CHAPTER

71

Power Plant

(LEAP-1B ENGINES)

CHAPTER 71
POWER PLANT

A = Added, R = Revised, D = Deleted, O = Overflow, C = Customer Originated Change

71-EFFECTIVE PAGES

CHAPTER 71
POWER PLANT

71-CONTENTS

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POWER PLANT - INTRODUCTION

General

Two CFM LEAP (Leading Edge Aviation Propulsion) -1B engines supply thrust for the airplane. The engines also supply power for these systems:

- Electric
- Hydraulic
- Pneumatic.

The CFM LEAP-1B is a high bypass ratio, dual rotor, turbo fan engine.

Power Plant

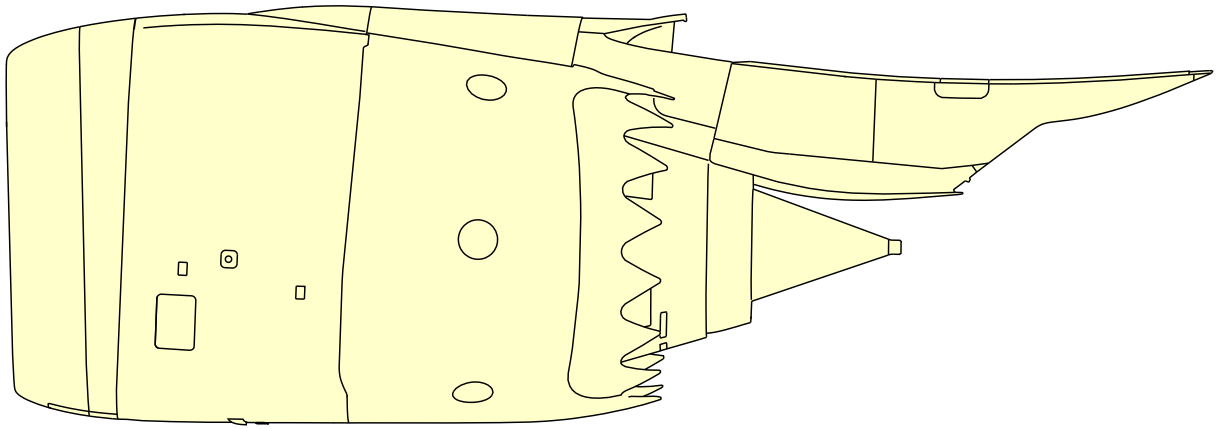
The power plant has these parts:

- Engine mounts
- Engine cowling
- Wire harnesses
- Engine vents and drains.

Acronyms and Abbreviations

- C - celsius
- cm - centimeters
- daN - deca newton
- EEC - electronic engine control
- FMU - fuel metering unit
- ft - feet
- HPTACC - high pressure turbine active clearance control
- LPTACC - low pressure turbine active clearance control
- IDG - integrated drive generator
- in - inches
- kg - kilograms
- lbs - pounds
- m - meters
- RPM - revolutions per minute
- TBV - transient bleed valve
- VBV - variable bleed valve
- VSV - variable stator vanes

POWER PLANT - INTRODUCTION



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POWER PLANT - INTRODUCTION

POWER PLANT - SPECIFICATIONS

General

General engine data for the LEAP-1B engine is shown.

These items show on the engine nameplate:

- Regulatory agency data
- Engine manufacture data
- Engine performance data.

The regulatory agency data blocks used depend upon where the engine was assembled. For all engines, the FAA and EASA TC numbers will appear in the top two blocks. For engines assembled by G.E., the production number will appear in the middle right block. For engines assembled by Safran, the production number will appear in the middle left block. The serial number and model number in the lower two blocks will be filled for all engines.

The first line of seven blocks will be filled at the assembly plant. The version of the engine will be in the CONFIG space. The second and third blocks show takeoff and max continuous thrust in metric (daN) thrust ratings. The fourth and fifth blocks show takeoff thrust and the max continuous thrust in pounds (LB). Block six shows the N1 trim applied to that engine. The last block is for service bulletins applied to this engine.

The lower two blocks identifies the manufacturer and the date of manufacture.

Six additional rows are available to show changes to the engine. This permits six different thrust rating changes before you must replace the nameplate. The engine nameplate is on the right fan case aft of the oil tank.

Engine Thrust Ratings and Aircraft Model Application

There are seven engine thrust rating configurations for the 737 MAX. The different engine thrust ratings are based on airplane weight and elevator/rudder control limits. The longer-fuselage 737 MAX-8, -9, and -10 models must be able to operate at the maximum thrust capability of the LEAP-1B engine. The lower thrust rating is not sufficient for the 737 MAX-8, -9, and -10. The table shows the engine thrust ratings for the 737 MAX models.

The engine identification (ID) plug gives the selected thrust rating data to the electronic engine controls (EECs).

