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To: Docket Operations, M–30
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From: H. Paul Shuch, PhD, Chief Flight Instructor and Director of Maintenance, AvSport LLC
CC: EAA, AOPA
Subj: Docket FAA-2023-1377, Modification Of Special AIrworthiness Certification

These comments are in response to the above-referenced Notice of Proposed Rulemaking. Since they are quite technical, I wish at the outset to establish my qualifications for responding to the subject NPRM. I am an FAA certificated Commercial Pilot with Instrument Airplane, Certified Flight Instructor (Airplane an Instrument), and Light Sport Repairman Maintenance (airplane, glider, weight shift control, and powered parachute) ratings. I hold a PhD in Air Transportation Engineering from the University of California, Berkeley, have taught engineering, physics, and aeronautics at the college level for over forty years, am recipient of numerous safety awards and the FAA Charles Taylor Master Mechanic Award, am an FAA designated Specialty Aircraft Examiner, and currently run a small fixed-base flight school and maintenance shop on the Piper Memorial Airport (KLHV) specializing in Light Sport Aircraft and Sport Pilot certificate training. As such, I regard MOSAIC as a definite step forward for improving an already highly successful entry level into General Aviation. As a career educator, I regard Sport Pilot as an ideal stepping stone to higher ratings. I do, however, see some areas where the NPRM can be improved. My comments will contain recommendations regarding aircraft limitations, pilot endorsements, maintenance technician certification and training, medical certification, and safety.

(1) Pilot Endorsements

For nearly two decades, FAA regulations have afforded Sport Pilots a safe and efficient path to increasing pilot privileges through additional training and instructor endorsements. Additional category and class authorizations, airspace access, and operation of aircraft with conventional (tailwheel) landing gear are cases in point. As a consequence, Sport Pilots have been encouraged to improve pilot skills while advancing their privileges, all with minimal bureaucratic interference. This avenue to pilot growth should not only be retained, but perhaps expanded.

For example, the NPRM suggests several enhancements which might be made to what qualifies as a Light Sport Aircraft. Retractable landing gear, FADEC control systems, and variable pitch propellers are all contemplated in the NPRM, and would add further utility to the Sport Pilot rating. Such additional capabilities will of course require additional pilot training, but should not necessitate any modification to existing Practical Test Standards (or indeed, to Airman Certification Standards, when adopted). Rather, training on these new systems, received from any Certified Flight Instructor, along with possibly a proficiency check from a second CFI, to be followed by a system-specific logbook endorsement, should suffice.

(2) Mechanic Endorsements

As the above-referenced system enhancements become integrated into the Light Sport Aircraft population, aviation maintenance technicians may well require further system-specific training beyond that already received under the highly successful Light Sport Repairman certificate system. I can envision (and in fact recommend) a series of training courses for mechanics, leading to logbook endorsements allowing holders of Light Sport repairman certificates to service, maintain, install, and repair such additional systems, in a manner similar to the system of pilot endorsements required to operate them.

Not all maintenance technicians may opt to add these additional skills and privileges; some may choose to continue servicing those simple, low-performance aircraft which are the basis of the current Light Sport Aircraft population. Thus, maintenance personnel should be free to receive training and endorsements only for such systems as they may choose to work on, with no modification to the existing LSRM and LSRI training programs or certificates.

There is already a shortage of qualified maintenance personnel who choose to work on LSAs, so nothing should be done to exacerbate this problem. I see no reason to impose an "A&P Lite" training burden upon Light Sport maintenance professionals.

(3) Flight at Night

The ability of Sport Pilots (or those operating under Sport Pilot rules) to fly properly equipped aircraft at night would significantly enhance the capabilities and utility of the Light Sport segment. The NPRM proposes that those operating at night be required to hold FAA medical certificates. But to my mind, the outstanding success of the driver's license medical concept (which, I would note, was largely the basis for the FAA's adoption of Basic Med) suggests that Sport Pilots should be able to continue flying safely, even past civil twilight, without the need to visit a Designated Medical Examiner.

The only relevant physical consideration for night operations should be night vision, and that can be ascertained by an examination not necessarily by a DME, but perhaps by a visit to a qualified ophthalmologist or optometrist. A night vision test would certainly be appropriate for those seeking night privileges, and although this can be accomplished through the Certificate of Demonstrated Ability process, a simple card signed by a vision specialist, carried along with the pilot certificate and drivers license, is a far less burdensome solution. In any case, the appropriate night vision test would need to assess the function of both the rods (for their ability to detect dim light), as well as the cones (wherein resides color vision).

(4) Increased Aircraft Capabilities

Much of the NPRM deals with bringing more capable aircraft under the LSA umbrella. Most onerous to many pilots are the limitations currently imposed on maximum gross weight and stall speed. The argument generally put forward by pilots for relaxing these restrictions ("Why only 1320 pounds? It should be 3000! And why 45 knot Vs0? It should be 54!") has been that they are

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seen as arbitrary. In fact, nothing can be further from the truth. These limitations have a firm scientific basis, and a solid safety justification. Allow me to elaborate.

Light Sport aircraft have an enviable safety record. The data show that, although they are just as prone to mishaps as any aircraft, their fatal accident rate has remained amazingly low for the nearly two decades since the LSA rules were implemented. This is precisely because the stall speed and maximum gross weight restrictions limit the amount of kinetic energy to be dissipated in the case of an accident.

NTSB data show the most common accident scenario in LSAs to be departure from the runway during takeoff or landing. (Due to a combination of engine torque, gyroscopic precession, and P-factor, these excursions are invariably off the left side of the runway.) And, almost always, such accidents result in no or minimal injuries – generally, the pilots and passengers simply walk away from the wreckage. This is because the kinetic energy (a factor of mass and velocity) is low.

Runway deviation accidents occur during takeoff and landing. Uniformly, they occur at or near stall speed (in the case of an LSA, 45 knots or less). And, they occur at or below the 1320 pound maximum gross weight limit for land-based LSAs. Under these conditions, the kinetic energy to be dissipated equals 160 kiloJoules. Some fraction of that energy gets absorbed by the occupants, and although an exact figure is difficult to compute, the accident data firmly suggest that it is nearly always below the threshold of what would cause serious injury to the occupants.

Now, let us consider expanding the LSA definition to include aircraft such as, let us say, the ubiquitous Cessna Skyhawk. Our maximum gross weight is now 2550 pounds, with a clean stall speed of 50 knots. From KE=1/2 m v^2, we see that, in the typical accident scenario, we would then have 377 kiloJoules of energy to dissipate, more than double of what now exists. Although again we can't say exactly how much of that energy will be absorbed by the occupants, it clear that fatality rates would have to go up.

Sensitivity analysis suggests the most significant determinant of accident survival rate to be gross weight. This is because stall speed (velocity) goes up with weight. And, since kinetic energy varies with the *square* of velocity, increasing weight alone gives you three strikes. Now, I'm not saying that we should disallow a higher maximum gross weight for LSAs. Nor am I suggesting that we hold the line on the current stall speed limit. I am, however saying, that we can't relax both, without compromising safety.

Perhaps, instead of strict stall speed and gross weight restrictions, we should set a reasonable upper limit on kinetic energy to be dissipated in a runway departure accident. How we slice the pie should be up to the aircraft designer and manufacturer, but our goal should be to set performance limits that will minimize loss of life. Light Sport aircraft currently have an enviable safety record. Let's keep it that way.

Respectfully,

H. Paul Shuch, Ph.D.