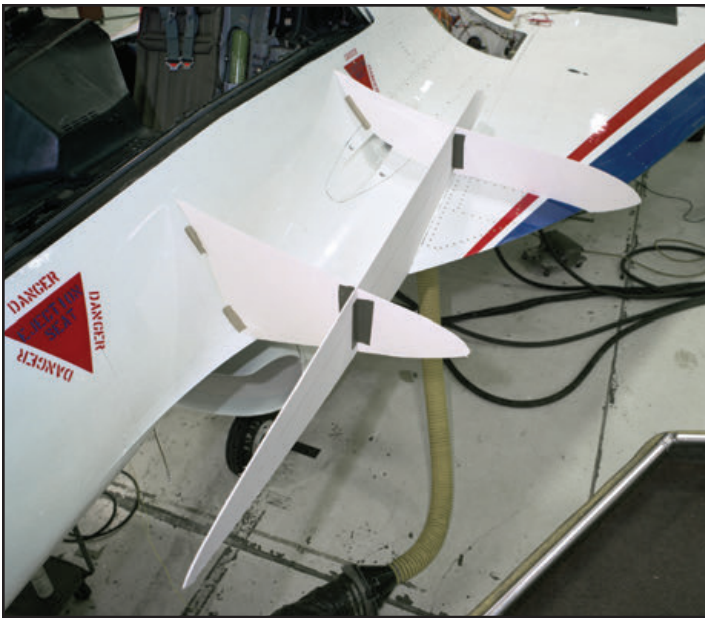
Marta Bohn-Meyer was a well-liked and highly respected engineer at NASA Dryden. When she flew in the aft seat of the F-16XL, the ground crew added 'Marta' and 'Marta's Pilot' names to the left side of the aircraft. (NASA)



The modified right wing and missing wing strakes are visible in this view of NASA 848 on 3 February 1993. (NASA)



Barely visible in this photo taken on 21 February 1993 are the white main gear wheels on NASA 848. (NASA)



Temporary templates for the SLFC wing glove are placed on NASA 848 on 24 February 1993 (left). F-16XL NASA 848 takes on fuel during a research mission on 26 March 1993 (above). (NASA- both)



KC-135 Stratotanker units rotated through Edwards AFB since they did not have a permanently-assigned refueling unit. The KC-135E refueling NASA 848 above, is from Barksdale AFB, LA. (NASA- both)

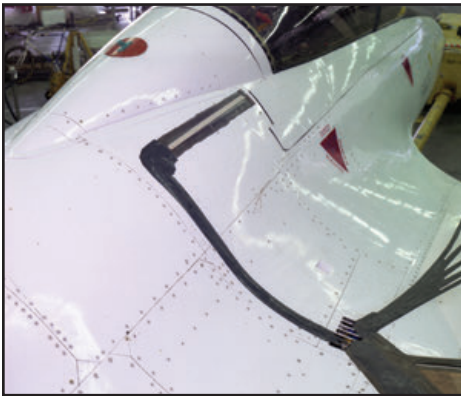


NASA 848 is seen flying over one of the flooded lakebeds around Edwards on 30 March 1993. (NASA)

Greeting commuters driving into Edwards AFB along a flooded Rosamond Lake during this time was the fictional Rosamond Sea Monster. (NASA)



NASA flew both F-16XL's together only once during the 11-year flight test program, during a flight on 1 April 1993. Unfortunately they did not include a photo chase aircraft to capture the event, instead the two are flown behind a KC-135 tanker (top, left), a shot from the aft seat of F-16XL NASA 848 (top, right) and from the ground during a NASA Center flyover (2 above). (NASA- all)

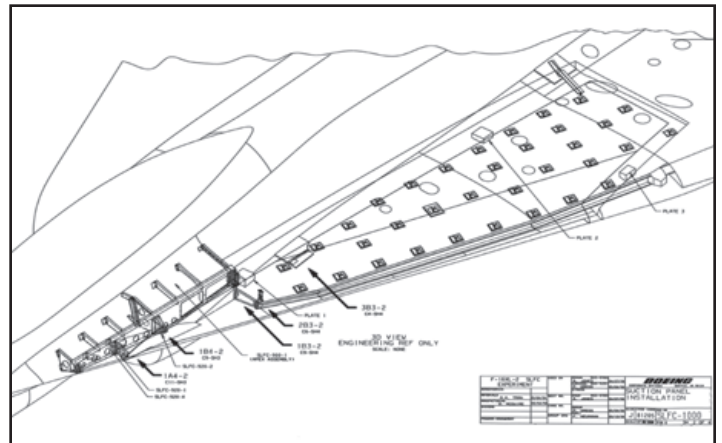
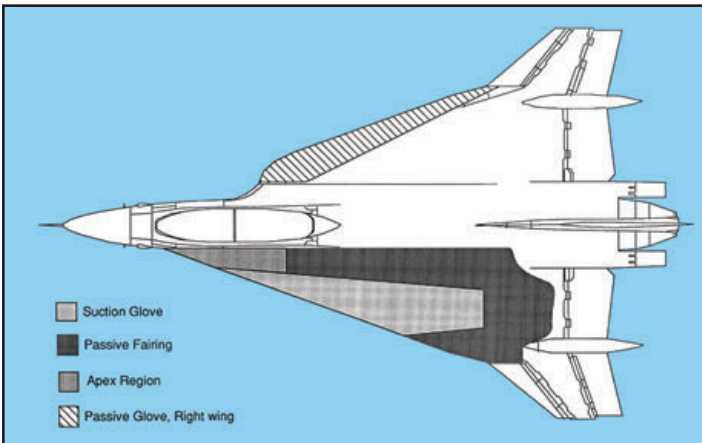


During May and June 1993, NASA technicians added more instrumentation, a modified leading edge, gun bay cover and shock fences under each wing to F-16XL NASA 848. (NASA- 6 above)

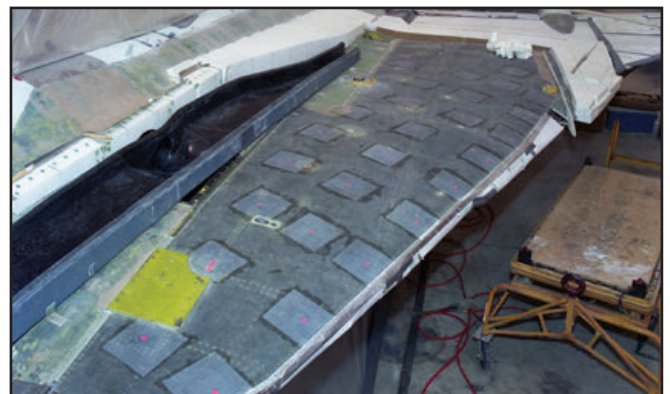


Prior to the SLFC modifications, NASA 848 performed in-flight sonic boom testing with SR-71A NASA 844 on 28 July 1993. (NASA)

The NASA project team for F-16XL 848 poses for a photo on 30 July 1993. (NASA)



The Supersonic Laminar Flow Control (SLFC) wing glove assembly required an extensive modification to the F-16XL airframe. In addition to the active suction glove, it required a passive glove section on both wings. (NASA)



Modifications to NASA 848 began in July 1993 and continued over the next two years. The forward structure for the new wing is shown above. (NASA- all)



Before returning to NASA Dryden on 28 November 1994 (top right), NASA 849 poses with other aircraft at NASA Langley in Virginia (above). After arrival, the F-16XL is towed to hangar 4826 (right) and parked next to AFTI/F-16, 75-0750, while Rockwell's X-31 flies overhead (below). (NASA- all)





Aviation photographer, Judson Brohmer, captured F-16XL NASA 849 pulling in behind the KC-135 tanker over the snow-capped mountains near Edwards AFB in December 1994 and donated the imagery to NASA. (NASA)



NASA 849 poses for the camera in front of NASA Dryden hangar 4826 on a beautiful winter morning in the desert on 5 December 1994. (NASA)



The F-16XL was an elegant aircraft from any angle as shown in these images taken on 5 December 1994. (NASA)

The NASA ground crew for NASA 849 included: L-R Art Cope, Robert Garcia, Rich Kelly, Dale Edminister, Susan Ligon and Randy Wagner. (NASA)



From February through April 1995, NASA 849 performed in-flight sonic boom testing with SR-71A NASA 844. NASA test pilot Steve Ishmael performs a dramatic departure on 15 February 1995 (top), and near-perfect flying pickup with the SR-71 on 25 February 1995 (above). Streaming its unique gold parachute, NASA 849 comes in to land at Edwards (right). (NASA photos by Tony Landis- all)



In February 1995, NASA Langley Research Center transferred ownership of their F-16A, NASA 516, to NASA Dryden. The 3 single-seat F-16's in NASA Dryden's fleet were positioned together on 2 February 1995. The F-16A was the only civil-registered F-16 at the time, and quickly received the new tail number NASA 816. (NASA)



With a black dummy Sidewinder missile on each wingtip, NASA 849 comes in to land at Edwards AFB. (Tony Landis)



Sonic boom test missions often began with early morning preflights on a busy NASA ramp with the aircraft involved. From front to back are the Lockheed YO-3A, McDonnell Douglas F/A-18B, General Dynamics F-16XL NASA 849, McDonnell Douglas F-15C, Lockheed SR-71A and Boeing NB-52B. (Tony Landis)



Preflight checks began before sunrise while the desert air was still cool (top). NASA test pilot Steve Ishmael taxis NASA 849 by SR-71A, NASA 844, (middle) in preparation for departure from Edwards runway 22 (right) in April 1995. (Tony Landis)





F-16XL, NASA 849, performed numerous test missions during April and May 1995. The pilot often kept the landing parachute attached until they taxied off the runway to prevent the ground crews from having to retrieve it. (Tony Landis)





NASA mission planners set aside a good block of time during a sonic boom test flight on 22 March 1995 to acquire good still and video imagery for public relations use, as seen on the photos above and on the previous page. The F-16XL flew in close formation with SR-71A and also in the below and behind position for sonic boom testing. (NASA)



Dramatic low-angle view of F-16XL, NASA 849 inside hangar 4826. (Tony Landis)



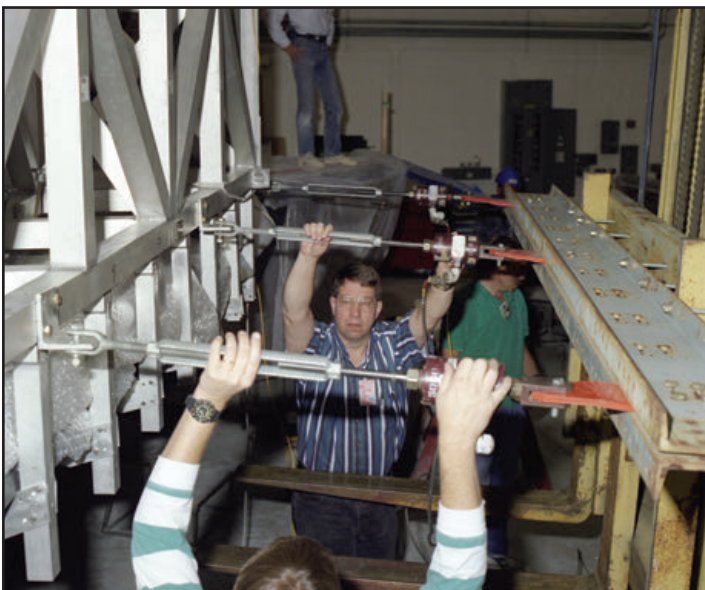
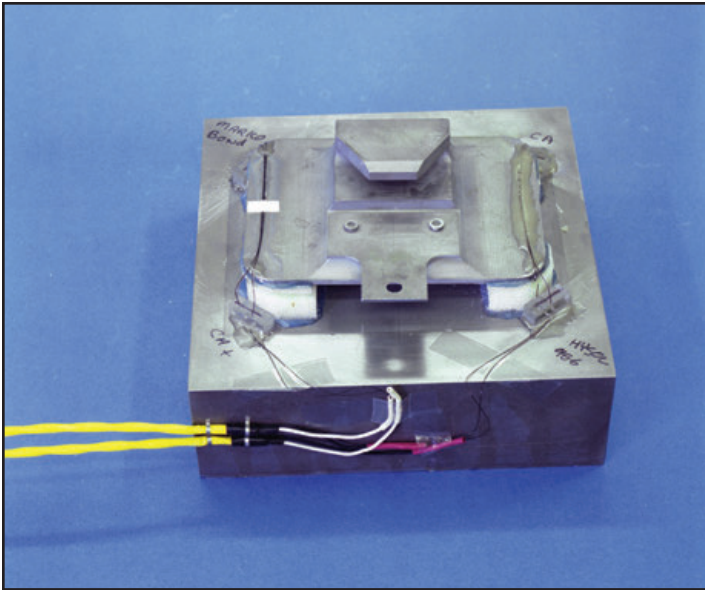
Top, front view of F-16XL, NASA 849 inside hangar 4826. The photo shoot had to be cut short due the landing of Space Shuttle Endeavour at Edwards AFB after STS-67 on 18 March 1995. (Tony Landis)



