A New Order

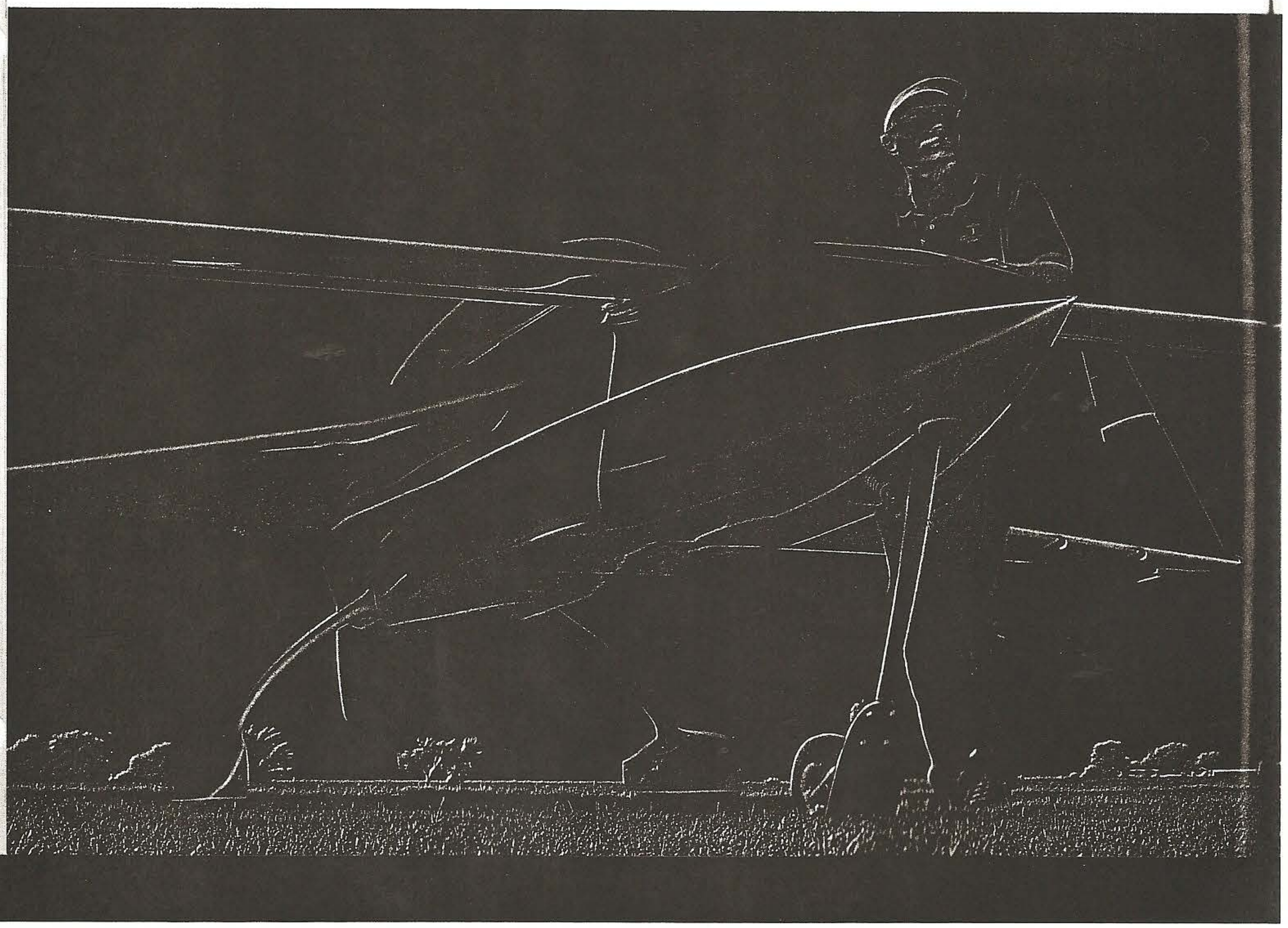
BY EARL LAWRENCE

A new era in homebuilt aircraft certification started on October 1, 1999 when the FAA signed into effect a new set of certification guidelines. The FAA, working with EAA, significantly streamlined and clarified the rules FAA inspectors use to certificate homebuilt aircraft.

