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 ATR 72 F.C.O.M.	FLIGHT CONTROLS		1.09.10		
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The control of the aircraft is achieved on the three axes by :

- On each wing, one aileron (spring tab equipped) and one spoiler
- Two elevators (servo-tab equipped)
- A rudder (spring-tab equipped)

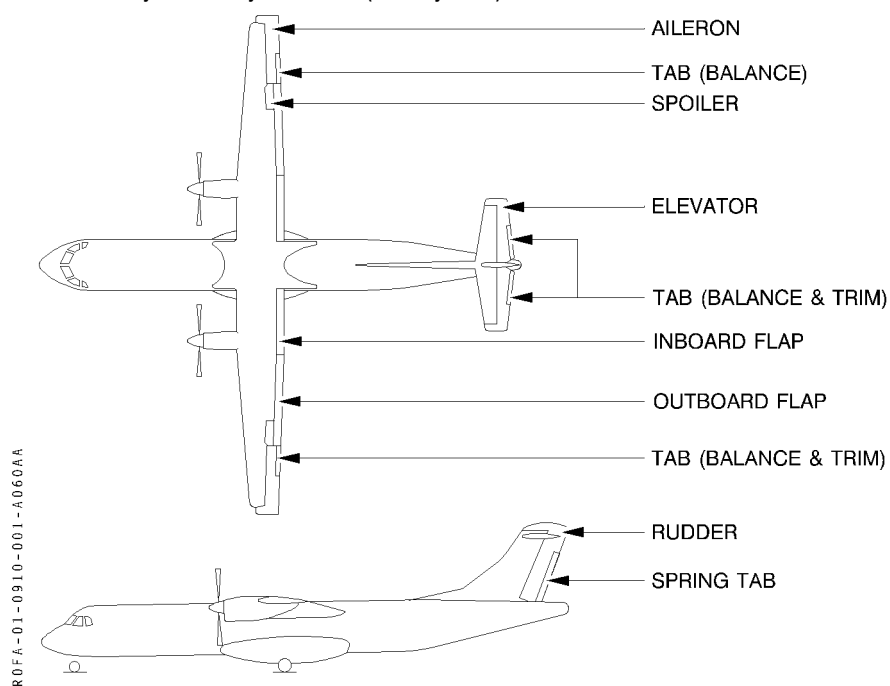
Ailerons, elevators and rudder are mechanically actuated.

Spoilers are hydraulically actuated (blue system).

Wind protection is achieved on ground by :

- a locking mechanism on pitch and roll axes
- a damping unit on yaw axis limiting rudder excessive travel speed.

On each wing flaps are provided in two parts (inboard and outboard) mechanically linked and hydraulically activated (blue system).



	FLIGHT CONTROLS		1.09.20		
			P 1	060	
	ROLL				JUL 01

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20.1 DESCRIPTION

Roll control is achieved through control wheels.

SPRING TAB

A spring tab provides a flexible compensation which automatically increases with the aerodynamic loads applied on the ailerons, thus ensuring a reduction of the pilot's efforts.

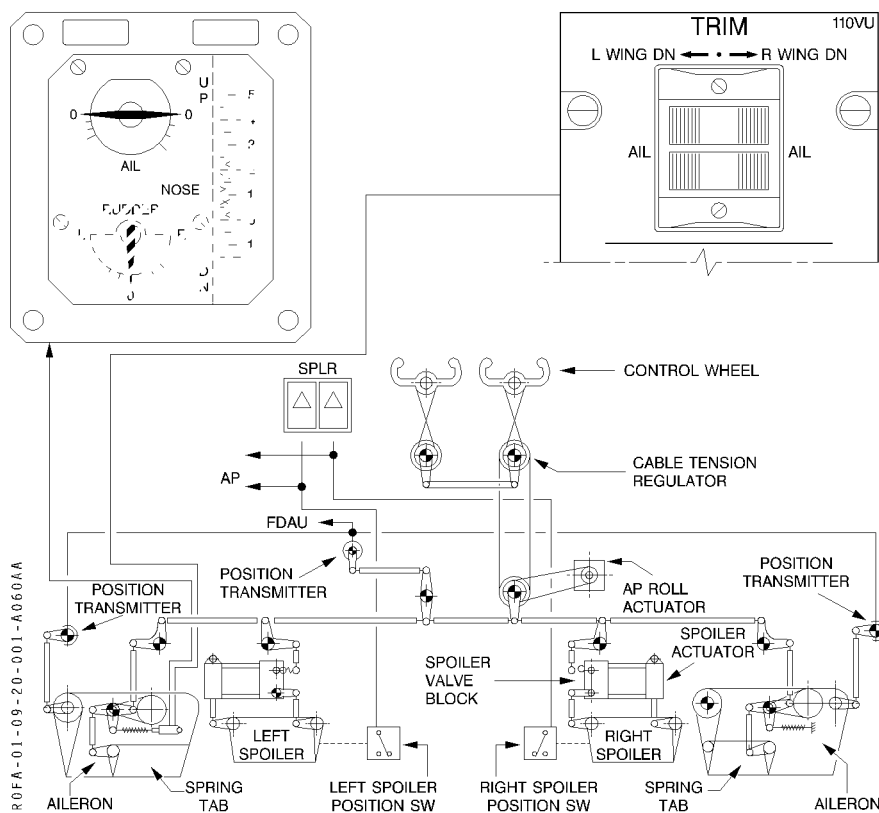
- R Wheel travel : $\pm 87^\circ$
 Ailerons travel : 14° up, 14° down

ROLL TRIM

Aileron trim is performed by varying the neutral position setting of the left aileron spring tab with respect to the aileron.

It is electrically controlled from a twin control sw through an electrical actuator.