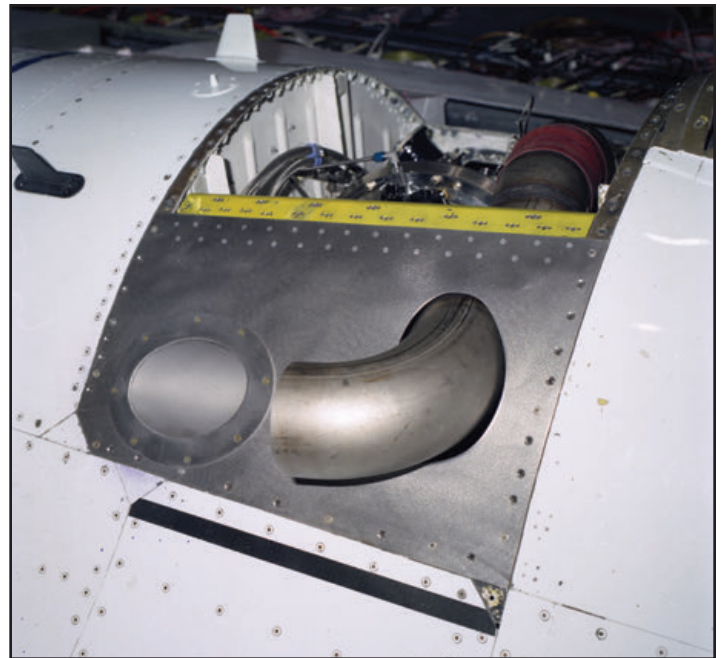
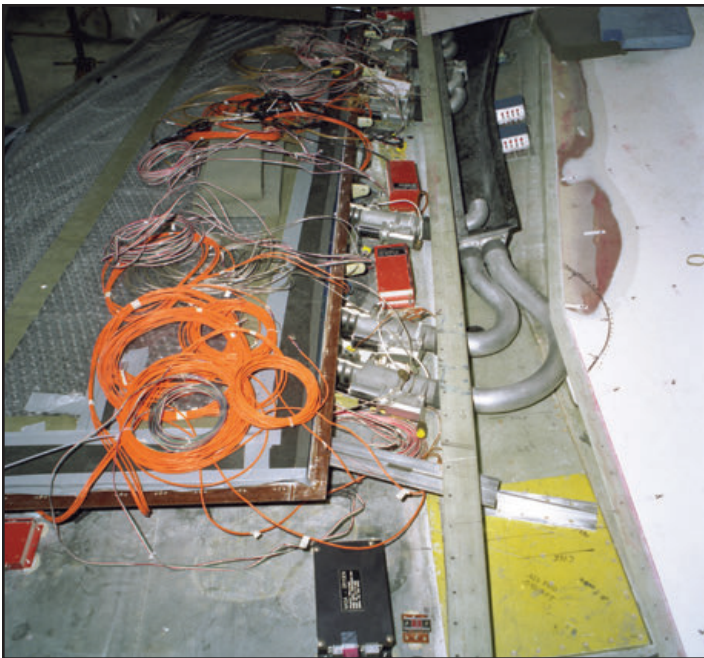
Lockheed acquired General Dynamics Tactical Aircraft Division in 1993, and merged with Martin Marietta Company in March 1995. Therefore, the 3 primary aircraft involved in the NASA sonic boom test program were the Lockheed SR-71A, NASA 844, Lockheed F-16XL, NASA 849 and Lockheed YO-3A, NASA 718 with wingtip-mounted microphones. During this timeframe, the YO-3A 'Quiet Star', was still assigned to Ames Research Center at Moffet Field, CA, which explains the 700-series tail number. It transferred to NASA Dryden in June 1997 and became NASA 818 before being sold by government auction to the Vietnam Helicopter Museum in Concord, CA in April 2015. (NASA)



Boeing completed assembly of the SLFC wing glove and delivered it to NASA on 17 December 1994 (top 2). NASA technicians quickly went to work installing the wing glove attachment fittings to NASA 848 (middle 4). Once the adhesive cured, the attachment fixture was removed and passive glove fairings installed in March 1995. (NASA- all)



Prior to flight testing, each of the attachment fittings (top left) required load test verification. The suction glove was removed (left) and each fitting was cleaned of excess adhesive (middle left). NASA instrumentation technician, Bill Lokos, uses a calibrated pull assembly to test each pad on 14 April 1995 (above). (NASA)



Test instrumentation and the associated orange wire dominated the interior of the F-16XL with the wing glove installed (top left). The turbo compressor exhaust vented out the right side of the aircraft (top right). A larger shock fence under the left wing replaced those on both wings. Note the Tasmanian Devil logo on the inlet. (above). NASA added test instruments to the upper left side of both front and aft cockpit control panels. (2 at right) (NASA- all)

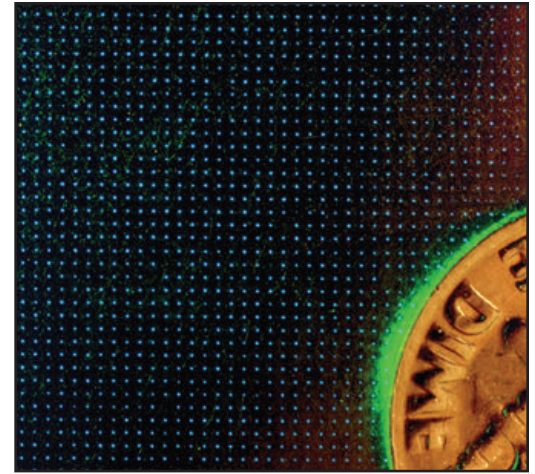
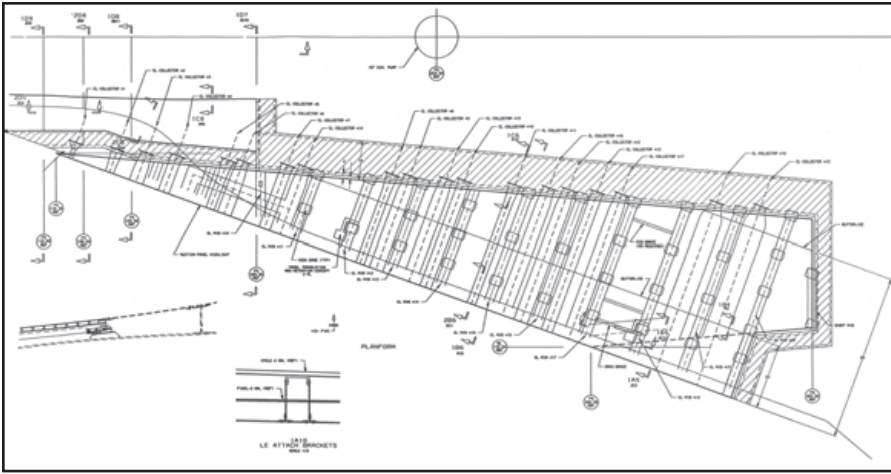




NASA aircraft maintenance chief, Tom Grindle, drives the tug pulling F-16XL, NASA 848, into position for the photographer. The significant change of shape to the left wing is readily noticeable in this view. (NASA)



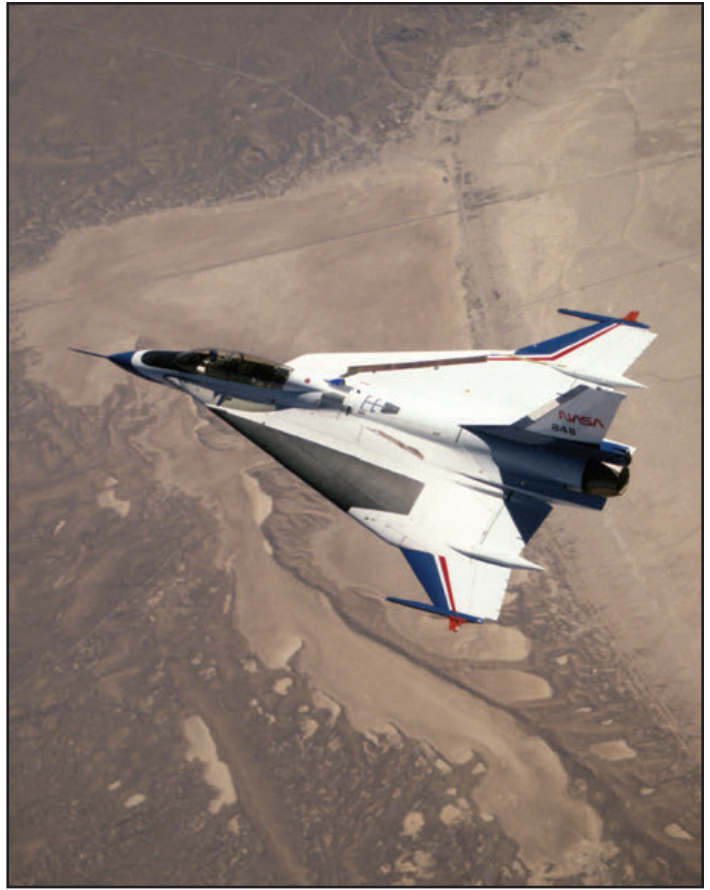
The asymmetric design of the wings on NASA 848 during the SLFC program show up well in this view. (NASA)



Boeing and Rockwell were responsible for the design and manufacture of the active SLFC titanium wing glove (top left). The suction portion of the wing glove contained over 10 million, laser-drilled holes (top right). The laser-drilled holes were not visible to the naked eye at any reasonable distance. Note the Tasmanian Devil logo was removed from the aircraft prior to flight testing (right). (NASA- all)



First flight of NASA 848 with the SLFC wing glove took place on October 13, 1995. NASA research pilot, Dana Purifoy departed from and returned to, Edwards runway 04. The back seat remained empty for this first test mission. (NASA)



Despite making its first flight on 'Friday the 13th', this mission of the SLFC project using F-16XL NASA 848 was relatively uneventful. (NASA- all)







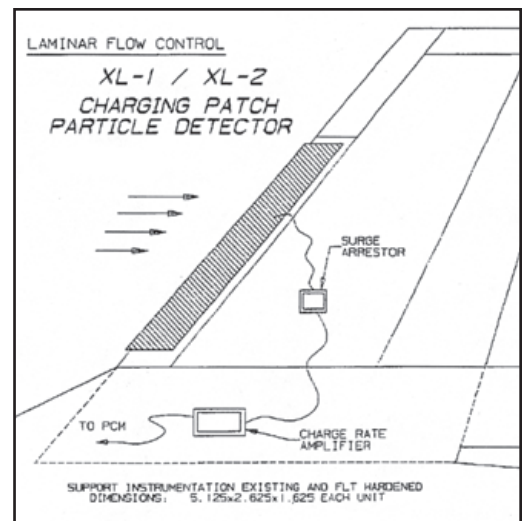
NASA research pilot Dana Purifoy brings F-16XL NASA 848 in for a landing at the end of the first flight with the SLFC wing glove on 13 October 1995. The white & black main wheels are noteworthy (top 2). (NASA- all)

