02-27 ATA 27 – FLIGHT CONTROLS

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INTENTIONALLY LEFT BLANK
INTRODUCTION

The primary flight controls of the Falcon 2000EX EASy airplane are hydraulically and actuated.

The primary flight controls include two ailerons, two mechanically-linked elevators, one horizontal stabilizer and one rudder.

Secondary flight controls include leading edge slats, trailing edge double slotted flaps and airbrakes. All secondary flight controls are hydraulically actuated and either controlled by control handles located in the flight deck center pedestal or automatically controlled when specific flight conditions are met for slats or airbrakes operation.
FLT CONTROL circuit breakers

ENG-TRM-BRK window indicating trim configuration

Airbrakes auto extension disarm pushbutton

HSI window indicating slats, flaps, airbrakes and pitch trim configurations

SPEED LIMITATIONS placard marking

Aileron and rudder normal trim controls, pitch and aileron emergency controls, and airbrakes controls

FIGURE 02-27-05-00 FLIGHT DECK OVERVIEW
# Flight Control Sources

## Primary Flight Controls

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<td>- Hydraulic No 2</td>
<td>- Hydraulic No 2</td>
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<tr>
<td>- A1 bus for aileron trim</td>
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<td>- B1 bus for aileron Arthur variable unit</td>
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<tr>
<td>- Hydraulic No 2 for emergency slat extension</td>
<td>- ESS bus for flap control</td>
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<tr>
<td>- A2 and BAT buses for normal slat operation</td>
<td></td>
<td></td>
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<td>- BAT bus for emergency extension</td>
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<td></td>
</tr>
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<td>- Angle of attack sensors for automatic extension and retraction</td>
<td></td>
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</table>
PRIMARY AND SECONDARY FLIGHT CONTROLS

FIGURE 02-27-05-01 PRIMARY AND SECONDARY FLIGHT CONTROLS

- Slat
- Aileron
- Elevator
- Rudder
- Horizontal stabilizer
- Airbrakes
- Flaps
INTRODUCTION

The primary flight control system is hydraulically and actuated. Control inputs from the flight deck are transferred from the dual control yoke and column through a system of push-pull rods and bellcranks, which provide manual inputs to dual hydraulic servo-actuators connected to the appropriate primary flight control surface.

In the case of total hydraulic failure, all primary flight controls can be operated manually. In this abnormal condition, airspeed should be limited to 260 KIAS or less.

Horizontal stabilizer, aileron and rudder trims are electrically actuated. The horizontal stabilizer trim has a second emergency electrical motor. The ailerons have a normal and an emergency electrical trim.

PRIMARY FLIGHT CONTROLS

Between the pilot or copilot column and yoke and a flight control surface, the control channel is composed of:

- a series of push-pull rods acting as the mechanical link between the control column and yoke and the servo-actuator,
- a main Artificial Feel Unit (AFU),
- a variable bellcrank, or Arthur, for roll and pitch feel control,
- a trim unit,
- a servo-actuator,
- an auxiliary artificial feel unit connected to the servo-actuator.
SERVO-ACTUATOR

Each primary flight control surface is actuated by its associated hydraulic servo-actuator. The servo-actuators consist of two independent barrel and piston assemblies operating in unison. Each of No1 and 2 hydraulic systems independently supplies a barrel and piston assembly.

FIGURE 02-27-10-00 SERVO-ACTUATOR SCHEMATIC (ONE BARREL REPRESENTED)
The servo-actuator unit is attached to the control surface and connected to the airframe by its rods.

Movement of a control-input linkage (push-pull rod) controls the servo-actuators by directing hydraulic fluid to displace the dual barrel and piston.

Movement of the servo-actuator assembly provides force to deflect the control surface through a connecting rod.

Should one hydraulic system fail, a bypass valve within the corresponding barrel interconnects the two chambers and depressurizes the barrel of the affected hydraulic system. This keeps possible the movement of the inert barrel actuated by the active one.

Should both hydraulic systems should fail, pilot inputs can mechanically move the entire servo-actuator assembly and deflect the control surface by bringing the control input lever to abutment. The by-pass valve is restricted in order to avoid flutter. An accumulator keeps pressure to compensate possible hydraulic fluid leakage and thermal retraction.

