SYSTEM DESCRIPTIONS



1.14.00 PAGE 1 VERSION 01 ISSUE 002



١.	14	.01	Primary	Flight	Controls
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- Description
- Controls and Indicators
- Alerts

1.14.02 Flaps

- Description
- Functional Diagram
- Controls and Indicators
- Alerts

1.14.03 Speed Brake

- Description
- Controls and Indicators

1.14.04 Lift Dumpers

- Description
- Functional Diagram
- Controls and Indicators
- Alerts

1.14.05 Stall Prevention System

- Description
- Controls and Indicators
- Alerts

1.14.06 Take-off Configuration Warning

- Description
- Controls and Indicators
- Alerts

FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS



DESCRIPTION

1.14.01 PAGE 1 VERSION 03 ISSUE 001

GENERAL

The primary flight controls are the ailerons, rudder, and elevator. The horizontal stabilizer is used for pitch trimming. Actuators powered by hydraulic system 1 and 2 operate the control surfaces. Consequently, a single hydraulic system failure does not affect operation. P/b's, located at the HYDRAULIC panel, provide control of hydraulic power for each flight control system. System failures will be detected and the relevant alerts will be presented. With the autopilot engaged, the flight controls are hydraulically operated by signals from the Automatic Flight Control System (AFCS). Stabilizer trim, yaw damping and turn coordination are provided by the Flight Augmentation System (FAS). See AFCAS.

If hydraulic pressure is not available, the ailerons, rudder, and elevator can be operated by direct mechanical control and the stabilizer can be operated by an alternate electrical mode.

AILERONS

The left aileron is powered by hydraulic system 1, the right aileron by hydraulic system 2. The allerons are interconnected mechanically. A servo tab at each aileron is locked during normal lf one aileron becomes depressurized, the servo tab will unlock to assist in manual operation of the affected aileron. If hydraulic pressure is not available, both servo tabs are unlocked and are operated by the control wheel movement. The ailerons are then operated by the servo tabs. An aileron trim wheel is located at the pedestal.

RUDDER

The rudder is normally operated by hydraulic system 2. If system 2 hydraulic pressure is not available the rudder will be operated by hydraulic system 1.

A rudder trim wheel is located at the pedestal.

Rudder authority at high speed is reduced by a rudder limiter, which uses airspeed information from both ADC's to reduce the hydraulic pressure at the rudder actuator.

Controls and indicators of the rudder limiter system are located at the FLIGHT AUGMENTATION panel. In the event of a rudder limiter failure, a low or a high speed mode can be manually selected when the rudder limiter p/b is depressed to MAN. Initially, the system will default to the low speed mode if the landing gear is down and to the high speed mode if the landing gear is up.

ELEVATOR

Elevator movement is normally provided by a dual hydraulic actuator. The left actuator is powered by system 1, the right actuator by system 2. Either system is capable of operating the elevator.

STABILIZER

The horizontal stabilizer is operated by two hydraulic actuators. The left actuator is powered by hydraulic system 1, the right actuator by system 2. Either system is capable of operating the stabilizer. Stabilizer position is normally controlled Flight Augmentation System bv the (FAS); see AFCAS. If the FAS fails, the stabilizer trim wheel at the pedestal can be used to position the stabilizer. If hydraulic pressure is not available, the stabilizer can be operated by an electric motor. The motor is controlled by the alternate stabilizer trim switch located at the pedestal.

A stabilizer postion indicator is located at the pedestal. Stabilizer position is also indicated by position markers at the vertical stabilizer.

FLIGHT CONTROL LOCK

The ailerons can be locked in the neutral position and the elevator in the control column forward position by a mechanical system operated from a lever at the rear of the pedestal. The lock is linked with the thrust levers to prevent take-off thrust being selected with the lock engaged. The locking system is springloaded to the unlocked position in the event locking system failure. The rudder is hydraulically dampened.

