Islamic Republic of IRAN

Civil Aviation Organization

Serious Incident Final Report

State File Number:	S13891029EPMNH
Type of Occurrence:	Serious Incident
Date of Occurrence:	January 19th 2011
Place of Occurrence:	I.R.IRAN
Aircraft Type:	A300B4-600
Registration:	EP-MNH
Operator:	MahanAir

Safety & Accident

Investigation Department

Islamic Republic Of Iran

Civil Aviation Organization

Deputy of Flight Standard

Aircraft Accident Investigation Department

Final Report

Basic Information

State File Number: S13891029EPMNH

Type of occurrence: Serious incident

Date of occurrence: January 19th 2011

Place of occurrence: Islamic republic of Iran (in cruise at FL.160)

Aircraft Model: A300B4-600

Registration: EP-MNH

Operator: Mahan Air

Civil Aviation Organization of I.R. of Iran

Aircraft Accident Investigation Department

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Contents:

Foreword:

According to Aircraft Accident Investigation Regulation (ICAR113) of Civil Aviation Organization of the Islamic Republic of Iran,

- Accident investigation shall be conducted separately from any judicial, administrative disposition, administrative lawsuit proceedings associated with civil or criminal liability.

Base on Annex 13 to the Convention on International Civil Aviation, Chapter 3, Paragraph 3.1, and Chapter 5, Paragraph 5.4.1; it is stipulated and recommended as follows;

- The sole objective of the investigation of an incident or accident shall be the prevention of incidents and accidents. It is not the purpose of this activity to apportion blame or liability.

Any judicial or administrative proceedings to apportion blame or liability should be separated from any investigation conducted under the provisions of this Annex

Abbreviations:

ADC	Air data computer
A/P	Autopilot
A/THR	Auto throttle system
BEA	Bureau d'Enquête et d'Analyses pour la sécurité de l'aviation civile
BFU	**Bundesstelle für Flugunfalluntersuchung**
CAO	Civil Aviation Organization
CAS	Calibrated airspeed
CMD	Command
EGPWS	Enhanced Ground Proximity Warning System
FDR	Flight data recorder
FL	Flight level
FMA	Flight mode annunciator
FO	First Officer
FW	Failure warning
GMT	Greenwich Meridian Time
IAS	Indicated airspeed
NCD	No computed data
PIC	Pilot in Command
PF	Pilot Flying
PFD	Primary Flight Display
PNF	Pilot non Flying
SAT	Static air temperature
TAT	Total air temperature
TAS	True airspeed
VMO/MMO	Maximum operating speeds

Synopsis:

On Wednesday midnight, 19.01.2011, the Accident Investigation Department of Civil Aviation Organization of I.R of Iran was notified that an A300, EP-MNH, operated by Mahan air with flight No; IRM.088 involved an in-flight incident en-route R.659 from the Shiraz International (OISS) airport to the Tehran Mehrabad International Airport (OIII)/I.R of Iran.

The Aircraft Accident Investigation Department of I.R of Iran Civil Aviation Organization began the incident investigation. According to Annex 13, chapter 5, the Notification was sent to state of Design &Manufacture (French Aircraft Accident Investigation Bureau-BEA). The Accredited Representatives and his Adviser were introduced to I.R of Iran CAO.

The Flight Data Recorder has removed from aircraft. The download of the FDR had performed in German Aircraft Accident Investigation Bureau (BFU) laboratory in Branschweig. The state of manufacture (BEA) has been provided the information of FDR by investigation team and finally this state sent FDR findings and their analysis.

It maybe concluded that on incident time, an unreliable airspeed phenomenon was happened on this flight which the pilots reaction caused high vertical acceleration experienced by the aircraft.

As a safety measure, the Airbus Co issued the SL-34-084 and recommended the Airbus operators to follow it to prevent further incidents or accidents.

1. FACTUAL INFORMATION:

1.1 History of the flight:

On January 19, 2011, aircraft A300-600 MSN405 belonged to Mahan Air took off from SYZ (Shiraz) airport on 19:50 UTC destination to THR (Tehran) as a scheduled flight. On this flight the copilot (FO) was the pilot flying (PF) and the captain was pilot monitoring. According to ATC clearance, they are authorized to keep FL.160 en-route R.659. The pilot report showed that they set FL160 on AP2. During climb at level FL.120, he saw some light clouds forward to the aircraft and simultaneously he switched ON the engine Anti-Ice system. While reaching to FL160, they saw R/H inst PFD red max in climb at 19:54 UTC. At this time the aircraft encountered an un-reliable airspeed phenomenon on captain side which lasted about 30s. Auto Pilot 2 disengaged, VMO warning was triggered during about 30s, and GPWS warning was triggered during about 6s. Then aircraft went down with high rate of descending. Then they disengaged AP when heard EGPWS warning. Then they controlled the aircraft and tried to ascend again which caused high loads experienced on the aircraft fuselage.

During whole remaining flight time to THR everything was ok.

1.2 Injuries to persons:

According to the information provided by the airline, 12 crew and 163 passengers were on board. No serious injuries were reported.

1.3 Damage to aircraft:

Due to experienced high loads on the airframe, the aircraft operation was suspended and the manufacturer issued structural inspections to comply before the next flight as:

Inspection summaries:

1 – Fuselage inspection
2 – Wing structure
3 - Pylon structure
4 – Horizontal stabilizer, rear section & LG door
5 – Vertical stabilizer
6 – Tests
7 – Systems

The inspections were done by Mahan Air according to Airbus inspection programs without any findings or major structural damages but according to the load assessment, Airbus advised Mahan Air to change the Trim-able Horizontal Stabilizer (THS) before releasing the aircraft into service.

1.4 Other Damages: None

1.5 Personnel Information:

1.5.1 Pilot None Flying :(Left Hand Seat)

- Pilot in command
- Male, 54 years old, Iranian Nationality
- Commercial pilot, ATPL (A) No.634 Class 1, from Iran CAO
- Type rating: A306/A310
- Valid Medical Certification
- Total flight time: 18362H
- Flight time on type: 8123 H

1.5.2 Pilot Flying: (Right Hand Seat)

- First Officer
- Male, 25 years old, Iranian Nationality
- Commercial pilot, CPL (A) No.2592 Class 2, from Iran CAO
- Type rating: A306/A310
- Valid Medical Certification
- Total flight time: 3411 H
- Flight time on type: 1950 H

1.6 Aircraft information:

The Airbus A300B4-603, S/N; 405 aircraft with registration EP-MNH was manufactured in 1987. It had airworthiness certificate No; 893106, valid until 28 Sep 2011 and issued by I.R.I civil aviation organization. A review of recent records of the aircraft did not show any significant related malfunctions.

