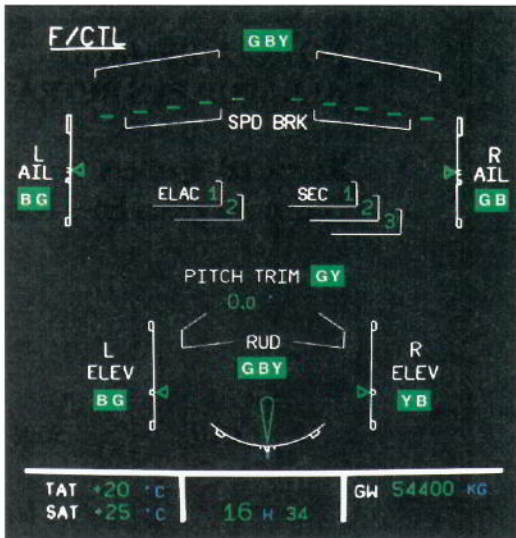


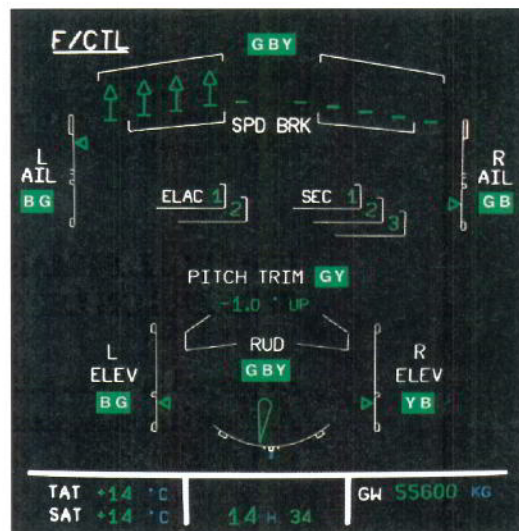
ELECTRONIC CENTRALIZED AIRCRAFT MONITOR (ECAM) SYSTEM DISPLAYS

Note - These photographs are intended to show the relevant spoiler indications. Other control indications are not intended to be representative of the incident.



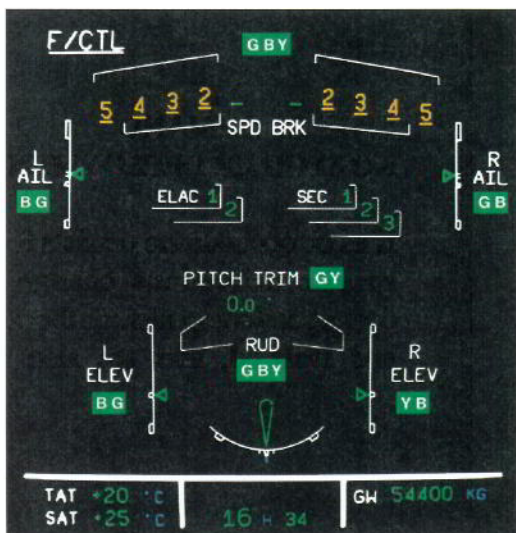
NO ROLL DEMAND  
ALL SPOILERS RETRACTED

Retracted spoilers are shown by short horizontal green lines near top of display.



