General Aviation
Joint Steering Committee
Safety Enhancement Topic

November 2014

FAA
Aviation Safety

Experimental/Amateur-Built Flight Testing

NTSB accident data show that experimental and amateur-built aircraft account for a disproportionate number of fatal events. The data also show that the first 50 hours of flight time on a newly constructed E/AB aircraft are particularly dangerous. Aircraft modifications show a similar spike in accidents shortly after those modifications are completed. Accident investigation of these events frequently shows that a robust flight test program conducted by a competent test pilot would reduce the number of fatal crashes. FAA's new Additional Pilot Program further enhances flight safety by allowing builders to have a qualified additional pilot be part of the flight testing process.

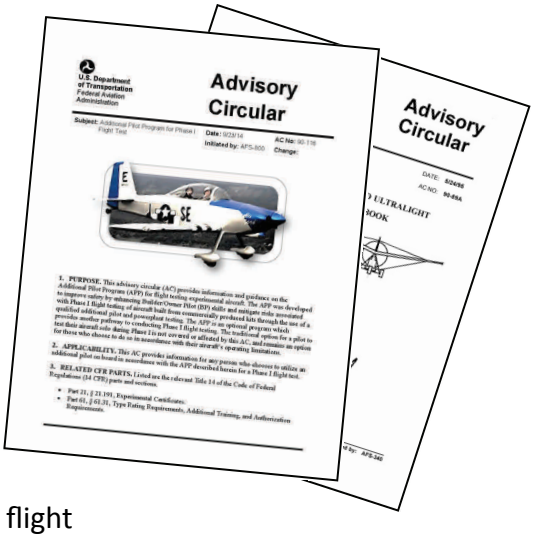
The Danger

In 2012, NTSB completed a safety study of E-AB aircraft that included the use of an EAA survey of E-AB pilots. Among other findings, the NTSB concluded that the flight test period—the first 50 hours of flight—is uniquely challenging for most E-AB pilots because they must learn to manage the handling characteristics of an unfamiliar aircraft while also managing the challenges of the flight test environment, including instrumentation that is not yet calibrated, controls that may need adjustments, and possible malfunctions or adverse handling characteristics. E/A-B aircraft can also be faster, have higher stall speeds, and be less crashworthy than many standard aircraft.

So how do you know your aircraft is in a condition for safe flight? Will it operate safely within its operational envelope? Will it have any quirky characteristics or limitations? That is where a detailed flight test plan can come in.

The Plan

Thankfully the FAA has produced an excellent document that can help you develop such a flight test plan, taking into account everything from selecting the right airport and runway to an exhaustive list of first flight and emergency procedures. It is Advisory Circular (AC) 90-89, *Amateur-Built Aircraft and Ultralight Flight Testing Handbook*, and it can be accessed by clicking the Advisory Circular link under the Regulations and Guidelines tab on www.faa.gov.



According to the AC, "the flight test plan is the heart of all professional flight testing." It also states that "the plan should account for every hour spent in the flight test phase and should be adhered to with the same respect for the unknown that all successful test pilots share."

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Take it Step By Step

It's important to heed the advice this AC offers in terms of flight test preparation. In addition to discovering any unwanted characteristics (e.g., perhaps you rigged the aileron cables too tightly), a thorough flight test plan will also help point out performance limitations you may not be used to with your previous aircraft type. For example, those transitioning to an ultralight will notice a big difference in how power settings can affect airspeed. In a light-weight aircraft, it is possible to go from cruise speed to a stall in less than 4 seconds. This is due to the low mass, high drag configuration, and smaller speed range characteristic of the majority of ultralights. (*Note: AC 90-109 is another helpful resource you should use when transitioning to an unfamiliar aircraft type*).

Chapter 1 of AC 90-89 guides builders in preparing for the flight test program. Subsequent chapters cover everything from initial taxi checks through the first 40 hours of flight.

Following AC guidance and the Flight Test Plan, test pilots progress from aircraft inspection and weight and balance calculations, through taxi and initial flight tests, and on to maximum performance maneuvers and spins.

Changes

Even pilots of manufactured aircraft may find themselves in a test pilot role. Manufactured aircraft are run through a Flight Test program during type certification of course, but they also undergo testing when they've been modified, upgraded, or improved.

The same is true for E/AB aircraft as well. It's a good idea to run your aircraft through flight test procedure any time you make a change that could alter the aircraft's flying characteristics. That will give you the opportunity to document any changes in weight and balance, performance, or operational procedures.

Test Pilots

Once the Flight Test Plan is complete, a test pilot must be selected. Most builders look forward to commanding the first flight in their aircraft but the builder may not be the best pilot for the job, especially with the ever-increasing complexity and capability of many E/AB aircraft.

Realizing the value an extra set of hands and eyes can provide during this crucial period, last September the FAA adopted AC 90-116, which offers E-AB pilots an alternate pathway to conducting Phase I flight testing. The AC introduces the Additional Pilot Program (APP), a program designed to improve safety by allowing homebuilders to have a qualified additional pilot on board to assist with flight tests.

Resources

Amateur-Built Aircraft and Ultralight Flight Testing Handbook (FAA-AC No 90-89A)
www.faa.gov/documentLibrary/media/Advisory_Circular/AC%2090-89A.pdf

Additional Pilot Program for Phase I Flight Test (FAA AC 90-116)

www.faa.gov/documentLibrary/media/Advisory_Circular/AC_90-116.pdf

Airmen Transition to Experimental or Unfamiliar Airplanes (FAA AC 90-109)

www.faa.gov/documentLibrary/media/Advisory_Circular/90-109.pdf