

# Pressure ports/RVSM areas contamination findings

Gianni Pidutti

RAMP Train-the trainer workshop

**Your safety is our mission.**

An Agency of the European Union 

# What is the issue?

Is this aircraft safe to fly?



# What is the issue?



# What is the issue?



# What is the issue?



# SAFA/SACA PDFs

Present PDFs provide same Standard, categorisation and description for both SAFA and SACA environments.

C01	M	3			Pressure port (and/or RVSM area) damaged or contaminated (outside dispatch limits/conditions)	SAFA-C01-12	Indicate the particulars of the situation observed
C01	M	3			Pressure port (and/or RVSM area) damaged or contaminated (outside dispatch limits/conditions)	SACA-C01-12	Indicate the particulars of the situation observed

Manufacturer's standard is the reference to be used for the assessment.

## Manufacturer's standards (Cont'd)

Manufacturers deal with damages affecting the pressure ports/RVSM areas by means of the AMM and SRM documents, which provide well defined information on dispatch limits.

# Manufacturer's standards (Cont'd)

**AIRBUS**

Customer : CRK Type : A318/A319/A320/A321 Rev. Date : Nov 01, 2017	Manual : AMM Selected applicability : ALL
34-11-16-200-001-A - Inspection of the Static Port	

## 4. Procedure

Subtask 34-11-16-220-050-B

### A. Inspection of the Static Port

(1) FOR 7DA1 , (PROBE-L STATIC, 1), 7DA2 , (PROBE-L STATIC, 2), 8DA1 , (PROBE-R STATIC, 1), 8DA2 (PROBE-R STATIC, 2)

(a) Do a visual inspection of the static port.

1 If the surface of the static port is not smooth , refer to Ref. SRM 531111 for permitted tolerances.

a If the damage is out of the tolerances given in the SRM:  
- Repair the static port (Ref. Ref. SRM 530011).

**NOTE:** If the damage is out of the SRM permitted tolerances, it is possible that Airbus Customer Services give specific permitted tolerances or repair procedures.

(2) FOR 7DA3 , (PROBE-L STATIC, 3), 8DA3 (PROBE-R STATIC, 3)

(a) Do a visual inspection of the static port blanking plate.

1 If the surface of the static port blanking plate is not smooth , refer to Ref. SRM 531111 for permitted tolerances.

a If the damage is out of the tolerances given in the SRM:  
- Replace the static port blanking plate (Ref. AMM TASK 53-19-42-000-001) and (Ref. AMM TASK 53-19-42-400-001) .

**NOTE:** If the damage is out of the SRM permitted tolerances, it is possible that Airbus Customer Services give specific permitted tolerances or repair procedures.



# Manufacturer's standards (Cont'd)

**AIRBUS**

Customer : ENV Type : A318 Rev. Date : Nov 01, 2017	Manual : SRM Selected effectivity : ALL
TASK 53-00-11-283-004 - Aerodynamic Requirements for Allowable Damage and Repairs	

## (a) Allowable Damage

The limitation data is given in **Diagram 001 and Diagram 002**. In addition to the given limits, the following requirements exist:

- 1 Applicable to the static probe ports from FR23 to FR24
  - a **Fastener flushness**, Skin waviness and Surface roughness:
  - b **Damage caused by lightning strikes or nicks:**  
The area defined by a radius of 15 mm (0.59 in) centered on the static port:
  - c Scratches  
The area defined by a radius of 15 mm (0.59 in) centered on the static probe port:  
For any scratches, Contact AIRBUS.

# Manufacturer's standards (Cont'd)

**AIRBUS**

Customer : ENV Type : A318 Rev. Date : Nov 01, 2017	Manual : SRM Selected effectivity : ALL
TASK 53-00-11-283-004 - Aerodynamic Requirements for Allowable Damage and Repairs	

2.

## A. Static Probe Ports

### (1). Definition of Areas

- For the definition of areas refer to Figures 004 and 001.

### (2). Definition of characteristic Parameters for Damages and External Repairs

- For the definition of characteristic parameters, refer to Figure 003.

### (3). Aerodynamic Requirements

The characteristic parameters (D and d) given in Figure 003, Sheet 1 must meet the aerodynamic requirements given in Diagrams 001 and 002 within the areas given in Figure 001.

NOTE: Make sure that the internal surfaces of the probe port holes are clean and free of burrs and the outer edge of the probe port holes are clean and free of burrs, raised edges or nicks.

# Manufacturer's standards (Cont'd)

## 2 Applicable to the standby static probe port blanking plate from FR3 to FR4

### a Mismatches:

The acceptable mismatch for head of the 8 pins of the blanking plate is - 0.05 mm (0.002 in) to - 0.35 mm (0.0138 in).

The mismatch between the blanking plate and the skin panel is + 0.55 mm (0.0217 in) with tolerances of  $\pm 0.35$  mm (0.0138 in) in the line of flight (IN LOF) and + 0.55 mm (0.0217 in) with tolerances of  $\pm 0.25$  mm (0.0098 in) across line of flight (A LOF).

### b Damage caused by lightning strikes or nicks:

The area defined by a radius of 15 mm (0.59 in) centered on the static probe port:

### c Scratches

The area defined by a radius of 15 mm (0.59 in) centered on the static probe port:  
For any scratches, Contact AIRBUS.

