



Flight Safety Foundation

# ALAR

Approach-and-landing Accident Reduction

# Tool Kit

## FSF ALAR Briefing Note

### 6.1 — Being Prepared to Go Around

The importance of being *go-around-prepared* and being *go-around-minded* must be emphasized, because a go-around is not a frequent occurrence. This requires having a clear mental image of applicable briefings, standard calls, sequences of actions, task-sharing and cross-checking, and being prepared to abandon the approach if requirements are not met in terms of:

- Weather minimums; or,
- Criteria for a stabilized approach (Table 1, page 118).

The sequence of events leading to a go-around can begin at the top of descent, so the following recommendations begin with descent preparation.

#### Statistical Data

The Flight Safety Foundation Approach-and-landing Accident Reduction (ALAR) Task Force found that failure to recognize the need for and to execute a missed approach when appropriate is a primary cause of approach-and-landing accidents (ALAs), including those involving controlled flight into terrain (CFIT).<sup>1</sup>

The task force found that inadequate professional judgment/airmanship was a causal factor<sup>2</sup> in 74 percent of 76 approach-and-landing accidents and serious incidents worldwide in 1984 through 1997.

Among the flight crew errors committed in these occurrences was failure to conduct a go-around when required by: an unstabilized approach; excessive glideslope/localizer deviations; absence of adequate visual references at the

minimum descent altitude/height (MDA[H]) or decision altitude/height (DA[H]); confusion regarding aircraft position; and automation-interaction problems.

The task force found that only 17 percent of the accident/incident flight crews initiated go-arounds when conditions indicated that go-arounds should have been conducted.

#### General

Being go-around-prepared and go-around-minded implies the following:

- Knowledge of applicable briefings, standard calls, sequences of actions, task-sharing and cross-checking;
- Being ready to abandon the approach if the weather minimums or the criteria for a stabilized approach are not met, or if doubt exists about the aircraft's position or about aircraft guidance; and,
- After the go-around is initiated, the flight crew must fly the published missed approach procedure.

#### Operational Recommendations

##### Task-sharing

Adherence to the defined pilot flying-pilot not flying (PF-PNF) task-sharing procedures for normal operations and abnormal operations is a major part of preparing for a go-around and of conducting a safe go-around.

## Descent Preparation

Descent preparation and the approach briefing should be planned and should be conducted to prevent delaying the initiation of the descent and to prevent rushed management of the descent profile.

## Approach Briefing

To be go-around-prepared, the approach briefing should include a discussion of the primary elements of the go-around maneuver and the published missed approach procedure. The discussion should include the following:

- Approach gate<sup>3</sup>;
- Go-around call (e.g., a loud and clear “go around/flaps”);
- PF-PNF task-sharing (flow of respective actions, including desired guidance, mode selection, airspeed target, go-around altitude, deviations calls); and,
- Missed approach vertical navigation and lateral navigation (including airspeed and altitude restrictions).

## Achieving Flight Parameters

The flight crew must “stay ahead of the aircraft” throughout the flight. This includes achieving desired flight parameters (e.g., aircraft configuration, aircraft position, energy condition, track, altitude, vertical speed, airspeed and attitude) during the descent, approach and landing. Any indication that a desired flight parameter will not be achieved should prompt immediate corrective action or the decision to go around.

## Descent Profile Monitoring

The descent profile should be monitored, using all available instrument references (including flight management system [FMS] vertical navigation [VNAV]).

The descent profile also may be monitored or may be adjusted based on a *typical 10 nautical mile per 3,000 feet descent gradient* (corrected for the prevailing head-wind component or tail-wind component) while adhering to the required altitude/airspeed restrictions (deceleration management).

If the flight path is significantly above the desired descent profile (e.g., because of an air traffic control [ATC] restriction or greater-than-expected tail wind), the desired flight path can be recovered by:

- Reverting from FMS VNAV to a selected vertical mode, with an appropriate airspeed target or vertical-speed target;
- Maintaining a high airspeed and a high descent rate as long as practical;
- Using speed brakes;

## Table 1 Recommended Elements Of a Stabilized Approach

All flights must be stabilized by 1,000 feet above airport elevation in instrument meteorological conditions (IMC) and by 500 feet 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  $V_{REF} + 20$  knots 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 feet per minute; if an approach requires a sink rate greater than 1,000 feet per minute, 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 feet 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 feet above airport elevation in IMC or below 500 feet above airport elevation in VMC requires an immediate go-around.*

Source: Flight Safety Foundation Approach-and-landing Accident Reduction (ALAR) Task Force (V1.1 November 2000)

- Extending the landing gear, if the use of speed brakes is not sufficient; or,
- As a last resort, conducting a 360-degree turn (as practical, and with ATC clearance).

If the desired descent flight path cannot be established, ATC should be notified for timely coordination.

## Final Approach

Because the approach briefing was conducted at the end of the cruise phase, the crew should review primary elements of

the go-around maneuver and the missed approach procedure at an appropriate time during final approach.

To be prepared to take over manually when flying with the autopilot (AP) engaged, the following should be considered:

- Seat adjustment and armrest adjustment (this is of primary importance for effective aircraft handling in a dynamic phase of flight); and,
- Flying with one hand on the control column and one hand on the throttle levers.

