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OwnerPilot UPDATE

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prepurchase inspection

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WELCOME TO our premier issue of OWNER/PILOT UPDATE.

Whether you are an aircraft owner, a professional airline or corporate pilot, flight instructor, a private pilot, or just starting out in aviation, OPU will provide information that will educate and give insight into the goings on of this great industry. In this and subsequent issues we will be covering topics such as flight training, simulators, interior design, maintenance requirements, and products and services that will be useful to the pilot and aircraft owner.

OPU, like its sister publication AMU (AIRMAINTENANCE UPDATE), will be working for you. Factual, informative, and most of all accurate, the information contained in each issue will be a resource to keep. I hope you enjoy this first issue and we look forward to giving you some of the best reading and learning for many years to come. Your responses are always welcome, so if there is something you would like to see or if you would like to comment on something, please do not hesitate to let us know.

—Sincerely, *Bill Carter*,
Publisher, AMU/OPU

Cover: Sikorsky S-76, photography courtesy of Sikorsky Aircraft

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OwnerPilot Update

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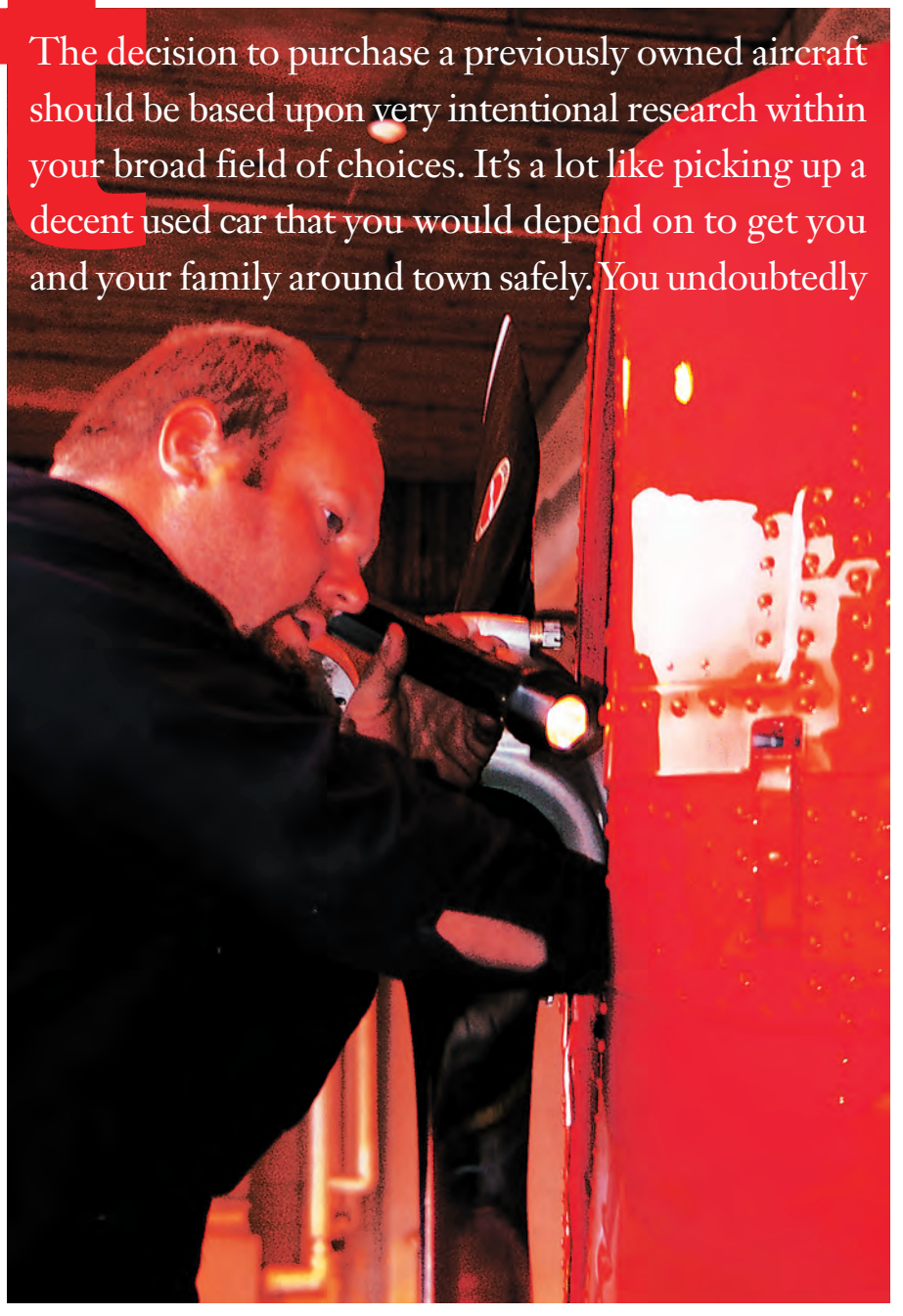
aircraft prepurchase