- R LH aileron trim controlled tab travel : 6.7° up, 6.7° down.
 Full roll trim travel requires about 30 s.



Mod : 4373 or 8167

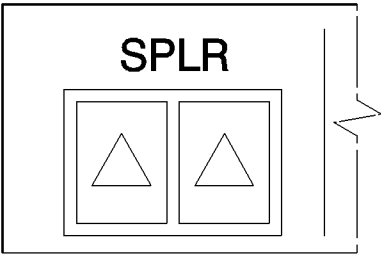
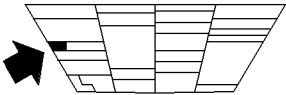
 ATR 72 F.C.O.M.	FLIGHT CONTROLS		1.09.20		
			P 2	001	
	ROLL				DEC 96

AB

20.2 CONTROLS

SPOILER POSITION IND

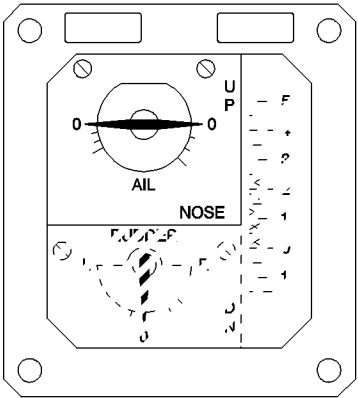
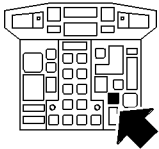
ROFA-01-09-20-002-A001AA



When illuminated, each blue light indicates that the associated spoiler is not in the retracted position.

ROLL TRIM POSITION IND

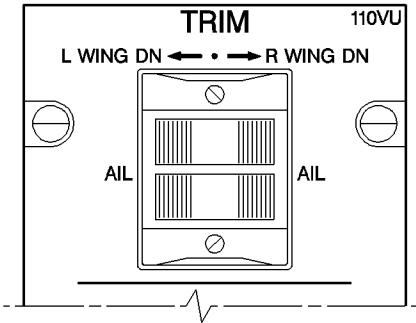
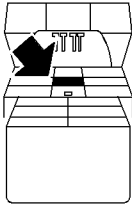
ROFA-01-09-20-002-B001AA



Indicates the LH aileron trim controlled tab travel.

ROLL TRIM CONTROL SW

ROFA-01-09-20-002-C001AA



Controls the roll trim actuator.
For operation, both sws must be moved and held in the same direction (L WING DN or R WING DN) to energize the system (safety reasons).

 ATR 72 F.C.O.M.	FLIGHT CONTROLS ROLL	1.09.20		
		P 3	001	
				DEC 96

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20.3 ELECTRICAL SUPPLY

EQUIPMENT	DC BUS SUPPLY (C/B)	AC BUS SUPPLY (C/B)
Spoiler position ind.	DC BUS 1 (on lateral panel SPLR IND)	– Nil –
Roll trim	DC EMER BUS (on lateral panel AIL)	– Nil –
Roll (pitch, yaw) Trim position ind.	– Nil –	26 VAC BUS 1 (on lateral panel POS IND)

	FLIGHT CONTROLS	1.09.30		
		P 1	001	
	PITCH			DEC 96

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30.1 DESCRIPTION (See schematic p 7/8)

Each control column mechanically drives the associated elevator and, through a pitch coupling mechanism, the other elevator and the opposite control column.

In case of jamming pitch control will be recovered by applying on both control columns a differential force (52 daN) disengaging the pitch coupling system.

The non affected channel allows the aircraft to be operated safely. System recoupling has to be performed on ground.

Pitch uncoupling generates "PITCH DISCONNECT" red alert.

Control column travel : 11.25° up, 6.75° down.

Elevators travel : 23° up, 13° down.

Elevators automatic tab travel : 50% of the pitch control course.

Pitch trim is performed by off setting both tabs neutral position.

Normal trim (control column) and STBY trim (pedestal) supply appropriate part of each actuator.

Each trim tab is activated by a dedicated actuator. The two actuators are synchronized by a flexible shaft.

In case of pitch tabs desynchronization :

- an alert is generated by the CCAS
- normal and STBY pitch trim control are inoperative
- AP disconnects

Trim tab travel, displayed on the pitch trim position indicator is added to the automatic tab travel.

Elevators trim controlled tab travel : 5° up, 1.5° down.

Full pitch trim travel requires about 30s in normal and in STBY control.

A stick pusher and a stick shaker are provided, preventing the aircraft from reaching a critical angle of attack. When the detected incidence becomes too high, the MFC sends a signal to an electric actuator which shakes the control column at stall alert thresholds.

If angle of attack keeps increasing a further threshold is reached and the MFC activates the stick pusher ; the complete pitch control linkage assembly is pushed forward.

Note : There are two stick shakers, one for each control column but only one stick pusher actuator located on the captain pitch channel. In case of pitch uncoupling when the pusher triggering angle of attack is reached, only the captain control column is pushed forward.

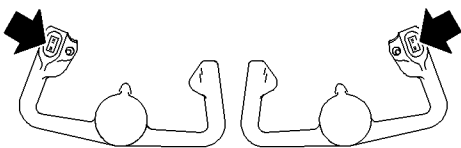
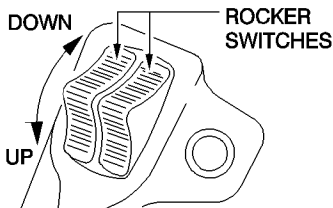
	FLIGHT CONTROLS		1.09.30		
			P 2	001	
	PITCH				DEC 96

AA

30.2 CONTROLS

PITCH TRIM ROCKER SWITCHES

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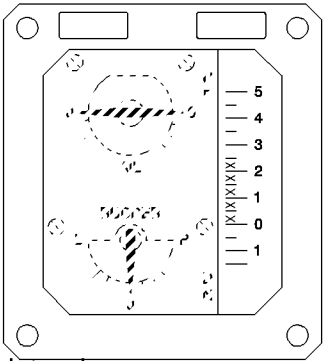
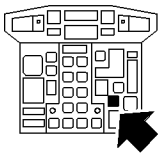


On each control wheel, two pitch trim rocker switches are installed. It's necessary to operate both rocker switches to activate the normal electrical motor of each trim actuator and to control nose up or down. The switches are spring loaded to neutral position. If both switches are operated simultaneously but in opposite direction, trimming action stops. If normal trim actuator is actuated during more than 1s, an aural whooler is generated by the CCAS.