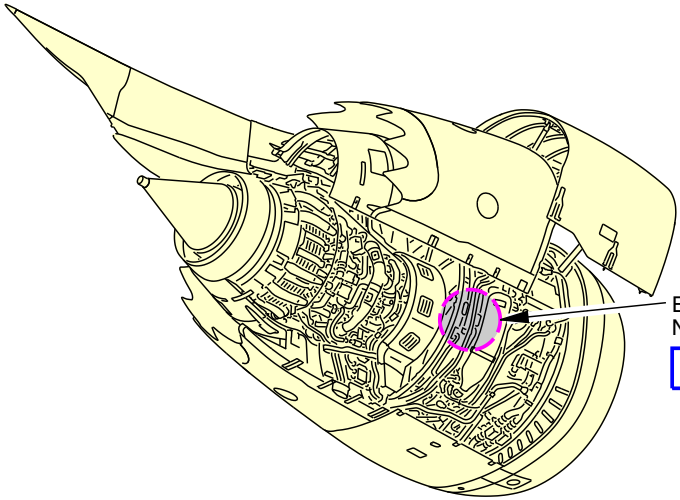
Airplane Models

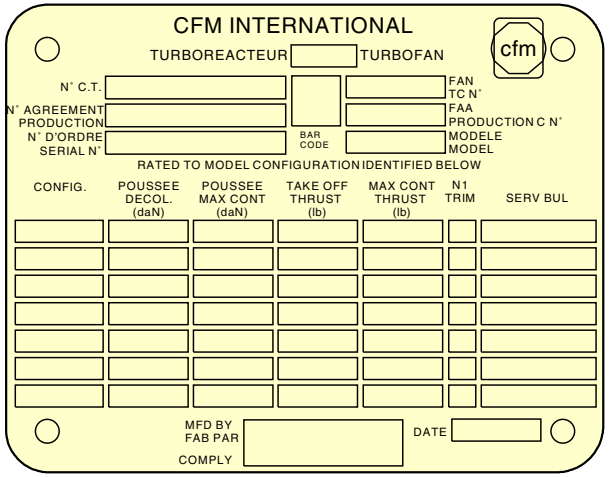
The normal models are 737 MAX-7, -8, -9, and -10. Some other variations can be for the Boeing Business Jet (BBJ).

General Engine Data

The general engine data applies to all engine configurations 1B21 - 1B28.

POWER PLANT - SPECIFICATIONS





ENGINE NAMEPLATE

A

ENGINE VERSION	ENGINE CONFIGURATIONS						
	1B21	1B23	1B25	1B27	1B28B2C	1B28	1B28B1
T/O THRUST	23000	24000	25000	26400	24600	27900	27900
AIRPLANE MODELS							
737-7	X	X	X	X	X		
737-8			X	X		X	X
737-9				X		X	X
737-10				X		X	X

ENGINE THRUST AND USAGE CHART

GENERAL ENGINE DATA	
MODEL	LEAP-1B
ENGINE WEIGHT	10,643 LB (4,828 KG)
FAN DIAMETER	69.4 IN (176.3 CM)
N1 REDLINE	4,586 RPM (104.3%)
N2 REDLINE	20,171 RPM (117.53%)
ENG START LIMIT	750C
EGT MAX CONT	1013C
EGT REDLINE	1038C
BYPASS RATIO	9:1

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POWER PLANT - ENGINE HAZARDS

General

It is dangerous to work around engines. Use the entry/exit corridor when the engine is in operation. Also, stay out of the inlet and exhaust areas when the engine is in operation.

Make sure that you do a walk for foreign object in front of and around the engine intake area before you start the engine. When you see an anti-collision light on, an engine is in operation or will start.

These are the hazards around an engine in operation:

- Inlet suction
- Exhaust heat
- Exhaust velocity
- Engine noise.

Inlet Suction

Engine inlet suction can pull people and large objects into the engine. At idle power, the inlet hazard area is a 10.6 ft (3.2 m) radius around and 4.5 ft (1.4 m) aft of the inlet. If the wind is over 25 knots, increase the inlet hazard area by 20 percent.

Exhaust Heat

The engine exhaust is very hot for long distances behind the engine. This can cause injury to personnel and damage to equipment.

Exhaust Velocity

Exhaust velocity is very high for long distances behind the engine. This can cause injury to personnel and damage to equipment.

Engine Noise

Engine noise can cause temporary and permanent loss of hearing. You must wear ear protection when near an engine in operation.

