Boletim Especial de Aeronavegabilidade (*Special Airworthiness Bulletin*)

ATA: 24 – Electrical Power System

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BEA Nº 2023-01

Date: February 10th, 2023

Subject: Rotary Switches Pull-to-Turn Feature inspection

Introduction:

This Special Airworthiness Bulletin (BEA) advises owners and operators of the Embraer – Empresa Brasileira de Aeronáutica S.A. airplane models listed in Table 1 about the inspection of the rotary switches (see Table 2) pull-to-turn feature.

This bulletin is informative, and the recommendations herein are not mandatory. Up to this time, there is no airworthiness concern that would warrant an Airworthiness Directive (AD) according to Regulamento Brasileiro de Aviação Civil (RBAC) nº 39.

Manufacturer: Embraer – Empresa Brasileira de Aeronáutica S.A.

Affected Aeronautical Product:

Table 1: Affected Aeronautical Product

Manufacturer	Aircraft Family	Models
Embraer – Empresa Brasileira de Aeronáutica S.A.	EMB-135/145	EMB-135BJ ("*Legacy*"), EMB-135ER, EMB-135KE, EMB-135KL, EMB-135LR, EMB-145, EMB-145EP, EMB-145ER, EMB-145EU, EMB-145LR, EMB-145LU, EMB-145MK, EMB-145MP, EMB-145MR and EMB-145XR
	EMB-390 KC	EMB-390 KC ("KC-390")
	EMB-500/505	EMB-500 ("*Phenom 100*") and EMB-505 ("*Phenom 300*") airplanes
	EMB-545/550	EMB-545 ("*Legacy 450/Praetor 500*") and EMB-550 ("*Legacy 500/Praetor 600*")
	ERJ-170/190	ERJ 170-100LR, ERJ 170-100SE, ERJ 170-100STD, ERJ 170-100SU, ERJ 170-200LL, ERJ 170-200LR, ERJ 170-200STD, ERJ 170-200SU, ERJ 190-100ECJ (*"Lineage 1000"*), ERJ 190-100IGW, ERJ 190-100LR, ERJ 190-100SR, ERJ 190-100STD, ERJ 190-200 IGW, ERJ 190-200LR, ERJ 190-200STD, ERJ 190-300, ERJ

		190-400

Background:

ANAC has received information that, during the pre-flight check on two Embraer – Empresa Brasileira de Aeronáutica S.A. airplanes model EMB-145 ER/LR, a pilot reported both Fuel Pump Power switches and the APU Control Master switch to be lacking the pull-to-turn feature. This feature, on the Fuel Pump Power switches, requires the switch to be pulled before it can be turned from the ON position to the OFF position. On the APU Control Master switch, the pull-to-turn feature requires the switch to be pulled before it can be turned from the ON position to the OFF position, from the OFF position to the ON position and from the ON position to the momentary START position.

ANAC performed an assessment of the possible scenarios and determined that, although the inadvertent turning of the Fuel Pump Power switches from the ON position to the OFF position during flight is possible to occur in the absence of the pull-to-turn feature, there are no significant safety related consequences of such event occurring.

A similar assessment was performed in relation to the possible scenarios involving the absence of the pull-to-turn feature of the APU Control Master switch considering the inadvertent turning of all switch positions and it was determined that there are also no significant safety related consequences of such event occurring.

After these actions related to the switches identified in the pilot report, ANAC performed, along with the airplane manufacturer, assessments of all rotary switches used on its aircrafts that possess the pull-to-turn feature. They are listed in Table 2 below. Similarly as before, considering the inadvertent turning of all possible switch positions and all possible scenarios, it was determined that there are no significant safety related consequences.

Despite these analyses performed identified no relevant safety consequences, the pull-to-turn feature is intentionally added to the design with the purpose to prevent inadvertent activation/de-activation of the associated systems and should be regularly verified for proper functioning.

Recommendations:

ANAC recommends all owners and operators to:

1- Visually inspect the panel face markings adjacent to the rotary switches identified in Table 2 below (see Figures 1 through 5 below for the locations of the switches for each aircraft family – Table 2 switches are highlighted in yellow), for obscured / erased paint markings. Ensure that the panel markings are clearly visible and legible. Obscured / erased panel markings can prevent the crew to accurately set the switch to the position intended;