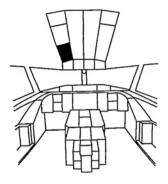


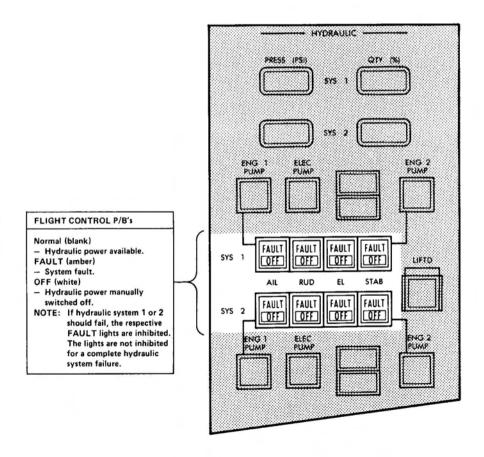
FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS DESCRIPTION

1.14.01 PAGE 2 VERSION 03 ISSUE 001

1.14.01 PAGE 3 VERSION 03 ISSUE 001



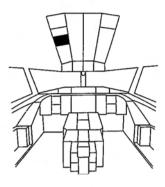


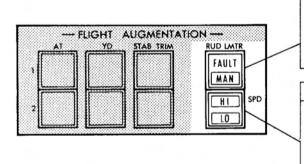


VD/OP-14-101/B

1.14.01 PAGE 4 VERSION 03 ISSUE 001







RUDDER LIMITER P/B

Normal (blank)

Rudder limiter in automatic mode.

FAULT (amber)

Rudder limiter failure.

MAN (white)

 Manual selection of high or low airspeed mode is possible, manually selected.

NOTE: RUD LMTR MANUAL memo message displayed at the MFDU.

SPEED P/B

Normal (blank)

Rudder limiter in automatic mode.

HI (white)

 Rudder limiter in high speed manual mode.

LO (white)

Rudder limiter in low speed manual mode.

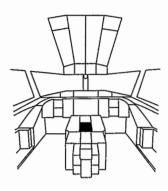
NOTE: Rudder limiter must be switched to MAN to

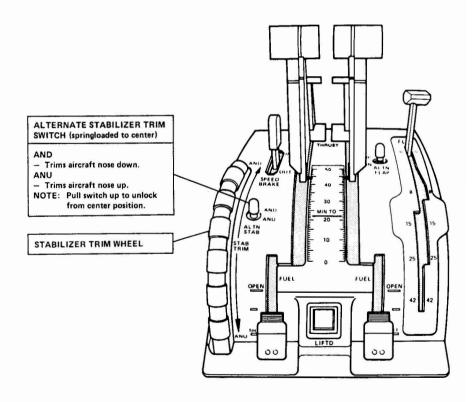
switched to MAN to enable either speed mode to be selected.

VD/OP-14-102/A





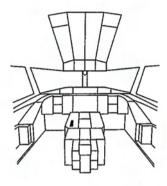


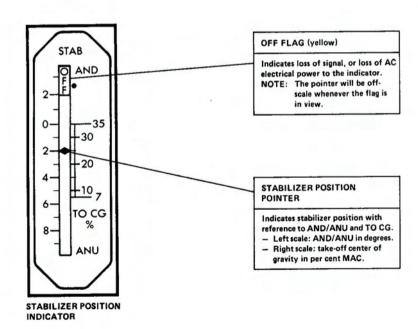


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FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS CONTROLS AND INDICATORS

1.14.01 PAGE 6 VERSION 03 ISSUE 001

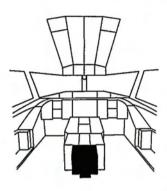


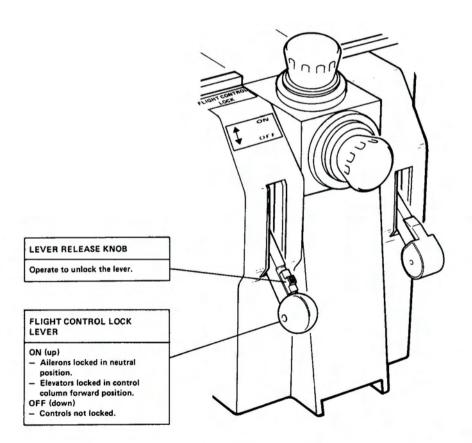


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FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS CONTROLS AND INDICATORS

1.14.01 PAGE 7 VERSION 03 ISSUE 001





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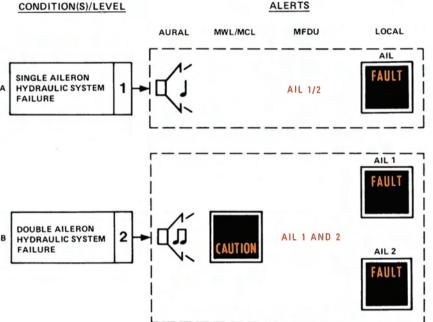