FIGURE 02-27-10-01 SERVO-ACTUATOR OPERATION
ARTIFICIAL FEEL UNIT

Each primary flight control incorporates a main spring-loaded Artificial Feel Unit (AFU) upstream from its servo-actuator. The main AFU provides an aerodynamic artificial load feel to pilot’s controls directly proportional to the input movement and to the resultant spring compression of the AFU.

The elevator main AFU is electrically heated for high altitude flight.

FIGURE 02-27-10-02 FLIGHT CONTROL SCHEMATIC (TYPICAL)

An auxiliary spring-loaded AFU is connected to the airframe and to the auxiliary arm of each servo-actuator. In case of control linkage disconnection, the auxiliary AFU forces the slide valves to position the servo-actuator into the neutral position.
ARTHUR VARIABLE BELLCRANK

A variable bellcrank, or Arthur, is incorporated within both the aileron and elevator control systems to vary the artificial load feel of the flight controls. The law governing the position of the Arthur unit is based upon specific parameters (speed or stabilizer deflection). As these parameters change, the pivot-point of the Arthur variable bellcrank effectively increases or decreases the AFU input arm length, thus decreasing or increasing the artificial load feel of the control yoke. The effort applied by the pilot on the yoke to obtain the same control surface deflection will be more important when the airplane speed is in the high range rather than when it is in the low range.

FIGURE 02-27-10-03 ARTHUR OPERATION SCHEMATIC (TYPICAL)
AILERONS

Moving the pilot or copilot control yoke causes aileron deflection through a series of push-pull rods, bellcranks and servo-actuators. The aileron flight control system also includes spring-loaded main and auxiliary AFU, variable bellcrank and trim units.

In the event of aileron control linkage jamming, an electrically powered aileron actuator can drive the left aileron servo-actuator. When the emergency aileron trim actuator is out of the neutral position, the amber **AIL ZERO** message appears in the CAS message window.

![AILERON CONTROL SYSTEM](image-url)
AILERON ARTHUR VARIABLE BELLCRANK

This variable bellcrank is incorporated within the aileron control system to adjust the artificial load feel of the flight controls with respect to the airplane airspeed.

The position of the Arthur unit is compared with the theoretical position computed from ADS1 airspeed. If the difference exceeds a threshold depending on the airspeed, the **AIL FEEL** CAS message appears. An Arthur unit failure may cause higher or lower control forces than normal depending on whether the unit has failed in high or low speed position.

AILERON TRIM UNITS

The aileron system has a normal trim and an emergency trim. Both trim unit actuators are electrically-driven screw jacks.

Acting on the normal trim actuator moves the AFU zero reference in order to obtain a zero reaction force. It is controlled by a dual rocker switch located on the flight deck center pedestal. Both halves of the rocker switch must be pressed simultaneously to close the electrical circuit and actuate the trim.

In case of aileron control linkage jamming, the emergency trim allows to control directly the LH servo-actuator. It is controlled by two red pushbuttons located on the flight deck center pedestal.

NOTE

Emergency aileron trim is operative even when airplane is not hydraulically powered.

Aileron trim range is displayed within the ENG-TRM-BRK windows within both pilot PDU. When the trim is used, the ENG-TRM-BRK window pops up on the Pilot Flying side.

FIGURE 02-27-10-05 AILERON TRIM SCHEMATIC
PITCH CONTROL

Pilot control inputs are transmitted from the control columns through a series of push-pull rods, bellcranks and hydraulic servo-actuator. The elevator flight control system includes spring-loaded main and auxiliary AFU, an Arthur variable unit and a horizontal stabilizer trim.

FIGURE 02-27-10-06 PITCH CONTROL SYSTEM
ELEVATOR ARTHUR VARIABLE BELLCRANK

The position of the horizontal stabilizer reflects the balance between the airplane airspeed and its center of gravity. This parameter and the slat control govern the Arthur variable unit position. Accordingly the Arthur unit changes the "artificial load feel" with respect to the position of the horizontal stabilizer.

