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**Safety recommendation:** ***AIC 19-R21/18-1002***

**Addressed to: Avions de Transport Regional (ATR) Limited**

**Date issued: 27th July 2019**

**Investigation link:** ***AIC 18-1002***

**Action status: Issued**

## Introduction

On 28th July 2018, at 23:37 UTC[1] (10:37 local time) an Avions de Transport Regional, ATR72-500 registered YJ-AV71 (AV71), operated by Air Vanuatu Operations Limited was on a scheduled flight from Whitegrass Airport, Tanna to Bauerfield Airport, Port Vila. During its landing roll, the aircraft lost directional control and veered off, towards the left of runway 29, and collided with two unoccupied Britten-Norman Islander Aircraft. The ATR had 39 passengers and four crew; two pilots and two Cabin Crew. No injuries were reported.

This occurrence was formally notified to the PNG Accident Investigation Commission (AIC) on 28th July 2018 with the request from the Director Civil Aviation Authority of Vanuatu (CAAV) for the PNG AIC to conduct the investigation. The CAAV delegated the whole of the investigation to the PNG AIC in accordance with *Annex 13 Paragraph 5.1*.

The PNG Minister for Civil Aviation approved the Commission to accept the delegated investigation and dispatch a team of investigators to Vanuatu as soon as possible. Investigators arrived at the accident site on Sunday afternoon 29th July 2018 and immediately commenced the on-site investigation. The investigation was fully supported by AIC staff in Port Moresby including the resources of the AIC's flight recorder laboratory.

Both the States of Manufacture of the Aircraft and the Engine participated as accredited representatives to the investigation. The manufacturer of the aircraft, ATR, and the engine, Pratt & Whitney Canada (P&WC) were involved as advisors to their respective accredited representatives.

In the absence of an independent investigation authority, the Director of the CAAV, represented the State of Operator, Registry and Occurrence undertook to provide guidelines on applicable Republic of Vanuatu Civil Aviation Occurrence Investigation Legislation. However, where possible the conduct of the investigation was to be in accordance with the PNG legislation, the *AIC Policy and Procedures*, and at all times in accordance with *ICAO Annex 13*.

## Occurrence

While enroute at 16,000 ft and about 60 nm from Port Vila, the flight crew noticed the No. 2 engine (right engine) *Interstage Turbine Temperature (ITT)* gauge increase rapidly and subsequently exceed its normal operating limits with the Master Caution visual and aural warnings being triggered.

Both the crew and passengers reported hearing loud banging noises from the right side of the aircraft. Some passengers reported seeing white flashes in the cabin. The investigation determined that the noises were as a result of the No. 2 engine compressor stalling.

1 The 24-hour clock, in Coordinated Universal Time (UTC), is used in this report to describe the local time as specific events occurred. Local time in the area of the accident, Vanuatu Time (VUT) is UTC + 11 hours.

At 23:20:54, the Senior Cabin Crew (SCC) was notified of the engine abnormality by the PIC via the crew interphone system. The SCC subsequently notified the flight crew that there was smoke entering the cabin from the right side of the cabin. The PIC broadcasted a *MAYDAY* and notified Vila Air Traffic Control (ATC) of their descent intentions. The pilots commenced the descent and proceeded to complete their checklist.

About 6 minutes after the first abnormal engine event, the No. 2 engine *oil low pressure warning* alert activated on the *Crew Alert Panel*. The pilots referred to the '*QRH*[2] *Engine Oil Low pressure'* checklist and subsequently shut down the No. 2 engine. The rest of the descent and the landing was conducted with the No. 2 engine inoperative.

Recorded data showed that one second after touchdown, both power levers were set to maximum reverse thrust. They were subsequently advanced back to Ground Idle after one second then after a further ground roll of about 200 metres the power levers were returned to reverse thrust.

The aircraft did not have hydraulically powered nosewheel steering and main-wheel brakes. Rudder authority, for ground aerodynamic steering was substantially limited because the switch for manual operation was not set to the appropriate setting. Reverse thrust was applied during the landing roll, which induced a significant left yaw resulting in the subsequent runway excursion.

