**"In the name of God"**

# Islamic Republic Of Iran

# Civil Aviation Organization

# Aircraft Accident Investigation Board

## Final Report

## Synopsis:

State File Number: I970604 EPTTA

Type of occurrence: Incident- (Cabin Pressure Warning)

Date of occurrence: Nov. 25, 2018

Place of occurrence: Enroute Tehran- Ahwaz, Islamic Republic of Iran

Aircraft Model: A320, MSN 393

Registration: EP-TTA

Operator: IRAN AIRTOUR

Date of Issue: 14 Aug, 2019

http://www.cao.ir E-mail: AIG@cao.ir Fax: + 98 21 6601 8659 Tel.: + 98 21 6604 7965

Mehrabad International Airport Tehran/Iran PBO: 13445-1795

# 1. FACTUAL INFORMATION:

## 1.1. History of the flight:

On Nov. 25, 2018, an A320, MSN 393, registration EP-TTA was planned to have scheduled passenger flight No: 956 from Mehrabad International Airport (OIII) to Ahwaz international airport (OIAW). The aircraft experienced cabin pressurization problem during cruise at FL 340. The pilot decided to descend immediately to the safe altitude level as Minimum enroute altitude (FL140). Passenger oxygen masks dropped. The aircraft continued for safe landing on the Ahwaz Airport. Six crew members and All 159 passengers disembarked safely without any injuries.

However during the Event, the flight crew and passengers used emergency use of oxygen but circumstances indicated that there was not a high probability of an accident so the event was categorized as an incident based on annex 13.

## 1.2. Personnel Information:

Both the pilots of the aircraft have valid certificates accordingly with valid medical issued by IR of Iran Civil Aviation Organization. Their qualifications were as:

**Pilot Flying :( Left Hand Seat)**

a) Pilot in command - Male, 54 years old, Iranian Nationality,
b) Commercial pilot, ATPL No1723, issued Iran CAO,
c) Type Rating: A320, TRI/TRE
d) Valid Medical Certification,
e) Total flight time: 12000 Hrs.,
f) Flight time on type: 10270 Hrs.

**Pilot None Flying: (Right Hand Seat)**

a) First Officer - Male, 47 years old, Iranian Nationality,
b) Commercial pilot, CPL/IR No.1867, issued Iran CAO,
c) Type Rating: A320,
d) Valid Medical Certification,
e) Total flight time: 2700 Hrs.,
f) Flight time on type: 1400 Hrs.

Both pilots were employees of Meraj Airline and temporarily had flight mission for by Mutual agreement between two airlines (Iran Airtour & Meraj Airlines).

## 1.3. Aircraft Information:

The Airbus A320 aircraft with registration EP-TTA was manufactured dated 01 Jan. 1993. The aircraft was belonged to Atrak Airline Previously and recently purchased and operated by Iran Airtour. It had valid Airworthiness Certificate issued by I.R. of Iran Civil Aviation Organization. The general information of this aircraft was as followed:

### 1.3.1 Aircraft:

Type: A320-231 S/N: 0393 Register: EP-TTA

Operator: Iran Airtour Airlines (IRB)

Total Flight Hours: 51842:29:00

Total light Cycle: 26929

### 1.3.2 Engine:

Eng. #1 Type: V25500-A1 Eng. #1 S/N: V0267

Eng. #1 TSN: 45381:31 Eng. #1 CSN: 23135

Eng. #2 Type: V25500-A1 Eng. #2 S/N: V0048

Eng. #2 TSN: 64716:31 Eng. #2 CSN: 30360

### 1.3.3 Aircraft Technical History:

Iran Air tours airline as aircraft operator was the company responsible for operation of aircraft under AOC certificate (IR.AOC.103) and CAMO approval and aircraft line maintenance was contracted to Iran Aseman Airlines (PART-145 approved maintenance organization). The related Part 145 organization did not file the technical documentation. The history of the aircraft operation on 24, 25 Nov 2018 within last 6 flights were reviewed based on aircraft logbook as:

**On 24 Nov 2018, at first flight the pilot reported:**

- ENG #1 bleed pressure shows near zero during flight.
- Wing Anti-ice System fault

The maintenance action: Eng#1 bleed precooler inlet press IND on the bleed page Deferred According to MEL 36-07-04A with CAT "C"

R/H wing anti-ice control valve has been deactivated in open position in accordance with AMM CH.30-11-00-040 & was deferred in CAT "C" based to MEL CH.30-11-01A

**The second flight of the day**: NO pilot report

**The third flight of the day:**

- Pilot report No; 1: ENG#1 & 2 Bleed fault

Maintenance action: ENG#1&2 bleed were checked found OK accordance with 36-12-00 with APU & Engine running.

- Pilot report No; 2: Air ENG#1 Bleed abnormal pressure

Maintenance action: refer to DDR NO, 4151 Item is deferred CAT "C"

**On 25 Nov 2018, the aircraft operation was continued as:**

**1ST Flight (Incident):**

- Pilot report No; 1: Air ENG #1 Bleed abnormal pressure
- Pilot report No; 2: Air ENG 1&2 Bleed fault
- Pilot report No; 3: Wing anti ice Right valve open
- Pilot report No; 4: Auto brakes fault
- Pilot report No; 5: Cabin pressure excess cabin altitude
- Pilot report No; 6: Cabin pressure low different pressure

**Maintenance Action:**

The aircraft was grounded in Ahwaz airport and a mechanic dispatched from maintenance base (Tehran) to Ahwaz and performed bellowed actions before a position flight back to Tehran.

In accordance with Trouble shooting Manual 36-11-00 LH engine bleed valve sense line tested was loose, tightened & bleed system Checked OK

Eng#1 bleed sensing line was leak, test found O.K and PRV valve was changed and ENG #1 run up bleed no; 1 was OK based to AMM (36-11-52)

Wing Anti-Ice Valve is differed item IAW AMM 30-11-01B.

RH engine bleed valve cleaned and tested was OK.

Bleed system #1 checked was OK.

Auto Brake system is differed.

**2RD Flight (position flight): pilot 1, 2, 3 reports:**

ENG #1 Bleed pressure show zero during flight

Wing anti ice right valve open

Air eng#1 bleed abnormal pressure

**Maintenance Action:**

Engine #1 bleed valve sensing line tested found ok and PRV valve was changed. Engines run up and bleed system Checked OK

Wing Anti-Ice Valve Was Changed AMM 30-11-00 so DDR item no.2 page 4151 was cleared.