Questions that you need to ask!

BY STUART McAULAY

The decision to purchase a previously owned aircraft should be based upon very intentional research within your broad field of choices. It's a lot like picking up a decent used car that you would depend on to get you and your family around town safely. You undoubtedly



inquire about the total milage, engine condition, tires and brakes, and the suitability of any special features. When shopping for a small aircraft, the gamble of what you get for the money is multiplied many times over in comparison to the family car. If your gut instinct is to check the car over before signing anything then your investigation should be that much more intense for the family flyer. The best way to approach this is by being willing to spend some time and money in the pursuit of your dream bird. If done properly, the pay off will come in the form of just what you wanted without the unwanted surprises.

Before we look at *what* to look for, lets get right to *why* the extra effort is so important. Most used aircraft come with baggage. Not the kind that sweetens the deal, but the kind that will challenge the depth of your pocketbook. You know those snags that appear when it's most inconvenient. Which is just about anytime you'd rather be powering through the air than on the ground trying to figure out why bad things happen to good people. Your job as a prospective buyer is to learn the nuts and bolts facts when it comes to talking the talk. This includes getting to know a reliable mechanic, other aircraft owners, operators, and enthusiasts. Get on the internet and use it to your advantage. That's what it's there for. If getting online just boggles your mind because you are not computer savvy, then get your friend to do it and tell him/her what you are looking for. Visit the aviation sites that offer consumer reports and reviews. Getting to know other owners and operators will give you a better perspective on the upsides and downfalls of particular models. Getting onside with the mechanic is where you are going to get the professional

opinion on the true condition of the aircraft beyond the paint. Don't go to just any mechanic. Choose one who knows his stuff and carries a good reputation. Once that is established, be sure to bring him a coffee and a donut or buy him lunch and let him know that you want the straight up goods on how he can help you. Your new friend is going to play the defining role between you and the aircraft you are so sweet on. He can tell you what he is impressed with and will tell you when it's a better idea to just walk away. After all, It's better to spend a few hundred dollars to know better than sixty-five thousand to learn a hard lesson. Now, let's review some good questions.

This aircraft just had a recent annual, do I still need to bother with the prepurchase?

Yes. The reason for the prepurchase is to provide the prospective buyer with a very unbiased evaluation of the airplane. The annual inspection is a regulatory requirement but is subject to many variables. Those include the integrity of the previous mechanic. As Dorothy found out, there are good witches and bad witches. In the land of aviation there are also good mechanics and not-so-good ones too. You want to sense the confidence of the good ones. Another reason to get an impartial opinion is to get another set of eyes on the job. Sometimes familiarity breeds complacency and the aircraft in question may have been inspected by the same person for fifteen years. Honest mechanics will even encourage a new set of eyes to keep them honest. Remember, You are forking out the cash for this ordeal so you get to choose the mechanic.

If you are able to coincide a prepurchase inspection with an annual at the same time then you will get a really good prepurchase. The timing doesn't always work out that way but it can be an advantage. Either way, the prepurchase inspection serves as a current reflection of the airplane as it sits today. It's always better to analyze things as they are rather than how they were. You also get to see for yourself, what's going on during the operation.

