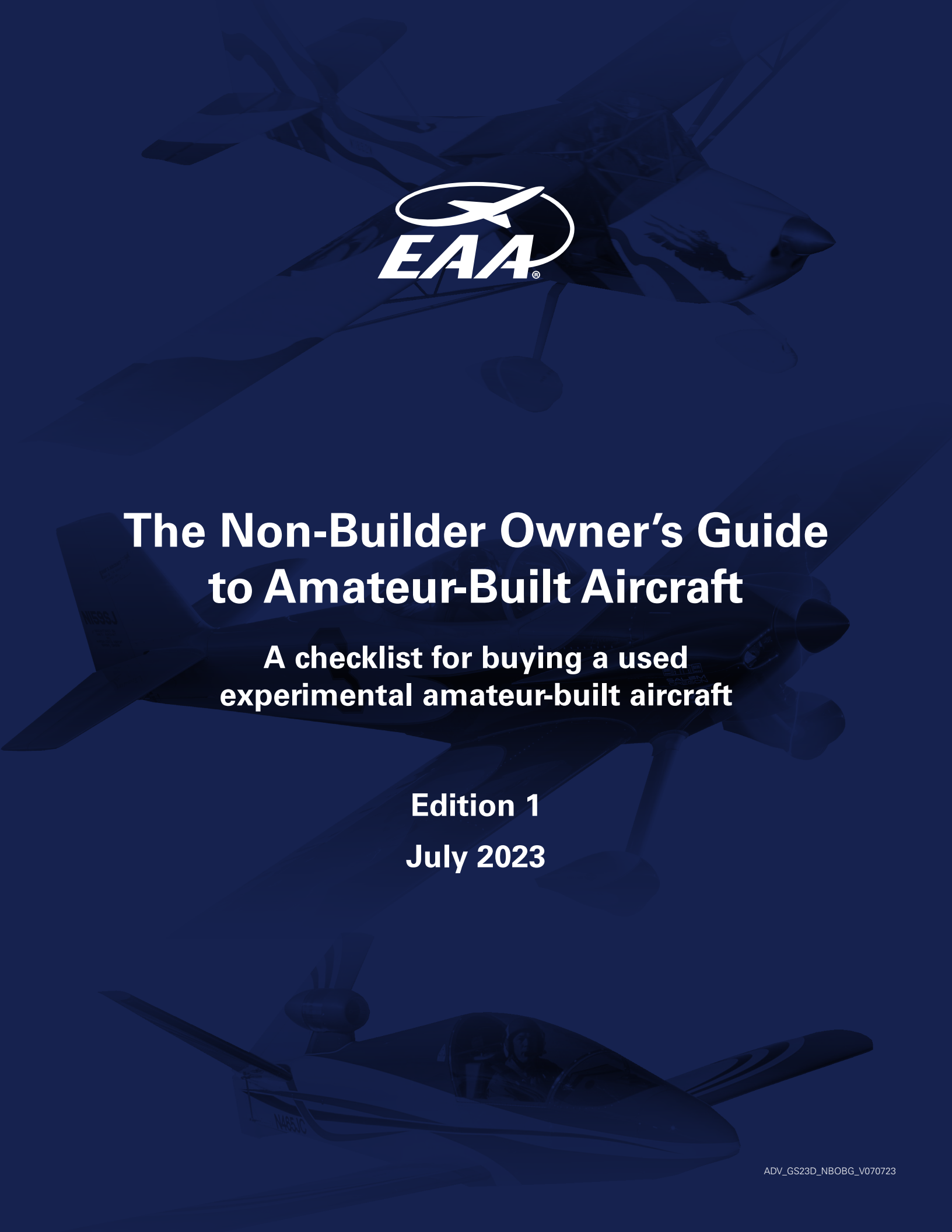

The Non-Builder Owner's Guide to Amateur-Built Aircraft

A checklist for buying a used experimental amateur-built aircraft

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Introduction

Congratulations on your decision to purchase an experimental amateur-built (E-AB) aircraft!

This is quite likely to be the beginning of one of the most exciting and rewarding chapters in your aviation experience! The purchase of an E-AB aircraft offers many exciting opportunities not available to owners of certified aircraft, not the least of which is the opportunity to operate or upgrade to exciting new avionics, as well as perform much of the aircraft maintenance yourself. Aircraft ownership has many unique aspects, and this checklist is designed to assist you in reducing your costs, purchase and ownership workload, and avoid missed opportunities that may only be available during the purchase of your aircraft.

This checklist is intended to provide guidance for experimental amateur-built (E-AB) aircraft owners who were not the original builders of the aircraft ("nonbuilder owners," or NBOs), and to allow you to fully understand the capabilities and limitations of your purchased E-AB aircraft.

> EAA strongly recommends you obtain a copy of the EAA Flight Test Manual (FTM) and re-accomplish much of the flight testing to completely understand the capabilities of your aircraft.

> EAA also strongly recommends that you complete a thorough transition training program based on your experience in the type of aircraft you are purchasing. Five or 10 hours of dual instruction can be a wise investment in your safety and operational enjoyment, and there are many resources available for this training.