### Transitioning Back to Instrument Flying

One of the most frequent reasons for conducting a go-around is weather.

When approaching the minimum descent altitude/height (MDA[H]) or the decision altitude/height (DA[H]), one pilot attempts to acquire the required visual references. During this time, the pilot is in *almost-visual* flying conditions.

If a go-around is initiated, an immediate transition to instrument flying should occur.

It is, therefore, of primary importance that the other pilot maintain instrument references and be ready to make appropriate calls if any flight parameter (airspeed, pitch attitude, bank angle, thrust) deviates from the normal value.

To ease this transition back to instrument flying, all efforts should be made to initiate the go-around with wings level and with no roll rate.

The above discussion does not apply when captain/first officer task-sharing is accomplished in accordance with an operating policy known as the *shared approach, monitored approach* or *delegated handling approach*. [See FSF ALAR Briefing Note 7.3 — *Visual References*.]

### Summary

Because a go-around is not a frequent occurrence, the importance of being go-around-prepared and go-around-minded should be emphasized.

If the criteria for safe continuation of the approach are not met, the crew should initiate a go-around and fly the published missed approach.

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

- 1.1 — *Operating Philosophy*;
- 1.3 — *Golden Rules*;
- 1.4 — *Standard Calls*;

- 1.6 — *Approach Briefing*;
- 4.1 — *Descent-and-approach Profile Management*;
- 4.2 — *Energy Management*;
- 6.2 — *Manual Go-around*;
- 7.1 — *Stabilized Approach*; and,
- 7.3 — *Visual References*.♦

### References

1. 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.
2. 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.
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

FSF Editorial Staff. “Business Jet Overruns Wet Runway After Landing Past Touchdown Zone.” *Accident Prevention* Volume 56 (December 1999).

FSF Editorial Staff. “Airplane’s Low-energy Condition and Degraded Wing Performance Cited in Unsuccessful Go-around Attempt.” *Accident Prevention* Volume 56 (July 1999).

FSF Editorial Staff. “B-757 Damaged by Ground Strike During Late Go-around from Visual Approach.” *Accident Prevention* Volume 56 (May 1999).

FSF Editorial Staff. “Attempted Go-around with Deployed Thrust Reversers Leads to Learjet Accident.” *Accident Prevention* Volume 56 (January 1999).

FSF Editorial Staff. "Unaware That They Have Encountered a Microburst, DC-9 Flight Crew Executes Standard Go-around; Aircraft Flies Into Terrain." *Accident Prevention* Volume 53 (February 1996).

FSF Editorial Staff. "Captain's Inadequate Use of Flight Controls During Single-engine Approach and Go-around Results in Loss of Control and Crash of Commuter." *Accident Prevention* Volume 52 (November 1995).

Lawton, Russell. "DC-10 Destroyed, No Fatalities, After Aircraft Veers Off Runway During Landing." *Accident Prevention* Volume 51 (May 1994).

Lawton, Russell. "Captain Stops First Officer's Go-around, DC-9 Becomes Controlled-flight-into-terrain (CFIT) Accident." *Accident Prevention* Volume 51 (February 1994).

Pope, John A. "Faulty Angle-of-attack Sensor Provokes Go/No-go Decision with an Inadequately Coordinated Crew." *Accident Prevention* Volume 50 (August 1993).

## Regulatory Resources

International Civil Aviation Organization (ICAO). *International Standards and Recommended Practices, Annex 6 to the Convention of International Civil Aviation, Operation of Aircraft. Part I, International Commercial Air Transport – Aeroplanes*. Appendix 2, "Contents of an Operations Manual," 5.16, 5.18, 5.19. Seventh edition – July 1998, incorporating Amendments 1–25.

ICAO. *Procedures for Air Navigation Services. Aircraft Operations*. Volume I, *Flight Procedures*. Fourth edition, 1993. Reprinted May 2000, incorporating Amendments 1–10.

ICAO. *Manual of All-Weather Operations*. Second edition – 1991.

U.S. Federal Aviation Administration (FAA). *Federal Aviation Regulations*. 91.175 "Takeoff and landing under IFR," 91.189 "Category II and III operations: General operating rules." January 1, 2000.

FAA. Advisory Circular 60-A, *Pilot's Spatial Disorientation*. February 8, 1983.

## Notice

The Flight Safety Foundation (FSF) Approach-and-landing Accident Reduction (ALAR) Task Force has produced this briefing note to help prevent ALAs, 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 (CAST) Joint Safety Analysis Team (JSAT) and the European Joint Aviation Authorities Safety Strategy Initiative (JSSI).

The briefing note has been prepared primarily for operators and pilots of turbine-powered airplanes with underwing-mounted engines (but can be adapted for fuselage-mounted turbine engines, turboprop-powered aircraft and piston-powered aircraft) and with the following:

- Glass flight deck (i.e., an electronic flight instrument system with a primary flight display and a navigation display);
- Integrated autopilot, flight director and autothrottle systems;

- Flight management system;
- Automatic ground spoilers;
- Autobrakes;
- Thrust reversers;
- Manufacturers'/operators' standard operating procedures; and,
- Two-person flight crew.

This briefing note is one of 34 briefing notes that comprise a fundamental part of the FSF *ALAR Tool Kit*, which includes a variety of other safety products that have been developed to help prevent ALAs.

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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