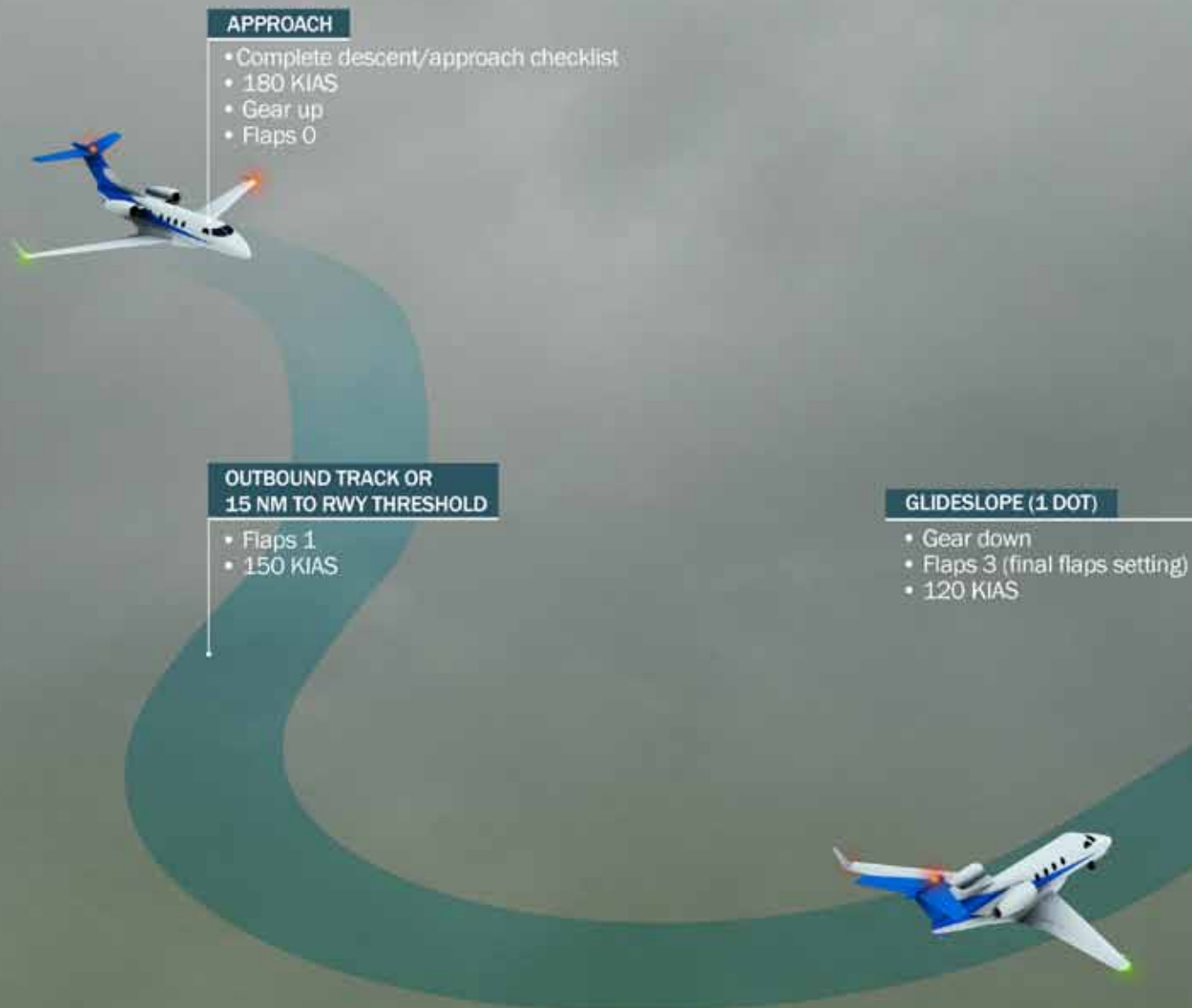


Phenom 300 One-Engine Inoperative ILS Approach Profile



Profiles and callouts

Short recipes for success during high-workload phases of flight

BY NEIL SINGER

It's common knowledge that things happen quickly in jets. Starting an approach in a light jet at 180 knots obviously requires much faster thinking to maintain situational awareness than does the same approach in a single-engine piston at 90 knots. While this reality certainly

challenges transitioning jet pilots, what's often even more challenging than the fact that things happen quickly is the fact that the pilot needs to make things happen even more quickly.