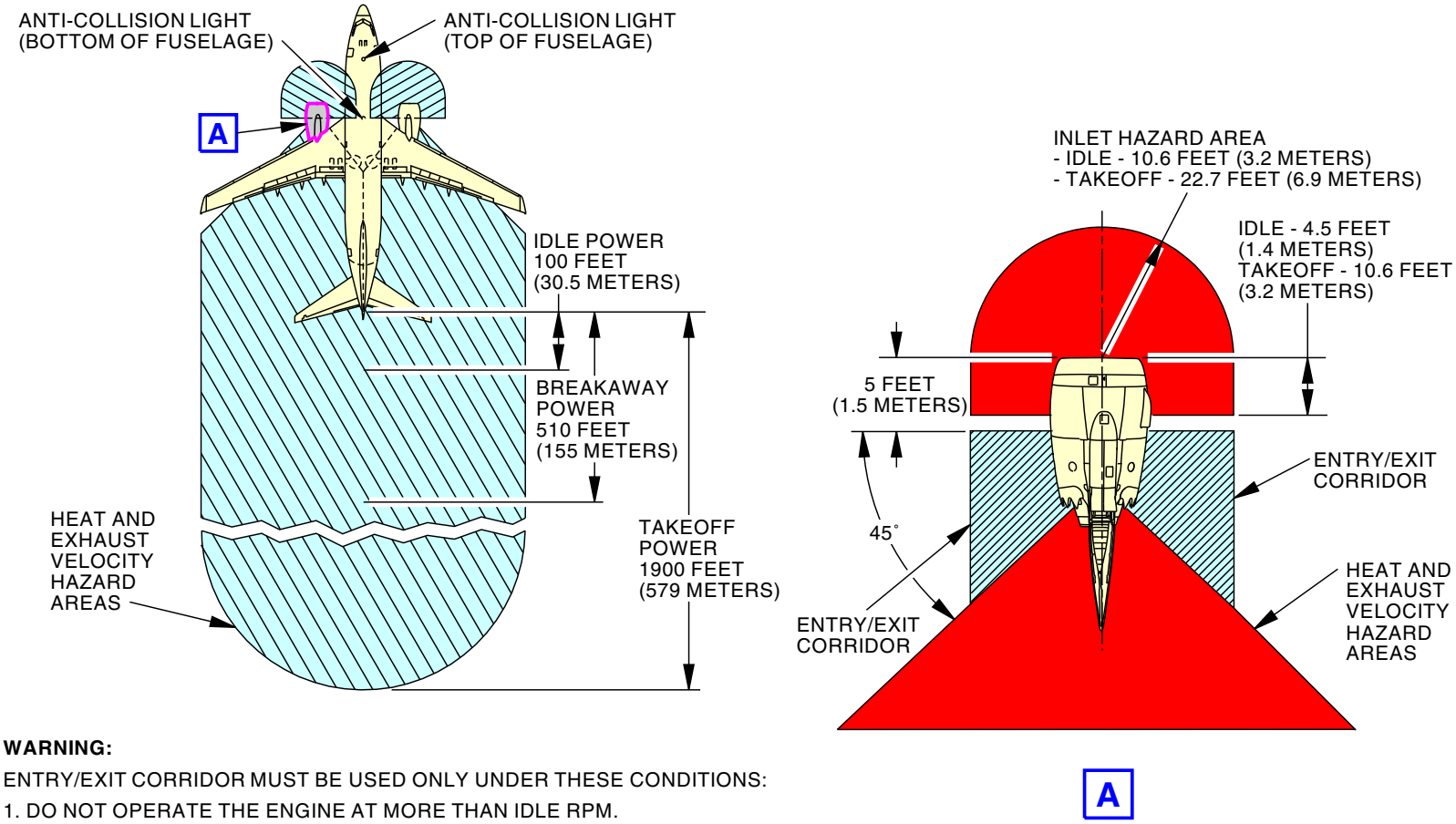
Engine Entry/Exit Corridor

Engine entry corridors are between the inlet hazard areas and the exhaust hazard areas. You should go near an engine in operation only when:

- Engine is at idle
- You can speak with people in the flight compartment.

For additional safety, wear a safety harness when the engine is in operation.

POWER PLANT - ENGINE HAZARDS



WARNING:

ENTRY/EXIT CORRIDOR MUST BE USED ONLY UNDER THESE CONDITIONS:

1. DO NOT OPERATE THE ENGINE AT MORE THAN IDLE RPM.
2. POSITIVE COMMUNICATION BETWEEN PERSONNEL IN THE FLIGHT COMPARTMENT AND PERSONNEL USING THE ENTRY/EXIT CORRIDOR IS MANDATORY.
3. OBEY INLET/EXHAUST HAZARD AREAS.
4. USE OF SAFETY LANYARD IS RECOMMENDED.

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POWER PLANT - ENGINE HAZARDS