The overall purpose of this manual is to improve the safety of the operation of your E-AB aircraft, as well as enhance your enjoyment of flight operations by increasing your knowledge of your own aircraft's handling and performance characteristics by providing some guidance on the needs and objectives of transition training.

This checklist is divided into the following major sections:

1. How to evaluate a specific aircraft before purchase

This section strongly recommends that you hire an independent, fully qualified inspector to look at candidate aircraft, and provides information on how to locate and evaluate your pre-buy inspector.

Accident statistics show that nearly 20 percent of E-AB accidents are caused by builder errors or mechanical failures, so a good pre-buy inspection can make your operations safer. A good pre-buy inspection can also save many thousands of dollars in repair costs for unwitting buyers. The construction quality of homebuilt aircraft can vary widely, and knowing the true condition of your future aircraft, and using that knowledge to properly assess its value, can save you money in the future.

2. Aircraft documentation

This section is designed to help you understand the pertinent documents you need to make sure are part of the aircraft purchase, and some resources for these documents.

There are a number of checklists provided in this section to help you organize your purchase. You want to obtain all necessary documents from the seller before completing the sale to ensure your aircraft is registered and operated in compliance with all regulations.

This section is primarily designed for E-AB aircraft operators in the United States, but may be useful to purchasers in other countries.

3. Transition training for your new aircraft

Experience in the experimental aircraft category has shown that flying is much safer and enjoyable when the new owner is familiar with the unique characteristics of their new aircraft. In fact, nearly 20 percent of all E-AB accidents involve pilots with fewer than 10 hours in type. E-AB accident statistics show that accidents with nonbuilder owners (NBOs) in their first 10 hours are actually higher than during the initial 10 hours on a new E-AB aircraft!

Extensive experience flying a C-172, an F-18 in the Navy, or a B-737 for an airline does not necessarily prepare a pilot for the challenges of many experimental aircraft. This is not to say that experimental aircraft are necessarily more difficult to fly, but the handling and performance characteristics of any given example can be quite different from other aircraft, and especially different from other certified aircraft. An excellent reference for creating a training program is FAA advisory circular AC 90-109A, "Transition to Unfamiliar Aircraft," which includes this wise quote: "All pilots should consider the first flight in any particular experimental airplane a test flight."

Most airlines provide their highly experienced pilots more than 25 hours of simulator time, and an additional 25 hours of aircraft training during a pilot's transition into a new model of aircraft. Military flight schools also provide experienced pilots with considerable simulator time, and five to 10 hours of dual instruction (if possible, depending on type) before pilots are allowed to solo in a new model of aircraft. It is perfectly reasonable for you to anticipate scheduling a minimum of five or more hours of transition time before flying as pilot in command, even if you are already quite familiar with other similar aircraft. Pilots transitioning to significantly different aircraft (e.g., amphibious, tailwheel, high-performance, etc.) should anticipate even more time to safely master their new acquisition.

You should develop a personal plan for training and qualification in your newly acquired aircraft, one that recognizes your personal experience as a pilot and highlights the unique challenges. Some of these areas to consider include:

> Tailwheel experience (if applicable)

> Electronic flight instrument displays versus traditional "round dials"

> Autopilot experience

> High performance or low performance relative to your new aircraft

> Aerobatic experience (if applicable)

> Constant-speed prop versus fixed-pitch experience

> Unique systems: retractable gear, flaps, turbocharger, etc.

Look for a CFI with a letter of deviation authority (LODA). The LODA allows a CFI to provide training in an aircraft that they rent for the purpose of training. You can find these CFIs through:

> The kit builder's website

> Type aircraft social media sites

> EAA's LODA list at EAA.org

SECTION 1

HOW TO EVALUATE A SPECIFIC AIRCRAFT BEFORE PURCHASE

Homework

Let's assume you have already picked out an aircraft model you are interested in. This is an aircraft that meets your defined mission profile, including:

> Number of seats

> Range

> Cruise speed

> Fuel consumption

> Climb rate

> Baggage space, capacity, and location (center-of-gravity limitations)

> Airframe size (Will it fit in a standard hangar?)

> Payload

> Runway requirements (short/long/smooth/rough/paved/grass)

> Stall and handling characteristics

> Accident history (from NTSB statistics)

> Ease of maintenance and inspection

> Availability of maintenance services and support for the type of construction (metal/fabric/composite)

> Availability of parts (Is the manufacturer of the kit still in business?)

> Cost and availability of insurance for you personally in this aircraft (obtain indicative quotes)

After selecting a model that meets your criteria, there is still much to be done before proceeding with a specific example for a pre-buy inspection. This early research is vital and may save you much heartache and considerable money in repairing or replacing expensive systems or components that were not in proper condition at the time of purchase. There is nothing wrong with buying an aircraft that needs work. However, you are much better off knowing the exact condition of the aircraft before deciding on its value and before you sign the purchase check.

> Check online forums and manufacturers' online resources for the aircraft, engine, propeller, and avionics in the aircraft you are considering.

> Find other pilots operating the same or similar aircraft and/or systems, and ask for their opinions on advantages and disadvantages of major components.

> Check the manufacturer's website (or type club in the case of orphaned aircraft that are no longer supported by a manufacturer/kit supplier) for service bulletins.