The elevator Arthur internal electronics continuously monitors the position of the Arthur variable unit with respect to the position of the horizontal stabilizer and slat control. If the comparison exceeds the warning threshold, the PITCH FEEL CAS message appears and a low speed Arthur configuration is commanded. An Arthur unit failure may cause lower control forces than normal.

CAUTION

In-flight Arthur unit failure induces speed limitations.
HORIZONTAL STABILIZER TRIM UNIT

The fully movable horizontal stabilizer is used to trim the airplane on the pitch axis. The horizontal stabilizer is actuated by one screw jack which is powered by two electric 28 V\textsubscript{DC} motors (normal or emergency mode). A dual rocker switch on both control yokes controls the normal pitch trim. Both halves of the rocker switch must be pressed simultaneously to close the circuit and actuate the trim. The order is cancelled with opposite order from the other pilot.

A clacker warns that the stabilizer moves.

FIGURE 02-27-10-07 ELEVATOR TRIM SYSTEM

The emergency pitch trim rocker switch is located on the flight deck center pedestal. In the event of horizontal stabilizer normal trim unit failure, the emergency pitch trim switch can then actuate the stabilizer. The switch is spring-loaded to the center (off) position and has unsteady up and down positions. Moving the switch to either operating position (up/down) automatically disengages the normal circuit breaker located near the switch. This makes the normal operating circuit inoperative.

Pitch trim range is displayed permanently in the HSI window and within the ENG-TRM-BRK windows in both pilot PDU. When the trim is used, the ENG-TRM-BRK window pops up on the pilot flying side.

On ground, in take-off configuration, if the stabilizer trim is not set within the green range there is a \textless\ NO TAKE-OFF \textgreater\ aural warning and the \textbf{NO TAKE-OFF} CAS message appears. The tick mark in STAB synoptic turns to red.

\textbf{CAUTION}

The pitch trim indication must be located in the green area for take-off.
Paint marks are provided on the fin for take-off range and extreme positions of the stabilizer for on-ground visual inspection.

![Paint marks on the fin for visual inspection.](image)

**FIGURE 02-27-10-08 PAINT MARKS FOR VISUAL TRIM POSITION INSPECTION**

**HORIZONTAL STABILIZER / MACH TRIM OPERATION**

To increase natural longitudinal stability at high Mach numbers, the Mach Trim System is active between Mach .77 and Mach .87. The Mach trim control box supplies pitch trim command inputs to the elevator trim to adjust the stabilizer position as the Mach number changes. A clacker warns that the stabilizer moves.

With the Mach trim system engaged, the normal trim can be used at any time to adjust stabilizer position. Once the normal pitch trim switch is released, the Mach trim system resumes automatic operation.

**NOTE**

Mach trim is overridden by normal trim and autopilot activation.
RUDDER

Moving the pilot or copilot rudder pedals provides rudder deflection through a series of push-pull rods, bellcranks and servo-actuator.

The flight control system also includes main and auxiliary spring-loaded AFU, a rudder trim unit and a yaw damper system.

FIGURE 02-27-10-09 RUDDER CONTROL SYSTEM
RUDDER TRIM UNIT

The rudder trim actuator is an electrical screw jack. The trim unit is controlled by a dual rocker switch located on the flight deck center pedestal. Both halves of the rocker switch must be pressed simultaneously to close the circuit and activate the rudder trim.

Acting on the trim actuator moves the AFU zero reference in order to obtain a zero reaction force. Movement of the rudder trim switch applies power (28 VDC) to the linear rudder trim actuator located in the fuselage.

Rudder trim range is shown within the ENG-TRM-BRK windows displayed on both pilots PDU. When the trim is used, the ENG-TRM- BRK window pops up on the Pilot Flying side.

YAW DAMPING SYSTEM

The yaw damping system reduces oscillations around the airplane yaw axis. An electrically powered actuator installed with the rudder control linkages upstream from the main rudder servo-actuator compensates for these oscillations by inputs to the control linkage.
SECONDARY FLIGHT CONTROLS

Secondary flight controls include electrically controlled and hydraulically actuated leading-edge slats, trailing edge flaps and airbrakes.

