Peimann TOFIGHI-NIAKI
Senior Engineer, A320 Family/A330/A340 Standards
Flight Operations Support and Safety Enhancement

The SMOKE/FUMES/ AVNCS SMOKE Procedure

1. Introduction

Until 2002 the Quick Reference Handbook (QRH) contained six independent smoke procedures. The crew had to decide which one to apply according to the suspected smoke source: CARGO, LAVATORY, CREW REST COMPARTMENT, AVIONICS, AIR COND, CABIN EQUIPMENT.

In practice, it is often difficult to discriminate between the last three sources of fire: AVIONICS, AIR COND, CABIN EQUIPMENT.

The procedures applicable to these sources were therefore merged into the single SMOKE/FUMES/AVNCS SMOKE procedure, thus relieving the crew from having to flip back and forth through the QRH pages and from repeating actions in case of switch to another suspected smoke source.

The first three sources of smoke - CARGO, LAVATORY, CREW REST COMPARTMENT- , which are easier to trace, have kept their own dedicated procedures.

This article will describe how the Airbus SMOKE/FUMES/AVNCS SMOKE procedure was developed. It will then explain its philosophy, thereby providing guidelines into the decision making process from the early stage of the procedure.

2. Procedure Development

The procedure takes into account three decisive challenges common to non immediately identified sources of smoke:

- **The shortage of time**
- **The difficulty to identify the smoke source**
- **The need for two ways cockpit/ cabin crew communication.**

2.1 The Shortage of Time

In a smoke situation, timing is critical. Studies show that a fire may become uncontrollable in as little as 8 minutes and that, in this case, the fight crew may have as little as 15 minutes to bring the aircraft on the ground.

For this reason the SMOKE/ FUMES/AVNCS SMOKE ECAM and QRH paper procedures both start with a LAND ASAP message. In the frame of this procedure, the LAND ASAP message requests crews to be prepared for a diversion.

The "Immediate Landing" term, found in the QRH paper procedure, means: "Accept exceptional circumstances such as a tailwind landing, ditching, off airport landing etc"

2.2 The Difficulty to Identify the Smoke Source

As stated in the introduction, Airbus decided to classify the known sources of smoke into two different categories:

- The smoke sources that are easier to locate, because they have an ECAM and/or a local warning, and for which there are available means of fire treatment:
  - CARGO
  - LAVATORY
  - CREW REST COMPARTMENT
- The smoke sources that are more difficult to locate, which may, or may not, be covered by an ECAM alert and that are considered more difficult to deal with:
  - AVIONICS
  - AIR COND
  - CABIN EQUIPMENT

As stated above, these three smoke sources call for the single SMOKE/FUMES/AVNCS SMOKE procedure.

note 1

The QRH SMOKE/FUMES/AVNCS SMOKE paper procedure is to be applied whenever the source of smoke is suspected to be AVIONICS, AIR COND, CABIN EQUIPMENT or in case of doubt about the smoke origin. If another smoke warning is triggered (e.g. LAVATORY SMOKE), the flight crew must apply the dedicated existing procedure.

2.3 The Need for two Ways Cockpit/Cabin Communication

Establishing good two ways communication with the cabin crew is essential in a smoke situation.

In case of smoke in the cabin, the cabin crew should inform the flight crew of the situation as soon as possible and should follow up on smoke dissipation. Vice versa, in case of smoke in the cockpit, the feedback from the cabin crew may prove useful to identify the smoke source.

Communication between cockpit and cabin is important in many situations. However, in a smoke/fire/fumes situation it is so important that Airbus added the CKPT/CABIN COM… ESTABLISH action step in the procedure.

3. Procedure Philosophy

The trigger of a smoke alert is either an ECAM message, or a visual or olfactory perception of smoke (by either cabin or cockpit crew). As soon as an alert is triggered, for which there is no dedicated procedure, the flight crew must apply the SMOKE/FUMES/AVNCS SMOKE procedure without delay. Both ECAM and QRH paper procedures are totally compatible with one another.

As mentioned in 2.1, the procedure starts with a LAND ASAP message.

In a smoke situation this message alerts the crew to anticipate the diversion.

The procedure is then designed around the following action blocks:

- **Immediate Actions**
- **AT ANY TIME Items**
- **Diversion Decision**
- **Troubleshooting.**

3.1 Immediate Actions

The first action block of the procedure is referred to as the "Immediate Actions" (fig. 1).

They have been designed to be quick, simple, and reversible. They are actions that will not make the situation worse, and prevent recirculation. They protect the crew and ensure communication. Immediate Actions must be applied without delay and prior to any further assessment from the flight crew.

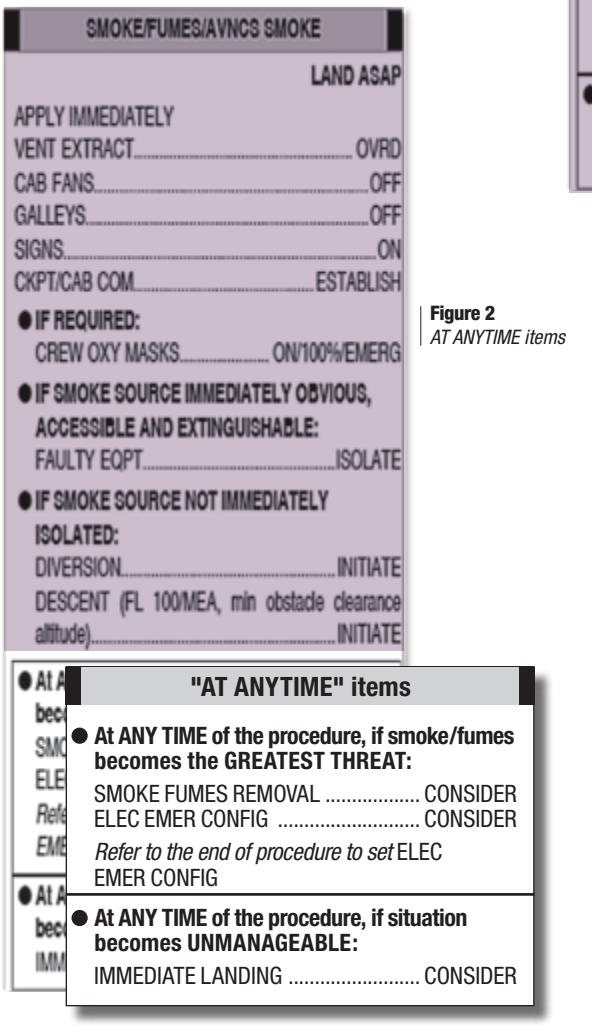


Figure 2
AT ANYTIME items

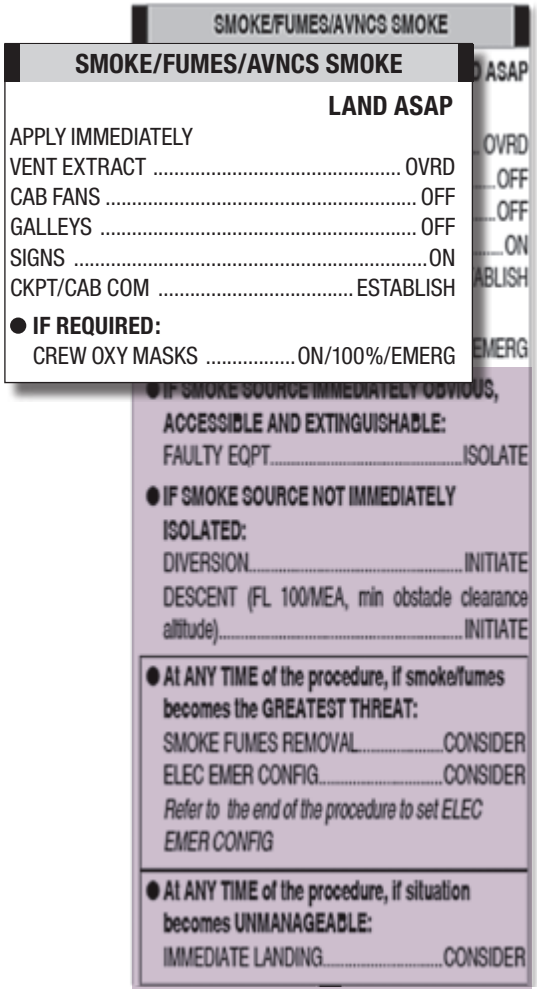


Figure 1
Immediate Actions

3.2 AT ANY TIME Items

The "AT ANY TIME" items must be applied if the smoke becomes the greatest threat or if the situation becomes unmanageable (fig. 2).

As the name suggests, the flight crew can apply the "AT ANY TIME" items at any stage of the procedure, provided that they have at least completed the immediate actions. These items must be known by memory.

It is important to keep in mind that the smoke removal procedure does not stop the smoke source but rather aims at removing the smoke from the cockpit.

The electrical emergency configuration aims to shed as much equipment as possible. On the A330/A340 Family, it is important to note that in electrical emergency configuration, smoke removal cannot be performed. Therefore if considered necessary, the smoke removal procedure must be applied before the electrical emergency configuration is set.

Finally, if the situation becomes unmanageable, if the flight crew is not able to maintain the control of the aircraft until an airfield is reached, then an immediate landing is to be considered.

note 2

As mentioned in 2.1, The "Immediate Landing" term, found in the paper SMOKE/FUMES/AVNCS SMOKE procedure, means: "Accept exceptional circumstances such as a tailwind landing, ditching, off airport landing etc".

3.3 Diversion Decision Making

The crew should consider the following two questions, which constitute the core of the SMOKE/FUMES/AVNCS procedure:

- **Is the smoke source immediately obvious, accessible and extinguishable?**
- If this is the case, **can it be isolated?**

If the answer to these two questions is YES, then this is the end of the procedure.

On the other hand, if the answer to at least one of the two above questions is NO, then the diversion must be initiated. In case of doubt a diversion should be initiated (fig. 3).

TASK SHARING FOR CABIN CREW

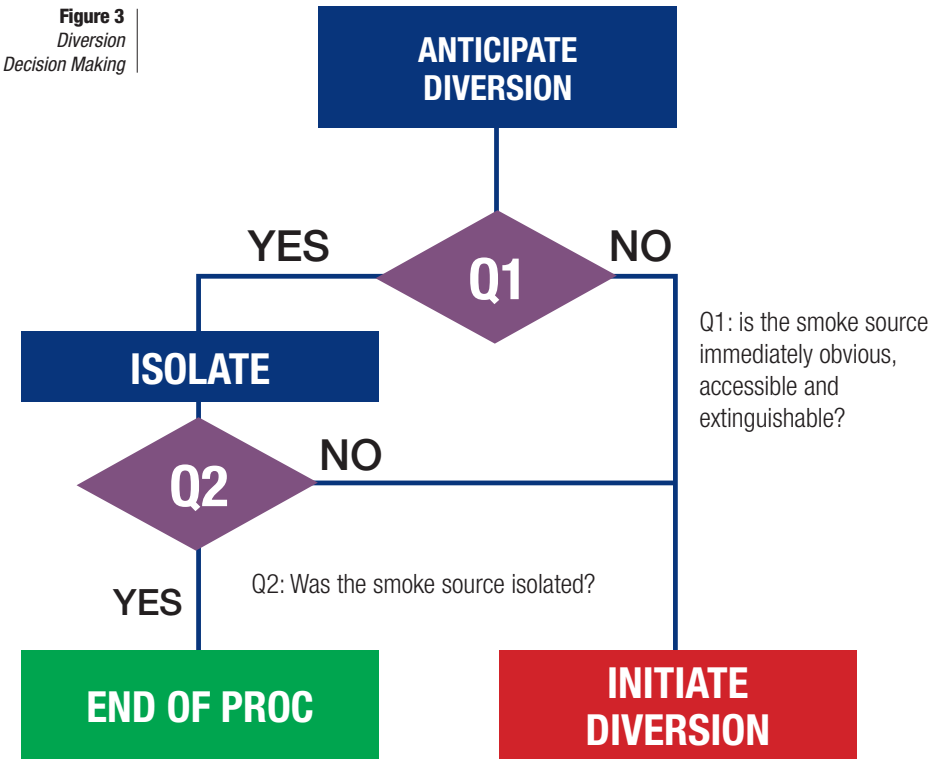
Airbus has developed a precise task sharing for cabin crew, which can be found in the Operator's Cabin Crew Operating Manual (CCOM), or in the "Getting To Grips with Cabin Safety" publication, available on Airbus World. The task sharing identifies three main roles within a cabin crew working team, each having a specific task to best prevent any escalation of the event.

3.4 Troubleshooting

Once the diversion is initiated, the troubleshooting may be carried on in an attempt to identify and fight the origin of the smoke. The identification will be undertaken by isolating different systems and assessing smoke dissipation.

The different smoke sources listed for troubleshooting in the procedure appear in the most probable to least probable order.

Figure 3
Diversion Decision Making



4. Conclusion

In 2002 the SMOKE/FUMES/AVNCS procedure replaced three different smoke procedures applicable to smoke sources that were difficult to locate: AVIONICS, AIR COND, CABIN EQUIPMENT. The other sources of smoke - CARGO, LAVATORY, CREW REST COMPARTMENT- , which are easier to trace, have kept their own dedicated procedures.

The SMOKE/FUMES/AVNCS procedure had to integrate the need to act quickly, the difficulty to identify the smoke source and the necessity to involve both cockpit and cabin crews. Equally, the challenge was to design a single procedure that would cover the largest number of situations while keeping it as simple as possible.

The SMOKE/FUMES/AVNCS procedure starts with an alert to anticipate a diversion and is then designed around four action blocks:

- Immediate Actions
- AT ANY TIME Items
- Diversion Decision Making
- Troubleshooting.

The general action flow calls for the Immediate Actions to be performed first, followed by the decision on whether or not to divert. The troubleshooting actions are performed last.

As implied by the title, the AT ANY TIME items should be performed immediately whenever the smoke/fumes becomes the greatest threat or whenever the situation becomes unmanageable.

Safety First

The Airbus Safety Magazine
For the enhancement of safe flight through increased knowledge and communications

Safety First is published by the Flight Safety Department of Airbus. It is a source of specialist safety information for the restricted use of flight and ground crew members who fly and maintain Airbus aircraft. It is also distributed to other selected organisations.

Material for publication is obtained from multiple sources and includes selected information from the Airbus Flight Safety Confidential Reporting System, incident and accident investigation reports, system tests and flight tests. Material is also obtained from sources within the airline industry, studies and reports from government agencies and other aviation sources.

All articles in Safety First are presented for information only and are not intended to replace ICAO guidelines, standards or recommended practices, operator-mandated requirements or technical orders. The contents do not supersede any requirements mandated by the State of Registry of the Operator's aircraft or supersede or amend any Airbus type-specific AFM, AMM, FCOM, MEL documentation or any other approved documentation.

Articles may be reprinted without permission, except where copyright source is indicated, but with acknowledgement to Airbus. Where Airbus is not the author, the contents of the article do not necessarily reflect the views of Airbus, neither do they indicate Company policy.

Contributions, comment and feedback are welcome. For technical reasons the editors may be required to make editorial changes to manuscripts, however every effort will be made to preserve the intended meaning of the original. Enquiries related to this publication should be addressed to:

Airbus
Product Safety department (GS)
1, rond point Maurice Bellonte
31707 Blagnac Cedex - France
Fax: +33(0)5 61 93 44 29
safetycommunication@airbus.com

A320
Winter operation in Yakutsk, Siberia

Safety First, #15 February 2013. Safety First is published by Airbus S.A.S. - 1, rond point Maurice Bellonte - 31707 Blagnac Cedex/ France. Editor: Yannick Malinge, Chief Product Safety Officer, Nils Fayaud, Director Product Safety Information. Concept Design by Airbus Multi Media Support Ref. 20130248. Computer Graphic by Quat'coul. Copyright: GS 420.1329 Issue 15. Photos copyright Airbus. Photos by ExM Company, Baldur Sveinsson. Printed in France by Airbus Print Centre.

© Airbus S.A.S. 2013 – All rights reserved. Proprietary documents.

By taking delivery of this Brochure (hereafter "Brochure"), you accept on behalf of your company to comply with the following guidelines:

► No other intellectual property rights are granted by the delivery of this Brochure than the right to read it, for the sole purpose of information.

► This Brochure and its content shall not be modified and its illustrations and photos shall not be reproduced without prior written consent of Airbus.

► This Brochure and the materials it contains shall not, in whole or in part, be sold, rented, or licensed to any third party subject to payment.

This Brochure contains sensitive information that is correct at the time of going to press.

This information involves a number of factors that could change over time, effecting the true public representation. Airbus assumes no obligation to update any information contained in this document or with respect to the information described herein.

Airbus S.A.S. shall assume no liability for any damage in connection with the use of this Brochure and of the materials it contains, even if Airbus S.A.S. has been advised of the likelihood of such damages.