These guidelines include a new set of operating limitations for homebuilt aircraft that simplify the things builders must do when making major changes to their aircraft. They clarify what builders must do during their test flights, and they reinforce that the builder is the only one required to endorse a homebuilt's airworthiness.

These guidelines are the FAA policy and procedures FAA inspectors must follow when they accomplish a specific task such as certificating a new homebuilt aircraft. The FAA publishes all of its guidelines in different "Orders," and the new homebuilt certification procedures are in FAA Order 8130.2D, "Airworthiness Certification of Aircraft and Related Products."

Before instituting the new guidelines, the FAA commingled the policy and procedural guidance for homebuilt aircraft with that for all experimental aircraft—and there are eight different experimental categories. Briefly, the different categories cover research and development; showing compliance with the regulations; crew training; exhibition (war-

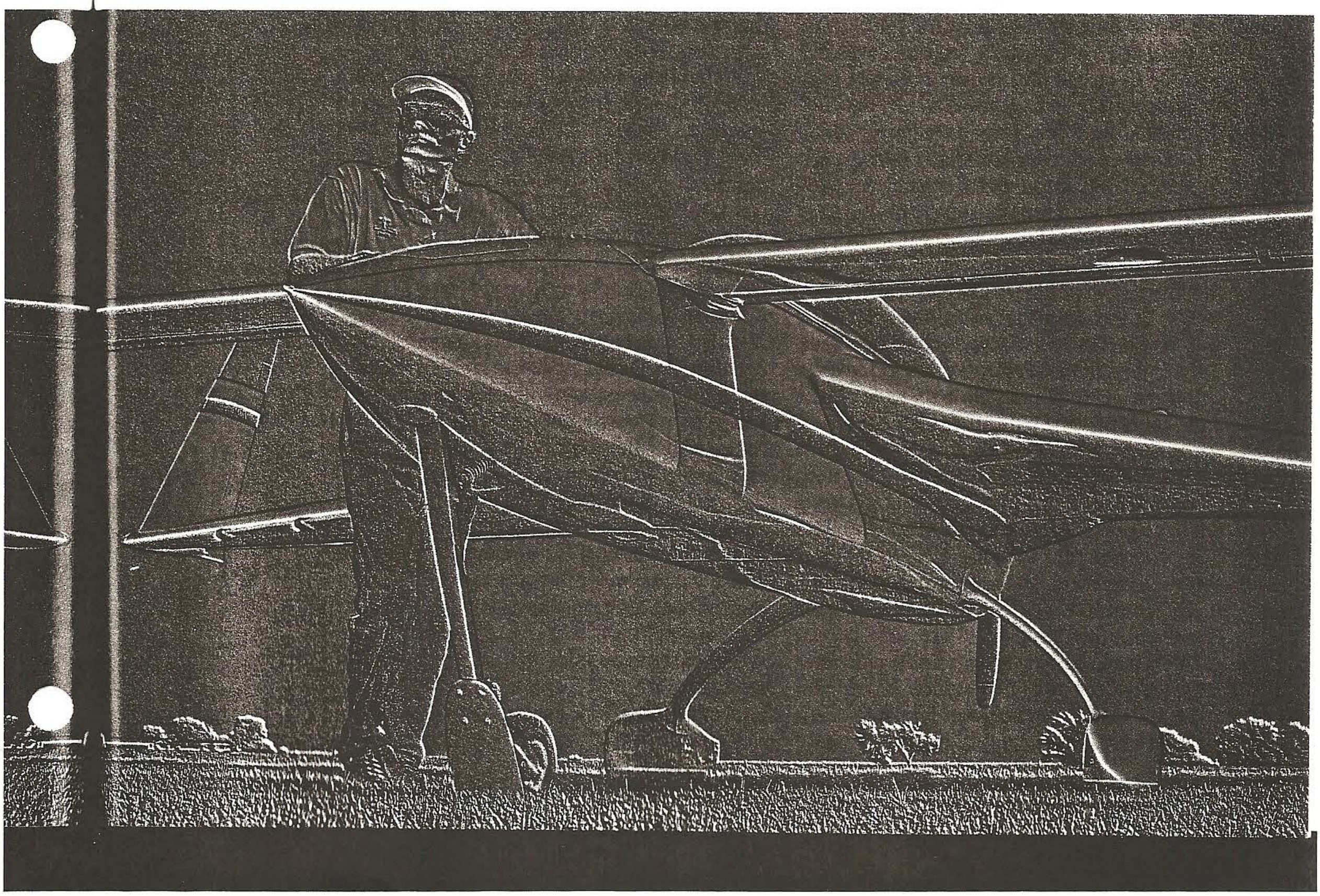


FAA simplifies homebuilt certification with new guidelines

birds); air racing; market surveys (selling a new design that's not yet certificated); amateur-built aircraft; and kit-built aircraft that operate in the primary category. This commingling confused everyone except those intimately familiar with the FAA Order. In some cases it was difficult to know what statement or operating limitation applied to what type of experimental aircraft.

Recognizing the growth of the homebuilt movement, the FAA created separate sections in the new Order for homebuilt and exhibition aircraft certification. By creating separate sections, the FAA was able to write, with EAA input, more specific explanations for homebuilt and exhibition aircraft certification. Just as important, it allows FAA inspectors to find all the required information in one place. This may seem like a simple change, but it should have a large, positive effect across the nation because it will make it easier for builders and inspectors alike to know what's expected of both parties during the certification process.