**IRAN AIRTOUR AIRLINE**

# AIRCRAFT TECHNICAL LOG

Aircraft Type: A320 | Log Page No.: 4155

Aircraft Register: EP-TTA

520, Sarparast Ave. cross road, Taleqani St., Tehran, Iran
Tel : (+98 21) 89317000, Fax : (+98 21) 89317081, E-mail : info@iat.aero

Copy Distribution: WHITE-CAMO - BLUE-Part 145 - PINK-Remain in Book - YELLOW: Station(Remove Before FLT)

| DATE | FLIGHT NUMBER | LEG FROM | LEG TO | START TAXI | TAKE OFF | LANDING | FINISH TAXI | FLYING HOUR | BLOCK TIME | Number of LANDING(s) | T.O.Mode* | Type of Approach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25/11/18 | 956 | OIII | OIAW | 03:00 | 03:15 | 04:25 | 04:30 | 01:10 | 01:30 | 1 | 1 | NON PR |

* "1" Flex./Norm. T.O "2" Maximum/TOGA

Fuel Data — UPLIFT: Planned / Actual / DENSITY; Receipt No.

| Fuel Distribution ( kg - lb ) | Tank | LEFT | CENTER | RIGHT | AUX | TOTAL |
|---|---|---|---|---|---|---|
| | Remained Fuel | 2100 | 50 | 2100 | | 4200 |
| | After Refuel | 5000 | 50 | 5000 | | 10000 |

CAPT: SABOUNI F/O: TOULSI

ECTM REPORT (for flight more than 1 hour): TIME AUTOTHROTTLE SWITCH OFF (5-7 Min) (UTC) | PRESS. ALT. | GROSS WGT. | TAT | IAS | MACH | SAT | Payload (T)

| ENG | EPR | N1 | N2 | EGT | FUEL FLOW | OIL PRESS. | OIL TEMP. | VIB. FWD | VIB. AFT |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |

| PHS | RWY | Wind dgr./(m/s) | Temp. | QNH | MAC% | Weight (T) |
|---|---|---|---|---|---|---|
| T.O. | | | | | | |
| LND. | | | | | | |

| ITEM # | DEFECT REPORT: PILOT ☐ MAINTENANCE ☐ NOTE ☐ (STATE "NIL" IF NONE) | Sign./Stamp Date & Time |
|---|---|---|
| 1 | AIR ENG 1 BLEED ABNORMAL PR | |
| 2 | AIR ENG 1 and 2 BLEED FAULT | |
| 3 | WING A.ICE R VALVE OPEN | |
| 4 | BRAKES AUTO BRK FAULT | |
| 5 | CAB PR EXCESS CAB ALT | |
| 6 | CAB PR LO DIFF PR (2) | |

| ITEM # | ACTION TAKEN (ADD Raised ☐ Cleared ☐) and Applicable Maintenance Data include Rev. No. or Rev. Date | DATE & Time | CRS Stamp, Sign., Lic. |
|---|---|---|---|
| 1,5,6 | IAW T.S.M 36-11-00 LH engine Bleed valve sense line rested was loose tightened & Bleed sys. ckd o.k | 25/11/2018 | 62 |
| 3 | wing A-ice valve is O.D Item IAW 30-11-01B CAT "2" | 25/11/2018 | 62 |
| 2 | RH engine Bleed valve Plug cleaned and tested was O.K | 25/11/2018 | 62 |
| 4 | Autobrake sys. is D/D Item CAT "C" refer to C/E sheet Item 3 | 25/11/2018 | 62 |
| 1 | Bleed system 1 ckd is o.k | | |

MAINTENANCE CHECKS

| MNT CHK | AAC | DWC | WKC | BDC |
|---|---|---|---|---|
| Date | 25/11/2018 | | | 25/11/2018 |
| Time (UTC) | 18:30 | | | 19:00 |
| Stn. | THR | | | THR |
| Lic. No. | 1274 | | | 1274 |
| Sign./Stamp | 62 | | | 62 |

Certifies that the work specified, except as otherwise specified was carried out in accordance with CAO.IRI Part 145 and in respect to that work the aircraft/aircraft component is considered ready for release to service. PART 145 APPROVAL NUMBER: IR.145.06/

Number of Reported Defect(s): CAPT Sign.:

| # | Part Description | Position | PN OFF/ | SN OFF/ | PN ON/ | SN ON/ | Tag No. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Pre-flight Inspection

Pre-flight Inspection signature confirms PFI carried out in accordance with the Operation Manual Pre-Flight Inspection Checklist and all operational and emergency equipment is correctly installed and found satisfactory.

| Performed by | DATE | Time (UTC) | Lic. No. | Signature |
|---|---|---|---|---|
| | / | : | | |

ENG. Oil Data (Qrt)

| ENG | REMAIN | ADDED | DEPART. |
|---|---|---|---|
| 1 | | | |
| 2 | | | |

Hydraulic Data (Qrt)

| SYS | REMAIN | ADDED | DEPART. |
|---|---|---|---|
| G | | | |
| B | | | |
| Y | | | |

APU Oil Added Yes ☐ No ☐

GROUND DEICING / ANTI-ICING RECORD

| NIL | Fluid Type | Mix. Ratio | Start Time | Finish Time |
|---|---|---|---|---|
| ☐ | | | : | : |

Certifies that there are no fluid residues that could endanger flight safety. Name: Signature:

CAPTAIN'S ACCEPTANCE

Captain's Acceptance Signature confirms acceptance of aircraft defects state, deferred defects, sufficient fuel and oil for the intended flight and correct completion of ground de-icing/anti icing if applicable.

CPT's Name: Date: / / Time(UTC): : CPT's Sign.:

IF NEXT PAGE USED ☐

Form No: CAM-101 Rev. : 04 Date : 01.01.2018

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**IRAN AIRTOUR AIRLINE**

# AIRCRAFT TECHNICAL LOG

Aircraft Type: A320 | Log Page No.: 4156

Aircraft Register: EP-TTA

520, Sarparast Ave. cross road, Taleqani St., Tehran, Iran
Tel : (+98 21) 89317000, Fax : (+98 21) 89317081, E-mail : info@iat.aero

Copy Distribution: WHITE-CAMO - BLUE-Part 145 - PINK-Remain in Book - YELLOW: Station(Remove Before FLT)

| DATE | FLIGHT NUMBER | LEG FROM | LEG TO | START TAXI | TAKE OFF | LANDING | FINISH TAXI | FLYING HOUR | BLOCK TIME | Number of LANDING(s) | T.O.Mode* | Type of Approach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25/11/18 | EP-TTA | OIAW | OIII | 19:50 | 20:00 | 20:50 | 21:00 | 00:50 | 01:10 | 1 | 1 | ILS |

* "1" Flex./Norm. T.O "2" Maximum/TOGA

Fuel Data — UPLIFT: Planned / Actual / DENSITY; Receipt No.

| Fuel Distribution ( kg - lb ) | Tank | LEFT | CENTER | RIGHT | AUX | TOTAL |
|---|---|---|---|---|---|---|
| | Remained Fuel | 3500 | 50 | 3700 | - | 7200 |
| | After Refuel | | | | | |