LEFT ROLL DEMAND  
SPOILERS ON LEFT WING EXTENDED

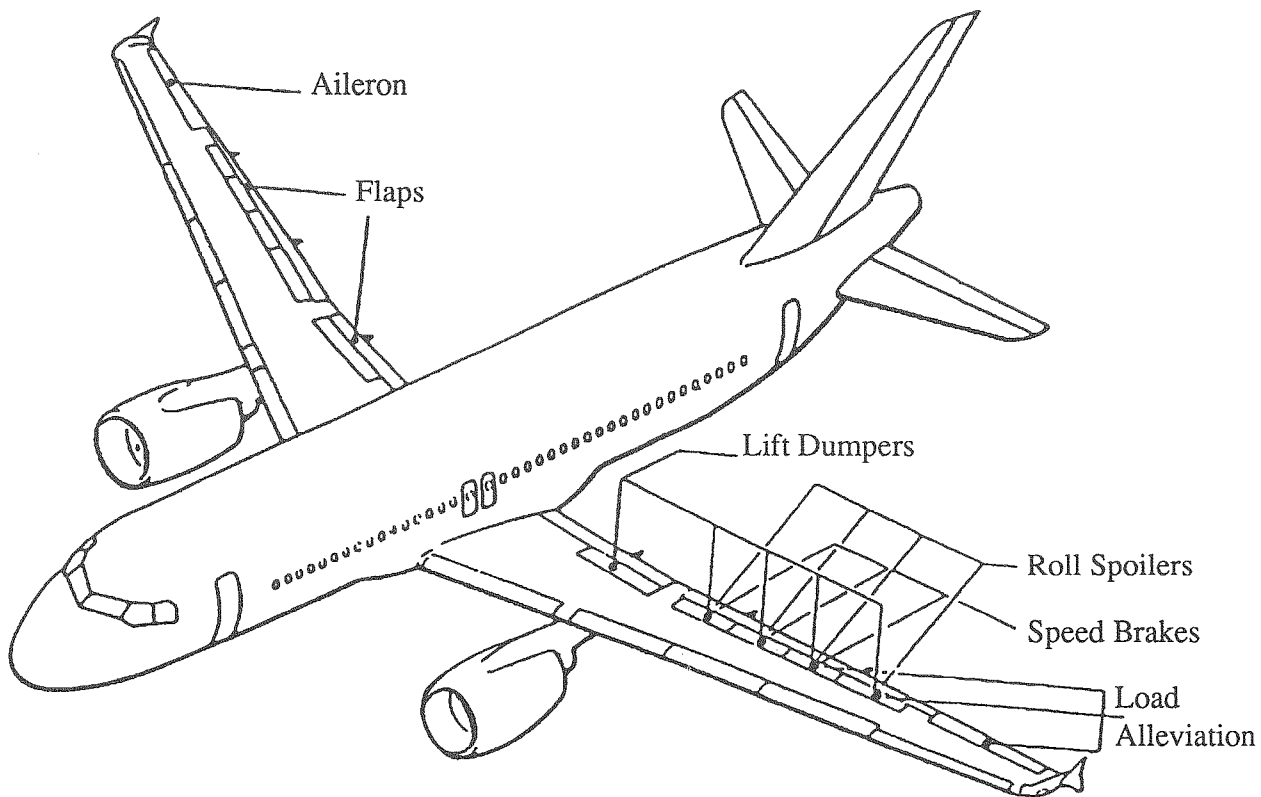
Deployed spoilers are shown by green "fir trees". As there is no disagreement between control demand and spoiler position the indications remain green.



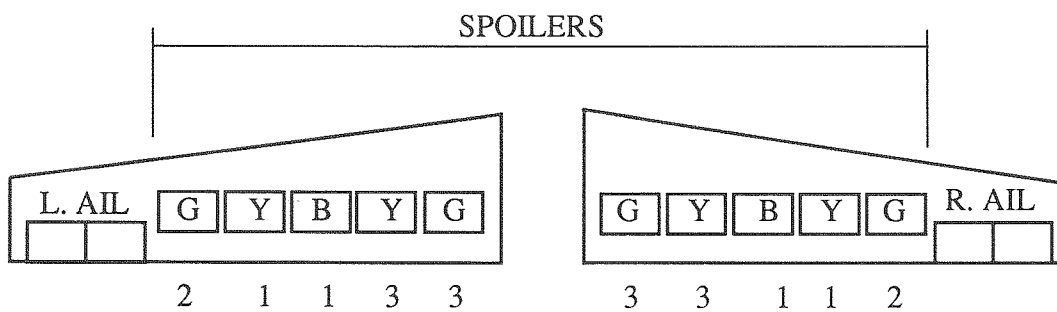
SPOILER DEMAND  
NO SPOILER DEPLOYMENT

If an error condition persists for three seconds the spoiler indications change to amber. The corresponding spoilers on the other wing are closed and isolated, and are also shown in amber.