How much attention should I give to the logbooks and AD's ?

A lot. Past log book entries are what you count on for detailed descriptions of what has been done to the aircraft. It's like a health record and can reveal much about the mechanical integrity and service history of the aircraft. You may want to question any recurring snags or inconsistencies in the otherwise chronological sequence of entries. Some techs don't have much time for logs and such paperwork and that's too bad because it's part of their duty to provide the necessary details to the owner/operator. Scattered log entries are about as helpful as your new doctor trying to figure out what's wrong with you without any reference to past medical records. Some keen mechanics will check particulars on the aircraft and relate them to the log entries to see if they jive. Uncovering an uncertified repair for example can become a big deal. Complete and organized log entries help to ease the pain and speed up the time of your investigative endeavor.

You will also want your mechanic to do an up-to-date Airworthiness Directive (AD) check. You'd be amazed at the number of times nobody thought to perform that mandatory AD from 1995 because it was going to be too expensive. (News flash—All ADs are mandatory and must be performed in accordance with the instructions and time limit set out in the body of the AD.) If an outstanding AD is pulled up, then the owner of the affected aircraft is responsible to have it complied with before further flight. Hint: You can use this also to your advantage when bargaining over who pays for what.

Okay, what about the engine?

So, what about it?

What do I need to know about TBO, top overhaul, oil analysis and TSOH ?

The engine is like the heart of your aircraft and the oil is the lifeblood that helps to determine its health. The Time Before Overhaul (TBO) of the engine represents the manufacturers recommended service life, which is subject to many operational and environmental influences. Don't get hung up on that prescribed figure but rather be concerned with how the engine has been used and maintained. It is common for most normal engines to require a top overhaul about half way to TBO or thereabouts. Consider when cylinder changes were accomplished and discuss the compression lottery with your mechanic (remember your new best friend?). Ask about other methods for determining cylinder condition such as using a borescope if necessary. Oil analysis is a scientific method used to determine whether the levels of wear metals in your engine are within acceptable limits. This can be another useful prepurchase tool, however the results are best interpreted over a measurable trend of several oil samples. Time Since Overhaul (TSOH) is the figure given to address total hours flown on that engine since installation. Just as with TBO, do not bank everything on the figure given. You may not pass go and you could be paying out much more than two hundred dollars. An engine with a low TSOH still may have been inactive for some time and the fresh horses aren't so fresh anymore due to environmental effects during improper storage. You may also want a quick lesson on the effects of corrosion on inactive engines especially when talking about cams and cylinder barrels. As you can see, there is a lot more to the story behind the story when it comes to reading the numbers. Don't let that scare you but don't let it bite you in the behind either.

How do I know if this is the right plane for me?

First of all, only you can determine what your needs are for owning an aircraft. You will want to consider whether you are strictly building hours, going cross country or showing up at the odd pancake breakfast. Based on that, you can narrow down your appropriate choices and further develop your forecasted operating costs. You may have a preference for high wing versus low wing, nose wheel versus tail wheel etc. You may also want to evaluate similar type aircraft for installed avionics, equipment or mods that best meet your personal requirements. Perhaps comparing installed avionics to like models on the market will influence the weight of your decision. Since avionics are a prominent feature for many buyers, be sure to test them out in order to verify that what is advertised actually works. When it comes to maintenance though, you have to devise a pretty accurate budget of what you are getting into. The cost of operating a couple hundred hours per year versus operating under twenty hours per year is a legitimate factor. Your calculation of maintenance costs must be based on what you have as well as whatever else

"Only you can determine what your needs are for owning an aircraft. You will want to consider whether you are strictly building hours, going cross country or showing up at the odd pancake breakfast."

might happen. The radio that works fine today could change its tune tomorrow without warning. I know that it is impossible to determine the unknown without a good crystal ball but at least realize that anything could happen when it comes to unexpected costs. Doing your homework can greatly reduce that anxiety though.

What should be my biggest maintenance concern at the prepurchase?