1.7 Meteorological information:

The related aviation routine meteorological reports (METAR) in SYZ airport on 19/01 /2011 were issued as following:

METAR: 19:00 UTC

Wind: calm Visibility: over 10 km
Cloud: Few 4000 ft Temp: 05 deg c
Dew point: 02 deg c QNH: 1015 MB

METAR: 20:00UTC

Wind: calm Visibility: over 10 km
Cloud: Few 4000 ft Temp: 03 deg c
Dew point: 02 deg c QNH: 1015 MB

According to significant weather chart on 07:07:06 UTC near this airport, the thunderstorm was estimated up to FL.180 and there was icing condition at FL. 110 up to FL 180 FT.

1.8 Aids to Navigation:

No problems with any navigational aids were reported.

1.9 Communications:

No technical communications problems were reported by the flight crew or any of the air traffic controllers who handled the accident flight.

1.10 Airport Information:

This incident was not happened in any airport field.

1.11Flight Recorders:

This aircraft has been equipped with SSFDR and CVR. The SSFDR was picked up from relatively undamaged compartment of aircraft in a very good condition and presented to BFU laboratory in order to download /analysis. Also according to request of French Authority (BEA) as the state of manufacturer, the Row Data File of SSFDR was sent to BEA for further investigation.

1.11.1 Cockpit Voice Recorder:

After happening of this incident, the flight was continued and the recorded cockpit voices at the time of incident were lost.

1.11.2 Flight Data Recorder:

Condition of the Recorder: no damaged, serviceable.

Made: FAIRCHILD (L3 Communication) Type: SSFDR

Type Number: 2100-4043-02 Serial number: 000182394

This type of FDR has a magnetic tape with a recording time of at least 180 hours.

The download of the FDR was successful .The initial evaluation of the flight data revealed known aircraft configuration.

1.11.3 Flight Data Recorder findings:

The following is a sequence of events based on FDR data. Time references are based on recorded UTC time of the FDR. Actions on control column are not recorded, only flight surfaces positions are recorded.

Time(UTC)	FDR information	Notes
19:49:33	Vertical Speed=0→48	Aircraft took off SYZ airport
19:50:31	Press ALT=5436 ft IAS=159 kt Ground Speed=167 kt AP2→engaged A/THR→ engaged	The pilots used automatic Systems
19:52:54	Press ALT=12000 IAS=245 kt Ground Speed=300 kt Heading=347° AP2=engaged A/THR= engaged #1ENG N_1=102 #2ENG N_1=103.7 W Speed=29 kt W direction=248°	Normal Flight
19:53:08	Press ALT=12400 IAS=264 kt ENG Anti-Ice=ON	ENG Anti-Ice on Due to cloudy sky
19:54:10 To 19:54:16	Press ALT=15840 IAS=271→191 kt Ground Speed=345 kt THR Resolve Angle=54→64 #1ENG N_1=96→106	Unreliable Speed beginning Aircraft sensed speed reduction & throttle increased by ATR
19:54:17	Press ALT=16372 ft AP2=disengaged Right Elevator angle=-0.7→3.1 Nose up → Nose down Order #1ENG N_1=102 #2ENG N_1=105	The crew reacted to the unreliable airspeed by a pitch down order which disconnected the AP2
19:54:18 To 19:54:20	AP2=disengaged IAS=191→33 kt Ground Speed=345 kt Pitch ATT=7°→1°→-2° A/THR= disengaged THR Resolve Angle=60 Nose up → Nose down #1ENG N_1=106 #2ENG N_1=107	Aircraft reaction to crew pitch down order Auto throttle disengaged in climbing power
19:54:20 To 19:54:40	IAS=30 to 60 kt Pitch ATT=9° Ground Speed=354 → 414 kt	Ground speed increased
19:54:22	Press ALT=16670 ft Pitch ATT=9° H. STAB Position=2.6°	Nose down trimming

	Elevator position=-5.3^0	Nose up Order
19:54:31 To 19:54:40	H. STAB Position=0.4^0 Elevator position=-0.1^0→-0.7^0→1.9^0	
19:54:32	Press ALT=15710 ft #1ENG N_1=104→94 #2ENG N_1=103→93	The pilot retarded engine power to reduce speed
19:54:35	Pitch ATT=-18^0 IAS=31 kt Ground Speed=411 kt	VMO/MMO Over Speed warning
19:54:40	Right Elevator angle=0.4→-6.1 (Nose down →Nose up Order) Pitch ATT=-27^0	Nose up order
19:54:42 To 19:54:47	EGPWS Warning IAS=400 kt G_v=1.2g→3.5g	EGPWS warning
19:54:48	Press ALT=12132 ft IAS=415 kt #1ENG N_1=86→106 #2ENG N_1=93→110	Increasing Engine power to climb
19:54:48	Press ALT=12130 ft G_v=4.31g	Climbing initiated High Vertical load experienced
19:55:06	Press ALT=15000 ft IAS=338 kt	Normal flight to destination

1.12 Wreckage and Impact Information:

After landing of aircraft in the destination (THR), the visual inspection was made on the aircraft with these results:

- There was not any deflection on the airframe and control surfaces.
- The pitot tubes were in normal condition .the covers were not installed and line blockage was not observed.

The flight data recorder removed from the aircraft and aircraft released for normal flight.

After analyzing of FDR information by airline flight data analysis section, the aircraft operation was suspended for further investigation.

1.13 Medical and Pathological Information:

During post incident interviews, Mahan Airlines reported that, at the time of the event, the company believed that the criteria for an incident had not been met to test for the presence of alcohol and drugs in the flight for both pilots, and that, therefore, testing was not conducted.

Of course, the research about crew and their medical documentation in CAO.IRI had not showed any illegal behaviors or medical problems in the last time.

1.14 Fire:

No in-flight or post incident fire occurred for the aircraft.

1.15 Survival Aspects:

According to crew interviews, at the incident time, the aircraft was climbing so the seatbelt lights have been illuminated. When incident was happened some passengers needed some treatment actions. So far, the flight attendant informed this subject to the pilot. Continuously he announced the critical situation of the flight to Iranian Aerospace Control Center (ACC) and estimated to land in the nearest Airport, (Isfahan International airport, OIFM) for medical rescues.

Fortunately, there were some medico professors from Shiraz University of Medical Sciences (SUMS) between the passengers. They visited mentioned passengers and declared normal condition for these passengers therefore the flight was continued to destination airport (Tehran Mehrabad international airport, OIII) normally.

