[SOUND EFFECTS]

PHILIP GREENSPUN: All right. Let's talk about aircraft ownership and maintenance. Some of this stuff actually, oddly enough, is on the test. What does it cost to own an airplane? Most people say, I can't afford that. But then you see them buy a brand new car or renovate their kitchen for $200,000. So I don't know what their excuse is.

It's actually not expensive to own a four-seat airplane. There's so many out there. There were more pilots in the '70s and '80s, when these airplanes were built in large quantities.

The owner of East Coast Aero Club, Mark, he says that, in the '80s, there was a waiting list even for a tie down at Hanscom. Now there's ample parking. The hangar space is still a little bit tight, but if you just want to get a Cessna and pay, it's actually a lot cheaper to tie a Cessna down at Hanscom than it is to park a car in Cambridge. And there's plenty of room. He said every firefighter, every teacher used to have a family airplane.

So the airplanes are relatively inexpensive to buy-- $20,000, $30,000 for something that's airworthy for VFR use, for basic VFR use. And you can see the prices here. The depreciation would be pretty close to zero for those lower-end airplanes. Anyway, all that said, it's still cheaper to rent from a flight school if you're going to fly 100 hours a year, paying $150 or $200 an hour to a flight school is still cheaper, and it's a lot easier.

For people for whom owning may actually make a little bit of rational sense, it never truly makes sense compared to just getting everywhere in your Toyota Camry. That if you fly a whole ton, more than 100 hours a year, and the fixed costs of insurance and storage and stuff won't kill you, if you have to use the airplane to make regular long trips somewhere and then just park it away from the home airport, then it makes sense. And a lot of people, also, you know you can't fly, if you have multiple airplanes, you can't fly them all at the same time.

And even one airplane, it's a little bit hard to use everyday the way you would use a car. So partnerships with two to four people are pretty common. And that cuts the cost dramatically without really impairing the utility. I shared an airplane for years with a guy, and I don't think we ever conflicted on when we wanted to use the plane.

All right. This is some stuff that you want to know a little bit. If you're an owner, it's really

critical. And if you're a renter, some of the stuff is still relevant. So the owner or operator, if you think about a leaseback airplane to the flight school, the leaseback owner is any individual, perhaps. And the flight school becomes the operator. And they're the ones who are primarily responsible for making sure the airplane is airworthy, that it gets its annual inspection, and that it has a logbook.

However, the pilot is also responsible. And if the pilot knows that something's inoperative, and it's not required, then it's still legal to fly the airplane in a lot of circumstances as long as that piece of equipment is placarded inop. And maybe the breaker is pulled, for example, on a GPS unit that's not working. After maintenance, then a private pilot with no passengers can make entry in the logbook saying that the test flight was done.

The core inspection is every 12 months. For a privately owned airplane, it has to have an annual inspection. Typically it won't fly a whole lot more than 100 hours during that year if it's just one person flying it. But the 100-hour requirement only becomes necessary when the airplane is operated commercially, like at a flight school. So that's 100 hours of flight time, not engine running time. So if it's taxiing around the airport, the engine might be running for 120 or 130 hours to build up 100 hours of flight time.

You say, well, god, these airlines must have to tear the airplane apart, open all the inspection panels every week or two. Jets have their own maintenance schedule that supersedes this FAA guidance. Even modest-sized jets often have a 300 or a 600-hour service Interval. The Pilatus PC-12, it was recently extended to 300 hours, for example.

OK, Tina covered this before. The transponder has to be inspected and sort of recertified every couple of years. Emergency locator transmitters-- if it's a civil airplane, 91.207 says it has to have an ELT except in certain circumstances. So gliders, helicopters, things like that don't really need it, I don't think. Maybe the glider does. I don't think so.

So the FAA really wants to ensure that every aircraft that's flying around in the US has a comprehensive logbook going back to the birth of the aircraft, the birth of the propeller, and the birth of the engine. Engines, when they get remanufactured by somebody like Lycoming or Continental, they get a zero-time logbook. So that logbook might only go back four or five years. But the logbook for the airframe should go back to when it was made. If the logbook ever gets lost, the airplane is significantly devalued, because stuff has to be reconstructed. And you can never really be sure what's happened to it.

