Flight Safety Foundation

ALAR

Approach-and-landing Accident Reduction

Tool Kit

FSF ALAR Briefing Note 5.1 — Approach Hazards Overview

Few air transport accidents occur on calm sunny days; risk increases during flight over hilly terrain, with reduced visibility, adverse winds, contaminated runways and limited approach aids.

Statistical Data

The Flight Safety Foundation Approach-and-landing Accident Reduction Task Force, in an analysis of 76 approach-and-landing accidents and serious incidents, including controlled-flight-into-terrain (CFIT) accidents, worldwide in 1984 through 1997,[1] found that:

- Fifty-three percent of the accidents and incidents occurred during nonprecision instrument approaches or visual approaches (42 percent of the visual approaches were conducted where an instrument landing system [ILS] approach was available);
- Fifty percent occurred where no radar service was available;
- Sixty-seven percent of the CFIT accidents occurred in hilly terrain or mountainous terrain;
- Fifty-nine percent of the accidents and incidents occurred in instrument meteorological conditions (IMC);
- Fifty percent occurred in precipitation (snow, rain);
- Fifty-three percent occurred in darkness or twilight;
- Thirty-three percent involved adverse wind conditions (i.e., strong crosswinds, tail winds or wind shear);
- Twenty-one percent involved flight crew disorientation or visual illusions;
- Twenty-nine percent involved nonfitment of available safety equipment (e.g., ground-proximity warning system [GPWS] or radio altimeter);
- Eighteen percent involved runway conditions (e.g., wet or contaminated by standing water, slush, snow or ice); and,
- Twenty-one percent involved inadequate ground aids (e.g., navigation aids, approach/runway lights or visual approach-slope guidance).

Awareness Program

A company awareness program on approach-and-landing hazards should emphasize the following elements that lead to good crew decisions:

- Use the FSF *Approach-and-landing Risk Awareness Tool* (page 84) to heighten crew awareness of the specific hazards to the approach;
- Use the FSF *Approach-and-landing Risk Reduction Guide* (page 86);
- Anticipate by asking, "What if?" and prepare;
- Adhere to standard operating procedures (SOPs); and,
- Prepare options, such as:
  - Request a precision approach into the wind;
  - Select an approach gate[2] for a stabilized approach (Table 1, page 82);

– Wait for better conditions; or,

– Divert to an airport with better conditions.

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

- *5.2 — Terrain*;
- *5.3 — Visual Illusions*;
- *5.4 — Wind Shear*;
- *6.1 — Being Prepared to Go Around*; and,
- *6.3 — Terrain-avoidance (Pull-up) Maneuver*.♦

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)

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 FSF Approach-and-landing Accident Reduction (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. "During Nonprecision Approach at Night, MD-83 Descends Below Minimum Descent Altitude and Contacts Trees, Resulting in Engine Flame-out and Touchdown Short of Runway." *Accident Prevention* Volume 54 (April 1997).

FSF Editorial Staff. "Dubrovnik-bound Flight Crew's Improperly Flown Nonprecision Instrument Approach Results in Controlled-Flight-into-Terrain Accident." *Flight Safety Digest* Volume 15 (July–August 1996).

FSF Editorial Staff. "Captain's Failure to Establish Stabilized Approach Results in Controlled-flight-into-terrain Commuter Accident." *Accident Prevention* Volume 52 (July 1995).

Duke, Thomas A.; FSF Editorial Staff. "Aircraft Descended Below Minimum Sector Altitude and Crew Failed to Respond to GPWS as Chartered Boeing 707 Flew into Mountain in Azores." *Accident Prevention* Volume 52 (February 1995).

Lawton, Russell. "Breakdown in Coordination by Commuter Crew During Unstabilized Approach Results in Controlled-flight-into-terrain Accident." *Accident Prevention* Volume 51 (September 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).

FSF Editorial Staff. "Cockpit Coordination, Training Issues Pivotal in Fatal Approach-to-Landing Accident." *Accident Prevention* Volume 51 (January 1994).

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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Flight Safety Foundation

ALAR Tool Kit

Approach-and-landing Accident Reduction

Approach-and-landing Risk Awareness Tool

Elements of this tool should be integrated, as appropriate, with the standard approach briefing prior to top of descent to improve awareness of factors that can increase the risk of an accident during approach and landing. The number of warning symbols (⚠) that accompany each factor indicates a relative measure of risk. Generally, the greater the number of warning symbols that accompany a factor, the greater the risk presented by that factor. Flight crews should consider carefully the effects of multiple risk factors, exercise appropriate vigilance and be prepared to conduct a go-around or a missed approach.