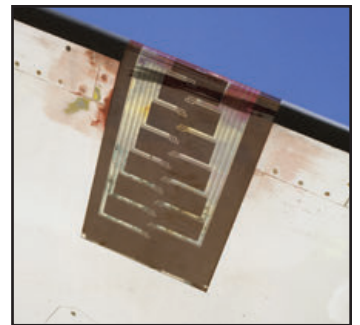
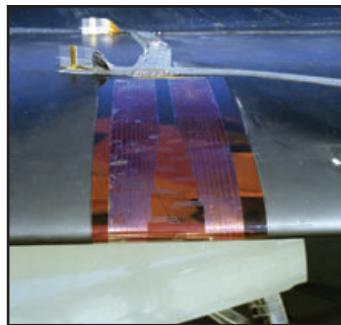
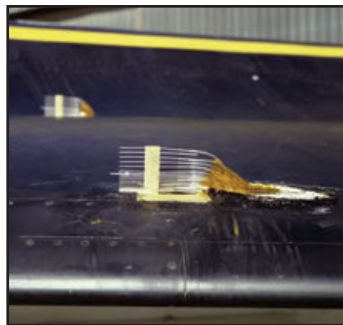


A very proud F-16XL Supersonic Laminar Flow Control (SLFC) project team pose with the aircraft at NASA Dryden Flight Research Center after the completion of the successful first flight on 13 October 1995. (NASA)



The first supersonic test flight took place on 22 November 1995 with Dana Purifoy at the controls. One of the many instruments added to NASA 848 was a charging patch particle detector placed on the leading edge of the vertical stabilizer. (NASA- all)





While NASA 848 performed testing on the SLFC wing glove, F-16XL NASA 849 continued testing various experiments added to the upper surface of the wings beginning in November 1995 and continuing into the following year. Boundary layer measurement rakes and hot film instrumentation were added in January and February 1996. (NASA- all)



Both F-16XL's are captured together outside NASA hangar 4826 on 26 January 1996. (Tony Chong)



Top view of NASA 849 over the Mojave Desert during a test mission on 18 February 1996 (above). (NASA)



The dark strips on the lower surface of the wing is sealant covering instrumentation wiring on NASA 848. Photo taken 21 March 1996. (NASA)



Despite its unique design, The F-16XL proved to be a reliable aircraft for flight research. The photos on this page, taken on 21 March 1996, provide a unique look at the different mission parameters of the F-16XL. (NASA- all)



Airflow tufts and white calibration dots cover the left wing on NASA 849 during a pressure distribution and airflow visibility test mission on 4 March 1996. The mission included one air refueling from NKC-135E, 55-3135 from the 4950th Test Wing, Aeronautical Systems Division out of Wright-Patterson AFB, OH. The tanker was on loan to the 6512th Test Squadron, 6510th Test Wing, at Edwards AFB. (NASA- all)



Towards the end of the F-16XL test program, on 4 April 1996, NASA tested a centerline fuel tank on NASA 849. The tank could reduce the need for in-flight refueling during certain test missions. (NASA)



A variety of views of F-16XL NASA 848 during an SLFC test mission on 13 May 1996. (NASA)

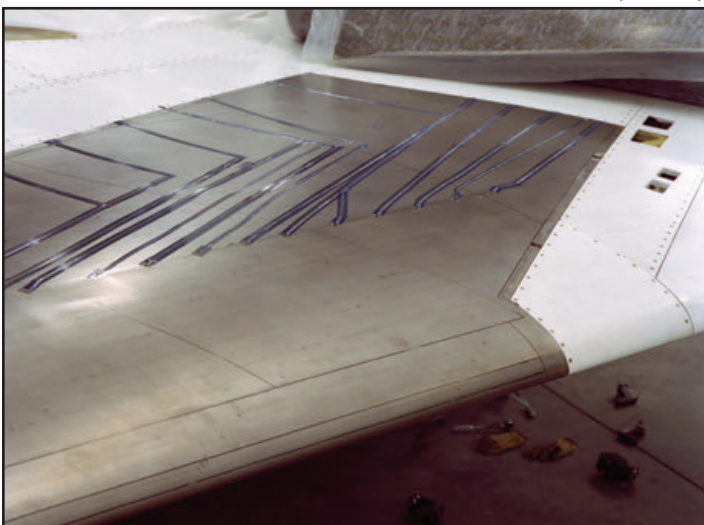


During the SLFC test program, the ground crew often changed the crew name blocks to various humorous names and phrases. For this mission on 1 May 1996, with Marta Bohn-Meyer and Dana Purifoy, the front is adorned with “Pretty Boy Purifoy” and the aft, “I Would Like To Thank All The Little People That Made This Possible”. (NASA)



F-16XL team members pose with the aircraft after the first flight for F-16XL project manager Marta Bohn-Meyer on 1 May 1996. L-R are: Randy Wagner, Tim Stidham, Bill Frederson, Mark Collard, Mike Reardon, Dana Purifoy, Tom Sidoti, Marta Bohn-Meyer, Laurie Grindle, Tom Grindle, Neil Haas and Mike Harlow. (NASA)

The shock fence design was changed a few times during the course of the SLFC project. The red markings and black foam were to prevent injury while on the ground. (NASA)



NASA technicians added additional instrumentation to the wing glove in August 1996. (NASA)

By the time this image was taken on 16 August 1996, F-16XL NASA 848 was looking a bit worn. (NASA)



F-16XL NASA 848 pulls in behind Boeing NKC-135E, 55-3135, Stratotanker during a test mission on 16 August 1996 while F-15B, 76-0132 of the 412th Test Wing at Edwards AFB awaits its turn. (NASA)



Prior to a research mission on 12 September 1996, NASA engineers attempted to modify the airflow over the canopy by adding thin foam covered in blue tape (above and far left). A portion of this section failed during the flight (left). Airflow tufts were also added near the back of the canopy. NASA technician, Bob Cummings, runs checks from the aft seat of the F-16XL (above). Note the different shock fence in the photo above left. (NASA- all)



NASA research pilot, Mark "Forger" Stucky commands this research mission which took the crew out over Lake Mead and Grand Canyon, AZ on 4 October 1996. The test section of the canopy has been modified with a more durable material. This mission carried a third crew member, a small Teddy Bear as seen in the aft cockpit (left). (NASA- all)



A smaller, highly swept, shock fence design mounted on NASA 848 on 8 October 1996. (NASA)



Two additional test missions were flown on 25 October and 13 November 1996 prior to the final SLFC mission on 26 November 1996. A total of 45 SLFC wing glove during the 13-month flight test program. (NASA)



Dana Purifoy was the primary project pilot for the F-16XL Supersonic Laminar Flow Control program. (NASA)



Mark "Forger" Stucky performed a number of research flights for the F-16XL SLFC program. (NASA)



Project engineers for the F-16XL SLFC program included Didi Olney, Mark Collard and Bill Lokos. (NASA)



Members of the F-16XL test team sit atop the aircraft after termination of the test program. (NASA)



A portion of the NASA Dryden test aircraft fleet are set up by aerospace photographer, Chad Slattery for a magazine photo shoot on 16 July 1997. Included are the Rockwell X-31A, McDonnell Douglas NF-15B, Lockheed SR-71A, Convair F-106, Lockheed F-16XL, NASA X-38, Boeing X-36 and yellow R/C Mothership. The tow tug is included for scale reference. (NASA)



A good comparison of the delta wing of the Convair F-106 and the 'Cranked Arrow' or 'Double-Delta' wing of the F-16XL. (Tony Landis)



F-16XL NASA 849 is set up for ground vibration testing inside NASA hangar 4826 on 16 January 1997. (2 at top and above). (NASA)

Ground vibration testing was also completed on NASA 848 in September 1997. (NASA)

The NASA maintenance technicians responsible for keeping the F-16 fleet going were: Tim Stidham, Art Cope, Bob Garcia, Tom Williams, and Randy Wagner. (NASA)





NASA's F-16 fleet parked together on 29 October 1997. F-16XL NASA 848, F-16A NASA 816, AFTI/F-16 75-0750, and F-16XL NASA 849. F-16A NASA 816 never flew at Dryden and was loaned to Lockheed for display. (NASA)



In 1997, NASA 849 received a digital fly-by-wire flight control system, replacing the original analog system. This gave the aircraft better flexibility as a flight testing platform. The F-16XL performed its first flight with the new system on 16 December 1997. The Lockheed Martin logo was added to the base of the vertical stabilizer during this time. (NASA)



NASA research pilot Dana Purifoy brings the F-16XL in close to the F/A-18 chase plane during the first test flight with the digital fly-by-wire control system on 16 December 1997. (NASA)



NASA 849 and its F/A-18 chase perform a low fly-over of NASA Dryden on 3 April 1998. (NASA)



F-16XL NASA 849 banks over the barren landscape near Edwards AFB South Base facility. (NASA)



F-16XL NASA 849 performs a functional check flight over the Mojave Desert in September 1999. (NASA)



The F-16XL and NF-15B perform at the annual Edwards AFB Open House on 9 October 1999. (NASA)



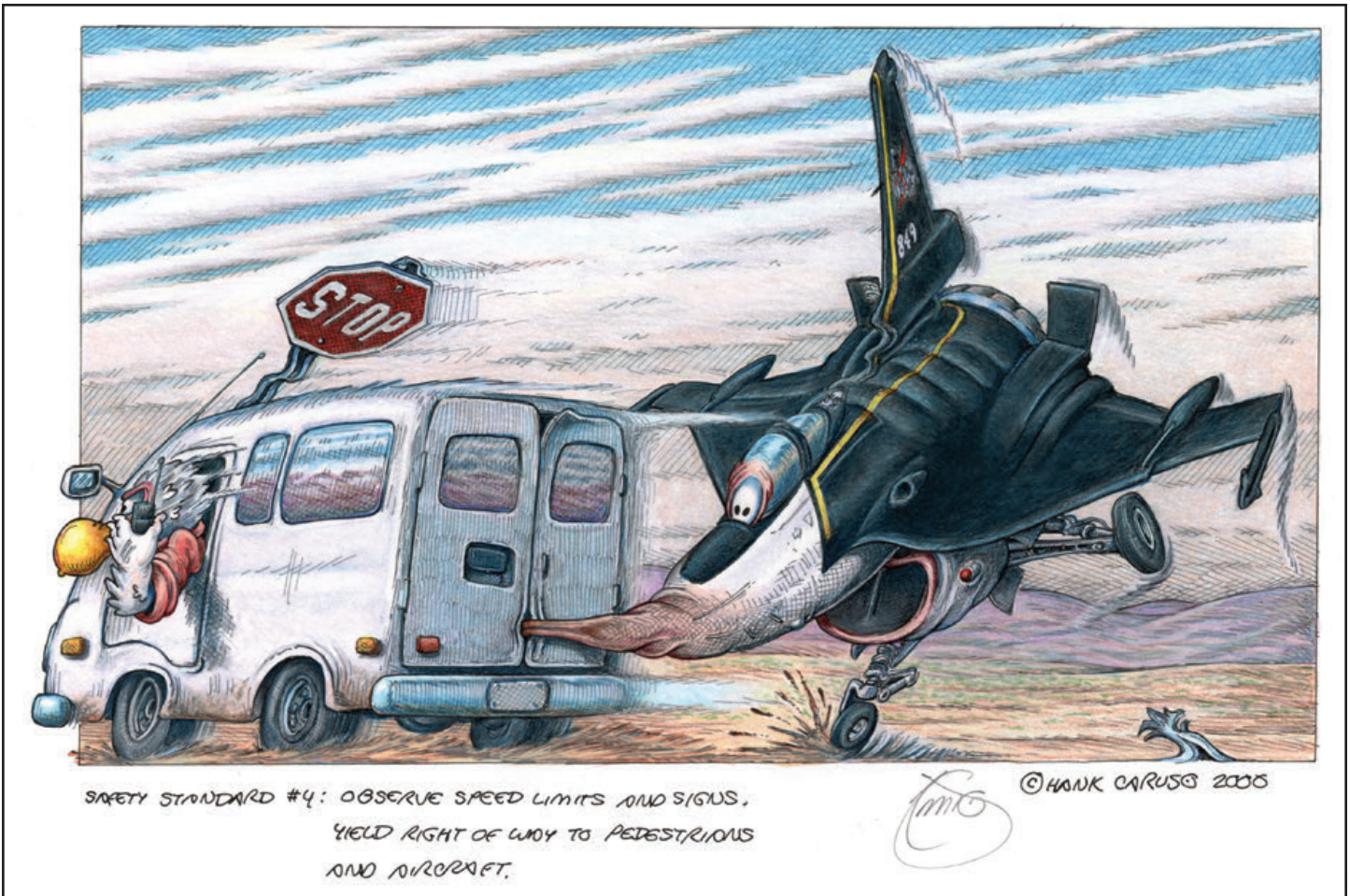
NASA pilot Dana Purifoy performed the final flight of the F-16XL program in F-16XL NASA 849 in front of a large crowd during the annual Edwards AFB Open House on 10 October 1999. (NASA)