All of the passengers deplaned without incident while the airplane was on the runway. According to the flight attendants, there was no sense of urgency to get the passengers off the airplane. The flight attendants stated that the deplaning was orderly and normal. For further remedial actions, the Dispatch of Mahan Air had coordinated the presence of some ambulance cars in the THR but after safe landing of the aircraft, usage of ambulances or any medical facilities were not reported.

1.16 Tests and Research:

The left hand side pitot probe Manufactured by Goodrich Co.USA, S/N 161291 (Pitot #1) was removed by the operator and sent to the Libratory for investigation. The following defects have been found:

- An insulation defect between the heater resistance and the pitot case.

- An intermittent continuity of the heater resistance. This continuity defect has been confirmed by X-ray inspection.

Both ADC,s of this aircraft were removed and sent to authorize maintenance base and normal operation of this components was reported.

1.17 Organizational and Management Information:

Mahan Air is an Iranian private airline that offers passenger and cargo services, including domestic and international flights. The company's corporate office is in Mahan Air Tower, Azadegan St., Karaj Highway, Tehran. This Airline operates a fleet of more wide body

airplanes, consisting of Airbus 300s, 310s; Boeing 747s and BAe-146s with following capacity:

Type	Number of Aircraft	Number of Seats	Business class seats	Economy class seats
B747-300	2	438	26	412
B747-400	3	438	44	394
A300-600	14	256	24	232
A300	6	246	15	231
A310-300	8	196	10	186
BAe-146	5	112	-	112

1.18 Additional Information:

According to the Airbus Co. data base, there were several occurrences of airspeed discrepancy which obligated the manufacturer to inform all operators and take preventative actions against erratic airspeed indication phenomena in all Airbus fleets. There for, all operators were invited to participate in common symposium which was hold in Istanbul on October 2011. In this symposium, Representatives of Airbus presented the conclusion of their findings. They also reminded the need to refer to existing SIL 34-084 with subject "ERRATIC AIRSPEED INDICATION - MAINTENANCE ACTIONS" to all operators as preventative actions

1.19 Useful or Effective Investigation Techniques:

The standard and normal techniques were applied.

2. ANALYSIS:

2- 1 Take off:

On January 19, 2006 an A300B4-600 airplane with Iranian registration number EP-MNH operated by Mahan Air, and with a cockpit crew consisting of the Captain and the co-pilot, was planned to do scheduled passenger flight IRM.088 from Shiraz (OISS) to Tehran (OIII).

Take-off from Shiraz was at 19:49UTC from runway 29 (right) in the normal configuration with good weather condition (Tem: +50C, QNH: 1015, Visibility: more than 10 km). Take-off, climb and the flight along the route occurred without deviations. The first officer was pilot flying (PF) and Auto-pilot no. 2 (AP2) was selected for the flight. They were authorized to choose FL.160 on the route R.659 by ATC clearance and FL.160 was set on AP2.

At 19:53:08, altitude 12400 ft: Engine Anti-ice was selected ON.

From 19:54:10 to 19:54:16:

Unreliable airspeed phenomena has occurred due to #1 Pitot (left) failure as reduction in IAS. So far TLA was increased by auto throttle system.

At 19:54:17 ft: aircraft reached to Press ALT=16372 ft, the information of Left PFD was invalid for the pilot and he should rely on Right PFD or STBY instrument, but AP2=disengaged by manual reaction of pilot on the Stick(control wheel).

- *The research about crossing level of the aircraft from selected Attitude on AP shows that this behavior is possible and experienced in some conditions same as (unsuitable ROC, unreliable airspeed events…) but if relative ADC is valid, the aircraft may return on selected altitude otherwise the pilot should press "ALT HOLD" bottom to prevent more deviation in altitude and define failure then take corrective actions..*

The crew's account of the sequence of events was consistent with the data recorded on the DFDR.

2-2 Scenario of events:

Yaw Damper 1 Fault:

Yaw Damper 1 (2) becomes faulty when TAS from ADC 1 (2) is considered invalid (NCD or FW). After detection of a failure in a yaw damper system, the corresponding lever trips. The remaining yaw damper continues to control the aircraft around the yaw axis.

At 19 h 54 min 19, TAS was NCD (below 100 kt) and "Yaw Damper 1" started to be recorded faulty between 19 h 54 min 17 and 19 h 54 min 21.

At 19 h 56 min 09, "Yaw Damper 1" ended to be recorded faulty .it means that TAS1 became valid again and the crew engaged yaw damper lever 1.

VMO/MMO Over speed warning:

Below FL250, The VMO warning is triggered when either CAS1 (from ADC1) and/or CAS2 (from ADC2) is greater than 339kt.When the VMO warning was triggered, the CAS1 was very low (around 30 kt). Consequently the VMO warning was triggered by the CAS2 (from ADC2) which was thus valid. This VMO warning lasted 30s

Airspeed from ADC1 and ADC2:

In normal configuration:

- The FDR records the speed from ADC1,
- Airspeed from ADC1 is displayed on captain side and airspeed from ADC2 is displayed on first-officer side. If ADC2 is manually switched on captain side, the FDR records the speed from ADC2. During the event, "Yaw Damper 2" was never recorded faulty. Therefore TAS from ADC2 was valid (Normal Operation),which means TAS from ADC2 remained above 100 kt
- Fr**om 19 h 54 min 19 to 19 h 54 min 40:**

TAS computed from recorded IAS was NCD and TAS from ADC_2 was never NCD. Therefore:

- IAS recorded was the speed from ADC_1
- There was a discrepancy between speeds from ADC_1 and ADC_2.

From 19 h 54 min 35 to 19 h 54 min 44:

VMO/MMO Overspeed warning has been recorded which means that CAS from ADC_1 or CAS from ADC_2 is greater than 345 kt, · IAS is recorded between 31 kt and 310 kt. Therefore, there is a discrepancy between speeds from ADC_1 and ADC_2.

A/P disengagement:

AP_2 CMD disengaged between 19 h 54 min 16.5 and 19 h 54 min 17.5. In the same time, right elevator position recorded (from -0.7° to 3.1°) indicates a quick change from nose-up to nose-down orders.

- *AP can be disconnected:*

Intentionally by setting the AP lever to OFF or by action on disconnect pushbutton, automatically if one of the engagement conditions is no longer met or when manually overriding the autopilot. The automatic operation (AP in CMD) may be overridden in pitch axis by applying a load on the control wheels.