Note : NORMAL TRIM will disengage the AP.

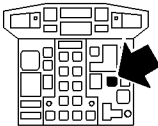
PITCH TRIM POSITION IND

R0FA-01-0930-002-B001AA



Indicates the right trim actuator controlled tab travel. A green sector (from 0° to 2.5° UP) identifies the take off range. If take off (or take off config test) is performed with pitch trim out of this range, CONFIG warning will be generated by the CCAS.

PITCH TRIM ASYM LIGHT



PITCH TRIM
ASYM

Illuminates amber to indicate a pitch tabs desynchronization.

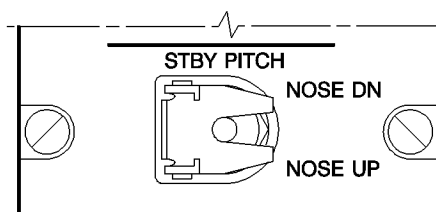
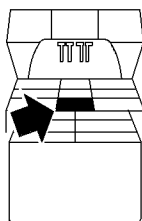
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			P 3	001	
	PITCH				DEC 96

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STBY PITCH CONTROL SW

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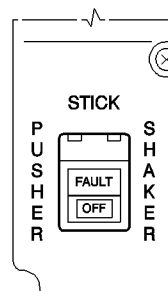
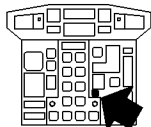


This guarded sw controls the electrical motor of each trim actuator. Action on this switch will disengage the AP.

CAUTION : SIMULTANEOUS ACTION ON A NORMAL ROCKER SWITCH AND THE STBY SWITCH IS NOT RECOMMENDED.

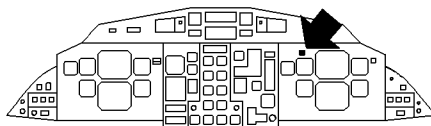
STICK PUSHER PB

R0FA-01-0930-003-B001AA



- FAULT light (amber) :
Indicates a stick pusher or stick shaker failure.
 - OFF Position :
Enables to switch OFF the stick pusher and the stick shaker system.
- Note* : *STALL WARNING aural alert is also lost.*

STICK PUSHER LIGHT



Illuminates green to indicate that the stick pusher is operating.

R0FA-01-0930-003-C001AA

	FLIGHT CONTROLS PITCH	1.09.30		
		P 4	001	
				DEC 96

AA

30.3 ELECTRICAL SUPPLY/MFC LOGIC/SYSTEM MONITORING

ELECTRICAL SUPPLY

EQUIPMENT	DC BUS SUPPLY (C/B)	AC BUS SUPPLY (C/B)
Normal pitch control	DC EMER BUS (on lateral panel NORM)	– Nil –
Standby pitch control	DC BUS 2 (on lateral panel STBY)	– Nil –
Pitch (roll yaw) trim position ind. Stick pusher PWR	– Nil –	26 VAC BUS 1 (on lateral panel POS IND)
Stick pusher CTL	DC BUS 1 (on lateral panel PWR)	– Nil –
Pitch tabs desynchronization	DC BUS 1 (on lateral panel CTL)	– Nil –
Left Stick Shaker	DC BUS 1 (on overhead panel CCAS WARN)	– Nil –
Right Stick Shaker	DC BUS 1 (On lateral panel PWR)	– Nil –
	DC BUS 2 (On lateral panel CTL)	– Nil –

MFC LOGIC

See chapter 1.01.

SYSTEM MONITORING

The following conditions are monitored by visual and aural alerts :

- Pitch trim out of the take off range (0° DN to 2.5° UP) when PL at TO position or simulated so by the TO CONFIG TEST.
 - MW Light flashing red
 - CONFIG red light on CAP
 - FLT CTL amber light on CAP
 - Aural alert is Continuous Repetitive Chime (CRC)
- Pitch coupling mechanism disconnected.
 - See PITCH DISCONNECT procedure in chapter 2.05.06.
- Pitch tabs desynchronisation
 - See PITCH TRIM ASYM procedure in chapter 2.05.06.
- Stick pusher/Stick shaker fault
 - See STICK PUSHER/SHAKER FAULT procedure in chapter 2.05.06.

The condition "Normal trim or stby trim actuator actuated during more than 1s" is monitored by aural alert only (whooler).

 ATR 72 F.C.O.M.	FLIGHT CONTROLS PITCH	1.09.30		
		P 5/6	050	
				DEC 96

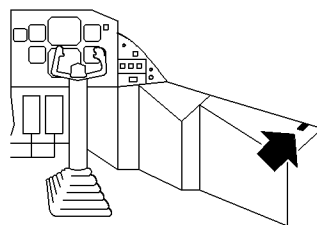
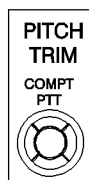
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30.4 LATERAL MAINTENANCE PANEL

PITCH TRIM TEST

A PTT pb is provided on RH lateral maintenance panel to test the pitch tabs shift detection unit.