AIRBUS INDUSTRIE A320 FLAP AND SPOILER CONFIGURATION



ARCHITECTURE

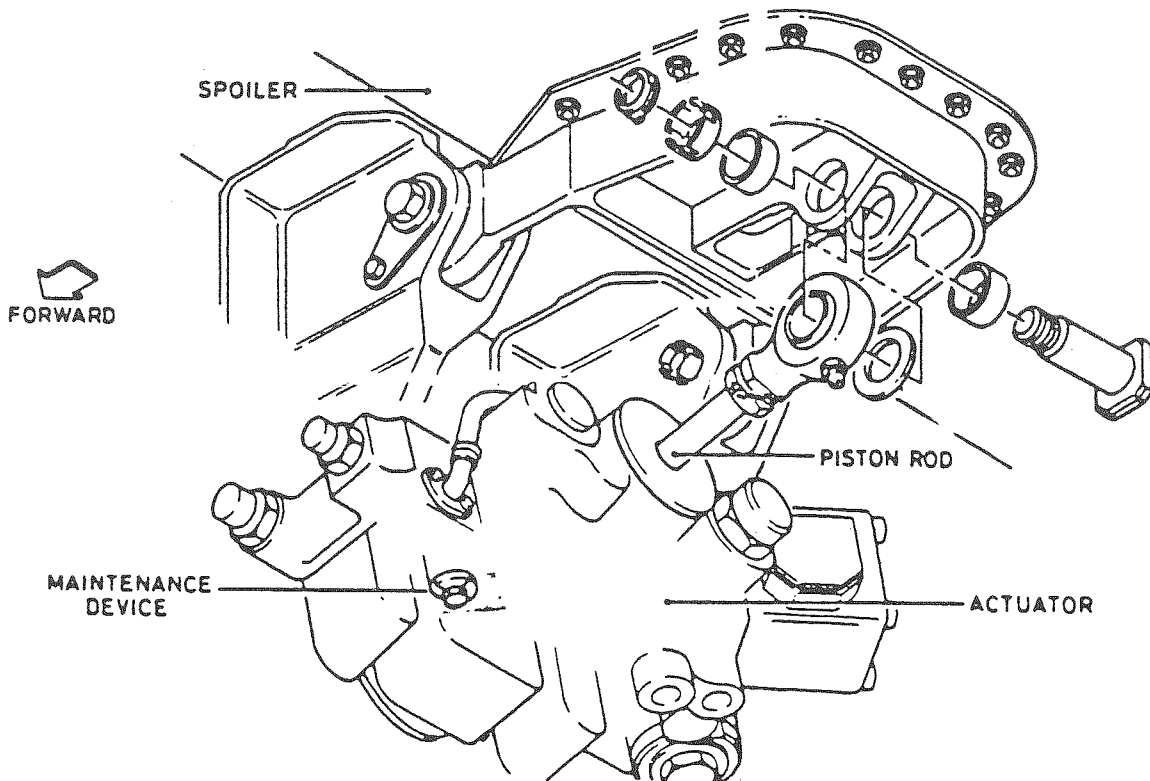


LEGEND

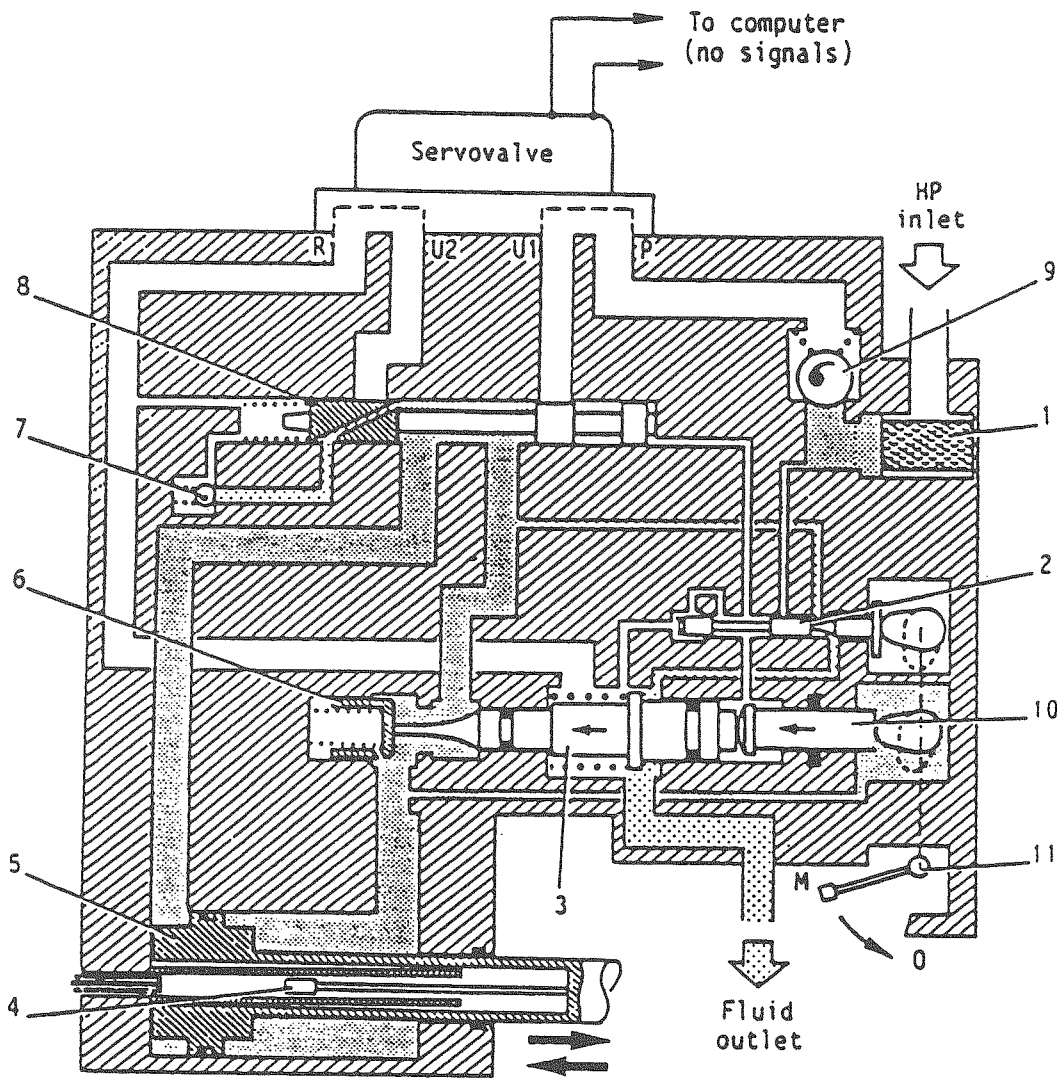
HYDRAULIC SYSTEMS - GREEN (G)  
 YELLOW (Y)  
 BLUE (B)

SPOILER ELEVATOR COMPUTERS (SEC)

- 1 SEC 1
- 2 SEC 2
- 3 SEC 3



AIRBUS INDUSTRIE A320 DETAIL OF SPOILER ACTUATOR  
SHOWING MAINTENANCE DEVICE



- |                            |                          |
|----------------------------|--------------------------|
| 1 - Filter                 | 7 - LP non-return valve  |
| 2 - Inhibiting valve       | 8 - Mode switching valve |
| 3 - Pusher                 | 9 - HP non-return valve  |
| 4 - LVDT position detector | 10 - Thermal follower    |
| 5 - Piston                 | 11 - Maintenance device  |
| 6 - Cup valve              |                          |