**Safety Deficiency description**

During the '*ELECTRICAL SMOKE'* checklist actions, the crew were referred to the '*ACW*[3] *GEN 1+2 LOSS*' checklist *(See attachment 1).* The aircraft was on descent, more than 20 nm from the aerodrome and was not yet within the appropriate speed range to be configured for landing. Therefore, the PIC instructed the copilot to 'skip' the '*before landing section*' of the checklist. That section contains essential action items for the configuration of the aircraft, such as the *landing gear* extension and *flap* selection. The crew subsequently returned to that section of the checklist and completed it when the aircraft was within 5 nm of the aerodrome and the speed had fallen to within the appropriate range.

The pilots did not refer to the normal '*BEFORE LANDING'* checklist *(See attachment 2),* which also contained the above action items and additional essential action and check items, including the rudder *Travel Limiting Unit (TLU)*. The investigation determined that they substituted the normal '*BEFORE LANDING'* checklist with the '*ACW GEN 1+2 LOSS'* checklist, before landing section.

As a result, the *QRH* did not draw the pilots' attention to check the *TLU indicator* and *switch* to ensure they had set it to the *low speed mode*. The *TLU* remained in the *high-speed mode,* which restricted rudder deflection to only +/- 4° instead of the its normal full available deflection of +/- 27°. In the absence of hydraulic steering capabilities, aerodynamic steering on the ground was absolutely necessary. However, the extremely limited rudder authority rendered aerodynamic control negligible.

## Recommendation number *AIC 19-R21/18-1002* to Avions de Transport Regional (ATR) Limited

The PNG Accident Investigation Commission recommends that ATR should ensure that the either:

1. The rudder *Travel Limitation Unit (TLU) Low Speed* check, along with other essential check and action items, is included in the before landing section of the *'Alternating Current Wild (ACW) GEN 1+2 LOSS'* checklist, and every abnormality and emergency checklist that has gear and flap extension procedures; or

2. the *Quick Reference Handbook (QRH)* contains appropriate information that informs the crew that the *before landing sections* of the '*ACW GEN 1+2 LOSS'* checklist and other abnormality and emergency checklist is not a substitute for the normal '*Before landing'* checklist.