During periods of load appliance, the pilot manually adjusted the flight controls. By applying a load on the control wheel in pitch axis, the autopilot has been disconnected.

A/THR disengagement:

At 19 h 54 min 19:

_ IAS recorded value was 511 kt, which corresponds to the max range and indicates data is invalid (NCD, FW…),

_ A/THR disconnected.

Auto throttle system uses in priority the ADC_1, even if AP_2 is engaged. Auto throttle system disarms if ADC_1 failed (CAS is invalid for example).

Horizontal stabilizer adjustment:

For the subject event, recorded position of stabilizer each second indicates a rate of around 1°/s which indicates horizontal stabilizer was adjusted manually.

Horizontal stabilizer adjustment may be initiated manually by trim wheel operation (mechanical) or by action on the control wheel rocking levers (electrical).

2.3 Loads assessment and Maintenance inspections:

Due to the high vertical acceleration experienced by the aircraft during the subject event, it was necessary to assess the load, to determine the required structural inspections and the associated maintenance actions.

Lateral loads:

Peak lateral loads levels were below the limit loads envelope.

Wing loads:

The vertical shear and bending loads were up to 111% of limit load and Moment (y) was in the vicinity of limit.

HTP (Horizontal Tail Plane) loads:

The most critical point (at about time 19.54.50) was the combination of:
- Vertical acceleration (n_z) = +4.17g
- AoA = 4.22°
- Stabilizer = 0.71°
- Elevator = -8.15°

It resulted in a positive (upwards) lift force due to AoA and stabilizer, and a negative (downward) lift force due to elevator; this created a large torque moment (y) of up to 173% of limit load.

Fuselage loads:

The fuselage loads were in the vicinity of limit loads.

Engine loads:

Engine loads were in the vicinity of the design flight cases envelope.
Engine-to-pylon and pylon-to-wing attachment loads were all below limit.

3. CONCLUSIONS:

3.1. Findings:

a) The airplane was properly certificated and was equipped and dispatched in accordance with industry practices.

b) The flight crewmembers were properly certificated and qualified under CAO IRI regulations.

c) No evidence indicated any preexisting medical or physical condition that might have adversely affected the pilot's performance during the incident flight

d) Although the pilots had sleep apnea, There was no evidence of flight crew fatigue

e) The aircraft was being flown by the co-pilot with the autopilot and auto thrust engaged.

f) The route R.659 from SYZ was conducted in IMC and icing conditions.

g) At 19 h 53 min 08, at FL120 the crew selected engine anti-ice ON when visual clouds were seen by the flight crew.

h) At 19 h 54 min 17, the aircraft crossed FL160 and A/P2 disengaged while manual nose-down orders are recorded,

i) At 19 h 54 min 19, A/THR disengaged due to CAS1 from ADC1 becoming invalid (CAS<30kt).

j) From 19 h 54 min 20 to 19 h 54 min 40, speed values displayed on captain side remained below 39 kt due to unreliable airspeed initiated by #1 pitot failure and ground speed increased from 354 kt to 414 kt

k) From 19 h 54 min 19 to 19 h 54 min 44, there was a discrepancy between speeds from ADC1 and ADC2.

l) From 19 h 54 min 35 to 19 h 55 min 06, over speed warning was generated.

m) From 19 h 54 min 42 to 19 h 54 min 48, GPWS warning was generated. Vertical speed reached -20000 ft/min,

n) During the event the following was experienced:

- Max pitch was -28.48°
- Max CAS1 was 415kt (VMO+80kt)
- Vertical acceleration variation: -0.47g / +4.31g
- Altitude loss was 4500ft
- VMO warning
- The high vertical acceleration (+4.31g) experienced during the flight was a consequence of the nose up input at high speed.

During this event high load experienced on Trimmable Horizontal Stabilizer and a large torque moment (y) up to 173% of the limit load have been reached.

o) At 19 h 54 min 49, normal acceleration reached a maximum of 4.31G,

p) After A/P disengaged, the aircraft lost more than 4000 ft in 30 seconds.

q) Accretion of ice in #1 Pitot was created by technical defects on the probe.

r) After the incident, the flight was continued normally to destination.

3.2 Cause:

The cause of Mahan Air A300-600, EP-MNH incident is an uncontrolled action by the pilot on controls, responding to an unreliable airspeed fault on ADC1.The crew did not follow up the unreliable airspeed procedure according to the operations manual.

3-2 contributive causes:

- Weak cockpit resource management.

- Technical defects on #1 Pitot heating system.

4. SAFETY RECOMMENDATIONS:

4.1 Previously Issued Safety Recommendation while incident investigation:

- ✓ *During the investigation, the Airbus company sent the SIL 34-084 with subject "ERRATIC AIRSPEED INDICATION - MAINTENANCE ACTIONS" to the investigation team as preventative actions. So far CAO.IRI issued a safety issue to all Iranian airlines to follow manufacturer prefaces and take corrective action both in their maintenance and operation.*
- ✓ *CAO.IRI requested Mahan Air to perform additional training about abnormal l procedure &Automatic Flight control, Unreliable airspeed familiarization and CRM course for the crew before continuing their flight operation.*

In order to prevent the same incidents or accidents in future, the following safety recommendations were issued:

4.2 To European Aviation Safety Agency (EASA) and certifying Authorities together with the Manufacturers of Pitot tube (FAA):

It is recommended to take immediate action to consider the implications of the findings of this investigation on the other certificated aircraft fleets.

4.3 To Mahan Airlines:

- ✓ Evaluate Continuing flight data Analysis and Surveillance System program about crew behavior associated with all aircraft fleets in Mahan Air.

- ✓ Establish and Implement the "Action Plan for Prevention of the Similar Accident" including the followings :
  - Reinforce the education on the cold weather operation, avoidance flight procedure and careful use of the weather reports.
  - Review of flight crews' flight procedure for efficient and immediate reaction against the similar emergency situation.
- ✓ Establish annual CRM training for the flight crew and evaluate its performance and send conclusion to CAO.IRI.