Of specific interest to the EAA members are Sections 6 and 7, which address airworthiness certification of experimental amateur-built (homebuilts), and Sections 6 and 8, which address experimental exhibition aircraft (warbirds). The full text of these sections are available by clicking the "Govt" link in the Members Only section of the EAA website at *www.eaa.org*. (We'll address homebuilt certification here. For more information about warbird policy, look to future articles in *Warbirds* magazine and the Warbird section of the EAA website.)



Operating Limitations

One of the most significant changes to the certification guidelines is a new set of operating limitations just for homebuilt aircraft. Operating limitations are part of every homebuilt's airworthiness certificate, and they outline when, where, and under what conditions the pilots may fly their homebuilts.

Federal Aviation Regulation 91.319, "Aircraft having experimental certificates: Operating limitations," gives all the particulars. Briefly, this regulation says you can't "operate an aircraft that has an experimental certificate:"

- For other than the purpose for which the certificate was issued
- To carry persons or property for compensation or hire
- Outside its assigned test area until the builder shows that the aircraft is controllable throughout its normal range of speeds and throughout all the maneuvers to be executed and the aircraft has no hazardous operating characteristics or design features

And, "unless otherwise authorized in special operating limitations," builders can't fly their homebuilts over a densely populated area or in a congested airway. However, the FAA "may issue special operating limitations for particular aircraft to permit takeoffs and landings to be conducted over a densely populated area or in a congested airway...."

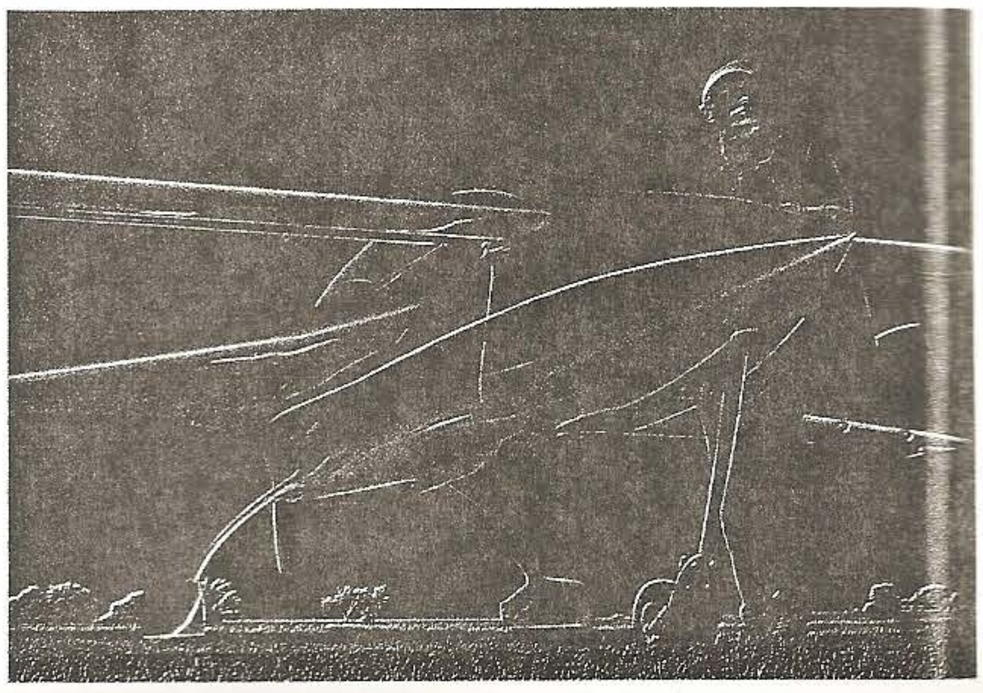
And, people flying homebuilts must:

- Advise each person carried of the experimental nature of the aircraft
- Operate under VFR, day only, unless otherwise specifically authorized by the FAA
- Notify the control tower of the experimental nature of the aircraft when operating the aircraft into or out of airports with operating control towers

Finally, the FAA "may prescribe additional limitations that the [FAA] considers necessary, including limitations on the persons that may be carried in the aircraft."

These limitations are part of the aircraft's airworthiness certificate, and they are the rules you must follow when the FAA issues you that certificate. This is why EAA worked so diligently to participate in the creation of these new limitation guidelines.

The new guidelines apply only to homebuilts certificated using the new FAA Order 8130.2D. Members who own already certificated homebuilts must follow the operating limitations issued under the old guidelines. But if you wish to have the new limitations, contact your local FAA Flight Standards District Office and ask an inspector to add the new limitations to your current limitations. The inspector might not know about the release of the new FAA Order 8130.2D. You can resolve this by showing the inspector a copy of this article, adding that he or she can download a copy of the new document from the "Govt" link in the Members Only section of the EAA website at *www.eaa.org*.



These guidelines are the FAA policy and procedures FAA inspectors must follow when they certificate a new homebuilt aircraft.

There are, of course, special exceptions to the new operating limitation guidelines, but few people are going to build their own space vehicle. For the average homebuilder the operating limitations in the new FAA Order are the ones you will receive. Here's a look at the new guidelines in the order that most builders completing a new project will deal with them.

Airworthiness Endorsement

EAA members call headquarters for assistance whenever FAA inspectors require them to get a sign-off from someone other than the builder, such as an airframe and powerplant mechanic with an inspection authorization or an EAA Technical Counselor, before they will issue the airworthiness certificate. Builders do not need to get this endorsement from a sec-

ond party. Their signature is all that's needed to attest to the aircraft's airworthiness.

Because inspectors too often required this second-party sign-off, EAA asked the FAA to issue guidance to its field inspectors about it, and the FAA did that in 1998. However, many inspectors have missed this guidance because it was not in the original FAA Order. It is in the new FAA Order 8130.2D. This is in the Order's section that deals with amateur-built certification:

"NOTE: There is NO requirement for Airframe and Powerplant mechanics to sign off amateur-built airworthiness inspections. The aircraft builder's signature on Form 8130-6, Block III attests to the airworthiness of the amateur-built aircraft."

This means that regardless of what an inspector may request, he or she must accept the builder's signature attesting to the airworthiness of the aircraft.

When is a homebuilt considered airworthy? The new Order defines that, too. "The aircraft must be in a condition for safe operation. This refers to the condition of the aircraft relative to wear and deterioration, e.g., skin corrosion, window delamination/crazing, fluid leaks, tire wear, etc."

Test Area

With their airworthiness certificate builders will receive their operating limitations that assign them a flight test area. In other words, where they can fly their aircraft while they are completing their flight test program. This is another topic about which EAA headquarters receives a lot of calls, especially from members who live in populated areas.

Builders who live in rural areas don't often have a problem getting a flight test area adjacent to their home airport. However, builders who live in a major metropolitan area often have a difficult time getting permission to perform their flight tests at the local airport, and the headquarters staff works with the inspecting FSDO in an attempt to let members test fly their aircraft at the airport were they built it.

