

Single-Pilot VLJ Operations

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A substantial component of the burgeoning VLJ market comes from private pilots who want to move up to the high-speed, high-altitude advantages of jets. Most of these pilots will want to be able to fly solo, and smaller corporate flight departments and charter operations may also choose to operate VLJs with single pilots.

Single-pilot VLJ operation certainly can be done safely, but requires careful analysis of the special challenges involved and development of training, operating procedures, and cockpit support tools focused on the unique nature of single-pilot operations in the VLJ flight regime.

VLJ manufacturers have already made significant progress in this direction by designing cockpit displays and automation to reduce pilot workload and enhance situation awareness. In fact, flying complex arrivals and departures in a VLJ may in some ways be easier than in older high performance aircraft such as a Baron. Also helpful, manufacturers are requiring pilots who purchase their aircraft to receive flight training conducted or approved by the company. In conjunction with this training, VLJ manufacturers are providing mentoring programs to pilots with limited prior experience in jets. These are all excellent measures, but more is required to achieve the desired level of safety.

For many reasons, some beyond the scope of this paper, the accident rate for personal flying is many times higher than in airline, air taxi, and high-end corporate operations. One reason is the absence of a seasoned second pilot who does more than just share the workload. This second pilot helps keep track of aircraft configuration, energy state, system status, and weather changes; monitors the actions of the pilot flying, and challenges those actions when needed. The second pilot is also a sounding board—someone to help think through decisions, identify risks, and find appropriate ways to manage risk. These functions greatly improve safety in both normal and emergency situations.

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Although well-designed automation can reduce workload and enhance situation awareness, it also creates its own vulnerabilities to error, such as becoming absorbed in re-programming a GPS in demanding phases of flight. Also, automation interfaces require a comparatively high level of interpretation to fully understand what the automation is doing. This is usually not difficult for pilots who are highly experienced and current in using the automation but can be quite problematic for pilots who are less experienced or less current.

VLJ pilots may be trained initially to adequate proficiency, but the knowledge and skills gained in initial training are typically brittle and vulnerable to degrading under high workload, unfamiliar situations, or stress—conditions that sometimes occur in routine operations and which are prominently manifest in emergencies.

The most common theme in accidents among pilots who do not fly every day is inadequate judgment and decision-making. These failures are not typically the result of character flaws of accident pilots, rather they result from the limited experience of the pilots, especially in dealing with unexpected or unfamiliar situations. The pilot with limited experience faces a higher level of mental workload in trying to reason through unfamiliar situations, which in turn leads to getting behind the airplane, which increases stress that impairs effective mental functioning—a sometimes fatal spiral of increasing difficulty. This problem of course is not unique to VLJ operations, but it may be exacerbated by the speed at which things happen in VLJs; for example, the opportunity to penetrate quickly into bad weather.

Several measures can help VLJ pilots meet the challenges of single-pilot operations. The FAA and other organizations have proposed single-pilot resource management (SRM) training, analogous to crew resource management (CRM) training, which has improved the safety of airline operations over the past 20 or so years. This is a fine idea, but it will require developing content specific to single-pilot operations and training methods. Without a second pilot to share tasks, single pilots must constantly juggle multiple tasks concurrently—which often contributes to pilot error—so SRM must provide specific techniques to help pilots distribute attention without becoming overly absorbed in any one task. SRM must also include

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judgment and decision-making training based on realistic scenarios that VLJ pilots are likely to face.

Most VLJ training will be done in flight simulators; this training cannot focus exclusively on mastering flight maneuvers. Also required is scenario-based training, in which pilots conduct entire flights that call upon them to practice managing a wide range of normal and emergency situations.

Annual recurrent training may be sufficient for airline, air taxi, and charter pilots who fly almost daily, but more frequent training may be required for pilots who fly much less often. It is not realistic to expect most VLJ pilots to go to a training center quarterly (comparable to military recurrent training), but an adequate substitute may be fashioned by providing pilots desk -top flight training devices using realistic flight scenarios that allow them to practice flight maneuvers, workload management, judgment and decision-making

Cockpit operating procedures are too often designed primarily to address the engineering requirements of correctly using an aircraft's systems and controls. VLJ operating procedures and checklists must be designed from a human factors perspective to support the single-pilot task management.

VLJs and other technologically-advanced aircraft are the result of remarkable engineering innovations. Our challenge is to be equally innovative in developing technology, functionality, interfaces, training and operating procedures to fully support single-pilot operations.