OK. There are airworthiness directives that legally have to be applied to aircraft. If the manufacturer issues a service bulletin, you don't have to do that, especially if you're not operating the airplane commercially, like as an airline or a charter. But airworthiness directives are mandatory.

So let's see if I can think of an example. I think there were some Cessna seats that were sliding back, so people were trying to fly their Cessna and the seat wasn't really locked into position. So that's the kind of thing where an airworthiness directive would be negotiated between Cessna and the FAA. And it would be issued, and they might say, within the next 10 flight hours, you have to go and get new seat rails for your Cessna to make sure that it doesn't slide back inadvertently.

If there's a plane-- if there's something really serious, they may issue an emergency airworthiness directive and say, everything's grounded until you apply this fix or change. Here is just an example, actually. What did we find here? This was for Cirruses.

Ah. In-flight cabin door separation-- that's not good. [LAUGHS] One was total separation. One was retained by the door strut. We're issuing this AD to prevent in-flight failure of the cabin door. OK, well, it's nice to have two doors, I guess. That's the takeaway from this one.

I don't know what they said that you have to do-- yeah, threads, leaves, blah, blah, blah. Oh, but it says within 50 hours. See that? Within the next 50 hours time in service. So they don't consider that an emergency.

And actually, if you ever do take off, don't slam an aircraft door. They tend to be fragile. The latches, various techniques have been tried over the years by various manufacturers. None of them are as foolproof as car doors, because they don't have the weight budget that a car has.

So if a door does pop open in flight, it's actually not hazardous as long as you're not so startled that you do something crazy on takeoff. They'll usually pop open just as you're climbing out, and you're like, whoa, what's that noise? Anyway, just remember, as Tina said, keep flying the airplane. And don't over-focus on something that's not related to the aircraft attitude and power.

OK, part 43 is mostly stuff that certified AMT mechanics need to know. It's illegal, actually for-- this is one reason why owning an airplane is better than owning a boat. It's illegal for you to work on your own airplane, more or less. [LAUGHS] So you have to have an FAA-certified

mechanic do it. You can't spend every weekend monkeying with your airplane.

There are a handful of things pilots are allowed to do. You can replace a tire. You can add oil. You can-- there's an enumerated list, 31 items. A lot of those are kind of more-- you can change a spark plug-- related to bush pilots.

If you're up in Alaska, or northern Minnesota, or out in the middle of Maine, and you want to change something, instead of being stuck, you can carry a spark plug and a wrench and get yourself back to the hangar. But it's unconventional for people with certified airplanes to do much in the way of maintenance. One exception is owner-assisted annuals. Some people who are very mechanically inclined like to work with an AMT and help out.

If you do this stuff, you have to sign it off by making a logbook entry with your certificate number and what kind of certificate. So if you change the oil, you still have to log it even though you're not a mechanic. You just say, I'm a pilot, and here's my pilot certificate number.

All right, if that's too much work, and you still really just want to own an airplane because you want to say that I own an airplane, you can buy an airplane. And then if you're not going to fly it 200 hours a year or more, you can lease it to a flight school and let the flight school be responsible for the maintenance. A lot of people do this to take advantage of depreciation.

Let's say they're a medical doctor. They start a side business working with a flight school, and they're now in the aircraft rental business. And they take a 100% deduction for their airplane. It hasn't really been completely tested by the IRS. Leasing is supposed to be a passive loss, and you're not supposed to offset it against active income. So people come up with various gimmicks where the flight school is marketing their aircraft for rental to other people.

Anyway, they're taking $700,000 or $800,000 write-off in one year against their million dollar income as a physician. And now they have a free airplane. And that's why you can go to the flight school and rent one of these beautiful new airplanes for $250 an hour. It sounds like a lot, but take advantage of it, because they're basically giving you the airplane for free.