Not all airports are located in areas that are appropriate for test flying, but in some cases the builder and EAA disagree with the FAA inspector about the safety of conducting test flights at a particular airport. The new FAA Order provides more guidance to the FSDO for determining what constitutes an acceptable, safe flight test area.

The new Order says: "In the case of the first flight of an aircraft from an airport surrounded by a densely populated area, but with at least one acceptable approach/departure route of flight, the FAA shall ensure that a route of flight is selected where the least number of persons and property may be subjected to possible hazards. In addition, upon leaving such an airport, the aircraft should be required to operate from an outlying airport until its controllability and safety are established, after which the aircraft may return to its base and use the established corridor for subsequent operations. *NOTE: An acceptable approach/departure route of flight may be considered to exist when the route of flight provides reasonable opportunity(s) to execute an off-airport emergency landing that will not jeopardize other persons or property."*

Test Flights

With your test flight area defined, you have to make your test flights after receiving the aircraft's initial certification, and the operating limitations relating to test fights has changed in the new Order. In recent years, EAA and FAA have observed that new builders often don't understand what they are expected to do during their 25 or 40 hours of initial test flying. Many builders simply fly their aircraft around the airport until they have the specified amount of time on the aircraft.

Because they haven't made their test flights, few builders have developed a pilot operation handbook for their aircraft. This lack of accurate performance and operating number for their aircraft affects the accuracy of their flight planning, and if they sell the homebuilt, the new owner doesn't know what the aircraft's basic operating parameters are.

Most important, the majority of homebuilt accidents are still occurring during the flight test period, and less than 10 percent of the new aircraft are being tested with the assistance of the EAA Flight Advisor program.

To address these problems, the FAA made these changes to its new Order. The inspector

will tell the applicant about the EAA Flight Advisor program and strongly encourage the person to take advantage of it. The applicant will be required to develop a test plan in the scope and detail outlined in FAA Advisory Circular 90-89, "Amateur-Built Aircraft & Ultralight Flight Testing Handbook," and record specific data from these flights.

The new operating limitation reads: "All test flights as a minimum shall be conducted day VFR to the scope and detail of Advisory Circular 90-89, Amateur-built Aircraft and Ultralight Flight Testing Handbook. Following satisfactory completion of the required number of flight hours in the flight test area, the pilot shall certify in the records that the aircraft has been shown to comply with § 91.319(b). Compliance with § 91.319(b) shall be recorded in the aircraft records with the following or a similarly worded statement: *I certify that the prescribed flight test hours have been completed and the aircraft is controllable throughout its normal range of speeds and throughout all maneuvers to be executed, has no hazardous operating characteristics or design features, and is safe for operation. The following aircraft operating data has been demonstrated during the flight testing: speed* V_{SO}, V_X, and V_Y, *and the weight and CG location at which they were obtained."* [Specific numbers must follow the V-speed, weight, and CG.]

The FAA selected these three V-speeds for the new operating limitation because the methods for determining them are given in AC 90-89. It's important for every aircraft builder to determine these speeds, even if a designer or kit manufacturer has published the aircraft's performance numbers. Because homebuilts are custom-made aircraft, each one is different to some degree, even if they start life as the same model from a kit manufacturer. How the aircraft performs depends on its construction, engine, propeller, and conditions under which the builder flies it.

Also, builders should not limit their test program to determining the V-speeds required by the operating limitation. To learn as much about flying their aircraft as they did building it, pilots should fly a complete test program. This includes meeting the scope of the operating limitation by evaluating your test airport, developing an emergency plan, completing engine tests, taxi tests, airspeed calibration, maximum gross weight tests, determining fuel consumption rates and much more.

Copies of all homebuilt-related Advisory Circulars and contact numbers for your local EAA Flight Advisors and Technical Counselors are available by calling EAA at 920/426-4821 or e-mail infoservices@eaa.org. With the help of an EAA Flight Advisor and the AC 90-89, test flying your aircraft should be fun and educational. Besides, it beats flying in circles for 40 hours.

Major Changes

One of the new operating limitations that has received the most interest since its announcement deals with major changes.

What is a major change? FAR 21.93, "Classification of changes in type design," doesn't specifically define a major change. It says: "A 'minor change' is one that has no appreciable effect on the weight, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the product. All other changes are 'major changes.'"