You really have to look at the big picture here. The type of maintenance that should concern you is dependent upon the condition of the aircraft and its particular systems. If you have specific engine concerns then focus on your repair options in greater detail. If you have a constant speed propeller, then consider overhaul costs. If you have retractable gear then consider the added cost and complexity of maintaining these systems. You get the idea. Wood spars and rag and tube designs are also of particular concern and demand a trained eye and who ever thought of putting those bladder tanks in the wings of some small aircraft?! Check them over carefully too. Aside from some of the trade secrets, the mechanic will usually refer to a prepared checklist just like the one used for a 100 hour inspection to cover the main areas of the airplane.

The prepurchase is actually a great time of learning, especially for the buyer. You can add to your mental repertoire of maintenance

tips, legalities and cover-ups. You can throw in a few acronyms while you're at it and maybe even pass along some friendly advise to someone else who decides to try on your shoes. When you go through this aircraft buyer boot camp, be sure to review the positive aspects of your findings as well as the snags. Remember that you are looking for reasons to buy as well as reasons not to buy, then hoping for the best upon your graduation into ownership. That measure of hope will be easier to live with once you know a thing or two.

Your mechanic should be able to point out any obvious or less obvious mods or repairs and evaluate them against the documentation in the aircraft records. Evidence of an extensive repair job done properly should not be a cause for alarm. A properly engineered and applied repair should restore the area to new or better than new condition. Many repairs can be blended over

nicely to complement the original lines of the aircraft. As I mentioned earlier, don't buy a slick paint job. The integrity of the airplane is what you are after. Check out what is under that paint job to see if the surface was properly stripped and also cleaned in the corners and seams. You kinda have to borrow a trained eye again to look through the paint and study the texture of the surface for old paint or corrosion. You can also determine if the flight controls were removed and probably balanced following a recent painting procedure by noticing the replacement of hardware and overall presentation of the plane.

You can save yourself some brain energy in the evaluation process by not being too concerned with regular replacement items such as tires, brakes and the battery. That stuff gets replaced sooner or later anyway. Also consider the condition of the interior based on your intent to live with it or refurbish it with your own choice of color or materials. Certified aircraft parts are not available at the corner store and what you see is not always what you get. An automotive style alternator may be found on your aircraft but it must have come with an aviation certification. The same is true for hardware and interior cloth. Be careful before you gather up your materials at the flea market with the intent of a little do-it-yourself makeover.

Is there anything else I need to know before I buy?

No amount of purchase price can be considered a "deal" if you don't really understand what you are getting. What looked like a good deal all compacted on a trailer and towed out of the bush may require a much greater investment in time and money than if you had just bought something ready to fly. Leave the labor of love projects for the guys who know what they're getting into. Maybe doing things the long way is your thing but be sure to get up to speed on the proper practices and procedures and keep within the rules.

Now you should be better prepared to go get that airplane of your dreams. Every little detail may not work out according to plan but at least you know more than you did before you started reading. You can walk into any maintenance office with confidence and talk like you've got your head on straight. Not as a know-it-all but as someone who's willing to receive some good advice. Investing in a prepurchase inspection will reveal areas of concern that can put you in a stronger negotiating position over the good, the bad, and the ugly. If you are new to this business, then be sure to get connected out at the airport and ask lots of questions. Think of your parents telling you how you won't know if you don't ask.

Your primary concern with your purchase should be safety. Safety is going to cost money. It's better to spend it on preparation than on cleaning up the mess afterwards. The excitement and emotion that accompany the buyer's position can eclipse the reality that you need to feel safe and secure once you are buckled in. Use the prepurchase activity to not only guide you on getting the deal but ultimately guide you in getting a good airplane. The prepurchase inspection has proven itself as a worthwhile effort to aircraft owners many times over. Ask some owners and your new friend, the mechanic. ■

on the finishing line

RICH THELEN, PE, GLOBAL FINISHING SOLUTIONS

My plane—

My King Air is over 25 years old and has served as my personal vice and most pleasurable transportation for about 6 years now. But eventually the mind wanders and fantasy gets you to saying "what if?" and anyone can play that game. It isn't that the finish is corroding or chipping off or anything. It is just that I was searching for a new look.