OK, what if that's not enough work? Well, go to Oshkosh in July. I'll be there. And we can go check out all the kit airplanes, and you can meet people who say they've spent 13 years building their airplane, and now they're finally flying it. So in theory, the airplane has to be built by this-- the intent was some person who was then going to fly it had to build half of it.

But you know, LLCs are also people, as far as the regulations are concerned. So basically, the

LLC becomes the builder of record. And the LLC is formed between somebody who actually knows what he or she is doing and the pilot who just wants to fly the cool experimental airplane. And then when the builder's finished, the pilot buys out the builder. There are a lot of limitations on experimentals.

Oh yeah, another technique is the factory-assist build. So to show that people have done a lot of work, they'll go down to the factory, and they'll change their clothing every two hours. And they'll have all these pictures of themselves doing various work on the aircraft. And then they can show that to the FAA and say, look, I was putting on the wings. I was doing this. I was doing that. [LAUGHS]

All right, you can't use the aircraft commercially. And if your passenger gets into the airplane, right in front of the passenger will be this scary-looking sign that says, this is experimental, doesn't meet FAA standards. So the passenger is warned that there's a lot more risk than flying a Cessna.

So you might say, well, why is it riskier than a Cessna or a Cirrus? And I talked to Alan Klapmeier about this, one of the founders of Cirrus. I said, how come these experimentals have so much better numbers for payload or speed than certified planes like the Cirrus?

So part of it is that they're relieved of a lot of the forgivingness requirements of certified airplanes. So they're a little bit trickier to handle. You might have a higher stall speed. They're just not as idiot-proof and as stable as a Cessna Piper or Cirrus.

The other issue is that they don't have as much redundant structure. With an experimental, you're allowed to assume that the construction process was perfect, that there were no defects, there were no missing screws, that nobody dropped a tool and damaged part of the structure during construction. But a certified airplane, you have to show to the FAA that even if all kinds of bad stuff goes on during manufacturing, and then the airplane's buttoned up so that those parts can't really be inspected afterwards, it still meets all of the structural requirements.

That's why you see these crazy YouTube videos of wings being tested. The transport category aircraft are only supposed to be certified to 2.5 Gs, and the wings don't break until they put 9 Gs on them. Partly they're over-designing because it's good engineering practice, but also because they have to over-design to some extent because it has to do 2.5 G's even if a lot of

mistakes were made during the manufacturing.

So experimentals-- there's not really a free lunch. It's not like they're better than a Cessna or Piper. They're subject to kind of different rules. The one element where they are arguably better is that, with composites, you're allowed to-- it becomes practical to make arbitrary shapes. If you're fabricating sheet metal, there's a limit to how exotic you can get at a reasonable price, whereas planes like the Cirrus and then some of these experimentalists, you can have a nice smooth skin, and you can make any shape you want.

It's closer to an ideal airflow. But otherwise, there's no free lunch. If it has better payload, that's because they took out all the redundant structure that makes a certified airplane a little safer.

All right, renter pilots are still responsible, to some extent, for this stuff. You've got to make sure the aircraft is airworthy. You can't pin it all on the flight school. If you see something hanging loose, or there's no oil in it, then it's your responsibility to call the mechanic over to re-secure the panel or put some oil in.

You want to make sure that the airplane has airworthiness certificate. The registration used to last forever. Now it expires every three years. So I guess if you're in a brand new flight school, and you don't know everybody there, it's worth at least paying some attention to the registration.

The AFM/POH, or owner's manual, if you want to be colloquial about it-- that has to be onboard the aircraft. Usually the weight and balance is not a separate thing. It's just inside the POH. And you have to also report accidents. We'll talk about that more in the seaplane lecture, [LAUGHS] since sloppiness in the seaplane tends to be more likely to lead to an accident.

All right, so you are responsible for the operation of the aircraft. And with responsibility comes the authority and ability to deviate from the rules in an emergency. You can just say, you know, Cirrus 707 whiskey tango emergency landing at this nearby Air Force base. And they can't really bust you for that.