In other words, anything that has an appreciable effect on the weight, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the product is a major change.

What's an appreciable change? There's no black and white answer to this one, but common-sense analysis of changes works well. For example, swapping a wood prop for a metal one would change the CG because one is heavier than the other. That's a major change.

Another good reference is Appendix A of FAR Part 43, "Major Alterations, Major Repairs, and Preventive Maintenance." It lists items that are "major alterations" on production aircraft, but these items would be major changes on a homebuilt. They include items such as alterations to the wings, tail surfaces, fuselage, engine mount, control system, landing gear, spars, ribs, fitting, shock absorbers, bracing, fairings, balance weights, changes to the fuel or oil system, a different engine or new engine accessories like a turbo, propeller changes, and anything that changes the aircraft's empty weight or empty balance that results in an increase in the maximum weight or center of gravity limits of the aircraft.

Before the FAA issued the new Order, owners who made a major change to their already certificated homebuilt had to get a letter from an FAA inspector approving it. In some cases, the inspector had to re-inspect their aircraft

This new operating limitation significantly reduces the bureaucracy and has the potential to increase safety.

after every major change as defined in FAR 21.93. What made this burdensome is that many builders didn't document their changes, nor did they call the FAA for the required review of the change.

Another problem was that FSDO inspectors were so busy with their other duties that they had to schedule the visit weeks in advance. And builders who called the FAA at the "last minute" had to wait for weeks for their inspection visit.

After reviewing the issue with EAA, the FAA decided that documenting the major change in the aircraft's logbook—and flying the proper flight tests in a safe area—were the primary keys to safety. This decision resulted in the new "major change" operating limitation, which applies only to homebuilts certificated under the new Order. It says:

"After incorporating a major change as described in [FAR] 21.93, the aircraft owner is required to re-establish compliance with [FAR]91.319(b). All operations will be conducted day VFR in a sparsely populated area. The aircraft must remain in flight test for a minimum of 5 hours. Persons non-essential to the flight shall not be carried. The aircraft owner shall make a detailed logbook entry describing the change prior to the test flight. Following satisfactory completion of the required number of flight hours in the flight test area, the pilot shall certify in the records that the aircraft has been shown to comply with [FAR] 91.319(b). Compliance with [FAR] 91.319(b) shall be recorded in the aircraft records with the following or a similarly worded statement: *I certify that the prescribed flight test hours have been completed and the aircraft is controllable throughout its normal range of speeds and throughout all maneuvers to be executed, has no hazardous operating characteristics or design features, and is safe for operation. The following aircraft operating data has been demonstrated during the flight testing: speeds V_{SO}, V_X, and V_Y, and the weight, and CG location at which they were obtained."* [Specific numbers must follow the V-speed, weight, and CG.]

This new operating limitation significantly reduces the bureaucracy and has the potential to increase safety by ensuring proper logging and testing of modified homebuilts. Also, it's hoped that articles such as this one will increase builder awareness about the need and requirement to test fly their aircraft properly after making a major change. It's even more important to remember that the 5 hours is the *minimum* test flight period. Depending on the change you make, it can take much more than five hours to re-verify the safety and controllability of your aircraft.

Again, this new operating limitation as well as all the new limitations only apply to aircraft certificated using the new FAA Order 8130.2D. Those who own homebuilts certificated under the old Order and wish to have the new operating limitations should contact their local FSDO. The FAA is working on a way it can modify all the existing major change in operating limitations to the new wording through a bulletin or letter to each current owner of an experimental amateur-built aircraft. But it needs to clear several hurdles before it can do this, so homebuilt owners who are making major changes to their aircraft now should not wait for the FAA to implement this new bulletin system.

The new FAA Order 8130.2D is, indeed, a new era on homebuilding. If you are building an aircraft, get a copy of it from EAA, read it, and be prepared for the FAA's inspection of your new set of wings. ◆

Get Your Order Today

You can download the full text of FAA Order from the "Govt" link on the Members Only section of the EAA website at www.eaa.org. The Order and all the homebuilt-related FAA Advisory Circulars and contact numbers for your local EAA Flight Advisors and Technical Counselors are available by calling 920/426-4821 or e-mail infoservices@eaa.org.