5-Appendices:

- SL 34-084

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AIRBUS

SERVICE INFORMATION LETTER

SUBJECT: **ERRATIC AIRSPEED INDICATION - MAINTENANCE ACTIONS**

ATA CHAPTER: 34-10

AIRCRAFT TYPE:
A300 / A310 / A300-600
A318 / A319 / A320 / A321
A330 / A340 (all models)
A380

APPLICABILITY: All Aircraft

REFERENCES:
OIT SEE/999.0009/99
OIT 999.0068/02/VHR
OIT - FOT 999.0015/02/VHR
OIT 999.0137/06/BB
OIT 999.0017/07/BB
OIT 999.0006/08/BB
OIT - FOT 999.0032/08
TFU 34.10.00.028 for A320 family
SIL 34-095
MPD 34-11, 34-21, 34-22
AMM 34-10, 34-20

Note: this SIL cancels and supersedes SIL 34-026 and SIL 34-047

1. PURPOSE:

This Service Information Letter aims at providing operators with the list of scheduled maintenance actions that will minimize occurrence of airspeed discrepancies, as well as the recommended actions to perform on aircraft whenever such an event happens.
In addition, Airbus encourages the operators to report any relevant aircraft findings to Airbus.

This SIL revision is made to incorporate:

- ✓ Change of title as this SIL now covers all maintenance actions linked to erratic air speed indication, not just those linked to Pitot probe maintenance.
- ✓ A300 B2/B4
- ✓ Recommendations concerning ice accretion on forward fuselage
- ✓ Minor corrections.

Changes in this SIL are highlighted by a vertical revision bar in the left hand margin of the page.

2. BACKGROUND

The following events have been reported from the field:

- ✓ Residual airspeed displayed on PFD while aircraft is not moving
- ✓ Rejected take off due to airspeed discrepancies noticed at crosscheck
- ✓ Airspeed discrepancies or fluctuations in flight
- ✓ Loss of Auto Flight System (AFS) due to air data discrepancies
- ✓ Flight Controls Alternate Law activation due to air data discrepancies

Note: Investigations conducted on A320 family aircraft showed that most of airspeed discrepancy events (during Take Off or approach) were due to Pitot water ingress and to probe draining holes obstructed by external particles. TFU 34.10.00.028 refers.

Pitot probe (C16195BA) with enhanced water trap and relocated drain holes was introduced to provide improved behavior when faced to adverse weather conditions (heavy rain for instance).

3. DESCRIPTION

Airbus experience shows that airspeed discrepancy or erratic indication can be caused by several factors:

- ✓ Pitot probe: tube obstruction by foreign materials (dust, fluid, insect, bird, ice, water), heater failure or deficiency, drain holes obstructed.
- ✓ Air Data Module (ADM): decalibration, sensor failures, perturbation by lightning.
- ✓ Total pressure lines: drain valve damaged, quick disconnect damage or disconnection, tubing damage (kinked or crushed).
- ✓ Aircraft skin damage around the air data probes: airflow around the probes could be modified impacting static or total pressure measurement.
- ✓ Probe Heat Computer (PHC) failure
- ✓ Angle of Attack (AOA) failure
- ✓ Ice accretion on the fuselage forward of the Pitot probes: Can occur if melted snow from windscreen freezes again on the sides and lower part of the forward fuselage. Extremely low temperature with snow falling are required for such a condition to become possible.

Pitot probe perturbation under marginal weather conditions is sometimes worsened due to drain hole obstruction by foreign materials (such as dust or insects).
This phenomenon can affect all Airbus programs and all types of Pitot probes.

To reduce the probability of such cases of airspeed discrepancy or fluctuation, the maintenance program has been adapted for total/static pressure lines (including flushing and cleaning of Pitot probes) and/or Pitot heating system.

4. MAINTENANCE ACTIONS

This Chapter provides the recommended troubleshooting and preventive actions as follows:

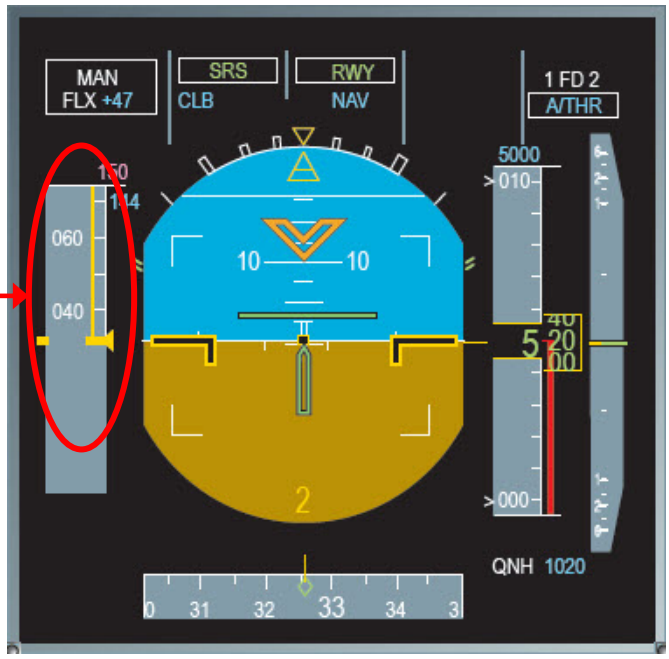
4.1. TROUBLE SHOOTING ACTIONS
- 4.1.1. Erratic airspeed (discrepancy or fluctuation)
- 4.1.2. Particular case: rejected take off due to discrepancy between both indicated airspeeds (Capt and F/O)
- 4.1.3. Steady residual airspeed on ground during departure (gate, pushback or taxi)

4.2. PREVENTIVE ACTIONS
- 4.2.1. Removal of snow and/or ice accretion on forward fuselage (if necessary)
- 4.2.2. Inspection/Check of the Pitot Probes and Pitot drain holes cleaning
- 4.2.3. Flushing of the Pitot line(s)
- 4.2.4. Pitot heater insulation/resistance test
- 4.2.5. Air Data Leak Test

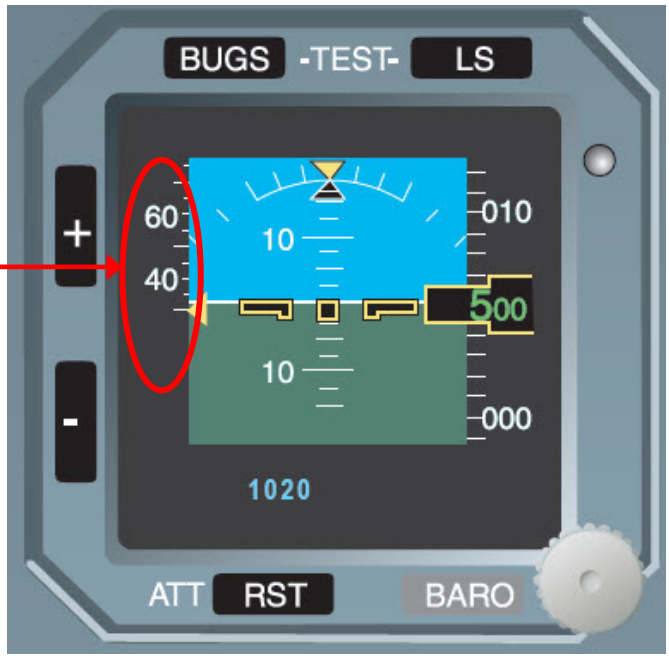
4.1. TROUBLE SHOOTING ACTIONS

Preliminary note: Airspeed is displayed on the PFDs and/or standby instruments.

