The F-16 Fighting Falcon

GENERAL DYNAMICS

A NEW FIGHTER...

The F-16 is a new-generation, single-engine, single-seat, multirole tactical fighter. Advanced technologies are combined as in no other aircraft – all designed to produce the best pilot-fighter combination possible in an airplane that is smaller, lighter, and simpler than present designs but having far greater maneuverability and combat capability. It will dominate the air-combat arena against both current and future threats. The F-16's low wing loading, high-thrust engine, and rugged structure contribute to its superiority in the air combat role and provide the basic qualities needed for the air-to-ground role. Added to these essential qualities are an advanced digital fire control and stores management system and nine store stations with capacity for the carriage of up to 15,200 pounds of external stores. The result is a superior multimission air-to-air and air-to-ground tactical fighter. The F-16 has been dubbed the Swing Force Fighter because of its ability to easily swing from one role to another.

. . . WITH DEMONSTRATED PERFORMANCE AND PROVEN MISSION AVAILABILITY

The F-16 represents a departure from the ever-increasing costs and complexities of modern fighter aircraft and achieves a unique combination of high performance and low-cost maintainability. Its performance has been demonstrated by six air forces. Its utility as a weapon system has been proven in rigorous operational exercises.

THE F-16 OFFERS GREATLY IMPROVED RELIABILITY

After less than one year and 8,000 hours of operational flying time, the F-16 exceeded the 90% mission reliability goal that is generally accepted as the mature goal at 100,000 hours of operation. Continuing reliability efforts are yielding a steadily increasing reliability rate. The F-16's multipurpose APG-66 radar, for example, is presently at a mission-capable rate in excess of 90%. Although this rate exceeds the most optimistic goals, other reliability improvement modifications that are being incorporated into the F-16 will further enhance its sortie generation potential.

HIGH MISSION CAPABILITY

F-16 mission capability rates exceeded the TAC 70% standard during the first year of operation. F-16 operational units in the USAF and European forces consistently demonstrate sortie rates in excess of four sorties per day per aircraft. During a recent exercise at Hill AFB, 18 aircraft flew 140 sorties in three days; 110 of the sorties were flown without a single discrepancy; less than 6% of the aircraft required maintenance actions before they could be reflown. Sixteen of the 18 aircraft were still mission-capable after the 140th sortie.

A NEW STANDARD OF READINESS

Readiness is the quality that enables an aircraft and well-trained crew to deploy rapidly and maintain an effective accelerated sortie rate for an extended period of time in support of a military contingency — any place in the world. Systems reliability, mission-capable rates, deployment range, ease of maintenance, and

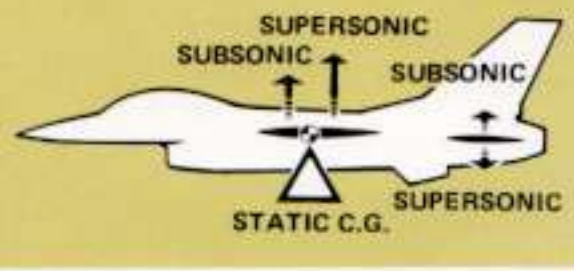
DEMONSTRATED READINESS AND MISSION CONFIDENCE

weapon system effectiveness are the essential elements of readiness. These qualities were part of the basic design considerations for the F-16. After less than two years of operational service, the F-16 has demonstrated a new standard of readiness that yields significant savings in operational costs and considerable increases in sortie generation potential. A further advantage is that this high-availability, high-reliability multirole aircraft comes with the lowest costs and the latest technologies of any fighter available today.

ADVANCED TECHNOLOGIES ...AT A LOW COST

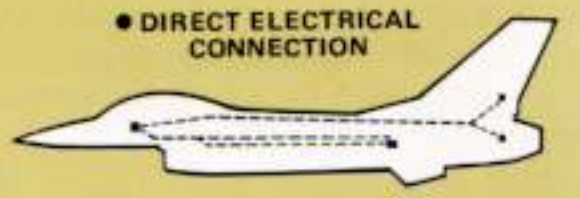
RELAXED STATIC STABILITY

Relaxed static longitudinal stability results in range-increasing high-lift-to-drag ratios at subsonic and supersonic speeds. This feature avoids or minimizes the trim drag of conventional systems by creating a useful tail up-load at subsonic speeds and a lower tail down-load at supersonic speeds.



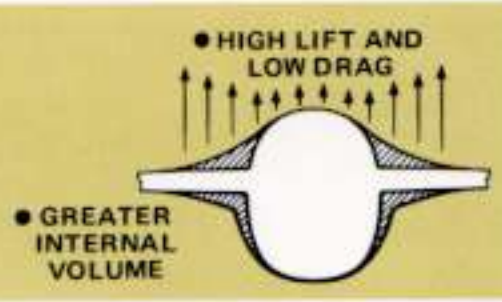
FLY-BY-WIRE FLIGHT CONTROL

A fly-by-wire flight-control system provides highly reliabile, precise, responsive control complementing the relaxed static stability concept. It enables the pilot to utilize the F-16's full maneuvering potential while guarding against loss of control and structural overload. It achieves high reliability through multiple redundancy, and its response characteristics are easily adapted to accommodate changes to the air vehicle configuration.



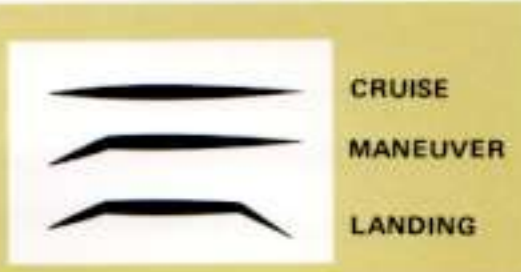
WING-BODY BLENDING

A blended wing-body enhances performance, reduces weight, and increases body lift at high angles of attack. It helps the F-16 achieve the high ratio of fuel to gross weight that is essential for outstanding range and endurance. Transonic drag is reduced as a result of improved area distribution.



VARIABLE WING CAMBER

Automatic cambering and contouring provide the efficient wing shapes needed for optimum lift across the range of varied flight conditions. Leading-edge flaps are automatically positioned as a function of Mach number and angle of attack to minimize drag and significantly reduce buffet.



HIGH "G" AND HIGH VISIBILITY COCKPIT

A 30-degree inclined seat and raised heel-rest line increase the pilot's "g" tolerance, winning high praise from pilots for comfort. The cockpit geometry and the unique bubble canopy permit almost unlimited visibility.

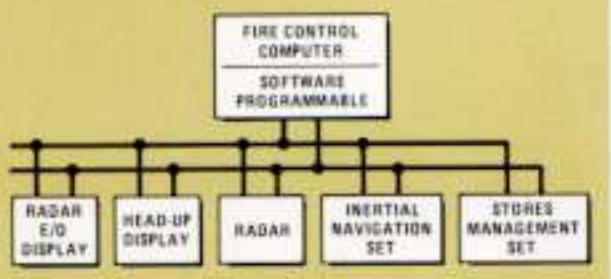
PRATT & WHITNEY F100-PW-200 ENGINE

Features of the high-thrust-to-weight turbofan engine are variable stator blades in the fan compressor, high turbine inlet temperatures with the first stages air cooled, high pressure ratio, a lightweight convergent-divergent nozzle, and component modularity.

25,000-POUND-THRUST-CLASS

DIGITAL AVIONICS

A digital avionics system, with distributed computer architecture tied together by a MIL-STD-1553 multiplex bus and managed by a fire control computer, features distributed microprocessors, high-order language, modular software, programmable symbology, and multimode weapons delivery. The multimode, pulse-doppler radar exploits digital techniques to produce outstanding performance in its air-to-air and air-to-surface modes.

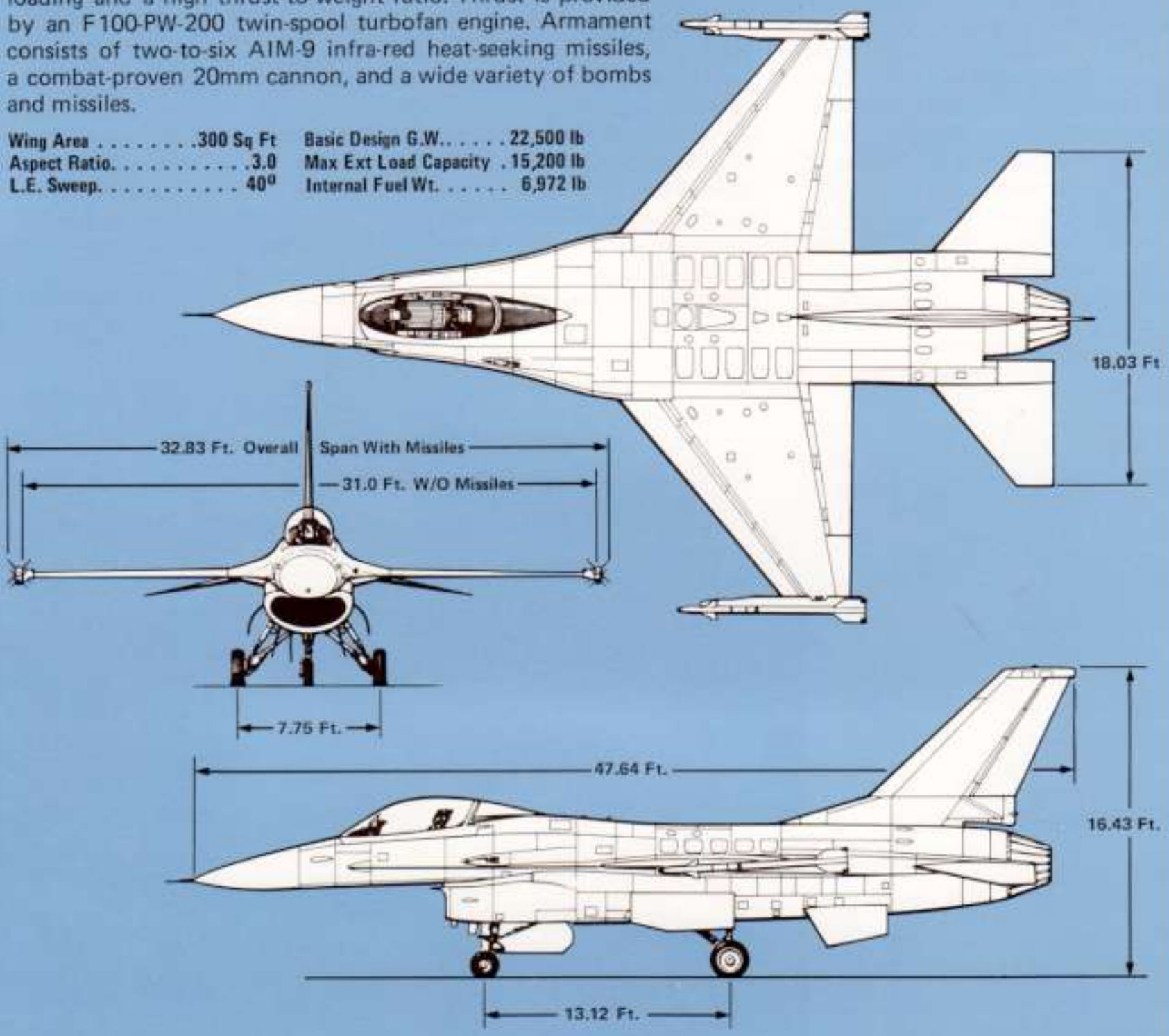


F-16A

SINGLE-PLACE FIGHTER

The General Dynamics F-16A is a single-seat, single-engine, high-performance, multipurpose fighter. It has a low wing loading and a high thrust-to-weight ratio. Thrust is provided by an F100-PW-200 twin-spool turbofan engine. Armament consists of two-to-six AIM-9 infra-red heat-seeking missiles, a combat-proven 20mm cannon, and a wide variety of bombs and missiles.

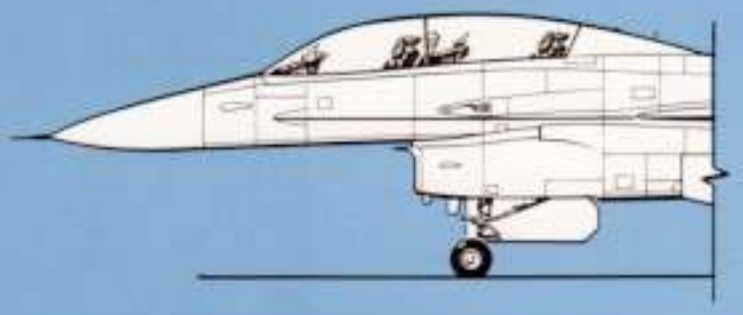
Wing Area . . . . . .300 Sq Ft	Basic Design G.W. . . . . 22,500 lb
Aspect Ratio. 3.0	Max Ext Load Capacity . 15,200 lb
L.E. Sweep. . . . . 40°	Internal Fuel Wt. . . . . 6,972 lb



F-16B

TWO-PLACE FIGHTER/TRAINER

The F-16B is a two-place fighter/trainer essentially identical to the F-16A except for the aft cockpit. Although the F-16A has a greater one-man capability than has been previously possible, the two-seat F-16B can readily be adapted to accomplish all two-man fighter-attack operations. The F-16B carries about 1100 fewer pounds of internal fuel but still surpasses earlier fighters in agility, range, and endurance.