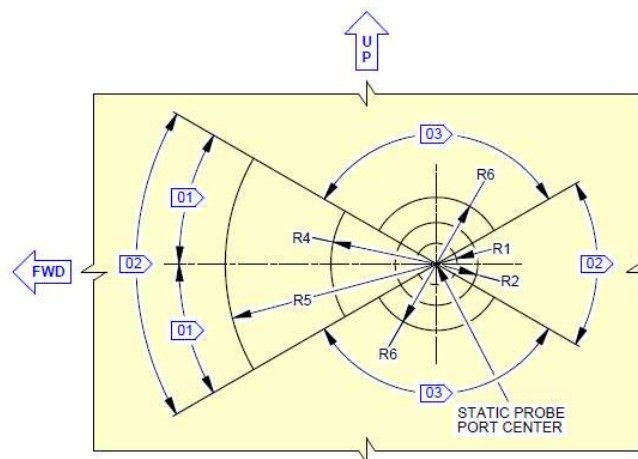
NOTE: All burrs must be removed. Apply chemical conversion coating (Material No. 10ABD1) for scratches in aluminum alloys (refer to Chapter 51-21-11).

Not more than three unreworked scratches (including existing unreworked scratches) accepted in this area.

### (b) Repairs

If the damage is more than the requirements and limitations given in Paragraph 2.A.(3).(a)., repair the damage according to the aerodynamic requirements given in Diagram 001 and Diagram 002 and the requirements given below:

# Manufacturer's standards (Cont'd)



DIMENSION AND CONVERSIONS		
	mm	in
R1	100	3.94
R2	200	7.87
R4	500	19.69
R5	1 000	39.37
R6	325	12.8

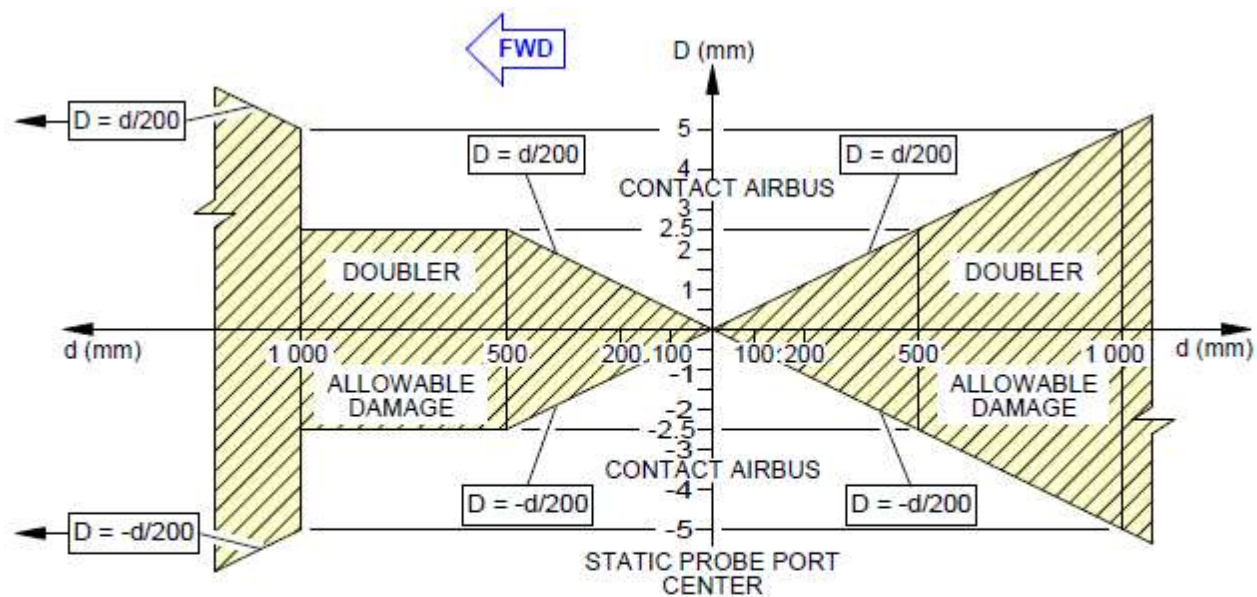
**NOTE:**

**01** ANGLE VALUE = 30° FOR CAPTAIN AND FIRST OFFICER STATIC PROBE PORTS AT FR23-FR24.  
ANGLE VALUE = 45° STANDBY STATIC PROBE PORT AT FR3-FR4.