Since the aircraft has a good range, I didn't need to settle for the local exterior shop or impose on a friend to paint it in his hangar. I could shop around a bit and see what kinds of paint shops there are out there that would do a good job and satisfy my inner pilot and my fantasies.

I knew of a couple of paint shops nearby and had heard people talking about the kind of work the shops did so I decided to check out one or two locals and see what they could do. There was one in Middletown that I had heard good things about and I decided that this week, I could fly over there and see his shop. It would be a good flight and they had a good FBO there that I really liked. I scheduled the trip so I would arrive at the airport's restaurant for breakfast.

Middletown

I taxied right up to the FBO's main entrance and asked them to "top me off" with Jet-A, then went to the crew lounge. Several guys were there and they admired my craft, while I got some coffee. I filled out my flightplan to Springfield while checking the weather and winds aloft. Then I went over to the grille next door.

There were about 6 other customers there and we chatted for a while about flying and then I began by asking about the local painter. One fellow had his plane, a nice Cherokee, painted there, but said it took several weeks to get it right, so I began to have my doubts. Another guy said things were a little weird over there and no one had seen the painter actually paint an aircraft.

The fire marshall, Will, piped up and said that he asked him not to paint because he had no fire protection and his ventilation was poor. I wondered how he was still in business if Will had asked him to stop painting.

I was getting leery, but decided that since I was there, I would check it out. I finished my breakfast and thanked the guys for their help. Then I went over to the paint shop.

It was housed in a hangar with an office just outside. The door was closed, but not locked, so I went in and found the owner and painter at his desk. We chatted for a minute and I asked if he could handle a King Air. He said he had done two King Airs recently and I was encouraged. I asked him to show me his paint shop.

When we went in, he hit the lights and started the ventilation. The 8 lights were metal halide lights on pendants hanging from the ceiling. The illumination was minimal but if he used local spot lighting he would still be able to do a job. The ventilation consisted of a small filter box made of wood that had about 12 furnace filters in it. The fan blew out the rear wall. Any make-up air came into the hangar by infiltration. It must be brutal in winter.

I mentioned that the booth did not appear to have any fire protection at all. Also, it appeared that the electrical equipment was not "explosion proof" and could cause an explosion, because the ventilation was inadequate. He said the fire marshal had told him the same thing, so he didn't do any painting until after about 1:00 am so the fire marshal would not interfere. I agreed that legal interference could certainly slow down progress. Privately, I was thinking I didn't want to have my aircraft be the one that was in the hangar when it went up.

Springfield

I did my "walk around" pre-flight inspection then climbed aboard and ran through the pre-flight checklist. I strapped in and called the tower, and they advised "Taxi when ready." I powered up and taxied out. All of my gauges were in the green, I got clearance and began my take-off roll. In three minutes I was at my stated altitude of 7500 ft and enjoying the flight. I radioed ahead to the Springfield FBO that I wanted to meet their paint shop foreman. They advised they would have him meet me as I deplaned. In that case, I decided to tie-down at the FBO.

I was glad to get as far away from Middletown as I could and Springfield looked like a good spot. Springfield had a good reputation for absolutely pristine exterior finishes and I was hopeful we could work out a

deal. Al was my host and I met him at the FBO and we drove over to the diner for coffee and pie. When we were done, he examined the King Air and was ready to make a quotation. I checked out his shop as he was doing the math. His was another hangar used as a paint barn like the affair at Middletown, but the ventilation was far better and the lighting was excellent.

About that time, Al came out into the hangar and gave me a sheet of paper. I loved the professional way he did business. The quotation was very high and I could not figure why he would need that kind of money to paint my King Air. I didn't say anything or react negatively, but let him discuss the reason for the price.

He said he was a very demanding judge of finishes and knew the best way to get the finish that I required on my plane. He was very convincing so I asked what happened when he found a defect. He explained that defects were a way of life in painting aircraft, but once one was found the defect would be sanded or buffed out and repainted, feathering and blending in the paint to perfectly match.

