



## Flight Operations Briefing Notes Standard Operating Procedures Operations Golden Rules

### I Introduction

*Golden Rules* have always guided human activities.

In early aviation days, the *Operations Golden Rules* defined the principles of basic airmanship.

With the development of modern-technology aircraft and with research on man-machine-interface and crew-coordination, *Operations Golden Rules* have been broadened to encompass the principles of interaction with automation and crew resources management (CRM).

The *operations Golden Rules* defined by Airbus assist trainees in maintaining their basic airmanship as they progress to increasingly integrated and automated aircraft models.

These rules apply with little modification to all Airbus models.

Although developed for trainees, the *Operations Golden Rules* are equally useful for experienced line pilots.

*Operations Golden Rules* address aspects that are considered frequent causal factors in incidents and accidents, e.g.:

- Inadequate situational / positional awareness;
- Incorrect interaction with automation;
- Overreliance on automation; and,
- Ineffective crew cross-check and mutual backup.

## II Statistical Data

The following factors frequently are identified as causal factor in approach-and-landing accidents:

Factor	% of Events
Inadequate decision making	74 %
Omission of action or inappropriate action	72 %
Inadequate CRM practice (crew coordination, cross-check and backup)	63 %
Insufficient horizontal or vertical situational awareness	52 %
Inadequate or insufficient understanding of prevailing conditions	48 %
Slow or delayed crew action	45 %
Flight handling difficulties	45 %
Incorrect or incomplete pilot / controller communication	33 %
Interaction with automation	20 %

( Source : Flight Safety Foundation – 1998-1999 )

**Table 1**

*Most Frequent Causal Factors in Approach-and-Landing Accidents*

## III General Golden Rules

The following eight *Operations Golden Rules* are applicable in normal conditions and, more importantly, in any unanticipated or abnormal / emergency condition.

### III.1 Automated aircraft can be flown like any other aircraft

To promote this rule, each trainee should be given the opportunity to fly the simulator just using the *yoke / sidestick, rudder and throttles / thrust levers*.

The use of flight director (FD), autopilot (AP), autothrottle/autothrust (A/THR) and flight management system (FMS) should be introduced progressively, as defined by the applicable training syllabus.

Practice of hand flying will illustrate that the pilot flying (PF) always retains the authority and capability to adopt:

- A more direct level of automation; or revert to,
- Hand flying, directly controlling the aircraft trajectory and energy.

### III.2 Fly, Navigate, Communicate and Manage – in that order

Task sharing should be adapted to the prevailing situation (i.e., task sharing for hand flying or with AP engaged, task sharing for normal operation or for abnormal / emergency conditions, as defined in the applicable FCOM) and tasks should be accomplished in accordance with the following priorities:

#### **Fly ( Aviate ) :**

PF must concentrate on **flying the aircraft** (i.e., by controlling and/or monitoring the pitch attitude, bank angle, airspeed, thrust, sideslip, heading, ...) to capture and maintain the desired targets, vertical flight path and lateral flight path.

PNF must backup the PF by monitoring flight parameters and by calling any excessive deviation.

#### **Navigate :**

Select the desired modes for vertical navigation and lateral navigation (i.e., selected modes or FMS-managed navigation), being aware of surrounding terrain and minimum safe altitude.

This rule can be summarized by the following three " know where ... " statements of situational-awareness :

- **Know where you are;**
- **Know where you should be; and,**
- **Know where the terrain and obstacles are.**

#### **Communicate :**

Effective crew communication involves communications between flight crew and controller, between flight crew members and between flight crew and cabin crew.

Communication allows sharing goals and intentions and enhancing crew's situational awareness.

In an abnormal or emergency condition, after a stable flight path has been regained and the abnormal or emergency condition has been identified, the PF should inform the ATC of the prevailing condition and of his/her intentions.

To attract the controller's attention, use the following standard phraseology, as applicable:

- Pan Pan – Pan Pan – Pan Pan; or
- Mayday – Mayday – Mayday.