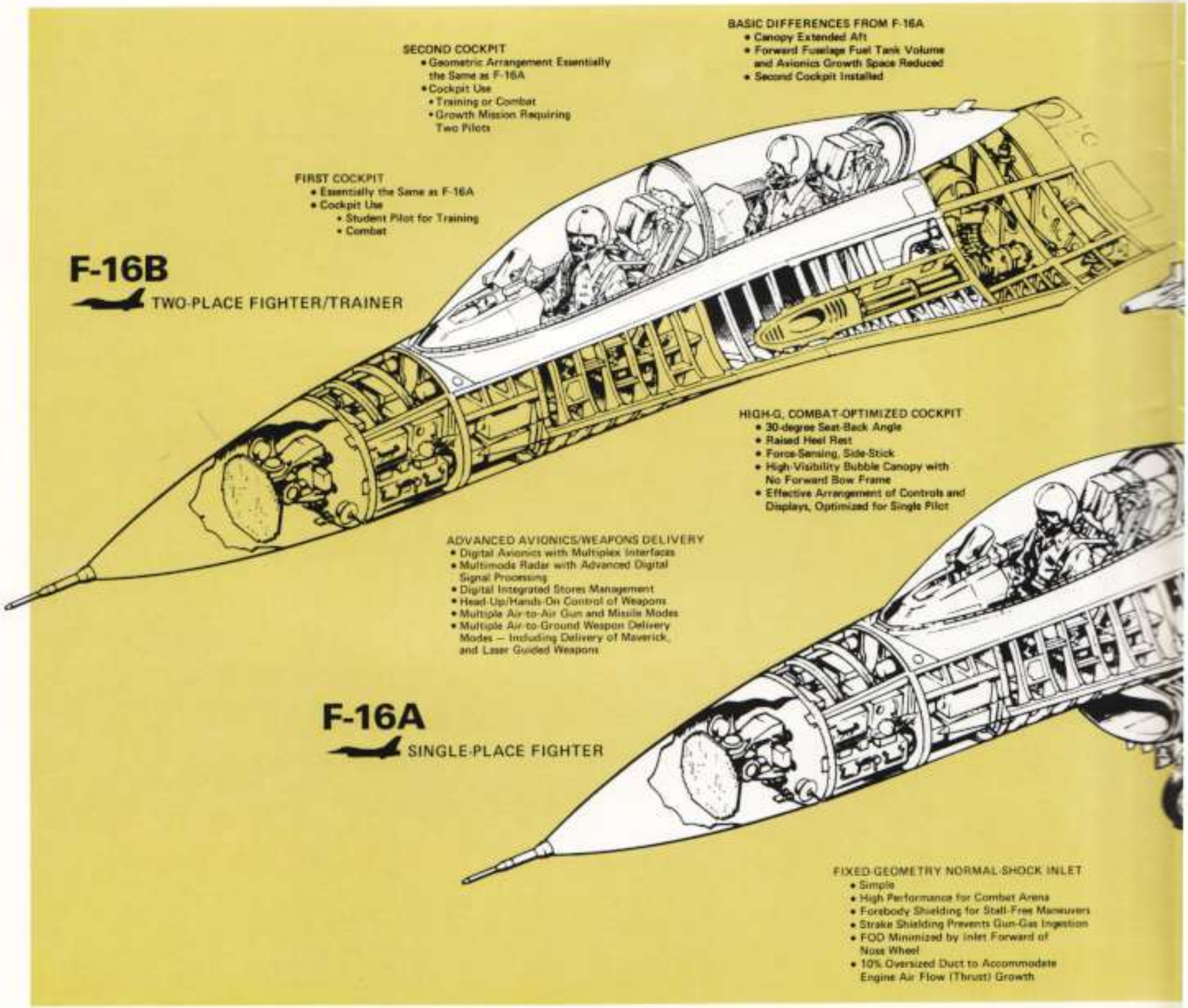


SIMPLE, MODULAR STRUCTURE AND EFFICIENT USE OF VOLUME

The soundness of the F-16 design concept and the airframe components has been verified by many ground tests and the flight tests conducted with the YF-16 prototypes. Design maneuver limits have been demonstrated repeatedly with maneuvers up to 9g. Freedom from flutter, divergence, and other aeroelastic phenomena has been demonstrated at speeds up to Mach 2.0. A typical pilot comment is "greatest and smoothest airplane I have flown."

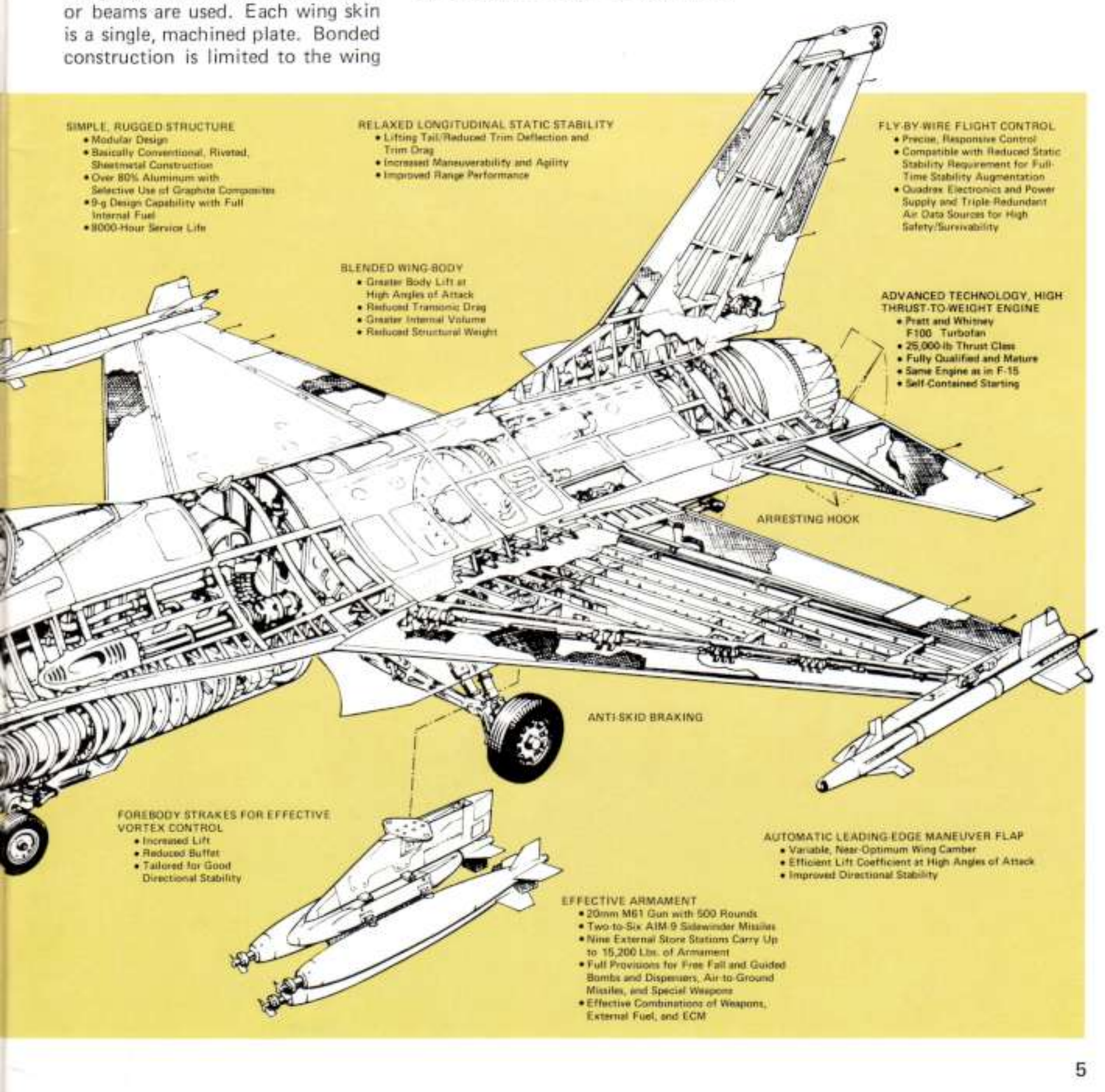
The 30-degree inclined seat and the 6-inch raised heel line above that required by MIL standards for fighter aircraft enable the pilot to tolerate a 9g load. A side-stick with arm rest is provided to assist the pilot in executing precise maneuvers under high-g loads. The F-16's design load limit is 9g with 100-percent internal fuel, in contrast to current fighters with design load limits of 6.5g to 7.3g with 60- to 80-percent internal fuel. A rugged, safe, durable airframe is assured by a design service life of 8000 hours. Service loads spectra cover a higher frequency of maneuvers in the intermediate- and high-load-factor range than occur in any other fighter.

The modular design approach – the forward fuselage, the inlet, the center fuselage, the aft fuselage, the empennage, and the wings are designed as modules – provides for ease of manufacture, growth, and the upgrading of technology.



F-16 airframe structure is designed to make effective and extensive use of mature equipment and proven techniques for high-production-rate aluminum manufacture. Fuselage construction is of sheet metal skins stiffened by formed and built-up sheet metal frames and longerons. In areas where concentrated loads or functional requirements dictate, integrally machined bulkheads, spars, or beams are used. Each wing skin is a single, machined plate. Bonded construction is limited to the wing control surfaces, rudder, leading edge of the vertical tail, horizontal tail, and secondary structure.

The blended-body fuselage provides both increased lift and internal volume for fuel and essential mechanical and avionic equipment. The leading-edge strakes generate vortices that permit buffet-free, divergent-free flight at high angles of attack. A 20mm cannon is housed in the left-hand strake. Separation of flight control and other flight-essential components make use of small spaces and enhances the survivability characteristics of the F-16. Extensive use of hinged or removable panels provides unrestricted access to all components for maintenance.



AN AGGRESSIVE, TENACIOUS AIR-SUPERIORITY FIGHTER

The F-16 Multirole Fighter incorporates those features — maneuverability and persistence — that recent air warfare has reaffirmed as essential characteristics of an air-superiority fighter. Combat pilots unanimously emphasize the need for an aircraft in which the pilot can aggressively out-maneuver a threat by maintaining an energy-state advantage. With persistence the pilot can engage the threat at will and carry the engagement through to successful completion.

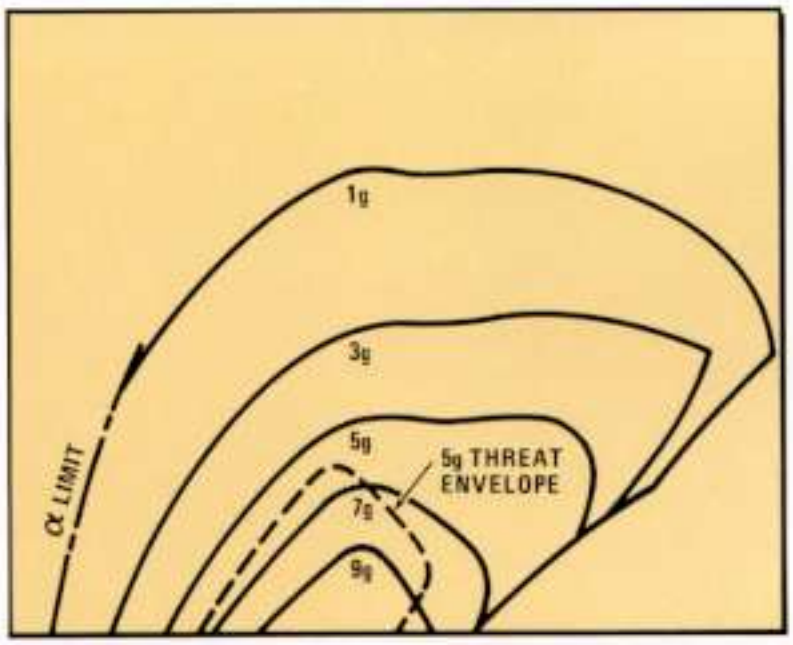
HIGH MANEUVERABILITY

The F-16's specific-excess-power (P_S) advantage, as expressed by the maximum sustained-g envelopes, over contemporary and projected threats enables the pilot to dominate a maneuvering engagement in the air-combat arena. The F-16 pilot can use the F-16's instantaneous and sustained 9-g maneuver capability — attained through the extensive aerodynamic tailoring and automatic

