FLIGHT SAFETY FOUNDATION

ALAR

APPROACH-AND-LANDING ACCIDENT REDUCTION

TOOL KIT

FSF ALAR BRIEFING NOTE 2.2

Crew Resource Management

Minimum required crew resource management (CRM) training is defined by regulations, and companies should consider customized CRM training for company-specific operations, such as multi-cultural flight crews.

Statistical Data

The Flight Safety Foundation Approach-and-landing Accident Reduction (ALAR) Task Force found that failure in CRM (i.e., flight crew coordination, cross-check and backup) was a causal factor[1] in 63 percent of 76 approach-and-landing accidents and serious incidents worldwide in 1984 through 1997.[2]

Because CRM is a key factor in flight crew performance and in their interaction with automated systems, *CRM has a role to some degree in most aircraft incidents and accidents*.

Company Safety Culture and Policies

Although the flight crew is the last line of defense — and usually the last link in an error chain — many factors associated with accidents are early links in the accident chain and can be forged far from the flight deck. The early links could be inadequate training, a design flaw in equipment or incorrect maintenance.

Thus, company safety culture should support CRM throughout the organization, as well as among aircraft crewmembers.

International Cultural Factors

As more companies have international operations and multi-cultural flight crews, cultural factors become an important part of customized CRM training.

Understanding differences among cultures and recognizing the importance of national sensitivities should be emphasized in CRM training.

The importance of using standard phraseology as a common working language also should be emphasized.

Leadership

The role of the pilot-in-command (PIC) in complex and demanding situations (e.g., an approach with marginal weather conditions, abnormal conditions or emergency conditions) is an integral part of CRM training.

Teamwork

The captain's attitude in establishing communication with the first officer and flight attendants is essential to maintain open communication, thus ensuring effective:

- Human relations (e.g., effective crew communication);
- Teamwork (e.g., encouraging the first officer to voice any concern about the safety and the progress of the flight); and,
- Crew coordination, cross-check and backup.

Conducting a preflight briefing that includes the flight crew and the cabin crew is one method of establishing the basis for effective teamwork.

Assertiveness

Incidents and accidents have revealed that when an option (such as conducting a go-around) has not been briefed, the flight crew may lack the information to make the go-around decision or to conduct the missed approach correctly.

Fatigue, overconfidence or reluctance to change a plan often result in inadequate assertiveness and decision making.

The pilot not flying/pilot monitoring should question any actions taken by the pilot flying that are not understood or are considered inappropriate.

Inquiry and Advocacy

Flight crews often receive air traffic control (ATC) requests that are either:

- Not understood (e.g., instructions to fly below the minimum safe altitude when the minimum vectoring altitude is not known); or,
- Challenging (e.g., a request to fly higher and/or faster than desired, or to fly a shorter route than desired).

Flight crews should not accept instructions without asking for clarification or being sure that they can comply safely with the instructions.

Procedures

Deviations from standard operating procedures (SOPs) and from other procedures usually are not deliberate; understanding the human factors involved in such deviations is essential for the development of company accident-prevention strategies.

Briefings

Conducting effective and interactive briefings requires adherence to SOPs to ensure crew coordination and preparation for planned or unexpected occurrences.

Time Management

Taking time to make time, task sharing and ensuring task prioritization are essential factors in *staying ahead of the aircraft*.

Interruptions/Distractions

Coping with interruptions/distractions on the flight deck requires the flight crew "to expect the unexpected," which lessens the effects of any disruption in the flow pattern of ongoing flight deck activities.

Error Management

Error management should be practiced at the company level and at the personal level.

To foster this practice, identifying and understanding the relevant factors that cause errors are necessary for the development of associated:

- Company accident-prevention strategies; and,
- Personal lines of defense.

The most critical aspect in discussing error management is not the error (deviation), but the failure to detect the error by cross-checking.

Risk Management

Risk management is the process of assessing potential safety hazards and finding ways to avoid the hazards or to minimize their effects on safety.

Risk management should be seen as *a balanced management of priorities*.

Decision Making

SOPs sometimes are perceived as limiting the flight crew's judgment and decisions.

Without denying the captain's emergency authority, SOPs are safeguards against biased decision making.

Effective flight crew decision making often requires a joint evaluation of options prior to proceeding with an agreed-upon decision and action.

The effect of pressures (such as delays or company policies) that may affect how the flight crew conducts the flight and makes decisions should be recognized by the aviation industry.

Nevertheless, eliminating all pressures is not a realistic objective. Thus, CRM — incorporated with company accident-prevention strategies and personal lines of defense — should be used to cope effectively with such pressures.

For example, using a tactical-decision-making model for time-critical situations is an effective technique.

Several tactical-decision-making models (usually based on memory aids or on sequential models) are available for discussion during CRM training.

All tactical-decision-making models include the following steps:

- Recognizing the prevailing condition;
- Assessing short-term consequences and long-term consequences for the flight;
- Evaluating available options and procedures;
- Deciding on a course of action;
- Taking action in accordance with the defined procedures, as available, and task sharing;
- Evaluating and monitoring results; and,
- Resuming standard flying duties.

Postponing a decision until a safe option is no longer available is a recurring pattern in ALAs.

CRM Factors

The following CRM factors have been identified as contributing to approach-and-landing incidents and accidents, including controlled flight into terrain:

- Risks associated with complacency (e.g., when operating at a familiar airport) or with overconfidence (e.g., resulting from a high level of experience with the aircraft);
- Inadequate proactive flight management (i.e., not "staying ahead of the aircraft");
- Inadequate preparedness to respond to changing situations or to an emergency (i.e., expecting the unexpected) by precise

planning and by using all the available flight deck technical and human resources;

- Crewmembers' personal factors (e.g., fatigue, spatial disorientation); and/or,
- Absence of specific training of instructors and check airmen to evaluate the CRM performance of trainees and line pilots.

Factors Affecting CRM

The following factors may adversely affect implementation of effective CRM:

- Company culture and policies;
- Belief that actions or decisions are the correct ones at the time, although they deviate from SOPs;
- Effects of fatigue and inadequate countermeasures for restoring vigilance and alertness; and/or,
- Reluctance to accept the influence of human factors and CRM in ALAs.

Summary

CRM alone is not the answer or universal remedy for preventing ALAs. Nevertheless, CRM is a powerful tool to optimize flight crew performance.

Good CRM skills:

- Relieve the effects of pressures, interruptions and distractions;
- Provide benchmarks for timely decision making; and,
- Provide safeguards for effective error management.

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

- 1.1 — Operating Philosophy;
- 1.3 — Golden Rules;
- 1.4 — Standard Calls;
- 1.5 — Normal Checklists;
- 1.6 — Approach Briefing;
- 2.1 — Human Factors;
- 2.3 — Pilot-Controller Communication; and,
- 2.4 — Interruptions/Distractions.

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.

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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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