#### Manage :

Managing the continuation of the flight is the next priority, this includes:

- Managing aircraft systems (e.g., fuel management, diversion management, etc); and,
- Performing applicable emergency and/or abnormal procedure(s).

Specific *Golden Rules* to assist flight crew in their decision-making and management process are provided in the second part of this *Flight Operations Briefing Note*.

The design of glass-cockpit aircraft fully supports the above four-step strategy, as summarized in **Table 2**.

Golden Rule	Display Unit
<b>Fly</b>	PFD
<b>Navigate</b>	ND
<b>Communicate</b>	DCDU
<b>Manage</b>	ECAM, FMS CDU

**Table 2**

*Glass-cockpit Design Supports Golden Rules*

### III.3 One head up at all times

Significant changes to the FMS flight plan should be performed by PNF and cross-checked by PF, after transfer of controls, in order to **maintain one head up at all times** for supervising the progress of the flight and aircraft systems (on PFD, ND and ECAM display units).

### III.4 Cross check the accuracy of the FMS with raw data

When within nav aids coverage area, FMS navigation accuracy should be cross-checked against nav aids raw-data (unless aircraft is GPS-equipped and GPS PRIMARY is available).

FMS navigation accuracy can be checked by:

- Entering a tuned VOR-DME in the bearing/distance (BRG / DIST TO) field of the appropriate FMS page;
- Comparing the resulting FMS DIST TO reading with the DME distance read on the RMI (or on ND, as applicable);
- Checking the difference between FMS DIST TO and DME distance against the criteria applicable for the flight phase (as defined in SOPs).

If the required FMS navigation accuracy criteria is not achieved, revert from NAV mode to selected heading mode with reference to nav aids raw-data.

Select PF ND to ARC or ROSE mode. If no map shift is observed, PNF may keep ND in MAP mode, with display of speed constraints and/or altitude constraints, for enhanced horizontal and vertical situational awareness.

### III.5 Know your guidance at all times

The Flight Control Unit (FCU) and FMS Control Display Unit (CDU) and keyboard are the prime interfaces **for the crew to communicate with aircraft systems** (i.e., to arm modes or engage modes and to set targets).

The Primary Flight Display (PFD) - particularly the Flight Modes Annunciator (FMA) section and target symbols on speed scale and altitude scale - and Navigation Display (ND) are the prime interfaces **for the aircraft to communicate with the crew**, to confirm that the aircraft systems have correctly accepted the flight crew's mode selections and target entries.

Any action on FCU or on FMS keyboard / line-select keys should be confirmed by cross-checking the corresponding annunciation or data on PFD and/or ND.

At all times, the PF and PNF should be aware of:

- Modes armed or engaged;
- Guidance targets set;
- Aircraft response in terms of attitude, speed and trajectory; and,
- Mode transitions or reversions.

### III.6 When things don't go as expected, Take over

If the aircraft does not follow the desired vertical flight path / lateral flight path or the selected targets, and time does not permit analyzing and solving the observed behavior, revert without delay from:

- **FMS guidance to selected guidance;**

or from,

- **Selected guidance to hand flying.**

#### III.7 Use the correct level of automation for the task

On highly automated and integrated aircraft, several levels of automation are available to perform a given task:

- FMS modes and guidance; or,
- Selected modes and guidance.

The **correct level of automation** depends on:

- The task to be performed:
  - short-term (tactical) task; or,
  - long-term (strategic) task;
- The flight phase:
  - departure, enroute, terminal area or approach-and-landing; and,
- The time available:
  - normal selection or entry; or,
  - last-minute change.

The **correct level of automation** often is **the one the pilot feels the most comfortable with**, depending on his/her knowledge and experience of the aircraft and systems, skills and confidence.

Reversion to hand-flying and manual thrust-control may be the **“correct level of automation”**, for the prevailing conditions.