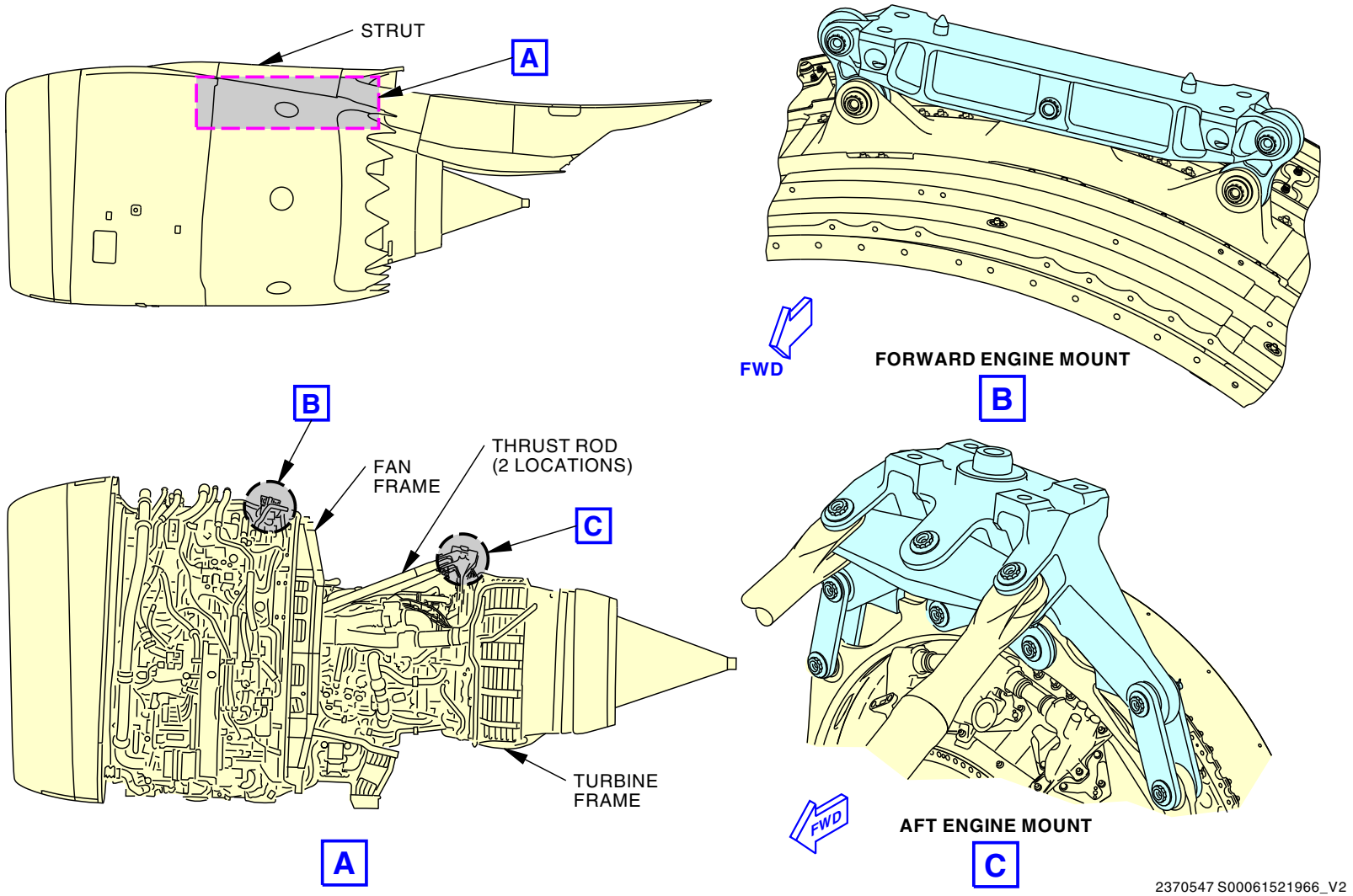
POWER PLANT - ENGINE MOUNTS

General

There is a forward and an aft engine mount. The engine mounts attach the engine to the strut. The forward engine mount attaches to the fan frame. The aft engine mount attaches to the turbine center frame (TCF).

Two thrust rods attach the aft engine mount to the fan frame. The thrust rods transmit engine thrust to the engine strut through the rear engine mount.