SPOILER ACTUATOR HYDRAULIC SYSTEM  
 SHOWN WITH MAINTENANCE DEVICE  
 IN MAINTENANCE POSITION



VIEW ON TRAILING EDGE SHOWING FLAPS AND SPOILERS  
EXTENDED, AND COLLARS AND FLAGS IN POSITION

AEROFORMATION TRAINING MEMO 2058 ISSUE 2

Notes:

1. Text which appears between the two horizontal lines is copied and formatted in a similar manner to the original source. Vertical lines in the left margin were copied from this source.
  2. In this memo PF is "Pilot Flying" and PNF is "Pilot Not Flying". However, Excalibur Airways had a company standard procedure whereby the commander always handled the aircraft whilst taxiing. Therefore, if this memo had been adopted by Excalibur Airways, irrespective of whichever pilot was to carry out the take off, before take off PF would always be the commander and PNF would always be the co-pilot.
- 

**DISTRIBUTION TO: All A320 Instructors**  
**SUBJECT: FLIGHT CONTROL CHECKS**

This memo cancels Training Memo 2058

Will instructors please note that the correct method for the time being of carrying out flight control checks on the A320 is as follows:

1. At a convenient stage during taxi : PF applies full travel of elevator, ailerons and spoilers. This check will be called by the PF as it is carried out :  
**"Full up, full down, neutral, full left, full right, neutral."**

The PF should maintain proper taxi look-out while conducting the F/CTL check.

The PNF responsibility is to check full travel and correct sense on F/CTL page and calls **"Check"** as each **"neutral"** is called.

2. PF presses PEDAL DISC P/B on nose wheel tiller and applies full left rudder, full right rudder and neutral. PNF monitors travel on F/CTL page as the check is called by PF :  
**"Full left, full right, neutral"**

PNF calls **"Check"** at the neutral call.

PNF physically follow up rudder check with PF to ensure pedals are adjusted correctly.

3. PNF applies full travel of elevator, ailerons and spoilers and checks full travel and correct sense on the F/CTL page.

**NOTE : This check is silent.**

The reason for having to check full travel and correct sense on both sidesticks is to cover for the remote possibility of a mechanical fault restricting full travel in one sidestick and because resolver monitoring tolerances decrease as surface deflection increases, thus a resolver fault at small surface deflections may remain undetected.

Modifications may be made in the future to maintenance procedures so that the above check may be simplified.

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**EXCALIBUR AIRWAYS' AFTER START CHECK LIST**

Extract from Excalibur airways FCOM Volume 3 NORMAL PROCEDURES pages 028 and 029 dated Feb 93

Note: CM1 indicates action by pilot seated on the left (normally the commander)  
 CM2 indicates action by pilot seated on the right (normally the co-pilot)

AFTER START

- **ENG MODE sel (CM1) . . . . . NORM**

- CM1 turning the ENG MODE SEL to NORM is the signal for the CM2 to commence the AFTER START actions.
- On ECAM lower display the ENG page is replaced by the WHEEL page.
- Leaving the ENG MODE at START/IGN position would prevent continuous relight selection on ground (would be supplied at lift off), in addition the ENG page would remain displayed.
- After start, to avoid thermal shock, the engine should be operated at idle or near idle for at least 2 minutes prior to advancing the thrust lever to high power. Taxi time at idle may be included in the warm-up period.
- In order to reduce risk of idle stall/roll back., make sure that pack valves are open before switching on the ENG ANTI ICE or before advancing the thrust levers.