1.14.01 PAGE 8 VERSION 03 ISSUE 001

FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS

1.14.01 PAGE 9 **VERSION 03** ISSUE 001

ALERTS CONDITION(S)/LEVEL



ALERT INHIBITION

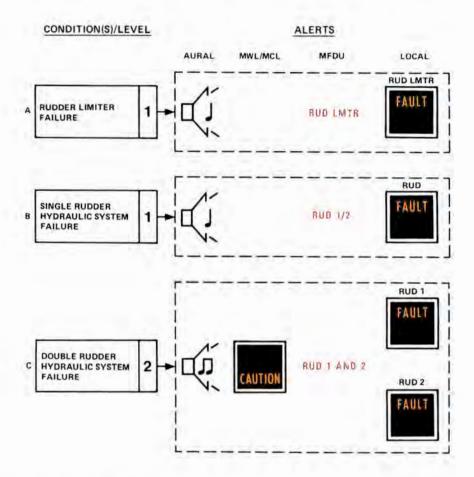
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FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS ALERTS

1.14.01 PAGE 10 VERSION 03 ISSUE 001



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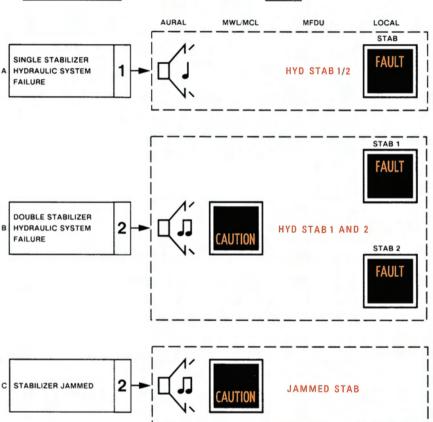
Tokker

FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS ALERTS

1.14.01 PAGE 11 VERSION 03 ISSUE 001

CONDITION(S)/LEVEL

ALERTS



ALERT INHIBITION

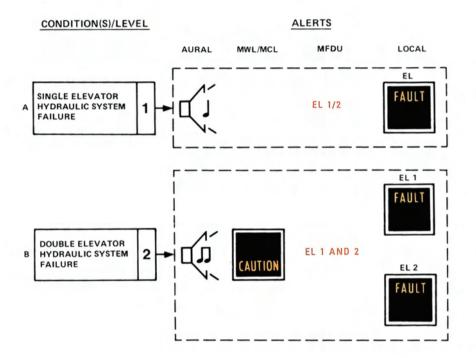
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В				*******								
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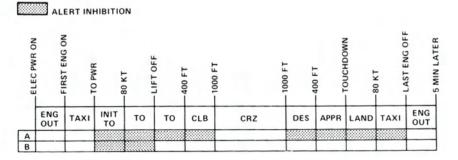
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Tokker

FLIGHT CONTROLS PRIMARY FLIGHT CONTROLS ALERTS

1.14.01 PAGE 12 VERSION 03 ISSUE 001





VD/OP-14-109/B

FLIGHT CONTROLS FLAPS DESCRIPTION

1.14.02 PAGE 1 VERSION 11 ISSUE 001



The flaps are normally operated by hydraulic pressure; alernately, the flaps can be operated by an electric motor. Flap travel is from 0 to 42 degrees. A flap position computer, which receives data about flap and selector positions, provides signals to the flight warning system, the Ground Proximity Warning System (GPWS), the stall warning computer, the Electronic Flight Instrument System (EFIS), and others. The EFIS provides for display of flap position at the PFD; see FLIGHT/NAVIGATION INSTRUMENTS.

HYDRAULIC OPERATION

The flaps are operated by hydraulic system 1. The flap selector is located at the pedestal. A feedback system will deactivate the flap drive when the flaps reach the selected position. Disagreement between the position of the flap selector and the flaps after flap travel will be detected, and an alert presented.

ALTERNATE CONTROL

Electrical operation of the flaps is controlled by an alternate flap switch located at the pedestal. Operation of the switch de-activates the hydraulic flap drive system. Normal hydraulic flap operation cannot be re-established in flight. During alternate flap control, the disagreement alert will be inhibited.

ASYMMETRY PROTECTION

Asymmetry protection is provided during hydraulic operation. As soon as an asymmetry between the LH and RH flap positions is detected, hydraulic operation will be de-activated and an alert will be presented. Normal hydraulic flap operation cannot be re-established in flight. During alternate operation, asymmetry protection is not provided.