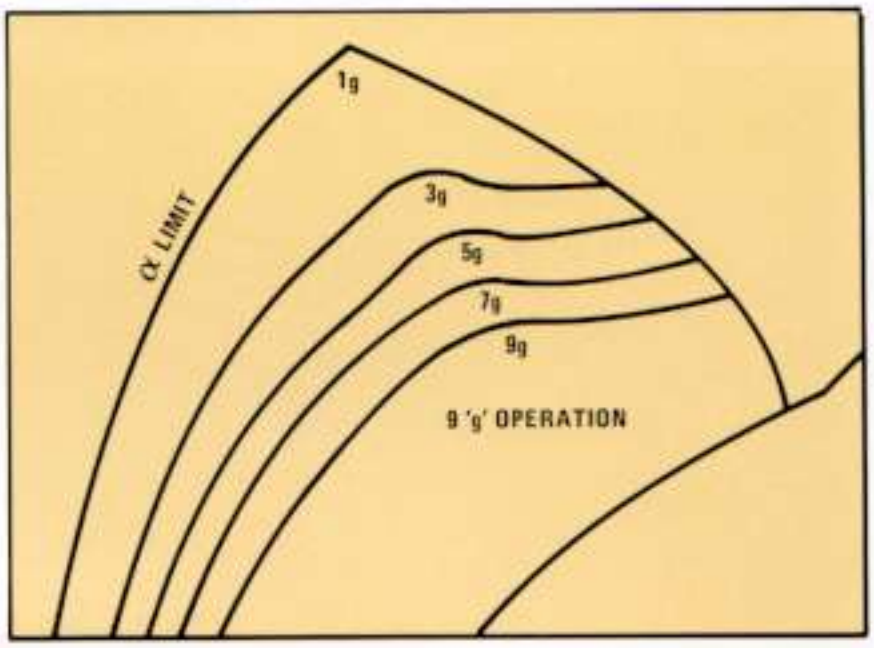
MANEUVER CAPABILITY

- AIR COMBAT CONFIGURATION
- MAXIMUM POWER
- 50% FUEL

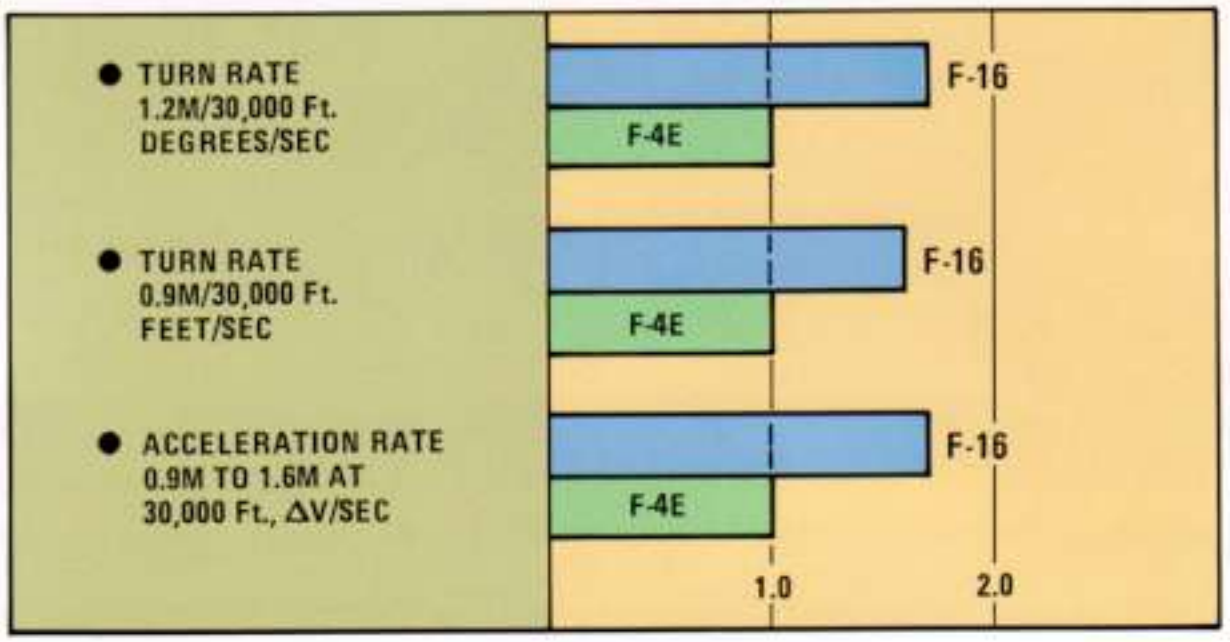
SUSTAINED MANEUVER (P_S = 0)



INSTANTANEOUS MANEUVER



HIGH TURN AND ACCELERATION RATES



leading-edge flap extension – to force the enemy into high-g energy-dissipating maneuvers while he maintains a commanding advantage in turn rate and acceleration rates. Deceleration is accomplished without attitude change by the use of a speed brake that one experienced fighter pilot has termed as "the best ever".

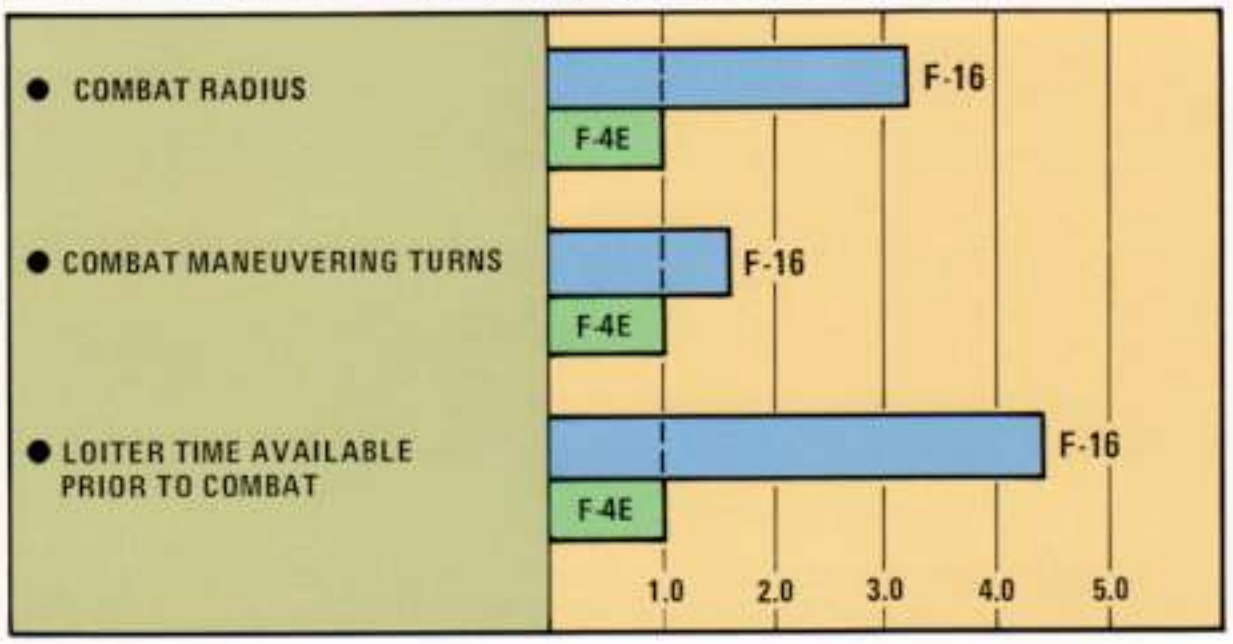
Undesirable characteristics frequently encountered in high-angle-of-attack, high-g maneuvers such as wing rock, pitchup, yaw divergence, and pro-spin tendencies were systematically eliminated. The F-16 provides a stable, buffet-free platform for accurate, lethal weapon delivery.

LONG RANGE AND PERSISTENCE

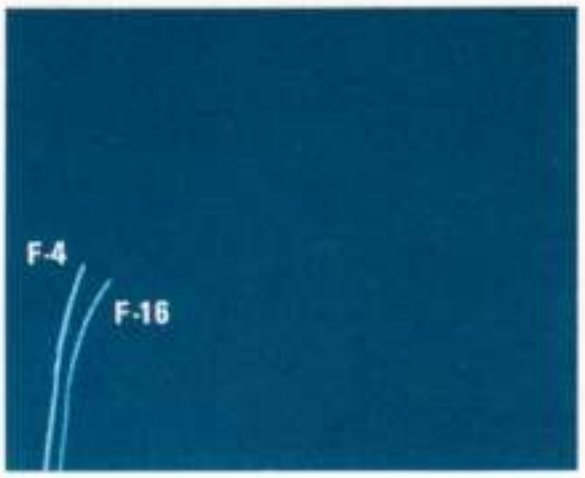
The F-16's efficient, low-by-pass-ratio turbofan engine, relaxed static stability, wing-body blending, and high fuel fraction combine to provide the F-16 with over three times the range of the F-4E. This range can be flexibly used to reach the battle area from remote fields, or to sustain prolonged time-on-station for Combat Air Patrol Missions, or to extend combat time.

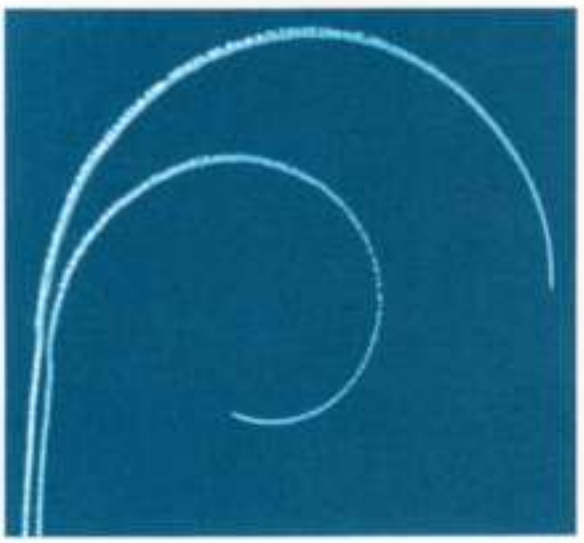
In operational parlance, the F-16 has the range "to get to the battle," the persistence "to stay with the fight," and the maneuverability to "be the winner."

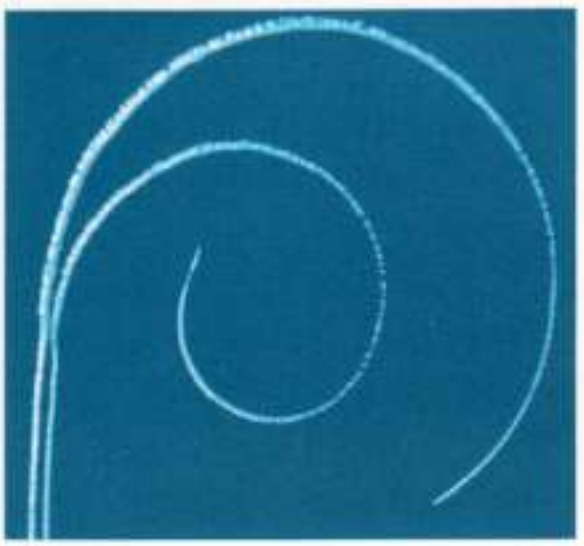
AIR SUPERIORITY MISSION RANGE & PERSISTENCE



F-16 OUT TURNS THE F-4







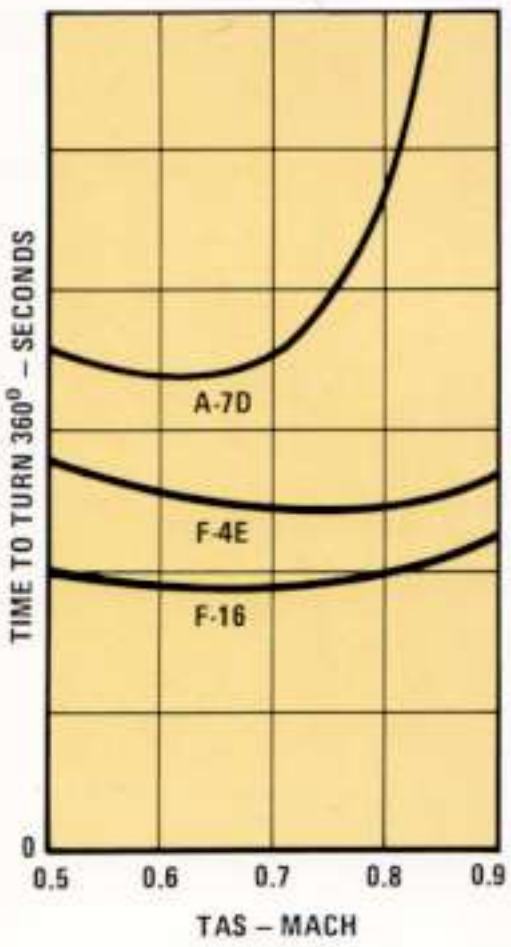
EXCELLENT AIR-TO-GROUND PERFORMANCE

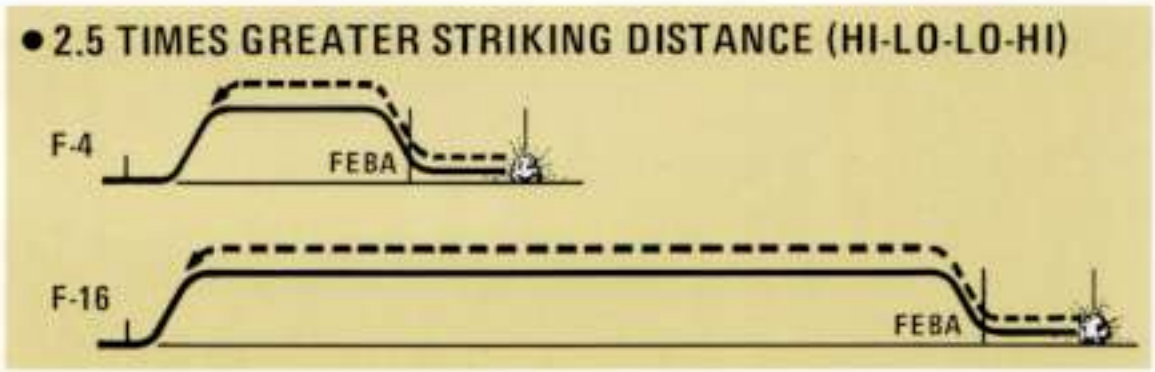
The F-16 Multirole Fighter has an outstanding air-to-ground mission capability. Range of the single-seat F-16A or two-seat F-16B with heavy weapon payloads is comparable or superior to that of current operational fighter and attack aircraft. This range can be used to strike distant targets or it can be traded for loiter time near the battle area to support ground operations.

