

# First Flight

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What does it take to do the first flight in a brand new homebuilt aircraft and how should you prepare? The NTSB analysis of first flights in amateur built experimental aircraft indicates that they are considerably riskier than normal flying, no surprise here. In fact, the risk of an accident during the first hour of Phase I testing is several times greater than during the remainder of the flight testing. See the graph below. Almost 20% of the accidents occur in the first hour of phase I testing. Over 60% occur in the next six hours, but my focus here is on that first flight so let's get back to that.

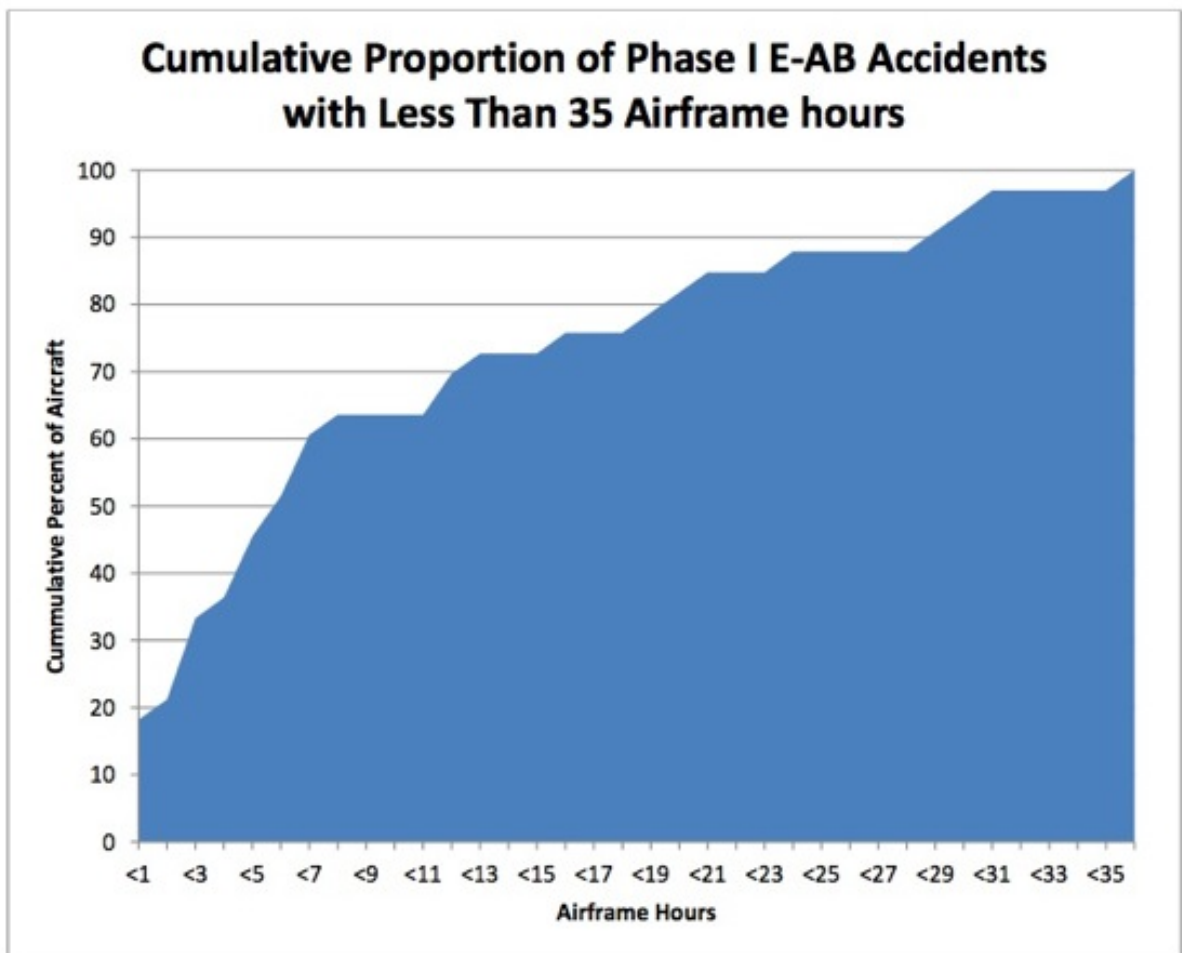


Figure 24. Airframe hours at time of accident.

This is a figure from the 2012 NTSB Report on Experimental Amateur Built (EAB) Aircraft Safety.

Looking at the cause of accidents in the table below, we see that 60% are due to loss of control in flight or on the ground, 30 % are due to component and system failures (usually engines), and 10% are due to miscellaneous factors. OK, so the two biggies are loss of control and component and system failures, so what can we do to prevent these things from happening. The loss of control accidents, are usually related to a lack of pilot proficiency or inexperience in the type of aircraft being flown. The solution here is to make sure that you are current and proficient and that if at all possible you have had some transition training. The component and system failures, are usually power plant related, so the solution here is to make sure that you are using a proven propulsion system and that it is running satisfactorily before you take to the air.

**Table 4.** Characteristics of the 10 accidents in 2011 that occurred during the first test flight of the newly built E-AB aircraft.

