

FSF ALAR BRIEFING NOTE 1.1

Operating Philosophy

Adherence to standard operating procedures (SOPs) is an effective method of preventing approach-and-landing accidents (ALAs), including those involving controlled flight into terrain (CFIT).

Crew resource management (CRM) is not effective without adherence to SOPs.

Statistical Data

The Flight Safety Foundation Approach-and-landing Accident Reduction (ALAR) Task Force found that “omission of action/inappropriate action” (i.e., *inadvertent* deviation from SOPs) was a causal factor¹ in 72 percent of 76 ALAs and serious incidents worldwide in 1984 through 1997.²

The task force also found that “deliberate nonadherence to procedures” was a causal factor in 40 percent of the accidents and serious incidents.

Manufacturer’s SOPs

SOPs published by an airframe manufacturer are designed to:

- Reflect the manufacturer’s flight deck design philosophy and operating philosophy;
- Promote optimum use of aircraft design features; and,
- Apply to a broad range of company operations and environments.

The initial SOPs for a new aircraft model are based on the manufacturer’s objectives and on the experience acquired during flight-testing programs and route-proving programs.

After they are introduced into service, SOPs are reviewed periodically and are improved based on feedback received from users (in training and in line operations).

Customized SOPs

An airframe manufacturer’s SOPs can be adopted “as is” by a company or can be used to develop customized SOPs.

Changes to the airframe manufacturer’s SOPs should be coordinated with the manufacturer and should be approved by the appropriate authority.

SOPs must be clear and concise; expanded information should reflect the company’s operating philosophy and training philosophy.

U.S. Federal Aviation Administration (FAA) Advisory Circular 120-71A, *Standard Operating Procedures for Flight Deck Crewmembers*, published Aug. 10, 2000, includes a list of generic topics that can be used for the development of company SOPs (see *Standard Operating Procedures Template*).

Company SOPs usually are developed to ensure standardization among different aircraft fleets operated by the company.

Company SOPs should be reassessed periodically, based on revisions of the airframe manufacturer’s SOPs and on internal company feedback, to identify any need for change.

Flight crews and cabin crews should participate with flight standards personnel in the development and revision of company SOPs to:

- Promote constructive feedback; and,
- Ensure that the SOPs, as well as the reasons for their adoption, are understood fully by users.

Scope of SOPs

The primary purpose of SOPs is to identify and describe the standard tasks and duties of the flight crew for each flight phase.

SOPs generally are performed by recall, but tasks related to the selection of systems and to the aircraft configuration should be cross-checked with normal checklists.

SOPs are supplemented usually by information about specific operating techniques or by recommendations for specific types of operations (e.g., operation on wet runways or contaminated runways, extended operations [ETOPS] and/or operation in reduced vertical separation minimum [RVSM] airspace).

SOPs assume that all aircraft systems are operating normally and that all automatic functions are used normally. (A system may be partially inoperative or totally inoperative without affecting the SOPs.) SOPs should emphasize the following items:

- Operating philosophy;
- Task sharing;
- Optimum use of automation;
- “Golden rules” (see [FSF ALAR Briefing Note 1.3 — Golden Rules](#));
- Standard calls;
- Normal checklists;
- Approach briefings;
- Altimeter-setting and cross-checking procedures;
- Descent profile management;
- Energy management;
- Terrain awareness;
- Approach hazards awareness;
- Radio altimeter;
- Elements of a stabilized approach (see recommendations) and approach gate³;
- Approach procedures and techniques;
- Landing and braking techniques; and,
- Preparation and commitment to go around.

General Principles

SOPs should contain safeguards to minimize the potential for inadvertent deviations from SOPs, particularly when operating under abnormal conditions or emergency conditions, or when interruptions/distractions occur. Safeguards include:

- Action blocks — groups of actions being accomplished in sequence;
- Triggers — events that initiate action blocks;
- Action patterns — instrument panel scanning sequences or patterns supporting the flow and sequence of action blocks; and,
- Standard calls — standard phraseology and terms used for effective crew communication.