> Review the aircraft and logbooks to be aware of the status of your potential purchase regarding these items.

> Make sure the aircraft has a certificate of airworthiness (CoA) and operating limitations. If the kit aircraft (or partially assembled kit) does not have a CoA, make certain you have the build history (e.g., builders log, photographs, receipts for component parts), and a fully documented chain of ownership listing all previous owners, preferably via FAA bill of sale forms. Refer to EAA's Step-by-Step Certification Guide, contained within the Amateur-Built Certification Kit, for details. It's available at EAA.org/Shop.

> Research service bulletins/notifications issued by the kit manufacturer or plans seller, including accessory parts (wheels/brakes, fuel pump/filter, avionics/electronic flight instrument systems, etc.).

> Research upgrades to your specific aircraft model or plan, and research available options to understand the exact condition of your potential purchase.

> Check the FAA (or appropriate regulator's) website for ADs regarding any installed certified equipment (i.e., the engine and propeller). In most cases, ADs don't specifically apply to E-AB aircraft; in rare cases they do. In any case, you should do this research and consider what action should be taken for your aircraft.

> Take a close look at the avionics that are installed. Are they still supported by a manufacturer? Are they compatible with your future plans? Can you connect them to the avionics you plan to install? Avionics evolve very quickly, and in some cases, it may be more cost-effective in the long run to upgrade many systems simultaneously, rather than trying to connect obsolete avionics to newer systems.

> Know the ballistic parachute and rocket expiration and repack intervals/costs.

Hiring a Pre-Buy Inspector

The decision to hire an independent inspector for your pre-buy inspection is an important and personal consideration that should be carefully thought out. Experienced pre-buy inspectors can easily identify serious issues that you may not, especially when they are experienced with the type of aircraft you are considering. If you have never built an E-AB aircraft, hiring a qualified, independent inspector may save you considerable cost and frustration in the long term. Most importantly, an experienced inspector may identify safety issues that could be significant enough that they may delay a pre-buy test flight or that may significantly affect long-term safe operations.

To locate an inspector:

> Check with the aircraft kit or plans manufacturer and/or type club, and solicit recommendations.

> Talk to potential inspectors and ask them what they look for in that particular aircraft, and what may be on their personal "do-not-buy" list.

> Use online forums or social media to find recommended individuals. Some types have dedicated social media sites that may provide references.

> If a professional pre-buy inspector can't be found (especially for types with smaller fleets), find an experienced, reputable builder of the type in your area. You may need to cover their travel costs.

Pre-buy inspector qualifications include:

> Has personally built the same or similar aircraft

> Has significant flying time in the same or similar aircraft

> Has previously accomplished numerous pre-buy inspections of that model aircraft (or similar types)

> Is familiar with the installed engine, propeller, avionics, GPS, autopilot, etc.

> Is recommended by a number of recent buyers of the same model

> Is an A&P/IA, EAA Technical Counselor, and/or EAA Flight Advisor

> Selected by you, not the seller

Pre-Buy Inspection General Considerations

Be ready to back away from an aircraft that has a lot of issues.

There are a number of things to do to help ensure a good pre-buy inspection. These include:

> The inspector should use a pre-buy checklist and make extensive notes. This may be similar to a conditional (e.g., "annual") inspection checklist, ideally specific to that model of aircraft.

> Make a list of each squawk for later discussion, potential repair, and purchase price negotiations.

> Take lots of photos and/or video.

> Use a bright light. Many problems are only detected by using a bright LED.

> Touch everything possible. Your hands are as valuable an inspection tool as your eyes, and in some instances, more valuable.

> Listen to the flight controls, flaps, etc., as they are moved through full deflection. Do this near the flight controls and from the cockpit.

> Ask your pre-buy inspector to comment on anything they identify that must be fixed before a test and/or ferry flight or that you may wish to upgrade in the future.

Overall Condition of the Aircraft

Look at the general condition of the aircraft. For example:

> General appearance, fit and finish of cowlings and panels

> Lubrication of moving parts

> Quality of rivets, fiberglass workmanship, corrosion

> If you find a single jam nut loose, there are probably more; be thorough.

> Look at how well organized the wiring is; all wires should be secured and routed in an organized manner.

Caution: Significant Modifications by the Builder/Owners

Look for significant modifications to kit aircraft or plansbuilt aircraft. While there are no regulatory limitations (e.g., FAA limitations) on builder design modifications, the buyer should proceed with caution and look for significant modifications by the builder. Some modifications and their consequences include:

> Increasing the engine horsepower may result in inadequate rudder authority during takeoff, at low speeds, or during go-arounds.

> A larger engine can result in center-of-gravity issues or inadequate flight control authority to counteract the increased power and torque of the engine. It may also apply higher stresses to the airframe structure designed to absorb the power, leading to potential premature failure of motor mounts or attached airframe components.

> Note: Installing an engine not supported by the kit manufacturer may cause problems obtaining insurance.

> Operating outside the manufacturer's design center of gravity may result in a loss of control, overstress of the aircraft, or undesirable handling characteristics.

> Increasing the maximum true airspeed (either indicated airspeed, altitude, or both) may result in less margin from flutter.