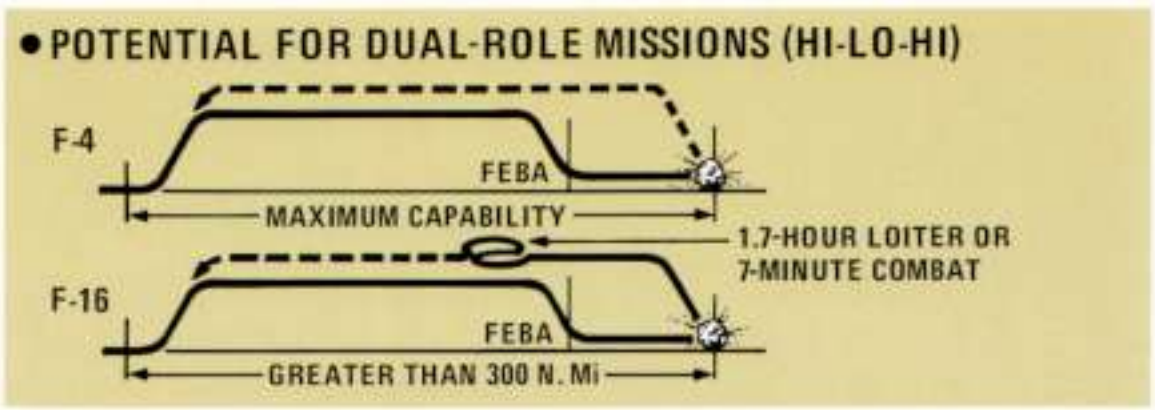
The maneuverability of the F-16 is particularly impressive at the low altitudes and throughout the range of airspeeds essential for air-to-surface operations. Its low-speed agility and unexcelled field of view allow the pilot to acquire the target, detect and maneuver to avoid SAM and AAA fire, attack the target, accelerate and climb to minimize exposure to ground fire, and return for reattack better than is currently possible with an aircraft specifically designed for ground attack and close-air-support missions.

RAPID REATTACK

- (2) 370-GAL TANKS
- (2) AIM-9 MISSILES
- (2) MK-84 BOMBS
- 10,000-FT ALT.
- MAXIMUM POWER







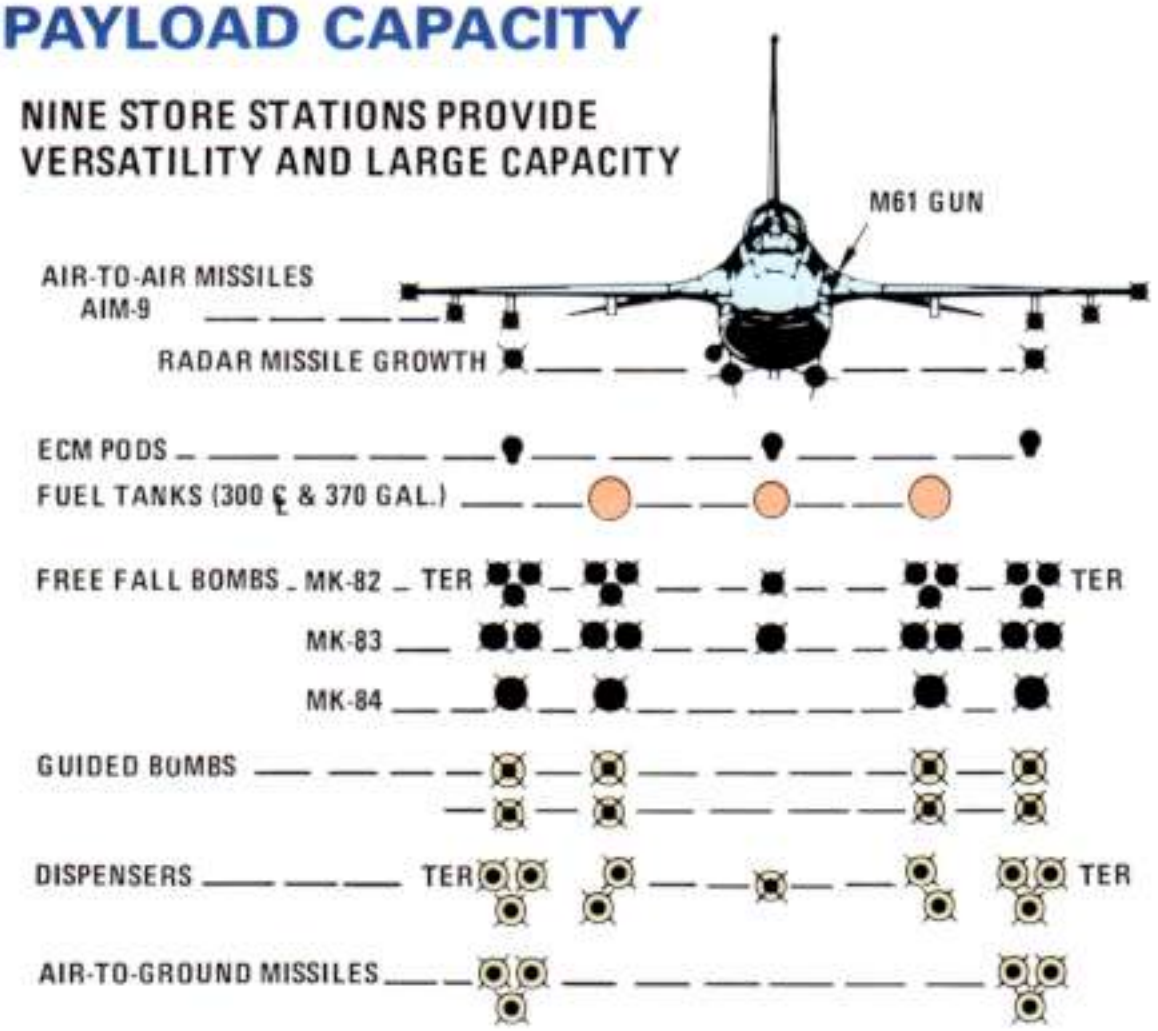
LARGE, VERSATILE PAYLOAD CAPACITY

Nine external store stations have a total carriage capacity of 15,200 pounds. With full internal fuel, the F-16 can carry 10,500 pounds of external stores.

The primary weapons for air-to-air missions are AIM-9 infrared missiles and a rapid-fire (6000 rounds per minute) Vulcan 20mm M61 gun. Six AIM-9 missiles can be carried on external store stations. Four of these stations are dedicated AIM-9 missile stations and need not be down-loaded for air-to-surface missions. The M61 gun is mounted internally in the left-hand strake next to the fuselage and aft of the cockpit and avionic bays.

Although the United States Air Force has no plans to so equip the F-16, there is a demand in the international market for a high-performance fighter with radar missiles. Therefore, F-16 radar-missile compatibility studies are under way at General Dynamics. Wind tunnel and captive flight tests have been conducted. Avionic system interface design is such that with installation of a CW illuminator, essential cockpit controls, and the modification of remote interface units, the F-16 can deliver radar missiles to meet the all-weather air-superiority mission needs of foreign allies.

NINE STORE STATIONS PROVIDE VERSATILITY AND LARGE CAPACITY



CAPACITY (LB)	250	250	2500	3500	2200	3500	2500	250	250
LOAD FACTOR ('g')	9.0	9.0	5.5	5.5	5.5	5.5	5.5	9.0	9.0

HARD POINT CAPACITY = 15,200 LBS

For air-to-surface missions, a large variety of guided and unguided weapons, ECM pods, and external fuel can be carried on the five remaining hard points. A dedicated station is located on the right-hand side of the inlet for mounting a laser target-identification set.

ALL-WEATHER, MULTI-MISSION AVIONICS

Revolutionary decreases in computer size and cost enable the F-16 to achieve air superiority and all-weather air-to-surface attack performance previously thought possible only by much larger aircraft. A digital avionics system exploiting microprocessors provides outstanding accuracy, flexibility and reliability.

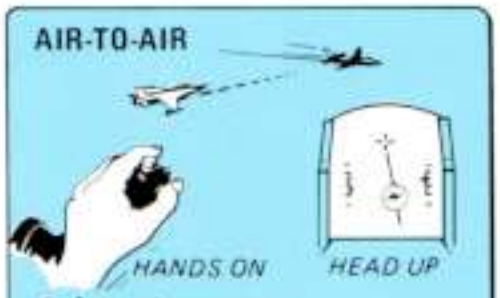
In the air-superiority role, the F-16 radar has an all-weather, lookup and lookdown target detection and tracking capability. Basic air-to-air weapons are the AIM-9 IR missile and the M-61 gun. Dedicated space, power, cooling air, and computational capacity have been reserved for carriage of radar missiles.

The fire control computer is mechanized to calculate dynamic launch zones — including the effects of both F-16 and target maneuvers — for presentation to the pilot on the head-up display. The fire control computer can easily be reprogrammed to accommodate new air-to-air weapons.

In the surface attack role, accurate delivery of air-to-ground weapons under either visual or adverse-weather conditions results from the display of continuously computed impact or release points (CCIP or CCRP). In visual conditions, either free-fall or guided weapons can be selected, as dictated by the target. Under adverse weather, the target or aimpoint is acquired by radar. Target/aimpoint identification is enhanced by pilot-selectable options — expanded (four-to-one) presentation, doppler beam sharpening, sea-clutter elimination, and video freeze.

MULTI-MISSION CAPABILITY

AIR-TO-AIR



- Accurate gunnery
- Look down into clutter
- Automatic radar acquisition
- Single switch entry into air-to-air
- Sidewinder dynamic launch zone computation

AIR-TO-GROUND

SINGLE POINT MODE & WEAPON CONTROL

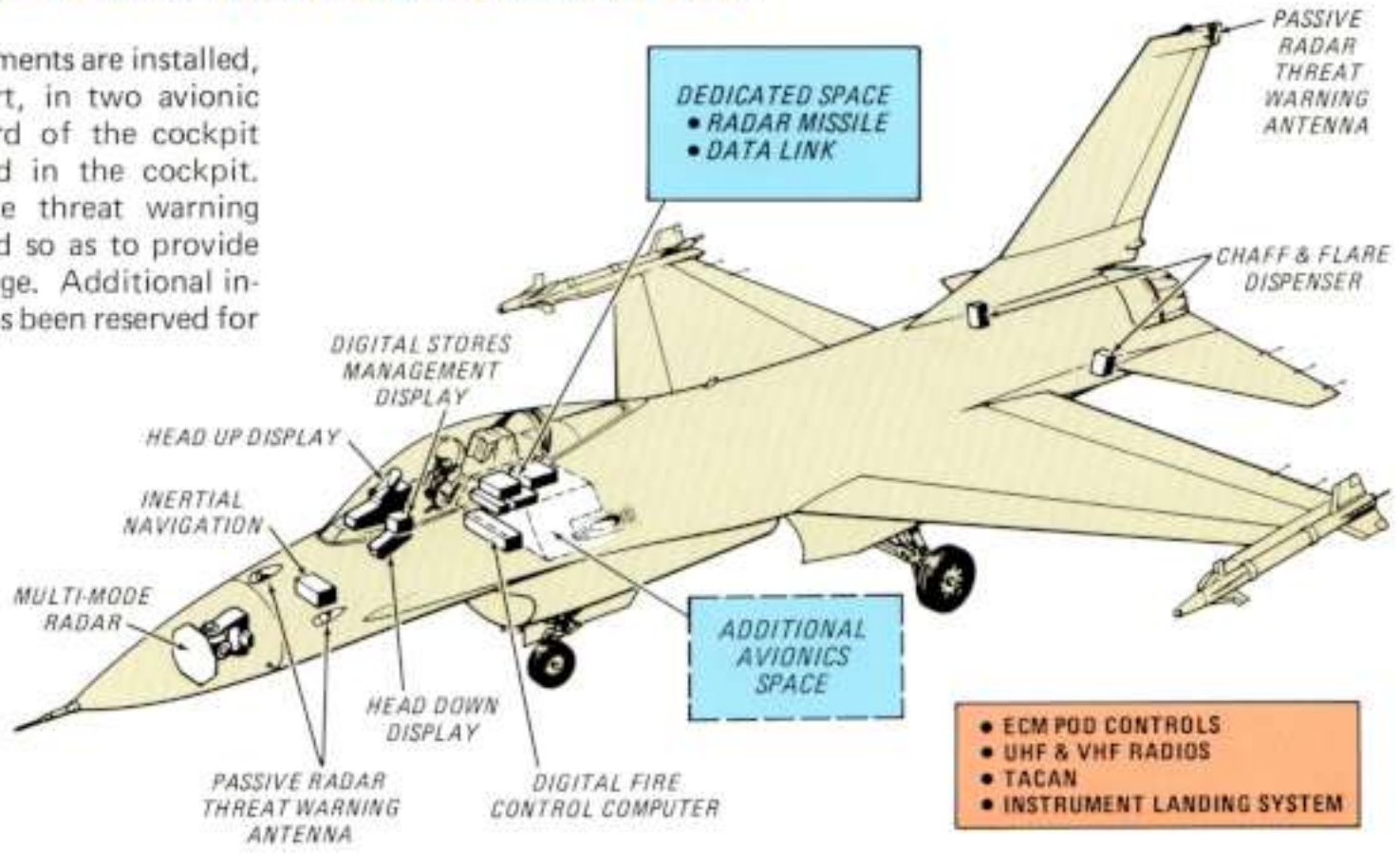
- Accurate weapon delivery
  - *VISUAL*
  - *BLIND*
- Offset and beacon radar bombing
- High resolution ground map
- Guide bombs and air-to-ground missile delivery
- Provision for laser spot receiver