Recommended Elements of a Stabilized Approach

All flights must be stabilized by 1,000 ft above airport elevation in instrument meteorological conditions (IMC) and by 500 ft above airport elevation in visual meteorological conditions (VMC). An approach is stabilized when all of the following criteria are met:

1. The aircraft is on the correct flight path;
2. Only small changes in heading/pitch are required to maintain the correct flight path;
3. The aircraft speed is not more than $V_{REF} + 20$ kt indicated airspeed and not less than V_{REF} ;
4. The aircraft is in the correct landing configuration;
5. Sink rate is no greater than 1,000 fpm; if an approach requires a sink rate greater than 1,000 fpm, a special briefing should be conducted;
6. Power setting is appropriate for the aircraft configuration and is not below the minimum power for approach as defined by the aircraft operating manual;
7. All briefings and checklists have been conducted;
8. Specific types of approaches are stabilized if they also fulfill the following: instrument landing system (ILS) approaches must be flown within one dot of the glideslope and localizer; a Category II or Category III ILS approach must be flown within the expanded localizer band; during a circling approach, wings should be level on final when the aircraft reaches 300 ft above airport elevation; and,
9. Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.

An approach that becomes unstabilized below 1,000 ft above airport elevation in IMC or below 500 ft above airport elevation in VMC requires an immediate go-around.

Source: FSF ALAR Task Force

Standardization

SOPs are the reference for crew standardization and establish the working environment required for CRM.

Task Sharing

The following guidelines apply to any flight phase but are particularly important to the high-workload approach-and-landing phases.

The pilot flying (PF) is responsible for controlling the horizontal flight path and the vertical flight path, and for energy management, by:

- Supervising autopilot operation and autothrottle operation (maintaining awareness of the modes armed or selected, and of mode changes); or,
- Hand flying the aircraft, with or without flight director (FD) guidance, and with an appropriate navigation display (e.g., horizontal situation indicator [HSI]).

The pilot not flying/pilot monitoring (PNF/PM) is responsible for monitoring tasks and for performing the actions requested by the PF; this includes:

- Performing the standard PNF/PM tasks:
 - SOP actions; and,
 - FD and flight management system (FMS) mode selections and target entries (e.g., altitude, airspeed, heading, vertical speed, etc.), when the PF is hand flying the aircraft;
- Monitoring systems and aircraft configuration; and,
- Cross-checking the PF to provide backup as required (this includes both flight operations and ground operations).

The PNF/PM should question any actions taken by the PF that are not understood or are considered inappropriate.

Although many airlines prefer the term *pilot monitoring* to reflect the primary responsibility of the PNF, it should be recognized that both the PNF/PM and the PF have a monitoring role.

Automation

With higher levels of automation, flight crews have more options and strategies from which to select for the task to be accomplished.

Company SOPs should define accurately the options and strategies available for the various phases of flight and for the various types of approaches.

Training

Disciplined use of SOPs and normal checklists should begin during transition training, because habits and routines acquired during transition training have a lasting effect.

Transition training and recurrent training provide a unique opportunity to discuss the reasons for SOPs and to discuss the consequences of failing to adhere to them.

Conversely, allowing deviations from SOPs and/or normal checklists during initial training or recurrent training may encourage deviations during line operations.

Deviations From SOPs

To ensure adherence to published SOPs, it is important to understand why pilots intentionally or inadvertently deviate from SOPs.

In some intentional deviations from SOPs, the procedure that was followed in place of the SOP seemed to be appropriate for the prevailing situation.