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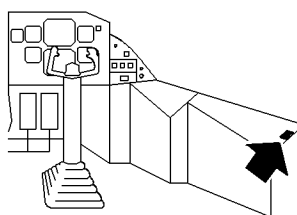
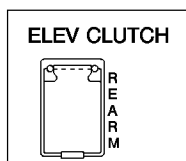


Test procedure

- DC electrical power available
- Depress and hold test button :
 - MC illuminates amber.
 - "FLT CTL" illuminates amber on CAP.
 - "PITCH TRIM ASYM" illuminates amber on center panel
 - SC is heard.
 - Disconnection of AP if engaged.

ELEVATOR CLUTCH

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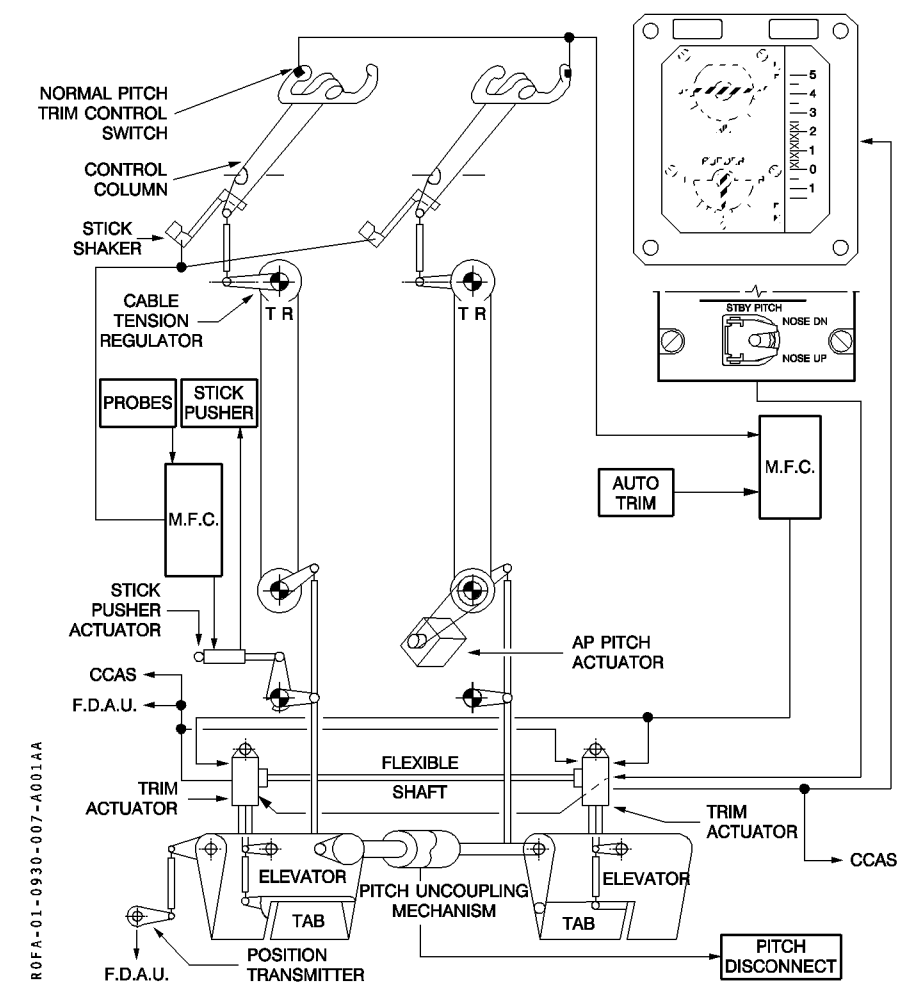


Allows to reconnect (only on ground) both elevators in case of declutch (see FCOM 2.02.06).

 ATR 72 F.C.O.M.	FLIGHT CONTROLS		1.09.30		
			P 7/8	001	
	PITCH				DEC 96

AB

30.5 SCHEMATIC



	FLIGHT CONTROLS		1.09.40		
			P 1	001	
	YAW				DEC 96

AA

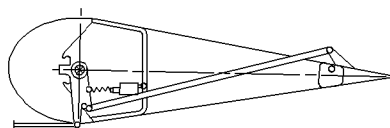
40.1 DESCRIPTION (See schematic p7/8)

Yaw control system consists of rudder pedals, TLU, RCU, rudder damper and trim. Rudder pedals mechanically act on a spring tab and through it on the rudder itself.

SPRING TAB

A spring tab provides a flexible compensation which automatically increases with the aerodynamic loads applied on the rudder, thus ensuring a reduction of the pilot's efforts when really needed (engine failure).

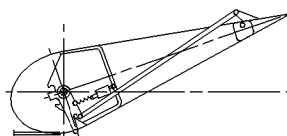
■ Neutral position



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Note : The « spring » consists of two Diapasons.

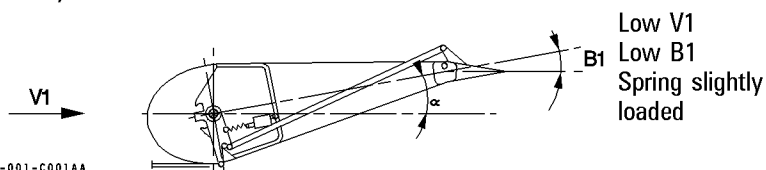
■ Without airload on the surface ($V = 0$), when rudder pedals are moved to full deflection, the spring tab stays in line with the rudder until the rudder reaches its stops, above that point it moves the tab.



