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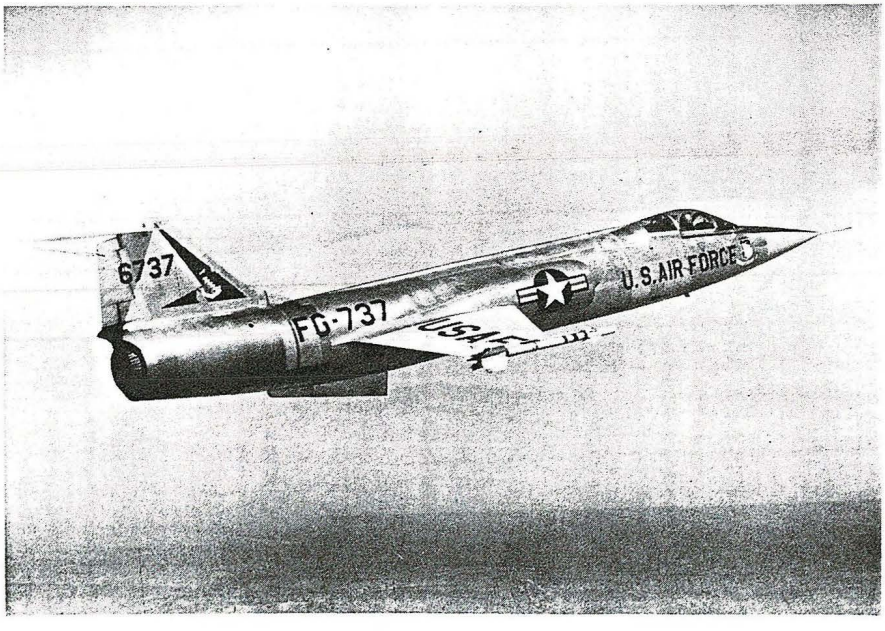

Contract to build 200 F104's — pardon us, the name is CF111 — has been awarded to Canadair Ltd. and Orenda Engines have received the order to manufacture the engines.

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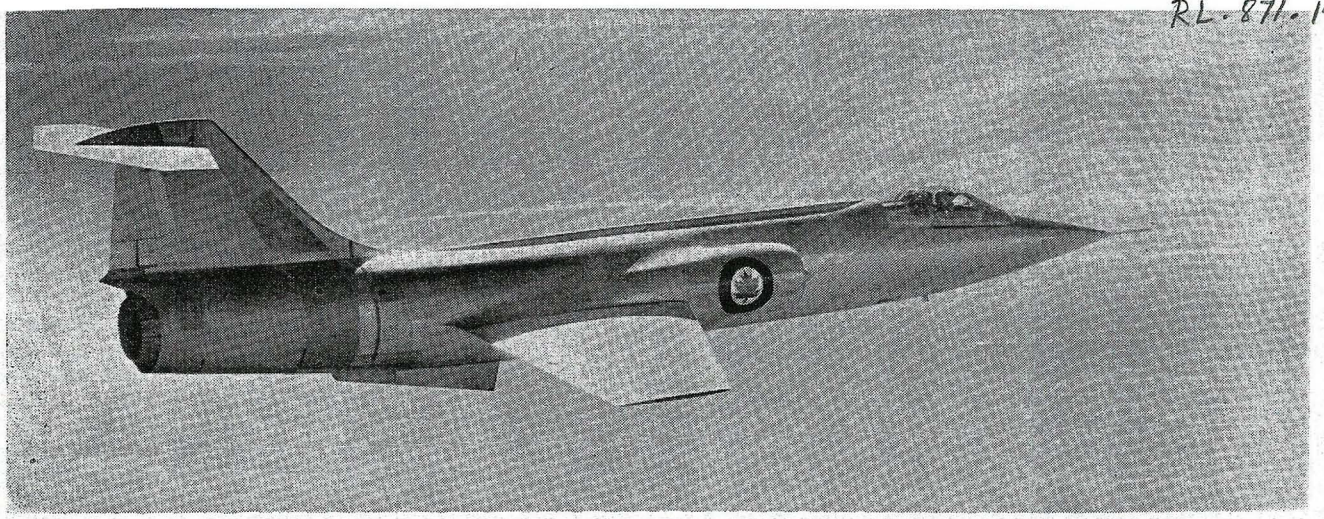


FOR THE AIR DIVISION. Skilful use of the artist's brush provides this preview of the Starfighter bearing the RCAF roundel and maple leaf. There is no trick about the smooth clean lines of this formidable aircraft—these really belong—but by the time the Canadian version, the CF-104, gets into operational trim it promises to look a good deal like a well-laden Christmas tree.

Putting the CF in the 104

RCAF's new mount shapes up as formidable electronic and missile platform

Differences between the standard Lockheed F-104 interceptor, in service with the U. S. Air Force, and the CF-104 scheduled for production for the RCAF by Canadair Ltd., Montreal, have been pointed up by Lockheed Aircraft Corp.

Broadly speaking the F-104—designed primarily as an "air superiority" weapon — is being re-stressed and re-equipped to perform as a fighter-interceptor, fighter-bomber or reconnaissance aircraft. In this form it will serve the RCAF, and the West German Air Force — whose version has been designated the F-104G.