Table 2: Rotary switches that possess the Pull-to-Turn feature

Panel	Switch	Aircraft Family
APU CONTROL	APU MASTER	EMB-135/145
		ERJ-170/190
ELECTRICAL	BUS TIES	EMB-135/145, EMB-545/550, ERJ-170/190 and EMB-390 KC
	SHED BUSES / DC BUSES / AC BUSES	EMB-135/145, EMB-545/550, ERJ-170/190 and EMB-390 KC
GND PROX/ELT	ELT	EMB-545/550
FUEL CONTROL	FUEL PUMP POWER	EMB-135/145 and ERJ-170/190
	FUEL XFEED	EMB-500/505
		ERJ-170/190
PASSENGER SIGNS	EMER LT	ERJ-170/190
POWERPLANT	ENGINE START/STOP	EMB-135/145 and EMB-545/550
		ERJ-170/190
		EMB-500/505
PRESSURIZATION CONTROL	MODE	EMB-500/505, ERJ-170/190

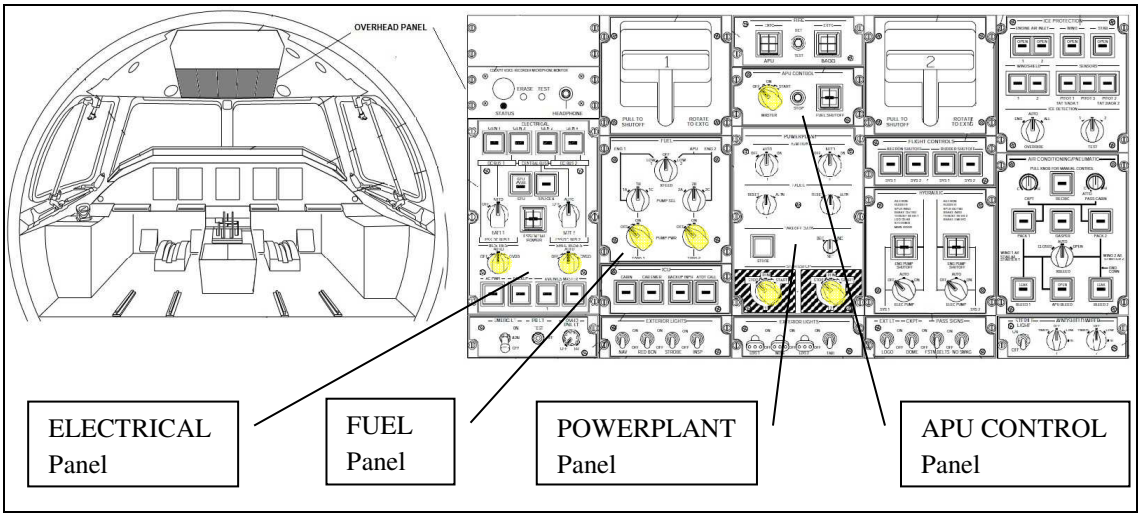

Figure 1 – EMB-135/145 Overhead Panel (typical) – Relevant switches are highlighted

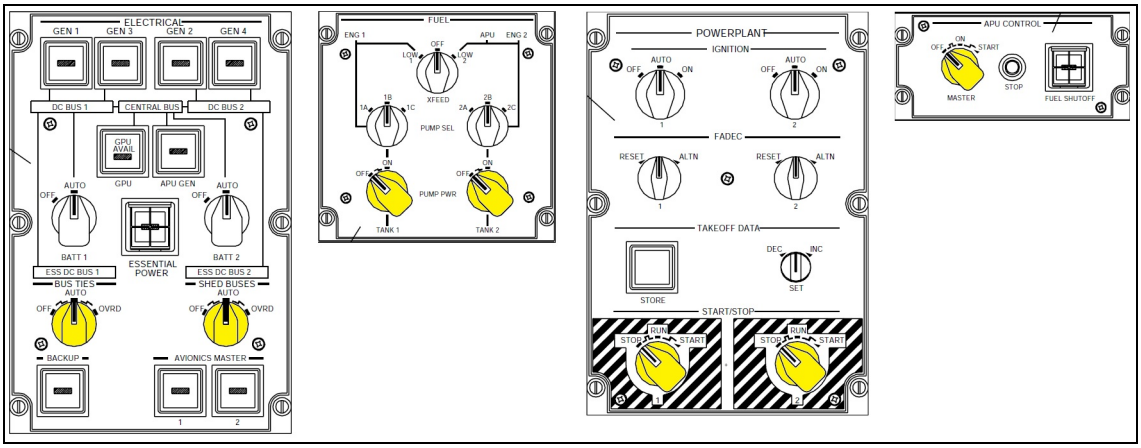

Figure 2 – EMB-135/145 Panel Detailing (typical) – Relevant switches are highlighted

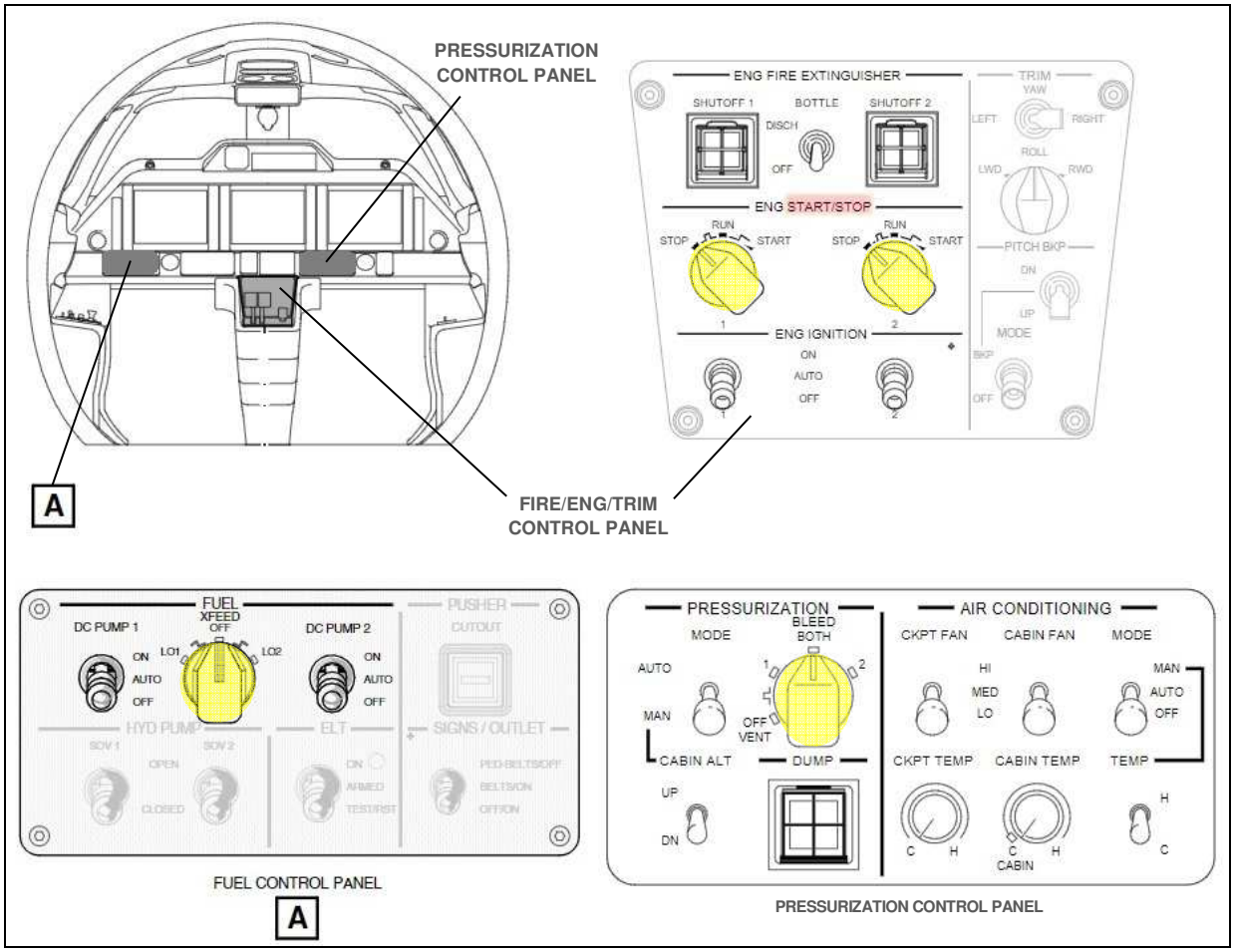

Figure 3 – EMB-500/505 Panels (typical) – Relevant switches are highlighted

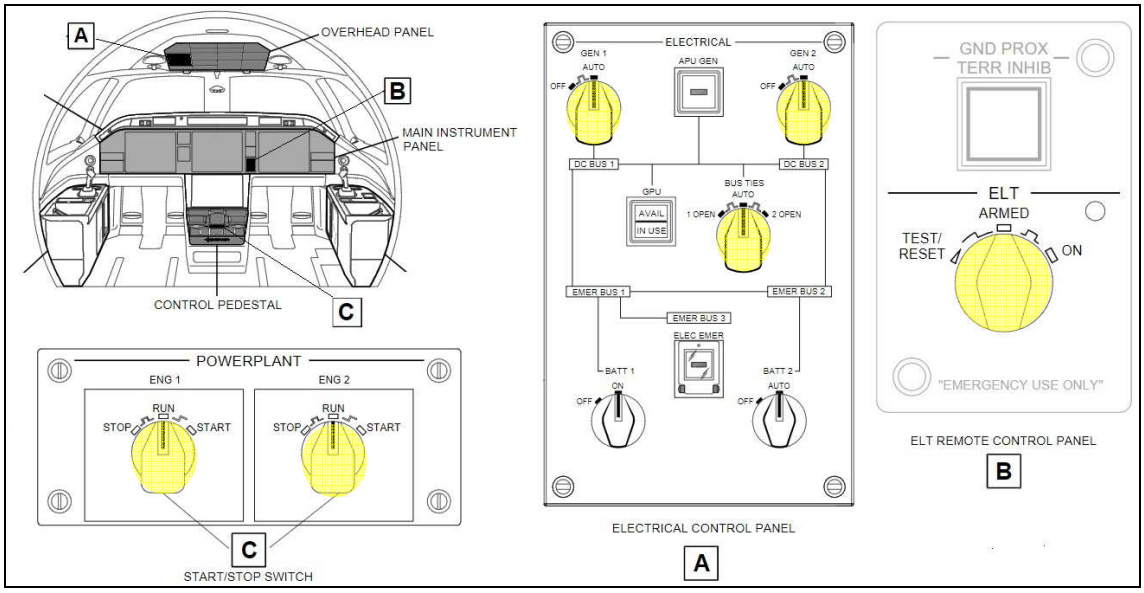

Figure 4 – EMB-545/550 Panels (typical) – Relevant switches are highlighted

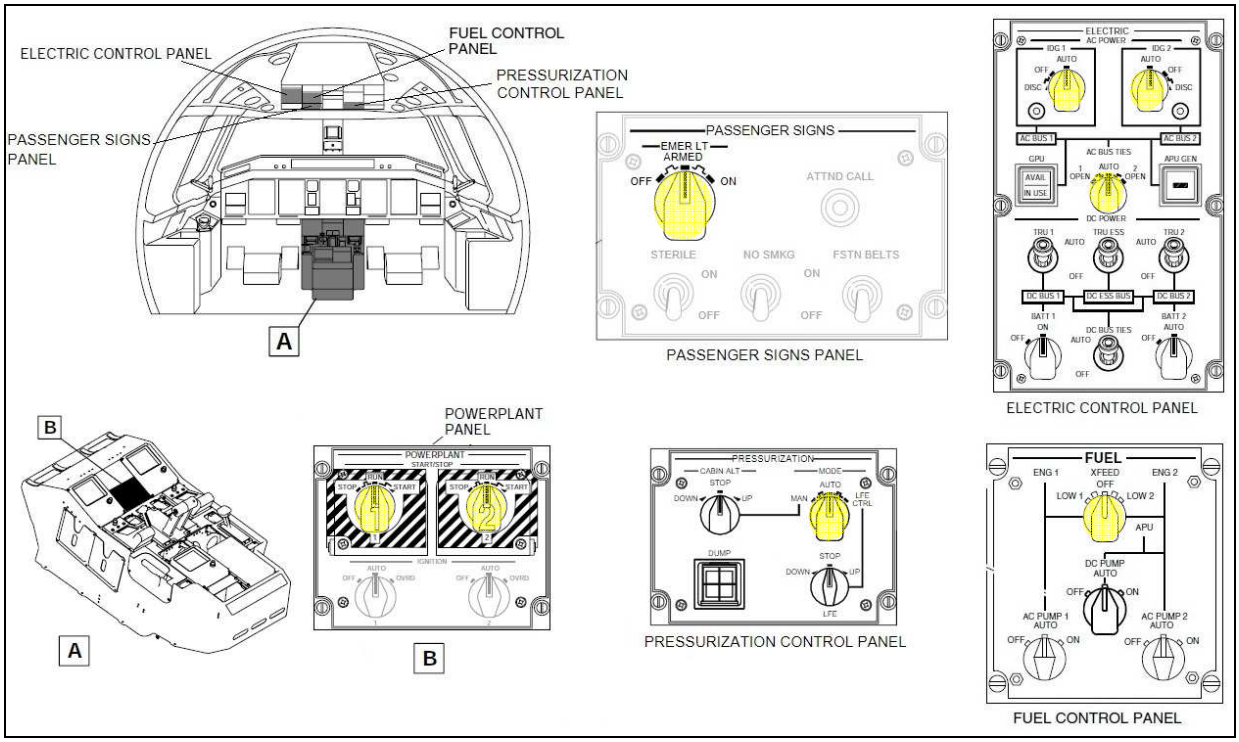

Figure 5 – ERJ-170/190 Panels (typical) – Relevant switches are highlighted

2- Do a check of the rotary switches identified in Table 2 as follows:

CAUTION: Take all relevant actions/precautions to make sure that is safe to operate the rotary switches before this check.

a) Make sure you cannot freely change the switch from its present position to the position that requires the pull-to-turn feature to be engaged (the feature is indicated in the painted markings for each switch).