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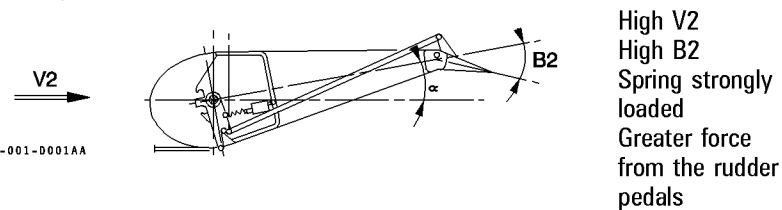
■ With airload on the surface ($V \neq 0$), the spring tab has a travel in the opposite direction of the rudder which generates a compensating moment. Spring travel increases with airspeed.

* Low aerodynamic forces



ROFA-01-0940-001-C001AA

* High aerodynamic forces



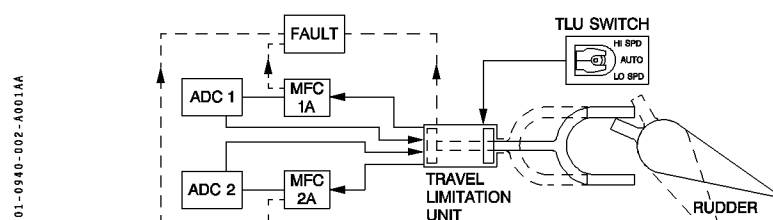
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	FLIGHT CONTROLS		1.09.40		
			P 2	001	
	YAW				DEC 96

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TRAVEL LIMITATION UNIT (TLU)

The travel limitation unit is fitted on the aircraft to limit pedals travel in order to prevent any damaging rudder travel when flying high speed.



The TLU automatic control is done through ADC 1/2 when reaching 185 kt during an acceleration and when reaching 180 kt during a deceleration. The TLU setting (high speed or low speed) may also be performed manually in case of ADC failure.

RELEASABLE CENTERING UNIT (RCU)

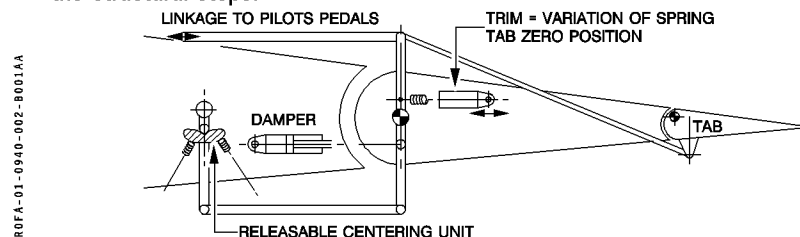
A releasable centering unit is provided between the rudder and the linkage to the pilots pedals to enable rudder position stabilization when no action is applied on the pedals.

This RCU position changes with trim setting. As soon as the yaw trim control upper lever is moved to the left or lower lever to the right, the releasable centering unit is disengaged to allow trim setting. It will be re-engaged at the new position when the yaw trim control switches are released.

DAMPER

The rudder is linked to the aircraft structure by a damper :

- In flight this damper regulates rudder travel speed
- On ground it limits excessive movement generated by gusts and avoids damaging the structural stops.



YAW TRIM

It is performed by offsetting the spring tab zero position.

Yaw trim is electrically controlled from a twin rudder rotary selector through a trim actuator.

Units of trim motor displacement are displayed on the yaw trim position ind.

Maximum values are ± 3 dots.

Full yaw trim travel requires about 15 s.

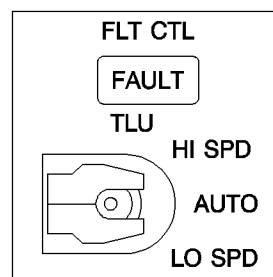
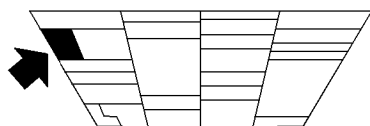
 ATR 72 F.C.O.M.	FLIGHT CONTROLS		1.09.40		
			P 3	001	
	YAW				DEC 96

AA

40.2 CONTROLS

TLU (control and indication)

R0FA-01-0940-003-A001AA



This is a guarded selector.

AUTO : Normal position in flight

HI SPD } : Used according to IAS after FAULT illumination.
LO SPD }

FAULT : illuminates amber when a system failure is detected.

- system disagree
- two ADC failure
- ADC datas incoherence
- TLU position synchro failure.

LO SPD Light (Associated to TLU)



RUD TLU
LO SPD

OK (OR LO SPD ACCORDING TO THE VERSION)

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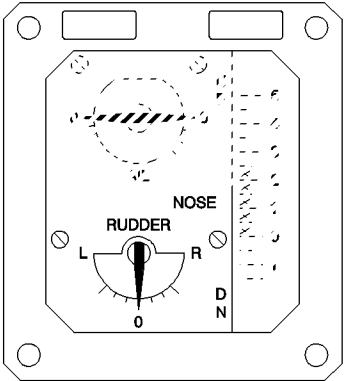
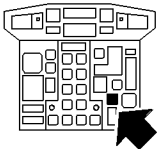
OK (or LOSPD) light illuminates green when rudder travel is not limited.

	FLIGHT CONTROLS		1.09.40		
			P 4	001	
	YAW				DEC 96

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YAW TRIM POSITION IND

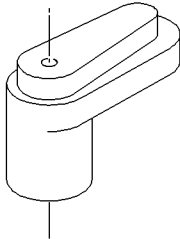
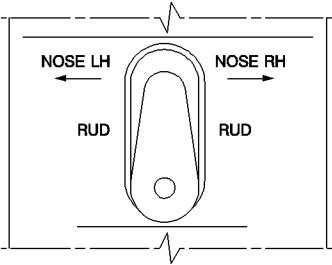
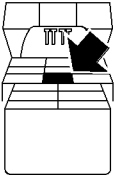
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Indicates units of trim motor displacement.