> Moving the gear forward on a conventional-gear aircraft may increase the propeller ground clearance while decreasing directional stability on the ground.

> Increasing the size of the elevator may increase the sensitivity to control inputs, and decrease V_{NO} (maximum structural speed, or the speed at which full control deflection results in maximum *g*).

> Some builders increase the gross weight above what the original designer recommended. This increase should be accompanied by a detailed analysis of what justified that weight increase, as this can increase stress on many areas of the aircraft and significantly affect performance and handling characteristics, including takeoff distance, landing distance, climb rate, stall speed, and stall characteristics.

» It also means maximum design structural loads are reached at lower *g*'s and at lower airspeeds.

- » Pay attention to the aircraft's empty weight compared to other typical examples of the type and the empty weight published by the manufacturer. Many amateur-built aircraft in the field are too heavy due to modifications, accessories, "creature comforts," heavy paint jobs, or engine installations that are alternative to the manufacturer's recommendations.
- » Make sure the aircraft's documents list the correct max gross weight versus that specified by the manufacturer.
- » Note also that many builders do their weight and balance before all the equipment is installed and before the aircraft has been painted. This can significantly affect the center of gravity, flying qualities of the aircraft, and reduce the useful load. Ensure the empty weight and center of gravity calculations were done after these things were completed.
- » Increasing the gross weight reduces the design margins and increases wear on components such as landing gear struts, tail wheels, landing gear steering mechanisms, etc.

> Adding fuel tanks to wingtips, leading edges, baggage compartments, etc., can greatly increase the aircraft's range and performance. It can also have very serious consequences regarding stability, center of gravity, and the aircraft's *g*-limits (particularly regarding gust loading and negative *g*). Considerations include fuel transfer issues, fuel tank venting, and flight control issues associated with potential failures of the fuel to transfer.

> Modifications to basic systems may enhance or reduce operational safety. For example, adding electronic engine ignition may be a significant performance and safety enhancement, but only if the backup power supply to the ignition system is installed properly.

This is not an all-inclusive list of issues that may result from design changes, but is designed to enhance your sensitivity regarding these types of changes.

Online Resources

It's a good idea to check the registration of the aircraft you are considering. For U.S. aircraft, enter the N-number at this site: Aircraft Inquiry (FAA.gov). You can also search this database under the aircraft serial number.

Another good idea is to visit one or more online flight tracking sites. Enter the N-number into that site, and see if the ADS-B is working well. FlightAware Flight Tracker/Flight Status (FlightAware.com) will allow you to see the most recent flights from that aircraft and gives a good indication of the ADS-B functionality.

Pre-Purchase Test Flight

In general, a pre-purchase test flight (with a qualified pre-buy inspector or the builder/owner) is a valuable opportunity to determine if the aircraft meets your needs and is in satisfactory condition. If you are not familiar with the aircraft type and have hired someone who is familiar with the type, you are probably better off letting them perform the test flight.

Make sure you are familiar with all the door controls, normal and emergency canopy controls, ballistic parachute controls, autopilot disconnect modes, and fuel system controls (including tank switching and fuel shutoff) during the preflight briefing. Are all of the controls labeled properly? This might be your only chance to ask what a particular switch or circuit breaker is designed to do.

> If the aircraft has not flown in some time, a short ground run with the engine cowling(s) removed may provide considerable information on the condition of the engine.

- » Test all fuel tanks during the ground run and test the fuel shutoff position. Make sure that you are aware of which position is the OFF position on the fuel selector and that all positions are clearly labeled. Dip all fuel tanks and compare them with indications in the cockpit.

> If the aircraft is equipped with dual controls, make sure to check all of them, including:
  - » Brakes
  - » Control-stick push buttons (both seats/sticks)
  - » Throttle/mixture/prop controls
> Exercise all of the normal systems on the aircraft during the test flight, including flaps, landing gear, cowl flaps, etc.
> Be sensitive to all electronic flight instrument system (EFIS) warnings that occur, and be certain to cycle through all of the EFIS pages available. You may want to turn audible warnings off or turn them down to a very low volume for your test flight, as they can become distracting or may be improperly set. If that is the case, it is best to verify each one and methodically reintroduce them into the system.
> If the aircraft is equipped with an engine monitoring system, take a close look at all cylinder head temperature (CHT), exhaust gas temperature (EGT), fuel flow, fuel quantity, and oil system readings. Use a camera.
> Is the aircraft equipped with a fire extinguisher and/or canopy breaker tool?
> If the engine is equipped with electronic ignition, understand and test (when possible) backup electrical power.
> Understand the electrical system, the use of alternate batteries, alternate electrical buses, etc.

Test Flight Checklist

Use the existing checklist for all steps if available.