**02** REFER TO FIGURE 5.

**03** REFER TO FIGURE 6 FOR ALL STATIC PROBE PORTS.

# Manufacturer's standards (Cont'd)

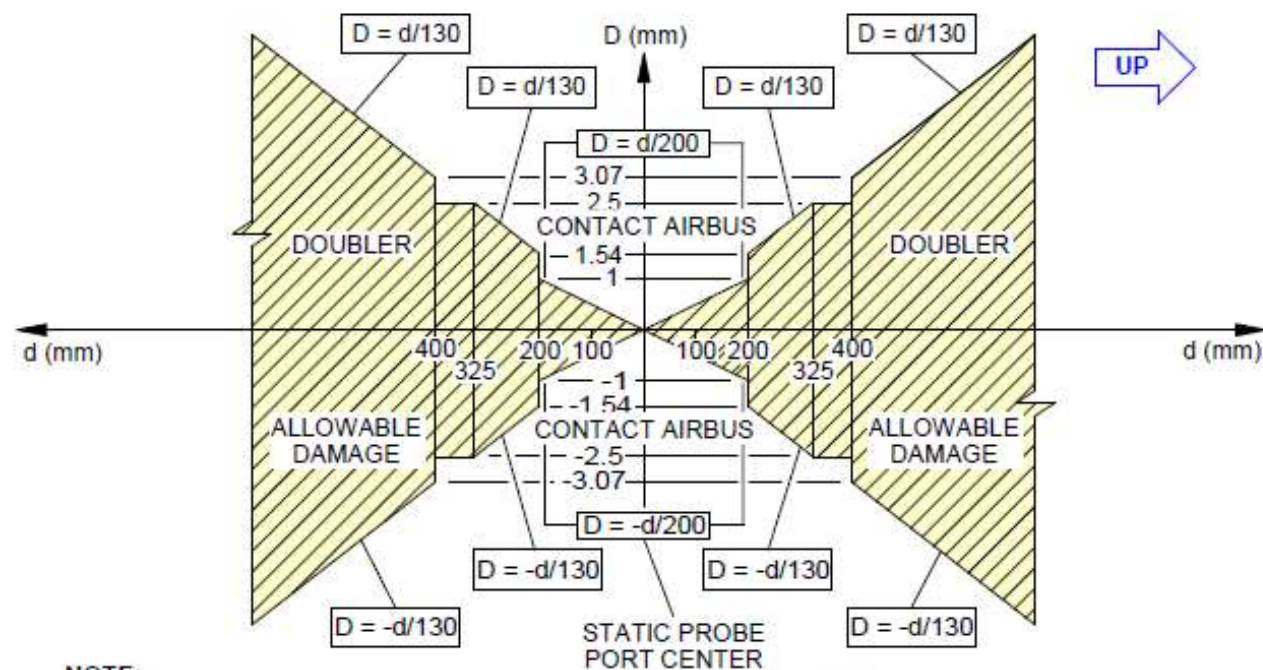


NOTE:  
THESE AERODYNAMIC REQUIREMENTS ARE APPLICABLE FOR 02  
MARKED AREAS GIVEN IN FIGURE 4.

N\_SR\_530011\_1\_6AQM0000\_01\_01



# Manufacturer's standards (Cont'd)

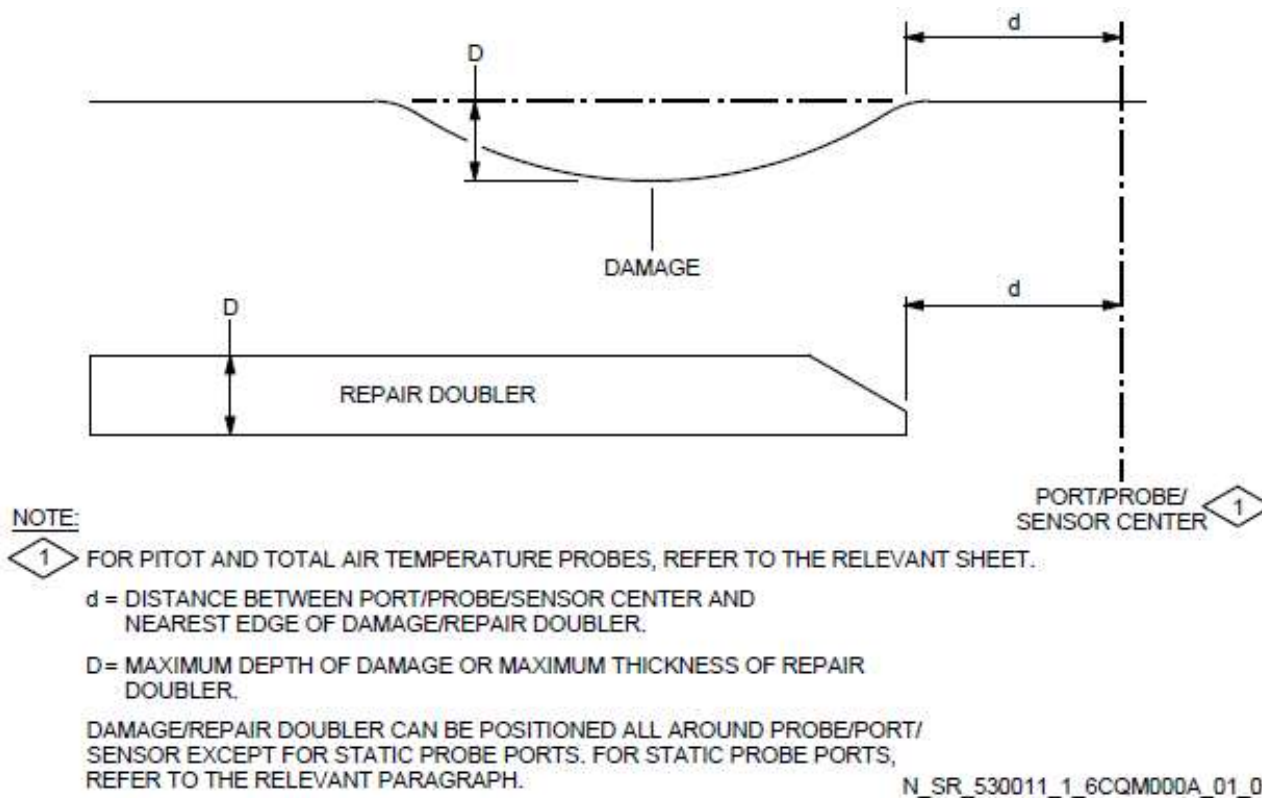


NOTE:

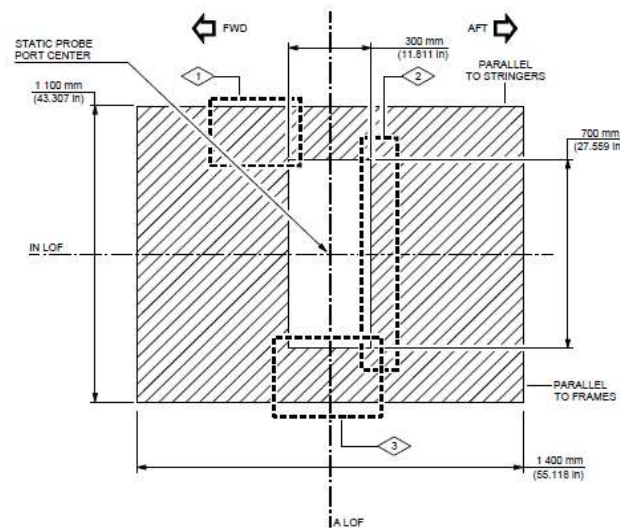
THESE AERODYNAMIC REQUIREMENTS ARE APPLICABLE FOR 03

N\_SR\_530011\_1\_6ASM0000\_01\_01

# Manufacturer's standards (Cont'd)



# Manufacturer's standards (Cont'd)



## NOTE:

1 NOT PERMITTED:  
NO EXTERNAL REPAIR DOUBLER CORNER PERMITTED IN AREA A.

2 NOT PERMITTED:  
NO EXTERNAL REPAIR DOUBLER TRAILING NOR LEADING EDGE PERMITTED IN AREA A.

3 PERMITTED:  
EXTERNAL REPAIR DOUBLER.

IN L OF DIRECTION = IN LINE OF FLIGHT DIRECTION.  
A L OF DIRECTION = ACROSS LINE OF FLIGHT DIRECTION.

AREA A = 300 mm x 700 mm (11.811 in x 27.559 in) AREA CENTERED ON THE STATIC PROBE PORT.

AREA B = 1 400 mm x 1 100 mm (55.118 in x 43.307 in) AREA CENTERED ON THE STATIC PROBE PORT (INCLUDING AREA A).

N\_SR\_S30011\_1\_6CSM000A\_01\_00



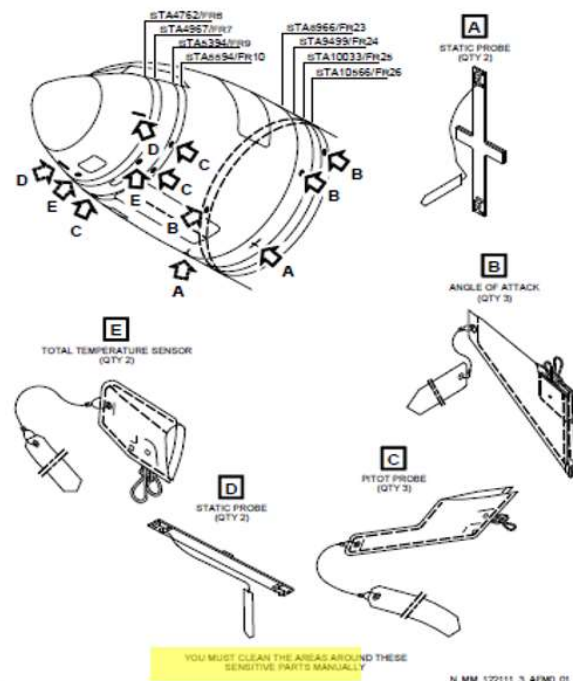
## Manufacturer's standards (Cont'd)

Manufacturers also provide instructions for cleaning actions (AMM - Chapter 12).

# Manufacturer's standards (Cont'd)



Customer : LXR	Manual : AMM
Type : A318/A319/A320/A321	Selected applicability : ALL
Rev. Date : Aug 01, 2017	
12-21-11 PB 301 CONF 00 - EXTERNAL CLEANING - SERVICING	



# Manufacturer's standards (Cont'd)

## 5. Close-up

Subtask 12-21-11-860-058-A

### A. Aircraft Maintenance Configuration

- (1) Remove the aircraft protection equipment (Ref. AMM TASK 10-11-00-555-014) .  
If you installed the AOA SENSOR COVER (98D34203005000) , remove it and put back the screws (Ref. AMM TASK 34-11-19-400-001) .  
You can:
  - Remove the AOA sensor screws that you installed in the applicable holes of the AOA SENSOR COVER (98D34203005000) and install them again on the AOA sensors, or
  - Install two new screws on the AOA sensors.
- (2) Refer to the record of application of the adhesive tape to remove all FILM - POLYETHYLENE and TAPE - ADHESIVE.
- (3) Make sure that all materials are recorded as removed.
- (4) Remove all signs of adhesive tape with a Textile-Lint free Cotton - (Material No. 14SBA1) soaked in Non Aqueous Cleaner-- Petroleum Based - (Material No. 08BBB1).