Failure to recognize the need for a missed approach and to execute a missed approach is a major cause of approach-and-landing accidents.

Flight Crew

- Long duty period — reduced alertness ⚠⚠
- Single-pilot operation ⚠⚠

Airport Services and Equipment

- No approach radar service or airport tower service ⚠⚠⚠
- No current local weather report ⚠⚠
- Unfamiliar airport or unfamiliar procedures ⚠⚠
- Minimal or no approach lights or runway lights ⚠
- No visual approach-slope guidance — e.g., VASI/PAPI ⚠
- Foreign destination — possible communication/language problems ⚠

Expected Approach

- Nonprecision approach — especially with step-down procedure or circling procedure ⚠⚠⚠
- Visual approach in darkness ⚠⚠
- Late runway change ⚠⚠
- No published STAR ⚠

Environment

- Hilly terrain or mountainous terrain ⚠⚠
- Visibility restrictions — e.g., darkness, fog, haze, IMC, low light, mist, smoke ⚠⚠
- Visual illusions – e.g., sloping terrain, wet runway, whiteout/snow ⚠⚠
- Wind conditions — e.g., cross wind, gusts, tail wind, wind shear ⚠⚠
- Runway conditions — e.g., ice, slush, snow, water ⚠⚠
- Cold-temperature effects — true altitude (actual height above mean sea level) lower than indicated altitude ⚠

Aircraft Equipment

- No GPWS/EGPWS/GCAS/TAWS ⚠⚠⚠
- No radio altimeter ⚠⚠⚠
- No wind shear warning system ⚠
- No TCAS ⚠

Definitions of acronyms appear on next page.

- Greater risk is associated with conducting a nonprecision approach (rather than a precision approach) and with conducting an approach in darkness and in IMC (rather than in daylight and in VMC). The combined effects of two or more of these risk factors must be considered carefully.
- Crews can reduce risk with planning and vigilance. If necessary, plans should be made to hold for better conditions or to divert to an alternate airport. Plan to abandon the approach if company standards for a stabilized approach are not met.
- After commencement of the approach, *a go-around or a missed approach should be conducted when*:
  - Confusion exists or crew coordination breaks down;
  - There is uncertainty about situational awareness;
  - Checklists are being conducted late or the crew is task overloaded;
  - Any malfunction threatens the successful completion of the approach;
  - The approach becomes unstabilized in altitude, airspeed, glide path, course or configuration;
  - Unexpected wind shear is encountered — proceed per company SOP;
  - GPWS/EGPWS/GCAS/TAWS alert — proceed per company SOP;
  - ATC changes will result in an unstabilized approach; or,
  - Adequate visual references are absent at DH or MDA.

Table 1
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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)

Notes:

1. All information in the FSF Approach-and-landing Risk Awareness Tool is based on data published in "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).
2. ATC = Air traffic control
   DH = Decision height
   EGPWS = Enhanced ground-proximity warning system
   GCAS = Ground-collision avoidance system
   GPWS = Ground-proximity warning system
   IMC = Instrument meteorological conditions
   MDA = Minimum descent altitude
   PAPI = Precision approach path indicator
   SOP = Standard operating procedure
   STAR = Standard terminal arrival route
   TAWS = Terrain awareness and warning system
   TCAS = Traffic-alert and collision avoidance system
   VASI = Visual approach slope indicator
   VMC = Visual meteorological conditions

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Approach-and-landing Accident Reduction

Tool Kit

Approach-and-landing Risk Reduction Guide

The Flight Safety Foundation (FSF) Approach-and-landing Accident Reduction (ALAR) Task Force designed this guide as part of the *FSF ALAR Tool Kit*, which is designed to help prevent ALAs, including those involving controlled flight into terrain. This guide should be used to evaluate specific flight operations and to improve crew awareness of associated risks. This guide is intended for use as a strategic tool (i.e., for long-term planning).

Part 1 of this guide should be used by the chief pilot to review flight operations policies and training. Part 2 should be used by dispatchers and schedulers. The chief pilot should provide Part 3 to flight crews for evaluating pilot understanding of company training objectives and policies. Part 4 should be used by the chief pilot and line pilots.

This guide is presented as a "check-the-box" questionnaire; boxes that are not checked may represent shortcomings and should prompt further assessment.

Part 1 — Operations: Policies and Training

Check the boxes below that apply to your specific flight operations.