- **GROUND CREW CLEARANCE (CM1). . . . . REQUEST**

- Request : - NWS by-pass pin removed (MEMO display "N WHEEL STEER DISC" extinguished)
  - Interphone disconnect
  - Hand signal on the left/right side

*Note: With the NWS by-pass pin installed, starting the second engine will cause the memo display 'N Wheel Steer Disc' to go amber.*

- **FLT CONTROLS (CM1) . . . . . CHECK**

- **APU BLEED (CM2) . . . . . OFF**

- APU BLEED valve closes, ENG BLEED valves open

- **APU (CM2) IF NOT REQ . . . . . OFF**

- **ANTI ICE (CM2) IF REQ . . . . .ON**

- **GROUND SPOILERS (CM2) . . . . .ARM**

- **RUD TRIM (CM2) . . . . .ZERO**

- IF RUD TRIM position indication is not at zero, press the RESET pb.



- **PITCH TRIM (CM2) . . . . . SET**
  - Set to CG on pitch trim wheel
- **FLAP lever (CM2) . . . . . .SET**
  - Set FLAPS for take-off
  - Check position on ECAM upper display
  - If taxiing in slush conditions, keep flaps retracted until reaching the holding point before take off.
- **AUTO BRAKE (CM2) . . . . . .MAX**
- **FLT CONTROLS (CM2) . . . . . .CHECK**
- **ECAM STATUS (CM2) . . . . . CHECK**
  - Check no status reminder on ECAM upper display
  - If status reminder displayed, press the STS pb.


**CAUTION**

**Note: Icing conditions may be expected when OAT or TAT is below +8°C with visible moisture.**

**- If the class II message "F/CTL" is displayed on ECAM status page:**

Flight controls priority integrity check must be performed as follows:

1. CAPT sidestick . . . . . FULL UP-RH, MAINTAIN
  2. F/O sidestick . . . . . FULL DN-LH, MAINTAIN
    - Check on ECAM F/CTL page surfaces at neutral.
  3. CAPT TAKE OVER PB . . . . . DEPRESS (about 5 sec)
    - Check: - Aural "PRIORITY LEFT" message activated
    - F/O red arrow light on
    - F/CTL page shows surfaces full travel (up right)
  4. CAPT TAKE OVER PB . . . . . RELEASE
    - Check flight control surfaces at neutral.
  5. Repeat check (3) and (4) above with F/O TAKE OVER pb.
-

 FLIGHT CREW OPERATING MANUAL	ABN and EMER PROCEDURES FLIGHT CONTROLS		3.02.27    P 3
			REV 18    SEQ 002

MAX SPEED with Slats or Flaps inop					
FLAPS* SLATS*	0	1	2	3	FULL
0	230 kt (No limitation in clean conf)	215 kt	200 kt	185 kt	177 kt
1					
2	200 kt	200 kt	200 kt	185 kt	177 kt
3					
FULL	177 kt	177 kt	177 kt	177 kt	177 kt

APPR SPD and LDG DIST with Slats or Flaps inop					
FLAPS* SLATS*	0	1	2	3	FULL
0	VREF + 50 at threshold Dist x 1.8	VREF + 45 Dist x 1.8	VREF + 30 Dist x 1.4	VREF + 25 Dist x 1.35	VREF + 25 Dist x 1.35 (FLAP, 3 not allowed)
1					
2	VREF + 25 Dist x 1.3	VREF + 25 Dist x 1.3	VREF + 15 Dist x 1.2	VREF + 10 Dist x 1.15	VREF + 10 Dist x 1.15
3					
FULL	VREF + 25 Dist x 1.3	VREF + 25 Dist x 1.3	VREF + 15 Dist x 1.2	VREF + 10 Dist x 1.15	VREF + 5 Dist x 1.1

\* SLATS / FLAPS position displayed on UPPER ECAM display.

Example : Flaps locked between position 0 and 1 with slats at zero :

MAX SPEED : 215 kt  
VREF + 45 LDG DIST × 1.8



**F / CTL ALTN LAW**

Refer to FCOM 3.04.27 for flight characteristics.  
With AP engaged A / C is controlled by FMGC (AP mode)

**(PROT LOST)**

All protections except maneuver protections are lost.  
Depending on the failure, static stability may be introduced.