## Manufacturer's standards (Cont'd)

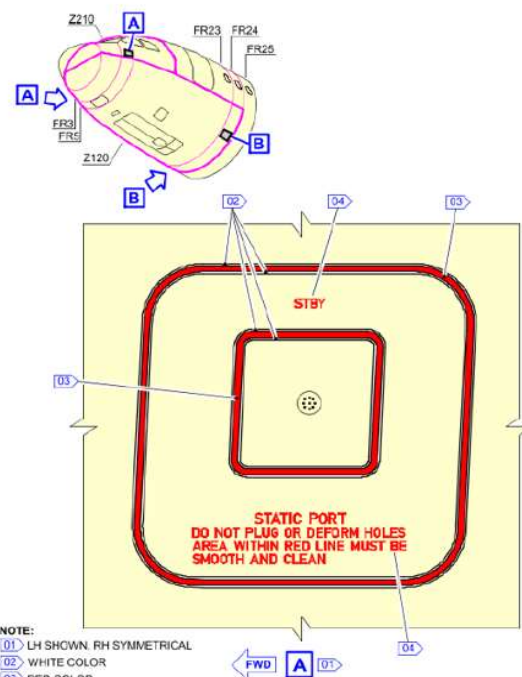
Additionally, further information can be retrieved in Chapter 11 of the AMM (Placards and markings).

# Manufacturer's standards (Cont'd)

**AIRBUS**

Customer : CRK  
Type : A318/A319/A320/A321  
Rev. Date : Nov 01, 2017

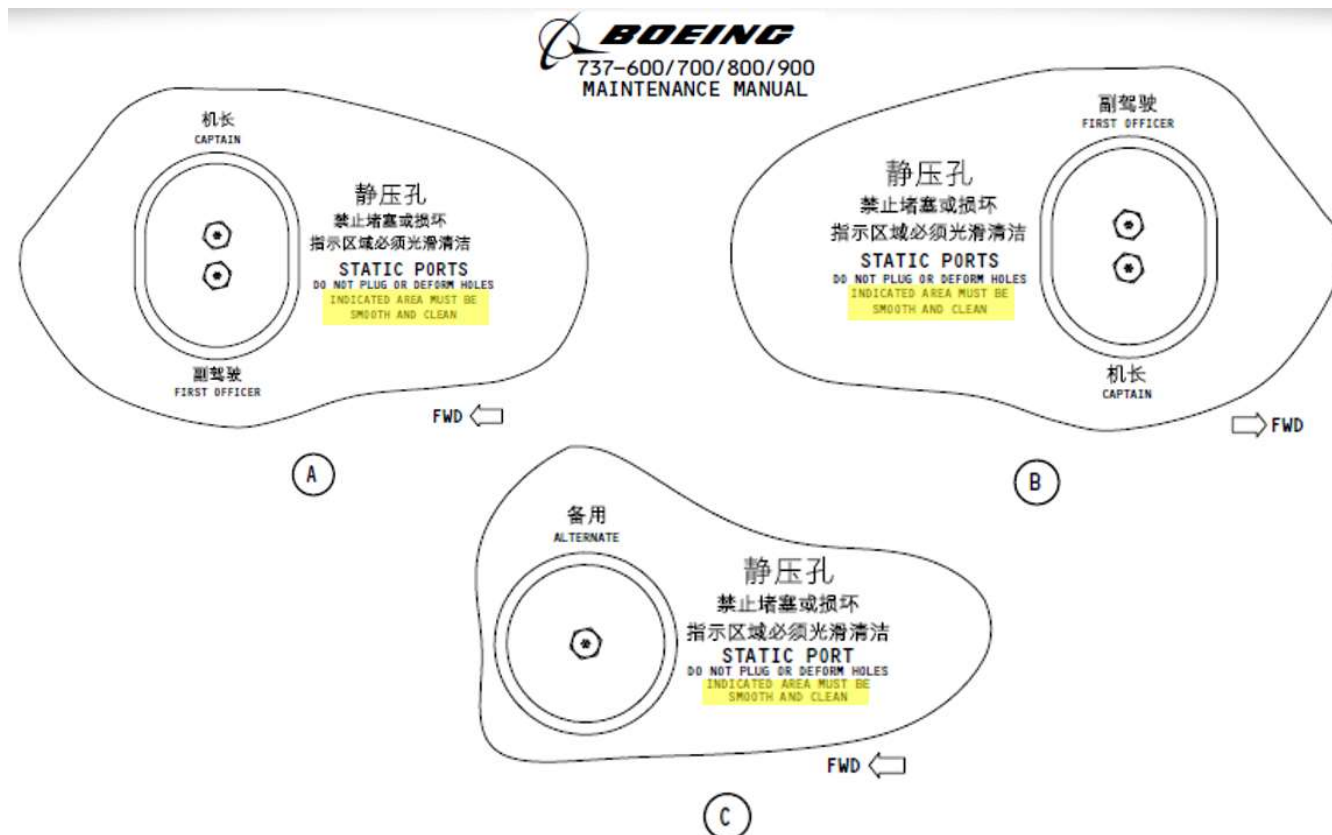
Manual : AMM  
Selected applicability : ALL



NOTE:  
01 LH SHOWN, RH SYMMETRICAL  
02 WHITE COLOR  
03 RED COLOR  
04 RED COLOR OR WHITE COLOR

N\_MM\_110000\_0\_G3G6\_01\_00

# Manufacturer's standards (Cont'd)



# Manufacturer's standards (Cont'd)

## ATR 42



## Manufacturer's standards (Cont'd)

Manufacturers (AFM/FCOM) and operators (OM) provide information on how to inspect and on what to look for during the pre-flight walk-around at the pressure ports/RVSM areas.



# Manufacturer's standards (Cont'd)

Normal Procedures  
Flight and cockpit preparation

## 777 Flight Crew Operations Manual

---

### **EXTERIOR INSPECTION**

(PM or relief pilot)

#### **GENERAL**

The exterior inspection must be performed prior to each flight donning proper individual protection devices.

This inspection is primarily a visual check to ensure that the overall condition of the airplane and visible components and equipment are safe for the coming flight phases.

The following is a list of main items to be checked and the recommended inspection sequence:

# Manufacturer's standards (Cont'd)

<b>A318/A319/A320/A321</b> FLIGHT CREW OPERATING MANUAL	<b>PROCEDURES</b> <b>NORMAL PROCEDURES</b> <b>STANDARD OPERATING PROCEDURES - EXTERIOR WALKAROUND</b>
<b>EXTERIOR WALKAROUND</b>	

## **LH FWD FUSELAGE**

AOA probes..... CONDITION  
 F/O and CAPT static ports..... CLEAR  
 Avionics equipment vent air inlet valve..... CONDITION  
 Oxygen bay..... CLOSED  
 Oxygen overboard discharge indicator..... GREEN  
 Toilet servicing door <Ⓜ> ..... CLOSED

## **NOSE SECTION**

Pitot probes..... CONDITION  
 STBY static ports..... CLEAR  
 TAT probes..... CONDITION  
 Radome and latches..... CONDITION/LATCHED  
 Forward avionics compartment door..... CLOSED  
 Ground electrical power door (if not required.)..... CLOSED

## **RH FWD FUSELAGE**

RH + AFT avionic compartment doors..... CLOSED  
 Avionic equipment vent air outlet valve..... CONDITION  
 F/O-CAPT static ports..... CLEAR  
 AOA probe..... CONDITION  
 Forward cargo door and selector panel..... CHECK

# Manufacturer's standards (Cont'd)

<b>A330</b> <small>FLIGHT CREW OPERATING MANUAL</small>	<b>STANDARD OPERATING PROCEDURES</b>  <b>EXTERIOR INSPECTION</b>	3.03.05	P 2
		SEQ 001	REV 17

## ① LH FWD FUSELAGE

- Outflow valve . . . . . CONDITION
- Static ports . . . . . CLEAR
- \*— AOA probe . . . . . CONDITION
- Wing and engine scan lights . . . . . CONDITION

## ④ RH FWD FUSELAGE

- \*— AOA probes . . . . . CONDITION
- Pax oxygen discharge indicator ◀ . . . . . GREEN
- Cargo loading operation access door . . . . . CLOSED
- Cargo door operation access door . . . . . CLOSED
- Cargo door . . . . . CLOSED
- Static ports . . . . . CLEAR
- Antennas . . . . . CONDITION
- \*— Drain mast . . . . . CONDITION
- Wing and engine scan lights . . . . . CONDITION

# Manufacturer's standards

## RIGHT FORWARD

<b>2 PITOTS</b> .....	<b>Checked</b>
Verify probes unobstructed and condition	
<b>AOA PROBE, ICE DETECTION PROBE</b> .....	<b>Checked</b>
<b>ANTENNAS ( under the body)</b> .....	<b>Checked</b>
<b>STATIC PORTS</b> .....	<b>Checked</b>

## LEFT FORWARD SIDE

<b>ENGINE</b> .....	<b>Checked</b>
Idem right engine	
<b>STATIC PORT</b> .....	<b>Checked</b>
Idem right side	

# Analysis and considerations (Cont'd)

## ATR static port covers



## Analysis and considerations (Cont'd)

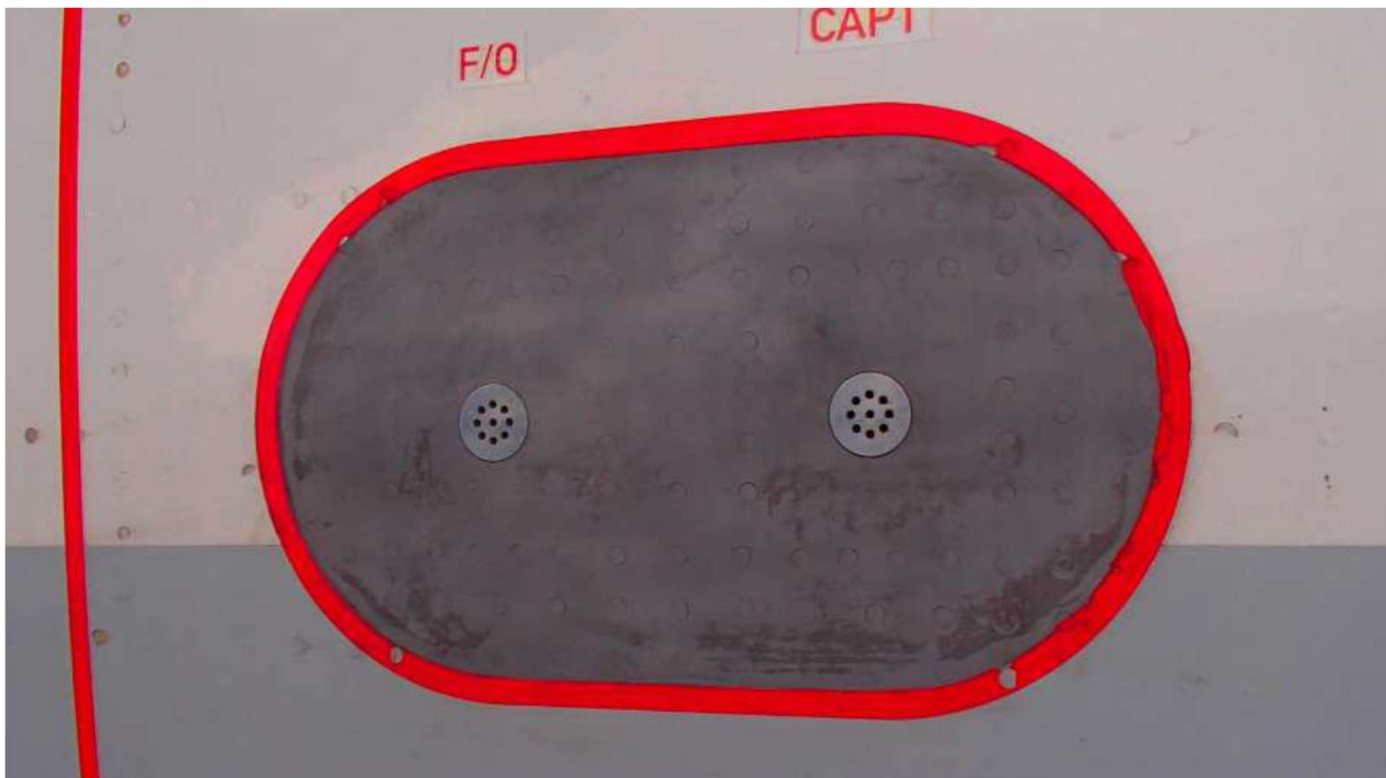
According to the manufacturers' standards, pressure ports/RVSM areas should be “**CLEAN**”; not only free from protections, covers, adhesive tapes, burrs, etc.