After spending years in storage, NASA aircraft maintenance crews, working in their spare time, brought NASA 849 back to life in 2007, in hopes of finding additional test work. (NASA)



Hard work and dedication to the F-16XL paid off on 29 June 2007 when NASA 849 taxied under its own power for the first time in years. NASA research pilot Jim Smolka, took the aircraft up and down the Edwards AFB taxiway. Team members involved included Tom Grindle, Art Cope, Jamie Wilhite, Vince Bayne and Jim Smolka. (Tony Landis)



NASA Dryden commissioned Aerocatures artist Hank Caruso to produce a series of safety-related illustrations for a year 2000 calendar. Among the dozen was this art of F-16XL NASA 849. (Hank Caruso)



After the taxi test in 2007, NASA 849 was kept in flyable storage for over a year, but no re-research programs surfaced for the aircraft and it was quietly retired, once again. (Tony Landis)

STORAGE AND DISPLAY

FORGOTTEN SOLDIERS



By 2006, both F-16XL's had completed their flight test programs and were placed in long-term outdoor storage pending a decision on their final disposition. The aircraft were placed in any open ramp space available. (Tony Landis)



November 2007 found F-16XL NASA 848 placed out on the edge of Rogers Dry Lakebed at Edwards AFB, just outside the fence near NASA Dryden, along with other F/A-18 airframes used for spare parts. (Tony Landis)



NASA Dryden's 'boneyard' continued to grow outside of hangar 4826 as seen in the photos above taken in August (top) and November (above) 2011. (Tony Landis)



Devoid of engine, F-16XL NASA 849 sits forlorn and forgotten on the ramp at NASA Dryden on 19 October 2010. (Tony Landis)

Once the Space Shuttle program ended in July 2011, Dryden used the area in front of the Shuttle Mate-Demate facility for aircraft storage. The aircraft undergoing tests in the background is Boeing's Phantom Eye, High-Altitude, Long-Endurance (HALE) prototype. (Tony Landis)



NASA transferred ownership of both F-16XL's over to the National Museum of the United States Air Force in 2013, and NASA 849 was towed next to the interim Air Force Test Center museum facility on Edwards AFB. (USAF)



With no immediate plans to display F-16XL 75-0747, AFTC Museum personnel towed the aircraft to the storage area at Edwards AFB North Base area and placed it in long-term storage along with other aircraft in the collection. The 2 photos above, right show XL-2 in storage in June 2023. (Todd Amon/AFTC Museum)



XL-1 spent 6 years basking in the desert sun on display outside of the Air Force Flight Test museum before receiving a new face lift in early 2019. The black paint faded severely from outdoor storage. (Mike Valdez)



XL-1 received a fresh coat of paint in February/March 2019. After sanding and prep work, the aircraft received a green primer undercoat (top left). The museum chose a fictional gray paint scheme based on the 'splinter camouflage' scheme flown on XL-2 and added an 'ED' tailcode not carried by either F-16XL. (USAF)

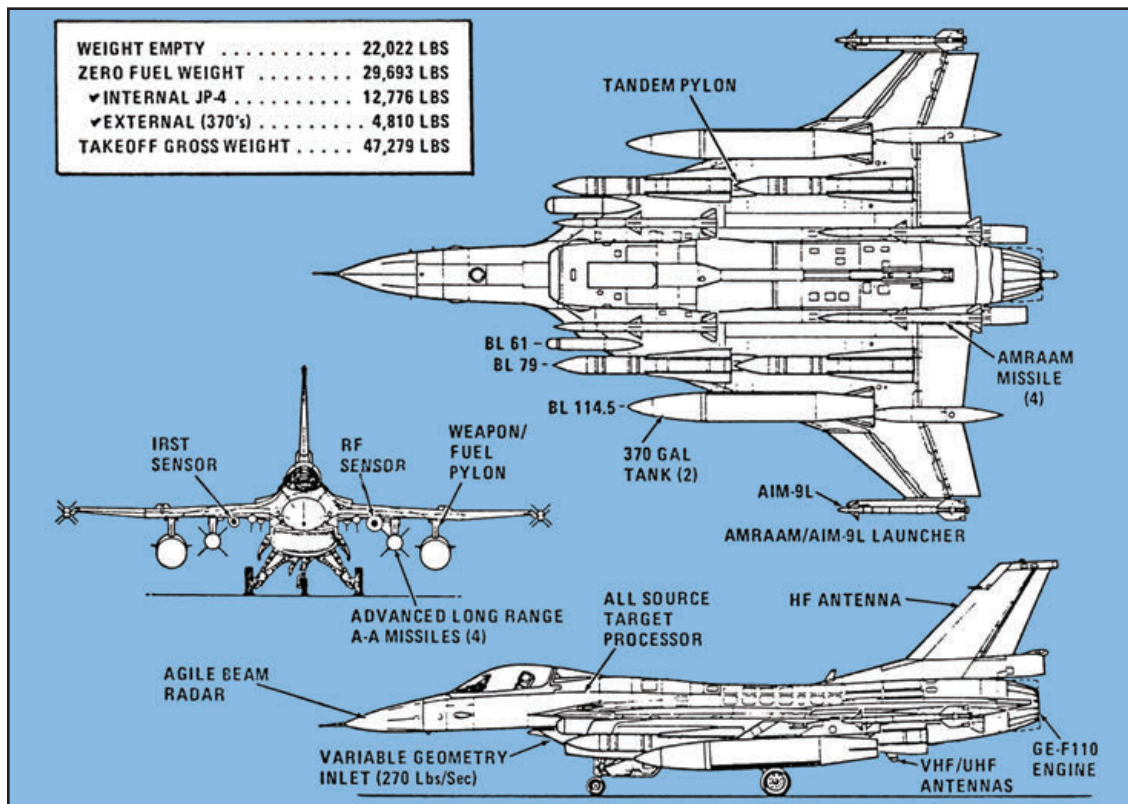
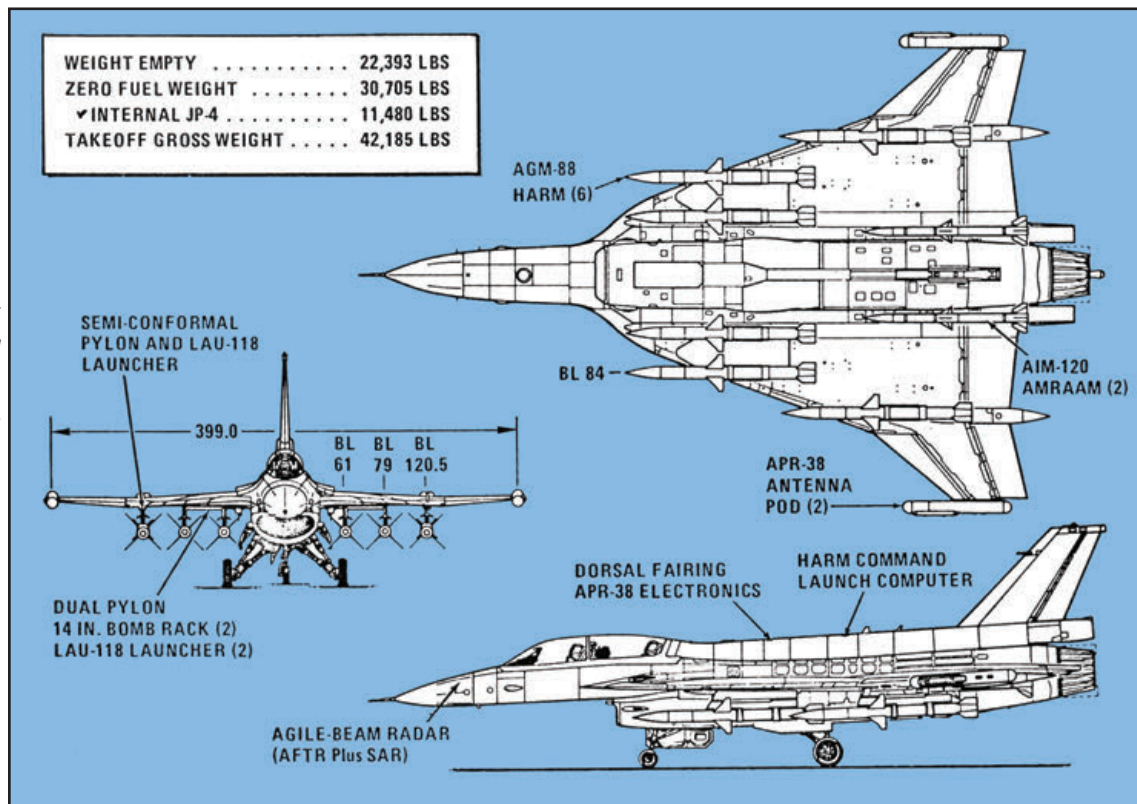


Once painted, the aircraft went back to its original display area next to AFTC museum (above left). The F-16XL was cleaned up and placed on display at the Edwards AFB Open House in October 2022 (above right). (USAF)

FUTURE VARIATIONS

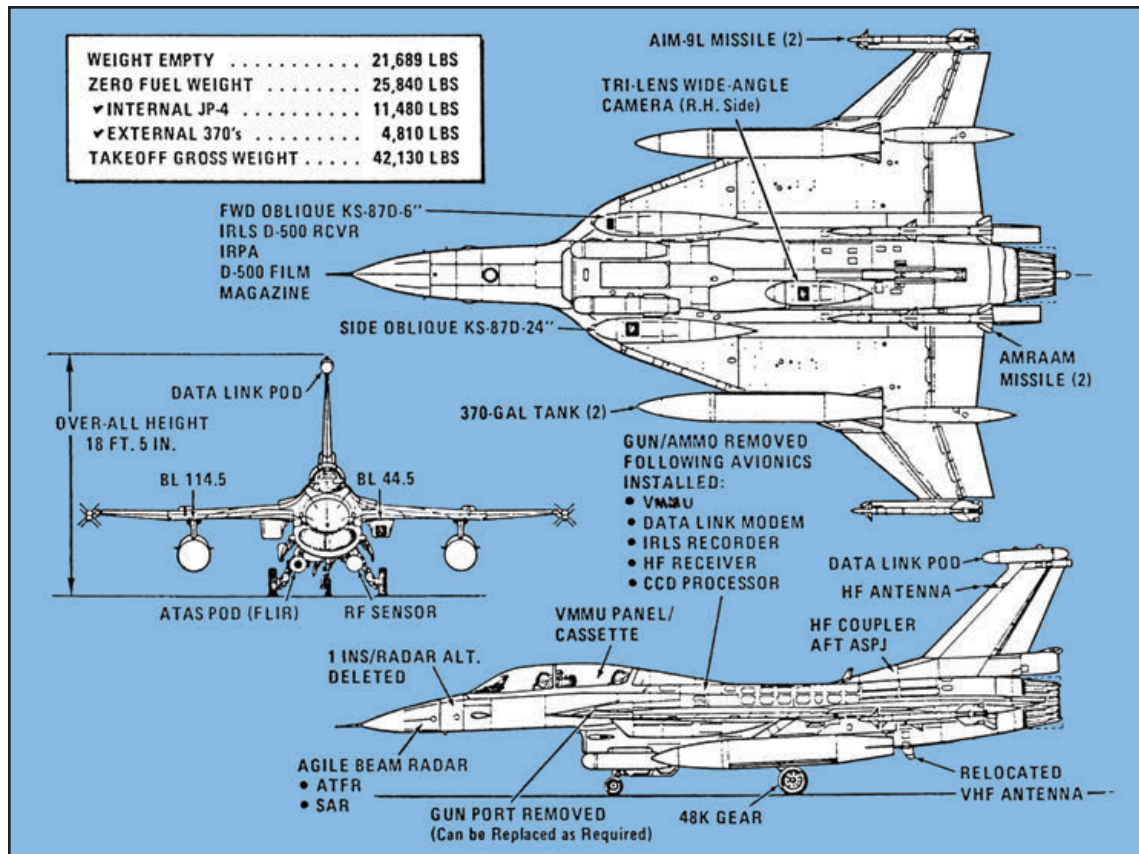
WHAT MIGHT HAVE BEEN

As most aerospace companies will do, General Dynamics proposed several variants based the F-16XL platform. The Wild Weasel variant shown at right included a dorsal fairing for the APR-83 avionics and HARM launch computer. (GD via Keith Svendsen)



