The 111 LOG’s main purpose is to keep its readers posted on news about F-111 aircraft as well as the latest on methods and procedures being used in support of the F-111 Program.

With this thought in mind, we begin this issue with an article entitled “Demonstrating the Structural Integrity of the F-111.” The article explains how the F-111 fleet is currently undergoing an inspection and ground test program that is unprecedented in aviation history. Moreover, the article explains how tortuous loads bend the aircraft’s wings to a total of 5.5 feet - all while the aircraft is at -40°F.

This issue’s second entry is a story about the F-111’s dual-circuit hydraulic-powered wheel brakes. The system’s intricate arrangement, and how the system stops the F-111 in less than 2,000 feet without the aid of thrust reversers, are explained in “The F-111’s Brake Control System.”

Next, we present an article called “FB-111A High Lift Devices.” This feature reveals just what makes the FB-111A’s high lift system function; how the system permits added lift at low speeds; and, how the system reduces the aircraft’s takeoff and landing distances.

Accurate engine trim is an absolute necessity for satisfactory propulsion performance. The “F-111 Engine Trim” story explains in detail how to achieve the proper engine trim for 111 aircraft. The story also explains what equipment is needed, as well as some of the perils of an improperly trimmed engine.

And last, but not least, we present Facts and Figures and an up-to-date 111 Logistic Field Directory. Without them, the 111 LOG would be incomplete.

A final note – Beginning with this issue, the 111 LOG will be published four times annually.
Demonstrating the Structural Integrity of the F-11 Eleven
The F-111 fleet is currently undergoing an extensive inspection and ground test program that is unprecedented in the aerospace industry. Specifically, the program serves to demonstrate the aircraft's structural integrity.

The program was initiated following the loss of an F-111 in late December. A thorough investigation of the accident disclosed evidence which conclusively confirmed the loss was due to an extremely rare cause; that of structural failure of a critical component due to an undetected forging flaw. A special committee of the Air Force Scientific Advisory Board, however, recommended that the F-111 fleet be subjected to an inspection and ground test program. In turn, the General Dynamics' Fort Worth division geared itself to prove unequivocally the integrity of all the aircraft's critical parts.

Basically, the program consists of inspection of critical structural members of the aircraft with nondestructive inspection (NDI) techniques, and
ULTRASONIC DELTA SCAN

TRANSMITTER/RECEIVER

GATE

INITIAL PULSE

FLAW

EXT. SIGS.

DETECTABLE FLAW SIZE – 0.030" x 0.015"

MAGNETIC PARTICLE

ULTRASONIC SHEAR WAVE

DETECTABLE FLAW SIZE...

0.060" x 0.030"

X-RAY

IMAGE QUANTIZER

OBSERVE RECORD

DETECTABLE FLAW SIZE...

2% MATERIAL THICKNESS

NONDESTRUCTIVE INSPECTION TECHNIQUES
proof-load testing at a -40°F temperature. On the surface, the program sounds simple; however, the task is really quite complex for no other aircraft in aviation history has undergone the extensive inspection and rigorous testing to which the F-111 is currently being subjected.

In proof-tests, the aircraft is subjected to loads that are equal to the maximum stress conditions for which the aircraft was designed. Proof-tests are made with simulated flight conditions at -40°F in special “igloo” facilities. Only four of these special facilities are in existence; two are located at Fort Worth, Texas, one at Waco, Texas, and one at Sacramento, California.

The program task sequence begins with the purging of each aircraft’s fuel tanks. Next, to assure that no inherent material defects exist, each aircraft is given a thorough inspection with new NDI techniques. These techniques include X-ray, magnetic particle, magnetic rubber, ultrasonic shearwave, and ultrasonic deltascan. (See Figure 1.) Inspection requires removal of portions of the aircraft such as access panels, the upper and lower fairings on the wing pivot fitting, the aft main landing gear door, the speed brake door, the horizontal tail, the arrest hook, wing carry through box access provisions, and the fuselage upper longeron.