I looked up at the light pendants and saw they were attached to the wooden ceiling joists. Looking closer, I noticed that a pigeon was roosting up there. I also noticed that the tops of the joist lower chords were covered in overspray dust. I asked Al if the dust ever fell onto the finish at the wrong time. He admitted that was the reason for most of the defects that he had to buff out. Then he told me "It really is hard to make any money in aircraft painting." I also wondered privately if he was concerned about a fire in his hangar. There was no fire protection. I decided to shop further.

Bradytown

Bradytown was several hundred miles away, but it was within twenty miles of my daughter's house and the home of two of my grandchildren. It was worth the trip. I decided to go there the next weekend. The painter at Bradytown had a new-fangled paint booth insert that had a complete sheetmetal surround that kept all overspray from the process from settling on hangar joists and the like. The paint shop manager was Kevin and he led me through the shop as his office manager was doing the quotation.

The lighting in the booth was sensational. There was nothing that couldn't be clearly seen and no shadows. Painters must love this environment. He had a Beech Bonanza in the shop and all the surfaces were clearly visible and well lighted. His painter was masking the sides of the Bonanza for stripes and I examined the paint job. It was magnificent and had no runs, orange peels or "skippers."

The airflow in the booth was excellent and it was easy to see how the overspray would be conveyed to the filter wall in the rear of the booth. His office manager brought out the quote and the pricing was in line with my expectations. In addition, they had software that allowed me to select just the right stripe.

I asked Kevin how he could do the job so reasonably. He explained that the secret is to have a professional paint booth. With a paint booth insert, he was able to prevent contamination of the air and thus keep dirt and other contaminants (like pigeon feathers and other dirt) from getting into the

"

I mentioned that the booth did not appear to have any fire protection at all. Also, it appeared that the electrical equipment was not "explosion proof" and could cause an explosion, because the ventilation was inadequate — he didn't do any painting until after about 1:00 am so the fire marshal would not interfere...

paint job. He said his rework rate was very low and thus he didn't have to sand or buff out too many imperfections in the paint job. It went on right the first time and cut the overall time in the booth to a minimum.

I looked overhead and noticed several sprinkler heads in the ceiling of the booth and decided I had traveled far enough. Time to see the grandkids, while I wait for my plane to be painted.

Summary

So what are the main items to look for in a paint shop? I guess I would have to say that cleanliness is the primary consideration. But the feature that gives the best cleanliness effect is a good sheetmetal surround that is smooth and easy to clean. The air outside

the spray zone contains much of the dirt that will eventually blemish the painted surface. It is necessary to control the space that the plane is painted in. The sheetmetal surround controls the entrance of air. If the air is brought into a paint area through a set of filters or filter doors, it will be the cleanest possible air and free of contaminants.

He said his rework rate was very low and thus he didn't have to sand or buff out too many imperfections in the paint job. It went on right the first time and cut the overall time in the booth to a minimum.

If the airflow is laminar and the streamlines are controlled, it is possible to carry away the overspray from the painting zone and further reduce the contaminants that will cause blemishes.

In addition, good lighting must be high on the list. Good lighting will show the painter what type of spray job he is doing. If there are skippers, he will see them. If there are runs, they will be obvious. If there is orange peel it will be apparent. Once detected, the painter can make changes to his spray parameters to eliminate the problem. Good lighting is essential.

It also helps to have a sprinkler system that will not endanger my need for security. The activity being conducted in a spray booth is by its nature dangerous. There is fuel (paint fumes) and oxygen present to start a fire. All that is needed for a fire is a source of ignition. Engineering controls can minimize the danger, but bad things can happen. If it does, it is reassuring to know that the fire will be extinguished quickly and my plane will be safe. After all, my plane is my devotion and my personal vice.

The stripes look nice too. ■

21st Century Flight School

The way professional flight training is done in Canada will change significantly during the 21st century. Advances in flight simulation are one reason, but in the coming years there will also be pressure by companies that employ pilots to take a new approach to training-syllabus design—

by RAY PRESTON

In addition, there will soon be a new type of pilot license that could result in a split into two distinct primary-flight-training options. These are my views and they could be accurate or way off, but I am going to give you my best guess based on some analysis of the trends and a little bit of personal bias about how professional flight training might evolve in this new century. The article is about the training of professional pilots, because

that is primarily what I know. Reflections on the health of recreational aviation and changes to private pilot courses I will leave to someone else.

