

2.2. FLAP SYSTEM

The electrically controlled flap system provides setting of the forward and the main wing flap surfaces. The flap control system consists of four mechanically independent subsystems:

- The Main Wing Outboard Flaps (MWOFF)
- The Main Wing Inboard Flaps (MWIF)
- The Forward Wing Left Flap (FWLF)
- The Forward Wing Right Flap (FWRF)

The operation of the four subsystems is coordinated by an Electronic Control Unit which controls the power supply to the d.c. motors of each subsystem actuator.

A Drive Unit, located in the center of the fuselage, embodies the two independent motors and geartrains which actuate the main wing outboard flaps (MWOFF) and inboard flaps (MWIF) subsystems.

Each Fowler-type outboard flap runs on two tracks and is actuated by two screwjacks. The screwjacks of the left and right surfaces are mechanically interconnected through rotating shafts linkages engaged on the drive unit.

Each single-slotted inboard flap is actuated by a single screwjack connected to the drive unit through a rotating shaft.

The mechanically independent left flap (FWLF) and right flap (FWRF) of the forward wing are single-slotted type. Each surface is driven by an electromechanical dual linear actuator.

A gated FLAP control lever, located on the control pedestal right side of the condition levers, allows setting the flaps through a flap selector switch. The control lever has three positions: UP (clean setting), MID (takeoff setting) and DN (landing setting). Each setting can be selected moving the control lever to the desired position: from UP to MID, from MID to DN and vice versa (single step command), or directly from UP to DN and vice versa (direct command).

NOTE

The use of single step control is recommended as normal operating procedure.

Stop microswitches control the surfaces stopping in the selected position. In addition mechanical stops are provided in the UP and DN configurations.

DESCRIPTION AND OPERATION

FLAP SYSTEM

Moving the FLAP lever from UP to MID the flap surfaces deployment will be completed in 16 seconds (nominal) as per the following schedule:

- the main wing outboard flaps will start travelling while the inboard flaps and the forward wing flaps will rest in the clean setting;
- after 9 seconds (nominal) of delay the forward wing flaps also will start then stop after 1 second of travel; the inboard flaps remain in clean setting; the main wing outboard flaps motion continues;
- after further 5 seconds (nominal) of delay the inboard flaps also will start; the forward wing flaps will restart; the main wing outboard flaps motion continues;
- after further 2 seconds all the flaps sections will reach the takeoff setting.

When the flap control lever is moved from MID to DN all the flap surfaces simultaneously will start motion and will reach the full extension in 5 seconds (nominal) travel.

The flap retraction requires 5 seconds (nominal) from the landing to the takeoff setting (FLAP lever from DN to MID) and 16 seconds (nominal) from the takeoff to the clean setting (FLAP lever from MID to UP). All flap subsystems start retracting simultaneously.

FLAP SETTING	FWD WING FLAPS	MAIN WING OUTBOARD FLAPS	MAIN WING INBOARD FLAPS
UP	0°	0°	0°
MID	13°	10°	20°
DN	30°	30°	45°

The full-time Flaps position indication on the upper left side of the two Primary Flight Display (PFD) and the Flap position indication on the Multifunction Display (MFD) System Page provides the crew with visual indication of flaps surfaces position (see [Figure 2.2-1](#) and [Figure 2.2-2](#)).

Each flap subsystem actuating motor drives a potentiometer which provides the position signal to the related Data Concentrator Unit (DCU) and then to the PFD/MFD displays through the flap electronic control unit.

The PFD Flaps position indication consists of a grey arc with markings for UP, MID (only a tickmark) and DN positions, a white position pointer and a grey FLAPS legend.

When the flap position value is failed or missing the position pointer is removed.
When the flaps are not synchronized the FLAPS legend and flap position pointer become yellow, and the pointer flashes for 5 seconds when it first turn yellow.

The MFD Flaps position indication consists of the following:

- two grey arc scales and white pointers for the Forward Wing Left and Right Flaps;
- two vertical scales and white pointers for the Main Wing Outboard Flaps (OUTB) and Main Wing Inboard Flap (INB);
- a grey FLAPS legend between the arc and vertical scales.

All the four scales have markings for the UP, MID and DN positions.

The position pointer is removed when the respective flap position value is failed or missing.

When the flaps are not synchronized the grey FLAPS legend becomes yellow; if the MFD is not in the System Page selection, a yellow FLAPS message appears below the Right Bottom line select key. Both the FLAPS legend and message flash for 5 sec. when they first turn to yellow.

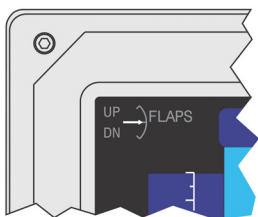


Figure 2.2-1. FLAPS Position Indication (on pilot's and copilot's PFD)

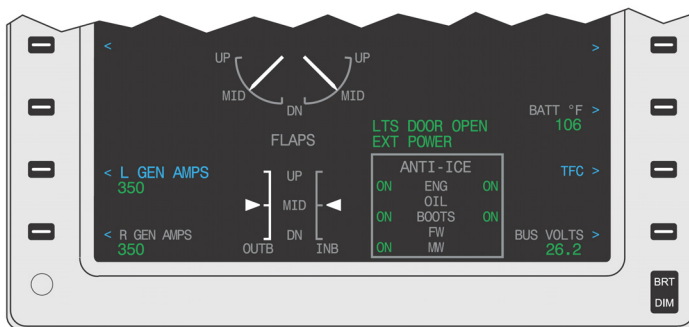


Figure 2.2-2. FLAPS Position Indication (on MFD System Page)

DESCRIPTION AND OPERATION

FLAP SYSTEM

A FLAP SYNC caution light on the annunciator display will come on in the event of either a system failure is detected or an asymmetric/incorrect flaps deployment occurs.

An acoustic warning will be generated whenever the flaps are lowered to the DN position and the landing gear is not locked down. In addition the acoustic warning will be generated whenever the flaps are in the MID position, the landing gear is not locked down and the left power lever is retarded approximately below the half travel position.

The 326 Hz warning tone cannot be silenced by the mute switch and will continue until either the landing gear is extended or the flaps are retracted to the clean (UP) setting.

The SYS TEST selector switch allows testing the system after being rotated to the FLAPS position. Refer to the Preflight Check procedure in Section 4 of the Airplane Flight Manual for further information about the system test procedure.

A MID Interlock Control (MIC) in the electronic control unit checks the main wing outboard flaps and both forward wing flaps subsystems for the transit through the MID setting when the FLAP control lever is moved directly from either UP to DN or DN to UP (direct command). There is no check on the main wing inboard flaps subsystem. The MID Interlock Control inhibits further travel beyond the MID position until all the checked subsystems have reached this configuration.

If an asymmetric flap condition occurs after such direct command, in order to reduce the asymmetry (if necessary) the FLAP control lever can only be moved to the previous (UP or DN) position.

If an asymmetric flap condition occurs after a single step command, the FLAP lever can only be moved to the previous position for recovering the original flaps configuration.

The flap system operates on 28 VDC supplied from the left generator bus through a 35-ampere remote control circuit breaker located in the baggage compartment: this breaker can be reset through the 0.5-ampere FLAPS PWR circuit breaker on the copilot circuit breaker panel.

As further protection three circuit breakers are provided, all located on the copilot circuit breaker panel: the 3-ampere L FWD WING FLAP and R FWD WING FLAP circuit breakers that protect respectively the left and the right forward wing flap actuators, and the 10-ampere OUTB WING FLAP circuit breaker that protects the main wing outboard flaps actuator.