1. **Exterior preflight:** complete
2. **Accomplish these additional checks**
   a. Exercise all flight controls for free, full, and proper movement; listen/feel for binding.
   b. Check for internal stick interference.
   c. Cross-check actual neutral elevator/aileron/rudder trim position with cockpit indicator.
3. **Engine start**
   a. Safety belts: set
   b. Canopy/doors: closed and latched
   c. Clear prop
   d. Engine readings
      Oil pressure: _____ Oil temperature: _____
      Fuel pressure: _____ Fuel flow: _____
      Idle rpm: _____ (check with throttle fully closed)
      CHTs: _____
   e. Alternator — ON Amps: _____ Volts: _____
4. **Taxi**
   a. Check brakes (both sets, if installed).
   b. Make gentle turns to check nose wheel/tail wheel steering.
5. **Before Takeoff**
   a. Canopy/doors: closed/latched

b. Flight controls: free and correct
c. Flight instruments: set
d. Fuel selector: desired tank
e. Mixture-rich below 3,000 MSL
f. Elevator and aileron trim: neutral
g. Throttle: run-up
h. Mags: check
i. Electronic magneto(s) alternate power: check
j. Prop: check
k. Carb heat: check
l. Radios: set
m. Transponder: set
n. Flaps: set
o. Fuel boost pump: pressure rise
p. Engine readings:

Oil pressure: _____ Oil temperature: _____
Fuel pressure: _____ Fuel flow: _____
Idle rpm: _____ (check with throttle fully closed)
CHTs: _____
Alternator — ON Amps: _____ Volts: _____

6. Takeoff

a. rpm/manifold pressure: _____
b. Liftoff speed: _____

7. Flight Evaluation

a. Aircraft flying qualities and note any issues.
b. Check all trim systems (pitch, aileron, rudder).
c. Power off stall in landing configuration: _____ IAS
d. Exercise all electronics:

Radios
Navigation aids/GPS
Autopilot
EFIS/engine monitor displays

e. Stabilized cruise flight evaluation:

Cruise speed (verify by GPS): _____
Oil pressure: _____ Oil temperature: _____
Fuel pressure: _____ Fuel flow: _____
CHTs: _____

f. Check the status of ADS-B In, if installed.
g. Miscellaneous notes

Delivery Flight Considerations

Don't feel pressured to fly your newly purchased aircraft home on a long cross-country! Consider a qualified ferry pilot with experience in type or using a trailer (if equipped with removable/folding wings). A long cross-country immediately after purchase is not a safe way to familiarize yourself with an unfamiliar experimental aircraft. If you are going to fly it home, make sure you are prepared for:

- The overall condition of the aircraft, especially if it hasn't flown in many months, or has not flown since its last maintenance or inspection.
- A few hours in the local area, followed by detailed post-flight inspections, might identify leaks in the fuel, oil, or brake lines that need attention before departure, or an aircraft battery that has reached its service life. These flights ideally could be combined with dual instruction to familiarize yourself with your new aircraft.
- Geographical or airspace conditions that you may not be accustomed to in your regular flying, such as mountain flying or hot weather. Consider and plan for high-density altitude conditions if picking up an aircraft in the Western states, for example, when your previous experience only consists of flying from density altitudes near sea level.
- Departing a short grass strip when your only experience is with long, hard-surface runways.
- Higher-workload airspace that you haven't experienced in years (or ever) because you've been mostly flying from uncontrolled strips.
- It is advisable to verify the proper operation of avionics and autopilots in VFR conditions before flying in IMC or at night

SECTION 2

AIRCRAFT DOCUMENTATION

The aircraft must have the following documentation:

- Airworthiness certificate (original certificate; note that copies of this certificate are prohibited)
  - Operating limitations. This is important! For E-AB aircraft, these are considered to be part of the airworthiness certificate and must be carried in the aircraft. Read the operating limitations to determine if there are any restrictions on the aircraft for the kind of flying you to intend to do (e.g., aerobatic, IFR).
- Registration (FAA form AC 8050-3 is the registration; AC 8050-1 is the application form)
- Weight and balance
- Aircraft data plate (permanently attached to the aircraft exterior)

Logbooks

You should review the following logbooks, and they should be included with the purchase of the aircraft:

- Aircraft logbook
  - Ensure there is a signed entry that Phase 1 flight testing has been completed.
  - Check for the date of the last condition (e.g., "annual") inspection.
- Engine logbook
  - When was the last overhaul?

- » When was the last oil change? Record of frequent oil changes? Any additives used?
- » What were the last compression check readings?
- » Does the engine have any nonstandard components installed?
- » Electronic ignition systems installed? If so, investigate power supply requirements (backup batteries, auxiliary alternators, etc.).
- » Turbocharger installed?
- » What types of spark plugs are installed? How old?
- » What type of fuel is authorized for the installed engine? Any additives used?

> Propeller logbook

- » Last overhaul?
- » Any damage or replacement history?

> Avionics logbook (may be included in aircraft log)

- » When was the last transponder and altimeter/encoder test and certification? These are required every two years by 14 CFR 91.411 (IFR), 91.217, and 91.413 (IFR and VFR).
- » When was the last emergency locator transmitter (ELT) inspection and/or battery replacement? (Main and remote batteries may be required.)
- » Are the avionics manufacturers still in business? If not, is there an ability to update these components?
- » What software/firmware load is installed in each avionic system?

> Is it possible to update this software/firmware with the component installed, or must it be shipped to the manufacturer for updating?

Highly Desirable Documentation:

> Aircraft Operating Handbook (AOH)

> Builders logs

> Original building plans and diagrams

> Installation and operation manuals

> Electrical wiring diagram (if available)

- » Note: It is not uncommon to find modifications to wiring diagrams that are not documented, so use any diagrams with caution.