CAPT: SABOUNI F/O: TOULSI

ECTM REPORT (for flight more than 1 hour): TIME AUTOTHROTTLE SWITCH OFF (5-7 Min) (UTC) | PRESS. ALT. | GROSS WGT. | TAT | IAS | MACH | SAT | Payload (T)

| ENG | EPR | N1 | N2 | EGT | FUEL FLOW | OIL PRESS. | OIL TEMP. | VIB. FWD | VIB. AFT |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |

| PHS | RWY | Wind dgr./(m/s) | Temp. | QNH | MAC% | Weight (T) |
|---|---|---|---|---|---|---|
| T.O. | | | | | | |
| LND. | | | | | | |

| ITEM # | DEFECT REPORT: PILOT ☐ MAINTENANCE ☐ NOTE ☐ (STATE "NIL" IF NONE) | Sign./Stamp Date & Time |
|---|---|---|
| 1 | ENG 1 Bleed PRESURE SHOW ZERO DURING FLIGHT | |
| 2 | WING A.ICE R VALVE OPEN | |
| 3 | AIR ENG 1 BLEED ABNORMAL PRESURE. | |
| 4 | AUTO BRAK FAULT. | |

| ITEM # | ACTION TAKEN (ADD Raised ☐ Cleared ☐) and Applicable Maintenance Data include Rev. No. or Rev. Date | DATE & Time | CRS Stamp, Sign., Lic. |
|---|---|---|---|
| 1,3 | ENG NO1 Bleed sensing line was leak Test Found ok and PRV valve was changed and ENG NO 1 Run up Bleed NO1 was ok 26-11-18 Engineer | 2153 | 91 |
| 2 | wing Anti-ice valve was changed. A.m.m 30-11-00 So DDP ITEM NO#2 Page 4151 was cleared. | Part | 17 |
| 4 | REFER TO ITEM NO.3 IN D/D SHEET. ITEM IS DEFER A/M 32-41 | 26/11/2018 07:00 | |

MAINTENANCE CHECKS

| MNT CHK | AAC | DWC | WKC | BDC |
|---|---|---|---|---|
| Date | 26/Nov/2018 | | | 26Nov2018 |
| Time (UTC) | 22:00 | | | 13:15 |
| Stn. | THR | | | THR |
| Lic. No. | 1976 | | | 2153 |
| Sign./Stamp | 17 | | | 91 |

Certifies that the work specified, except as otherwise specified was carried out in accordance with CAO.IRI Part 145 and in respect to that work the aircraft/aircraft component is considered ready for release to service. PART 145 APPROVAL NUMBER: IR.145.06/

Number of Reported Defect(s): CAPT Sign.:

| # | Part Description | Position | PN OFF/ | SN OFF/ | PN ON/ | SN ON/ | Tag No. |
|---|---|---|---|---|---|---|---|
| | PRV VLV | ENG 1 | 67140070000 | 9249 | 67140070000 | 00523 | 1814 |

Pre-flight Inspection

Pre-flight Inspection signature confirms PFI carried out in accordance with the Operation Manual Pre-Flight Inspection Checklist and all operational and emergency equipment is correctly installed and found satisfactory.

| Performed by | DATE | Time (UTC) | Lic. No. | Signature |
|---|---|---|---|---|
| | / | : | | |

ENG. Oil Data (Qrt)

| ENG | REMAIN | ADDED | DEPART. |
|---|---|---|---|
| 1 | | | |
| 2 | | | |

Hydraulic Data (Qrt)

| SYS | REMAIN | ADDED | DEPART. |
|---|---|---|---|
| G | | | |
| B | | | |
| Y | | | |

APU Oil Added Yes ☐ No ☐

GROUND DEICING / ANTI-ICING RECORD

| NIL | Fluid Type | Mix. Ratio | Start Time | Finish Time |
|---|---|---|---|---|
| ☐ | | | : | : |

Certifies that there are no fluid residues that could endanger flight safety. Name: Signature:

CAPTAIN'S ACCEPTANCE

Captain's Acceptance Signature confirms acceptance of aircraft defects state, deferred defects, sufficient fuel and oil for the intended flight and correct completion of ground de-icing/anti icing if applicable.

CPT's Name: Date: / / Time(UTC): : CPT's Sign.:

IF NEXT PAGE USED ☐

Form No: CAM-101 Rev. : 04 Date : 01.01.2018

## 1.4. Meteorological Information:

Weather at departure and destination airports made not any limitation for the flight. The available en-route meteorological prediction showed the probability for occurrences of convective instabilities, up to FL360 and during en-route phase of flight, the pilots decide to set a higher altitude.

## 1.5.Flight Recorders:

The aircraft FDR was removed from the aircraft without any damages and delivered to IRI.CAO AAIB for investigation. The FDR information of incident flight from Tehran to Ahwaz was analyzed by FDM software of the airline. Also raw data file of FDR was sent to Airbus Company to analyze simultaneously.

## 1.6.Other information:

Two Similar events on the aircraft operation were recorded before publication of this report. On 15 May 2019, a test flight from Isfahan to Tehran at FL240 was requested with condition of supporting both pack system demanding by Air bleed #2. Based on aircraft MEL, the system should operate normally up to FL290 but over temperature event on Air bleed#2 Systems was triggered due to technical condition of air bleed system on the right engine.

## 1.7. Load sheet information:

According to the METAR information of departure airport ;OIII 250200Z 24008KT 2000 RA BR SCT025 SCT035 OVC070 08/07 QNH 1022 & Route Performance Manual A320-211 / V2500 – A1 for OIII/THR 29L, CONFIG 2, Wet runway, the max takeoff weight has been 69528 kg, which according to load sheet has been reported by flight crew as 66000 kg.

# 2. ANALYSIS OF THE EVENTS BASED ON DFDR:

Time (UTC): 03:14:43 Took off was initiated from OIII. (RWY 29)

The following conditions exited:

a) Pack Flow Control Valve (FCV) #1 were at CLOSE position (OFF)

b) Pack flow Control Valve (FCV) #2 was at OPEN position (ON).

c) Both BLEED - Pressure Regulator Valve (PRV) #1+ #2 were at OPEN position

d) Cross bleed valve was at CLOSE position, and

e) Both Anti-ice engines #1 and #2 were ON.

d) Take off was done with RWY Track mode engaged after departure rather than RWY HDG mode based on MEH2A departure according to Iran AIP.

Note: This is not in accordance with MMEL Item 30-11-01A “WAI Valve Inoperative in the open position” (attachment No; 1) that requests to switch OFF the BLEED of the affected side (i.e. BLEED2) for take-off and until 1500ft RA which was not done by the pilot.