POWER PLANT - ENGINE MOUNTS



POWER PLANT ENGINE MOUNTS

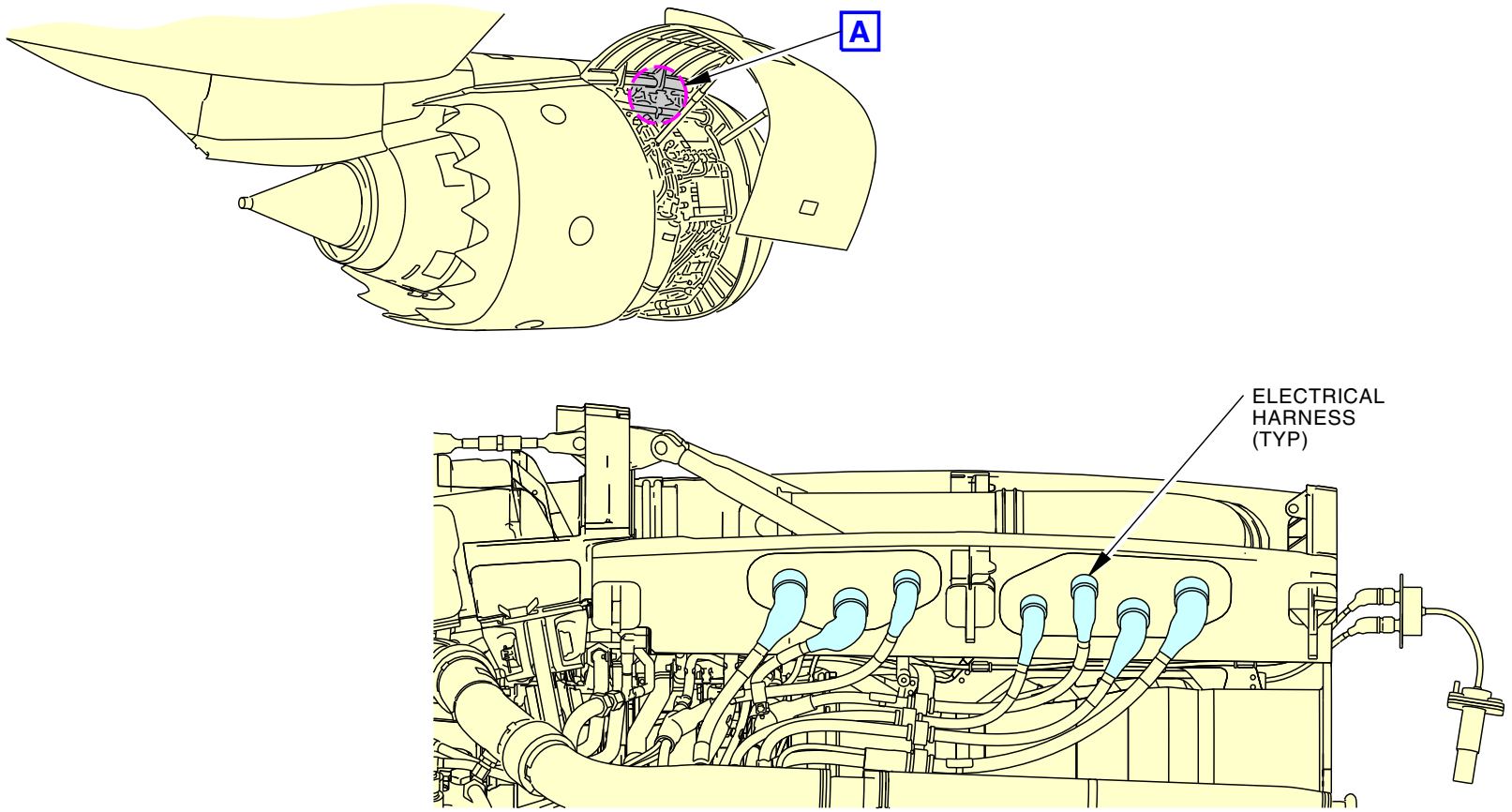
POWER PLANT - ELECTRICAL HARNESSES

General

The signals on the electrical harnesses that connect on the right side of the fan cowl support beam come from these components:

- Electronic Engine Control (EEC) Channels A and B
- N1 speed sensor
- N2 speed sensor
- Oil quantity transmitter
- Engine anti-ice valve
- Ignition exciters
- Alternate accelerometer
- Turbine Center Frame (TCF) accelerometer
- Overheat/fire detector loop A and B.
- Start valve
- Integrated Drive Generator (IDG)
- Hydraulic system engine-driven pump
- Fuel Metering Unit (FMU).

POWER PLANT - ELECTRICAL HARNESSES



POWER PLANT - ELECTRICAL HARNESSES

POWER PLANT - ENGINE DRAINS

General

Engine drains prevent fluid contact with hot engine areas. You use engine drains to detect component failures. Engine drains direct these fluids overboard:

- Oil
- Fuel
- Hydraulic fluid
- Water
- Vapor.

Two independent engine drains direct fluids overboard from each area. There is an engine drain in the fan compartment and one in the core compartment.

Fan Compartment Drains

These components drain fluids through the fan drain mast:

- Oil tank scupper
- Fuel pump
- Hand cranking pad
- Hydraulic pump
- Integrated Drive Generator (IDG)
- Support strut.

There is a dedicated drain line for each of the components. The fan drain mast is marked to identify each drain line. A label on the oil tank also shows a schematic of these drain lines.

Core Compartment Drains

These components drain fluids from the core compartment through the core drain mast:

- A-Sump 1R
- A-Sump 3R
- B-Sump
- C-Sump
- Modulated turbine cooling (MTC) actuators
- Variable stator vane (VSV) actuators
- Variable bleed valve (VBV) actuators
- High pressure turbine active clearance control (HPTACC) valve
- Low pressure turbine active clearance control (LPTACC) valve
- Booster anti-ice/start bleed valve (BAI/SBV)
- Transient bleed valve (TBV)
- Auxiliary drain.

The oil sump drain lines are dedicated drain lines. The fuel component drain lines are joined by group. There is a drain line for components on the left and a drain line for components on the right. Coupling joints and witness tees assist in fault detection for these engine fuel drain lines. The core drain mast has markings to identify each drain line.