- MAX SPEED ..... 320 KT  
(320/.77 if dual HYD SYS LO PR)  
Speed is limited to 320 / .82 or 320 / .77 for dual hyd failure due to loss of high speed protection
- SPD BRK (if L or R elev. fault) ..... DO NOT USE

**STATUS**

MAX SPEED ..... 320 KT (320/.77 if dual hyd sys lo pr.)	INOP SYS
SPD BRK (if L or R elev. fault) .. DO NOT USE	ATT LIMIT
	OVSPD LIMIT
	ALPHA LIMIT

ALTN LAW : PROT LOST

**APPR PROC :**

- FOR LDG ..... USE FLAP 3
- GPWS LDG FLAP 3 ..... ON
- APPR SPD ..... VREF + 10
- LDG DIST ..... X 1.15

● **if no AP engaged :**

WHEN L/G DN : DIRECT LAW

At L/G extension control reverts to direct law in pitch as well as in roll.  
Refer to DIRECT LAW proc.

● **if AP engaged :**

WHEN L/G DN AND AP OFF : DIRECT LAW

If AP is disengaged :  
- before L / G extension, flight control alternate law is active  
- after L / G extension, flight control direct law is active.

Refer to DIRECT LAW proc.

**F/CTL L (R) ELEV FAULT**

**F/CTL ALTN LAW (PROT LOST)**

*Note : Since, in case of L (R) elevator failure, the pitch control through elevator is lost in the ELACs, it is performed by the SECs in alternate law.*

*This is not the case if R elevator is lost due to the failure of B + Y hyd circuits : pitch normal law remains active in ELAC.*

MAX SPEED ..... 320 KT

*Speed is limited due to loss of high speed protection.*

– SPD BRK ..... DO NOT USE

**STATUS**

MAX SPEED ..... 320 KT

– SPD BRK ..... DO NOT USE

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

*At L/G extension, control reverts to direct law in pitch as well as in roll. Refer to DIRECT LAW proc*

CAT 1 ONLY

INOP SYS  
ATT LIMIT  
OVSPD LIMIT  
ALPHA LIMIT  
L (R) ELEV  
AP 1 + 2

**F/CTL SPLR FAULT**

*Loss of one or more spoilers*

– SPD BRK (if SPLR 3 + 4 affected) ..... DO NOT USE

*Do not use speed brakes if only surface n° 2 is operative to avoid undesirable pitch up moment.*

*If spoilers 4 or 5 is affected LAF is degraded.*

*Note : If SPLR 1 FAULT and heavy vibrations are felt use FLAPS 3 for landing*

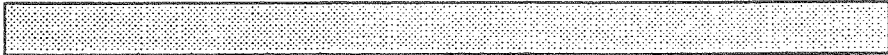
**STATUS**

● if SPLR 3 + 4 affected

SPD BRK ..... DO NOT USE

LDG DIST See GND SPLR FAULT below

INOP SYS  
SPLR (affected)





APPR SPD – LDG DIST CORRECTIONS FOR FAILURES		APPR SPD INCREMENT		LDG DIST MULTIPLY BY
		VLS	VREF	
FTL CTL	ONE SPLR FAULT (except n°5)	-	-	1.1
	TWO SPLR FAULT	-	-	1.1
	Three or more SPLR FAULT	-	-	1.3
	SEC 1 or 3 FAULT	-	-	1.1
	SEC 2 FAULT	-	-	Negl.
	Two or three SEC FAULT	-	-	1.3
	STAB JAM / L + R ELEV FAULT	-	10	1.15
FLAPS	FLAPS < 1 : Slats < 1	-	50	* 1.80
	Slats ≥ 1	-	25	1.30
	1 ≤ FLAPS < 2 : Slats < 1	-	30	1.40
	Slats ≥ 1	-	15	1.20
	2 ≤ FLAPS < 3 : Slats < 1	-	25	1.35
	Slats ≥ 1	-	10	1.15
	FLAPS ≥ 3 : Slats < 1	-	25**	1.35**
1 ≤ Slats ≤ 3	-	10	1.15	
Slats > 3	-	5	1.10	
HYD	BLUE or GREEN or YELLOW	-	-	1.1
	GREEN + BLUE	-	25	1.5
	GREEN + YELLOW	-	25	2.1
	YELLOW + BLUE	-	-	1.3
BRK	ANTI SKID	-	-	1.5
	BRK RELEASE	-	-	1.2
ELEC	EMER ELEC CONFIG / DC BUS 1 + 2	-	-	1.55
	DC BUS 2	-	-	1.3
	DC ESS BUS / AC BUS 1	-	-	1.1