After a visual inspection, critical parts are inspected with the most unique of the NDI methods – the ultrasonic deltascan. Deltascan permits detection of flaws in a part by sending high-frequency sound waves at an angle into the metal. Ultrasonic deltascan is one of several technological innovations that have resulted from the inspection portion of the program.

To make effective use of the downtime required for the inspection and ground test cycle, each F-111 undergoes a modernization task in conjunction with the program. The access gained to the aircraft for the nondestructive inspection permits modernizing each aircraft to the most recent customer requests. The modernization task includes making certain required structural changes, updating the penetration aids system, nuclear circuitry modification, and other improvements.

Upon completion of inspection and modernization, each aircraft is reassembled and prepared for proof-load testing. In the preproof stage, certain assemblies are replaced with test fixture hardware and instrumentation equipment. Once this stage is completed the aircraft is ready for the “igloo” (cold chamber) and actual testing.

Actual testing – applying positive and negative loads to the wings and fuselage – takes only a little over 40 minutes. However, the involved procedure of rolling the aircraft into position, then aligning, attaching hydraulic load rams, installing, instrumenting, freezing, testing, and warming it requires about 15 hours.
The operation begins when an F-111 is rolled into the 85 x 58 x 24-foot test chamber, which is at room temperature. Once inside the chamber, supports and hydraulic rams are attached and instrumenting gets underway. A total of about four hours are necessary to prepare the aircraft for testing. Next, to create the “igloo” atmosphere, liquid nitrogen from a 28,000-gallon tank is pumped through five lines into the test chamber. The nitrogen, at a -320°F in its liquid form, “boils off” or vaporizes as it passes into the warm test chamber. Thus, within about three hours, the chamber is chilled to a -65°F; in about five hours, the structure being tested reaches the desired temperature of -40°F.

An arrangement of hydraulic rams which bend the wings during proof load is clearly shown in this closeup photo of the wing.

In this photo, an F-111 is shown during the chilling process in the cold chamber at the Fort Worth division.
Torturous loads are then applied to the aircraft's wings, which are fixed at 56 degrees sweep. Negative loads of 2.4 g's pull the wings downward one and one-half feet below normal. Positive loads of 7.33 g's raise the wings four feet above normal. Roughly a total sum of about 245,000 pounds upload and 109,000 pounds download force the wings to bend a total of five and one-half feet — all while the aircraft is at -40°F.

After the tests, the test chamber is slowly warmed up above the dew point or to about 80°F. This procedure slowly warms the airplane to assure that moisture doesn't accumulate in the aircraft's systems and structure.

Next, the aircraft is again thoroughly inspected. Test fixture hardware is removed and the aircraft is reassembled and restored to flight status.

Finally, each aircraft is given a complete operational checkout. All systems are carefully tested. Before returning to the Air Force, each aircraft is given three checkout flights; two company flights and one Air Force acceptance flight.

To date, the inspection and ground test program has not produced evidence of any structural flaws. In fact, the extensive inspection and rigorous testing have only proven to be another first in the F-111's history. General Dynamics has accepted its responsibility and is unequivocally demonstrating the aircraft's structural integrity. F-111s are undauntedly withstanding all tests and returning to the Air Force inventory as a proven product for the men who fly them.
The F-111’s Brake Control System

Figure 9. Multiple Disk Brake
The F-111 must land on short-runways; consequently, it requires an exceptionally effective brake control system which will stop the airplane with maximum reliability under all practical conditions. The brake control design features necessary to meet this and other requirements are summarized as follows:

- Proportional brake control
- Differential brake control between left and right wheels
- Emergency and power-off brake operation with proportional and differential control
- Redundant circuitry for brake control with any single malfunction or failure
- Anti-skid control under normal and emergency (power-off) conditions
- Brake control for parking

- Automatic post take-off main landing gear wheel spin arrestment.

System Description

Analysis of several control system configurations and arrangements resulted in the selection of a dual-circuit hydraulic-powered brake control arrangement. All valve components of this system are integrated together in a single compact package which weighs only 12 pounds and provides all the necessary functions. (See Figure 1.)

Normal Operation

Single source power to operate the brake control unit is supplied by the aircraft's utility hydraulic system at 3100 psi, and is divided between two independent circuits. Check valves within these circuits prevent cross-flow. Power
actuating pistons, in a right or left brake assembly.

**Proportional Control**

A mechanically actuated spool in each of four metering valves provides output braking pressure proportional to the input force with output pressure force feedback to a reaction spring. The mechanical control which transmits brake pedal forces to the levers of the control unit includes a spring loaded overtravel link. This link limits the pedal input force to that which provides the desired maximum normal operating pressure and produces an operating characteristic approximately as shown in Figure 2.

**Differential Control**

The right and left brakes are controlled independently by separate linkage from the brake pedal to the brake control unit actuating levers. Each lever actuates two metering valves which supply control pressure from each hydraulic circuit to the applicable brake assembly. Individual brake control permits unlimited differential braking within the normal operating range.

**Emergency and Power-Off Operation**

Accumulators provide power for brake control when the utility hydraulic system is inoperative due to either an in-flight system failure or ground handling. Each accumulator supplies fluid to its respective control circuit. Should the normal source of power fail during the critical seconds of the landing roll, transition from normal to emergency operation is automatic; hence, the pilot needs to do nothing.

Using accumulators as the stored energy source for emergency operation requires all hydraulic components of the brake control package to have extremely low internal leakage characteristics. The reason for this is that to obtain the volume necessary for emergency braking, all leakage must be made up by proportionately larger accumulators. The amount of fluid which must be stored for long-duration F-111 flights, coupled with "normal" leakages for the number of valves contained within the control package, would require accumulators of intolerable size and weight that would penalize the system. For this reason, the maximum allowable internal leakage for the brake control unit (exclusive of skid control components) is an exceedingly low 0.45 cc/minute.
Redundant Circuitry

Parallel hydraulic circuitry provides redundancy for adequate braking in case of failure. Should a single or double failure result in loss of the utility power system and one of the brake accumulators, the other accumulator will provide braking. When only one of the dual control circuits is operative, the brake pressure at equal pedal force is automatically regulated to nearly twice the normal value. This is a secondary design feature, but one which contributes significantly to the overall brake control system effectiveness.

Anti-Skid Control

The F-111 is designed with an adaptive skid control system to provide the required braking for short-runway operations under all weather conditions. The system supplies proportionally controlled pressure to the wheel brakes by means of a two-stage pressure modulating servovalve for each brake, a solid state electronic control box, and two generator-type wheel speed sensors. Each of the skid control servovalves bolts directly on to the brake control unit. Moreover, each contains two second-stage modulating spools controlled in unison by a single first-stage pilot valve. The pilot valve is a proportional position, solenoid-driven spool and sleeve valve. This design was selected over the conventional flapper-nozzle and jet-nozzle pilot valves for its low internal leakage characteristics.

Incipient tire skidding, from excessive brake pressure, detected by the wheel speed sensor, is converted by the control box into a dc voltage and applied to the skid control valve solenoid. The voltage magnitude is proportional (up to a maximum of 28 volts) to the severity of the skid and through the servovalve results in a proportionate decrease in the applied brake pressure, avoiding a skid. For a short interval, the electronic control circuit maintains the nominal brake pressure at the reduced level, preventing immediate recurrence. Other features such as locked-wheel protection and automatic deactivation are incorporated into the skid control system to enhance the overall brake system operation. A detailed discussion of these items is beyond the scope of this treatise and will be presented in subsequent issues.

Parking Controls

Parking brake control is provided by a mechanically actuated three-way, two-position selector valve of tandem design. When the valve is actuated, fluid from both accumulators is routed through shuttle valves directly to the brakes. Normal metering and skid control components are bypassed and accumulator fluid leakage is minimized. A handpump is provided to replenish accumulator fluid during ground handling operations.

This mode of operation does not provide proportional or differential brake control and, except in extreme emergency, is not used while the airplane is in motion. If, while operating in the power-off mode, excessive braking activity results in premature depletion of the accumulator fluid, the priority valves will close when supply pressure drops to approximately 1000 psi. No further braking action can be obtained by depressing the brake pedals. Closing the priority valves reserves a fluid quantity sufficient for approximately eight brake applications which, at the pilot’s discretion, can be obtained by actuation of the park selector valve.

Wheel Spin Arrestment

The main landing gear wheel spin, which occurs after take off, is automatically stopped before the wheels can be retracted. Landing gear retract pressure fluid is ported to a pair of control pistons concentric with and acting on the input shaft of two brake pressure metering valves. These control pistons displace the metering valves enough to port approximately 750 psi fluid to the respective piston groups in each brake. The brakes are released when the landing gear retract circuit is depressurized.

Operational Experience

Actual service experience with the wheel brake control system has completely fulfilled all expectations. During many months of flight test operations involving hundreds of aircraft flights the brake control system has performed faultlessly. The F-111 has consistently stopped in less than 2000 feet during routine landing operations without benefit of thrust reversers or deceleration parachute. Landing operations performed with an inoperative utility hydraulic system have demonstrated the adequacy of the emergency accumulator provisions. Perhaps the best testimonial, however, comes from F-111 pilots who have lauded the “excellent brake control system.”
During takeoff and landing, the high lift devices on an aircraft provide high lift at low speeds to reduce takeoff and landing distances and speeds and to increase single engine rate of climb. The geometric configuration of the wing can be changed to increase aerodynamic lift at low speeds by utilizing the high lift devices.

The FB-111A high lift devices consist of full-span, double-slotted trailing edge flaps with Fowler motion; full-span variable leading edge slats; and a rotating glove section.

The multisection flaps on the FB-111A are divided into six sections. The five outer sections are the main flaps which are mechanically connected and operate as one unit. A mechanically controlled vane is an associated part of each main flap. As the flap extends aft and downward, the vane is positioned by a mechanical linkage to provide the proper airflow through the space between the flap leading edge and the spoilers or the fixed trailing edge. An airflow control door is associated with each main flap section to provide proper airflow when flaps are extended. These airflow control doors are located along the basic wing trailing edge lower surface and are below the vanes when the flaps are retracted. These doors are moved to proper positions during flap extension and retraction by gearboxes which are driven by the flap drive torque shafts. The inboard sections of the flaps are the auxiliary flaps, which operate independently of the main flaps. The auxiliary flaps are small flaps designed to provide closure between the fuselage and the first main trailing edge flap sections with the wings in a 16-degree sweep position. (See figure 1.)
Figure 2.
LIFT FROM FLAPS & SLATS

Figure 1.
FLAP-SLAT DRIVE MECHANISM FB-111A
Without a wing leading edge device, the powerful flap system would cause wing stall at an early angle of attack. (See figure 2.) Each wing of the FB-111A is equipped with a leading edge slat, which is divided into five sections. The slats operate in conjunction with the main flaps and are connected to the main high lift power unit by flexible drive shafts. During the extend cycle, the slats must extend to the full down position before the flaps can extend. During the retract cycle, the flaps must be retracted fully before the slats can retract. (See figure 3.)

The outboard edges of the wing gloves, adjacent to the wing inboard leading edges, are equipped with movable surfaces known as rotating gloves. Rotating these surfaces at the glove-wing intersection tends to deflect the strong glove vortex and also allows full extension of the inboard slats. A door forms the lower surface of each rotating glove. Each rotating glove and its associated door are operated by a linkage and a mechanical actuator which is connected to the slat drive flexible shaft.

The flap and the slat systems are integrated systems which have a common control lever for normal control of the slats, the gloves, the main flaps, and the auxiliary flaps. (See figure 4.) Normal extension or retraction takes approximately 12 seconds. A common emergency switch controls emergency operation of the slats, the gloves, and the main flaps. All normal and emergency control commands go through a combination wing-sweep/flap-slat control unit. (See figure 5.) The control unit also contains mechanical interlocks and electrical cutouts to prevent main flaps and slats from extending when the wings are swept past 26 degrees. One common power unit drives the slats (and gloves) and the main flaps in both the normal hydraulic mode and the emergency electric mode. (See figure 6.)

The common flap-slat control lever has three positions marked UP, SLAT DOWN, and FLAP DOWN; and a manual gate which separates the flap and the slat areas. (See figure 7.) The flap-slat lever can be commanded to any desired position without having to wait for the surfaces to move to that position. Movement of this lever initiates a mechanical input to the wing-sweep/flap-slat control unit which moves the output linkage to open the flap-slat hydraulic control valve. (See figure 8.) The control valve directs utility hydraulic pressure to drive the main flap-slat power unit which, in turn, drives the flexible shafts that control movement of the slats and flaps. The main drive power unit is so designed that it will not extend the flaps until the slats are fully extended and will not retract the slats until the flaps are fully retracted. (See figures 6 and 8.) The actuator rotates five flexible shafts: two for the slat drives, two for the flap drives, and one for position feedback to the control unit. The slat drive flexible shafts drive the rotating glove actuators and another pair of flexible shafts which drive the wing leading edge...
Figure 5.
WING-SWEEP/FLAP-SLAT
CONTROL UNIT SCHEMATIC
slat rotary actuators. These actuators drive torque tubes which, in turn drive the slats. Moving the control lever down to the gate will cause the slats to extend fully. The rotating glove and the leading edge slats are driven by a common flexible shaft. When the gate is released and the control lever is moved into the flap-down area, the flap-slat power unit rotates the flexible shafts connected to the flap angle gearboxes and the flap actuators. These angle gearboxes transfer and reduce the flexible shaft rotation to the rotation of torque tubes which, in turn, drive the main flap screwjacks actuators and airflow control door gearboxes. The flaps can be set at any position between full up and full down positions.

The auxiliary flaps are driven by 115-volt alternating current electrical motors. A detent position in flap-slat lever travel is provided to aid in selecting the main flap 15-degree position. When the lever is moved down to a position corresponding to 25 degrees or more of flaps, a contact closes, providing electrical power to extend the auxiliary flaps. Both auxiliary flaps will retract when the flap-slat lever is raised to a point corresponding to less than 25 degrees of main flaps. Interruption of the auxiliary flap extend circuit prevents extension of the auxiliary flaps when the wings are afof 16 degrees.

The design of the high lift system was optimized in both weight and cost by use of torque limiter brakes. For example, the high lift main power unit processes enough torque capability to drive the flaps on both wings simultaneously. However, a torque limiter brake is located in each output of the main power unit to limit the torque available through that output to the maximum required to drive the flaps in that wing. Incorporation of these torque limiter brakes in the design made it possible to utilize lighter weight and less costly components since they would not be subjected to double torque during a possible system malfunction. Also, the flap linear actuators at track stations 1, 3, and 5 in each wing have torque limiter brakes to protect the jack-screws and the flap tracks and carriages. The slat
drives outboard of the glove actuators also are protected by torque limiter brakes. The whole drive system, including the main power unit, is capable of being stalled without damage as a result of the functioning of these brakes.

Both the flap and the slat systems contain monitoring devices. Flap travel is monitored by an asymmetry device on each wing. When the asymmetry device senses more than three degrees of asymmetrical flap travel, a signal is sent to close the flap-slat drive control valve and to apply both flap and slat torque shaft brakes, stopping the travel of flaps and slats. Once the control valve has been closed and the torque shaft brakes applied by this method, the flaps and slats cannot be extended or retracted by either the normal or the emergency mode until the brakes are manually reset on the ground. The slat monitors, located at the outboard ends of slat drive torque shafts, have two internal switches. One switch is set to close at 83 percent of slat extension to complete a slat-down indication signal. The other switch
remains closed up to 79 percent of slat extension. If the flaps start to extend while either slat is less than 79 percent extended, a signal is sent to close the flap-slat control valve and to apply all slat and flap torque shaft brakes. Once these brakes are applied, the slats and flaps cannot be moved until the brakes are manually reset.

The flap and the slat systems receive operating power from the utility hydraulic system through a single hydraulic motor. A standby 115-volt alternating current electrical motor is mounted on the main flap and slat power unit to provide emergency power in case of utility hydraulic system failure. (See figure 6.) The emergency mode of operation can be selected by positioning the flap and slat switch (figure 7), located on the left sidewall in the cockpit, from NORM position to EMER position. With the switch in EMER position, the flaps and slats may be extended or retracted electrically by holding the emergency flap and slat switch, also located on the left sidewall in the cockpit, to EXTEND or RETRACT position. Emergency operation of the flaps and slats is the same as normal operation except that the main drive power unit is driven by an electrical motor in the emergency mode and by a hydraulic motor in the normal mode. Emergency extension or retraction takes approximately 60 seconds.

Flap and slat position indicators are on the wing-sweep/flap-slat position indicator (figure 7), located on the left main instrument panel. The main flap position indicator provides flap position in degrees. The slat indicator is a window which provides the following indications: UP for slats and auxiliary flaps retracted; SLAT DN for slats down; BOTH DN for slats and auxiliary flaps extended; and a crosshatch for power off, or slats or auxiliary flaps in transit.

Though recognition of the leading edge slot (slat) and the trailing edge flap as means of providing lift was evident in early aerodynamic technology, it was not until 1929 that the aircraft which won the coveted Daniel Guggenheim International Safe Aircraft award incorporated a crank with which the flaps were controlled from the cockpit. The slots and flaps as originally designed were automatic; hence, there was always the possibility that they might not open when needed.

Significant technological advances are evident in the FB-111A integrated flap and slat systems.

END

FACTS AND FIGURES

As of 10 September 1970

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TOTALS                  | 23,341         | 55,146.7            |
The F-111 is powered by two TF30 engines. The TF30 is an axial flow, 16-stage dual compressor, turbofan engine with afterburner. The basic engine control system consists of a hydro-mechanical main fuel control. Afterburner system control comprises an integral afterburner fuel control and an exhaust nozzle area control. Thrust is controlled by a throttle. The engine control system automatically provides optimum fuel flow for any throttle setting and sets the nozzle area required to maintain a desired engine pressure ratio during afterburning.

Accurate engine trim is essential for satisfactory propulsion performance. Engine trim is a maintenance function which consists of adjusting the engine controls for proper settings to ensure takeoff thrust and satisfactory operation within engine limits. The TF30 engine requires adjustments of the main engine control and afterburner control when the engine is installed in the aircraft or whenever either control is replaced. Each engine of a particular model should produce approximately the same thrust for a given ambient condition - outside air temperature (OAT) and uncorrected barometric pressure ($P_{bar}$). Engine pressure ratio (EPR) and turbine discharge pressure ($P_{t7_m}$) are proportional to thrust. Since EPR and $P_{t7_m}$ are related to thrust, curves indicating variation of $P_{t7_m}$ or EPR with OAT can be defined. When $P_{t7_m}$ is used as a variable, uncorrected barometric pressure also must be considered. On a hot day compressor rotor speeds for a given throttle setting will be higher than on a standard day. On a cold day compressor rotor speeds will be lower than on a standard day under the same conditions. The fuel control is designed to compensate for this change in compressor rotor speed relative to compressor inlet temperature. Engine trim curves are dependent on the aircraft inlet configuration as well as the engine model (TF30-P-3, P-7, or P-9).

Other conditions are essential to ensure accurate engine trim. If an engine has been preserved, it must be depreserved. When TF30-P-3 or P-7 engine trim runs are performed at high elevations, and the uncorrected barometric pressure is less than 26.50 inches of mercury, the $P_2$ tube at the rear face of the main fuel control must be disconnected to prevent biasing of the control. On aircraft with translating cowl the cowl must be fully open. The OAT thermometer should be positioned away from heat radiation source and aircraft environmental control system air outlets. Position the trim kit as shown in the figure. The F-111 trim kit, H119G; should be calibrated prior

![TF30 DUAL ROTOR TURBOFAN AFTERBURNING ENGINE](image)

**ENGINE SCHEMATIC**

**SYMBOLS USED IN ENGINE TRIMMING**

- $N_1 =$ LOW PRESSURE COMPRESSOR RPM
- $N_2 =$ HIGH PRESSURE COMPRESSOR RPM
- $P_{bar} =$ UNCORRECTED BAROMETRIC PRESSURE
- $P_{t7_m} =$ TURBINE DISCHARGE MIXED TOTAL PRESSURE
- $T_{IT} =$ TURBINE INLET TEMPERATURE
- $OAT =$ OUTSIDE AIR TEMPERATURE
- $EPR =$ ENGINE PRESSURE RATIO ($P_{t7_m}/P_2$)
- $A_j =$ NOZZLE POSITION

111 LOG
to every trim run in accordance with procedure in Organizational Maintenance Manual, Power Plant and Related Systems. All high lift devices must be retracted, and the aircraft should be faced into the wind. To achieve consistently good trim results, the aircraft should be headed as nearly as possible into the wind and trimmed when the wind velocity (steady or gusts) is not more than 15 knots with the engine inlet headed into the wind at not more than ±45 degrees. When heading is ±45 to ±90 degrees, the wind velocity (steady or gusts) should not exceed 8 knots. Engine trimming is not recommended when the aircraft heading is greater than ±90 degrees or when the wind velocity (steady or gusts) is more than 15 knots. All engine access doors may be open during trim; however, structural considerations require that the nacelle frames at fuselage stations 770.25 and 725 be installed. Doors 4104 and 4204 should be released from the latched open position and permitted to hang down to prevent damage to the nacelle doors in event the horizontal control surfaces are accidently actuated.

Engine trim procedure for production aircraft consists of the following:

- Adjusting military power turbine discharge total pressure (Pt7m)
- Adjusting N2 idle rpm
- Adjusting afterburner exhaust nozzle control in zone 3 afterburner operation (88-degree engine power lever angle)

- F-111A ONLY: Checking and adjusting, if necessary, turbine inlet temperature in maximum afterburner.
- Checking maximum afterburner turbine discharge pressure (Pt7m)
- Checking EPR versus maximum afterburner EPR check curve
- FB-111A #2 & ON: Checking for minimum nozzle position (Aj) of 8.4 in maximum afterburner.

Engine trim data recorded with air leaks in the engine or in the trim-kit installation will be invalid, resulting in incorrect engine trim or undesirable trim level. Leak checks should be performed prior to recording engine trim data.

An improperly trimmed engine can cause engine stalls, afterburner malfunctions, overspeeds, engine overtemperature conditions which necessitate special inspection and/or repair, and generally unsatisfactory engine operation. Strict adherence to the prescribed engine trim procedure (Organizational Maintenance Manual, Power Plant and Related Systems) will ensure optimum system performance.
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<td>Attn: R. J. Helm</td>
<td>Phone: 1-916-643-5066/5067</td>
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<td>Upper Heyford, England:</td>
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