> Any kit manufacturers' or component manufacturers' service bulletin information

You should also obtain, whenever possible, the following:

> Serial and model numbers for all installed major components (engine, prop, airframe)

> Serial and model numbers for avionics, wheels/brakes, autopilot, etc.

> Total airframe hours

> Engine hours versus manufacturer's recommended time between overhauls (TBO) interval

- » Give consideration to the recommended overhaul for engine ignition systems (e.g., magneto overhaul intervals).

> Propeller hours versus manufacturer's recommended TBO interval

> Propulsion battery overhaul for electric/hybrid aircraft (manufacturer's recommended battery cycle replacement)

> Aircraft fabric age versus recommended replacement interval

> Ballistic recovery system (BRS) parachute and rocket motor age versus recommended replacement/repacking interval. Check with the BRS manufacturer for interval information and costs (which may be in the thousands of dollars).

> ADS-B installation status

> Statement of occasional sale or similar documentation. This varies by state, but in some cases, if the seller is an individual, sales/use tax can be avoided by the use of the proper state forms, which must be completed by the seller.

Software and Data Card Status

> Determine the status of any GPS database cards (obtain any spare cards, if possible, and database card loader hardware/cables)

» Are the data cards installed in the GPS?

» Are the databases (navigation, obstacles) current?

» Is the storage technology still available?

> What software is loaded in each electronic system?

Miscellaneous Items to Consider (may be worth thousands of dollars total)

> Canopy and wing covers, pitot tube covers, landing gear safety pins

> Power connection adapters

> Chocks (some aircraft require special chocks)

> Tie-downs

> Extra parts (tire tubes, brake pads, etc.)

Documentation Checklist (some items may not be applicable)

Documentation	Received from seller?
Airworthiness certificate	_____
Operating limitations	_____
Aircraft registration	_____
Aircraft Operating Handbook (AOH; highly desireable but not required)	_____
Weight and balance	_____
Aircraft data plate (attached to aircraft exterior)	_____
Nonflying aircraft kits: Obtain a complete ownership record with no gaps in ownership from manufacturer's delivery to the original buyer to you.	_____

Logbooks and miscellaneous documentation	**Received from seller?**
Aircraft logbook (confirm Phase 1 signed off)	_____
Engine logbook	_____
Propeller logbook	_____
Avionics logbook	_____
Manufacturer's plans and documentation	_____
Builders logs (highly desirable but not required)	_____
Any additional plans or component installation instructions	_____
Operating manuals for engine, propeller, avionics, etc.	_____
Serial/model numbers for all installed major systems	_____
Electrical system wiring diagram (desirable but not required)	_____

Hours/Dates to Note (some items may not be applicable)

	Hours (Hobbs meter/tach)
Total airframe hours	_____
Engine hours since overhaul	_____
Hours since last conditional ("annual") inspection	_____
Hours/months since last oil change	_____
Propeller hours since overhaul	_____

	Electric aircraft charging cycles
Propulsion batteries, electric aircraft	_____
Total lifetime allowable cycles on engine(s)	_____

	Date of last inspection
Conditional ("annual") inspection	_____
Pitot static inspection (IFR aircraft)	_____
Transponder/encoder inspection	_____
ELT inspection/battery replacement	_____
Ballistic recovery system (BRS)	_____
Parachute due date	_____
BRS rocket due date	_____

Change of Ownership Items to Track (some items may not be applicable)

Item	Completed?
FAA bill of sale (FAA form AC 8050-2) bit.ly/FAA_BillofSale	_____
FAA registration (FAA form AC 8050-3) bit.ly/FAA_RegForm	_____
State registration	_____
Registration of sale with aircraft kit manufacturer	_____
Registration of sale with component manufacturers (EFIS, autopilot, GPS, etc.)	_____
NOAA ELT registration (406 MHz ELT only) BeaconRegistration.NOAA.gov/RGDB/RegisterUsername	_____
Insurance policy in your name?	_____

SECTION 3

TRANSITION TRAINING FOR YOUR NEW AIRCRAFT

Why It's Important

The most important thing a new owner can do to protect their investment, increase the safety of their operations, and minimize their insurance premiums is to obtain at least five hours of dual instruction from a qualified transition CFI. A new owner has just expended significant time and money finding and acquiring a new-to-them aircraft. In this context, a few more hours and dollars of training time is a small additional percentage of investment that has the potential to pay major dividends.

Nearly 20 percent of all E-AB accidents occur to pilots with less than 10 hours in type, and the accident rate for nonbuilder owners (NBOs) in their first 10 hours is actually higher than during the initial 10 hours on a newly constructed E-AB aircraft. Most E-AB aircraft are not inherently difficult to fly, but their equipment, flight, and handling characteristics can be significantly different from other aircraft that the new owner may have flown. Learning the control feel and sight picture with an experienced transition CFI on board is much better than trying to learn these things after they are needed.

