



Flight Safety Foundation

ALAR

Approach-and-landing Accident Reduction

Tool Kit

FSF ALAR Briefing Note

6.4 — Bounce Recovery – Rejected Landing

A rejected landing (also called an aborted landing) is a go-around maneuver initiated after touchdown of the main landing gear. A rejected landing is a challenging maneuver and typically is recommended only when an aircraft bounces more than approximately five feet (1.5 meters) off the runway after touchdown.

No global statistical data are available on rejected-landing incidents or accidents. Nevertheless, the following are possible consequences of an incorrect decision to conduct a rejected landing:

- Tail strike following a go-around initiated because of directional control difficulties after thrust reverser selection;
- Aircraft performance limitation following the inappropriate selection of reverse thrust during a touch-and-go landing and failure of one reverser to stow; and,
- Loss of control following a go-around initiated after thrust reverser selection and failure of one reverser to stow.

Touch-and-go Training

A touch-and-go landing is a training exercise. Nevertheless, the conditions required for the safe conduct of this maneuver provide a valuable introduction to the discussion of bounce recovery/rejected landing.

Preconditions

Four preconditions (usually referred to as the “four-no rule”) must be observed before initiating a touch-and-go:

- No ground spoilers:
 - Ground spoilers must not be armed or manually selected after touchdown;
- No autobrake system:
 - Autobrakes must not be armed;
- No reverse:
 - Thrust reversers must not be selected upon touchdown; and,
- No pedal braking:
 - Pedal braking must not be used after touchdown.

The above preconditions show that conducting a rejected landing during a nontraining flight (i.e., with ground spoilers and autobrakes armed, and being ready to select reverse thrust upon touchdown) involves an added challenge.

Aircraft Reconfiguration

After touchdown during a planned touch-and-go, the aircraft must be reconfigured for the takeoff configuration:

- Flaps reset;
- Pitch trim reset;
- Rudder trim reset; and,
- Throttle-lever “stand-up” (i.e., initial movement of the throttle levers to a straight-up position) for symmetric engine acceleration.

Task-sharing

Conducting a touch-and-go also is dynamic and demanding in terms of task-sharing:

- The pilot flying (PF) is responsible for:
 - Tracking the runway centerline; and,
 - Advancing initially the throttle levers slightly above idle;
- The pilot not flying (PNF) is responsible for:
 - Reconfiguring the aircraft for takeoff;
 - Resetting systems, as required;
 - Monitoring engine parameters and flight-mode annunciations;
 - Conducting the takeoff calls;
 - Deciding to reject the takeoff, if required; and,
 - Ensuring backup of the PF during rotation and initial climb.

Conducting a rejected landing further amplifies the importance of adherence to defined task-sharing by the PF and the PNF.

Bouncing and Bounce Recovery

Bouncing during a landing usually is the result of one or more of the following factors:

- Loss of visual references;
- Excessive sink rate;
- Late flare initiation;
- Incorrect flare technique;
- Excessive airspeed; and/or,
- Power-on touchdown (preventing the automatic extension of ground spoilers, as applicable).

The bounce-recovery technique varies with each aircraft type and with the height reached during the bounce.

Recovery From a Light Bounce (Five Feet or Less)

When a light bounce occurs, a typical recovery technique can be applied:

- Maintain or regain a normal landing pitch attitude (do not increase pitch attitude, because this could lead to a tail strike);
- Continue the landing;
- Use power as required to soften the second touchdown; and,
- Be aware of the increased landing distance.

Recovery From a High Bounce (More Than Five Feet)

When a more severe bounce occurs, do not attempt to land, because the remaining runway may be insufficient for a safe landing.

The following go-around technique can be applied:

- Maintain or establish a normal landing pitch attitude;
- Initiate a go-around by activating the go-around levers/switches and advancing the throttle levers to the go-around thrust position;
- Maintain the landing flaps configuration or set a different flaps configuration, as required by the aircraft operating manual (AOM)/quick reference handbook (QRH).
- Be prepared for a second touchdown;
- Be alert to apply forward pressure on the control column and reset the pitch trim as the engines spool up (particularly with underwing-mounted engines);
- When safely established in the go-around and when no risk remains of touchdown (steady positive rate of climb), follow normal go-around procedures; and,
- Reengage automation, as desired, to reduce workload.

Commitment to a Full-stop Landing

Landing incidents and accidents have demonstrated that after the thrust reversers have been deployed (even at reverse idle), the landing must be completed to a full stop because a successful go-around may not be possible.

The following occurrences have resulted in a significantly reduced rate of climb or in departure from controlled flight:

- Thrust asymmetry resulting from asymmetric engine spool-up (i.e., asymmetric engine acceleration characteristics as thrust increases from a ground-idle level);
- Thrust asymmetry resulting from asymmetric stowing of thrust reversers (i.e., one reverser going to the stowed position faster than the other); and,
- Severe thrust asymmetry resulting from one thrust reverser failing to stow.

Commitment to Go Around

If a go-around is elected, the flight crew must be committed to conduct the go-around. The crew must not change the go-around decision and must not retard the throttle levers in an attempt to complete the landing.

Such a change of decision usually is observed when the decision to reject the landing and the go-around are initiated by the first officer (as PF) but are overridden by the captain.

Runway overruns, collisions with obstructions and major aircraft damage (or postimpact fire) often are the consequences of landing after a go-around is initiated.

Summary

The flight crew should adhere to decision criteria for:

- Committing to a full-stop landing; or,
- Committing to a rejected landing and a go-around.

These criteria (adapted for each individual aircraft type) should be incorporated in the standard operating procedures (SOPs)/supplementary techniques of each AOM/QRH.

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

- 6.1 — *Being Prepared to Go Around*;
- 7.1 — *Stabilized Approach*; and,
- 8.1 — *Runway Excursions and Runway Overruns*. ♦

Related Reading From FSF Publications

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. "Attempted Go-around with Deployed Thrust Reversers Leads to Learjet Accident." *Accident Prevention* Volume 56 (January 1999).

Flight Safety Foundation (FSF). "Killers in Aviation: FSF Task Force Presents Facts about Approach-and-landing and Controlled-flight-into-terrain Accidents." *Flight Safety Digest* Volume 17-18 (November-December 1998, January-February 1999).

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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