#### III.8 Practice task sharing and back-up each other

Task sharing, effective cross-check and backup should be practiced in all phases of ground and flight operation, in normal operation or in abnormal / emergency conditions.

Emergency, abnormal and normal procedures (i.e., normal checklists) should be performed as directed by the ECAM and/or QRH, e.g. :

- In case of an emergency condition:
  - **emergency procedure**;
  - **normal checklist** (as applicable); and,
  - **abnormal procedure(s)**.

- In case of an abnormal condition:
  - abnormal procedure down to the STATUS page;
  - normal checklist (as applicable); and,
  - resuming abnormal procedure(s).

These actions should be accomplished in accordance with the published task sharing, crew coordination principles and phraseology.

Critical or irreversible actions, such as selecting an engine fuel lever / master switch or a fuel isolation valve to OFF, should be accomplished by the PNF but require prior confirmation by the PF (i.e., confirmation loop).

#### IV The Golden Rules Card

The **GOLDEN RULES** card has been developed to promote and disseminate the *Operations Golden Rules*.

The card is provided to all trainees attending a flight-crew-training course at an Airbus Training Center (i.e., in Toulouse, Miami and Beijing).



**Figure 3**

*Golden Rules Card*

#### V Golden Rules for Abnormal and Emergency Conditions

The following additional rules may assist flight crew in their decision making when in an abnormal or emergency condition, but also when faced with a condition or circumstance that is beyond the scope of published procedures.

##### V.1 Understand the prevailing condition before acting

Incorrect decisions often are the result of an incorrect recognition and identification of the actual prevailing condition.

##### V.2 Assess risks and time pressures

Take time to make time, by:

- Delaying actions, when possible (e.g., during takeoff and final approach); and/or,
- Requesting entering a holding pattern or requesting delaying vectors (as appropriate).

##### V.3 Review and evaluate the available options

Consider weather conditions, crew preparedness, type of operation, airport proximity and self-confidence when selecting the preferred option.

Include all flight crewmembers, cabin crew, ATC and company maintenance, as required, in this evaluation (as applicable).

Consider all implications before deciding and plan for contingencies.

Consider all the aspects of the continuation of the flight until landing and reaching a complete stop.

##### V.4 Match the response to the situation

An emergency condition requires an immediate action (this does not mean a rushed action) whereas abnormal conditions may tolerate a delayed action.

##### V.5 Manage workload

Adhere to the defined task sharing for abnormal / emergency conditions to reduce workload and optimize flight crew resources.

Use AP-A/THR, if available, to alleviate the PF workload.

Use the correct level of automation for the task and circumstances.



#### V.6 Create a shared problem model with other crewmembers

Communicate with other flight and cabin crewmembers to create a shared understanding of :

- Prevailing condition(s); and,
- Planned actions.

Creating a shared problem model allows crewmembers to work with a **common reference** towards a **common and well-understood objective**.

#### V.7 Apply recommended procedures and other agreed actions

Understand the reasons and implications of any action before acting and **check the result(s) of each action before proceeding with the next step**.

Beware of irreversible actions (i.e., apply strict confirmation and cross-check before acting).

### VI Summary of Key Points

*Operations Golden Rules* constitute a set of key points for safe operation under normal, abnormal and emergency conditions.

If only one lesson were to be learned from the above set of *Operation Golden Rules*, the following is proposed:

*Whatever the prevailing condition(s), always ensure that one pilot is controlling and monitoring the flight path of the aircraft.*

### VII Associated Briefing Notes

The following *Flight Operations Briefing Notes* can be referred to, for further illustrating and developing the above information:

- **Operating Philosophy,**
- **Optimum Use of Automation,**
- **Use of Normal Checklists,**
- **CRM Issues in Incidents and Accidents.**

#### VIII Regulatory References

- ICAO – Human Factors Training Manual (Doc 9683).
- FAA – AC 60-22 – Aeronautical Decision Making.

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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