Where to Find Training

The category of experimental amateur-built aircraft covers a wide spectrum, everything from one-offs to plansbuilt designs to quick-build kits that number in the thousands. If the chosen aircraft is relatively common, it may be easy to find a transition instructor who has significant experience in that specific make and model. In other cases, it may be necessary to conduct the transition training in a different model of aircraft that is anticipated to have similar flight characteristics. For these aircraft, it may not be possible to find an instructor who can provide transition training in that specific model, but in this case, part of the purchase agreement might include spending a few hours in the airplane with the former owner. In this case, the training may not meet the letter of insurance requirements and it may not be possible to log the flight as dual instruction, but the knowledge gained can be invaluable nonetheless.

Possible sources to find a transition instructor include:

> Manufacturer's approved transition instructors
> Type clubs
> Builders/owners of the same or similar models
> EAA website
> EAA Flight Advisor
> Local EAA chapter

What to Consider

> Determine the unique characteristics of your new aircraft
  » How many examples are flying?
  » Are they similar to other aircraft that might be more common?
  » Does the aircraft have unique controls, systems, or avionics?
> Determine your experience and currency in this type of aircraft (if any)
  » Do you have make and model experience?
  » Do you have experience in a similar make and model?
  » Do you have experience in other E-AB aircraft with similar control feel and performance?
  » Do you have experience in other certified aircraft with similar control feel and performance, and are you confident that the control feel is in fact similar to the new airplane?

Transition Training Program Elements

A good place to start is to contact the kit manufacturer or type club and see if they have a recommended transition training program. Also look at the FAA's advisory circular AC-91-09 for many different training considerations.

A good transition instructor should come with their own outline of an appropriate program, starting with generic requirements that are then tailored to the specific experience and requirement of the new owner. However, most programs should include elements similar to the following:

> **Ground Training**
  » Systems
    – Seat belts and door operation
    – Fuel system
      ◊ Operation of the fuel selector while seat belts are fastened
      ◊ Setting of fuel totalizer, if installed. Validate the calibration after purchase.
      ◊ Determination of fuel level (dipping tanks, sight glass, etc.)
      ◊ Presence or absence of low-fuel warnings and fuel timers
      ◊ Selection of fuel tank to be displayed on the fuel gauge (if selectable)
      ◊ Operation of optional/nonstandard tanks
      ◊ How to sump the fuel system
    – Electrical
      ◊ What happens if the master is switched off in flight?

- ◊ Activation of main or E-bus if installed
- ◊ Selection of primary versus backup batteries, if installed
- ◊ Selection of primary versus backup alternators, if installed
- ◊ Location of key fuses/circuit breakers. Are the key breakers (autopilot, electric trim) identified with some kind of tag or marker? Can they be quickly found in an emergency, with the seat belt fastened?

– Hydraulic

- ◊ Minimum and maximum levels
- ◊ Auxiliary pump, if equipped
- ◊ Provision for emergency hydraulic pressure
- ◊ How to service hydraulic fluids

– Flight controls

- ◊ Are there any nonstandard controls or switches necessary to operate the systems during a typical flight?
- ◊ Are all controls clearly labeled, and can they be operated through the full range of travel while the seat belt is fastened?
- ◊ Neutral and takeoff trim cockpit indications
- ◊ How to interrupt trim functions
- ◊ What dual controls are installed (including brakes)?

– Landing gear

- ◊ Operation of indicator lights (up/down/transition)
- ◊ Operation of emergency gear deployment system
- ◊ Maximum airspeed for gear extension/retraction
- ◊ Maximum speed while gear is extended
- ◊ How to control and modulate brakes
- ◊ Tail wheel: Does the tail wheel lock or free caster?

– Ventilation/heating/pressurization

- ◊ Are there any nonstandard controls? Seat heaters? Airflow versus temperature controls?
- ◊ If a standard exhaust heat muff is used for cabin heat, is the aircraft equipped with a carbon monoxide detector?

– Avionics

- ◊ Review of all installed avionics and the degree of interoperability between them (e.g., GPS, EFIS, autopilot, nav source selection, component bypass switches, etc.)
- ◊ How to update and check databases and firmware

– Powerplant(s)

- ◊ Cold and hot starting procedures
- ◊ Temperature, pressure, and rpm limits
- ◊ Mixture control and leaning indications
- ◊ Prop control (and adjustments)
- ◊ Cowl flap controls
- ◊ Engine information system (EIS) limits (how to check, set, or clear)

- Autopilot systems
  - ◊ All methods for autopilot deactivation
  - ◊ Can the autopilot servos be manually overridden?
  - ◊ Sources of nav data and how to select them
  - ◊ Roll and heading controls
- Flight instruments
  - ◊ Ground functional tests, if any
  - ◊ Locations for setting barometric pressure (e.g., do individual EFIS units or altimeters communicate, or must they be set independently?)
  - ◊ How to verify backup battery status
- Warning systems
  - ◊ How to ground test
  - ◊ On-screen versus dedicated warning lights, and the triggers that could cause them to illuminate
- Oxygen systems
  - ◊ Activation/deactivation of oxygen flow
  - ◊ Control of flow rate
  - ◊ Method to monitor tank pressure
  - ◊ Method to verify flow is actually occurring
- Emergency equipment
  - ◊ Location of fire extinguisher or fire suppression system
  - ◊ Method to escape in the event of obstructed exit (canopy axe?)
  - ◊ ELT remote control location and manual activation
  - ◊ Is the ELT portable; can it be removed from the aircraft and still operate?
  - ◊ Ballistic parachute envelope and activation