FLIGHT CONTROLS FLAPS. DESCRIPTION

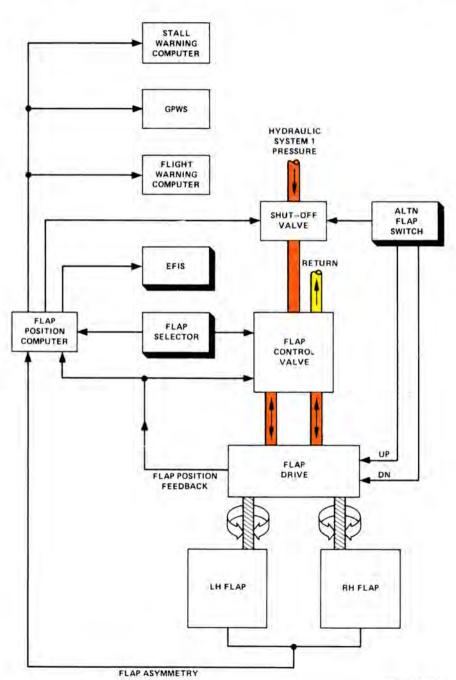
1.14.02 PAGE 2 VERSION 11 ISSUE 001

FLIGHT CONTROLS



FUNCTIONAL DIAGRAM

1.14.02 PAGE 3 VERSION 11 ISSUE 001





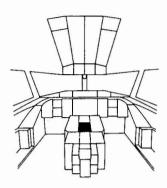
FLIGHT CONTROLS FLAPS FUNCTIONAL DIAGRAM

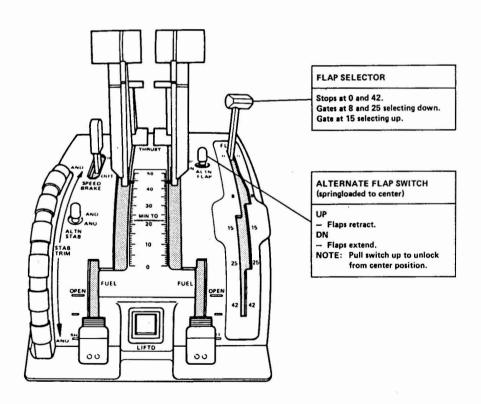
1.14.02 PAGE 4 VERSION 11 ISSUE 001

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FLIGHT CONTROLS FLAPS CONTROLS AND INDICATORS

1.14.02 PAGE 5 VERSION 11 ISSUE 001







FLIGHT CONTROLS FLAPS CONTROLS AND INDICATORS

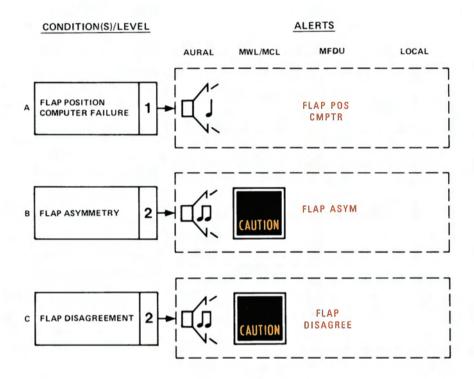
1.14.02 PAGE 6 VERSION 11 ISSUE 001

FLIGHT CONTROLS FLAPS ALERTS



PAGE 7 VERSION 10 ISSUE 001

1.14.02



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1.14.02 PAGE 8 VERSION 10 ISSUE 001

FLIGHT CONTROLS SPEED BRAKE DESCRIPTION

1.14.03 PAGE 1 VERSION 02 ISSUE 002



The speed brake, located at the tail cone, is controlled by a speed brake lever at the pedestal. The lever has IN and OUT positions. Hydraulic system 1 is used to extend and retract the speed brake. Speed brake extension is indicated by two speed brake lights at the main instrument panels.

The speed brake can be extended when the thrust levers are below MIN TO position or when the landing gear is down, except when AFCAS is in the TO or GA mode. The speed brake can be retracted manually, via the speed brake lever, and automatically.

Automatic retraction occurs when:

The TOGA triggers are activated.

- A thrust lever is advanced beyond MIN TO with landing gear up,

- Maximum forward thrust position is selected (wind shear recovery),

- The landing gear is selected up with both thrust levers set above MIN TO (manual go-around).

In the event of an electrical failure, an extended speed brake will retract automatically but very slowly. In the event of a hydraulic failure the speed brake will remain in the selected position. If the speed brake was extended, the speed brake will retract after IN selection by the aerodynamic airload, but at a slower than normal rate.