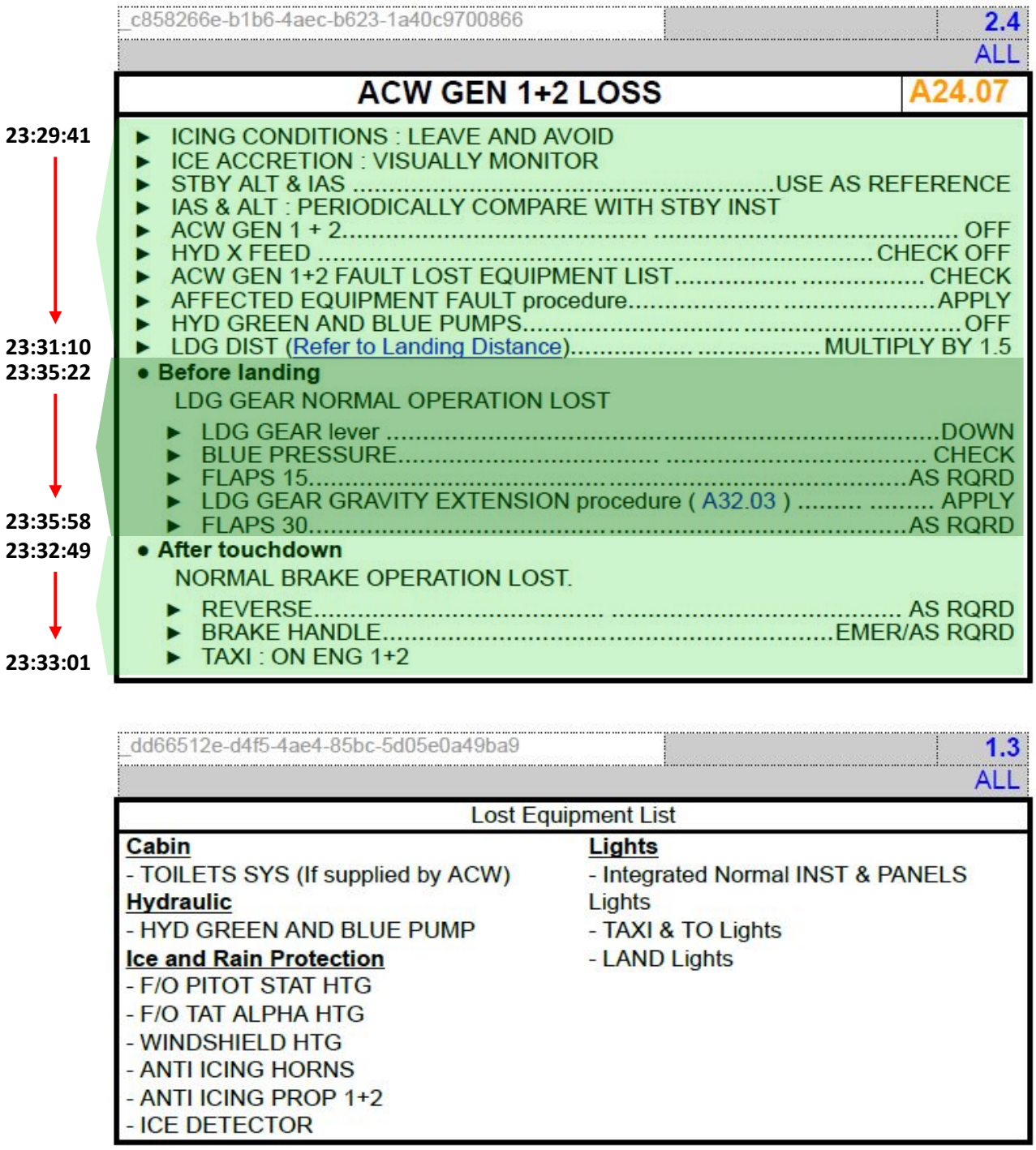
## Action requested

The AIC requests that ATR note recommendation *AIC 19-R21/18-1002*, and provide a response to the AIC within 90 days of the issue date, and explain (including evidence) how ATR has addressed the safety deficiency identified in the safety recommendation. Status **ACTIVE.**

2 QRH: *Quick Reference Handbook* checklist

3 ACW: *Alternating Current Wild* means that the **alternating current** that is frequency **wild**, meaning as the generator speeds up or slows down, the frequency of the alternating current actually changes.

## ATTACHMENT 1: *ACW GEN 1/2 LOSS* CHECKLIST



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ALL

**ACW GEN 1+2 LOSS** A24.07

**23:29:41**

- ICING CONDITIONS : LEAVE AND AVOID
- ICE ACCRETION : VISUALLY MONITOR
- STBY ALT & IAS .....USE AS REFERENCE
- IAS & ALT : PERIODICALLY COMPARE WITH STBY INST
- ACW GEN 1 + 2..... OFF
- HYD X FEED .....CHECK OFF
- ACW GEN 1+2 FAULT LOST EQUIPMENT LIST..... CHECK
- AFFECTED EQUIPMENT FAULT procedure.....APPLY
- HYD GREEN AND BLUE PUMPS.....OFF

**23:31:10**

- LDG DIST (Refer to Landing Distance).....MULTIPLY BY 1.5

**23:35:22**

- **Before landing**

LDG GEAR NORMAL OPERATION LOST

- LDG GEAR lever .....DOWN
- BLUE PRESSURE..... CHECK
- FLAPS 15.....AS RQRD
- LDG GEAR GRAVITY EXTENSION procedure ( A32.03 ) ..... APPLY

**23:35:58**

- FLAPS 30.....AS RQRD

**23:32:49**

- **After touchdown**

NORMAL BRAKE OPERATION LOST.

- REVERSE..... AS RQRD
- BRAKE HANDLE.....EMER/AS RQRD

**23:33:01**

- TAXI : ON ENG 1+2

_dd66512e-d4f5-4ae4-85bc-5d05e0a49ba9 1.3

ALL

Lost Equipment List

| | |
|---|---|
| **Cabin** | **Lights** |
| - TOILETS SYS (If supplied by ACW) | - Integrated Normal INST & PANELS Lights |
| **Hydraulic** | - TAXI & TO Lights |
| - HYD GREEN AND BLUE PUMP | - LAND Lights |
| **Ice and Rain Protection** | |
| - F/O PITOT STAT HTG | |
| - F/O TAT ALPHA HTG | |
| - WINDSHIELD HTG | |
| - ANTI ICING HORNS | |
| - ANTI ICING PROP 1+2 | |
| - ICE DETECTOR | |

**AIC Note:** Pale green highlighting added by the AIC to identify the area of checklist completed.

Dark green highlighting added by the AIC to identify the area of checklist action delayed.