Approach

Crew Resource Management

- ❑ Is risk management taught in initial training and recurrent training?
- ❑ Are crew resource management (CRM) roles defined for each crewmember?
- ❑ Are CRM roles defined for each crewmember for emergencies and/or system malfunctions?
- ❑ Are standard operating procedures (SOPs) provided for "sterile-cockpit"[1] operations?
- ❑ Are differences between domestic operations and international operations explained in CRM training?
- ❑ Is decision making taught in CRM training?

Approach Procedures

- ❑ Do detailed and mandatory approach-briefing requirements exist? (See Part 4 below.)
- ❑ Are approach risks among the required briefing items?
- ❑ Are standard calls defined for approach deviations?
- ❑ Are limits defined for approach gate[2] at 1,000 feet in instrument meteorological conditions (IMC) or at 500 feet in visual meteorological conditions (VMC).
- ❑ Is a missed approach/go-around recommended when stabilized approach criteria (Table 1) are exceeded?
- ❑ Is a "no fault" go-around policy established? If so, is it emphasized during training?
- ❑ Does the checklist policy require challenge-and-response for specified items?
- ❑ Does the checklist policy provide for interruptions/distractions?
- ❑ Is a go-around recommended when the appropriate checklist is not completed before reaching the approach gate?

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

- ❑ Are captain/first officer weather limits provided for approach (e.g., visibility, winds and runway conditions)?
- ❑ Are crewmember roles defined for approach (e.g., crewmember assigned pilot flying duties, crewmember monitoring and conducting checklist, crewmember who decides to land or go around, crewmember landing aircraft, exchange of aircraft control)?

Fuel

- ❑ Are fuel minimums defined for proceeding to the alternate airport, contingency fuel, dump-fuel limits?
- ❑ Are crews aware of when to declare "minimum fuel" or an emergency?
- ❑ When declaring an emergency for low fuel, is International Civil Aviation Organization (ICAO) phraseology required (e.g., "Mayday, Mayday, Mayday for low fuel")?

Approach Type

- ❑ Is your risk exposure greatest during precision, nonprecision, circling or visual approaches? Is the training provided appropriate for the risk?
- ❑ Are SOPs provided for constant-angle nonprecision approaches (CANPAs) using rate of descent or angle?

Environment

- ❑ Is training provided for visual illusions on approach (e.g., "black hole effect,"[3] sloping terrain, etc.)?
- ❑ Is training provided for minimum-safe-altitude awareness?
- ❑ Does a policy exist to use the radio altimeter as a terrain-awareness tool?
- ❑ Are crews required to adjust altitudes during approach for lower than international standard atmosphere (ISA) standard temperatures?

- ❑ Are crews aware that most approach-and-landing accidents occur with multiple conditions present (e.g., rain and darkness, rain and crosswind)?

Airport and Air Traffic Control (ATC) Services

- ❑ Are crews aware of the increased risk at airports without radar service, approach control service or tower service?
- ❑ Is training provided for unfamiliar airports using a route check or a video?
- ❑ Is potential complacency at very familiar airports discussed?
- ❑ Are crews provided current weather at destination airfields via automatic terminal information service (ATIS), airborne communications addressing and reporting system (ACARS) and/or routine weather broadcasts for aircraft in flight (VOLMET)?

Aircraft Equipment

- ❑ Are procedures established to evaluate the accuracy and reliability of navigation/terrain databases?
- ❑ Are mechanical checklists or electronic checklists installed?
- ❑ Is a radio altimeter installed in the pilot's normal scan pattern?
- ❑ Does the radio altimeter provide visual/audio alerting?
- ❑ Is a wind shear alert system (either predictive or reactive) installed?
- ❑ Is a ground-proximity warning system (GPWS) or a terrain awareness and warning system (TAWS)[4] installed?
- ❑ Is a traffic-alert and collision avoidance system (TCAS) installed?
- ❑ Are head-up displays (HUDs) installed with a velocity-vector indicators?
- ❑ Are angle-of-attack indicators installed?
- ❑ For aircraft with a flight management system (FMS), are lateral navigation/vertical navigation (LNAV/VNAV) approach procedures database-selected?
- ❑ Are pilots prevented from modifying specified FMS data points on approach?
- ❑ Is the FMS system "sole-means-of-navigation" capable?
- ❑ Is there a policy for appropriate automation use (e.g., "full up for Category III instrument landing system, okay to turn automation off for a daylight visual approach")?
- ❑ Is there a policy requiring standard calls by the pilot not flying for mode changes and annunciations on the mode control panel?
- ❑ Is training provided and are policies established for the use of all the equipment installed on all aircraft?
- ❑ Are current and regulator-approved navigation charts provided for each flight crewmember?