Leakage Limits

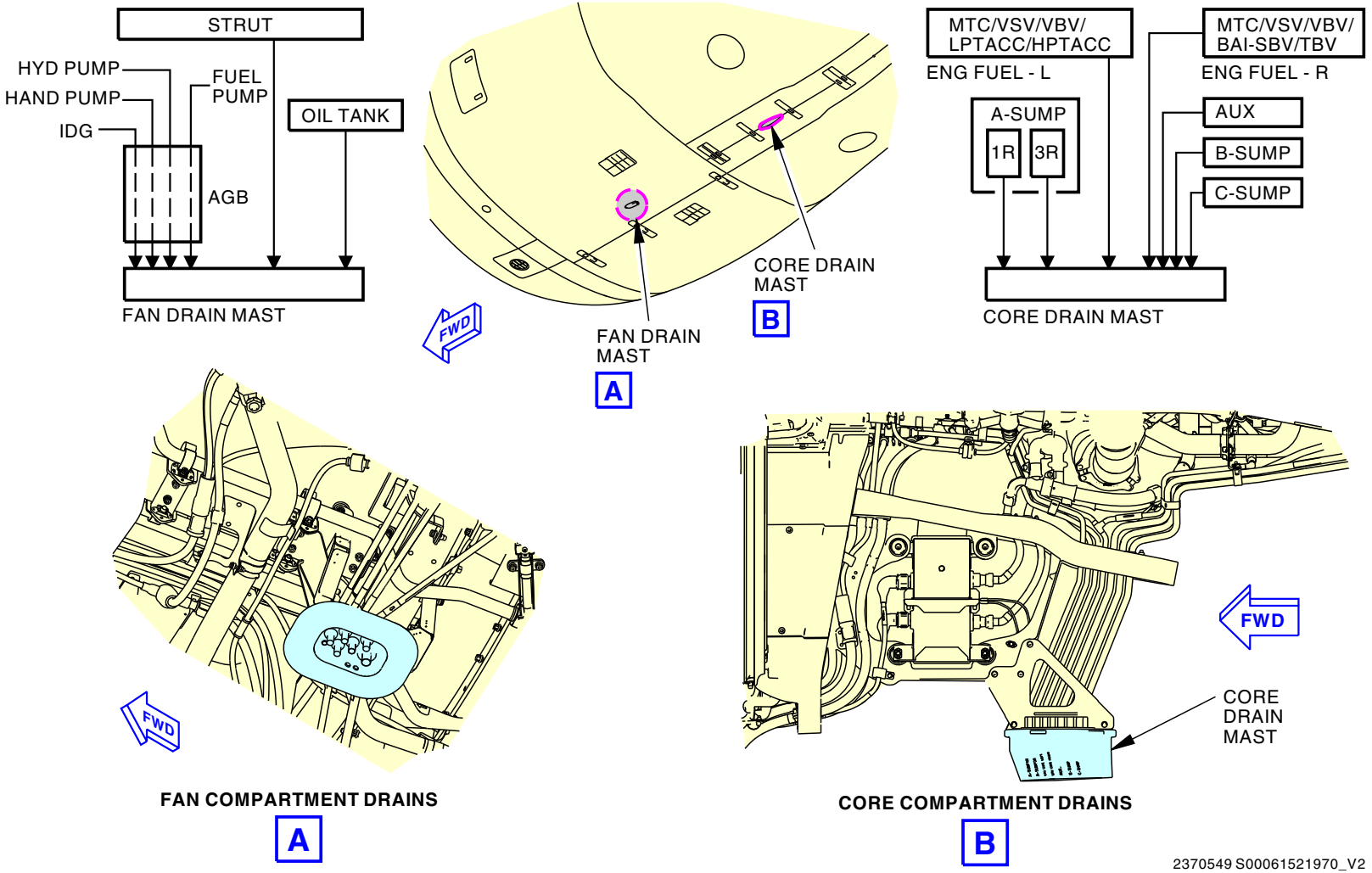
Leaks from drain lines can occur on an engine that is not operating or during engine start. These leaks are normal, and may stop after the engine operates at idle power for 5 minutes.

Oil leaks are classified as:

- less than the threshold limit, no maintenance required
- more than the threshold limit but less than the serviceable limit, corrective action required within 25 flight cycles
- more than the serviceable limit, corrective action is required.

See the AMM for more information about allowable leakage limits (AMM CHAPTER 71).

POWER PLANT - ENGINE DRAINS



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POWER PLANT - ENGINE DRAINS

POWER PLANT - ENGINE DRAINS

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POWER PLANT - ENGINE COWLING

General

The engine cowling gives an aerodynamically smooth surface into and over the engine. It also gives a protective area for engine components and accessories.

These are the parts of the engine cowling:

- Inlet cowl
- Fan cowl
- Thrust reverser.

See the exhaust chapter for more information on the thrust reverser (CHAPTER 78).

The thumbnail, mid-strut and over-wing fairings are above the engine cowls. The fairings give an aerodynamically smooth surface over the engine strut. The thumbnail and mid-strut fairings each have a pressure relief door.

Inlet Cowl

The inlet cowl sends air into the engine. The inlet cowl attaches to the engine fan case.

These items are on the inlet cowl:

- T12 access door

A dropped tool access panel is at the bottom of the inlet cowl outer barrel.

Fan Cowls

The fan cowls give an aerodynamically smooth surface over the fan case. The fan cowls attach to the fan cowl support beam. The fan cowls open for maintenance.

These items are on the fan cowls:

- IDG access door (left)
- Fan cowl chine (inboard)
- Starter valve access port (left)
- Oil tank access door (right).

T12 Access Door

The T12 access door is on the inlet cowl. The T12 access door permits access to the T12 sensor.

IDG Access Door

The IDG access door permits access to the IDG for servicing. It is on the left fan cowl.

Fan Cowl Chine

The fan cowl chine is a vortex control device that smooths airflow around the wing. It is only on the inboard fan cowl.