The rate of technological change in aviation is accelerating. New aircraft types, navigation systems, engine designs, etc. are coming into service daily, and much more quickly than old equipment is retired. Consequently, the 21st century pilot must be trained to fly not only new 21st century aeroplanes but the "antiques" from the 20th century as well. In the coming decades the diversity of aeroplanes, instrumentation, and equipment will far exceed what any one person can master. Twenty years from now there is going to be a much wider range of complexity in "first jobs" for professional pilots (running the gamut from old technology to new). Today it is usually the case that a pilot's first job is on an aeroplane with relatively simple systems and operating conditions. In the future some, but not all, pilots will begin their careers further up the complexity ladder. Why do I say this? There are two reasons. First, the large group of people known as baby-boomers is about to retire. In many professions, and aviation is no exception, there will be shortages of experienced professionals within ten years. Second, the expanding economies of many third world countries will bring hundreds of millions of people into the middle class, resulting in unprecedented demand for international airline flights (and pilots). When you put these factors together it seems likely that many young pilots will be going directly from primary training to sophisticated two-pilot airline cockpits where they will find captains who also have relatively little experience. To properly prepare pilots for this career path the current commercial pilot course, which emphasizes single pilot VFR flying will not be appropriate. Many people anticipate that a new license known as the Frozen-Airline Transport Pilot License (ATPL) will be introduced to facilitate this new career path.

On the other hand there will be lots of 21st century pilots who will fly single pilot, both VFR and IFR, without the support of a big airline or corporate flight department. They too will experience rapid career advancement and will need to be able to operate safely with limited supervision in some very challenging environments, and without years of experience behind them.

"the rate of technological change in aviation is accelerating. New aircraft types, navigation systems, engine designs, etc. are coming into service daily, and much more quickly than old equipment is retired.

For these pilots the traditional single pilot VFR bias of commercial pilot training will be appropriate, but the need to rapidly take command of working aeroplanes, in difficult situations, means that the Commercial Pilot License (CPL) curriculum should be broader than at present. I think it likely that pilot employers, or their insurance companies, are going to put pressure on flight schools to provide training experiences that more accurately reflect pilot work conditions. As a result, I predict that flight schools will tend to specialize in either CPL or the new Frozen-ATPL training. Some schools will of course attempt to do both, but I think that it will be hard to do a good job without specializing.

As far as we know the Frozen-ATPL will be introduced sometime in the next ten years, and it will have specified flight, simulator, and classroom requirements tailored to two-pilot flight operations. A pilot completing the training, examinations, and testing will be qualified and should be competent to act as a first officer on any aeroplane that requires a two-pilot crew. Subsequent "thawing" of the Frozen-ATPL into a regular ATPL would be automatic upon completion of a specified amount of experience (perhaps 3000 co-pilot hours) at which point the pilot would be eligible to act as pilot-in-command of a two-pilot aeroplane.

I believe it will be best if the Frozen-ATPL course does not include the exams or flight tests for the CPL (and the license therefore NOT have the privileges of the CPL.) My reasoning has to do with curriculum design. Of course anyone who wants both a CPL and a Frozen-ATPL could take both courses, but I want to emphasize that the development of curriculum for these two licenses will result in very different syllabi that cultivate quite different skill and knowledge sets. In the 21st century aviators should embrace training specialization as many other professions did in the 20th century.