**ATTACHMENT 2:** ***BEFORE LANDING CHECKLIST***

## 16 Before Landing

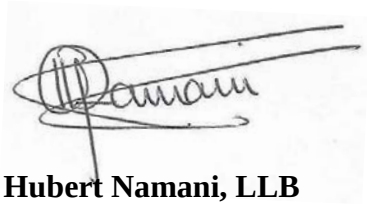
_eab6f18c-1073-423a-956c-a6c68f46b435 | 4.2

ALL

| PF | PM |
|---|---|
| **When Passing Deceleration Point**<br>▶ PL 1+2..... ..... RETARD AS RQRD | |
| **At Appropriate Speed**<br>▶ FLAPS 15.....ORDER | ▶ FLAPS..... ..... 15° |
| **At Appropriate Speed**<br>▶ LDG GEAR DOWN..... ..... ORDER | ▶ LDG GEAR ..... ..... DOWN<br>▶ TLU LO SPEED..... .....CHECK ON<br>▶ PWR MGT..... .....TO<br>▶ TAXI & T.O lights ..... .....ON<br>▶ LDG GEAR .....MONITOR<br>*Announce Gear when locked.*<br>▶ ICING AOA ..... .....AS RQRD<br>**Note**<br>*Icing AOA must remain ON for a landing under icing conditions. Make sure that the aircraft is clean and out of icing conditions before resetting icing AOA for a landing under normal conditions. Refer to ADVERSE WEATHER.* |

| CAPT | F/O |
|---|---|
| ▶ CABIN CREW REPORT.....OBTAIN | |

| PF | PM |
|---|---|
| **At Appropriate Speed**<br>▶ FLAPS 30.....ORDER | ▶ FLAPS..... ..... 30° |
| ▶ BEFORE LDG C/L ..... ..... ORDER | ▶ BEFORE LDG C/L ..... ..... PERFORM |
| **Note**<br>*In the case of turbulence CL must be set to 100% OVRD to help maintain approach speed.* | **Note**<br>*In the case of turbulence CL must be set to 100% OVRD to help maintain approach speed.* |



**Hubert Namani, LLB**

*Chief Commissioner*

*27th July 2019*

**AIC assessment of BEA response to *Recommendation AIC 19-R21/18-1002* issued to Avions de Transport Regional (ATR) Limited.**

The BEA represented the State of Manufacturer and as such was responsible for coordinating safety action responses from the aircraft manufacturer Avions de Transport Regional (ATR) Limited.

On 9 October 2019 the AIC received a response from BEA which stated in part:

> With regard to the recommendations, they are in line with improving safety. The BEA believes that the problem highlighted by the Investigation Commission in the recommendation for the manufacturer is relevant.

In June 2021, Avions de Transport Regional (ATR) Limited issued an *Airplane Flight Manual (AFM)* revision that addressed the safety deficiencies identified in AIC *Safety Recommendation AIC 19-R21/18-1002.* (See Attachment 1.)

The AIC assessed the Avions de Transport Regional (ATR) Limited corrective action and **assigns response as *fully satisfactory*.**

The AIC has recorded the **Status of the AIC Recommendation: CLOSED**

**Capt. Aria Bouraga, MBE**
*Acting Chief Commissioner*

31 October 2022

**ATTACHMENT 1: ATR AIRPLANE FLIGHT MANUAL, REVISION 29.0 – TOTAL JUNE 2021**

# FLEET 72-600

REV 29.0 - TOTAL

JUN 21

Kg

# AFM

## Airplane Flight Manual

APPROVED



ATR

**CG6_AFM_75_EASA_L_SI_full_Rev29.0**

| | | |
|---|---|---|
| | **AFM**<br><br>**RNR**<br>**Reason of Normal Revision** | |