OPERATIONS & SURVIVABILITY

- Standard communications, air-to-ground IFF, TACAN, ILS and inertial navigation
- Threat warning, chaff and flare dispenser and ECM pod controls

EFFICIENT AVIONIC INSTALLATION

Avionic system elements are installed, for the most part, in two avionic bays (one forward of the cockpit and one aft) and in the cockpit. Antennas for the threat warning system are located so as to provide 360-degree coverage. Additional installation space has been reserved for avionic growth.



ONE-MAN OPERATION

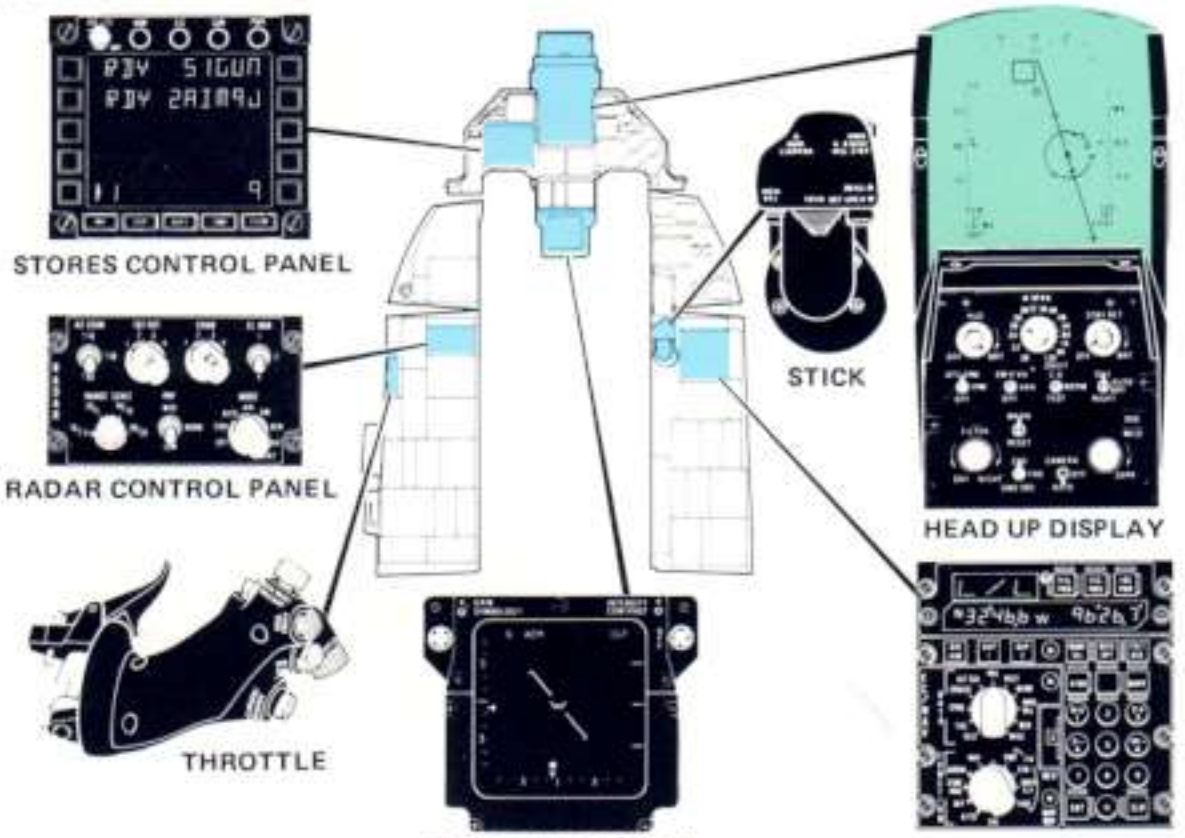
The F-16 fire control system makes for easy, effective one-man operation. Key functions have been integrated to provide the pilot with quick-reaction, fingertip control of displays and weapons from the throttle, stick, and integrated stores management set.

An air-to-surface attack mode, weapons, and weapons options can all be selected simultaneously by depressing only one button on the stores select panel. Other pre-programmed attack combinations are available by depressing only one additional button on the panel, and any of the pre-programmed parameters may be easily changed in flight. EO and radar sensors can be aligned with the target by use of the throttle-mounted cursor control switch and locked to the target for automatic tracking by use of a designate/return search switch on the stick .

Air-to-air modes can be selected by an override switch on the throttle (dogfight/missile override) at any time and, importantly, the exact air-to-ground mode, weapons, displays, and computations at the time of override will be resumed when air-to-air mode is deselected.

Essential avionic controls, the trigger, and the missile release switch are located on the throttle and stick. Other switches are located on either console within easy reach of the pilot.

AIR-TO-AIR AND AIR-TO-GROUND WEAPON DELIVERY CONTROLS AND DISPLAYS



TWO-MAN OPERATION

A two-seat fighter-attack aircraft is frequently desirable for combat conditions where anti-air threat intensity, degraded weather, and rigorous mission requirements enable effective use of an additional pilot. In addition to its usefulness as a trainer, the F-16B provides the capability for effective operations with two pilots. The avionics system capability for the F-16A and the F-16B is identical, and the aft cockpit of the F-16B is configured for both training and combat missions.

The aft cockpit is configured either for an instructor pilot — with a redundant instrument panel for selection of alternate displays of ILS, TACAN, and navigation steering — or for a weapons systems operator with a RADAR/EO display, its associated controls, and the weapon system controls to accomplish the weapon delivery function.

The F-16B has the inherent potential to accomplish special-application missions, such as self-contained laser weapon delivery and certain defense suppression missions, with only moderate changes to equipment and controls.

EFFECTIVE AIR-TO-AIR FIRE CONTROL

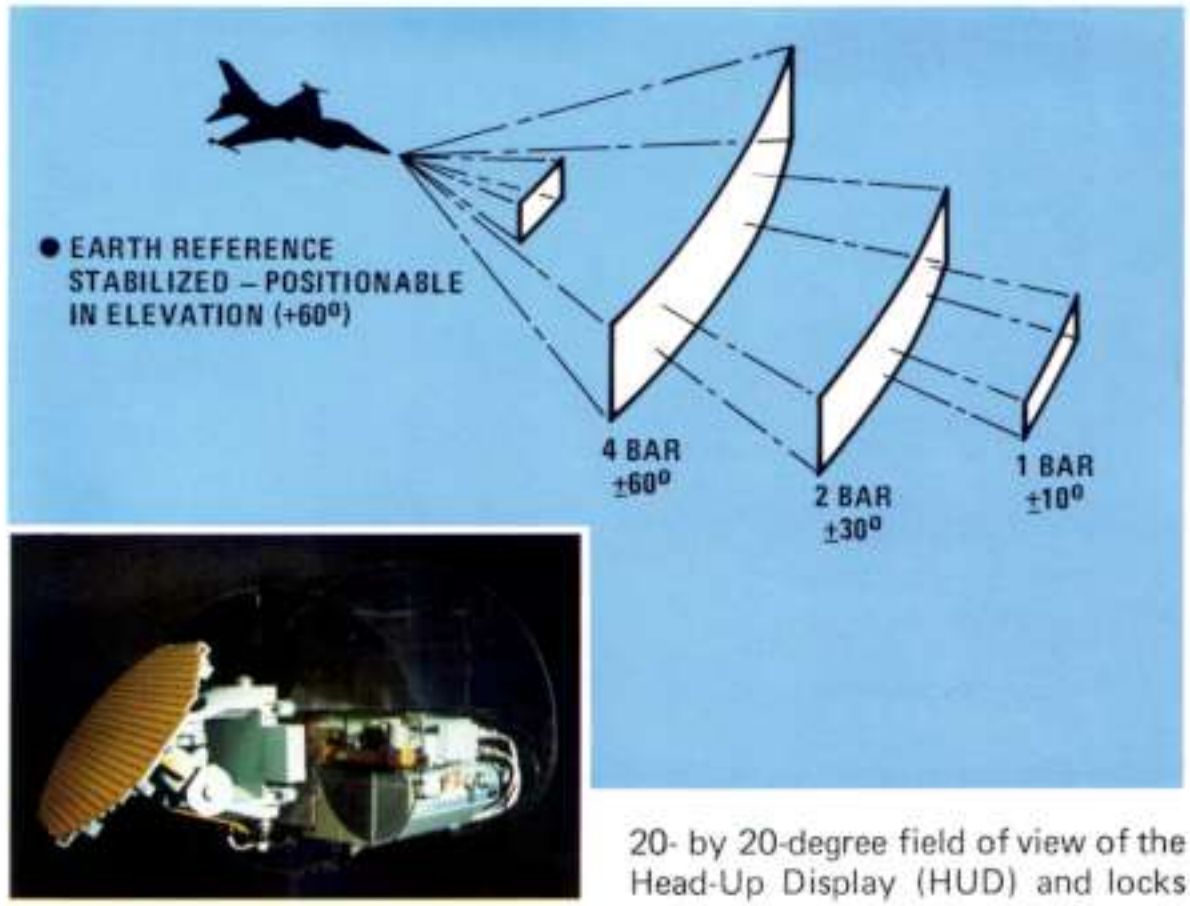
The fire control radar operates in the X-band frequency range to minimize atmospheric degradation. Pulse-doppler techniques using low and medium pulse repetition frequencies eliminate ground clutter in look-down encounter conditions. Scan fields are pilot-selectable from 10, 30, or 60 degrees in azimuth and one, two or four bars in elevation. The fire control radar detection range exceeds that of all known offensive threats.

A missile mode, selectable from the throttle or stores control panel, provides dynamic missile launch zone calculations, thereby increasing missile kill probability over outmoded concepts that provide launch cues for only non-maneuvering targets.