LEADING-EDGE SLATS

Each wing incorporates leading edge slats. Slat operation is hydraulically actuated and electrically controlled by a slats / flaps control handle located on the flight deck center pedestal.

Three hydraulic actuators supply each slat. Two double-acting units provide both retraction and extension during normal slat operation and are powered by No 1 hydraulic system. The third actuator provides only emergency extension with hydraulic power supplied by No 2 system.

Slat operation is electrically sequenced. The slat extension occurs before flap extension. During retraction, flaps are first fully retracted then slats are retracted.

FIGURE 02-27-10-10  LEADING EDGE SLAT SYSTEM
The slats are operated in three modes: normal, automatic and emergency.
- The normal operation mode consists in deploying and retracting the slats and flaps using the slats / flaps control handle.
- The automatic operation mode is active in flight and is controlled according to Angle Of Attack (AOA) probes. Airspeed parameter is also used to inhibit automatic operation above 265 kt. The AOA threshold for automatic slats extension depends on slats / flaps control handle notch.
- The emergency mode is manually activated in flight to extend slats in case of No 1 hydraulic system failure.

In conjunction with automatic slat extension or retraction, engine ignition is activated. The <STALL> aural warning sounds above specific AOA thresholds. Automatic slat operation is active in flight only.

The emergency slat extension is controlled by a two-position guarded switch located on the center pedestal. It supplies the emergency actuator hydraulic manifold directly from the BAT bus. It allows the slats to extend for approach in the event of a No1 hydraulic system failure. This mode of operation is intended for landing configuration only and does not provide for slat retraction.

**CAUTION**

When the EMERG SLATS switch has been used, it must not be returned to the off position.

The monitoring of slat extension / retraction is performed through microswitches indicating slat position.

On ground, in take-off configuration, if the slats are not extended, there is a <NO TAKE-OFF> aural warning and the NO TAKE-OFF CAS message appears. The slat symbol turns to red.
TRAILING EDGE FLAPS

The trailing edge flaps consist of an inboard and outboard double slotted flaps on each wing. A control handle located on the flight deck center pedestal operates the slats and flaps. The handle provides the flaps geared hydraulic motor with electrical activation. The flaps are then actuated through a series of rotating rods and screw jacks. A spring-loaded brake within the hydraulic motor holds the flaps in their selected position.

The difference between right and left flap position is continuously monitored to detect a possible asymmetry. In case of asymmetry detection, a FLAPS ASYM CAS message appears and the flap control circuit breaker trips, stopping the flap movement.

CAUTION

Selection of SF2 or SF3 notch from CLEAN notch is forbidden.

On ground, in take-off configuration, if the flaps are not deployed or are set to SF3, there is a < NO TAKE-OFF > aural warning and the NO TAKE-OFF CAS message appears. The flap symbol turns to red.
AIRBRAKES

Three airbrake panels are provided for each wing upper surface. The airbrakes are hydraulically actuated and electrically controlled.

The airbrakes handle is located on the flight deck center pedestal. The normal operation mode allows selection of three notches of the handle. Setting airbrakes handle to notch 0 induces all airbrakes retraction. Setting the handle to notch 1 causes the extension of the center airbrake panels. Selecting notch 2 causes the extension of all six airbrake panels.

![Airbrakes Diagram](image)

FIGURE 02-27-10-13 AIRBRAKE PANEL LOCATION

Each panel is either fully deployed or fully retracted. Depending on the panel location (inboard, center or outboard), the deflection angle of the panel when fully extended varies. Switches allow the system to monitor airbrakes panel position.

An automatic mode allows automatic airbrake extension at landing and during Rejected Take-Off (RTO). This mode of operation of the airbrakes depends on throttle angles and BSCU data.

They are automatically retracted when speed decreases below 20 kt.

This automatic function enhances global braking action during landing or rejected take-off and reduces bounces after touchdown.

The AUTO EXT. pushbutton (amber DISARM status light) located on the overhead panel allows the crew to disarm this function.

A stall protection feature commands automatic retraction of the airbrakes when high Angle Of Attack (AOA) is detected by the two AOA probes. The AOA threshold for automatic retraction depends on the slats / flaps control handle notch.