Time (UTC): 03:17:35 Bleed #1 abnormal pressure.

a) Pack Flow Control Valve (FCV) #1 selected ON and OPEN position

b) No abnormal Bleed parameter was observed at that time.

c) During the whole climb phase, FMA shows that pilot flying was using OP CLB mode rather than CLB (managed mode).

Time (UTC): 03:31:10 Aircraft passing FL300, Engine #1 and #2 anti-ice were set to OFF

When passing FL 317 & approaching cleared FL.320, rate of climb was 1600 ft/Min with just 300 ft to go. This has been exceeded max 1000 ft/Min rate of climb during the last 1000 ft before reaching cleared flight level.

The crew encountered to instability of the weather en-route and decided to climb to FL340.

When passing FL 336 & approaching cleared FL 340, rate of climb was 1800 ft/min with just 400 ft to go. Which has been exceeded max 1000 ft/min rate of climb during the last 1000 ft before reaching cleared flight level.

Time (UTC): 03:37:17 aircraft reached to cruise altitude FL340. High Pressure Valve (HPV) #2 was OPEN and BLEED #2 providing air to both Pack #2 and Wing anti-ice. (R/H wing anti-ice control valve was already secured to open).

The situation caused high air bleed demand on engine #2. The airbus bleed system design shows that a bleed system from one engine can supply system alone but internal failure and condition of Air Bleed #2 could not provide normal operation of the related systems.

Time (UTC): 03:41:15 High Pressure Valve (HPV) #2 faulty and closed and PRV #2 closed subsequently (Bleed page triggered).most likely the ECAM caution AIR ENG #2 bleed fault triggered .

Note: The root cause for the loss of BLEED 2 is suspected to be an over temperature scenario linked to a degradation of the bleed temperature control subsystem, combined with WAI valve fixed open during cruise at FL340 (to be confirmed by PFR). Degradation of the bleed temperature control subsystem can be due to misbehavior of any of the following LRUs: Fan Air Valve (FAV), Temperature Controller Thermostat (TCT), Sensed Line and/or bleed temperature sensor.

- The aircraft post flight report (PFR) had not paper and related PFR was not picked/observed.

Time (UTC): 03:41:38 XBLEED valve became in open position. The flight continued in a one BLEED and two PACK configurations. The opening of the XBLEED valve led to pneumatic opening of the HPV1.

Note: The OEB 40-1 applicable on this aircraft (attachment No; 2) should be applied in case of AIR ENG 1(2) BLEED FAULT. The OEB procedure asks to open the XBLEED valve and to switch OFF associated PACK if the WAI is ON. This last action is also requested in the Operational Procedure associated to the MMEL item 30-11-01A “WAI Valve Inoperative in the open position”.

Time (UTC): 03:45:30 BLEED #1 faulty. HPV1, PRV1 and FCV1 closed and BLEED page triggered led to loss of pressurization. The crew could descend to Route MEA.

Note: The root cause for the loss of BLEED 1 is suspected to be linked to an over temperature scenario due to an incorrect application of the operational procedure of the MMEL (or OEB 40-1) following the loss of the BLEED 2. Indeed as per procedure, the PACK on the affected side (i.e. PACK 2) should have been switched OFF to reduce the bleed air demand.

Time (UTC): 03:46:00 Crew decided to descend at this time with a selected altitude changing to FL180.

Note: Descend & Emergency descend procedure was not done according to AIRBUS 320 FCOM & FCTM & AIP procedure completely which caused the crew to waste more than 5 minutes to reach from FL 340 to FL 140 which should have been done in less than 3 minutes & descending in route rather than diversion from route during emergency descend.

Time (UTC):03:46:30 ECAM warning CAB PR EXCESS CAB ALT triggered (indicating a cabin altitude > 9550ft) and passenger oxygen masks dropped.

Time (UTC): 03:47:46 ANTI-ICE ENG #1, 2 were set to ON
Time (UTC): 04:00:10 XBLEED Valve closed.
Time (UTC):04:01:14 Reached to FL100 and both BLEED system were reset and recovered, PRV2 and HPV2 opened and PRV1 and HPV1 after about 5 seconds. FCV #1 also was opened.

Time (UTC):04:02:52 Cabin ALT Pressure warning off at FL88 STD, means the cabin pressure altitude decreased below 9550 ft.

Time (UTC): 04:24:30 Landed at OIAW safely.

There are several same incidents on A32o in the world that reported to the manufacturer. The Airbus Company developed a technical solution as Operations Engineering Bulletins (OEB) to prevent events on aircraft bleed system (attachment No; 3) and the operator divide OEB for the crew (attachment No; 4). There is an explanation in the Manufacturer OEB which warns pilots about overheating engine bleed and leading for possible emergency descend to prevent cabin depressurization. The crew had not focus on # 2 bleed system and its temperature based on the explanation of OEB and related Pack was not set on OFF position timely manner and cabin pressure reached to abnormal condition and oxygen masks dropped automatically.

## 3. CONCLUSION:

Some facts and findings observed on the incident scenario which help to conclusion of the incident as:

- The aircraft was operated based on MEL but technical failure of Air bleed #2 caused supporting low quantity of demanded air for both pack system and wing anti-ice system.
- The crew did not follow the procedures descripted in OEB *40.01 and MEL* timely. Including Approach climb performance penalty of 2400 kg as per MEL Flight Preparation/ Limitation.
- Flight crew made several mistakes in normal flying procedures (MTOW calculation, SID, LVL OFF & approach).
- Flight crew did not follow emergency descend procedure as per AIRBUS & AIP instructions & procedures.

## 4. SAFETY RECOMMENDATIONS:

Considering the final results of the investigation to prevent similar incidents, the Aircraft Accident Investigation Board (AAIB) issues the following safety recommendations:

***To: IRI Civil Aviation Organization*:**

1- To ensure of continued airworthiness of aircrafts through the operators and contracted approved maintenance organizations.
2- Follow up of bellowed safety recommendations for affected airlines

***To: Iran Airtour Airline:***

3- To emphasize the standard procedures outlined in OEB and QRH during crew recurrent trainings.
4- To apply more restriction and limitation to MEL items when two or more deferred defects in similar system are applied based on the condition of the flights.

***To: Iran Aseman Airlines:***

5- To improve maintenance documentation based on IRI CAO Part 145 requirements and related internal supervision is observed.