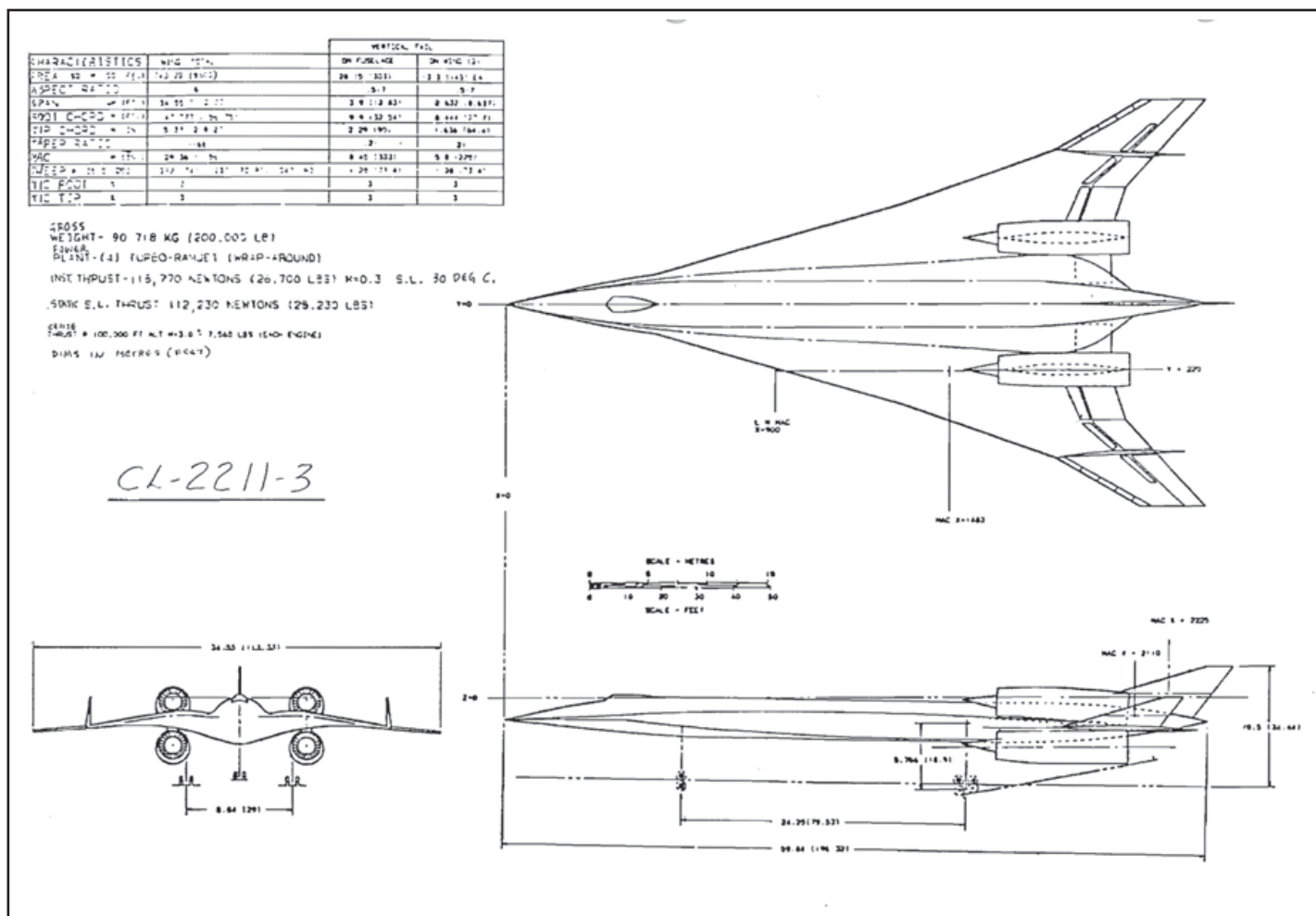
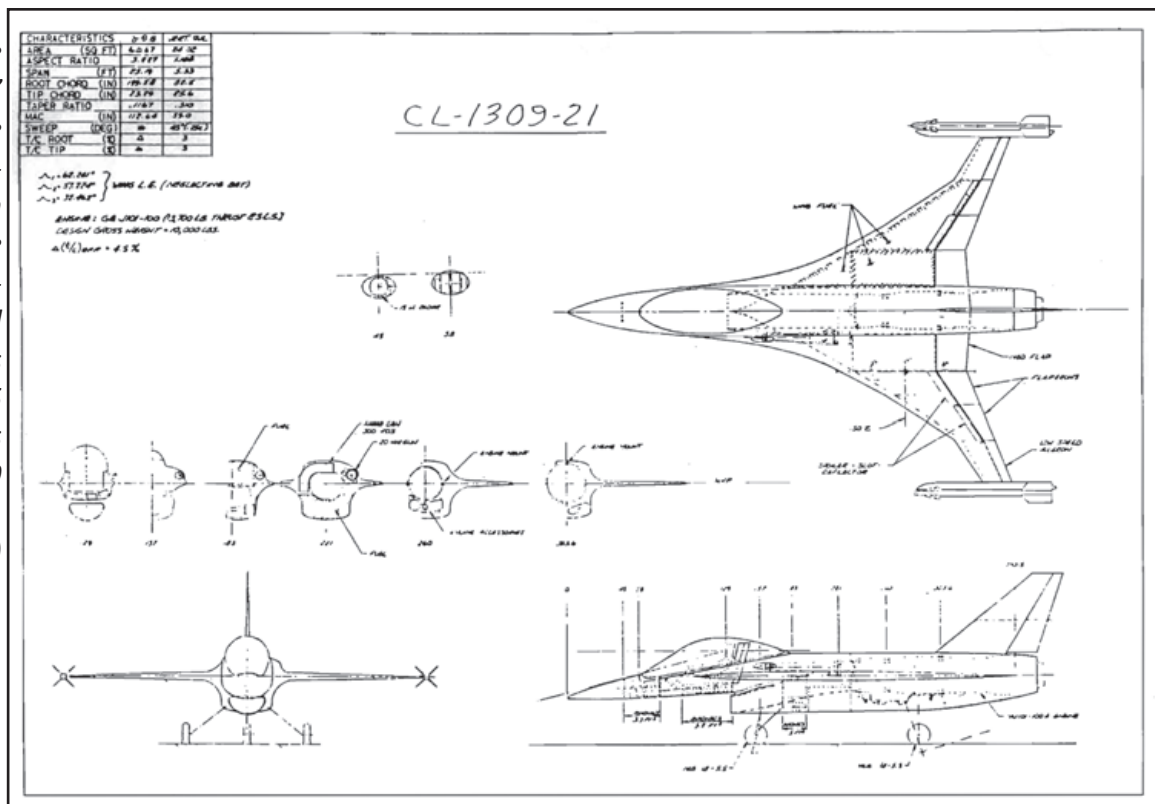
The advanced Interceptor variant of the F-16XL carried a variety of sensors and advanced air-to-air missile systems. (GD via Keith Svendsen)

This two-seat Reconnaissance variant carries two KS-87D oblique cameras of different focal lengths and tri-lens wide-angle camera in separate pods. The data link pod on top of the vertical stab and removal of the gun port are noteworthy. (GD via Keith Svendsen)



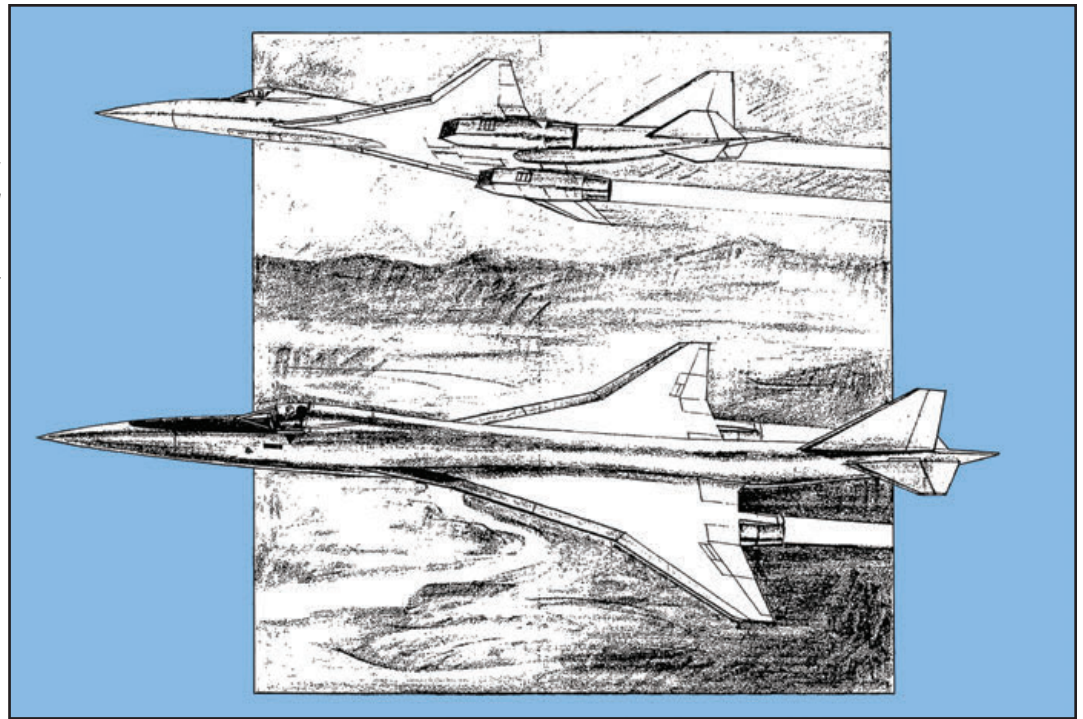
Lockheed Martin proposed tailless variations of the F-16XL under its Innovative Control Effectors (ICE) program as early as 1995. Many derivatives of this design were tested in the wind tunnel. (Lockheed Martin)

Variations of the 'Cranked Arrow' wing design have shown up on a number of designs from different aerospace companies. This layout for an advanced tactical fight design is number 21 of the 25 different variations under the CL-1309 series from Lockheed. (Lockheed Martin)