NTSB Case #	Aircraft Category	Aircraft Type	Occurrence Category	Phase	Test Pilot
ERA11LA208	Airplane	JTD Minimax	Collision During Takeoff/Landing	Takeoff	Builder
ERA11LA213	Airplane	Volksplane VP1	System/Component Malfunction or Failure (Powerplant)	Initial Climb	Builder
CEN11CA336	Gyroplane	KB3 Gyroplane	Collision During Takeoff/Landing	Takeoff	Builder
CEN11FA346	Airplane	Cassutt III	Other	Initial Climb	Builder
CEN11LA432	Airplane	Zenith CH-750	Loss of Control in Flight	Take Off	Builder
CEN11LA488	Airplane	Volksplane VP1	System/Component Malfunction or Failure (Powerplant)	Initial Climb	Certified Flight Instructor
CEN11FA537	Airplane	E-Racer	Loss of Control in Flight	Maneuvering	Builder
ERA11LA459	Airplane	Pegazair STOL 100	Loss of Control in Flight	Initial Climb	Builder
CEN12LA013	Gyroplane	Calidus Autogyro	Loss of Control on Ground	Landing	Builder
CEN12CA029	Gyroplane	American Autogyro Sparrow Hawk	System/Component Malfunction or Failure – (Non-Powerplant)	Takeoff	Builder

This is table from the same 2012 NTSB Report that shows what type of accidents occur during the first flight of EAB type aircraft.

The other thing to do is to have the aircraft thoroughly inspected before attempting flight. This means getting an inspection not only by the FAA,

but also by anybody else you can get to lay eyes on it (A&Ps, technical counselors, other builders, etc). As an example, I had my Peg looked at by my IA, our chapter technical counselor, a couple of other builders, and it was the FAA inspector who found that I neglected to tighten the nut on one of my front strut attach bolts. I don't know how the rest of us missed it, but thank goodness, he caught it. Conducting a fuel flow test is mandatory, as is weighing the airplane and doing an accurate weight and balance.

I'll give you another example. I have helped builders do a fuel flow test on their aircraft on many occasions sometimes with interesting results. Some have thought it was a bit of an over-kill but agreed to do it, mostly to get me out of their hair. They are often surprised to see how their fuel flow is affected by aircraft attitude, particularly aircraft with only one fuel pickup tube in a fuel tank. It is not unusual to find that you may have 2-5 gallons of unusable fuel when the fuel sloshes away from the pickup in a nose down attitude. Without a fuel flow test, this could come as an unpleasant surprise when the engine quits on your first steep approach to landing. I can't over emphasize the importance of doing a proper fuel flow test and the fact that every homebuilder should conduct one prior to their first flight.

I recommend that before you takeoff or even do high-speed taxi tests that you make sure that your engine **will run at full power for at least 1 minute, preferably 2 minutes**. You should be able to do this test on most engines (if they have already been broken in) on the ground, without over heating them. On a normal aircraft engine, if you keep the cylinder head temperatures under 400 F and the engine oil temperature under 210 F you don't have to worry about damaging anything. Why at least 1-2 minutes at full power? At sea level, with the engine running at full power, you should be able to climb to pattern altitude in a couple of minutes and can return to the field if you have a power failure shortly afterwards. Also, you will find out pretty quickly on the ground, if you have a cooling problem with this test.

Let's get back to the pilot being ready for test pilot duty. Most homebuilders have used 110% of their resources getting ready for the first flight. I mean financial resources to build the airplane, and their time and energy to complete the construction. Often they have committed very little of their time, energy, and money to prepare themselves to be a test pilot. This is not good and is a major reason, so many homebuilt aircraft are wrecked on the first flight. So, be sure that you are not only current, meaning legally ready for the flight, but also proficient at your duties as test pilot. Try asking yourself these questions.

1) Have I completed **transition training in my aircraft type** and am I proficient at all the maneuvers expected from a test pilot?

Maneuvers like, maximum performance takeoffs, dead stick landings, power on/off stalls, cross controlled and accelerated stalls, three point and wheel landings, X-wind landings, steep turns, emergency procedures (engine failure, engine fire, electrical fire), to name a few. On a normal test flight you won't need hardly any of these skills, but if something goes wrong, you will be glad that you have them all.

2) If not, have **I trained in a similar aircraft** and am I proficient at all the maneuvers expected from a test pilot?

3) Am I **physically and mentally prepared** for a first flight?

4) Have I thoroughly **taxi tested** the aircraft?

5) Am I wearing a **Nomex flight suit, gloves, and helmet** for the first flight.

6) Do I have a **test card** for my first flight? I recommend keeping the first flight simple. Takeoff, climb up to 3000 feet AGL and circle the field at 55%-65% power. Monitor your engine temperatures and get a feel for the handling characteristics of the aircraft. Try a few steep turns. Try some slow flight. After 30 minutes come back and land. Give yourself plenty of room on the approach and make sure it is stabilized. If everything doesn't feel right on the first approach (which it usually doesn't), go around early and come back for another one. If it doesn't feel right on the second one, go around again, until it does feel right. Land in the first half of the runway and taxi up to the cheering crowd, which should be pretty small for the first flight, just a few people. Someone on a radio that you can talk to, someone to act as fireman/EMT (unless you are at a large airport with those services), and anyone else that you feel needs to be there, but who won't put any pressure on you to fly if things aren't just right. Sometimes we use a chase plane, it can be helpful for spotting parts falling off, or smoke coming out, but you need to make sure that the chase pilot knows what he is doing and stays out of your way and it certainly isn't necessary.

Well that's my two cents on first flights in homebuilts. Do it right and you will have an experience to cherish for the rest of your life.