» Procedures and checklists:
- Normal
- Abnormal
- Emergency

» Performance:
- Takeoff and landing
- Climb
- Cruise
- Descent
- One-engine inoperative (OEI)
- Glide

» Limitations:
- Weight

- Center of gravity
  - ◊ Typical loading and use cases (pilots/passengers/baggage locations)
  - ◊ CG shifts with fuel burn
- V-speeds
- Types of operation
  - ◊ Aerobatic/nonaerobatic
  - ◊ If aerobatic, what maneuvers are approved and have been demonstrated during Phase 1?
- Crosswind
  - ◊ Consider both aircraft capability and pilot capability, relative to the new owner's current proficiency with the aircraft. A conservative personal crosswind limit is highly advised until experience is gradually acquired.
- Landing surface

Flight Training (example of a three-flight training program, approximately 90 minutes per flight)

Flight Lesson 1:

Basic introduction and flight demonstration

> Aircraft preflight
> Normal procedures and techniques
> Standard entry and exit procedures
> Canopy latch and emergency egress
> Cockpit familiarization
> Checklist usage
> Review fuel and oil capacity and consumption
> Passenger safety and pre-takeoff briefs
> Engine start, taxi, and run-up
  » Cold start
  » Hot start
> Mixture control usage
> Control and trim positioning for takeoff
> Normal takeoff and climb (demonstrated)
> Normal operations
> Aborted takeoff procedures (discussion)
> Basic aircraft control
> Pitch attitude familiarization
> Effect of trim
> Engine operation
> Normal descent and landing, including gear and flap operation (demonstrated)

- > Normal operations
- > Effect of flaps
- > Crosswind and gust considerations taxi/takeoff/landing
- > Energy management
- > Shutdown and securing aircraft
- > Checklist usage
- > Post-flight inspection

Flight Lesson 2: Basic Maneuvers

- > Normal takeoff and climb
- > Normal operations
- > Maintaining directional control
- > Basic flight maneuvers
  - » Straight and level flight
  - » Normal climbs and descents
  - » Normal turns (30-degree bank, 360 left and right)
- > Performance maneuvers
  - » Steep turns (45 degrees left and right)
  - » Slow flight (clean, partial, and full flaps)
- > Stall maneuvers
  - » Stall awareness
  - » Power-off stalls
  - » Effect of flap settings
  - » Power-on stalls
  - » Spin awareness and prevention
- > Normal descent and landing
- > Landing pitch attitude familiarization
- > Maintaining directional control after landing

Flight Lesson 3: Takeoff and Landing

- > Takeoff maneuvers
  - » Normal and crosswind procedures
  - » Short field and soft field procedures
  - » Crosswind takeoff
  - » Aborted takeoff

- > Aircraft characteristics
  - » Energy loss following engine failure during initial climb
  - » Recovery from high sink rates at speeds below V_{APP}
  - » Glide performance engine-out
  - » Engine response time from idle
  - » Trim changes and acceleration during a full flap configuration go-around
- > Landing maneuvers
  - » Normal and crosswind procedures
  - » Stabilized approach using power and trim
  - » Short field and soft field procedures
  - » Slips
  - » No-flap landing
  - » Mitigating high sink rates when slow
  - » Crosswind and gusty landing procedures
- > Emergency procedures
  - » Complete engine power-loss landing
  - » Partial power-loss landing
  - » Return to landing (i.e., the "impossible turn"): practice at altitude
  - » Electrical system/instrument failure

References

1. EAA Flight Test Manual (FTM). Current version available at EAA.org.

2. FAA Advisory Circulars (ACs) (refer to latest version of each AC at FAA.gov)
    a. AC 90-89 Amateur-Built Aircraft and Ultralight Flight Testing Handbook
    b. AC 20-27 Certification and Operation of Amateur-Built Aircraft
    c. AC 90-116 Additional Pilot Program for Phase 1 Flight Testing
    d. AC 90-109 Transition to Unfamiliar or Experimental Airplanes

3. FAA Aviation Regulations (visit www.FAA.gov to verify current regulations)
    a. FAR 43 Appendix D: Scope and Detail of Items to be Included in Annual and 100 Hour Inspections (12-month interval)
    b. FAR 91.207 Emergency Locator Transmitter Inspection (12-month interval)
    c. FAR 91.411 Static System, Altimeter, and Mode C Testing for IFR Flights (24-month inspection interval)
    d. FAR 91.413 Transponder Tests and Inspections (24-month inspection interval)

4. EAA Sport Aviation Articles
    a. February 2018, Vic Syracuse, "Impacting E-AB Accident Rates"

5. Kitplane Magazine Articles
    a. April 2019, Vic Syracuse, "Prepping for the Sale"
    b. February 2019, Vic Syracuse, "Airworthiness Prep"
    c. June 2019, Dave Prizio, "The Pre-Buy Inspection"

6. Miscellaneous References
    a. Sonex Builders and Pilots Foundation Transition Training Syllabus
    bit.ly/EAA_Sonex
    b. Vans RV Transition Training Syllabus
    bit.ly/EAA_Vans