FLIGHT CONTROLS SPEED BRAKE DESCRIPTION

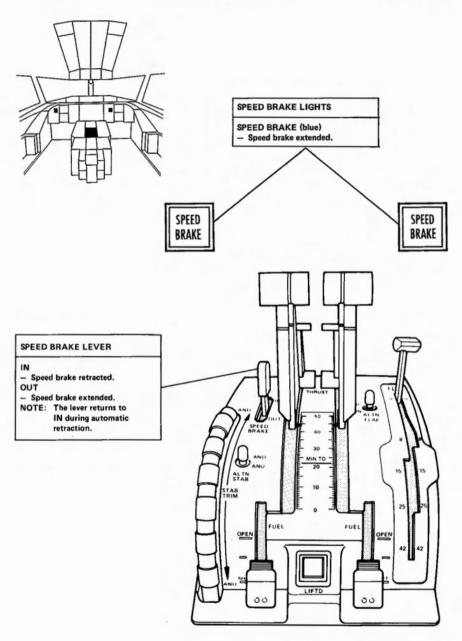
1.14.03 PAGE 2 VERSION 02 ISSUE 002

FLIGHT CONTROLS

SPEED BRAKE
CONTROLS AND INDICATORS

1.14.03 PAGE 3 VERSION 02 ISSUE 001





VD/OP-14-113/A



FLIGHT CONTROLS SPEED BRAKE CONTROLS AND INDICATORS

1.14.03 PAGE 4 VERSION 02 ISSUE 001

Tokker

FLIGHT CONTROLS LIFT DUMPERS DESCRIPTION

1.14.04 PAGE 1 VERSION 01 ISSUE 006

GENERAL

Lift dumpers are provided to destroy lift and to achieve more effective braking after touchdown. The lift dumpers, five doors on each wing, are operated by hydraulic system 1. If hydraulic pressure is not available, accumulators provide pressure to extend and retract the lift dumpers once.

The system can be operated automatically and manually. When the lift dumpers are extended, a LIFT DUMPER OUT memo message is displayed by MFDS. When a fault or unsafe condition in the lift dumper system is detected, an alert will be presented.

AUTOMATIC OPERATION

The arming push button, located at the pedestal, is used to arm the automatic extension system on the ground and in flight. When armed, an ARM light in the push button is on. When armed before take-off, the system is automatically disarmed at lift-off, if the system does not disarm at lift-off, an alert will be presented and the system can be disarmed by depressing the arming push button. In the event of a rejected take-off with the system armed, the lift dumpers will extend when the thrust levers are retarded and the speed is above approximately 50 kt.

When armed before landing, the lift dumpers extend when the wheels spin up on touchdown and the thrust levers are in idle. The lift dumpers will retract when the thrust levers are advanced or when the system is disarmed. The system will disarm when the arming push button is depressed. When armed in flight, the system will disarm automatically if the TOGA triggers are activated or when either thrust lever is advanced to maximum TLA.

NOTE: Do not arm the lift dumper system before landing gear is down and locked.

MANUAL OPERATION

If the system is not armed, the lift dumpers will extend when on the ground the reverse thrust levers are raised. The lift dumpers will retract when the reverse thrust levers are reset.

SYSTEM INHIBIT

The automatic and manual extension of the lift dumpers is inhibited and the lift dumper doors are retracted and locked when the lift dumper push button at the hydraulic panel is manually switched off. Switching the lift dumper push button to off also closes the shut-off valve and the control valve to prevent lift dumper extension should the system become unsafe.



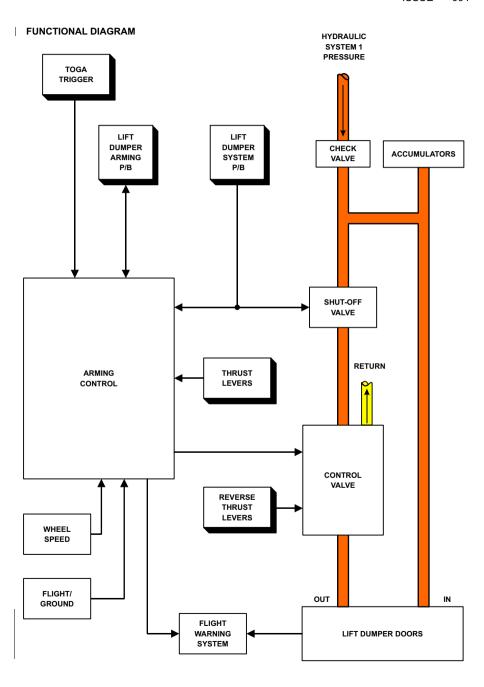
FLIGHT CONTROLS LIFT DUMPERS DESCRIPTION