## ATTACHMENTS:

1. MMEL Reference
2. Airtour MEL Reference
3. Manufacturer OEB 40-1
4. Airtour OEB 40-1

## 30-11-01 Wing Anti-Ice Control Valve

Ident.: MI-30-11-00007897.0001001 / 27 JUN 11
**Applicable to: ALL**

### 30-11-01A Inoperative in the open position

| Repair interval | Nbr installed | Nbr required | Placard |
|---|---|---|---|
| **C** | **2** | **1** | **No** |

**(o) (m)** The RH valve may be inoperative in the open position provided that the associated ECAM procedure is applied.

Reference(s)

**(o)** *Refer to OpsProc 30-11-01A Wing Anti-Ice Control Valve*
**(m)** *Refer to AMM 30-11-00-040-004*

### 30-11-01B Inoperative in the closed position

| Repair interval | Nbr installed | Nbr required | Placard |
|---|---|---|---|
| **C** | **2** | **0** | **Yes** |

**(m)** One or both may be inoperative in the closed position provided that:
**1)** ETOPS is not conducted, and
**2)** The aircraft is not operated in known or forecast icing conditions.

Reference(s)

**(m)** *Refer to AMM 30-11-00-040-001*

## 30-11-01A — Wing Anti-Ice Control Valve

Ident.: MO-30-11-00009047.0021001 / 15 FEB 18
**Applicable to: ALL**

### FLIGHT PREPARATION/LIMITATIONS

Flight planning:

Increase fuel consumption by:

| Zp (ft) | 5 000 | 10 000 | 15 000 | 20 000 | 25 000 | 30 000 | 35 000 | 40 000 |
|---|---|---|---|---|---|---|---|---|
| **Fuel penalties** | 2.5 % | 2.5 % | 3.5 % | 3.5 % | 2.5 % | 2.0 % | 2.0 % | 2.0 % |

Single engine cruise:

Decrease drift down ceilings by:

1 700 ft when OAT ≤ ISA + 10 °C
3 500 ft when OAT > ISA +10 °C

Approach climb performance:

- **When the engine bleed air supply system is closed:**

  No penalty.

- **When the engine bleed air supply system is open:**

  Decrease maximum climb limiting weight by:

  2 400 kg (5 300 lb)

### DURING COCKPIT PREPARATION

- **After application of the maintenance procedure:**
  On the BLEED SD page, check that the anti-ice arrow symbol is displayed.
  *The anti-ice arrow symbol may be displayed amber or green.*

  The WING ANTI ICE L(R) HI PR alert must not be displayed on the EWD.

### BEFORE ENGINE START

- Maintain the X BLEED selector at SHUT before engine start when the APU bleed is used.
- Start the engine 1.
  *Maintain the X BLEED selector at SHUT during the start of engine 1.*
- Use the CROSS BLEED ENGINE START (*Refer to FCOM/PRO-NOR-SUP-ENG Crossbleed Engine Start*) procedure to start the engine 2.
- Apply the procedure associated with the WING ANTI ICE R VALVE OPEN alert displayed on the EWD.

*Continued on the following page*

*Continued from the previous page*

**AFTER TAKEOFF**

- **When above 1 500 ft:**
  Apply the automatic recall of the WING ANTI ICE R VALVE OPEN procedure displayed on the EWD.

**IN FLIGHT**

If the wing anti ice is operated in flight, WING ANTI ICE R HI PR alert may be displayed on the EWD.

- **In the case of failure of a Bleed Air Supply System:**
  - **If both PACKs are operative:**
    PACK (affected side) pb-sw..... OFF

**AFTER LANDING**

Apply the automatic recall of the WING ANTI ICE R VALVE OPEN procedure displayed on the EWD.

## WING A.ICE L(R) VALVE OPEN (Cont'd)
(FAILURE DETECTED IN FLIGHT)

Ident.: PRO-ABN-W_A_ICE-N-00018332.0001001 / 21 MAR 16

**STATUS**

| | INOP SYS |
|---|---|
| ● **In flight:**<br>THRUST LIM PENALTY<br>WAI AVAIL IN FLT | ENG 1(2) BLEED (On ground only)<br>PACK 1(2) (On ground only) |

## WING A.ICE L(R) VALVE OPEN
(FAILURE DETECTED ON GROUND)

**Applicable to: ALL**

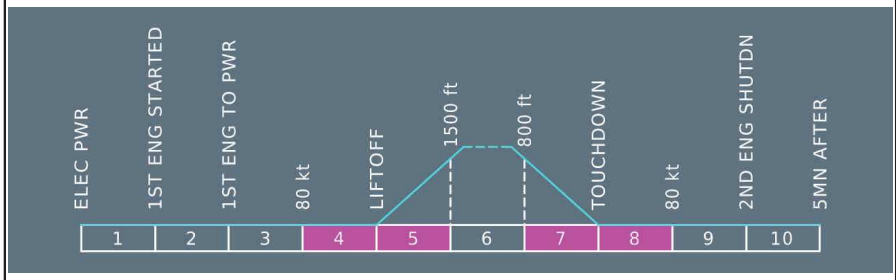
Ident.: PRO-ABN-W_A_ICE-M-00017495.0001001 / 21 MAR 16

### ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the WING ANTI ICE pb-sw is set to OFF and one wing anti ice valve remains open, on ground.

Flight Phase Inhibition:

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## WING A.ICE L(R) VALVE OPEN (Cont'd)
(FAILURE DETECTED ON GROUND)

Ident.: PRO-ABN-W_A_ICE-M-00018333.0001001 / 21 MAR 16

WING ANTI ICE.....OFF
ENG BLEED (AFFECTED SIDE).....OFF
X BLEED (IF NOT CLOSED).....SHUT
APU BLEED (IF LEFT WING AFFECTED AND IF APU RUNNING).....OFF
WAI AVAIL IN FLT

■ **After takeoff when above 1 500 ft (automatic recall):**
WAI AVAIL IN FLT
ENG BLEED (AFFECTED SIDE).....ON
WING ANTI ICE.....AS RQRD

L2 *Wing anti ice is available if needed and anyway is continually on, on failed side.*

L1 THRUST LIM PENALTY

■ **After landing (automatic recall):**
WING ANTI ICE.....OFF
ENG BLEED (AFFECTED SIDE).....OFF
X BLEED (IF NOT CLOSED).....SHUT
APU BLEED (IF LEFT WING AFFECTED).....OFF

Ident.: PRO-ABN-W_A_ICE-M-00018334.0001001 / 21 MAR 16

**STATUS**

| | **INOP SYS** |
|---|---|
| ● **Before takeoff:**<br>WAI AVAIL IN FLT<br>● **In flight:**<br>THRUST LIM PENALTY | ENG 1 (2) BLEED (On ground only)<br>PACK 1 (2) (On ground only) |

## 30-11-01 Wing Anti-Ice Control Valve

Ident.: MI-30-11-00007897.0001001 / 27 JUN 11
**Applicable to: ALL**

### 30-11-01A Inoperative in the open position

| Repair interval | Nbr installed | Nbr required | Placard |
|---|---|---|---|
| C | 2 | 1 | No |

**(o) (m)** The RH valve may be inoperative in the open position provided that the associated ECAM procedure is applied.

Reference(s)

**(o)** *Refer to OpsProc 30-11-01A Wing Anti-Ice Control Valve*
**(m)** *Refer to AMM 30-11-00-040-004*

### 30-11-01B Inoperative in the closed position

| Repair interval | Nbr installed | Nbr required | Placard |
|---|---|---|---|
| C | 2 | 0 | Yes |

**(m)** One or both may be inoperative in the closed position provided that:
1) ETOPS is not conducted, and
2) The aircraft is not operated in known or forecast icing conditions.