The airbrakes can not be extended again until the handle is returned to notch 0, recycling the system.

On ground, in take-off configuration, if at least one airbrake panel is not retracted there is a <NO TAKE-OFF> aural warning and the **NO TAKE-OFF** CAS message appears. The airbrake symbol on HSI window and AB1 or AB2 on speed scale turn to red.
### SYNTHETIC TABLES

#### Slats and flaps

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<th>TO DEACTIVATE</th>
<th>SYNOPTIC</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Sets slats / flaps to CLEAN notch: (slats + flaps retracted)</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td>CLEAN (Above 18,000 ft: for 15 sec only, nil after) See NORMAL OPERATION</td>
</tr>
<tr>
<td></td>
<td>Sets slats / flaps to first notch: SF1 (slats + slaps 10°)</td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td>Sets slats / flaps to the second notch: SF2 (slats + flaps 20°) (flaps 22° after retraction from SF3)</td>
<td><img src="image6.png" alt="Image" /></td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td>Sets slats / flaps to the third notch: SF3 (slats + flaps 40°)</td>
<td><img src="image9.png" alt="Image" /></td>
<td><img src="image10.png" alt="Image" /></td>
<td><img src="image11.png" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td>Extends the slats in emergency mode.</td>
<td><img src="image12.png" alt="Image" /></td>
<td><img src="image13.png" alt="Image" /></td>
<td><img src="image14.png" alt="Image" /></td>
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# Airbrakes

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<tr>
<td></td>
<td>Sets airbrakes to CLEAN notch (airbrake panels retracted)</td>
<td><img src="image1" alt="Control" /></td>
<td><img src="image2" alt="Synoptic" /></td>
</tr>
<tr>
<td></td>
<td>Sets airbrakes to first notch: (center airbrake panels deployed)</td>
<td><img src="image3" alt="Control" /></td>
<td><img src="image4" alt="Synoptic" /></td>
</tr>
<tr>
<td></td>
<td>Sets airbrakes to second notch: (all airbrake panels deployed)</td>
<td><img src="image5" alt="Control" /></td>
<td><img src="image6" alt="Synoptic" /></td>
</tr>
<tr>
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<td><strong>AUTO EXT.</strong></td>
<td><strong>AIR BRAKE</strong></td>
<td><strong>DISARM</strong></td>
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<tr>
<td>Pushbutton</td>
<td>Arms / disarms automatic airbrake extension</td>
<td><img src="image7" alt="Control" /></td>
<td><img src="image8" alt="Synoptic" /></td>
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Normal and emergency trims

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<td>AILERON</td>
<td>Activates aileron left or right trim (trims roll axis).</td>
<td><img src="image" alt="AILERON activation" /></td>
<td><img src="image" alt="AILERON synoptic" /></td>
</tr>
<tr>
<td>Rudder</td>
<td>Activates rudder left or right trim (trims yaw axis).</td>
<td><img src="image" alt="RUDDER activation" /></td>
<td><img src="image" alt="RUDDER synoptic" /></td>
</tr>
<tr>
<td>Horizontal Stabilizer</td>
<td>Activates horizontal stabilizer to move up or down (trims pitch axis).</td>
<td><img src="image" alt="Stabilizer activation" /></td>
<td><img src="image" alt="Stabilizer synoptic" /></td>
</tr>
<tr>
<td>Tailplane</td>
<td>Activates emergency horizontal stabilizer up or down (trims pitch axis) and deactivates primary trim.</td>
<td><img src="image" alt="Tailplane activation" /></td>
<td><img src="image" alt="Tailplane synoptic" /></td>
</tr>
</tbody>
</table>
INDICATION

Aileron, rudder and horizontal stabilizer trim positions are displayed in the ENG-TRM-BRK windows on pilots request and as soon as one trim control surface movement is detected (including untimely or non-commanded movement). A green mark-up moves along a graduated scale to indicate trim surface position. A white range (width +/- 10% of full control surface travel) indicates the zero setting position.

NOTE

ERRONEOUS INDICATION

The first certification load is not in accordance with the white definition. The white range width is around +/- 5%.