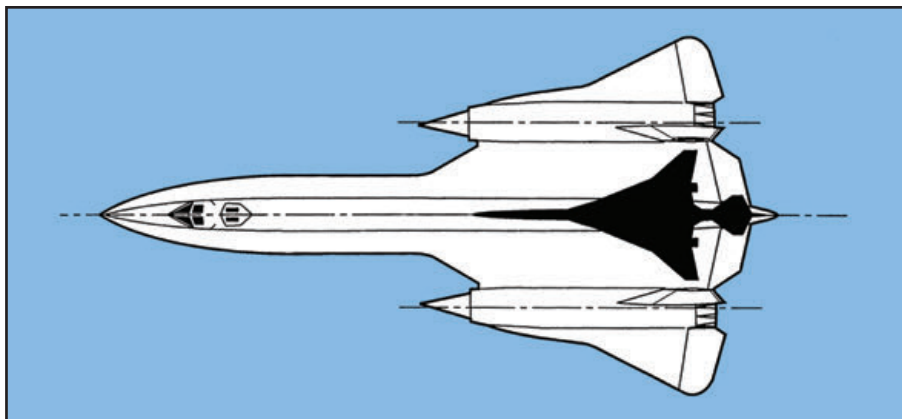
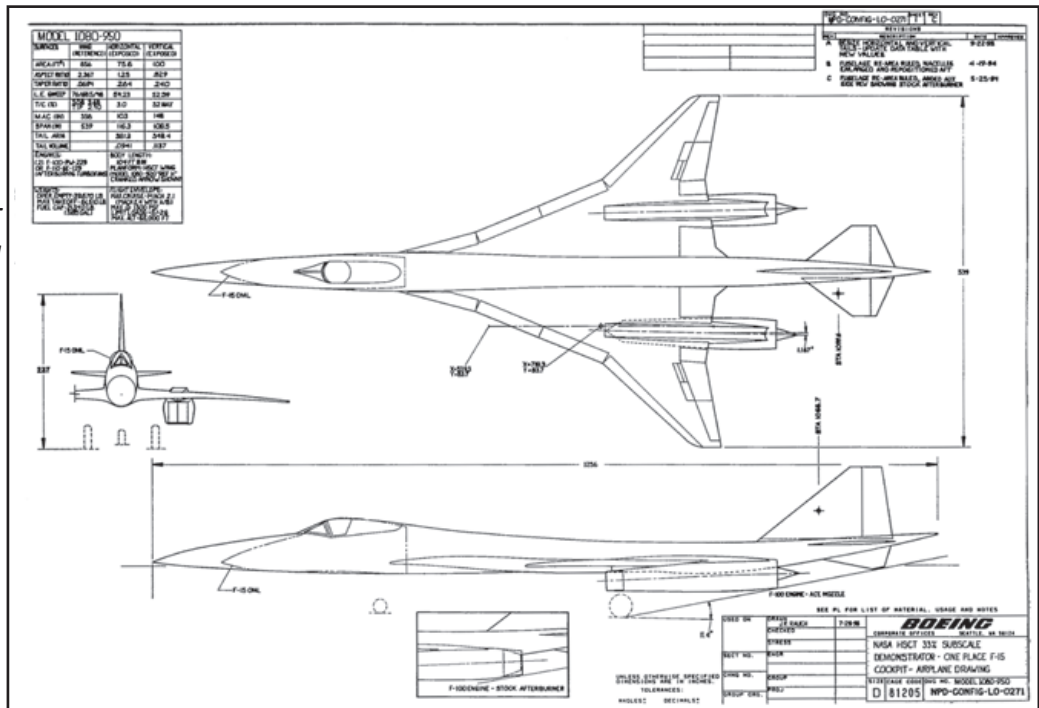


Another design out of Lockheed around 1983 was this vehicle conceived under the High Altitude Configuration Technology program and given project number CL-2211-3. (Lockheed Martin)

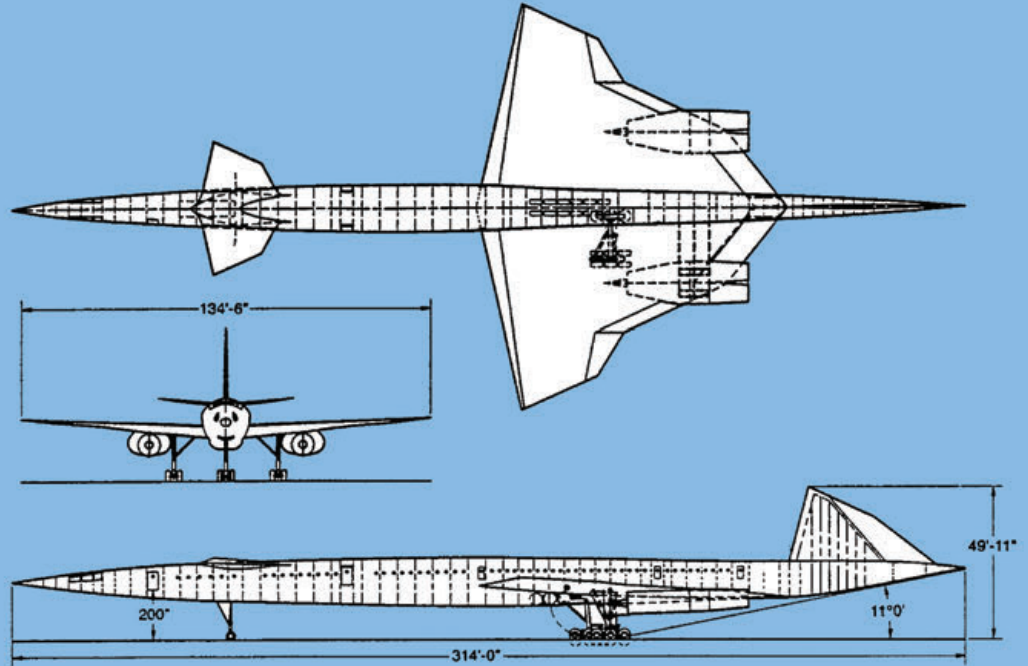
In the 1990's, nearly every aerospace company had some involvement in the High Speed Civil Transport (HSCT) project. A projected replacement for the Concorde, this new supersonic airliner would revolutionize air travel. (Boeing)



One of Boeing's entries into the HSCT project was this Model 1080-950 which was a cranked arrow wing design capable of mach 2.1 cruising speed. (Boeing)



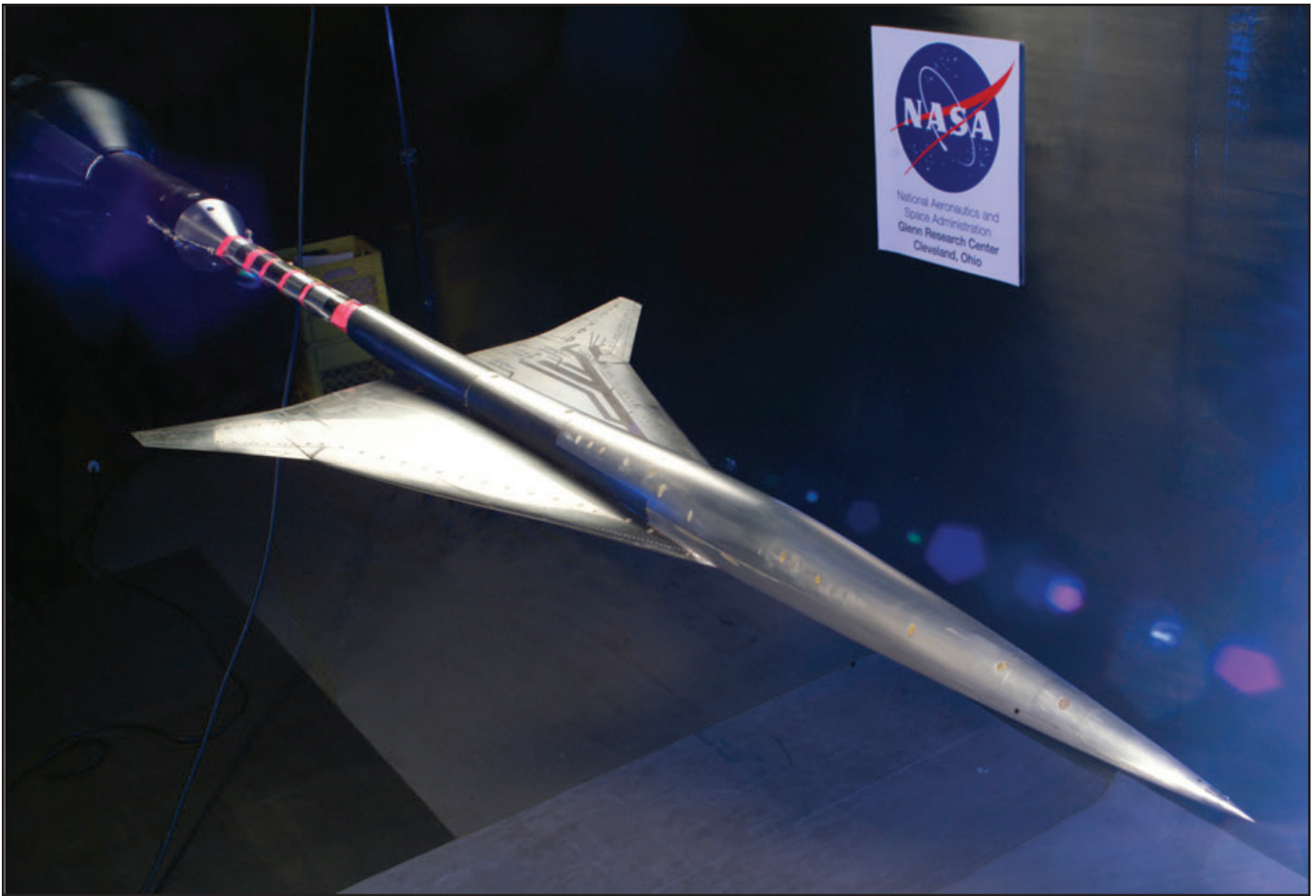
Boeing proposed mounting a sub-scale model of their HSCT design atop a Lockheed SR-71A to acquire high-speed data of the design configuration. (Boeing)



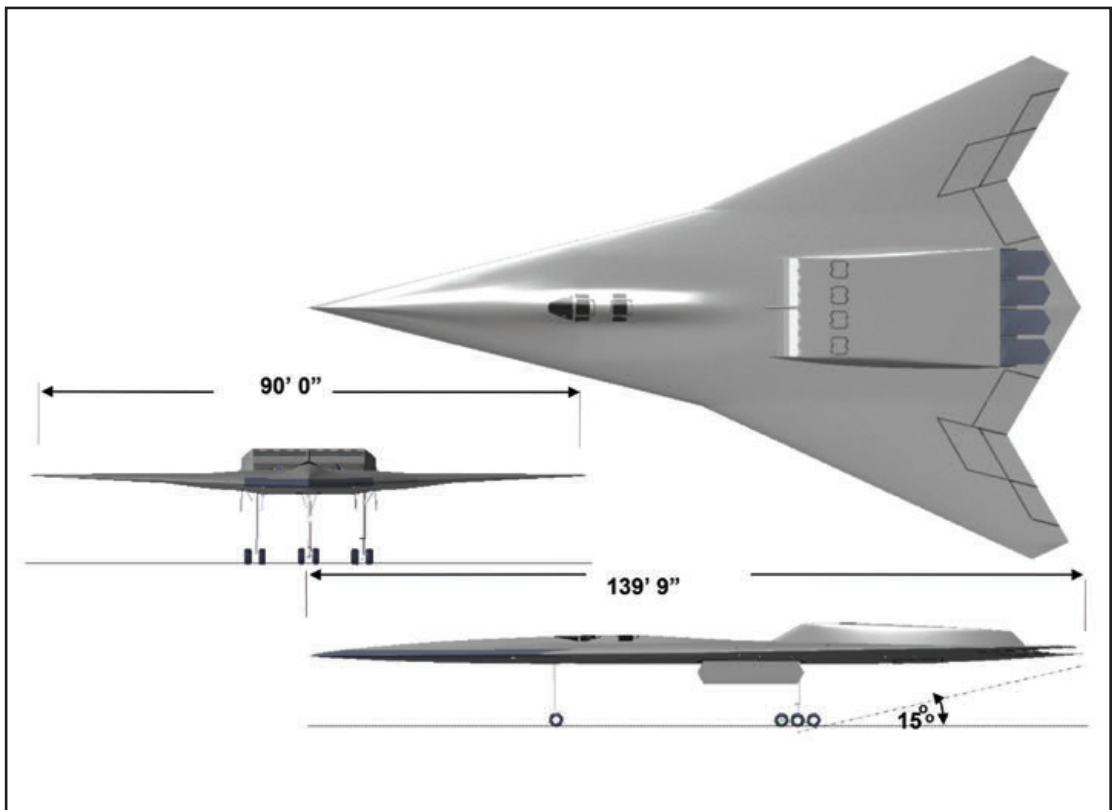
Configuration LST-011

Northrop Grumman chose a unique, reversed, 'cranked arrow' wing design for their HSCT proposal. Northrop Grumman believed a wing of this design could achieve a natural laminar flow effect. (Northrop Grumman)





Simply referred to as High Speed Research Model 5, this design was used for loads comparison testing between wind tunnels at NASA Langley and NASA Glenn Research Centers in 2003. (NASA)



One of the most recent examples making use of the 'cranked arrow' wing design is this proposal from Northrop Grumman of a Supersonic Tailless Air Vehicle from 2008. (Northrop Grumman)

F-16XL PERSONNEL

APPENDIX A: THE PEOPLE

The success or failure of any aerospace test program comes down to one thing; the quality of the personnel involved. The F-16XL program was blessed with top personnel in every respect. From design and engineering, to assembly and flight test. The test team overcame many insurmountable issues and achieved a high rate of success throughout its demanding flight schedule and variety of weapon systems tested. Fortunately, the company recognized this early on, and gave many individuals an opportunity to have their photo taken with the aircraft. Despite the 40 years that have passed since this test program was active, every person contacted by this author shared many fond memories of working on the program, which holds a special place in the hearts of everyone involved to this day.