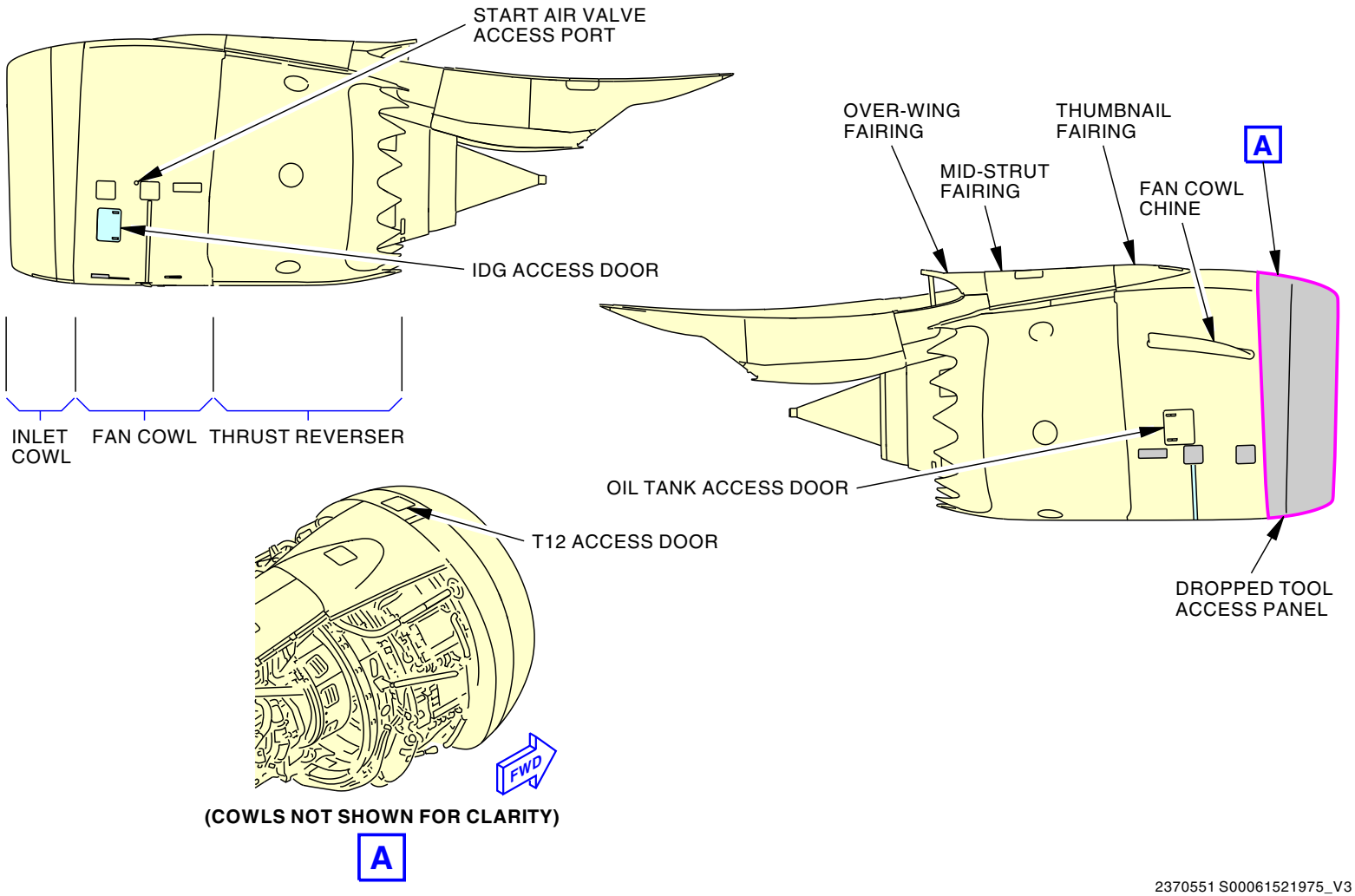
Starter Valve Access Port

The starter valve access port permits access to the starter valve for manual operation. It is on the left fan cowl.

Oil Tank Access Door

The oil tank access door permits access to the oil tank for servicing. It is on the right fan cowl. The oil tank access door is also a pressure relief door for the fan compartment.

POWER PLANT - ENGINE COWLING



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POWER PLANT - ENGINE COWLING

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POWER PLANT - FAN COWL

General

There are two fan cowls for each engine. Each fan cowl attaches to the strut with three hinges. The left and right fan cowls are not interchangeable. The inboard fan cowl has a vortex control device (chine). The Cross Engine Debris (CED) shields are installed only on the inboard fan cowl of engine 1. The fan cowls are interchangeable between engine position, but you must install the chine and the CED shields in the correct location.

Engine 1 left fan cowl weighs 144 lb (65 kg). Engine 1 right fan cowl weighs 161 lb (73 kg).

SIA 001-003 PRE SB 737-71-1866

Engine 2 left fan cowl weighs 161 lb (73 kg). Engine 2 right fan cowl weighs 152 lb (69 kg).

SIA 004-999; SIA 001-003 POST SB 737-71-1866

Engine 2 left fan cowl weighs 161 lb (73 kg). Engine 2 right fan cowl weighs 154 lb (70 kg).

SIA ALL

Each fan cowl has a single hold open rod.

Fan Cowl Latches

Three fan cowl latches secure the left and right fan cowls together. The latches are along the bottom of the fan cowls.

A High Visibility Handle (HVH) covers each latch. To gain access to the latch, you push the HVH trigger to release the HVH from the latch frame. You then push the latch main trigger to release the fan cowl latch. The HVH extends about 12 inches down from the latch mounting assembly when the latch is open.

SIA 008-999; SIA 001-007 POST SB 737-71-1894

The Latch Indication System (LIS) is installed on the right fan cowl and gives a visual indication if the fan cowls are not latched. If the latch is released, the oil fill access door will open and this will show the ground personnel or crew that the fan cowl is not latched. The fan cowl will have to be latched before flight.

SIA ALL

Fan Cowl Hinges

Each fan cowl attaches to the strut with three hinges.