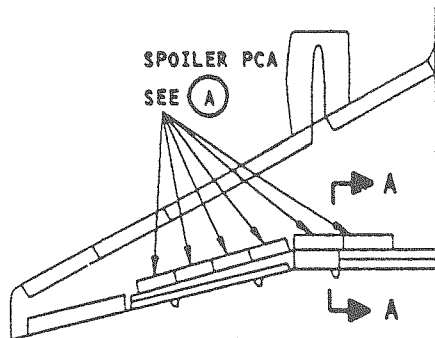
\* Maintain VREF + 60 down to 300 ft, then reduce speed to reach VREF + 50 at runway threshold.

\*\* FLAPS > 3 and SLATS < 1 not allowed

*Note* : For multiple failures, affecting landing distances if LDG DIST increase coef is not given, multiply the coefs associated to the single failures.



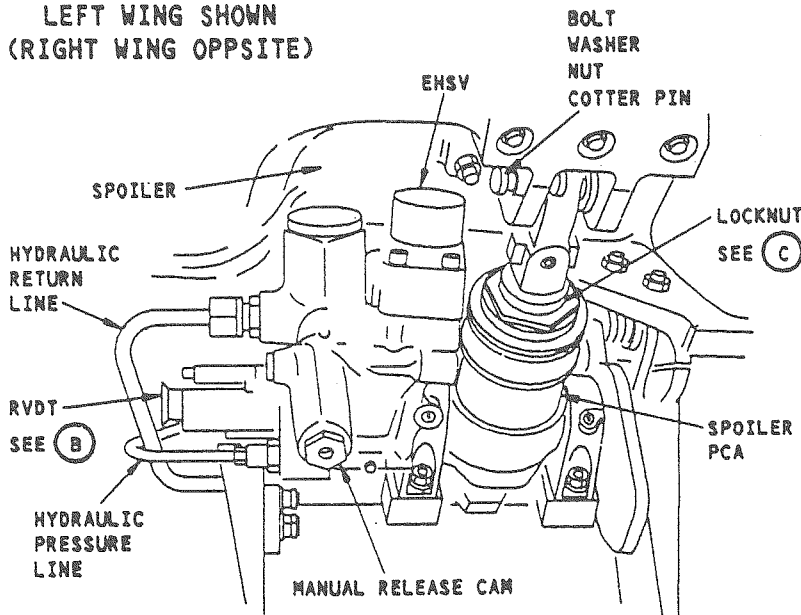
# BOEING 757 MAINTENANCE MANUAL



LEFT WING SHOWN  
(RIGHT WING OPPOSITE)



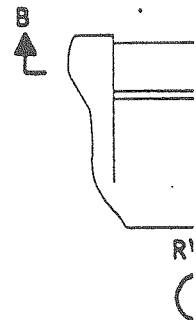
(AN EXAMPLE FOR ALL SPOI  
A-A



**NOTE:** THE ELECTRICAL CONNECTOR IS BEHIND THE RVDT.

SPOILER POWER CONTROL ACTUATOR (PCA)

(A)



## BOEING 757 SPOILER POWER CONTROL ACTUATOR