Airspeed scale shown on PFD



Airspeed scale shown on ISIS



4.1.1. Erratic airspeed (discrepancy or fluctuation)

When troubleshooting erratic airspeed issues (discrepancy or fluctuation), Airbus recommends operators to follow the specific tasks mentioned below in accordance with the TSM entry:

A300 B2/B4

FIM 34-11-00 Flight Environment Data

A310/A300-600

TSM 34-10-00 Figure 110 "Airspeed discrepancy between PFDs or Standby Airspeed indicator"

A318/A319/A320/A321

TSM Task 34-13-00-810-998 "Altitude or Airspeed Discrepancy between CAPT PFD and F/O PFD"

OR

TSM Task 34-13-00-810-998-A "Altitude or Airspeed Discrepancy between CAPT PFD and F/O PFD" (a/c with RVSM capability).

A330/A340

TSM Task 34-10-00-810-995 "Altitude or Airspeed Discrepancy between CAPT PFD - F/O PFD - STDBY/ISIS"

A380

TSM Task 34-13-00-810-927 "Difference between the Airspeed Values on the CAPT and F/O PFDs"

OR

TSM Task 34-22-00-810-817-A "Difference between the Airspeed and/or Altitude Values on the CAPT and F/O PFDs and the ISIS Indicator"

In case of recurrent erratic airspeed issues, Airbus recommends particular focus on the following tasks:

A300 B2/B4

AMM 34-11-15 PB 601 “Pitot probes 40DA, 41DA AND 42DA - Inspection/check”
AMM 30-31-00 PB 501 “Insulation Test of Pitot Heater Resistance” (ref. TR 30-001)
AMM 34-11-00 PB 501 “Flight Environment data – Adjustment/test”
SRM 53-11-00 “Skin Plates - Allowable damage”

A310/A300-600

AMM 34-11-15 PB 601 “Pitot probes 40DA, 41DA AND 42DA - Inspection/check”
AMM 30-31-00 PB 501 “Insulation Test of Pitot Heater Resistance”
AMM 34-10-00 PB 501 “Flight Environment data – Adjustment/test”
SRM 53-10-12 “Skin Plates - Allowable damage”

A318/A319/A320/A321

AMM 34-11-15-200-001 “Inspection/Check of the Pitot Probe (9DA1, 9DA2, 9DA3)”
AMM 30-31-00-720-001 “Functional Test of the Insulation Resistance of the Pitot Probe Heater”
AMM 34-10-00-170-004 “Cleaning of the Pitot Probe Drain Holes”
SRM 53-00-11 “Skin Plates - Allowable damage”

A330/A340

AMM 34-11-15-200-801 “Inspection/Check of the Pitot Probe”
AMM 30-31-00-720-802 “Functional Test of Heater Insulation Resistance of the Pitot Probes”
AMM 34-11-00-170-804 “Cleaning of the Pitot Probe Drain-Holes”
SRM 53-00-11 “Skin Plates - Allowable damage”

A380

AMM 34-10-00-100-802-A “Cleaning of the Multifunction Probes”
AMM 34-20-00-100-801-A “Cleaning of the Drain Hole of the Standby Pitot Probe”
SRM 53-00-11 “Skin Plates - Allowable damage”

4.1.2. Particular case: rejected take off due to discrepancy between both indicated airspeeds (Capt and F/O)

When troubleshooting rejected take off due to discrepancy between indicated airspeeds, TSM TASK indicated in chapter 4.1.1 applies. However, Airbus recommends operators to focus on the specific tasks mentioned below:

A300 B2/B4

AMM 34-11-15 PB 601 "Pitot probes 40DA, 41DA AND 42DA - Inspection/check"
AMM 34-11-00 PB 301 "Air Data System Flushing"

A310/A300-600

AMM 34-11-15 PB 601 "Pitot probes 40DA, 41DA AND 42DA - Inspection/check"
AMM 34-10-00 PB 301 "Air Data System Flushing"

A318/A319/A320/A321

AMM 34-11-15-200-001 "Inspection/Check of the Pitot Probe (9DA1, 9DA2, 9DA3)"
AMM 34-10-00-170-001 "Flushing of the Principal Total Pressure Lines"
AMM 34-10-00-170-003 "Draining and Flushing of Standby Pneumatic Circuits"
OR
AMM 34-22-25-170-001 "Draining and Flushing of the Standby Static and Standby Total Pressure lines (ISIS)".

A330/A340

AMM 34-11-15-200-801 "Inspection/Check of the Pitot Probe"
AMM 34-11-00-170-801 "Flushing of the Principal Total Pressure Lines"
AMM 34-11-00-170-803 "Draining and Flushing of the Standby Static and Standby Total Pressure Lines"

A380

AMM 34-10-00-100-802-A "Cleaning of the Multifunction Probes"
AMM 34-20-00-100-801-A "Cleaning of the Drain Hole of the Standby Pitot Probe"
AMM 34-22-25-170-801-A "Draining and Flushing of the Standby Total Pressure Line and Standby Static-Pressure Lines (ISIS)"

4.1.3. Steady residual airspeed on ground during departure (gate, pushback or taxi)

Cases of residual airspeed on ground were reported. In such a case, Airbus recommendation is that operators perform the following actions:

A318/A319/A320/A321

AMM 34-11-00-720-001 "Functional Test of the ADM"
AMM 34-10-00-170-001 "Flushing of the Principal Total Pressure Lines"
AMM 34-10-00-170-003 "Draining and Flushing of Standby Pneumatic Circuits"

A330/A340

AMM 34-13-00-720-802 "Functional Test of the ADM Accuracy"
AMM 34-11-00-170-801 "Flushing of the Principal Total Pressure Lines"
AMM 34-11-00-170-803 "Draining and Flushing of the Standby Static and Standby Total Pressure Lines"

A380

Residual airspeed on ground can be due to clogging of the Pitot part of the Multifunction probes. Such an issue could have the following impacts:

- ✓ Residual speed present on PFD (ADR3 airspeed is only displayed on PFD if ADR3 is switched on CAPT or on F/O) while aircraft is not moving.
- ✓ ALTERNATE or DIRECT flight controls law activation
- ✓ FWC flight phase latched in phase 10
- ✓ Impossibility to access OMS maintenance menu (due to FWC phase latched in phase 10).