As I see it, a common tendency is to have the Transport Canada exams and flight tests drive the syllabus design. This should not be the case. The commercial pilot flight test does not examine the skills and knowledge actually needed by a working commercial pilot. But to be fair, it is completely impossible to set a single flight test that in one short trip evaluates all the required skills. Many of the needed skills cannot be demonstrated in just one aeroplane or one weather condition. Commercial pilots must be able to fly VFR in marginal weather, from small unimproved airstrips, and handle heavily loaded aeroplanes. But they must also be competent around large airports and in IFR flight with medium complexity aeroplanes. Commercial pilots must be able to locate needed resources (weather, aircraft care, etc.) at unfamiliar airports at which their company has no base of operations. Commercial pilots must be able to sum up a range of conditions and factors including load, weather, and aircraft serviceability and make some tough go/no-go decisions largely without the assistance of a dispatcher, or other supervisors. To fully test (or train) this range of skills requires multiple flights on different days in different types of aeroplanes, different weather conditions, and into different geographic regions. The responsibility to arrange such a curriculum rests entirely with the flight schools, because one single flight test could not possibly confirm that the full set of desired skills is present. My hope is that 21st century flight schools will step forward and start designing curriculum that actually prepare commercial pilots for the working environment rather than for a specific flight test.

Similarly, a curriculum for a Frozen-ATPL should be developed from an analysis of the skills, knowledge, and attitudes needed by ATPL pilots. A premium should be placed on communications skills and team problem-solving and decision-making. Of course classroom instruction should emphasize high altitude and global meteorology, advanced aircraft systems, etc. It will be necessary for the curriculum to include extensive two-pilot flight operations, which almost certainly requires a sophisticated simulator. As with the CPL course, a single flight test cannot examine the full set of skills. That is why flight schools must develop their Frozen-ATPL syllabus based on analysis of job requirements not the contents of the single flight test Transport Canada will likely set. The Frozen-ATPL syllabus will be quite different than the CPL syllabus. That is why I believe that specialization is preferable for 21st century flight schools.

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> **It is completely** impossible to set a single flight test that in one short trip evaluates all the required skills. Many of the needed skills cannot be demonstrated in just one aeroplane or one weather condition.

A flight school specializing in CPL training needs relatively modest resources. Ideally it should have two or three different types of aeroplanes available, covering a range of weight and complexity. Expensive Flight Simulators are not needed although a very simple Flight Training Device, for learning basic IFR procedures, would be an asset. It is possible that 21st century technology will someday provide advanced simulators capable of realistically emulating VFR flight in marginal weather, and the variety of different aeroplanes, runway conditions, etc. that a commercial pilot faces. But, I suspect that these simulators will be priced out of the reach of many flight schools, and they are really not needed if the school is creative in its curriculum design. By far the most important thing for a flight school is to develop its curriculum by performing an analysis of the actual skills, knowledge, and attitudes that a working CPL pilot needs. By its very nature this approach leads to specialization, since it starts by analyzing a particular work situation, and there are going to be many of those. Flight schools will need to work directly with pilot employers, who will find themselves under pressure to hire low time pilots and give them long-term careers, not just a place to gain some hours for an ATPL and a “real job.” If employers refuse to do this they may find flight schools are unable to provide new pilots that insurance companies are willing to endorse. I think that marketing by flight schools to both students and employers will become the new face of 21st century flight training.

A flight school specializing in the Frozen-ATPL will need a sophisticated flight training device or simulator that emulates flight in an aeroplane that requires two pilots. As flight simulation technology advances over the next decade or two it is conceivable that pilots will eventually be trained to the

Frozen-ATPL level without ever actually flying a real aeroplane. We are still a long way from that day, but it could be coming. Certainly the amount of aeroplane hours can be substantially reduced through the appropriate use of flight simulators. The total number of aircraft hours should be much lower for the Frozen-ATPL course than for the CPL course.

In summary, I think the 21st century will see the emergence of two distinct categories of professional flight schools. CPL training is most suited to small schools with limited capital resources that can develop niche training programs for single-pilot flight operations. Such schools can offer lots of one-on-one time with students and tailored syllabi. Frozen-ATPL training is suited to larger schools with the capital resources to purchase expensive simulators. These schools will generally enroll students in large groups once or twice per year which makes it possible to facilitate crew pairing and simulate an "airline like" environment. Both types of schools should develop their syllabi by analyzing the needs of working pilots, not the contents of a flight test. ■

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