

TECH' DESK

FIRST FLIGHT IN MY NEW HOMEBUILT

Spring has come and I'm ready and anxious to get my new homebuilt aircraft into the sky; our first flight! I have spent the last few weeks tweaking all the little odds and ends left over from building the project, and it's now or never!

Disclaimer:

The reader should understand that the following article is based on personal experience and relates to just that. I do not recommend or endorse anyone to follow my first flight experiences, but only relate them as personal. The reader can take what he or she wishes from these experiences for their own personal use.

Preparation:

In our last column we covered a number of preparatory items; items that deserve thought and contemplation. Today, I make a quick checklist to ensure that I haven't overlooked anything:

Am I, as test pilot, ready today?

- Current? - check
 - Familiar with the aircraft; controls, systems, emergency procedures? When sitting in the cockpit or cabin, can I close my eyes and place my hands on, and identify each flight control, each instrument? Can I reach the fire extinguisher and release it from its holding bracket when I'm tightly fastened in my seat belts? – check
 - Reviewed expected flight characteristics of this aircraft – check
 - Reviewed anticipated critical speeds?
 - ◊ Best angle of climb – 1.5 X lift-off speed
 - ◊ Best glide – 1.5 lift-off speed
 - ◊ Maneuvering – 2 X lift-off speed
 - ◊ Approach – 1.5 X lift-off speed - check
 - Can I open the canopy or door from my seat with my eyes closed simulating an emergency exit? – check
 - Do I have the appropriate fire-resistant flight suit, helmet, or parachute as would be suitable for the aircraft type? - check
 - Comfortable with the challenge? – check
- Rested and up for the challenge – well maybe, check

Is the Aircraft ready today?

- Have I completed all the tasks on my to-do list? – check
- Have I had an EAA Technical Counselor or other knowledgeable person go over the aircraft in detail to

ensure safety, and no overlooked snags? – check

- Have I completed the fuel-flow test and am I satisfied that there is no blockage or restriction to adequate fuel flowing to the engine? – check
- Do I have enough fuel on board for the first flight? Enough fuel in each of the main tanks to carry out the flight with reserve, so that I do not need to worry about changing fuel tanks in flight? But no more than necessary! - check

Weight and Balance:

- Have I accurate weight and balance data for this aircraft? – check
- Do I have the appropriate ballast safe and secured to place the CG at the desired 22% MAC position? (About 25% of the CG range aft of the expected front limit for a conventional aeroplane)? – check
- Is my takeoff weight well within the limitations of the aircraft and substantially less than maximum takeoff weight? – check

Weather:

- Are the weather conditions within the required parameters? ie. Wind < 5 mph, ceiling > 5000 ft. AGL, Visibility – unrestricted? – check
- Is the forecast agreeable and set to stay or improve? – check

Airport:

- Is the time right? Not too much activity and all emergency systems in place? – check
- Have stakeholders (EMS, police, firefighters) been notified of this first flight test – check
- Have I reviewed the runway length, and have I established a 'go' - 'no-go' point along the runway that allows sufficient length for an aborted takeoff run? – check
- Has the Tower Controller or airport officials been made aware of this first flight in an untested aircraft? - check

Support Crew:

- Is my EAA Flight Advisor (or other knowledgeable person) in place to help me through the check-list and the First Flight Test Card? - check
- Is he/she properly briefed and completely clear on the objectives of this first flight? – check
- Is he/she familiar with, and have we together gone over the various possible emergency procedures for all

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imaginable situations? - check

- Does he/she have a reliable hand-held radio and have we co-ordinated a useable and standby frequency? – check
- Is there an emergency vehicle, preferably a four-wheel drive unit that can quickly come to any location if required? – check
- Does the support person/s have necessary tools, and fire extinguisher on hand for any emergency? - check

Miscellaneous:

- Are the appropriate Flight Documents onboard?
 - ◊ Flight Authority
 - ◊ Pilot's preliminary Handbook with emergency procedures
 - ◊ Weight and Balance
 - ◊ Insurance
 - ◊ Journey Log – check

I guess I'm ready!

In my flying career I have flight tested a conventional tube-and-fabric homebuilt, a restored Luscombe 8C, an RV-4 that I built and an RV-9A that Jean built. In addition I've flight tested an RV-8A, an RV-9, and an RV-7A for friends who felt comfortable with me as test pilot. All of the RV's were tested after I had taken a Flight-test Training Seminar from Ed Kolano through EAA. (Ed is well known for his background as a US Navy test pilot, and his many articles in Sport Aviation and other publications. In my estimation, this training seminar was most beneficial and practical for my adventures.)

Objective:

The objective of this first test is to accomplish two goals:

1. To ensure that the aircraft is airworthy and flies safely and with satisfactory control
2. To get me, the pilot, past the highly intense adrenalin-packed experience of a first flying rela-

tionship with an untested aircraft.

So with this objective, I want to keep things as safe and stress free as possible. I will fly the aircraft, and my support crew will record the data. They will prompt me for pertinent information as the test proceeds, and I will simply keep flying the aircraft, keeping my sensory activities focused entirely on the flying aspects of the test. The entire test flight will take approximately 45 minutes.



The test will consist of three stages:

- Take-off and climb to 3000 ft. AGL,
- Explore some ele-

mentary flight characteristics pertinent to this first flight and safe landing, and Descend and land safely.

After each of the first two stages I will take a 'breather', relax and just fly the aircraft for a few minutes in preparation and review for the next stage.

Pertinent Information:

The information that I want to get from this test is kept to a few items:

1. How does the aeroplane handle in taxi especially under higher speeds of taxi?
2. In the take-off roll, at what indicated speed do I lift off?
3. How does it handle in flight?
4. How does the engine work? What are the temperature readings? Is there any concern with engine operation?
5. What flight symptoms are discerned when approaching slow flight above the anticipated stall speed?
6. Any snags?