Note that these symptoms can be seen just after engine start (at engine start, probe heating is started, leading to the increase of the pressure within the probe due to increase of the temperature of the air blocked in the probe).

If such a situation is encountered, Airbus recommends **TSM 34-13-00-810-928**
"Residual Airspeed on Ground"

4.2. PREVENTIVE ACTIONS

- Operators are reminded that Pitot tube covers should be used:
1. When the aircraft is parked, to reduce the risk of foreign material ingress (dust, insect, etc.). Refer to **AMM 10-11-00** for all aircraft.
2. During external aircraft cleaning or de-icing with engines stopped: probes covers would help to avoid cleaner wax or de-icing fluid ingress. Refer to **AMM 12-21-11** and **AMM 12-31-12** (when engines are stopped) for all aircraft.

During de-icing procedures (AMM 12-31-12 when engines are running), avoid de-icing fluid ingress as per caution note indicated in AMM task. If it is suspected that any de-icing fluid residue contamination has occurred (e.g. because a jet of de-icing fluid was applied directly to an air data probe) the contaminated probes and possibly pneumatic lines should be replaced and sent to the supplier for cleaning.

- In order to reduce the possibility of occurrence of an erratic airspeed issue, Airbus recommends that the following tasks are performed.

4.2.1. Removal of snow and/or ice accretion on forward fuselage (if necessary)

A318/A319/A320/A321

AMM 12-31-12-660-008 "Forward Fuselage Ice Accretion De-icing"
To be performed on an as-needed basis. This issue has not been reported on any other Airbus aircraft types than A320 family.

4.2.2. Inspection/Check of the Pitot Probes and Pitot drain holes cleaning

A300 B2/B4

AMM 34-11-15 Page Block 601 "Pitot probes 40DA, 41DA AND 42DA - Inspection/check" – Not covered by MPD.

AMM 34-11-00 Page Block 308, 309, 310 "Cleaning of the Pitot Probe Drain-Holes": Airbus recommends cleaning the Pitot probes drain holes every 500 FH or every 4 Months alternately on each Pitot probe*.
This will be included at the next MPD revision opportunity.

*AMM task 34-11-00 Page Block 308, 309, 310 should be performed only on one Pitot probe per check. Sequence remains at operators' decision. It is up to the operators to follow in which order this is managed, example:
1st check: Pitot 1; 2nd check: Pitot 2; 3rd check: Pitot 3 OR
1st check: Pitot 2; 2nd check: Pitot 1; 3rd check: Pitot 3 OR ...
At the 4th check, the task should be applied to the same Pitot as in the 1st check. This means that all Pitot probes will be cleaned every 1500 FH or every 12 Months.

A310/A300-600

AMM 34-11-15 Page Block 601 "Pitot probes 40DA, 41DA AND 42DA - Inspection/check" – Not covered by MPD.

AMM 34-10-00 Page Block 301 Chapter 3.C, 3.D and 3.E "Cleaning of the Pitot Probe Drain-Holes": Airbus recommends cleaning the Pitot probes drain holes every 500 FH or every 4 Months alternately on each Pitot probe*. This will be included in next MPD revision expected in 2011.

* AMM 34-10-00 Page Block 301 Chapter 3.C, 3.D and 3.E should be performed only on one Pitot probe per check. Sequence remains at operators' decision. It is up to the operators to follow in which order this is managed, example:
1st check: Pitot 1; 2nd check: Pitot 2; 3rd check: Pitot 3 OR
1st check: Pitot 2; 2nd check: Pitot 1; 3rd check: Pitot 3 OR ...
At the 4th check, the task should be applied to the same Pitot as in the 1st check. This means that all Pitot probes will be cleaned every 1500 FH or every 12 Months.

A318/A319/A320/A321

AMM 34-11-15-200-001 "Inspection/Check of the Pitot Probe (9DA1, 9DA2, 9DA3)" – Not covered by MPD.

AMM 34-10-00-170-004 "Cleaning of the Pitot Probe Drain Holes": Airbus recommends performing this task alternately on each Pitot probe every 750 FH or every 4 Months (covered by current MPD)*.

* AMM 34-10-00-170-004 should be performed only on one Pitot probe per check. Sequence remains at operators' decision. It is up to the operators to follow in which order this is managed, example:
1st check: Pitot 1; 2nd check: Pitot 2; 3rd check: Pitot 3 OR
1st check: Pitot 2; 2nd check: Pitot 1; 3rd check: Pitot 3 OR ...
At the 4th check, the task should be applied to the same Pitot as in the 1st check. This means that all Pitot probes will be cleaned every 2250 FH or every 12 Months.

A330/A340

AMM 34-11-15-200-801 "Inspection/Check of the Pitot Probe" – Not covered by MPD.

AMM 34-11-00-170-804 "Cleaning of the Pitot Probe Drain-Holes": Airbus recommends performing this task alternately on each Pitot probe every 800 FH. (covered by current MPD)*.

* AMM 34-11-00-170-804 should be performed only on one Pitot probe per check. Sequence remains at operators' decision. It is up to the operators to follow in which order this is managed, example:
1st check: Pitot 1; 2nd check: Pitot 2; 3rd check: Pitot 3 OR
1st check: Pitot 2; 2nd check: Pitot 1; 3rd check: Pitot 3 OR ...
At the 4th check, the task should be applied to the same Pitot as in the 1st check. This means that all Pitot probes will be cleaned every 2400 FH.

A380

AMM 34-10-00-100-802-A "Cleaning of the Multifunction Probes" – Airbus recommends performing this task alternately on each MFP every 1000 FH - This task will be included in next MPD revision expected 2Q 2011*.

* AMM 34-10-00-100-802-A should be performed only on one Multi Function probe per check. Sequence remains at operators' decision. It is up to the operators to follow in which order this is managed, example:
1st check: MFP 1; 2nd check: MFP 2; 3rd check: MFP 3 OR
1st check: MFP 2; 2nd check: MFP 1; 3rd check: MFP 3 OR ...
At the 4th check, the task should be applied to the same MFP as in the 1st check. This means that all MFP probes will be cleaned every 3000 FH.

AMM 34-20-00-100-801-A "Cleaning of the Drain Hole of the Standby Pitot Probe" - Airbus recommends performing this task every 2000FH - This task will be included in next MPD revision expected 2Q 2011.

4.2.3. Flushing of the Pitot line(s)

Note: If applicable, interval for these procedures is given in the MPD.