**There is not any reference establishing contamination limits.**

Nevertheless, despite manufacturer and operator instructions, reality shows a quite different world.



## Analysis and considerations (Cont'd)

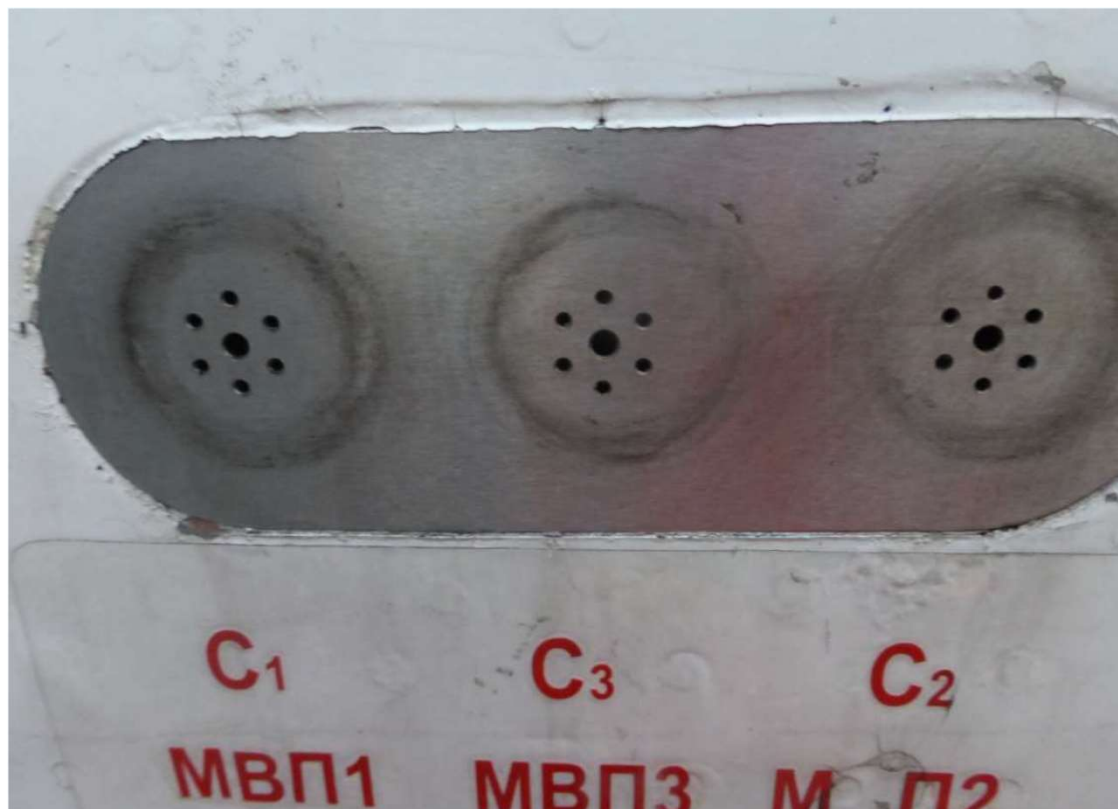


# Analysis and considerations (Cont'd)





## Manufacturer's standards (Cont'd)



## Analysis and considerations (Cont'd)

To have an understanding of the possible effects the contamination has on flight safety, statistical data were extracted from the European Central Repository on certain occurrences relevant to the period 2010 - 2018.

Analysis was based on three main topics:

- Altitude busts;
- Altitude reading error; and
- Conflict of information (pilot and co-pilot).

## Analysis and considerations (Cont'd)

Further screening was performed by selecting subjects such as:

- Altimeter system;
- Air data computer system;
- Pitot and static system; and
- Variometric and altimeter encoder.

87 events were identified as possibly related to static system issues.

## Analysis and considerations (Cont'd)

Further screening reduced the number to 19.

Among these 19 events, 2 have been discarded by aircraft type.

Unfortunately, for the remaining 17 events the information contained in the Repository does not allow to go deeper into the root cause investigation, as the follow-up actions are very seldom uploaded.