If later they come and say, well, we want to know why you landed at the Air Force base, then you have to you respond with what led you to want to do that. But if they don't request you to do that, then there's no need.

So basically, you can just read the slide. But abort the mission if you see something broken during the pre-flight. All right, here's a standard airworthiness certificate there on the bottom

right. When was it issued? 1995. So I think that's when the airplane was built. The airworthiness certificate should tell you when the manufacturing process terminated.

Start shopping. So if you look at Controller.com, that's where your higher-end aircraft are. And Trade-a-Plane is that big yellow book that some of you guys may have seen at flight schools. Barnstormers.com is the homebuilt center.

Before we take questions, I'll just close by telling you all that's fine. But it's not really rational. Having done one aileron roll and one loop in my life, do I need a GameBird? No. But it's only $400 grand, and I want a GameBird. [LAUGHS] And wouldn't it be cool to arrive in a GameBird? Look at that luggage space. You could put in probably three packs of crush-proof cigarettes [LAUGHS] and a spare pair of socks, like Charles Lindbergh used to travel with.

So anyway, yeah that ownership stuff-- it's never a rational decision to buy an aircraft unless you're planning on dying rich. Why not? Actually jetAVIVA has this thing. Their whole tagline for this airplane brokerage is life is short, fly a jet. [LAUGHS]

Does anyone have any exciting questions about maintenance and your responsibilities as a pilot? OK, there's a little bit of interaction there between the pilot and the mechanic. You can't practically check everything. You have to rely on mechanics, who are generally quite reliable. And they're FAA-certificated. But you have to have a little bit of common sense about not accepting a broken airplane or helicopter. Oh, [INAUDIBLE]

AUDIENCE: [INAUDIBLE] build your own airplane how [INAUDIBLE] does the process of [INAUDIBLE] certification [INAUDIBLE]

PHILIP GREENSPUN: If you build your own airplane?

AUDIENCE: Yeah.

PHILIP GREENSPUN: My friend Christian can answer that. There may be a YouTube video. But anyway, I think the FAA is supposed to inspect at one or two points during the construction. I'm not 100% sure about that, But I think that they may come in. More importantly, there is, like, 40 hours of flight testing that has to be done. And you can't go over populated areas during that flight testing. And you get cut loose, I think, after 40 or 50 hours in the experimental world.

It's never been attractive to me. I mean, if you talk to the people who do experimentals, they're

really passionate about building and tinkering. They actually have very few hours of flight time accumulated. And that becomes a problem, because their pilot-- even if they were a good pilot when they started, after spending 13 years in a garage building, their pilot skills are pretty rusty. [LAUGHS]

TINA SRIVASTAVA: I would also recommend that you ask Sebastian. If you guys remember, Sebastian came yesterday afternoon from the flying club. And he was discussing how they're getting that plane refurbished. He had a picture with the wing not attached, and now the wing is attached. So I believe that he's going through that airworthiness process right now. So definitely recommend you talk to Sebastian.

And then the other thing I would just add to aircraft ownership in general is that there are also a lot of opportunities where there are-- basically, you can become part of a group that partially owns an airplane. So there's a bunch of clubs around here where, for example, there are three planes that are owned by 60 people. And so you kind of timeshare those planes.

And a number of the other instructors of this course have done that. So you might have heard Luke or Marissa talk about that. And so they have some planes, for example, in Beverly, where there are three planes, and a bunch of people own it. And so you can timeshare the plane, and they have to be very mindful about these types of maintenance aspects, as well. So it's kind of an in-between cost of renting versus owning your own airplane by yourself.

PHILIP GREENSPUN: Yeah, and if you want to-- the Experimental Aircraft Association, which runs Oshkosh, they have chapter meetings all over the country all the time. They're kind of the most social folks in the aviation world. So if you want to find out what it's like to build your own kit airplane or design your own airplane from scratch, those people will be happy to hang out with you, at least every month, all over the country-- EAA.