YAW TRIM CONTROL SWITCHES

ROFA-01-0940-004-B001AA



Controls the yaw trim actuator.
As a safety device both levers must be moved and held in the same direction (Nose LH or Nose RH) to energize the system and trim the aircraft.

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		P 5/6	001	
	YAW			DEC 96

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40.3 ELECTRICAL SUPPLY/MFC LOGIC

ELECTRICAL SUPPLY

EQUIPMENT	DC BUS SUPPLY (C/B)	AC BUS SUPPLY (C/B)
Yaw trim	DC EMER BUS (on lateral panel RUD)	– Nil –
Yaw (pitch, roll)		26 VAC BUS 1
Trim position ind.	– Nil –	(on lateral panel POS IND.)
. Travel limitation unit control	DC BUS 1 (lateral panel)	– Nil –
. Travel limitation unit indication	DC STBY BUS	– Nil –

MFC LOGIC

See chapter 1.01.

 ATR 72 F.C.O.M.	FLIGHT CONTROLS		1.09.50		
			P 1	001	
	FLAPS				DEC 96

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50.1 DESCRIPTION (See schematic p 5/6)

Lift augmentation is achieved on each wing by two flaps mechanically linked with a fail safe design.

The flaps control lever has three distinct positions : 0°, 15° and 30°.

It is not possible to select an intermediate position.

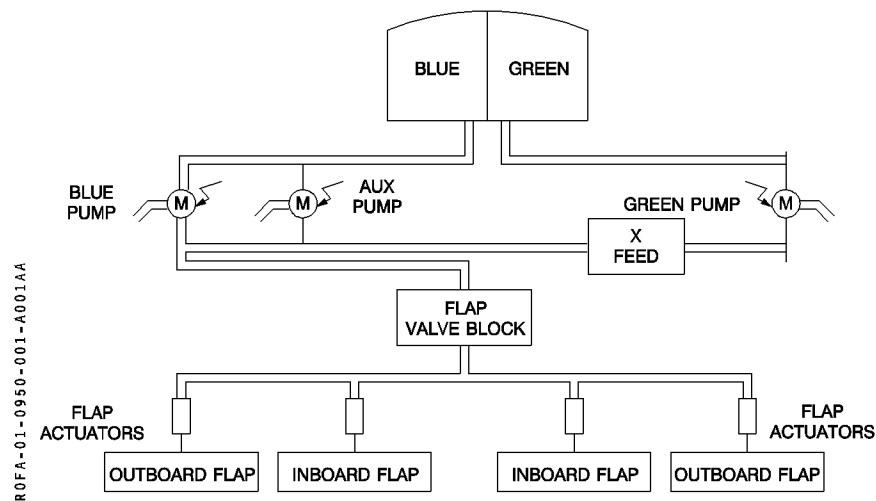
The lever and the flaps positions electrically control the flap valve which hydraulically actuates the four flap actuators.

Possible asymmetry is sensed by two flap position transmitters and detected by the MFC when an angle of 6.7° is reached. Then the electrical supply to the flap control system is isolated :

- The flaps stay in their present position,
- The control lever has no effect on the system up to a maintenance action.

A FLAP UNLK alert is provided to inform the crew of flaps spurious retraction. The alert is triggered if spurious retraction of more than 4° occurs.

FLAPS HYDRAULIC POWER SUPPLY

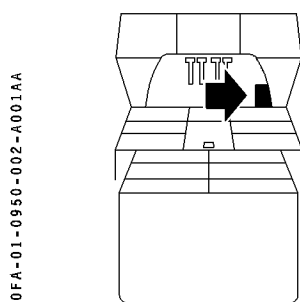


 ATR 72 F.C.O.M.	FLIGHT CONTROLS		1.09.50		
	FLAPS		P 2	001	
					DEC 96

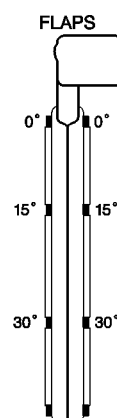
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50.2 CONTROLS

FLAPS CONTROL LEVER



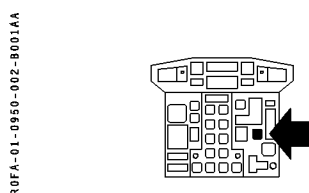
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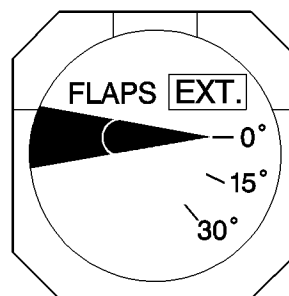
Controls the flaps operation. Distinct positions correspond to flaps 0°, 15°, 30°.

To change flaps position, pull up the lever, move it to the selected position (an amber strip at the bottom of the lever is visible as long as the lever is not in one of the three distinct positions) and release the lever.

FLAPS POSITION IND



ROFA-01-0950-002-B001AA



Indicates flaps position.

A blue EXT flag appears to indicate that the flap valve is hydraulically commanding flap extension.

Note : If EXT flag appears when flaps are extended, it means that there is a leak in the flaps hydraulic circuit.

FLAPS ASYM It



ROFA-01-0950-002-C001AA

**FLAPS
ASYM**

Illuminates amber when flaps asymmetry exceeds 6.7°.

 ATR 72 F.C.O.M.	FLIGHT CONTROLS FLAPS	1.09.50		
		P 3	001	
				DEC 96

AA

50.3 ELECTRICAL SUPPLY/MFC LOGIC/SYSTEM MONITORING

ELECTRICAL SUPPLY

EQUIPMENT	DC BUS SUPPLY (C/B)	AC BUS SUPPLY (C/B)
Flaps control and asymmetry detection	DC STBY BUS (on lateral panel CTL)	– Nil –
Flaps position ind.	– Nil –	26 VAC STBY BUS (on lateral panel POS IND)

MFC LOGIC

See chapter 1.01.