Reference(s)

**(m)** *Refer to AMM 30-11-00-040-001*

## 30-11-01A — Wing Anti-Ice Control Valve

Ident.: MO-30-11-00009047.0021001 / 15 FEB 18
**Applicable to: ALL**

### FLIGHT PREPARATION/LIMITATIONS

Flight planning:

Increase fuel consumption by:

| Zp (ft) | 5 000 | 10 000 | 15 000 | 20 000 | 25 000 | 30 000 | 35 000 | 40 000 |
|---|---|---|---|---|---|---|---|---|
| **Fuel penalties** | 2.5 % | 2.5 % | 3.5 % | 3.5 % | 2.5 % | 2.0 % | 2.0 % | 2.0 % |

Single engine cruise:

Decrease drift down ceilings by:

1 700 ft when OAT ≤ ISA + 10 °C
3 500 ft when OAT > ISA +10 °C

Approach climb performance:

- **When the engine bleed air supply system is closed:**

  No penalty.

- **When the engine bleed air supply system is open:**

  Decrease maximum climb limiting weight by:

  2 400 kg (5 300 lb)

### DURING COCKPIT PREPARATION

- **After application of the maintenance procedure:**

  On the BLEED SD page, check that the anti-ice arrow symbol is displayed.

  *The anti-ice arrow symbol may be displayed amber or green.*

  The WING ANTI ICE L(R) HI PR alert must not be displayed on the EWD.

### BEFORE ENGINE START

- Maintain the X BLEED selector at SHUT before engine start when the APU bleed is used.
- Start the engine 1.

  *Maintain the X BLEED selector at SHUT during the start of engine 1.*
- Use the CROSS BLEED ENGINE START (*Refer to FCOM/PRO-NOR-SUP-ENG Crossbleed Engine Start*) procedure to start the engine 2.
- Apply the procedure associated with the WING ANTI ICE R VALVE OPEN alert displayed on the EWD.

*Continued on the following page*

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**AFTER TAKEOFF**

- **When above 1 500 ft:**

  Apply the automatic recall of the WING ANTI ICE R VALVE OPEN procedure displayed on the EWD.

**IN FLIGHT**

If the wing anti ice is operated in flight, WING ANTI ICE R HI PR alert may be displayed on the EWD.

- **In the case of failure of a Bleed Air Supply System:**
  - **If both PACKs are operative:**

    PACK (affected side) pb-sw ..... OFF

**AFTER LANDING**

Apply the automatic recall of the WING ANTI ICE R VALVE OPEN procedure displayed on the EWD.

| 36-07-04 | Engine Bleed Precooler Inlet Pressure Indication on the BLEED SD page |
|---|---|

Ident.: MI-36-07-00008810.0001001 / 22 MAR 10
Applicable to: ALL

36-07-04A

| Repair interval | Nbr installed | Nbr required | Placard |
|---|---|---|---|
| C | 2 | 0 | No |

One or both may be inoperative.

| 36-07-05 | Engine Bleed Precooler Outlet Temperature Indication on the BLEED SD page |
|---|---|

Ident.: MI-36-07-00008811.0001001 / 22 MAR 10
Applicable to: ALL

36-07-05A

| Repair interval | Nbr installed | Nbr required | Placard |
|---|---|---|---|
| C | 2 | 0 | No |

One or both may be inoperative.

| 36-07-06 | X Bleed Valve Indication on the BLEED SD page |
|---|---|

Ident.: MI-36-07-00008812.0001001 / 22 MAR 10
Applicable to: ALL

36-07-06A

| Repair interval | Nbr installed | Nbr required | Placard |
|---|---|---|---|
| C | 1 | 0 | No |

May be inoperative.

# OEB40 Issue 1
# Associated with QRH OEB Proc N°: OEB40/1.0
# AIR ENG 1(2) BLEED ABNORMAL PR OR AIR ENG 1(2) BLEED FAULT

Ident.: OEB-40-00013607.0001001 / 18 MAR 11
**Applicable to: ALL**

Approved by: Head of Flight Operations Support and Services

- This OEB covers a significant operational issue. Non-compliance with this OEB may have a significant impact on the operations of the aircraft. Airbus recommends that the operators apply this OEB within 30 days from the date of issue of this OEB.
- An extract of this OEB is provided for insertion in the QRH.
- Airbus recommends that all operators rapidly incorporate the corrective Service Bulletins that cancel this OEB when they become available.

**Reason for issue:** This OEB replaces the A320 OEB 203.
Subsequent to several dual bleed loss cases reported by Operators, Airbus decided to develop different technical solutions to improve the robustness of the bleed system. These technical solutions, although significantly reducing the number of dual bleed loss occurrences, cannot fully avoid such occurrences.
Therefore, this OEB is published in order to provide all SA Operators with operational procedures aiming at further reducing the number of dual bleed loss occurrences, whatever the bleed system solution installed.

**Applicable to:** All A320 family aircraft.

**Cancelled by:** FWC Standard H2-F6 (MOD 151269)

*Note: The interchangeability code, given in the Illustrated Part Catalog (IPC), indicates the conditions for interchangeability of equipment. After installation of corrective modification(s)/SB(s), if an Operator reinstalls any equipment affected by this OEB, it is the Operator's responsibility to ensure that the recommendations given in this OEB are applied again for the applicable aircraft.*

Operations Engineering Bulletins are issued by Airbus, as the need arises, to quickly transmit technical and procedural information. They are distributed to all FCOM holders and to others who need advice of changes to operational information.
The information in the OEB is recommended by Airbus, but may not be approved by Airworthiness Authorities. If the procedures contained in this OEB differ from the procedures in the AFM, the AFM remains the reference.

| M | Localization | T | DU Title | DU identification | DU date |
|---|---|---|---|---|---|
| | OEB-40 | | **AIR ENG 1(2) BLEED ABNORMAL PR or AIR ENG 1(2) BLEED FAULT** | 00013607.0001001 | 18 MAR 11 |
| | Criteria: SA<br>**Applicable to: ALL** | | | | |
| | OEB-40 | | **AIR ENG 1(2) BLEED ABNORMAL PR or AIR ENG 1(2) BLEED FAULT** | 00013608.0001001 | 18 MAR 11 |
| | Criteria: SA<br>**Applicable to: ALL** | | | | |

# AIR ENG 1(2) BLEED ABNORMAL PR OR AIR ENG 1(2) BLEED FAULT

Ident.: OEB-40-00013608.0001001 / 18 MAR 11
**Applicable to: ALL**

## EXPLANATION

In case of AIR ENG 1(2) BLEED ABNORMAL PR or AIR ENG 1(2) BLEED FAULT ECAM cautions, the current associated ECAM procedures, ask to open the crossbleed valve in order to supply both Packs (or one Pack and the Wing Anti-Ice system) with the remaining engine bleed. This leads to an increase in air demand on the remaining engine bleed. On ageing bleed equipment or due to undetected failure, the remaining bleed may not succeed in sustaining this increase in air demand. In that case, it can result in an overheat of the remaining engine bleed and subsequent loss of the entire engine bleed system, leading to possible emergency descents. The purpose of this OEB is, therefore, to prevent from the loss of the remaining engine bleed by reducing the bleed air demand, when the first engine bleed has been already lost.