Let's look at these:

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Under slow taxi conditions, does the aircraft respond to applied brakes? After a few braking applications, are the brake rotors at acceptable temperatures? As taxi speeds increase and as prop-wash increases, is rudder authority effective? In a tail-dragger, as I increase the taxi speed, (still well below the anticipated lift-off speed), does the tail lift promptly to level or flight attitude? (If I have a 'heavy' tail, I will stop the test immediately and re-evaluate the 'weight and balance' calculations.) Also, at this time I will bring back the throttle to idle and check the lateral controllability with the rudder. This is where I have my first concern; a good speed on the runway with reduced or little rudder authority can quickly deteriorate into a ground loop, and from experience, I had better be sharp with my asymmetric brake application.

Alright, so the taxi tests are satisfactory and I press on to the take-off roll. I will have marked a spot at a point of no-return with a flag along the runway and if I do not have sufficient speed for lift-off at this point, I will still have enough runway distance left for stopping the take-off roll. So with my support person at the estimated lift-off point along the runway, and all check-lists completed,



I begin my take-off roll. As I gain speed, (on a tail-wheel aircraft as the tail lifts), I feel out the ailerons for effectiveness.

I check my runway position for 'go' - 'no go' and if all systems are still 'go', I allow the aeroplane to smoothly lift off from the runway, relaying the indicated lift-off air-speed to my support crew by radio. Wow! I'm flying!

The exhilaration is breathtaking and I slowly feel the aircraft's responsiveness to very small control inputs. If I have a retractable gear and/or have been using some degree of flaps, I leave them as positioned as I climb out. I climb straight ahead until I have reached an altitude of 400 ft AGL, and then begin a shallow climbing turn (preferably) to my left. When this turn has reached 180 degrees and I'm flying opposite to the take-off direction, I can breathe easy! And as I continue to climb out I now have the airport footprint beneath me within gliding distance. At this point I will slightly reduce my throttle from full to a comfortable climb setting and monitor the engine instruments. I will report all readings to my support crew where they are recorded. I continue slow climbing turns until I'm over the airport at about 3000 ft. AGL. I trim the aircraft to level flight. I and my support crew now turn our radio to a discrete frequency.

Time for a break! I fly the aircraft in lazy circles, enjoying the flight, becoming comfortable with the handling qualities, monitoring and reporting instrument readings, and relaxing with deep breaths. If all systems remain 'go', I allow myself a good ten minutes in this mode.

Now back to work. I want to explore, in a very conservative manner, the flight characteristics and handling qualities of this new breed. I will execute several shallow turns in either direction, slowly steepening the turns to a rate-one turn. (No more.) Comfortable? Next I'll try some pitch stability checks. I will pull back slightly on the stick or yoke and release it to see if it returns to level flight. I will repeat this process, this time pushing on the stick. Does it return to level flight?

How many oscillations? I report these actions and the aircraft's response. I do the same with my ailerons. I do not expect a strong positive stability in the roll mode but I do want to know if the aircraft falls off in either direction. Then how effective is the rudder. I do expect a strong positive stability in this lateral mode. I report all actions and reactions to my support person for recording.

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If I've forgotten to monitor my instruments, especially the engine temperatures, I would have been prompted by my ground support crew for this information. I use my crew as much as possible, leaving me to concentrate on flying the aircraft.

I want to know how the aircraft will react as I approach the stall. I do not expect to stall the aircraft, but I do want to get down to near the indicated airspeed that I recorded at lift-off. Do I detect any pre-stall buffet? Are the controls perceptibly less sensitive and sluggish? Again, I report and have this information recorded.

No surprises so far? All systems "go"? Time again for relaxed flight, the opportunity to calm down the nerves. I fly for another 10 minutes or so enjoying the flight, the feel of the aircraft, the sensations that come to me in this wonderful environment, and then it's time to return to earth.

I report my intentions and set up a controlled glide with appropriate power to prevent shock cooling. I keep monitoring the engine instruments and report the readings. I and my support person now return to the airport frequency on the radio and report our intention and if in a controlled zone, request permission to land.

My approach is conservative, a long final, maintaining 1.5 X lift off speed and aiming for touchdown about 100 yards or so past the button. I will use flaps if my landing speed is above 50 mph and if I'm comfortable extending them in flight. After landing I slow the aircraft to a comfortable taxi speed and taxi directly to the hangar, where the post-flight de-briefing will take place.

For my flight tests, I develop Test Cards for myself and for my support person, based on the aircraft being tested. The pilot's test card is in three sections, Takeoff and

Climb, Exploring Flight Characteristics, Descent and Land. The support person's is the same, but is fleshed out to include engine data, notes on flight handling, emergency procedures, critical speeds, etc.

In case of any problems, the fall-back position is that the test will be terminated at the earliest opportunity commensurate with the emergency encountered. This is where the emergency check lists become so important.

In the various flight tests that I have performed, situations have come up that include:

- Severe engine vibration on lift-off
- A high-speed taxi trial that almost ended in a disastrous ground loop.
- Engine overheating problems
- Failed radio communication
- A runaway prop governor
- A number of snags that needed attention

In every case, the situation was salvaged and fixed, so that additional flight tests could take place. In all

situations, the pre-flight preparations proved to be adequate to handle the situations and no damage or injuries were incurred. And that's the way a good first flight test should be, almost if not entirely uneventful.

Next column let's look at the post-flight de-briefing, and the required actions taken before the flight testing can proceed and the flight test envelope explored.

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