SYSTEM MONITORING

The following conditions are monitored by visual and aural alerts :

- Flaps untimely retraction of more than 4° when flaps extended.
 - See FLAPS UNLK procedure in chapter 2.05.06.
- Flaps not in appropriate TO position when PL at TO position or simulated so by the TO CONFIG TEST.
 - MW light flashing red
 - CONFIG red light and FLT CTL amber light on CAP
 - Continuous Repetitive Chime (CRC)
- Flaps asymmetry of more than 6.7° during flaps actuation.
 - See FLAP ASYM procedure in chapter 2.05.06.

Note : When wing flaps are extended, the VMO alert (clacker) operates at VFE.

VFE flaps 15° = 185 kt

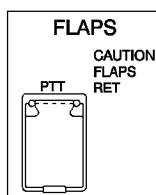
VFE flaps 30° = 150 kt

 ATR 72 F.C.O.M.	FLIGHT CONTROLS		1.09.50		
			P 4	001	
	FLAPS				DEC 96

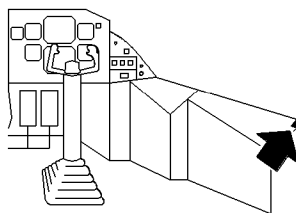
AA

50.4 LATERAL MAINTENANCE PANEL

FLAPS UNLOCK TEST



ROFA-01-0950-004-A001AA



On RH lateral maintenance panel, a pushbutton is provided, for maintenance purpose only, to test "Flaps unlock" alarm relays.

Test procedure

- DC electrical power available
- Hydraulic power available
- Flaps extended to other than 0 position
- Press and hold test button

The flaps retract as long as the button is held and "Flaps unlock" warning lights up each time the flap position passes over a selectable position

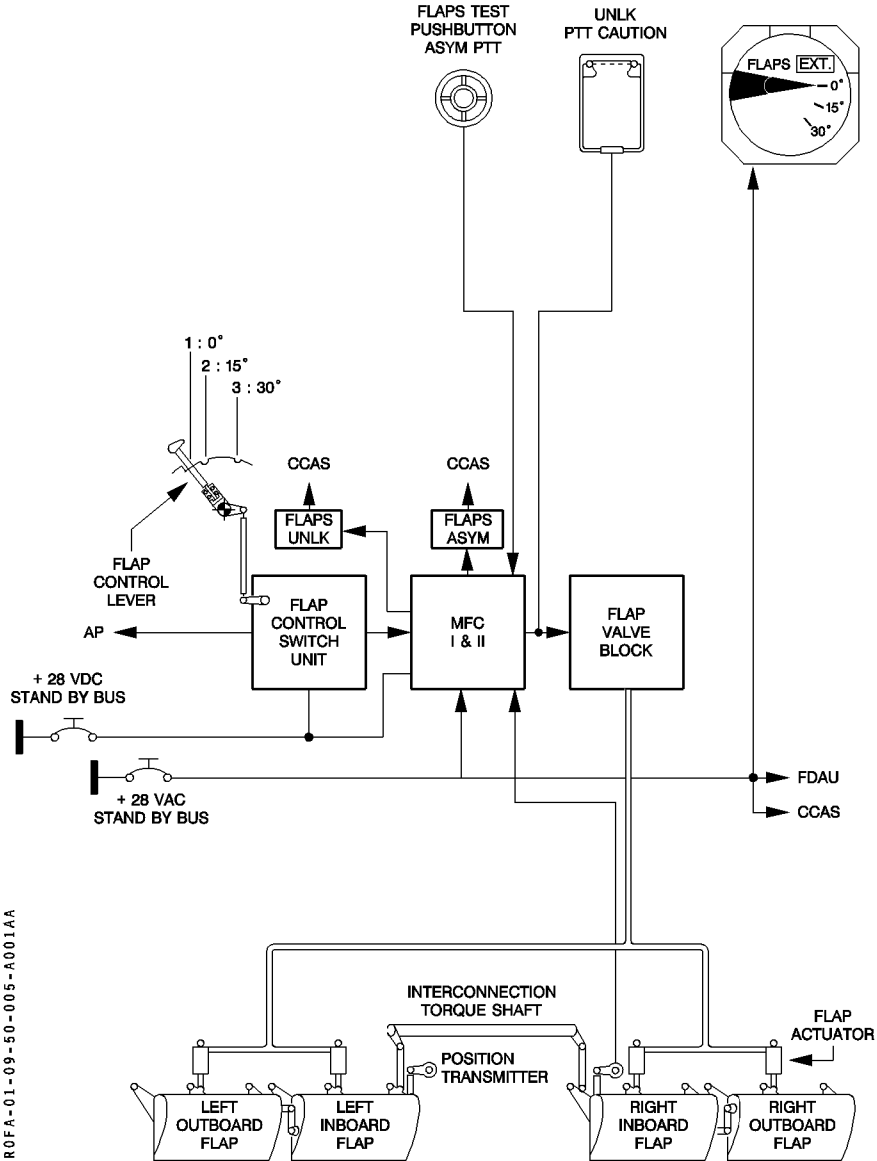
- Button released : flaps come back to selected position.

 ATR 72 F.C.O.M.	FLIGHT CONTROLS FLAPS	1.09.50		
		P 5/6	001	
				SEP 03

AA

50.5 SCHEMATIC

R



	FLIGHT CONTROLS		1.09.60	
			P 1	060
	GUST LOCK			JUL 00

AA

60.1 DESCRIPTION

A gust lock system is provided to protect the pitch and roll flight controls on ground and to limit the PL travel slightly below Fl. This system includes an elevator mechanical locking device and an aileron electrico-mechanical locking device.