Particularly during atypical events, such as nonprecision approaches or single



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OUTER MARKER

- After established on glideslope:
- Set go-around altitude and heading
 - Reduce speed to V_{REF} ($V_{REF} 3 + 10$ KIAS)
 - Before-landing checklist

MISSED APPROACH

- Push go-around button
- TO/GA thrust
- Rotate to go-around attitude
- Flaps 1
- With positive rate of climb, gear up
- Minimum airspeed V_{AC}

ACCELERATION ALTITUDE

- Select lateral mode according to missed approach profile
- Select ALT hold
- Retract flaps on schedule

AT V_{FS}

- Select FLC
- CON/CLB thrust
- Complete applicable checklist
- After-takeoff checklist

engine operations, while the pilot needs to be on top of standard IFR tasks (maintaining airspeed and course, leveling off at appropriate altitude, et cetera), he also must accomplish aircraft-specific configuration and power changes. These can happen in quick sequence, and often can occur only after specific cueing events such as attaining a predetermined altitude or airspeed.

To further add to pilot workload, the advanced autopilots and avionics suites of new jets require careful mode management if the automation blessing is not to become a very dangerous curse. Unfortunately, cruising at 40,000 feet with ample airspeed, the pilot could sleep for hours without touching the systems. It's when pilots find themselves at speeds not much above stall and critically close to the ground that the most active autoflight management is required.

The challenge, then, is to perform specific tasks at appropriate times in quick succession during critical transitions—say, from ground to flight (takeoff) or descent to climb (missed approach). This is typically the greatest inflight challenge for new jet pilots, and likely leads to more checkride failures than any other issue.

Fortunately, jet pilots have a powerful tool to aid in performance of these tasks: the use of standardized profiles and callouts. A profile is simply the complete set of steps the aircraft manufacturer produces to accomplish a given task—a single-engine go-around, for example. Callouts, which are prompts or commands spoken aloud by the pilot or co-pilot, are an integral part of the profile for both single-pilot and crewed operations.

How they work

As a look at how profiles and callouts work, let's look at the case of a single-engine go-around, often the most challenging checkride task. For the profile of a common light jet, arriving at DH or MDA and finding the runway socked in requires several actions.

First, the pilot begins the missed approach by advancing the thrust levers to the go-around setting while pushing the go-around button on the side of the thrust lever. This disconnects the autopilot, changes the flight director from ILS tracking to a wing-level climb, and tells the avionics to

begin the missed-approach guidance. As the pilot is adding thrust, he will pitch up to meet the flight director, and then immediately retract flaps to the go-around setting.

The increase in thrust, combined with the reduction of drag from flap retraction, will cause a slow climb to begin. Confirmation of climb triggers the pilot to retract landing gear so as to further reduce drag.

The pilot's next task is to configure the flight director for the missed approach. Wings level and fixed pitch are fine for the transition from

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approach to missed, but more specific and accurate guidance is needed right away. Two button pushes and a knob twist will result in the flight director tracking the missed approach course (lateral guidance), and tracking single-engine climb speed (vertical guidance). Now the aircraft is configured for initial climb to 1,000 feet agl, at which point further flap clean-up, acceleration, and power changes will occur—again, in a very specific sequence.

To illustrate the need for quick recall, all the actions in the above two paragraphs should occur in less than three seconds. There's simply no way a pilot can try to consciously recall from memory the steps to be executed if the actions are to be performed that quickly. Rather, the actions must be automatic, performed without conscious thought or effort.

Memorization of a sequence of spoken callouts, combined with many, many repetitions, turns the conscious

into the automatic. Those two paragraphs of actions can be distilled to the following call-outs: "Set Max Thrust, Flaps 2. Positive Rate, Gear Up. Select NAV, Filch VAC." Quite a bit easier to memorize, isn't it? Once the pilot has memorized the spoken callouts, they are combined with the mechanical movements of the hands to the appropriate lever or button, often with the aid of a cockpit poster. Finally, once the callouts and movements are mastered, they can be transferred to the simulator or aircraft for in-flight practice.

Mastery

While it may sound simple to memorize rote callouts and actions, pilots inevitably find that recall in a comfortable chair on the ground, and performance while sweating in the simulator or airplane, are two very different things. New students are always surprised to find they didn't quite have the profiles as memorized as they thought. When first performing a single-engine missed, the demands of flying the airplane—with its greatly reduced performance and high rudder force—frequently are so great that the question of what to do next draws a blank look from the over-taxed pilot.

Further, multiple profiles must be memorized. Most light jets have distinct profiles for steep turns, three types of stalls, circling approaches, as well as single-engine and normal variants of takeoff, go-around, precision approach, and nonprecision approach. Many are just similar enough that mixing up two is a very real possibility in the heat of the moment.

One of the reasons airlines have achieved the remarkable safety record they have is the mandatory mastery of profiles and callouts by all pilots. At least once a year in recurrent training pilots will perform all the critical maneuvers in the simulator, and deviation from the standardized profiles is not tolerated. Restricting and stifling? Far from it. Having a profile memorized allows the pilot to focus on simply flying the airplane, rather than trying to remember what to do when.

And at the end of the day, flying's the fun part, all the more so in a highly performing light jet.

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