1.14.04 PAGE 2 VERSION 01 ISSUE 006



FLIGHT CONTROLS LIFT DUMPERS FUNCTIONAL DIAGRAM

1.14.04PAGE 3
VERSION 01
ISSUE 004





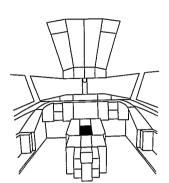
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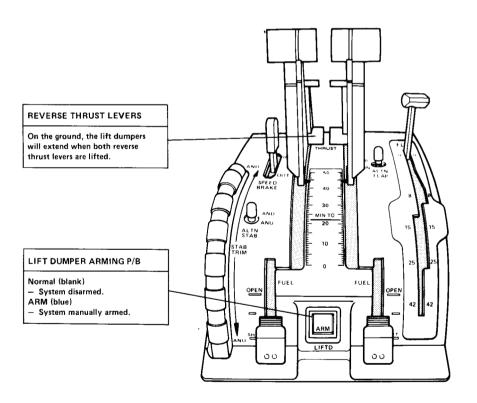
1.14.04PAGE 4
VERSION 01
ISSUE 004

FLIGHT CONTROLS

LIFT DUMPERS
CONTROLS AND INDICATORS







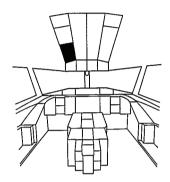
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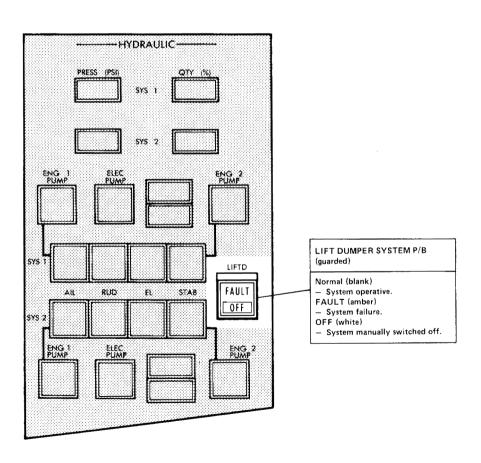
FLIGHT CONTROLS LIFT DUMPERS CONTROLS AND INDICATORS

1.14.04PAGE 6
VERSION 01

ISSUE 003







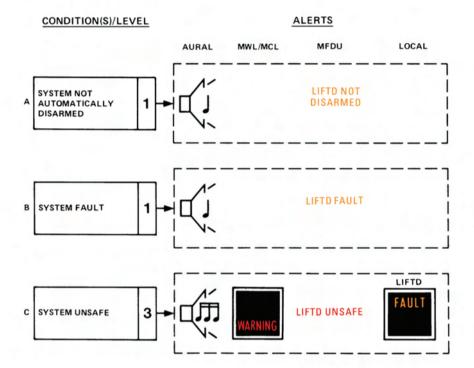
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FLIGHT CONTROLS LIFT DUMPERS



ALERTS

1.14.04 PAGE 7 **VERSION 01** ISSUE 003



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	ENG OUT	TAXI	INIT TO	то	то	CLB	CRZ	DES	APPR	LAND	TAXI	ENG
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A 3		TAXI		то	то	CLB	CRZ	DES	APPR	LAND	TAXI	OUT

VD/OP-14-118/A

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FLIGHT CONTROLS LIFT DUMPERS ALERTS

1.14.04 PAGE 8 VERSION 01 ISSUE 003

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FLIGHT CONTROLS STALL PREVENTION SYSTEM DESCRIPTION

1.14.05 PAGE 1 VERSION 03 ISSUE 002

GENERAL

The stall prevention system provides for pre-stall warning and post-stall recovery. The system comprises two Angle-Of-Attack (AOA) vanes, two stall protection computers, two stall protection enhancement units, two stick shakers, and a stick pusher. System failures will be detected and relevant alerts will be presented.