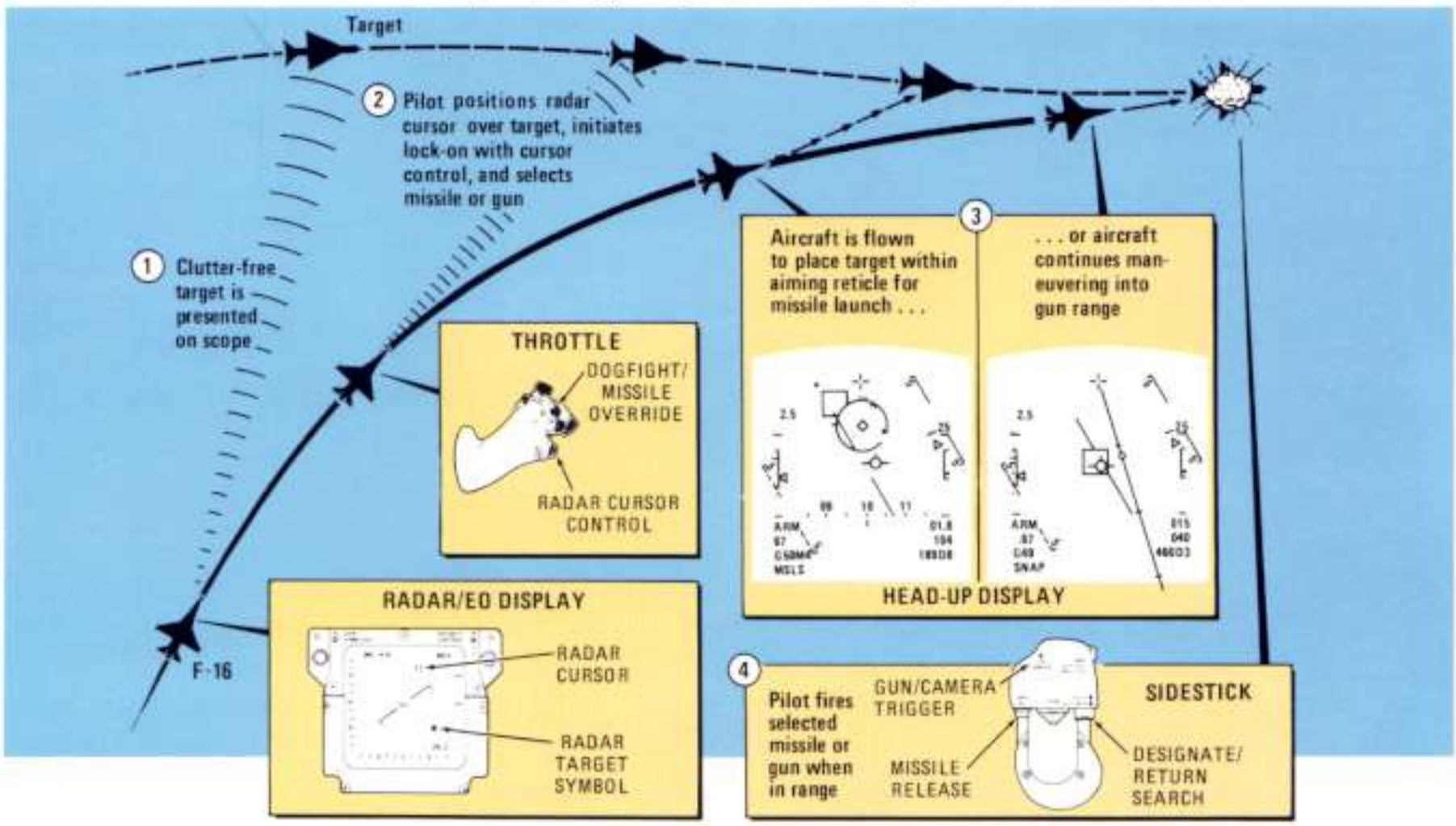
Two air-to-air gunnery modes are selectable from the stores control panel. A snapshoot mode provides electronic tracers for transient firing opportunities. A Lead Computing Optical Sight (LCOS) mode provides a lead-angle computation for encounters where smooth angle tracking of the target is possible.

A dogfight mode, selectable by a switch on the throttle, overrides all other modes for close-in combat. The radar automatically searches a 20- by 20-degree field of view of the Head-Up Display (HUD) and locks on the closest target out to 5 n. mi. Target range, angle, and their rates of change are fed to the fire control computer. Target position, dynamic missile launch zone, and snapshoot gunnery solutions are displayed on the HUD.

RADAR CAPABILITY



AIR-TO-AIR OPERATION . . . Simplified Target Acquisition and Weapon Selection Procedures



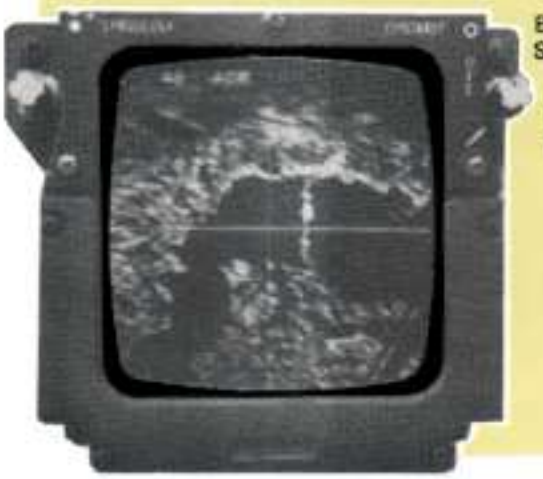
EFFECTIVE AIR-TO-GROUND FIRE CONTROL

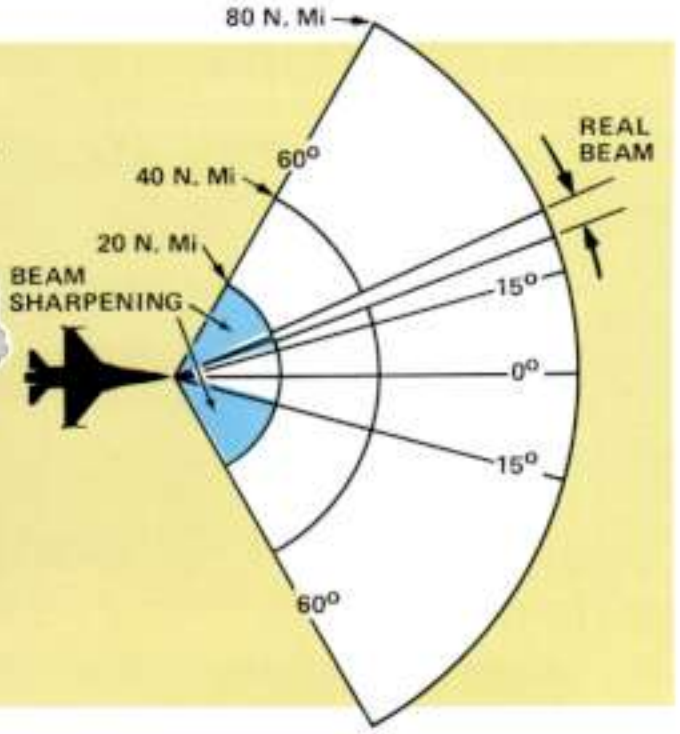
A complete set of visual and blind air-to-ground weapon delivery modes is mechanized in the F-16 fire control system. The fire control computer (FCC) combines range-to-target and altitude above target data (measured by the fire control radar), velocity and aircraft motion data (measured by the inertial navigation unit), and weapon ballistic coefficients (permanently stored in the FCC) to precisely and continuously compute weapon trajectories. This mechanization frees the pilot to maneuver or "jink" right up to weapon release without degrading delivery accuracy.

Under visual conditions the pilot can select CCIP, dive-toss, strafe, or EO weapon delivery modes. In the first three modes, the weapon delivery trajectories are continuously computed and the solutions displayed on the HUD. In the EO weapon delivery mode, the TV sensor image appears on the RADAR/EO display. Weapon lock-on can be achieved when the target is centered under the cursors.

RADAR CAPABILITY

- LOW PRF MODE
- 10, 20, 40 AND 80 NM REAL BEAM SELECTABLE RANGES
- 2.5/10, 5/20, 10/40 AND 20/80 NM REAL BEAM EXPANDED SCALE
- DOPPLER BEAM SHARPENING AT 2.5/10 AND 5/20 NM SCALE





At night and in adverse weather, accurate weapon delivery can be accomplished using radar direct, radar offset aimpoint, or beacon bombing techniques. The fire control radar can provide target or aimpoint radar video in the real-beam groundmap mode, and use of expanded presentation or doppler beam-sharpening modes as appropriate will enhance target definition. Ten target locations with two offset aimpoints per target can be stored in the fire control computer prior to takeoff or enroute to the target area. In the beacon mode, a clutter-free display of ground beacons permits offset bombing of targets with a known range and bearing from the beacon previously positioned by forward observers.

Blind bombing options use the CCRP mechanization techniques. The F-16 is directed to the weapon release point by steering cues displayed on the HUD and the RADAR/EO display. Both lateral steering and time-to-go cues are displayed. When the solution cue coincides with the flight path marker symbol on the HUD, the fire control computer generates a release signal. Weapon release is automatic if the pilot has given consent by depressing the weapon release button on the sidestick.

AIR-TO-GROUND ATTACK FEATURES

DELIVERY	SELECTIONS	CAPABILITIES/WEAPONS
VISUAL	CCIP BOMBS	FREE-FALL BOMBS, LASER-GUIDED BOMBS
	CCIP GUNNERY	M61 STRAFE
	CCIP ROCKETS	2.75 ROCKETS
	DIVE TOSS	FREE-FALL BOMBS
EO	MAVERICK	RADAR/EO DISPLAY OF MAVERICK/VIDEO
BLIND	CCRP & BEACON	BLIND BOMBING WITH RADAR GROUND MAP (Doppler Beam Sharpening, Real Beam, or Sea-Clutter Rejection Modes) LASER SPOT TRACKER, OR GROUND RADAR BEACON

ACCURATE NAVIGATION AND WEAPON DELIVERY

DESIGNED FOR HIGH READINESS AND RELIABILITY

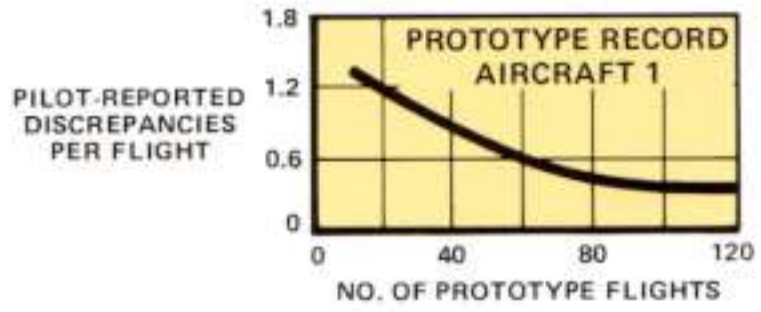
USAF OPERATIONAL DESIGN GOALS FOR F-16

(2 YEARS AFTER IOC)

• SORTIES PER DAY	
• Sustained Operations	1.5
• 30-Day Surge	2.0
• Short-Duration Surge	4.0
• TURNAROUND TIME (Minutes)	
• Simultaneous Actions	15
• Consecutive Actions	30
• MISSION RELIABILITY	90%
• DIRECT-MAINTENANCE MANHOURS/FLIGHT HOUR	12
• MEAN FLIGHT HOURS BETWEEN FAILURES	2.9
• ENGINE CHANGE TIME (Minutes)	30

INFLIGHT REFUELING

RELIABILITY THROUGH PROTOTYPING



The F-16 is designed to meet high operational readiness and reliability goals. These goals necessitate high systems reliability and expedient repair of reported discrepancies. To provide the Air Force with the assurance that these goals will be met a mission reliability of 85 percent and an MFTBF of 1.75 hours was required to be demonstrated early in the program.

The design concepts of simplicity and use of off-the-shelf equipment that were used so successfully during the prototype stage have been adhered to during the production program. The F-16 uses fuel pumps, hydraulic pumps and the M61 A1 cannon used on the F-111. The F-16 also uses the F100 engine, which was developed for and proven on the F-15. The F-16 head-up display concept was previously proven on the A-7D. Approximately 65 percent of the 500 F-16 hardware components are either currently in service on other aircraft or are minor modifications to proven components; 35 percent are new development items. Some of the modifications to in-service equipment were made to correct known reliability deficiencies. New development items were subjected to severe reliability testing prior to approval for use on the F-16.

A strict adherence to obtaining performance with a minimum of complexity was observed to reduce the number of components that can fail. Where redundancy or back-up modes are required to insure flight safety or mission completion, the necessary components to meet these requirements have been incorporated.

The YF-16 prototype program provided data for verifying equipment design and pinpointing potential hardware improvement areas. The YF-16 experienced rapid and significant improvements in discrepancy rates during the flight test programs. This

improvement can be attributed to an aggressive reliability program which emphasized analysis of failure data, identification of reliability problem areas, and prompt design action to eliminate the problem areas.

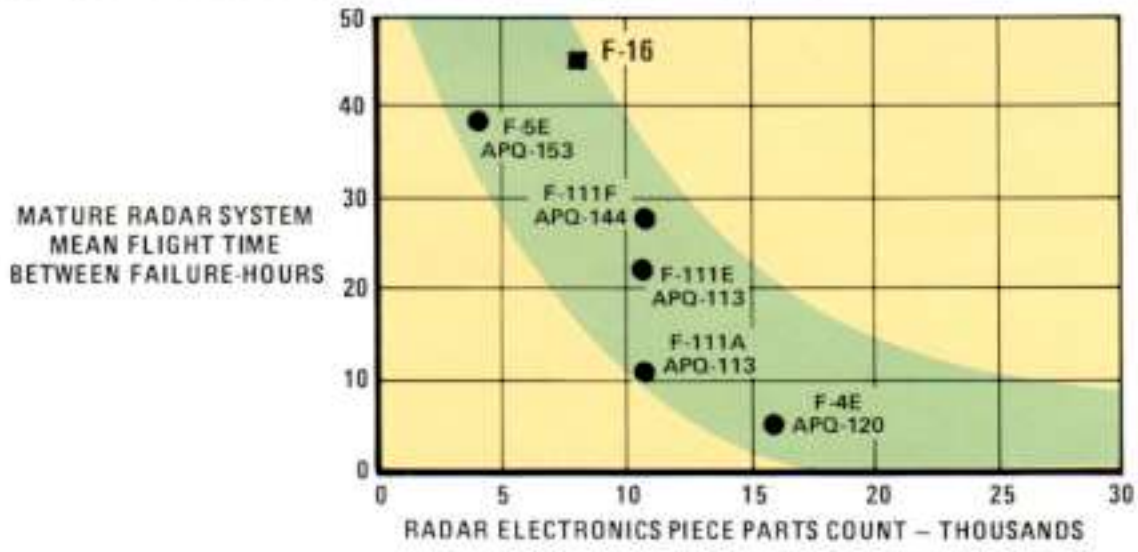
Historically, avionic components have been among the most unreliable equipment on operational aircraft. Radars, because of their large number of components and system complexity, have had very high failure rates. By the use of solid-state electronic technology and by decreasing the number of piece parts, a major increase is realized in the time between failures of the F-16 radar system. The same techniques for increasing reliability have been applied to all F-16 avionic components.