General Dynamics took a series of personnel photos prior to the official rollout ceremony. The series of images are shown on the following pages and identified by group or individuals, if known. The largest personnel group was of those involved in engineering for the F-16XL. (Lockheed Martin)



Engineering, Operations and Production personnel. (Lockheed Martin)



F-16XL pilots. (Lockheed Martin)



F-16XL Stores Management System Software Group. (Lockheed Martin)



F-16XL Inspection staff. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Test and Evaluation. (Lockheed Martin)



F-16XL Preliminary Design Group. (Lockheed Martin)



F-16XL Aerodynamics Group. (Lockheed Martin)



F-16XL Manufacturing Group. (Lockheed Martin)



F-16XL Airframe Design Group. (Lockheed Martin)



F-16XL Planning Office. (Lockheed Martin)



F-16XL Tooling personnel. (Lockheed Martin)



F-16XL Stability & Control Group. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Loft Group. (Lockheed Martin)



F-16XL Mechanical and Fluid Systems Group. (Lockheed Martin)



F-16XL Inspection Group. (Lockheed Martin)



F-16XL Inspection Supervisors. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Field Operations Crew. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Engineering Staff. (Lockheed Martin)



F-16XL Production Control. (Lockheed Martin)



F-16XL Production Control. (Lockheed Martin)



F-16XL Program Plans & Controls. (Lockheed Martin)



F-16XL Procurement Group. (Lockheed Martin)



F-16XL Mechanical Design Group. (Lockheed Martin)



F-16XL Program Management Staff. (Lockheed Martin)



F-16XL Stress Analysis Group. (Lockheed Martin)



F-16XL Program Manager, Randy Kent. (Lockheed Martin)



Randy Kent and Harry Hillaker. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



F-16XL Production Group. (Lockheed Martin)



F-16XL Production personnel. (Lockheed Martin)



Harry Hillaker. (Lockheed Martin)



F-16XL Field Operations Crew. (Lockheed Martin)



F-16XL Field Operations Crew. (Lockheed Martin)



F-16XL Instrumentation Group. (Lockheed Martin)



F-16XL Field Operations and Edwards AFB Crew. (Lockheed Martin)



Duncan Guest and Klein Katarnery. (Lockheed Martin)



F-16XL Static Proof Testing personnel. (Lockheed Martin)



F-16XL Flightline Operations personnel. (Lockheed Martin)



F-16XL Maintenance: Paul Parra, JC Lewis, Tom Grindle, Shelly O’Kelly, Leonard Bucheger, Harry Ray, Frank McDonald, unknown, and Chris Cole. (Tom Grindle collection)



F-16XL 100th Flight personnel. (Tom Grindle collection)



F-16XL Maintenance: Leonard Bucheger, unknown, JC Lewis, Tom Grindle, Paul Parra, D. McBride, and Harry Ray. (Tom Grindle collection)



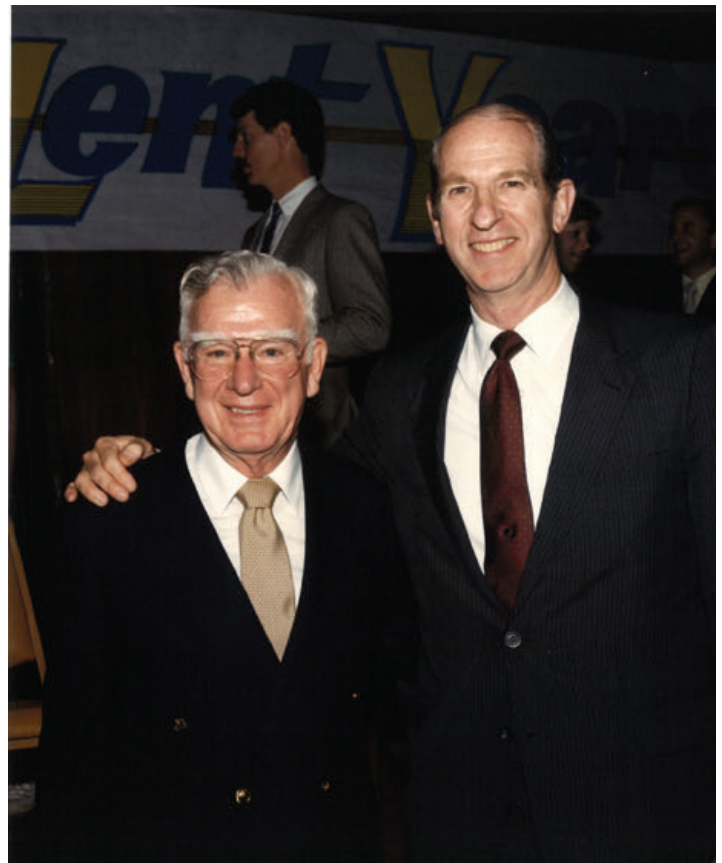
F-16XL 400th Flight personnel. (Lockheed Martin)



F-16XL Group Award at Edwards AFB, CA. (Tom Grindle collection)



Dave Wyatt with F-16XL-A wind tunnel model. (Lockheed Martin)



Harry Hillaker and Randy Kent. (Lockheed Martin)



Jim McKinney and Harry Hillaker. (Lockheed Martin)



F-16XL Managers and Supervisors. (Lockheed Martin)



Randy Kent. (Lockheed Martin)



Gordon Smith (manager of test & evaluation), Randy Kent and Harry Hillaker. (Lockheed Martin)



F-16XL maintenance personnel. (Tom Grindle collection)

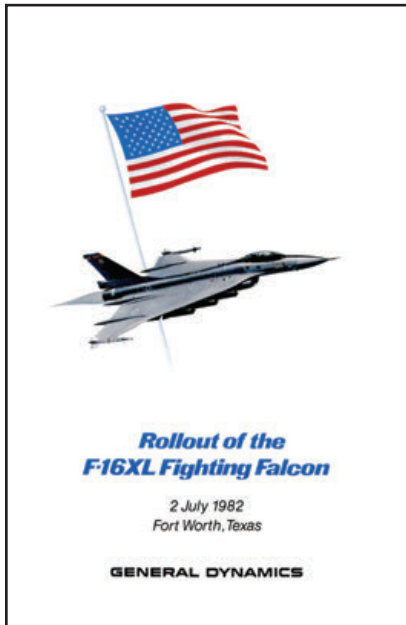


NASA F-16XL personnel in front of both aircraft. (Stephen Landers collection)

F-16XL MEMORABILIA

APPENDIX B: F-16XL PROGRAM SWAG

The measure of any great aerospace test program is the amount of memorabilia, or 'swag', produced by the contractors, or the individuals involved. The F-16XL program produced a variety of patches, models and other items that are treasured by those involved with the program, and highly sought-after by collectors today.



Increased Combat Capability By Evolution

The F-16XL is an advanced version of the F-16 Falcon now in service with the U.S. Air Force and the air forces of six other nations. A multimission aircraft, the F-16XL combines the most advanced aerodynamic and structural technology with the latest navigation, weapons delivery, and armament systems to be incorporated in the F-16C/D.

The F-16XL configuration was evolved through straight-forward modification of the basic F-16. The major and most visible change is the cranked arrow wing developed in close cooperation with aeronautical specialists at NASA. The F-16XL design provides a balance of excellent high and low speed flying qualities, shorter runway requirements, high penetration speeds, and significant increases in combat range and performance.

A corporate decision to proceed was made in November 1980 and the detail design work started immediately. Fabrication started in 1981 and according to present plans the first flight will be less than 20 months after go-ahead.

The single-seat F-16XL rolled out today is powered by a Pratt & Whitney F100 engine. A two-seat version of the F-16XL, powered by a General Electric F101 derivative fighter engine, will enter flight testing later this year.

F-16XL Rollout Program

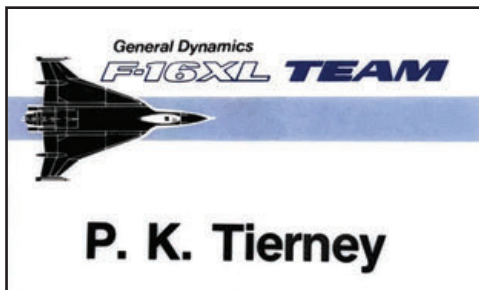
Music By - Mansfield High School Band
Don Harrell, Director

Opening - Herbert F. Rogers
Vice President & General Manager
Fort Worth Division of General Dynamics

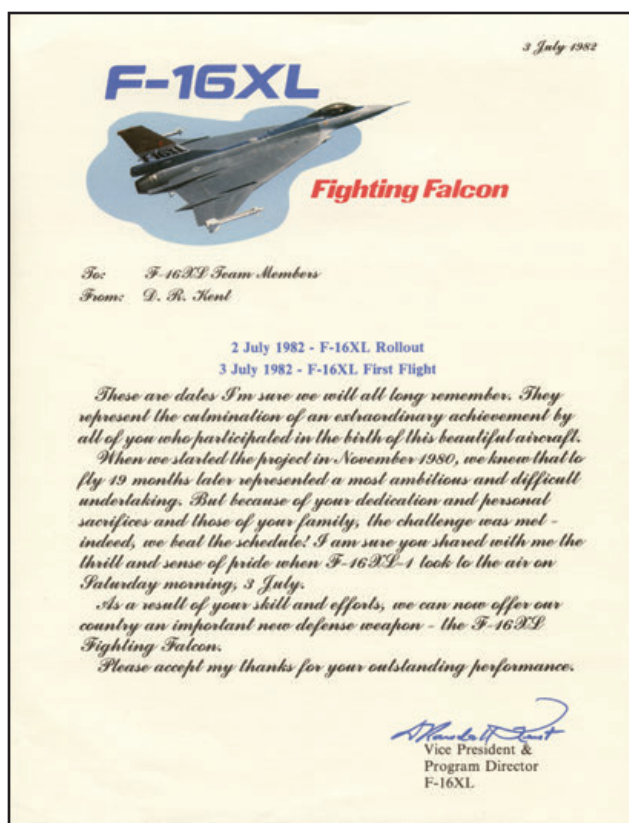
Remarks By

- David S. Lewis
Chairman & Chief Executive Officer
General Dynamics Corporation
- Senator John G. Tower
Chairman,
Senate Armed Services Committee
- Congressman Jim Wright
House Majority Leader
- Lieutenant General Lawrence A. Skantze
Commander, USAF
Aeronautical Systems Division

General Dynamics F-16XL official rollout program. (Paul Tierney Collection)



F-16XL rollout team member name badge. (Paul Tierney Collection)



Letter of appreciation from F-16XL Program Director, Randy Kent, sent to all personnel working on the program after the successful first flight. (Paul Tierney Collection)



Morale patches of all types are the most popular items produced for any test program. The F-16XL program generated no less than a dozen different patches. (Multiple sources)



Commemorative medallions produced for the F-16XL program included the bronze coin (above, left) and the nickel version produced by NASA's Dryden Flight Research Center (above, right). (Tony Landis collection)



Belt buckles were a popular in the 1980's with least 2 different F-16XL buckles being created. (Tony Landis collection)



Lapel pins for the F-16XL were made in large quantities and can still be easily found today. In the late 1980's, the National Museum of the United States Air Force gift shop sold a special sterling silver F-16XL lapel pin. (Tony Landis collection)



Something for the engineering nerd in all of us, an F-16XL pocket protector. (Tom Grindle collection)



Display models of the F-16XL are the most prized possessions of project personnel and highly sought after items for collectors. The most detailed display models came from the General Dynamics internal model shop and were used for trade show displays or presented to VIP's and came in a variety of sizes. Precise Models Inc, of Elyria, OH, received the contract for manufacturing F-16XL display models for sale to project personnel.