| N° Rev | Revision Date | Reason For Issue | Impacted DM |
|---|---|---|---|
| | | - Structure-wording improvement in order to clarify that timer of 30s start after the Disch completion of the agent 1. | AFM.PRO.NNO.EMR.70.02.E70.02<br>ENG 1(2) FIRE OR SEVERE MECHANICAL DAMAGE IN FLIGHT<br>ALL |
| | | - Structure-wording improvement in order to clarify that timer of 30s start after the Disch completion of the agent 1. | AFM.PRO.NNO.EMR.70.03.E70.03<br>ENG 1(2) FIRE OR SEVERE MECHANICAL DAMAGE ON GROUND<br>ALL |
| | | - Update of the Note in order to provide different links to all VmHB values. | AFM.PRO.NNO.EMR.70.05.E70.05<br>ENG 1+2 FLAME OUT<br>ALL |
| | | - Revision of the procedure in order to cover single and double doors and for clarification purpose | AFM.PRO.NNO.EMR.99.2.E99.02<br>COCKPIT DOOR LOCKING SYSTEM<br>ALL |
| | | - Harmonization of the condition Just belore ditching for BRACE FOR IMPACT order (for ditching and forced landing procedures). | AFM.PRO.NNO.EMR.99.3.E99.03<br>DITCHING<br>ALL |
| | | - No technical change, aircraft configuration management. | AFM.PRO.NNO.EMR.99.4.E99.04<br>EMERGENCY DESCENT<br>ALL |
| | | - Correction of the flaps configuration 35° for 42-400-500 aircraft. | AFM.PRO.NNO.EMR.99.8.E99.08<br>SEVERE ICING<br>ALL |
| | | - Caution added to avoid human factor ambiguity.Standardization of TLU actions wording. | AFM.PRO.NNO.EMR.99.10.E99.10<br>UNRELIABLE AIRSPEED INDICATION<br>ALL |
| | | - Addition of a Note linked to MAX FLIGHT TIME value (FCOM only). | AFM.PRO.NNO.ABN.21.1.3.A21.03<br>PACK 1+2 VALVES FAULT<br>ALL |
| | | - Addition of a MAX TIME value and an associated note. | AFM.PRO.NNO.ABN.21.2.3.A21.14<br>EXCESS CAB DELTA P<br>ALL |

# 26 SMOKE

## SMOKE or FUMES

6.2
1317-1461
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■ **If smoke/fumes in the cockpit**

► CREW OXY MASKS..... DON / 100 %

► GOGGLES..... DON

► CREW COMMUNICATIONS..... ESTABLISH

► RECIRC FANS 1+2..... OFF

► AP ..... ON

► CABIN CREW COMMUNICATIONS..... ESTABLISH

**CAUTION**

ELEC SMK warning may be triggered by an air conditioning smoke source.

► SMOKE / FUMES SOURCE ..... IDENTIFY

■ **If electrical smoke/fumes identified**

► ELECTRICAL SMOKE procedure ( E26.02 ) ..... APPLY

■ **If air conditioning smoke/fumes identified**

► AIR COND SMOKE procedure ( E26.03 ) ..... APPLY

■ **If FWD SMK comes on or smoke/fumes in FWD zone of aircraft**

► FWD SMOKE procedure ( E26.04 ) ..... APPLY

■ **If AFT SMK comes on or smoke/fumes in aft zone of aircraft**

► AFT SMOKE procedure ( E26.06 ) ..... APPLY

■ **If smoke/fumes source not identified**

**Note**

*Refer to FCOM - QRH PRO/NNO/EMR/26/SMOKE SOURCE DETECTION provides additional guidance to identify smoke/fumes source.*

► ELECTRICAL SMOKE procedure ( E26.02 ) ..... APPLY

■ **If smoke/fumes in the cockpit**

- ▶ CREW OXY MASKS..... DON / 100 %
- ▶ GOGGLES..... DON
- ▶ CREW COMMUNICATIONS..... ESTABLISH
- ▶ RECIRC FANS 1 + 2..... OFF
- ▶ AP ..... ON

▶ CABIN CREW COMMUNICATIONS..... ESTABLISH

**CAUTION**

ELEC SMK warning may be triggered by an air conditioning smoke source.