Each fan cowl hinge has these components:

- Fan cowl clevis
- Quick release pin
- Strut lug.

Each fan cowl clevis is on the fan cowl. All strut lugs are on the strut. The quick release pins make it easy to remove a fan cowl.

Fan Cowl Hold Open Rods

There is a hold open rod (HOR) for each fan cowl. The HOR attaches at the fan cowl and the engine fan case engine build up (EBU) bracket. You do not have to attach/detach the hold open rods when you open/close the fan cowls.

The HOR automatically locks open at 35 degrees and at 61 degrees.

Each HOR makes an audible click as locking mechanism is engaged when the fan cowl door is fully opened.

Spring Door Opening System

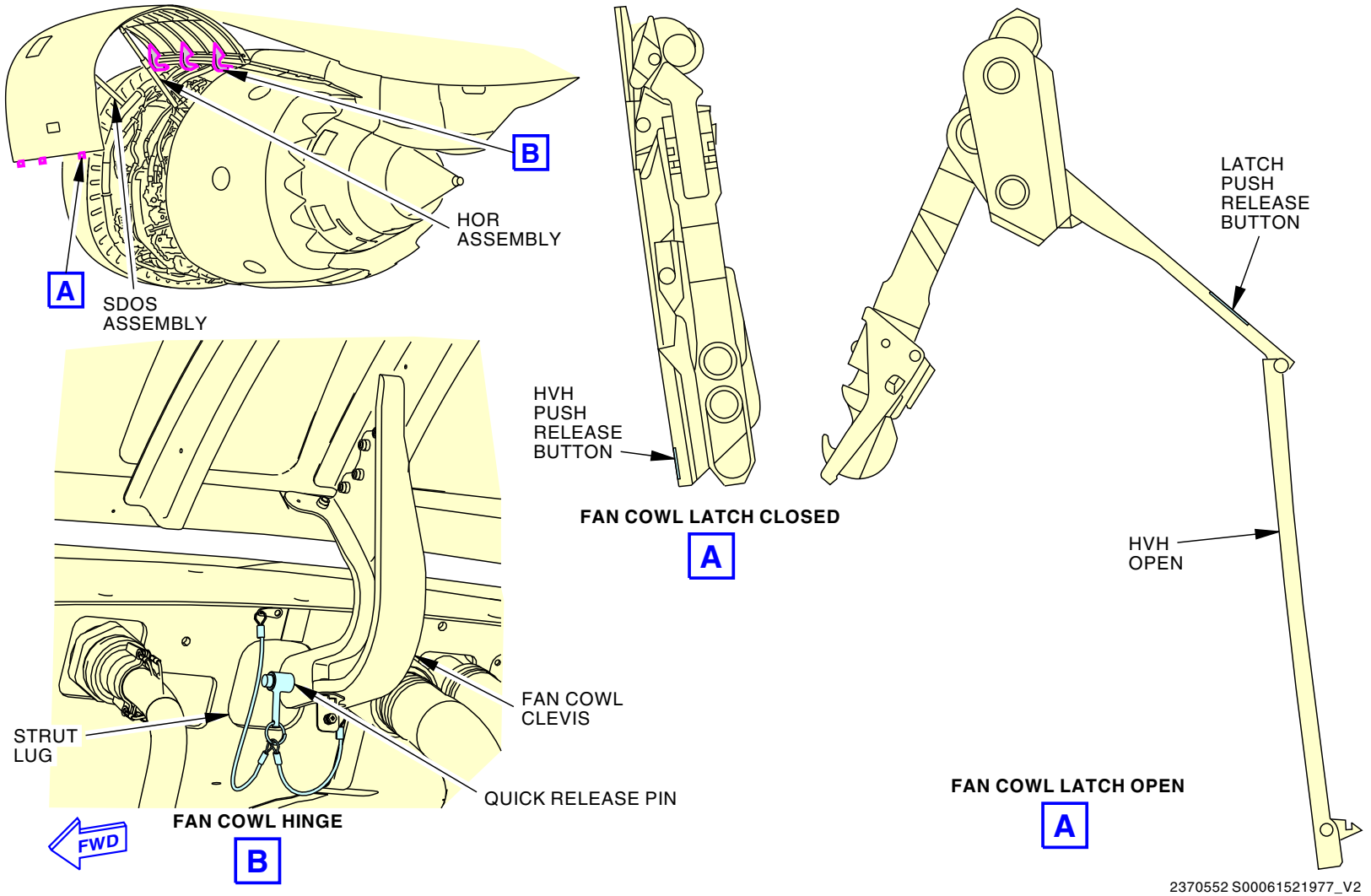
There is a spring door opening system (SDOS) rod for each fan cowl. The SDOS attaches at the fan cowl and the engine fan case.

The SDOS reduces the force to open the fan cowl to about 35 pounds. When the fan cowl is open, the SDOS locks to hold the fan cowl open at 35 degrees and at 61 degrees. The SDOS and the HOR together lock the fan cowl open for safety.

Inlet Alignment Bumper

There is a forward alignment bumper to the left side & right side fan cowls to help guide when closing. The alignment bumper prevents damage to the inlet and engine components when closing the fan cowls. The alignment bumpers can be retrofitted on fan cowls that do not have them.

POWER PLANT - FAN COWL



POWER PLANT - FAN COWL