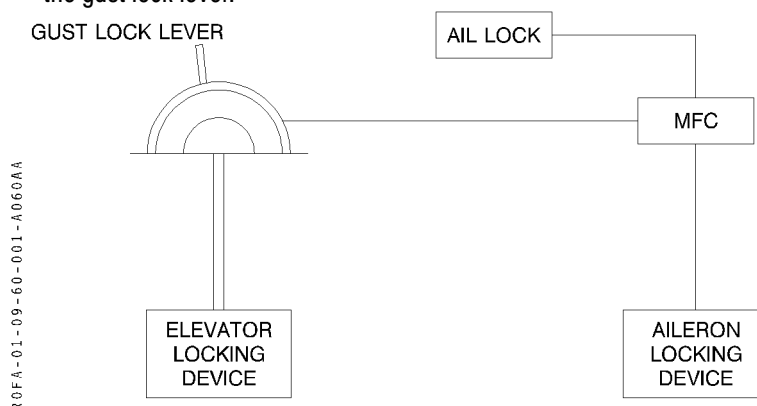
This system provides protection against take off with gust lock engaged, or too high power setting when in hotel mode.

ELEVATOR MECHANICAL LOCKING DEVICE

The system immobilizes the control column in pitch and therefore control surfaces. This device is controlled by a control lever located on the pedestal and mechanically operated through cables and gears.

AILERON ELECTRO MECHANICAL LOCKING DEVICE

The system is composed of two electro-mechanical locking devices immobilizing one aileron each. Each locking device is electrically actuated through switches installed on the gust lock lever.



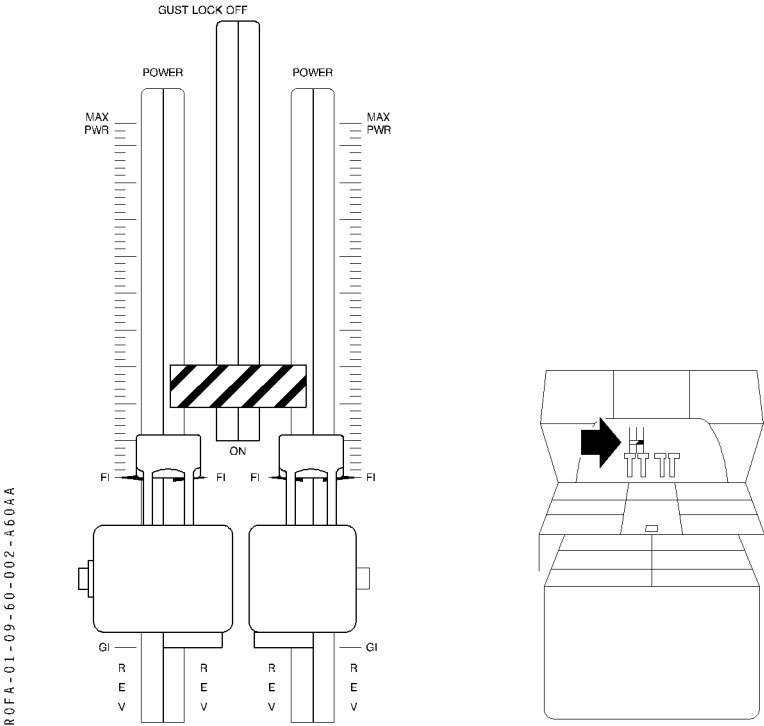
Note : Ailerons may be locked slightly beyond the neutral position. Therefore the control wheel may be tilted ($\pm 5^\circ$), according to the actual position of ailerons.

	FLIGHT CONTROLS		1.09.60	
	GUST LOCK		P 2	060
				JUL 00

AA

60.2 CONTROLS

GUST LOCK LEVER



When the gust lock is engaged, the PL travel is limited slightly below FI to provide protection against take off and two high power setting when in hotel mode. The gust lock handle can be put into the locking notch whatever the position of the flight controls but these controls must be brought to neutral to positively engage the locking devices.

AIL LOCK It



Illuminates amber and the CCAS is activated through the MFC whenever one of the locking actuators is in disagreement with the gust lock lever position (Lock or unlock position).

	FLIGHT CONTROLS	1.09.60		
		P 3	060	
	GUST LOCK			JUL 00

AA

60.3 ELECTRICAL SUPPLY/MFC LOGIC/SYSTEM MONITORING

ELECTRICAL SUPPLY

EQUIPMENT	DC BUS SUPPLY (C/B)
Aileron lock ind.	DC EMER BUS (on lateral panel AIL TRIM & AIL LOCK WARN)
Aileron lock CTL	DC ESS BUS (on lateral panel GUST LOCK AIL)

MFC LOGIC

See chapter 1.01.

SYSTEM MONITORING

The following conditions are monitored by visual and aural alerts.

- Disagree between Aileron locking actuators and gust lock control (Temporized alert 8 sec).
 - . "MC" flashing amber
 - . "FLT CTL" amber light illuminates on CAP
 - . "AIL LOCK" amber light illuminates on the pedestal
 - . Aural alert is single chime (SC)
- Aileron locking actuators not fully retracted and PL on TO position

R

- . "MW" flashing red
- . "CONFIG" red light illuminates on CAP
- . "FLT CTL" amber light illuminates on CAP
- . Aural alert is Continuous Repetitive Chime (CRC)

R

- Disagree between Aileron locking actuators and gust lock control during the T.O. CONFIG TEST.

R

- . "MW" flashing red
- . "CONFIG" red light illuminates on CAP
- . "FLT CTL" amber light illuminates on CAP
- . Aural alert is Continuous Repetitive Chime (CRC)

R

R

R

R

R