## PROCEDURE

Apply the corresponding procedures if one of the following ECAM caution is triggered:

- AIR ENG 1(2) BLEED ABNORMAL PR
- AIR ENG 1(2) BLEED FAULT

### AIR ENG 1(2) BLEED ABNORMAL PR

■ **If Wing Anti-Ice is OFF**

PACK FLOW.....LO (A319/A320)
ECON FLOW.....ON (A321)
AFT CARGO HOT AIR (if installed).....OFF
X BLEED.....OPEN
BLEED page.....SELECT and MONITOR

● **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**

PACK (on the first affected bleed side).....OFF

*Note: If Wing Anti-Ice is required (icing conditions) while operating with one PACK, consider switching OFF the remaining pack, if aircraft's altitude permits.*

■ **If Wing Anti-Ice is ON**

● **If both PACKS are ON**

PACK (affected bleed side).....OFF

X BLEED.....OPEN

*Continued on the following page*

## AIR ENG 1(2) BLEED ABNORMAL PR OR AIR ENG 1(2) BLEED FAULT (Cont'd)

BLEED Page.....SELECT and MONITOR

- **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**
  BLEED AIR DEMAND.....REDUCE
  *Consider reducing the bleed air demand, by, depending on the flight conditions:*
  - *Switching OFF the remaining pack (if aircraft's altitude permits), or*
  - *Switching OFF the Wing Anti-Ice system (if no longer icing conditions).*

### AIR ENG 1(2) BLEED FAULT

ENG BLEED affected.....OFF

■ **If Wing Anti-Ice is OFF**
PACK FLOW.....LO (A319/A320)
ECON FLOW.....ON (A321)
AFT CARGO HOT AIR (if installed).....OFF
X BLEED.....OPEN
BLEED Page.....SELECT and MONITOR

- **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**
  PACK (on the first affected bleed side).....OFF

  Note: *If Wing Anti-Ice is required (icing conditions) while operating with one PACK, consider switching OFF the remaining pack, if aircraft's altitude permits.*

■ **If Wing Anti-Ice is ON**

- **If both PACKS are ON**
  PACK (affected bleed side).....OFF

X BLEED.....OPEN
BLEED Page.....SELECT and MONITOR

- **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**
  BLEED AIR DEMAND.....REDUCE
  *Consider reducing the bleed air demand, by, depending on the flight conditions:*
  - *Switching OFF the remaining pack (if aircraft's altitude permits), or*
  - *Switching OFF the Wing Anti-Ice system (if no longer icing conditions).*

*Continued on the following page*

## AIR ENG 1(2) BLEED ABNORMAL PR OR AIR ENG 1(2) BLEED FAULT (Cont'd)

### OEB REMINDER

For aircraft that have the OEB reminder function activated, the AIR ENG 1(2) BLEED ABNORMAL PR and AIR ENG 1(2) BLEED FAULT ECAM cautions procedure and status may be flagged.
If the AIR ENG 1(2) BLEED ABNORMAL PR and AIR ENG 1(2) BLEED FAULT ECAM cautions procedure are flagged, the ECAM will display the REFER TO QRH PROC line or REFER TO QRH/OEB PROCline (depending on Flight Warning Computer (FWC) standard) instead of the procedure itself.
To flag the procedure and the status that corresponds to the AIR ENG 1(2) BLEED ABNORMAL PR and AIR ENG 1(2) BLEED FAULT ECAM cautions, the following code must be entered in the FWC OEB database:

| CODE | WARN | STS |
|---|---|---|
| AIR ENG 1 BLEED ABNORMAL PR<br>36/11/150/081 | Y | N |
| AIR ENG 2 BLEED ABNORMAL PR<br>36/11/160/083 | Y | N |
| AIR ENG 1 BLEED FAULT<br>36/21/010/075 | Y | N |
| AIR ENG 2 BLEED FAULT<br>36/21/020/077 | Y | N |

### CORRECTIVE ACTION

The embodiment of FWC Standard H2-F6 (MOD 151269) cancels the need for this OEB.

**END OF OEB40**

# AIR ENG 1(2) BLEED ABNORMAL PR OR AIR ENG 1(2) BLEED FAULT

## ECAM ENTRY

- AIR ENG 1(2) BLEED ABNORMAL PR
- AIR ENG 1(2) BLEED FAULT

## PROCEDURE

Apply the corresponding procedures if one of the following ECAM caution is triggered:

- AIR ENG 1(2) BLEED ABNORMAL PR
- AIR ENG 1(2) BLEED FAULT

### AIR ENG 1(2) BLEED ABNORMAL PR

■ **If Wing Anti-Ice is OFF**

PACK FLOW..... LO (A319/A320)
ECON FLOW.....ON (A321)
AFT CARGO HOT AIR (if installed).....OFF
X BLEED..... OPEN
BLEED page.....SELECT and MONITOR

● **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**

PACK (on the first affected bleed side)..... OFF

*Note: If Wing Anti-Ice is required (icing conditions) while operating with one PACK, consider switching OFF the remaining pack, if aircraft's altitude permits.*

■ **If Wing Anti-Ice is ON**

● **If both PACKS are ON**

PACK (affected bleed side).....OFF

X BLEED..... OPEN
BLEED Page..... SELECT and MONITOR

● **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**

BLEED AIR DEMAND.....REDUCE

*Consider reducing the bleed air demand, by, depending on the flight conditions:*
- *Switching OFF the remaining pack (if aircraft's altitude permits), or*
- *Switching OFF the Wing Anti-Ice system (if no longer icing conditions).*

### AIR ENG 1(2) BLEED FAULT

ENG BLEED affected.....OFF

■ **If Wing Anti-Ice is OFF**

PACK FLOW..... LO (A319/A320)
ECON FLOW.....ON (A321)
AFT CARGO HOT AIR (if installed).....OFF
X BLEED..... OPEN
BLEED Page..... SELECT and MONITOR