These modifications detailed by Lockheed apply principally to the West German version, and while most of them will also be incorporated in the Canadian-produced aircraft, the RCAF's declared strike and reconnaissance requirements for its Sabre replacement will necessitate certain equipment differences. Items will be added or re-packaged to conform with the aircraft's planned utilization in Canada's European Air Division.

Externally, the F-104 and the CF-104 Starfighters will look almost identical. The over-all dimensions of the aircraft are unchanged. But benefitting from the flexibility of the basic design, the CF-104 will incorporate certain structure changes to enable its assignment to a variety of missions.

Advanced fighter-bomber missions require structural improvements of fuselage, wing and empennage components to meet strength requirements with full external loads. These also provide for high-speed low-altitude ground support assignments and penetration strikes.

A total of 36 new forgings will be provided for such major structural items as fuselage main frames, wing fittings and beams, fuselage longerons and joints, fuselage tail frames, empennage beams and ribs, plus some fuselage skins. Additionally, the horizontal stabilizer servomechanism is being modified to afford increased hinge movement.

Power Control Added

Incorporating a larger fin with hydraulic powered rudder will enhance the pilot's ability to provide exact incremental control by use of rudder when aiming at ground targets. This is a refinement of the large vertical tail developed originally for the two-place F-104Bs. The larger area (approximately 25 percent more) will also provide increased directional stability at high Mach numbers.

The addition of manoeuvering flaps to the stub wings provides an increase in the available load factor and will afford significant advantages in ground attack operations. They will result in as much as 33 percent reduction in airplane turn radius at an altitude of 5,000 feet.

The new aircraft utilizes an 18-foot-diameter drag chute in place of the 16-foot chute employed in USAF F-104s. The chute is attached to the bottom side of the airplane aft of the ventral fin. Starfighters now in service commonly have a landing roll of only 3,000 feet, and frequently less, using the drag chute.

To safeguard low speed flight, where icing conditions could be encountered, electrical heating elements are being provided for the engine air scoop leading edge and cone surface.

To afford maximum range for bombing missions, alternate provision has been made for installing aluminum fuel tanks in the ammunition, gun and shell case compartments. This gives the option of increasing the internal fuel capacity by 120 gallons.

In line with the current program for USAF Starfighters, an upward escape system is scheduled.

Protection against skidding while making maximum braking effort stops under bad weather conditions will be provided through installation of anti-skid brakes. The system has power brake valves connected to pilot brake pedals, with a master brake standby. Skid sensing units are provided in each main wheel axle. Solenoid operated dump valves in each main wheel well will meter off excess brake pressure. An on-off switch and indicator lights are provided in the cockpit.

Provision has been made for installation of two Sidewinder missiles on the fuselage. They would be installed on either side of the aircraft centreline beneath the belly. This will permit a 100 percent firepower increase (present F-104s carry two Sidewind-

ers on their wingtips) or will permit carrying two fuselage missiles in combination with wing pylon and tip tanks for extended combat range.

The aircraft can also be equipped to carry a large caliber rocket. This will be mounted externally on a launcher rail below the fuselage capable of being extended approximately five feet below the aircraft at time of firing. Other modifications will be made to provide a capability for carrying various armament store combinations in addition to pylon fuel tanks.

An autopilot with stick steering is being installed which will greatly enhance the efficiency of the weapon for interceptor and fighter-bomber missions. It includes modes for preselecting and holding altitude, speed and heading. It also includes a mode for holding a standard rate turn.

Another addition, the multi-purpose NASARR radar system consists of a radar set and a fire control computer. The equipment operates in two basic modes: air-to-ground for bombing and navigation, and air-to-air for target interception. It is also capable of providing data link information read-out.

For air-to-ground operation the radar provides: 1. Ranging information for bombing computation in visual bombing modes; 2. Ground mapping for all-weather bombing; 3. Contour mapping for navigation; and 4. Terrain avoidance.

In air-to-air use, NASARR provides increased power for radar search, acquisition and automatic tracking of air targets to achieve the capability for: 1. Lead-collision attack for automatic release of rockets; 2. Lead-pursuit attacks using the M61 gun with information supplied to director type gunsight; and 3. Pursuit attack with Sidewinder weapons.

Addition of a bombing computer is also scheduled. This ties in with the inertial navigator, air data computer and NASARR systems, and mechanizes the relationship between the bomb trajectory and the aircraft in space. As a result of this mechanization, bomb release takes place at the proper point in space to impact on the target.

Four basic bomb delivery modes can be utilized by the pilot with this computer. These are: dive-toss, LABS (Low Altitude Bombing System), over-the-shoulder and level release.

Located in the integrated electronics compartment, close to the equipment it serves, is an air data computer. This receives electrical analogs of pitot and static pressure, air temperature, and angle of attack from remotely located transducers. The computer transforms this information into the various functions of altitude, airspeed, Mach number, rates of change, and angle of attack required by other computers in the aircraft. This central air data computer device is said to afford the advantages of less weight and complexity of multiple (individual) units, plus providing greater accuracy.