A primary cause for avionic equipment failures has been their exposure to operational environmental conditions such as large fluctuations in temperature and vibration modes. The approach to these problems on the F-16 was to stabilize the avionic compartment and internal equipment temperatures, to procure high-reliability qualified piece parts, and to require extended-time laboratory testing of components and subsystem assemblies.

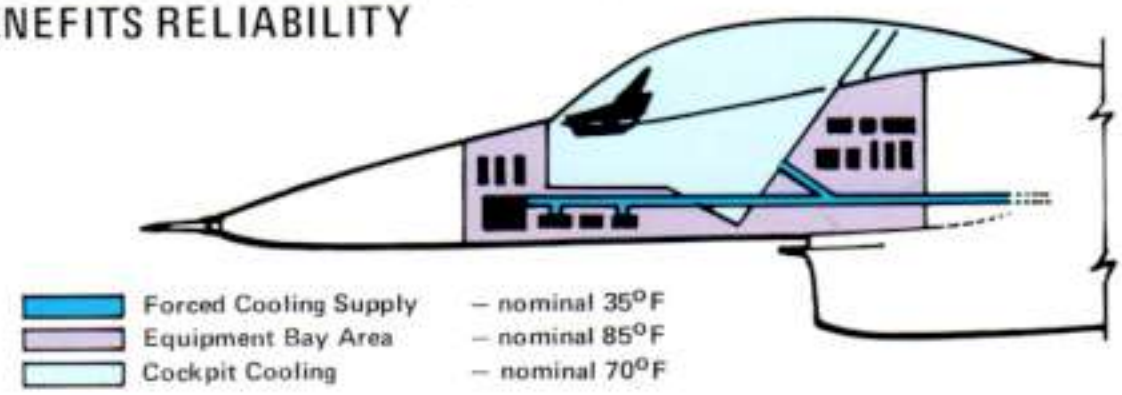
The F-16 environmental control system — by regulating airflow and supply temperatures — minimizes equipment failures induced by thermal shock and cyclic fatigue.

High-reliability piece parts that have undergone rigorous inspection screening, process conditioning, extended burn-in time at elevated temperatures, and life tests at maximum rated conditions are used in avionic equipment to insure high reliability. Multiple qualified sources with high-volume production and lot qualification testing insure an uninterrupted supply of high-quality piece parts.

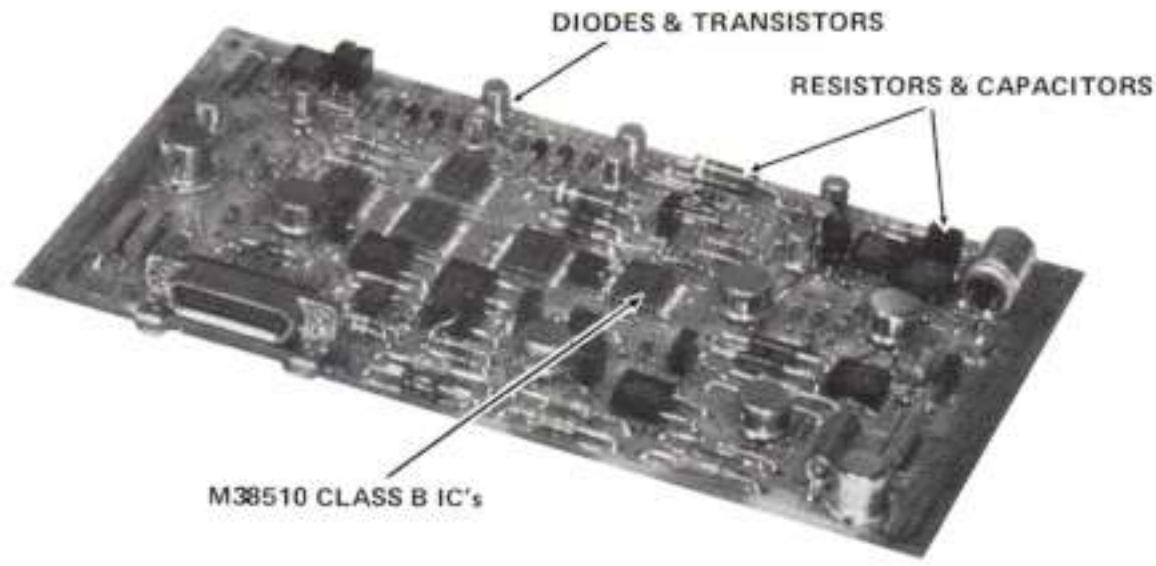
REDUCED COMPLEXITY AND SOLID-STATE TECHNOLOGY BENEFIT RADAR AND OTHER AVIONICS RELIABILITY



STABLE ENVIRONMENT FOR ELECTRONICS BENEFITS RELIABILITY



HIGH RELIABILITY PIECE PARTS



Completed equipment using high-reliability piece parts is then subjected to rugged extended-time environmental tests, including rapid thermal excursions and vibration tests, in laboratories prior to qualification. The radar, during its development, was subjected to additional reliability testing that consisted of random vibration and humidity, altitude, temperature, and on-off cycling. Reliability acceptance testing provides early detection and correction of problems and verifies continued reliability throughout equipment life.

LOW MAINTENANCE NEEDS

F-16 maintenance requirements have been minimized by the use of extensive built-in-tests, self-tests, and status indicators, and by the provision of quick-access panels for inspection and maintenance. These features reduce trouble-shooting time and the maintenance skill levels required at the organizational level.

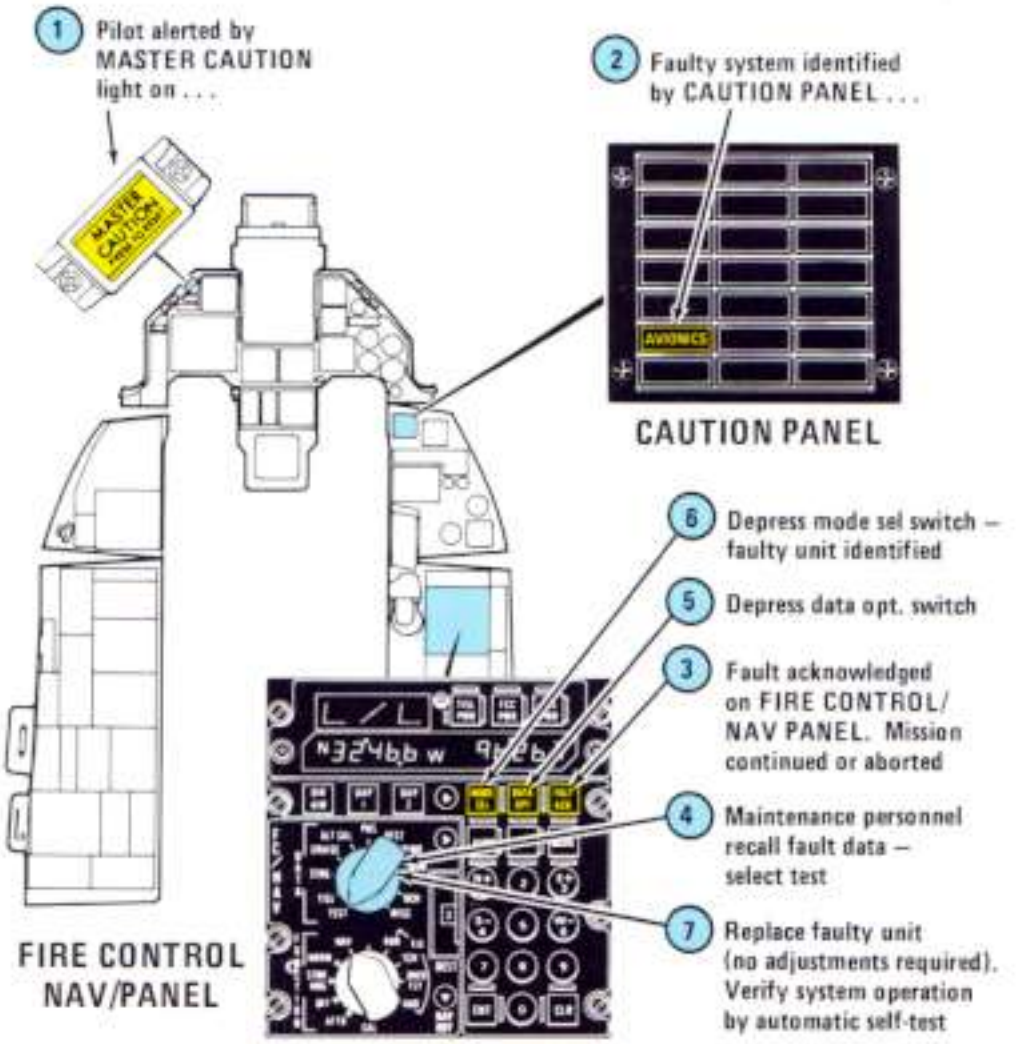
AVIONIC SYSTEMS

Faults detected in the avionic systems are stored in the fire control computer. Those that are of interest to the pilot are indicated by a caution and warning system. All fault data – that displayed to the pilot and that stored in a maintenance fault table for identification of the faulty line replaceable unit (LRU) – can be recalled on the ground by maintenance personnel. No adjustments are required when faulty units are replaced, and the built-in test can be used to verify that the fault has been corrected.

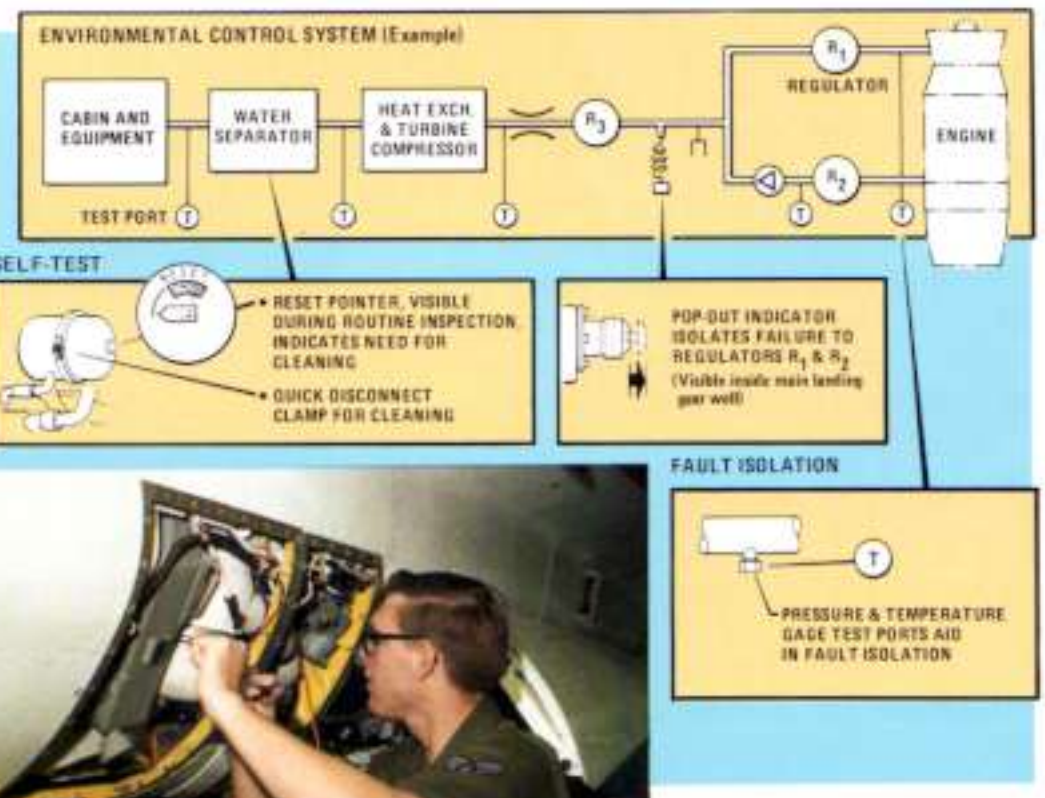
MECHANICAL SYSTEMS

Pop-out indicators, wear indicators, pressure gages, and other mechanical indicators are used to determine the status of many mechanical systems. For example, the environmental control system uses a pop-out indicator to indicate a failure of one of the two pressure regulators and a pointer is used to indicate status of the water separator/filter for cockpit air.

ADVANCED SELF-TEST AND FAULT ISOLATION MINIMIZE MAINTENANCE SKILL NEEDS



MECHANICAL SYSTEMS INCORPORATE SELF-TEST/ FAULT ISOLATION – Minimizes Maintenance Skill Needs



EASY TO INSPECT

QUICK ACCESS FOR MAINTENANCE

MODULAR ENGINE, ON-AIRCRAFT MAINTENANCE

The F100-PW-200(3) engine incorporates the latest innovations to enhance both maintainability and reliability. Internal inspection of the engine installed in the aircraft can be made through six borescope ports. Access to these ports is through quick-access panels. An engine event recorder provides a history of over-temperature or overspeed conditions. The on-aircraft inspection and event recorder eliminates the need for engine removal disassembly and inspection except when required to replace a defective module.