# AIR ENG 1(2) BLEED ABNORMAL PR OR AIR ENG 1(2) BLEED FAULT (Cont'd)

- **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**
  PACK (on the first affected bleed side)..... OFF

  Note: *If Wing Anti-Ice is required (icing conditions) while operating with one PACK, consider switching OFF the remaining pack, if aircraft's altitude permits.*

■ **If Wing Anti-Ice is ON**

- **If both PACKS are ON**
  PACK (affected bleed side).....OFF

  X BLEED..... OPEN
  BLEED Page..... SELECT and MONITOR

- **If the precooler outlet temperature of the remaining bleed exceeds 240 °C within 2 min after X BLEED valve opening:**
  BLEED AIR DEMAND.....REDUCE
  *Consider reducing the bleed air demand, by, depending on the flight conditions:*
  - *Switching OFF the remaining pack (if aircraft's altitude permits), or*
  - *Switching OFF the Wing Anti-Ice system (if no longer icing conditions).*

**END OF OEB40**

# ENGINE 1+2 BLEED FAULT

- **At ANY TIME of the procedure, if** CAB PR EXCESS CAB ALT **alert triggers:**
  APPLY ECAM PROC

■ **If** AIR ENG 1 BLEED FAULT **alert or** AIR ENG 1 BLEED ABNORM PR **alert**
and
**If** AIR ENG 2 BLEED FAULT **alert or** AIR ENG 2 BLEED ABNORM PR **alert:**
X BLEED ..... SHUT
ENG 1 BLEED .....OFF THEN ON
ENG 2 BLEED .....OFF THEN ON

- **If reset unsuccessful (NO engine bleed recovered):**
  DESCENT TO FL 100 / MEA-MORA..... INITIATE
  ENG 1 BLEED ..... OFF
  ENG 2 BLEED ..... OFF
  APU BLEED..... OFF
  APU.....START
  WING A.ICE..... OFF
  AVOID ICING CONDITIONS
  - **If APU available:**
    - **When at or below FL 200:**
      KEEP WING A.ICE OFF
      APU BLEED.....ON
      - **If APU bleed available:**
        MAX FL: 200
        ENG 1 BLEED.....ON
        ENG 2 BLEED.....ON
        APU BLEED.....OFF
        - **If no engine bleed recovered:**
          APU BLEED..... ON
          ENG 1 BLEED.....OFF
          ENG 2 BLEED.....OFF
          WING A.ICE NOT AVAILABLE
          - **If PACK 1 inoperative:**
            X BLEED..... OPEN
      - **If APU bleed not available:**
        CONTINUE DESCENT TO FL 100 / MEA-MORA
        APU BLEED.....OFF
        - **When at or below FL 100 / MEA-MORA:**
          ENG 1 BLEED.....ON
          ENG 2 BLEED.....ON
          - **If no engine bleed recovered:**
            ENG 1 BLEED.....OFF
            ENG 2 BLEED.....OFF

# ENGINE 1+2 BLEED FAULT (Cont'd)

WING A.ICE NOT AVAILABLE

- **When CAB PR ΔP < 1 psi:**
  RAM AIR..... ON
  MAX FL: 100 / MEA-MORA

■ **If APU not available:**
CONTINUE DESCENT TO FL 100 / MEA-MORA
APU BLEED..... OFF

- **When at or below FL 100 / MEA-MORA:**
  ENG 1 BLEED..... ON
  ENG 2 BLEED..... ON
  - **If no engine bleed recovered:**
    ENG 1 BLEED..... OFF
    ENG 2 BLEED..... OFF

    WING A.ICE NOT AVAILABLE
    - **When CAB PR ΔP < 1 psi:**
      RAM AIR..... ON
      MAX FL: 100 / MEA-MORA

■ **If at least one engine bleed failed due to bleed leak or engine fire or Start Air Valve failed open:**
DESCENT TO FL 100 / MEA-MORA..... INITIATE
X BLEED..... SHUT
ENG 1 BLEED..... OFF
ENG 2 BLEED..... OFF
APU BLEED..... OFF
APU..... START
WING A.ICE..... OFF
AVOID ICING CONDITIONS

■ **If** AIR ENG 2 BLEED FAULT **alert or** AIR ENG 2 BLEED ABNORM PR **alert:**

- **When at or below FL 100 / MEA-MORA:**
  ENG 2 BLEED..... ON
  - **If engine 2 bleed not recovered:**
    ENG 2 BLEED..... OFF

    WING A.ICE NOT AVAILABLE
    - **When CAB PR ΔP < 1 psi:**
      RAM AIR..... ON
      MAX FL: 100 / MEA-MORA

# ENGINE 1+2 BLEED FAULT (Cont'd)

- **If** AIR ENG 1 BLEED FAULT **alert or** AIR ENG 1 BLEED ABNORM PR **alert:**
  - **If APU available:**
    - **When at or below FL 200:**

      KEEP WING A.ICE OFF

      APU BLEED.....ON
      - **If APU bleed available:**

        MAX FL: 200

        ENG 1 BLEED.....ON

        APU BLEED.....OFF
        - **If engine 1 bleed not recovered:**

          APU BLEED.....ON

          ENG 1 BLEED.....OFF

          WING A.ICE NOT AVAILABLE
      - **If APU bleed not available:**

        CONTINUE DESCENT TO FL 100 / MEA-MORA

        APU BLEED.....OFF
        - **When at or below FL 100 / MEA-MORA:**

          ENG 1 BLEED.....ON
          - **If engine 1 bleed not recovered:**

            ENG 1 BLEED.....OFF

            WING A.ICE NOT AVAILABLE
            - **When CAB PR ΔP < 1 psi:**

              RAM AIR.....ON

              MAX FL: 100 / MEA-MORA
  - **If APU not available:**

    CONTINUE DESCENT TO FL 100 / MEA-MORA

    APU BLEED.....OFF
    - **When at or below FL 100 / MEA-MORA:**

      ENG 1 BLEED.....ON
      - **If engine 1 bleed not recovered:**

        ENG 1 BLEED.....OFF

        WING A.ICE NOT AVAILABLE
        - **When CAB PR ΔP < 1 psi:**

          RAM AIR.....ON

          MAX FL: 100 / MEA-MORA
- **If neither** AIR ENG 1(2) BLEED FAULT **alert nor** AIR ENG 1(2) BLEED ABNORM PR **alert on any side:**

  NO ENGINE BLEED CAN BE RECOVERED

  WING A.ICE NOT AVAILABLE

# ENGINE 1+2 BLEED FAULT (Cont'd)

- **When at or below FL 100 / MEA-MORA**
  and
  **CAB PR ΔP < 1 psi:**
  RAM AIR..... ON
  MAX FL: 100 / MEA-MORA