Harry Hillaker and Randy Kent present F-16XL first flight pilot, Jim McKinney, with an in-house F-16XL presentation model. Note the large scale F-16XL sitting on the desk at right. (Lockheed Martin)



Two-seat ground attack variant of the F-16XL produced by the General Dynamics model shop in 1/40th scale and painted in a Euro-One camouflage. The clear canopy is very unique. (Allyson Vought collection)



The display models sold by Precise Models came with, and without, weapons. Painted in basic F-16 colors with a fictional serial number, the models were produced in 2 scales, 1/40th (left) and 1/72nd. (Sheryl Tierney collection)



Over the years, the larger Precise Models have been found in a variety of different color schemes, such as the single and two-seat versions shown above in the original demonstrator markings. (Tony Landis collection)



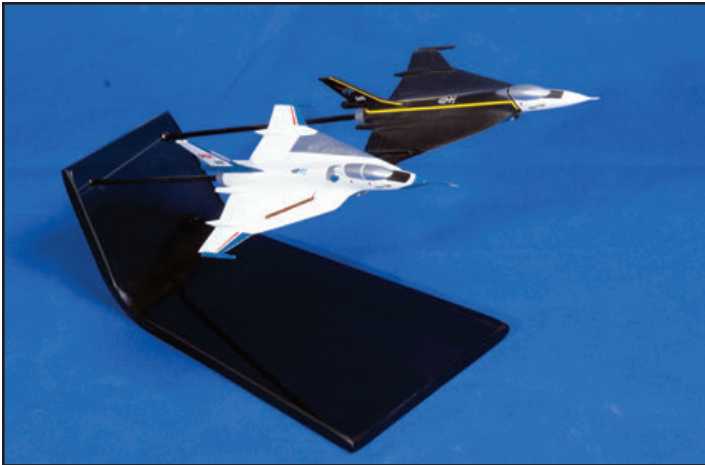
This cluster bomb equipped Precise Models F-16XL in 1/40th scale, is finished in operational markings for the 57th Fighter Weapons Wing at Nellis AFB, NV. (Tony Landis collection)



Not much could be found on this Precise Models 1/40th scale, dark gray, F-16XL with black radome. Precise offered models with black plastic or walnut bases. (Allyson Vought collection)



A 1/6th scale remote control (R/C) F-16XL made by Global Knight Models. The model measures 108 inches long with a 70 inch wingspan. (Global Knight Models)



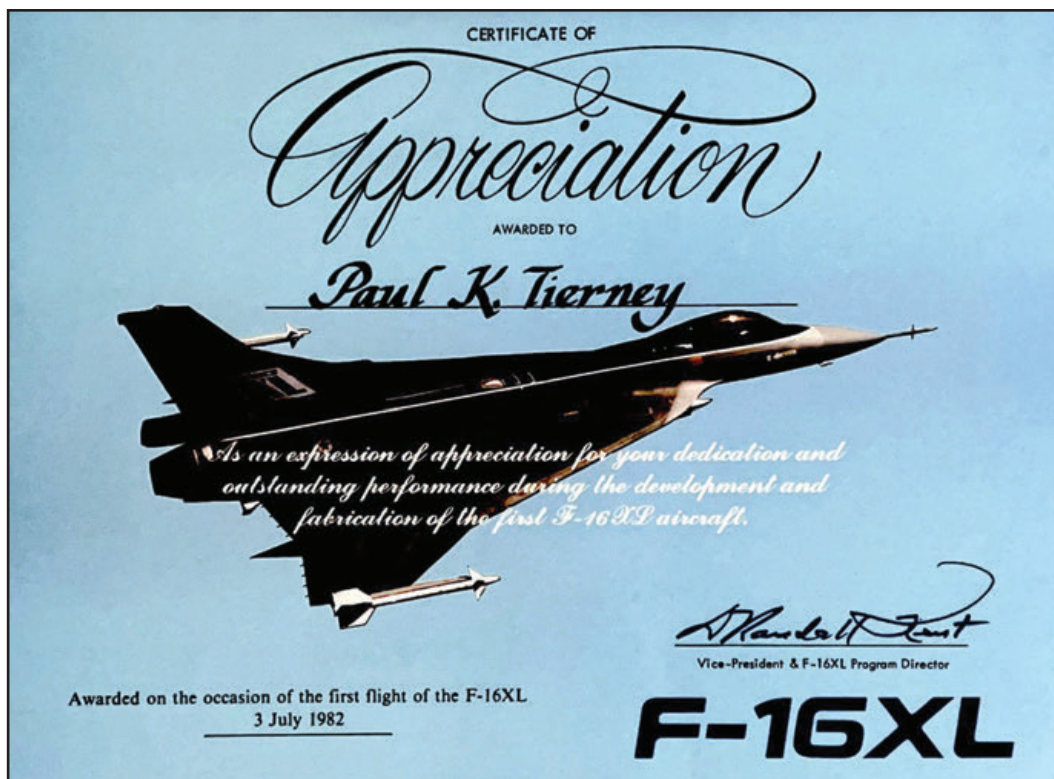
Model kits and conversions for the F-16XL can be found in a variety of scales from various manufacturers. Companies such as Kangam/Ace/Revell produce kits in 1/32nd, Meteor Productions conversion for the Tamiya F-16 in 1/32nd (top, right), Kinetic and Skunk Models in 1/48th, Monogram (top left) and Lone Star Japan in 1/72nd, and ARII, LS (above, left), Airfix & Mini Hobby in 1/144th. Deformed, chibi, eggplanes (above, right) are produced by KASL Hobbies and Lone Star Japan. (Tony Landis collection)



The NASA F-16XL project office produced a limited number of T-shirts for personnel involved in the Supersonic Laminar Flow Control test program. (Tony Landis collection)



General Dynamics/Lockheed Martin, the U.S. Air Force and NASA held a 25th Anniversary celebration for the F-16XL at General Dynamics Recreation Association clubhouse in Ft. Worth, TX, on 3 July 2007. The anniversary program replicated the original made for the rollout ceremony. Among the hand-outs was a Monopoly board display commemorating the first flight in 1982. (Tony Landis collection)





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A Look Back...

FIRST AROUND-THE-WORLD FLIGHT
 6 APRIL—28 SEPTEMBER 1924

22464

EDITED BY: R. RAY ORTENSIE
 DEPUTY DIRECTOR, HQ AFMC HISTORY & HERITAGE PROGRAM

The Summer Before 9/11

By: W. Scott D. White

FLASHBACK

This September marks 20 years since our nation came under attack. Most people can vividly remember where they were on 9/11 and repeat that event in full detail, however, when you ask them what the nation, or the Air Force, looked like in the summer before 9/11, they struggle to find a memory.

The year 2001 represented change for the nation. In January, President George W. Bush took office and began selecting his cabinet. However, the controversy over the Florida election returns, and "hanging chads," delayed the appointment of defense officials even more than in previous years. Eventually, he charged Donald Rumsfeld to lead the Department of Defense, and while the overall impression was that things were generally calm around the globe, Rumsfeld reminded President Bush that Iran was pursuing chemical and biological weapons, North Korea wanted long-range ballistic missiles, and the Chinese were increasing their military capabilities across the board. Thus, in the spring and early summer, the Secretary of Defense focused on the long-range goal of transforming the armed forces to fight a war of the future. To do this, they would need new equipment.

Outside of Washington, the first six months of 2001 had many uplifting, controversial, and sad moments. In February, the NASCAR Huston test Dale Earnhardt when he crashed on the last lap of the Daytona 500. In April, a Chinese fighter jet collided with a Navy EP-3E surveillance aircraft, forcing the American military plane to make an emergency landing in Hainan, China. That same month, in Mississippi, voters elected to not alter their state flag, which had a Confederate Battle Flag in its canton, but rather leave it as is until 2021. Also, the first space shuttle, American Dream, was launched on the Space Shuttle Columbia. The shuttle was headed for the Space Station. Her usual safety return eight days later.

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A Look Back...

NAA B-70 VALKYRIE VARIANTS
 A Future That Never Was...

88 FOR LAUNCH VEHICLE FOR LIFTING BODY RESEARCH

EDITED BY: TONY R. LANDIS
 WRITER/ARCHIVIST, HQ AFMC HISTORY OFFICE

A Look Back...

LOCKHEED C-141 STARLIFTER

TEXT BY: DR. WILLIAM F. HEAD & JAMES TINDLE
 PHOTOGRAPH LAYOUT BY: HQ AFMC HISTORY OFFICE
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A Look Back...

PEACEMAKER PARASITES
 GOBLINS AND OTHER STRANGE PROPOSALS

BY: TONY R. LANDIS
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Manned Nuclear Aircraft Program

By: Jack Ward

The XB-70 with a B-70 in 1959, the only aerial in early nuclear status.

A nuclear powered aircraft? Today it sounds like a crazy concept, but was it really? Within the last several months there was a joke in the office about this very thing. One of the historians in the office was writing a paper about the XB-70. The paper mistakenly mentions the engines of the XB-70 were nuclear powered (should have read it was a physics package delivery platform). As things often do the joke evolved and all in the office continue to laugh about. As it turns out the joke was much more a reality than most would believe. The XB-70, initially designed as a Mach 3 bomber, never went into production and the two XB-70 aircraft built saw one as experimental aircraft.

HISTORY
 IN TWO

A Look Back...

RECOVERABLE BOOSTER PROPOSALS
 A Future That Never Was...

EDITED BY: TONY R. LANDIS
 WRITER/ARCHIVIST, HQ AFMC HISTORY OFFICE

Back to the Future...

The Reemergence of the Flying Wing in the 21st Century

By: W. Scott D. White

The highly anticipated B-21 Raider named in honor of the legendary "Doublet Raider" who bombed Tokyo, Japan in April 1942—under development by Northrop Grumman, will be the first Air Force bomber manufactured in the twenty-first century. The concept of the "flying wing" however, is over 100 years old, originating in the early 1900s. First, in February 1910 German aeronautical engineer, Hugo Junkers, applied to patent a flying wing concept airplane. Just months later, British Army aviator, and John W. Dumas (J.W.) Dumas, successfully flew his tailless, swept wing model "D.1" just over two miles, making the aircraft the world's first flying wing to achieve sustained flight. Four years after this flight, the Belgians Computers, an American aircraft manufacturer, reproduced Dumas's subsequent model D.8 for both the U.S. Army and Navy, the latter of which was equipped with floats for landing on water. According to one passage of the Bergson D.8, the airplane displayed remarkable stability and ease of control.

In the United States, it would be aircraft designer John "Jack" Northrop who was most responsible for making the flying wing concept a reality. The initial appeal of the flying wing was the reduction in drag that it offered. Distributing weight evenly across an aircraft's wings, as opposed to up and down a conventional fuselage, enabled engineers to eliminate the tail section. Jack Northrop's X-2148 "Flying wing" was his first attempt at creating an all-wing aircraft. It was not a true flying wing due to its rear tail boom, however, it provided a foundation from which he would develop subsequent flying wing airplanes. With the assistance of government aerospace engineer, Theodore von Karman, Northrop's team was able to overcome fundamental challenges of controlling surfaces, flying wing aircraft in their experimentation with the X-44 (1940). They combined the pitch and roll of the aircraft by using elevons on the trailing edge of the wing, which served the function of both elevator and aileron. A split flap mechanism on the top of the wings took the place of a conventional tail and were angled downward, presumably for improving maneuvering stability, but was ultimately abandoned. All of these adjustments made it possible to eliminate control structures like tail booms altogether.

Figure 2 - Computer D.8 (Dumas) D.8 in June 1910

FLASHBACK

EDITED BY: TONY R. LANDIS
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