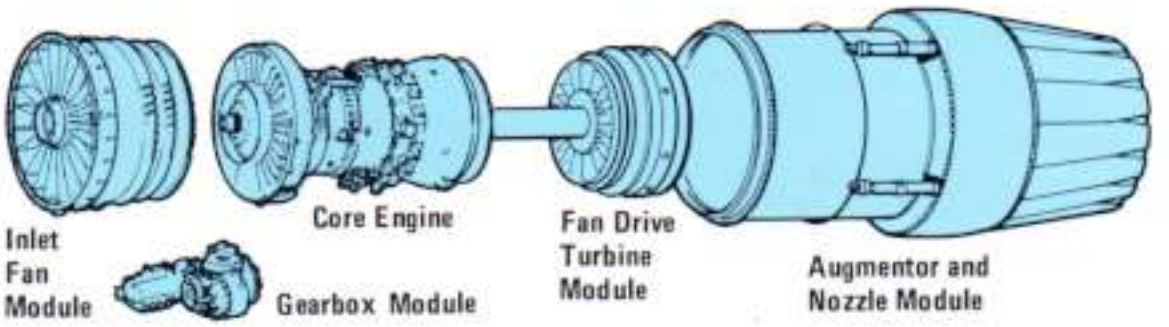
The modular concept not only saves maintenance man-hours, but also reduces the number of engines in the "pipe-line" between repair facilities and operating bases.

ACCESSIBILITY

Good access makes repair and replacement easy to do correctly and quickly. Quick-access panels and hinged doors were selected on the basis of the characteristics of the enclosed equipment. Avionic equipment requiring a high frequency of repair or replacement is located behind hinged access doors.

Equipment requiring daily inspection — electrical receptacles, oxygen servicing, hydraulic system gages, fuel pump status indicators, etc. — are located at eye level in wheel wells or behind quick-access panels.

FIVE INDEPENDENT ENGINE MODULES



EASY ACCESS TO AVIONICS

ACCESSIBILITY

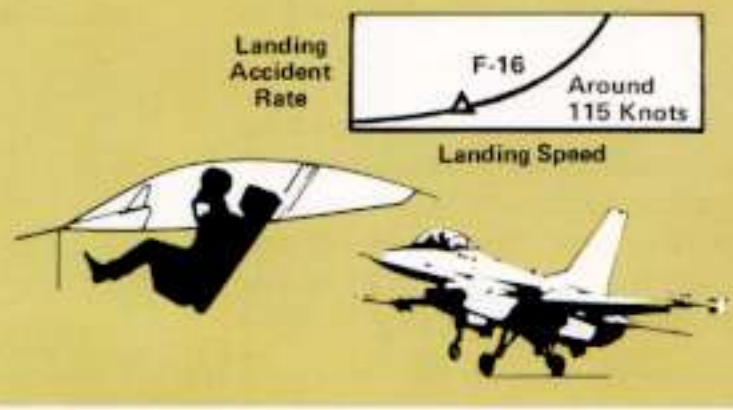
- **60% OF SURFACE REMOVABLE**
  - *REMOVAL TIME*
    - *Quick-access hinged doors — less than 1 min. each*
    - *Hinged doors with quick-acting structural fasteners — 3-10 min. each*
    - *Removable structural panels — 6-62 min. each*
- **228 ACCESS DOORS**
- **80% OF EQUIPMENTS ACCESSIBLE FROM GROUND LEVEL**
- **ONLY 4 TOOLS REQUIRED**

F-16 IS DESIGNED FOR SAFETY...

Analysis of fighter safety shows that accidents have been reduced by a factor of 20 from the time that modern jet fighters were first introduced into the U.S. Air Force. Part of this tremendous improvement in peacetime safety is an increased awareness of what causes accidents and how design and operations can eliminate these causes. Designers of the F-16, working closely with USAF and other governmental safety experts, have produced an effective fighter that is expected to have an outstanding safety record.

A LOW LANDING SPEED

- Variable wing camber, wing-body blending, and low wing loading produce a low-speed landing.
- Bubble canopy with head-up displays and head-out-of-the-cockpit flying provides excellent visibility.
- High-energy-absorbing-capacity carbon disc brakes with adaptive anti-skid and locked-wheel protection ensures safe ground-speed control and braking.



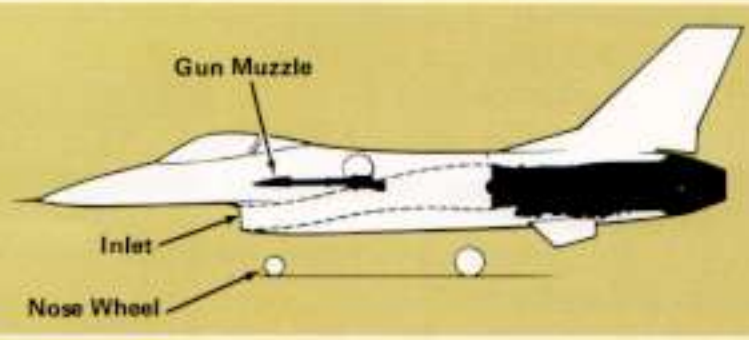
A MATURE, PROVEN ENGINE

- Nearly 400,000 flight hours (F-15 and F-16) preceded production delivery.
- Events recorder permits early detection/corrective action for hot-start, overspeed, and overtemp conditions.
- Borescope ports enable on-aircraft internal inspection.

P&W F100-PW-200(3)

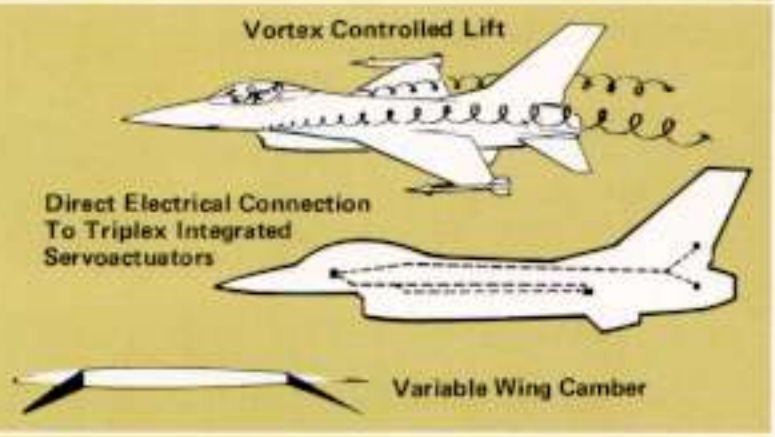
AN EFFECTIVE ENGINE/AIRFRAME INTEGRATION

- Fixed air inlet forward of nose wheel.
- Gun muzzle aft of inlet.
- Retained fasteners forward of inlet.



A NEW CONCEPT IN FLIGHT CONTROL

- Aerodynamic tailoring – vortex-controlled lift and automatic variable wing camber reduce buffet and improve directional stability.
- Quadruplex flight control electronics, sensors, and electrical power supplies insure transmission of pilot's control commands (no cables and linkages to jam).
- Automatic angle-of-attack and overstress limiting prevent loss of control and/or structural damage.



OTHER SAFETY FEATURES

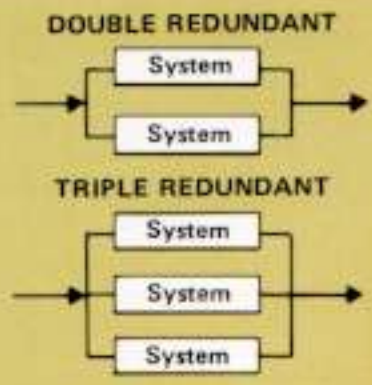
- Reliability through separation and redundancy:

Double-redundant systems
- *Hydraulic power*
- *Fuel transfer*
- *Brake control*

Triple-redundant systems
- *Fuel tank overpressurization protection*
- *Air-data static and impact pressure sensors*

Separate warning and power circuitry

- Emergency provisions: – Pneumatic landing gear extension – Emergency electrical and hydraulic power – Jet-fuel-starter-assisted engine air restart – Zero-altitude/zero-velocity ejection seat

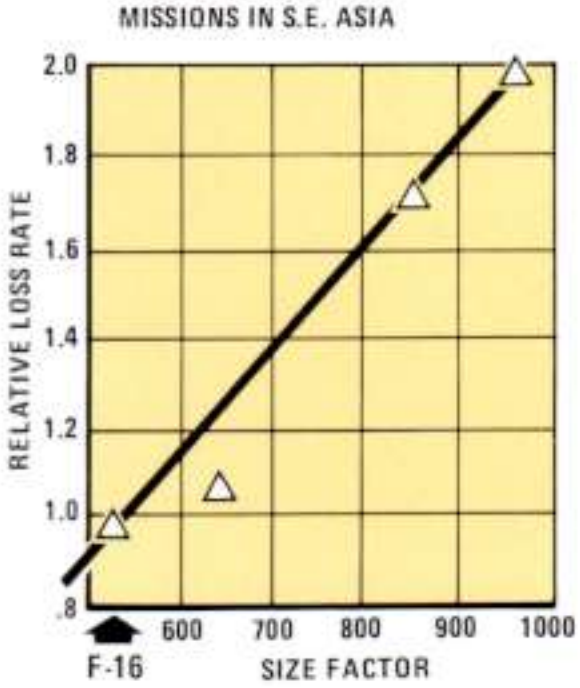


EXCELLENT COMBAT SURVIVABILITY

The F-16 weapon system has many features which enhance its ability to avoid hits and to survive after being hit.

Combat experience has demonstrated the value of small size, threat awareness, speed and agility, and countermeasures to avoid being hit. The F-16 is a small aircraft with a smokeless engine for reducing visual detection. Its 360-degree threat warning system and the excellent visibility from its "bubble" canopy reduce the probability that an F-16 pilot will be caught unaware. Its high thrust-to-weight ratio, low wing loading, and 9-g structure provide acceleration, speed, and agility to counter threat aircraft and SAMs. It carries both chaff and flares internally with provisions for external carriage of electronic countermeasure pods.

HARD TO SEE, HARD TO HIT



If hit, the F-16 will be a tough aircraft to down. Damage tolerance has been achieved by proper material selection, redundancy in flight-critical systems, separation of redundant systems, and special vulnerability reduction techniques.

The aircraft structure is simple and rugged, having multiple load-carrying paths. The metal for the lower wing panel – a 7475 aluminum alloy – was selected for strength and damage tolerance. The quadraplex control system provides multiple, separate channels for flight control survivability; there are no cables or linkages to jam.

Hydraulic, electrical, and fuel feed systems are redundant and separated. An explosion suppression system (fuel tank inerting) is incorporated.

The combination of hit avoidance and damage tolerance results in a highly survivable aircraft for operation in current and projected environments.

HIGH VISIBILITY BUBBLE CANOPY

SURVIVAL ENHANCEMENT FEATURES

SUMMARY

The United States Air Force selected the F-16 as the winner of the Air Combat Fighter competition in January 1975. This selection was made because of the F-16's overwhelming performance and life cycle cost advantages over its competitor. Six months later, the F-16 was selected by the air forces of Belgium, Denmark, the Netherlands, and Norway (European Participating Governments - EPG) to modernize their fighter forces. Along with the Air Force selection came the beginning of a unique co-production program where the EPG's industries would share in the manufacturing of the F-16.

This has truly been a success story with the four EPG countries and the U.S. producing the newest tactical fighter aircraft in the world. The program has been on time and on cost. Over 200 F-16s have been produced off three production lines with an unsurpassed quality mark being achieved at Fort Worth where over 48 aircraft have been delivered with zero defects.

In August 1978 the government of Israel announced the selection of the F-16 as the newest addition to its fighter force. Seventy-five aircraft were designated for the first buy with a potential for additional aircraft at a later date.

The F-16 is now in operational status with the air forces of the United States, Belgium, Denmark, the Netherlands, Norway, and Israel. The F-16 is slated for incorporation into the Egyptian Air Force in early 1982.

Nations purchasing the F-16 benefit by the substantial upgrading of proven multirole combat capability. The F-16 has demonstrated its superb close-in dogfight ability during many exercises in the United States and NATO. 'The F-16 is unbeatable' are the words coming from the pilots of other new sophisticated aircraft.

The F-16's ability to generate sorties and be mission-capable has surpassed the number predicted by the U.S. Air Force. The EPG countries are also very pleased with the F-16's ability to meet the European sortie requirements even under adverse weather conditions.

The F-16 is a proven system operating within six air forces and offers other nations purchasing the F-16 a demonstrated operational capability as well as on-time, on-cost aircraft deliveries.

F-16

THE CHOICE OF SEVEN AIR FORCES. . .

U.S. Air Force

Belgian Air Force

Royal Danish Air Force

Royal Netherlands Air Force

Royal Norwegian Air Force

Israeli Air Force

Egyptian Air Force

F-16

...Fighting Falcon

GENERAL DYNAMICS

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