Flight Crew

- ❑ Is there a crew-pairing policy established for new captain/new first officer based on flight time or a minimum number of trip segments?
- ❑ Is the check airmen/training captain program monitored for feedback from pilots? Are additional training needs, failure rates and complaints about pilots from line operations tracked? Is it possible to trace these issues to the check airmen/training captain who trained specific pilots?
- ❑ Is there a hazard reporting system such as a captain's report? Are policies established to identify and to correct problems? Is a system set up to provide feedback to the person who reports a hazard?

Safety Programs

- ❑ Is a nonpunitive safety reporting system established?
- ❑ Is a proactive safety monitoring program such as a flight operational quality assurance (FOQA) program or an aviation safety action program (ASAP) established?

Landing

- ❑ Is training provided and are policies established for the use of visual landing aids?
- ❑ Is it recommended that crews use all available vertical guidance for approaches, especially at night?
- ❑ Is training provided and are policies established for landing on contaminated runways with adverse winds?
- ❑ Are crews knowledgeable of the differences in braking deceleration on contaminated runways and dry runways?
- ❑ Does training include performance considerations for items such as critical touchdown area, braking required, land-and-hold-short operation (LAHSO), engine-out go-around, and full-flaps/gear-extended go-around?
- ❑ Does the aircraft operating manual (AOM)/quick reference handbook (QRH) provide crosswind limitations?
- ❑ Is a policy in effect to ensure speed brake deployment and autobrake awareness?
- ❑ Does policy prohibit a go-around after reverse thrust is selected?

Part 2 — Dispatcher/Scheduler

Check the boxes below that apply to your specific flight operations.

- ❑ Does the company have a dispatch system to provide information to assist flight crews in evaluating approach-and-landing risks?

Approach and Landing

- ❑ Are dispatchers and captains familiar with each other's authority, accountability and responsibility?
- ❑ Are crews monitored for route qualifications and appropriate crew pairing?
- ❑ Are crew rest requirements defined adequately?
- ❑ Does the company monitor and provide suitable crew rest as defined by requirements?
- ❑ Are crews provided with timely and accurate aircraft performance data?
- ❑ Are crews assisted in dealing with minimum equipment list(MEL)/dispatch deviation guide (DDG)/ configuration deviation list (CDL) items?
- ❑ Do dispatch-pilot communications exist for monitoring and advising crews en route about changing conditions?
- ❑ Are updates provided on weather conditions (e.g., icing, turbulence, wind shear, severe weather)?
- ❑ Are updates provided on field conditions (e.g., runway/taxiway conditions, braking-action reports)?
- ❑ Is there coordination with the captain to determine appropriate loads and fuel required for the effects of ATC flow control, weather and alternates?
- ❑ Are all the appropriate charts provided for routing and approaches to destinations and alternates?
- ❑ Is a current notice to airmen (NOTAM) file maintained for all of your operations and is the appropriate information provided to crews?

Part 3 — Flight Crew

Check the boxes below that apply to your specific flight operations.

- ❑ Do you believe that you have appropriate written guidance, training and procedures to evaluate and reduce approach-and-landing risks?

Approach

- ❑ Is the Flight Safety Foundation *Approach-and-landing Risk Awareness Tool* (*RAT*) provided to flight crews, and is its use required before every approach?
- ❑ Does the approach briefing consist of more than the "briefing strip" minimum? (See Part 4 below.)