A green range also defines the authorized settings for take-off on the horizontal stabilizer graduated scale.

FIGURE 02-27-15-02 ENG-TRM-BRK WINDOW, TRIM POSITIONS

NOTE

In cruise, after trimming the airplane, it is usual to have aileron and rudder trim indicators not centered (due to differential dilatation of aileron linkage rods).
Horizontal stabilizer position is also permanently displayed in the top left hand corner of the HSI windows. Any movement of the horizontal stabilizer generates a clacker sound in the aural warning system.

Slat, flap and airbrake positions are displayed in the top left hand corner of the HSI. Symbols and labels can be displayed in this dedicated area according to the following rules:

- slats / flaps / airbrakes symbols are displayed as long as:
  - there is one slat, one flap or one airbrake panel extended (including untimely or non-commanded surface movement), or
  - there is a flight control CAS message displayed, or
  - a flight control label is triggered (AUTO, EMERG, AUTO RET, DISARM),
- the slats / flaps / airbrakes symbols are replaced by a white CLEAN label if:
  - the airplane is in the CLEAN configuration and,
  - no flight control CAS message is displayed, and
  - no flight control label is triggered,
- the CLEAN white label is erased (nothing is displayed) if:
  - the airplane altitude is above 18,000 ft, and
  - the CLEAN label has been displayed for 15 sec.
Flap handle and airbrake handle positions are shown in the indicator as a magenta tick mark (1, 2 or 3 for flap indication, 1 or 2 for airbrake indication).

The airbrake indication label (AB1 or AB2) is also displayed in airspeed tape as a reminder.

**FIGURE 02-27-15-04 AIRSPEED TAPE WITH AIRBRAKE POSITION 1**

**SLATS, FLAPS AND AIRBRAKES SYMBOLS**

- **CLEAN**
  - Airplane is in CLEAN configuration. No flight control CAS message is displayed and no flight control label is triggered

- **CLEAN label has been displayed for 15 sec (see conditions associated to the CLEAN white label) and airplane altitude is above 18,000ft**

- Slats / flaps / airbrakes indications are not valid
SLAT SYMBOL

Slat extension sequence

Control handle in CLEAN notch. Slats are retracted and slat symbol is not displayed. See NORMAL OPERATION

Control handle moved into SF1 notch. Selecting the SF1 position causes arrow symbol to flash (green filled to blank). Position tick mark 1 is displayed in magenta

When slats and flaps are extended, slat symbol comes green filled and steady

Slat retraction sequence

Control handle in SF1 notch. Slats are extended and slat symbol is green filled. Tick mark 1 is displayed in magenta. Flap position, green outlined, is in the 10° status

Control handle returned to CLEAN notch. Selecting the control handle back to CLEAN causes arrow symbol to flash (green filled to blank) tick mark 1 is displayed in white

When both slats are retracted, slat graphic is not displayed. Flap position, outline green, is in 0° status. See NORMAL OPERATION
No take-off: slat graphic is flashing red to blank. The slats / flaps configuration is not allowed for take-off

Discrepancy between pilot slat control and slat position

Automatic slat movement

Slats automatically extended

Emergency slat movement

Slats extended by emergency system
**FLAPS SYMBOL**

Flaps extension sequence from SF1 to SF2 (from CLEAN to SF1: identical to slats extension)

Control handle in SF1 notch: flaps are extended to a deflection angle of 10°, tick marks and labels 0, 2, 3 are displayed in white, label 1 is displayed in magenta and flaps symbol, outline green, is in status 1. Slats are extended (green filled).

Control handle moved to SF2 notch. Selecting the control handle to the SF2 notch causes: tick mark and label 2 to be displayed in magenta. When flaps reach the notch of 20°: flap symbol, outline green, is in status 2.

Flaps retraction sequence from SF1 to SF2 (from SF1 to CLEAN: identical to slats retraction)

Control handle in SF2 notch: flaps are extended to a deflection angle of 20°, tick marks and labels 0, 1, 3 are displayed in white. Label 2 is displayed in magenta and flap symbol, green outlined, is in status 2. Slats are extended (green filled).