A300 B2/B4

AMM 34-11-00 Page Block 301 "Air Data System Flushing". Airbus recommends to perform this task every 2C check (covered by current MPD).

A310/A300-600

AMM 34-10-00 Page Block 301 "Air Data System Flushing". Airbus recommends to perform this task every 6000 FH or 48 MO (covered by current MPD).

A318/A319/A320/A321

AMM 34-10-00-170-001 "Flushing of the Principal Total Pressure Lines". Airbus recommends to perform this task every 6000 FH or 20 MO (covered by current MPD).

AMM 34-10-00-170-003 "Draining and Flushing of Standby Pneumatic Circuits". Airbus recommends to perform this task every 6000 FH or 20 MO (covered by current MPD).
OR
AMM 34-22-25-170-001 (ISIS, post mod 27620) "Draining and Flushing of the Standby Static and Standby Total Pressure lines (ISIS)". Airbus recommends to perform this task every 6000 FH or 20 MO (covered by current MPD).

A330/A340

AMM 34-11-00-170-801 and/or **– 803** "Flushing of the principal pressure lines". Airbus recommends to perform this task every 1C check (covered by current MPD).

AMM 34-22-25-170-801 (ISIS, post mod 47244) "Drain and Flush of Pneumatic Circuits". Airbus recommends to perform this task every 1C check (covered by current MPD).

A380

AMM 34-22-25-170-801-A "Draining and Flushing of the Standby Total Pressure Line and Standby Static-Pressure Lines (ISIS)". Not covered by MPD.

4.2.4. Pitot heater insulation/resistance test

In addition to the current MPD requirements, Airbus recommends to perform the following tasks on Goodrich Pitot probes which are affected by the loss of insulation resistance failure mode with age.

A300 B2/B4

AMM 30-31-00 Page Block 501 "Insulation Test of Pitot Heater Resistance" – Airbus recommends performing this task every 24 months.
This will be included in next MPD revision expected in 2011.

A310/A300-600

AMM 30-31-00 Page Block 501 "Insulation Test of Pitot Heater Resistance" – Airbus recommends performing this task every 24 months.
This will be included in next MPD revision expected in 2011.

A318/A319/A320/A321

AMM 30-31-00-720-001 "Functional Test of the Insulation Resistance of the Pitot Probe Heater"– Airbus recommends performing this task every 24 months (covered by current MPD).

A330/A340

AMM 30-31-00-720-802 "Functional Test of Heater Insulation Resistance of the Pitot Probes"– Airbus recommends performing this task every 24 months (covered by current MPD).

A380

Not applicable as the probes technology is different on A380.

4.2.5. Air Data Leak Test

Note: If applicable, the interval for these procedures is given in the MPD

A300 B2/B3

AMM 34-11-00 Page Block 501 "Leak test of the total and static pressure system". Airbus recommends to perform this task every 1C check (covered by current MPD).

A310/A300-600

AMM 34-10-00 Page Block 501 "leak test of the total and static pressure system". Airbus recommends to perform this task every 6000 FH or 48 MO (covered by current MPD).

A318/A319/A320/A321

AMM 34-13-00-790-002 "Leak Test of the Principal Static and Total Air Data System". Not covered by MPD. However, this task is requested at the end of the **AMM 34-10-00-170-001** "Flushing of the Principal Total Pressure Lines" which is performed every 6000FH or 20MO as per current MPD.
AMM 34-21-00-790-001 "Low-Range Leak Test of the Standby Pneumatic Circuits". Airbus recommends to perform this task every 12000 FH or 80 MO (covered by current MPD).
AMM 34-22-25-790-001 "Low range Leak Test of the Standby Pneumatic circuits". Airbus recommends to perform this task every 12000 FH or 80 MO (covered by current MPD).

A330/A340

AMM 34-11-00-790-801 "Low Range Leak Check of the Principal Pneumatic Circuits". Airbus recommends to perform this task every 2C check (covered by current MPD).
AMM 34-22-25-790-801-A "Low Range Leak Check of Standby Pneumatic Circuits". Airbus recommends to perform this task every 2C check (covered by current MPD).

A380

AMM 34-20-00-790-801-A "Leak test of the Standby Air Data System". Not covered by MPD.

5. EVENT REPORTING

In case an event of airspeed discrepancy is experienced, a detailed feedback from the flight crews is essential to conduct an investigation.

In order to characterize the external conditions that may produce such airspeed discrepancies, the operators are invited to provide Airbus with the following data:

- ✓ The Telex showing the weather forecasts/conditions
- ✓ Detailed flight crew report (in particular events not recorded in DFDR data such as over speed warnings or reconfiguration on ADR3 data).
- ✓ The post flight report (PFR) (not available on A300/310)
- ✓ ADR TSD or engineering data (not available on A300/310)
- ✓ ADR Class 3 faults (A320/A330/A340)
- ✓ DFDR or DAR data (refer to SIL 00-086)

It is recommended to fill in the questionnaire attached to this SIL after any erratic airspeed occurrence and forward it to Airbus via local Field Service Representative or Manager together with the above data.

6. MODIFICATION INFORMATION

N/A.

7. MATERIAL

N/A.

8. PROCUREMENT

N/A.

ANNEX

OPERATOR:	AIRCRAFT MSN:	EVENT DATE:

1) Weather conditions during the event:	**YES**	**NO**
- Presence of rain…….	☐	☐
- Presence of hail…….	☐	☐
- Presence of fog……..	☐	☐
- Stormy conditions…….	☐	☐
- Strong wind gusts…….	☐	☐
- Icing conditions……..……..	☐	☐
- Lightning strikes / St Elmo's fires. …….	☐	☐

2) Aircraft parameters during the event:			
- Altitude:	- Airspeed:		- TAT/SAT:
- Latitude:	- Longitude:		
- Affected side(s):	☐ #1	☐ #2	☐ #3 (stby)
- Initial airspeed jump:	☐ lower (than normal airspeed)		☐ higher
- Range of the airspeed jump or altitude jump:			
- Event duration:	- GMT:		
- Flight phase: Take off ☐	Climb ☐	Cruise ☐	Descent ☐ Landing ☐

3) Post flight check results:	**YES**	**NO**
- Presence of water in the Pitot hoses……..	☐	☐
- Presence of sand/dust in the Pitot hoses……	☐	☐
- Presence of particles in the Pitot drain holes……	☐	☐
- Insulation/Resistance check of the Pitot probes ok? ……	☐	☐
- Time since last Pitot flushing: ……..		

4) General comments: