



## Flight Operations Briefing Notes

### Human Performance

### Managing Interruptions and Distractions

#### I Introduction

Interruptions and distractions are the main threat facing flight crews.

**Note :**

*A threat is a condition that affects or complicates the performance of a task or the compliance with applicable standards.*

*Threats are conditions, created by the operating environment, that may induce errors ( e.g., omissions, inadvertent actions, ... ).*

The omission of an action or an inappropriate action is the most frequent causal factor in incidents and accidents, as illustrated by **Table 1**.

Interruptions ( e.g., due to ATC communications ) and distractions ( e.g., due to a cabin attendant entering the cockpit ) occur frequently; some cannot be avoided, some can be minimized or eliminated.

The following aspects should be considered to assess company exposure and personal exposure, and to develop prevention strategies and lines-of-defense to lessen the effects of interruptions and distractions in the cockpit :

- Recognize the potential sources of interruptions and distractions;
- Understand their effect on the flow of cockpit duties;
- Reduce interruptions and distractions ( e.g. by adopting the **Sterile Cockpit Rule** );
- Develop prevention strategies and lines-of-defense to minimize the exposure to interruptions and distractions; and,
- Develop techniques to lessen the effects of interruptions and distractions.

## II Statistical Data

The US Aviation Safety Action Program ( ASAP ) reveals that 14 % of crew reports includes reference to an interruption or distraction ( Source – US ASAP – 2000-2001 ).

The following causal factors, frequently observed in approach-and-landing accidents, often are the result of interruptions or distractions in the cockpit :

Factor	% of Events
Omission of action or inappropriate action	72 %
Inadequate crew coordination, cross-check and back-up	63 %
Insufficient or loss of lateral or vertical situational awareness	52 %
Inadequate or insufficient understanding of prevailing conditions	48 %
Slow or delayed action	45 %
Incorrect or incomplete pilot / controller communications	33 %

( Sources : Flight Safety Foundation - ALAR - 1998-1999 )

**Table 1**

*Effects of Distractions and Interruptions in Approach-and-Landing Accidents*

## III Factors Involved in Interruptions and Distractions

Interruptions and distractions in the cockpit may be subtle or be momentary, but all can be disruptive to the flight crew.

Interruptions or distractions usually result from three main causes ( Sources : NASA ASRS – 1998 ) :

- **Communications :**
  - receiving the final weights while taxiing; or,
  - a flight attendant entering the cockpit;
- **Head-down activity :**
  - reading the approach chart; or,
  - programming the FMS;

- **Responding to an abnormal condition or to an unanticipated situation :**
  - system malfunction;
  - weather or environmental threat; or,
- **Searching for traffic following a TCAS / ACAS alert :**
  - traffic collision avoidance system (TCAS) traffic advisory (TA) or resolution advisory (RA) – search for traffic following TCAS / ACAS alert.

Successive surveys of the NASA Aviation Safety Reporting System ( ASRS ) data base identifies the respective contributions of the above factors :

Factor	% of Events
Communications	50 to 68 %
Head-down Activity	16 to 22 %
Response to Abnormal Condition / Unanticipated Situation	14 to 19 %
Searching for Traffic Following TCAS / ACAS Alert	8 to 11 %

( Sources : NASA – ASRS )

**Table 2**  
*Factors Involved in Interruptions and Distractions*

The following **contributing factors** often are cited when discussing interruptions and distractions :

- Flight-deck ergonomics;
- Flight-deck noise level;
- Language proficiency ( pilots and controllers );
- Airport infrastructure ( e.g., unclear markings, ... ) ; and,
- Flightcrew fatigue.

Minor disruptions ( e.g., a minor equipment malfunction ) can turn a routine flight into a challenging event !

#### IV Effect of Interruptions or Distractions

The primary effect of interruptions or distractions is to **break the flow of ongoing cockpit activities** ( i.e., actions or communications ), this includes :

- SOPs;
- Normal checklists;
- Communications ( i.e., listening, processing, responding );
- Monitoring tasks ( i.e., systems monitoring, PF/PNF mutual cross-check and back-up ); and,
- Problem solving activities.

The diverted attention resulting from the interruption / distraction usually leaves the flight crew with the feeling of being rushed and faced with competing / preempting tasks.

When being faced with concurrent task demands, natural human limitations result in performing one task to the detriment of another.

Unless mitigated by adequate techniques, the disruption and lapse of attention may result in:

- Not monitoring the flight path ( e.g., possibly resulting in an altitude or course deviation or a controlled flight into terrain );
- Missing or misinterpreting an ATC instruction ( e.g., possibly resulting in traffic conflict or runway incursion );
- Omitting an action and failing to detect and correct the resulting abnormal condition or configuration ( e.g., interruption during the reading of a normal checklist ); or,
- Experiencing task overload ( i.e., being " **behind the aircraft** " ).

The following **types-of-event** have been observed as a result of interruptions and distractions ( source : Airbus and non-Airbus events operational and human factors analysis ) :

- Taxiway or runway incursion;
- Incorrect aircraft configuration for takeoff;
- Late landing gear retraction;
- Premature slats / flaps retraction; or, conversely,
- Flaps placard-speed (  $V_{FE}$  ) exceedance;
- Late response to ATC instructions;
- Failure to select engine anti-ice, when required;
- Altitude / Flight Level bust in climb or descent;

- Inadequate fuel management ( e.g., late detection of fuel imbalance, ... );
- Speed below minimum speed during descent;
- Failure to reset altimeter setting;
- Altitude deviation or stall during holding pattern;
- Late aircraft configuration for landing;
- Failure to capture ( or monitor capture of ) localizer or glide slope;
- Descent below MDA;
- Taxiway excursion; and / or,
- Failure to set parking brake on arrival at gate or parking stand.

## V Reducing Interruptions and Distractions

Acknowledging that flight crew may have control over some interruptions / distractions and not over some others is the first step in developing prevention strategies and lines-of-defense.

Actions that may be controlled (e.g. SOP's actions, initiation of normal checklists, ...) should be scheduled during periods of less likely disruption, to prevent interference with actions that cannot be controlled (e.g. ATC communications or flight attendant interruptions).

Adhering to the **Sterile Cockpit Rule** can largely reduce interruptions and distractions.

The **Sterile Cockpit Rule** reflects the requirement of U.S. FAR – Part 121.542 :

- “ No flight crewmember may engage in, nor may any pilot in command permit any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties ”.

For the purpose of this requirement, an “ activity ” includes :

- “..., engaging in non-essential conversation within the cockpit and non-essential communication between the cabin and cockpit crews, ... ”.

The term “ critical phases of flight ” encompasses :

- “ all ground operations involving taxi, takeoff and landing, and all other flight operations below 10,000 feet, except cruise flight ”.

In the FARs understanding, the 10,000 feet limit is defined as 10,000 ft MSL.

When operating to or from a high elevation airport, a definition based on 10,000 ft AGL might be considered as more appropriate.

Complying with the **Sterile Cockpit Rule** during taxi-out and taxi-in requires extra discipline as taxi phases often provide a relief between phases of high workload and concentration.

Interruptions / distractions during taxi is the main causal factor in takeoff accidents and runway incursions.

The sterile cockpit rule has been adopted by non-U.S. operators and is also covered (although in less explicit terms) in the JAR-OPS 1.085(d)(8).

**Adhering to the Sterile Cockpit Rule is an integral part of Airbus Standard Operating Procedures ( SOPs ).**

The sterile cockpit rule should be **implemented with good common sense** in order not to break the communication line between flight crewmembers or between cabin crew and flight crew.

Adherence to the Sterile Cockpit Rule should not affect :

- Use of good CRM practices by flight crew; and,
- Communication of emergency or safety related information by cabin crew.

The U.S. FAA acknowledges that **it is better to break the Sterile Cockpit Rule than to fail to communicate !**

The implementation of the Sterile Cockpit Rule by cabin crew creates two challenges :

- How to identify the 10,000 ft limit ?
- How to identify occurrences that warrant breaking the Sterile Cockpit Rule ?

Several methods for signaling to the cabin crew the crossing of the 10,000 feet limit have been evaluated ( e.g., using the all-cabin-attendants call or a public-address announcement ).

Whatever method is used, it should not create its own distraction to the flight crew.

The following occurrences are considered to warrant breaking the Sterile Cockpit Rule :

- Fire, burning smell or smoke in the cabin;
- Medical emergency;
- Unusual noise or vibration ( e.g. evidence of tailstrike on takeoff );
- Engine fire ( e.g., tail pipe or nacelle torching flame );
- Fuel or fluid leakage;
- Uncertainty about condition ( i.e., suspected incapacitation, ... );
- Emergency exit or door unsafe condition ( although this condition is annunciated to the flight crew );

- Extreme local temperature changes ( e.g., suspected bleed air duct leakage );
- Evidence of incorrect or incomplete deicing;
- Cart stowage difficulty;
- Suspicious, unclaimed bag or package; and,
- Any other condition, as deemed relevant by the senior cabin crewmember (purser).

This list may need to be adjusted for local regulations or to suit each individual company policy.

Cabin crewmembers may hesitate to report technical occurrences to the flight crew ( e.g., because of cultural aspects, company policies and / or intimidation ).

To overcome this reluctance, the implementation and interpretation of the sterile cockpit rule should be discussed during cabin crew CRM training, and recalled by the captain during the pre-flight briefing.

Analyses of aviation safety reports indicate that the most frequent violations of the Sterile Cockpit Rule are caused by the following factors :

- Non-flight-related conversations;
- Distractions by cabin crewmembers;
- Non-flight-related radio calls; and/or,
- Non-essential public-address announcements.

## VI Prevention Strategies and Lines-of-defense

A high level of interaction and communication between flight crewmembers, and between flight crew and cabin crews, constitutes the first line of defense to reduce errors.

Effective communication is a **two-way transfer of information**, not just a mere **one-way consultation or registration**.

The foundations for an effective line of communication and interaction between all flight crewmembers and cabin crewmembers should be embedded in :

- Company policies;
- SOPs;
- CRM training; and,
- Leadership role of the pilot-in-command.

Strict adherence to the following operating policies provides safeguards to minimize disruptions or to lessen their effects:

- Sterile Cockpit Rule;
- Operations Golden Rules; and,
- Standard Calls.

The following lines-of-defense address the three families of cockpit disruptions and, thus, prevent or minimize the interference of competing or preempting tasks:

- **Communications :**
  - brief jump-seat rider, as applicable, regarding adherence to the Sterile Cockpit Rule;
  - don headsets during critical phases of flight ( e.g. for any operations below 10,000 ft );
  - plan Public Address ( PA ) announcements during low-workload periods;
  - keep intra-cockpit communications brief, clear and concise; and,
  - interrupt conversations when approaching the defined **next target** or the next altitude restriction / constraint.
- **Head-down activity ( FMS programming or chart review ) :**
  - define task sharing for FMS programming or reprogramming depending on the level of automation being used and on the flight phase ( SOPs );
  - plan long head-down tasks in low-workload periods; and,
  - announce that you are going “ **head-down** ”.
- **Responding to an abnormal condition or to an unanticipated situation :**
  - keep the AP engaged to decrease workload, unless otherwise required;
  - adhere to PF / PNF task sharing for abnormal / emergency conditions ( i.e., PNF should maintain situational awareness, monitor and back-up the PF );
  - give particular attention to normal checklists, because handling an abnormal condition may disrupt the normal flow of SOPs actions;

SOPs actions and normal checklists are initiated based on events ( triggers ); in case of disruption these events may go unnoticed and the absence of the usual trigger may be result in the omission of **actions** or **checklists**.
- **Search for Traffic :**
  - Express a clear and loud “ **I fly, you watch** ” call.