Control handle moved to SF1 position: tick marks and labels 0, 2 and 3 are displayed in white. Tick mark and label 1 are displayed in magenta. Flaps symbol, green outlined, is in status 2.

When flaps reach the position of 10°: flaps symbol, green outlined, is in status 1.
No take-off: flap graphic is flashing red. The flap configuration is not allowed for take-off.

**AIRBRAKES SYMBOL**

**Airbrake extension (from 0 to AB1)**

Control handle in notch 0. Airbrakes are retracted and airbrake symbol is not displayed.

Control handle moved to notch 1. Selecting the control handle to notch 1 causes tick mark and label 1 to be displayed in magenta.

When airbrakes are deployed, airbrake symbol is displayed at position 1.

**Airbrake retraction (from AB1 to 0)**

Control handle in notch 1. Airbrakes are deployed, airbrake symbol is displayed at position 1. Tick mark and label 1 are displayed in magenta.

Control handle moved to notch 0. Selecting the control handle to position 0 causes tick mark and label 1 to be displayed in white.

When airbrakes are retracted, airbrake symbol is no more displayed. After 2 sec displayed, turns to CLEAN display configuration as seen before.
No take-off: airbrake graphic is flashing red. The airbrake configuration is not allowed for take-off.

Airbrake failure. At least one panel is in discrepancy with control.

Automatic retraction (stall protection).

Automatic extension.

Airbrakes in DISARM mode: no automatic extension.
INTRODUCTION

The circuit protection is provided by conventional trip-free circuit breakers located above the overhead panel and on the center pedestal.

CIRCUIT BREAKERS

FIGURE 02-27-20-00 OVERHEAD AND CENTER PEDESTAL CIRCUIT BREAKERS
### PLACARD MARKINGS

**SPEED LIMITATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Limitation (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF1</td>
<td>200</td>
</tr>
<tr>
<td>SF2</td>
<td>190</td>
</tr>
<tr>
<td>SF3</td>
<td>180</td>
</tr>
<tr>
<td>VLO</td>
<td>190</td>
</tr>
<tr>
<td>VLE</td>
<td>245</td>
</tr>
<tr>
<td>VA</td>
<td>198</td>
</tr>
</tbody>
</table>

*FIGURE 02-27-20-01  SPEED LIMITATIONS PLACARD MARKINGS*
INTRODUCTION

In the following, typical on ground and in-flight situations have been selected to help the crew to understand the symbols provided in the various panels and displays.

ON GROUND

FIGURE 02-27-25-00 PDU DISPLAY ON GROUND WITH FLAPS SET FOR TAKE-OFF

IN-FLIGHT

FIGURE 02-27-25-01 PDU DISPLAY IN FLIGHT BELOW 18,000FT
SYNOPTIC DURING AIRBRAKE RETRACTION IN SEVERAL CASES

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>OPERATION</th>
<th>SYNOPTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Below 18,000 ft</td>
<td>Above 18,000 ft</td>
</tr>
<tr>
<td><img src="image1" alt="Image" /></td>
<td>Airbrakes control handle is on notch 1</td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td><img src="image4" alt="Image" /></td>
<td>Airbrakes control handle moved to notch 0 Airbrakes are retracted</td>
<td><img src="image5" alt="Image" /></td>
</tr>
<tr>
<td><img src="image7" alt="Image" /></td>
<td>2 sec after airbrake retraction</td>
<td><img src="image8" alt="Image" /></td>
</tr>
<tr>
<td><img src="image10" alt="Image" /></td>
<td>17 sec after airbrake retraction</td>
<td><img src="image11" alt="Image" /></td>
</tr>
</tbody>
</table>
INTRODUCTION

In the following, examples of abnormal operations have been selected to help the crew to understand the CAS message philosophy for flight controls.