▶ SMOKE / FUMES SOURCE .....IDENTIFY

■ **If electrical smoke/fumes identified**

▶ ELECTRICAL SMOKE procedure ( E26.02 ) .....APPLY

■ **If air conditioning smoke/fumes identified**

▶ AIR COND SMOKE procedure ( E26.03 ) .....APPLY

■ **If FWD SMK comes on or smoke/fumes in FWD zone of aircraft**

▶ FWD SMOKE procedure ( E26.04 ) .....APPLY

■ **If AUX AFT COMPT SMK comes on**

▶ AUX AFT COMPT SMOKE procedure ( E26.05 ) .....APPLY

■ **If AFT SMK comes on or smoke/fumes in aft zone of aircraft**

▶ AFT SMOKE procedure ( E26.06 ) .....APPLY

■ **If smoke/fumes source not identified**

**Note**

*Refer to FCOM - QRH PRO/NNO/EMR/26/SMOKE SOURCE DETECTION provides additional guidance to identify smoke/fumes source.*

▶ ELECTRICAL SMOKE procedure ( E26.02 ) .....APPLY

## ELECTRICAL SMOKE

3.3
ALL
APPROVED

► SMOKE or FUMES procedure ( E26.01 ) ..... APPLY

CAUTION
ELEC SMK warning may be triggered by an air conditioning smoke source

► AVIONICS VENT EXHAUST MODE..... OVBD
► AIR FLOW..... HIGH
► DC SVCE & UTLY BUS..... OFF
► DC BTC ..... ISOL
► ICING CONDITIONS : LEAVE AND AVOID
► ACW GEN 1 + 2..... OFF
► SUSPECTED EQUIPMENT..... OFF

■ **If smoke source not identified**

► **LAND ASAP**
► ACW GEN 1+2 LOSS procedure ( A24.09 ) ..... APPLY

■ **If smoke source identified**

► OPERATING EQUIPMENT..... RESTORE

Note
*Restore ACW GEN, DC BTC and/or DC SVCE & UTLY BUS if appropriate*

► AFFECTED EQUIPMENT FAULT PROCEDURES..... APPLY

● **When ΔP below 1 psi**

► OVBD VALVE ..... FULL OPEN
► AVIONICS VENT EXHAUST MODE..... NORM

## AIR COND SMOKE

4ecc7cff-5fd9-42e3-b76b-1c14ebdb7175

5.2
ALL
APPROVED

► SMOKE or FUMES procedure ( E26.01 ) ..... APPLY
► PACK VALVE 1..... OFF
► MAX FL : 200/MEA

**CAUTION**

Air conditioning smoke may trigger an ELEC SMK warning. Do not apply ELECTRICAL SMOKE procedure in this case.

■ **If smoke persists**

► PACK VALVE 1..... ON
► PACK VALVE 2..... OFF
► ENG PARAMETERS : CAREFULLY MONITOR

■ **If ENG 1(2) OVER LIM amber message on EWD**

- OR -

■ **Total loss of NL indication**

- OR -

■ **Engine abnormality clearly identified (NH, NL, ITT indications, noise, surge...)**

**CAUTION**

Identify the engine that shows signs of abnormal operation in order to avoid shutting down the safe engine.

► PL (affected ENG)..... FI
► CL (affected ENG)..... FTR THEN FUEL S.O.
► **LAND ASAP**
► SINGLE ENG OPERATION procedure ( A70.12 ) ..... APPLY

## ACW GEN 1+2 LOSS

4.4
ALL
APPROVED

- ICING CONDITIONS : LEAVE AND AVOID
- ICE ACCRETION : VISUALLY MONITOR
- IESI ALT & IAS ..... USE AS REFERENCE
- IAS & ALT : PERIODICALLY COMPARE WITH IESI
- ACW GEN 1 + 2..... OFF
- HYD X FEED ..... CHECK OFF
- ACW GEN 1+2 LOSS LOST EQUIPMENT LIST..... CHECK
- AFFECTED EQUIPMENT FAULT procedure..... APPLY
- HYD BLUE PUMP..... OFF
- HYD GREEN PUMP..... OFF
- LDG DIST (Refer to Landing Distance)..... MULTIPLY BY 1.5

• **Before landing**

LDG GEAR NORMAL OPERATION LOST

- LDG GEAR lever ..... DOWN
- BLUE PRESSURE..... CHECK
- FLAPS 15..... AS RQRD
- LDG GEAR GRAVITY EXTENSION procedure ( A32.03 ) ..... APPLY
- FLAPS 30..... AS RQRD

NORMAL BRAKE OPERATION LOST.

**Note**

*"TLU LO SPEED" label on EWD is not visible, check that no TLU FAULT alert is displayed on EWD or local alert on overhead panel.*

• **After touchdown**

- REVERSE..... AS RQRD
- BRAKE HANDLE..... EMER/AS RQRD
- TAXI : ON ENG 1+2