NOTE: Before you change the switch from its present position, you must pull the switch first in order to turn to the desired position. The switch has an internal locking device that does not permit you to change the switch positions freely.

b) Completely pull the switch.

CAUTION: Do not apply excessive force during this step. Excessive rotating force to change the switch position without pulling it will cause damage to the internal locking device possibly resulting in the switch command with no detent feature.

c) Rotate the switch to the desired position.

NOTE: If the desired position is momentary position, it means a spring load will bring the switch back to its original position.

d) Repeat steps (a) and (b) above for all positions of the rotary switch that possess the pull-to-turn feature.

3- As an example, see below the procedure to check the APU MASTER and ENGINE START/STOP switches for the EMB-135/145 aircraft models:

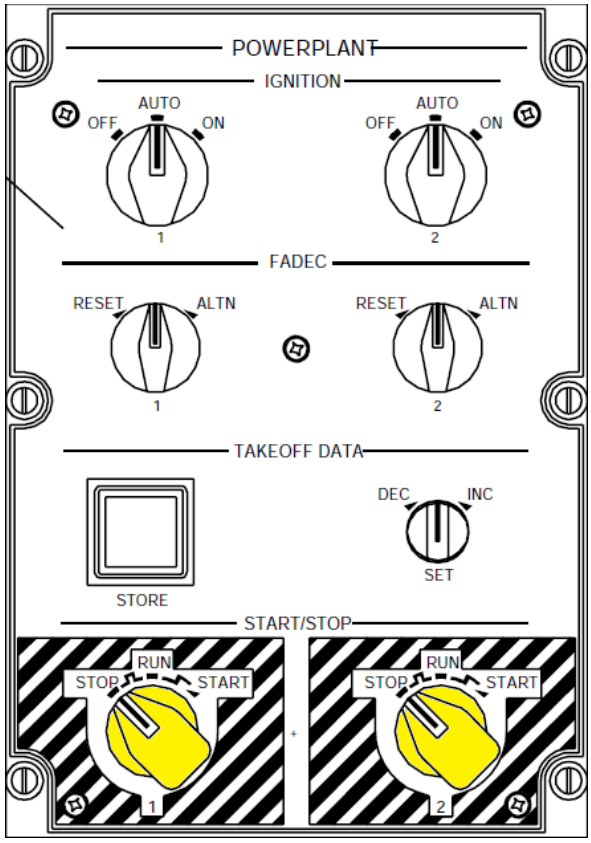

Figure 6 – EMB-135/145 Powerplant panel (typical) – Engine Start/Stop switches are highlighted

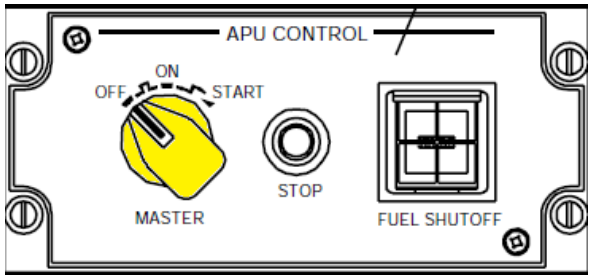

Figure 7 – EMB-135/145 APU Control panel (typical) – APU Master switch is highlighted

a) Set the switch (see Figures 6 and 7 above) to the initial position indicated in Table 3 below:

Table 3: Rotary switches Pull-to-Turn feature test

Switch	Initial Position	Test Position 1	Test Position 2
ENGINE START/STOP 1 and 2	RUN	STOP	START
APU MASTER	ON	OFF	START

b) Verify that turning the switch to the Test Position 1 (see Table 3) is only possible if, before turning, it is necessary to pull the switch first.

c) Verify that turning the switch back to the Initial Position (see Table 3) is only possible if, before turning, it is necessary to pull the switch first.

d) Verify that turning the switch to the momentary Test Position 2 (see Table 3) is only possible if, before turning, it is necessary to pull the switch first.

Recommended action:

If any of the switches listed in Table 2 have unreadable / obscure / erased markings, and/or if there is no need to pull the switch first before turning them, replace the discrepant switch.

Reference documents:

- EMBRAER SERVICE NEWSLETTER SNL145LEG-00-0031, revision 0, dated 04/Feb/2022.

For further information contact

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