SLAT ABNORMAL OPERATION

<table>
<thead>
<tr>
<th>CONTEXT</th>
<th>RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slats do not extend</td>
<td><strong>- SLATS FAIL</strong> CAS message</td>
</tr>
<tr>
<td></td>
<td>- Slat symbol is amber</td>
</tr>
<tr>
<td>Unwanted slat extension</td>
<td><strong>- UNWANTED SLATS</strong> CAS message</td>
</tr>
<tr>
<td></td>
<td>- Slat symbol is amber</td>
</tr>
<tr>
<td>Failure of automatic slat system (i.e. invalid AOA or airspeed data or Weight On Wheel data)</td>
<td><strong>- AUTO SLATS</strong> CAS message</td>
</tr>
</tbody>
</table>

No 1 HYDRAULIC SYSTEM FAILURE

The slats are only powered by the emergency actuators. They can only be extended and not retracted (for landing only).

The aileron, rudder and elevator control surfaces are still hydraulically powered. Flaps and airbrakes are operating normally.

No 2 HYDRAULIC SYSTEM FAILURE

Flaps and airbrakes are inoperative.

The aileron, rudder and elevator control surfaces are still hydraulically powered. Slats are operating normally.

No 1 AND 2 HYDRAULIC SYSTEM FAILURE

Slats, flaps and airbrakes are inoperative.

The aileron, rudder and elevator control surfaces are only mechanically actuated.

CAUTION

In case of both hydraulic systems failure, do not use emergency aileron trim to control laterally the airplane.
JAMMING

In the event of jamming of the aileron linkage, roll control is obtained through the electric emergency actuator of the left hand aileron.

In case of jamming of the elevator linkage, the horizontal stabilizer trim allows pitch control.

➢ For further information, refer to CODDE 2 / Chapter 03 / ABNORMAL.

CAS MESSAGES

<table>
<thead>
<tr>
<th>CAS MESSAGE</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO TAKE-OFF</td>
<td>Airplane is not properly configured for take-off</td>
</tr>
<tr>
<td>AIL FEEL</td>
<td>Failure of aileron Arthur unit</td>
</tr>
<tr>
<td>AIL ZERO</td>
<td>Aileron emergency trim not in neutral position</td>
</tr>
<tr>
<td>AIRBRAKES AUTO EXTENSION</td>
<td>At least one airbrake panel failed to extend when automatically commanded</td>
</tr>
<tr>
<td>AIRBRAKES DO NOT EXTEND</td>
<td>At least one airbrake panel failed to extend when commanded</td>
</tr>
<tr>
<td>AIRBRAKES DO NOT RETRACT</td>
<td>At least one airbrake panel failed to retract when commanded</td>
</tr>
<tr>
<td>AUTO SLATS</td>
<td>Automatic slat system failure (i.e. invalid AOA or airspeed data or Weight On Wheel data)</td>
</tr>
<tr>
<td>FLAP ASYM</td>
<td>Flaps asymmetrical extension</td>
</tr>
<tr>
<td>PITCH FEEL</td>
<td>Pitch Arthur unit failure</td>
</tr>
<tr>
<td>SERVO ACCU LEFT TEST FAIL</td>
<td>On parking only. Erroneous servo-actuator accumulator position data sent to MAU 1. A maintenance message indicates which accumulator failed</td>
</tr>
<tr>
<td>SERVO ACCU RIGHT TEST FAIL</td>
<td>On parking only. Erroneous servo-actuator accumulator position data sent to MAU2. A maintenance message indicates which accumulator failed</td>
</tr>
<tr>
<td>SLATS FAIL</td>
<td>Slats failed to extend when commanded</td>
</tr>
<tr>
<td>UNWANTED SLATS</td>
<td>Unwanted slat extension</td>
</tr>
<tr>
<td>CAS MESSAGE</td>
<td>DEFINITION</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SERVO ACCU LEFT TEST FAIL</td>
<td>In cruise only. Erroneous servo-actuator accumulator position data sent to MAU 1. A maintenance message indicates which accumulator failed</td>
</tr>
<tr>
<td>SERVO ACCU RIGHT TEST FAIL</td>
<td>In cruise only. Erroneous servo-actuator accumulator position data sent to MAU 2. A maintenance message indicates which accumulator failed</td>
</tr>
<tr>
<td>STAB EMERGENCY</td>
<td>Emergency pitch trim in use instead of normal one</td>
</tr>
</tbody>
</table>
INTENTIONALLY LEFT BLANK