The above lines of defense minimize the flight crew exposure to disruptions caused by interruptions and distractions.

## VII Managing / Mitigating Interruptions and Distractions

Because some interruptions and distractions may be subtle and insidious, the first priority is to **recognize and identify the disruption**.

The second priority is to **re-establish situational awareness**, as follows :

- **Identify :**
  - What was I doing?
- **Ask :**
  - Where was I interrupted?
- **Decide/Act :**
  - What decision or action shall I take to get “back on track” ?

The following **decision-making-process** should be applied:

- **Prioritize :**
  - Operations Golden Rules provide clear guidelines for task prioritization :
    - **“ Fly, Navigate, Communicate and Manage systems, in that order ”.**
- **Plan :**
  - Some actions may have to be postponed until time and conditions permit.  
Asking for more time ( e.g. from the ATC or from the other crewmember ) will prevent being rushed in the accomplishment of competing actions.  
In other words, **take time to make time**.
- **Verify :**
  - Using SOPs techniques ( i.e., concept of next target, action blocks, event triggers and normal checklists ), ensure that the action(s) that had been postponed have been duly accomplished.

Finally, if the disruption interrupt the course of a normal checklist or abnormal checklist, an explicit hold should be verbalized to mark the interruption of the checklist and an explicit command should be used for resuming the checklist.

## VIII Summary of key points

Interruptions and distractions usually result from the following factors :

- Pilot / controller or intra-cockpit communications ( i.e., including flight crew / cabin crew communications );
- Head-down activity;
- Responding to an abnormal condition or an unanticipated situation; or,
- Searching for traffic.

Prevention strategies and lines-of-defense should be developed to minimize interruptions and distractions and to lessen their effects.

Strict adherence to the following standards is the most effective company prevention strategy and personal line-of-defense:

- SOPs;
- Operations Golden Rules;
- Standard calls;
- Sterile Cockpit Rule; and,
- Recovery techniques such as :
  - Identify – ask – decide – act; and,
  - Prioritize – plan – verify.

## IX Associated Flight Operations Briefing Notes

The following Flight Operations Briefing Notes provide expanded information to complement the discussion of interruptions and distractions :

- **Operations Golden Rules**
- **Standard Calls**
- **Normal Checklists**
- **Human Factors in Incidents / Accidents**
- **CRM Aspects in Incidents / Accidents**
- **Effective Pilot / Controller Communications**
- **Threat Management**
- **Error Management**

## X Regulatory References

- ICAO - Preparation of an Operations Manual (Doc 9376).
- ICAO – Human Factors Training Manual (Doc 9683).
- ICAO – Human Factors Digest No 8 – Human Factors in Air Traffic Control (Circular 241).
- FAR 121.406, 121.419, 121.421 or 121.422 - CRM Training.
- FAR 121.542 – Sterile Cockpit Rule.
- JAR-OPS 1.945, 1.955 or 1.965 - CRM Training.
- JAR-OPS 1.085(d)(8) – Sterile Cockpit.

## XI Industry References

- Flight Safety Foundation website – <http://www.flightsafety.org>
- NASA – ASRS website - <http://asrs.arc.nasa.gov/main.htm>

This Flight Operations Briefing Note (FOBN) has been developed by Airbus in the frame of the Approach-and-Landing Accident Reduction (ALAR) international task force led by the Flight Safety Foundation.

This FOBN is part of a set of Flight Operations Briefing Notes that provide an overview of the applicable standards, flying techniques and best practices, operational and human factors, suggested company prevention strategies and personal lines-of-defense related to major threats and hazards to flight operations safety.

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