- ❑ Do briefings include information about visual illusions during approach and methods to counteract them?
- ❑ Are the following briefed: setup of the FMS, autopilot, HUD, navigation radios and missed approach procedures?
- ❑ Is a discussion of missed approach/go-around details required during every approach briefing?
- ❑ Are performance minimums briefed for the approach gate?
- ❑ Are standard calls required for deviations from a stabilized approach?
- ❑ Does the briefing include execution of a missed approach/go-around if criteria for the approach gate are not met?
- ❑ Are stabilized approach criteria defined? Is a go-around recommended in the event that these criteria are not met?
- ❑ Does your company practice a no-fault go-around policy?
- ❑ Are you required to write a report to the chief pilot if you conduct a missed approach/go-around?
- ❑ Do you back up the flight plan top-of-descent point with your own calculation to monitor descent profile?
- ❑ Are approach charts current and readily available for reference during approach?
- ❑ Are policies established to determine which crewmember is assigned pilot flying duties, which crewmember is assigned checklist duties, which crewmember will land the aircraft and how to exchange aircraft control? Do these policies change based on prevailing weather?
- ❑ Do terrain-awareness procedures exist (e.g., calling "radio altimeter alive," checking radio altimeter altitudes during approach to confirm that the aircraft is above required obstacle clearance heights)?
- ❑ Do altitude-deviation-prevention policies exist (e.g., assigned altitude, minimum descent altitude/height [MDA(H)], decision altitude/height [DA(H)])?
- ❑ Are you familiar with the required obstacle clearance criteria for charting design?
- ❑ Do altimeter-setting procedures and cross-check procedures exist?
- ❑ Do temperature-compensation procedures exist for temperatures lower than ISA at the destination airport?
- ❑ Are you aware of the increased risk during night/low-visibility approaches when approach lighting/visual approach slope indicator/precision approach path indicator aids are not available? How do you compensate for these deficiencies? For example, are runways with vertical guidance requested in those conditions?
- ❑ Are you aware of the increased risk associated with nonprecision approaches compared with precision approaches?
- ❑ Is a CANPA policy established at your company? Are you aware of the increased risk associated with step-down approaches compared with constant-angle approaches?
- ❑ Is a policy established for maintaining visual look-out, and is there a requirement to call "head-down"?
- ❑ Does a look-out policy exist for approach and landing in visual flight rules (VFR) conditions?

Part 4 — Recommended Approach-and-landing Briefing Items

For the approach-risk briefing, refer to top-of-descent use of the FSF *Approach-and-landing RAT*.

In addition to the briefing strip items (e.g., chart date, runway, approach type, glideslope angle, check altitudes), which of following items are briefed, as appropriate?

- ❑ Automation setup and usage
- ❑ Navigation equipment setup and monitoring
- ❑ Rate of descent/angle of descent

- ❑ Intermediate altitudes and standard calls
- ❑ Altitude-alert setting and acknowledgment
- ❑ MDA(H)/DA(H) calls (e.g., "landing, continue, go-around"); runway environment expected to see (offsets); lighting
- ❑ Radio-altimeter setting in the DH window, calls required (e.g., "radio altimeter alive" and "below 1,000 feet" prior to an intermediate approach fix; "below 500 feet" prior to the final approach fix [FAF]; "go around" after the FAF if "minimums" is called [with radio altimeter at 200 feet] and if visual contact with the required references is not acquired or the aircraft is not in position for a normal landing)
- ❑ Aircraft configuration
- ❑ Airspeeds
- ❑ Checklists complete
- ❑ ATC clearance
- ❑ Uncontrolled airport procedures
- ❑ Manual landing or autoland
- ❑ Missed approach procedure/go-around
- ❑ Performance data
- ❑ Contaminated runway/braking action and autobrakes
- ❑ Illusions/hazards or other airport-specific items
- ❑ Abnormals (e.g., aircraft equipment/ground facilities unserviceable, MEL/DDG items, glideslope out)
- ❑ Runway (e.g., length, width, lighting, LAHSO, planned taxiway exit)
- ❑ Procedure for simultaneous approaches (as applicable)

References

1. The *sterile cockpit rule* refers to U.S. Federal Aviation Regulations Part 121.542, which states: "No flight crewmember may engage in, nor may any pilot-in-command permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties. Activities such as eating meals, engaging in nonessential conversations within the cockpit and nonessential communications between the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight are not required for the safe operation of the aircraft. For the purposes of this section, critical phases of flight include all ground operations involving taxi, takeoff and landing, and all other flight operations below 10,000 feet, except cruise flight." [The FSF ALAR Task Force says that "10,000 feet" should be height above ground level during flight operations over high terrain.]
2. The Flight Safety Foundation Approach-and-landing Accident Reduction (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."
3. The *black-hole effect* typically occurs during a visual approach conducted on a moonless or overcast night, over water or over dark, featureless terrain where the only visual stimuli are lights on and/or near the airport. The absence of visual references in the pilot's near vision affect depth perception and cause the illusion that the airport is closer than it actually is and, thus, that the aircraft is too high. The pilot may respond to this illusion by conducting an approach below the correct flight path (i.e., a low approach).
4. Terrain awareness and warning system (TAWS) is the term used by the European Joint Aviation Authorities and the U.S. Federal Aviation Administration to describe equipment meeting International Civil Aviation Organization standards and recommendations for ground-proximity warning system (GPWS) equipment that provides predictive terrain-hazard warnings. "Enhanced GPWS" and "ground collision avoidance system" are other terms used to describe TAWS equipment.