PRE-STALL WARNING

A pre-stall warning is provided at each control column by the stick shakers. The stick shakers can be activated by the stall protection computers and the stall protection enhancement units, each is able to activate both stick shakers. System activation will occur as a function of angle of attack and flap position, or airspeed. Below 20 250 ft stick shaker activation is a function of angle of attack and flap position and is controlled by the stall protection computers. Above 20 250 ft the stall protection enhancement units will activate the stick shakers when the airspeed drops to $V_{\rm SS}$, the stick shaker speed calculated by the FCC's. If both stall

protection enhancement units fail, the stick shaker function would still be performed by the stall protection computers. In this case the margin between the moment of stick shaker actuation and actual stall will be reduced. The stick shaker system will be armed during the take-off roll and remains armed in flight. During stick shaker operation, ground proximity warnings are inhibited

POST-STALL RECOVERY

Post-stall recovery is provided by a pneumatically operated stick pusher, which will push the control columns fully forward when activated. Both stall protection computers must detect a stall condition to activate the stick pusher. A stick pusher disconnect handle which operates a shut-off valve is located at the pedestal. Upon operation of the disconnect handle, the stick pusher system will be de-activated and the handle will remain locked in the extended position. The stick pusher operation is inhibited until 10 seconds after lift-off, and also during wind shear recovery. See WIND SHEAR DETECTION AND RECOVERY.

Tokker

FLIGHT CONTROLS STALL PREVENTION SYSTEM DESCRIPTION

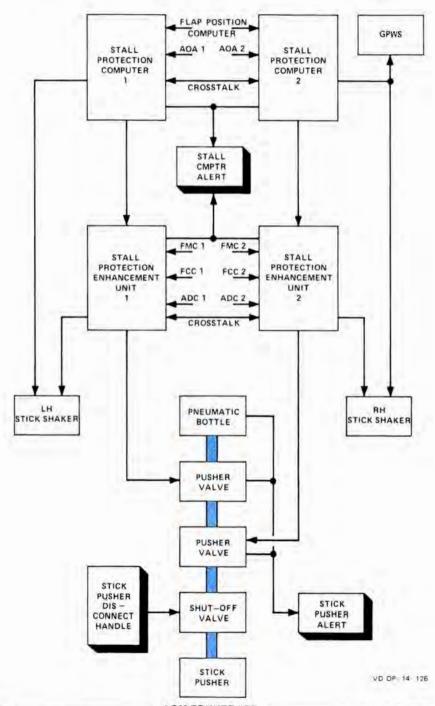
1.14.05 PAGE 2 VERSION 03 ISSUE 002

FLIGHT CONTROLS STALL PREVENTION SYSTEM

Tokker

FUNCTIONAL DIAGRAM

1.14.05 PAGE 3 VERSION 03 ISSUE 002



Jokker

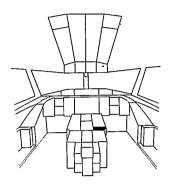
FLIGHT CONTROLS STALL PREVENTION SYSTEM FUNCTIONAL DIAGRAM

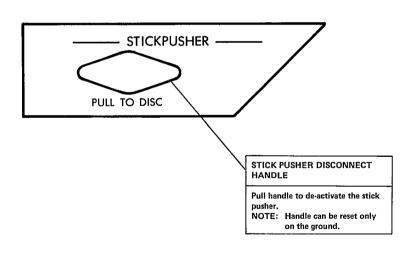
1.14.05 PAGE 4 VERSION 03 ISSUE 002

Jokker

FLIGHT CONTROLS STALL PREVENTION SYSTEM CONTROLS AND INDICATORS

1.14.05 PAGE 5 VERSION 03 ISSUE 002







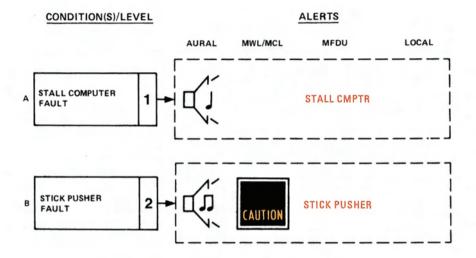
FLIGHT CONTROLS STALL PREVENTION SYSTEM CONTROLS AND INDICATORS

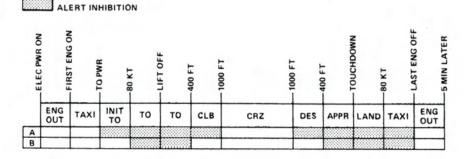
1.14.05 PAGE 6 VERSION 03 ISSUE 002

Tokker

FLIGHT CONTROLS STALL PREVENTION SYSTEM ALERTS

1.14.05 PAGE 7 VERSION 03 ISSUE 001





Tokker

FLIGHT CONTROLS STALL PREVENTION SYSTEM ALERTS

1.14.05 PAGE 8 VERSION 03 ISSUE 001

FLIGHT CONTROLS TAKE-OFF CONFIGURATION WARNING



DESCRIPTION

1.14.06 PAGE 1 VERSION 01 ISSUE 003

With the aircraft on the ground, and either thrust lever advanced to MIN TO position, distinctive take-off configuration alerts will be presented if any of the following conditions are met:

- Flaps not in TO position or in the alternate mode.
- Stabilizer not in TO range.
- Parking brake set.
- Speed brake not in.
- Lift dumper unlocked.
- Flight control lock on.
- One elevator hydraulic system depressurized.

NOTE: The take-off configuration alerts cannot be cancelled by depressing the MWL.

The take-off configuration may be tested prior to take-off with the parking brake set by depressing the TAKE-OFF CONF test button at the pedestal. If the take-off configuration is satisfactory no alerts will be presented and a T-O CONFIG NORM memo message is displayed.

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FLIGHT CONTROLS TAKE-OFF CONFIGURATION WARNING DESCRIPTION

1.14.06 PAGE 2 VERSION 01 ISSUE 003

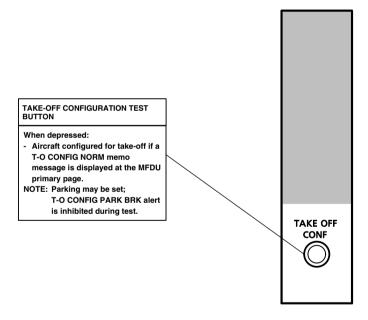


FLIGHT CONTROLS TAKE-OFF CONFIGURATION WARNING

CONTROL AND INDICATORS

1.14.06PAGE 3
VERSION 01
ISSUE 004

TAKE-OFF CONFIGURATION TEST BUTTON LOCATION: PEDESTAL



JFCT-021/A



FLIGHT CONTROLS TAKE-OFF CONFIGURATION WARNING CONTROL AND INDICATORS

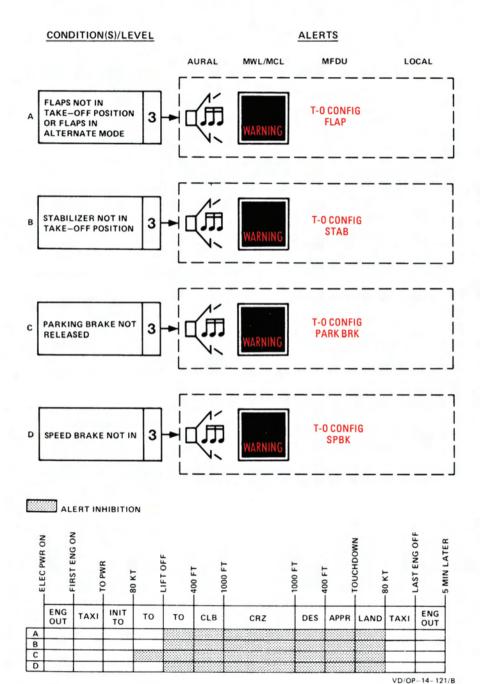
1.14.06PAGE 4
VERSION 01
ISSUE 004



FLIGHT CONTROLS TAKE-OFF CONFIGURATION WARNING **ALERTS**

1.14.06 PAGE 5

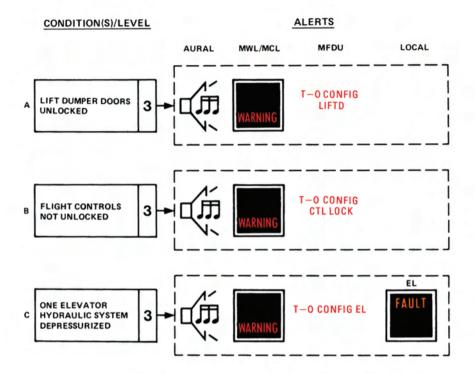
VERSION 01 ISSUE 003



Tokker

FLIGHT CONTROLS TAKE-OFF CONFIGURATION WARNING ALERTS

1.14.06 PAGE 6 VERSION 01 ISSUE 003



ELEC PWR ON	N I	DWB CMB		2	110111			1000 FT		TOUCHDOWN		
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A B	ENG		INIT		-	Ī	CRZ	-	<u></u>		-	ENG OUT