## Analysis and considerations (Cont'd)

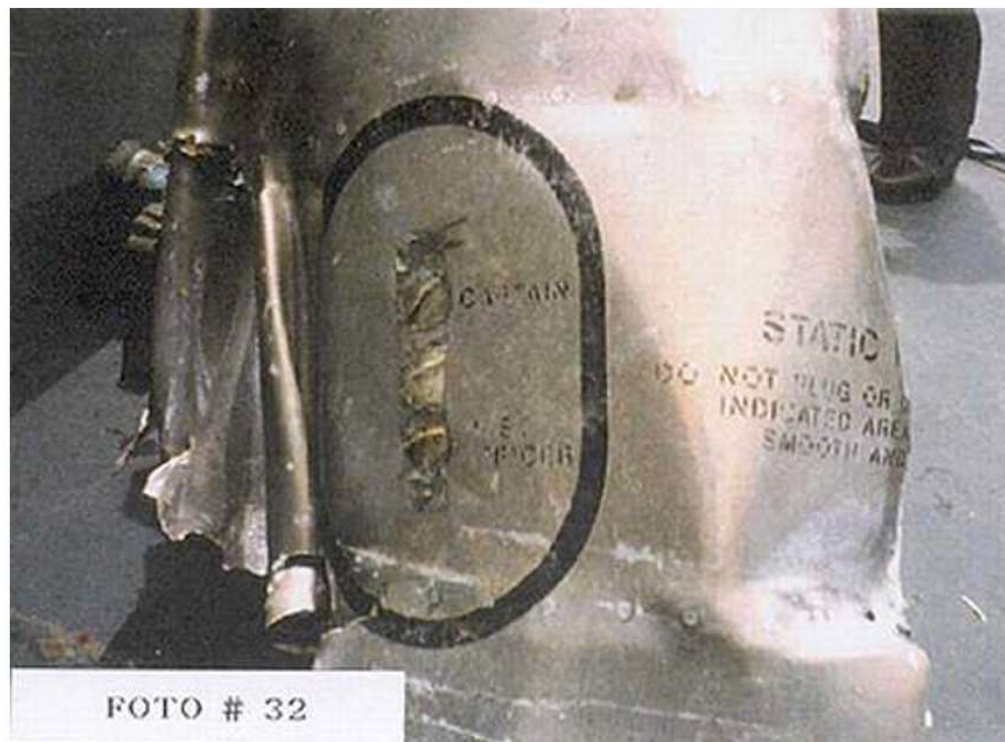
It was impossible to establish whether the identified relevant events were caused by contaminated areas (traces of masking tape/adhesive), clogged ports (which is a condition not part of this analysis), or any other static system trouble.

## Analysis and considerations (Cont'd)

The EASA SAFA database was also checked, without identifying any proof that among the findings raised there was evidence of issues related to an operational casualty involving the performance of the static system.

# Analysis and considerations (Cont'd)

AEROPERU 603



## Analysis and considerations (Cont'd)

Feedback from one competent authority which performed an analysis of the MOR back since 01/01/2014, has shown no evidences related to pressure ports/RVSM area troubles originated by contamination as subject of this assessment.



## Analysis and considerations (Cont'd)

The statement concerning the purpose of the pre-flight inspection as highlighted in a previous slide, should always be brought in mind.

Pre-flight inspections may be carried out at night, under rain and snow falls, and involves items that may be located at several meters high.

## Analysis and considerations (Cont'd)

At present, there is no *known* evidence that adhesive tape glue residuals (contamination) have caused any operational mishap affecting the altitude accuracy.

## Analysis and considerations (Cont'd)

Currently, there are five options available:

- **PDF** A23 Cat 2 - *Known defect not reported/assessed* – SAFA/SACA-A23-05.
- **PDF** A23 Cat 2 - *No evidence of identification nor monitoring of significant defect* – SAFA/SACA-A23-06.

Both of them followed by a Cat G remark on C01.

## Analysis and considerations (Cont'd)

- **PDF A23 Cat 3** - *Required maintenance action not performed or not in accordance with applicable (MEL/AMM/SRM) instructions – SAFA/SACA-A23-10.*
- **PDF C01 Cat 3** - *Pressure port (and/or RVSM area) damaged or contaminated (outside dispatch limits/conditions) – SAFA/SACA-C01-12.*
- **UDF C01 Cat X** - *with detailed description.*

## Proposal to the PDF WG (Cont'd)

Possible proposal to change present PDFs in:

- **PDF C01 Cat 3** - *Pressure port (and/or RVSM area) damaged or obstructed outside dispatch limits/conditions.*

And add a new PDF:

- **PDF C01 Cat 1 (or 2)** - *Pressure port (and/or RVSM area) contaminated with minor impact on aircraft operation safety.*

## Conclusions (Cont'd)

The external pre-flight inspection for present liners is limited to a very general assessment of the physical appearance of the aircraft, no in-depth checks are required.

There are no dispatch limits on surface adhesive contamination.

## Conclusions

To date, investigation showed that there is no immediate safety concern for glue residuals around pressure ports/RVSM area; (max CAT 2 in case issue addressed against manufacturer standard).

PDF working group will provide information on how to approach pressure ports/RVSM area glue contamination issues.

**Any questions?**

**Thank you for your attention.**

[easa.europa.eu/connect](https://easa.europa.eu/connect)



**Your safety is our mission.**

An Agency of the European Union 