CDC System Adopted

The PHI (Position and Homing Indicator), a small, lightweight, automatic navigator developed by Computing Devices of Canada Ltd., will also be carried. This computes the aircraft's position by keeping track of all course changes and speeds.

The pilot has a choice of five push-buttons, each marked with the name of a target or destination. Pushing any button causes the pilot's indicator to show him the heading to fly to reach that destination and the distance to go in nautical miles.

TACAN is also programmed for installation in the new F-104. This is a radio air navigation system of the polar co-ordinate type which provides the aircraft with instantaneous and continuous information on distance (in nautical miles) and direction (in degrees of bearing) from a ground station. In combination with the PHI dead reckoning navigator, TACAN offers an excellent aid for all mission assignments.

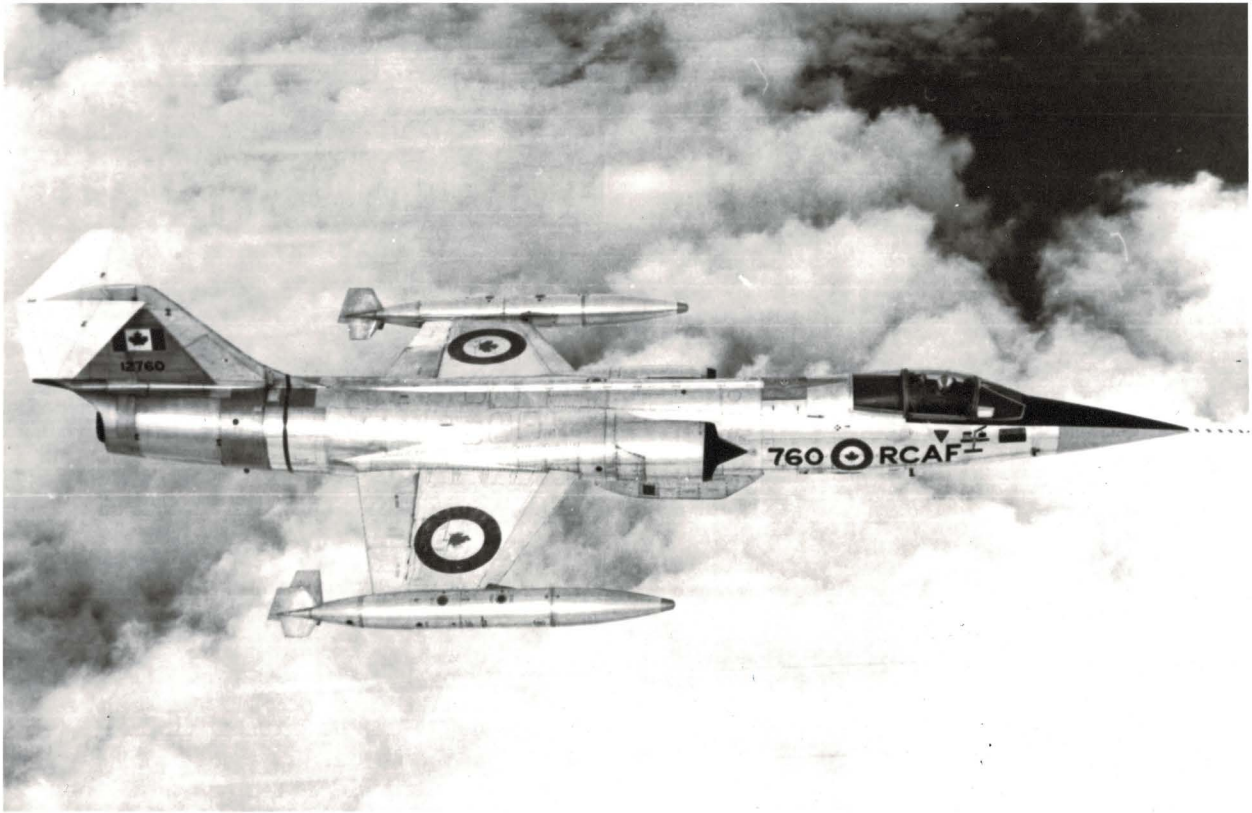
Complete provisions will be made for installation of a data link-time division set. This equipment provides a means of receiving course direction (which is automatically computed at the ground environment) for the purpose of directing the interceptor to its target until acquisition is made by airborne radar.

A lightweight, fully automatic, self-contained inertial navigation system can also be incorporated. It requires no external support and does not emit electromagnetic radiation. The unit measures actual ground distance and track, and is not dependent upon forecast or computed winds.

A high degree of accuracy is claimed for the device, which provides a continuous presentation to the pilot of his position by latitude and longitude, reading through the PHI indicator.

Later installation of a camera pod on the underneath side of the CF104 fuselage can be made by retrofit. Designed to afford mission flexibility, optional pods are available with camera equipment designed for either high or low altitude reconnaissance assignments.

COCKPIT CHECK. Air Vice Marshal M. M. Hendricks, of the RCAF, checks over the cockpit of a USAF F-104. Answering his questions is Lt.-Col. J. J. Kropenick.



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