The following factors and conditions are cited often in discussing deviations from SOPs:

- Inadequate knowledge or failure to understand the procedure (e.g., wording or phrasing was not clear, or the procedure was perceived as inappropriate);

- Insufficient emphasis during transition training and recurrent training on adherence to SOPs;
- Inadequate vigilance (e.g., fatigue);
- Interruptions (e.g., communication with air traffic control);
- Distractions (e.g., flight deck activity);
- Task saturation;
- Incorrect management of priorities (e.g., lack of a decision-making model for time-critical situations);
- Reduced attention (tunnel vision) in abnormal conditions or high-workload conditions;
- Inadequate CRM (e.g., inadequate crew coordination, cross-check and backup);
- Company policies (e.g., schedules, costs, go-arounds and diversions);
- Other policies (e.g., crew duty time);
- Personal desires or constraints (e.g., schedule, mission completion);
- Complacency; and,
- Overconfidence.

These factors may be used to assess company exposure to deviations and/or personal exposure to deviations, and to develop corresponding methods to help prevent deviations from SOPs.

Summary

Deviations from SOPs occur for a variety of reasons; intentional deviations and inadvertent deviations from SOPs have been identified as causal factors in many ALAs.

CRM is not effective without adherence to SOPs, because SOPs provide a standard reference for the crew's tasks on the flight deck. SOPs are effective only if they are clear and concise.

Transition training provides the opportunity to establish the disciplined use of SOPs, and recurrent training offers the opportunity to reinforce that behavior.

The following FSF ALAR Briefing Notes provide information to supplement this discussion:

- [1.2 — Automation](#);
- [1.3 — Golden Rules](#);
- [1.4 — Standard Calls](#);
- [1.5 — Normal Checklists](#);
- [1.6 — Approach Briefing](#);
- [2.1 — Human Factors](#); and,
- [2.2 — Crew Resource Management](#). ➔

Notes

1. The Flight Safety Foundation Approach-and-landing Accident Reduction (ALAR) Task Force defines *causal factor* as “an event or item judged to be directly instrumental in the causal chain of events leading to the accident [or incident].” Each accident and incident in the study sample involved several causal factors.
2. Flight Safety Foundation. “Killers in Aviation: FSF Task Force Presents Facts About Approach-and-landing and Controlled-flight-into-terrain Accidents.” *Flight Safety Digest* Volume 17 (November–December 1998) and Volume 18 (January–February 1999): 1–121. The facts presented by the FSF ALAR Task Force were based on analyses of 287 fatal approach-and-landing accidents (ALAs) that occurred in 1980 through 1996 involving turbine aircraft weighing more than 12,500 pounds/5,700 kilograms, detailed studies of 76 ALAs and serious incidents in 1984 through 1997 and audits of about 3,300 flights.
3. The FSF ALAR Task Force defines *approach gate* as “a point in space (1,000 feet above airport elevation in instrument meteorological conditions or 500 feet above airport elevation in visual meteorological conditions) at which a go-around is required if the aircraft does not meet defined stabilized approach criteria.”

Related Reading From FSF Publications

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Notice

The Flight Safety Foundation (FSF) Approach-and-Landing Accident Reduction (ALAR) Task Force produced this briefing note to help prevent approach-and-landing accidents, including those involving controlled flight into terrain. The briefing note is based on the task force's data-driven conclusions and recommendations, as well as data from the U.S. Commercial Aviation Safety Team's Joint Safety Analysis Team and the European Joint Aviation Authorities Safety Strategy Initiative.

This briefing note is one of 33 briefing notes that comprise a fundamental part of the FSF *ALAR Tool Kit*, which includes a variety of other safety products that also have been developed to help prevent approach-and-landing accidents.

The briefing notes have been prepared primarily for operators and pilots of turbine-powered airplanes with underwing-mounted engines, but they can be adapted for those who operate airplanes with fuselage-mounted turbine engines, turboprop power plants or piston engines. The briefing notes also address operations with the following: electronic flight instrument systems; integrated

autopilots, flight directors and autothrottle systems; flight management systems; automatic ground spoilers; autobrakes; thrust reversers; manufacturers'/ operators' standard operating procedures; and, two-person flight crews.

This information is not intended to supersede operators' or manufacturers' policies, practices or requirements, and is not intended to supersede government regulations.

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