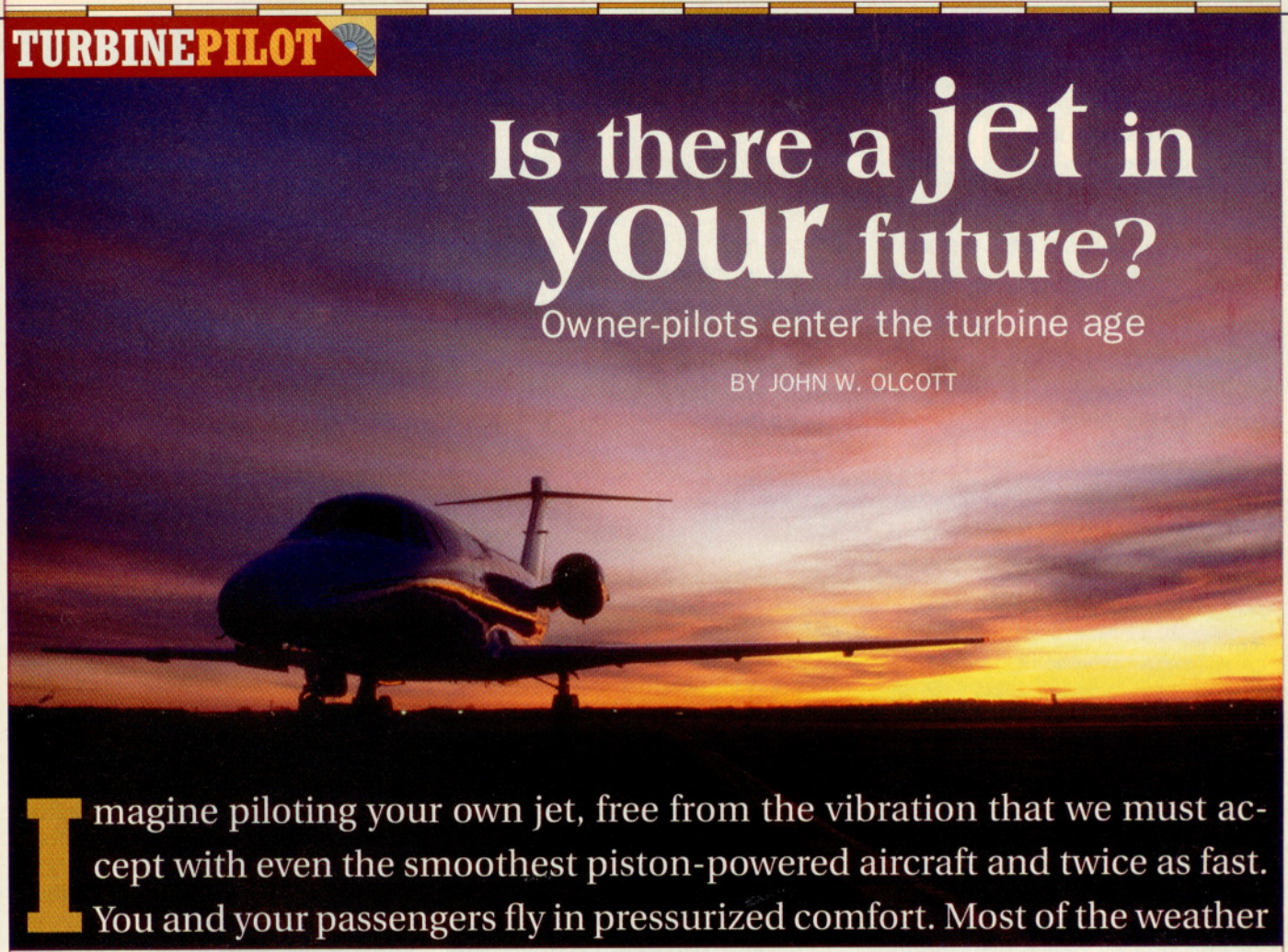
Is there a jet in your future?

Owner-pilots enter the turbine age

BY JOHN W. OLCOTT



Imagine piloting your own jet, free from the vibration that we must accept with even the smoothest piston-powered aircraft and twice as fast. You and your passengers fly in pressurized comfort. Most of the weather is below you, and your aircraft is equipped with the latest avionics, including data-linked weather information such as Nexrad and lightning detection, showing you how to avoid the bad stuff. While hand-flying presents its own satisfaction, your aircraft's autopilot and flight management system control normal modes of operation, leaving you free to command the successful completion of your flight. GPS provides access to direct routes as well as lower instrument approach minimums at many GA airports. Yes, joining the jet age would indeed be sweet.

Imagine jet capability and reliability at the price of a new light piston twin or a used turboprop, and at a cost per mile of about $1—possibly less—in direct expenses. Imagine the advantages of 3,500 hours of operation between overhauls.

Imagine a jet aircraft sufficiently light and powerful to take off and land safely at most of the nation's public-use airports, which number more than 10 times the 429 facilities that are served by scheduled air carriers and well over 100 times the hubs with really convenient commercial service. Today's hub-and-spoke airline system requires so much time checking in at the departure airport, switching planes at a hub, and then traveling to your ultimate destination that the actual door-to-door speed for the typical 500-mile trip on the airlines is less than 75 mph. With the ability to use local airports on your own schedule, your travel speed increases dramatically.

Imagine what you and your business associates could accomplish with the ability to reach more customers in the time you now allot to business travel. Think what such mobility could do for your company. Think what such mobility could do for your personal travel.

An emerging market

The promise of lower-cost jet aircraft powered by the new class of advanced, small-turbine powerplants such as the Pratt & Whitney PW610/615 series and the Williams International FJ33 has stimulated the concept of a large fleet or fleets of aerial taxicabs. Entrepreneurs envision many of these smaller, economical jets networked into a relatively short-haul transportation system that will serve destinations up to 500 miles apart, and in some cases farther distances, hopefully bringing the speed and efficiency possible with air travel to a broader segment of the public. As much as 50 to 75 percent of the market for the new class of jets may be with innovative air taxi companies engaged in this potentially precedent-setting "sky cab" concept.

The market, however, consists of more than just companies that will employ professional aviators and operate these aircraft either commercially or as part of a professionally run corporate flight department. Individuals who desire to fly these aircraft by themselves, without the accompaniment of instructor, check pilot, or second in command, account for approximately 25 percent to more than 50 percent of current orders, depending upon the manufacturer.

Whether from air taxi operators or owner-pilots, industry experts predict strong demand for this new class of jet. Honeywell, a manufacturer of engines and avionics, estimates that as many as 8,000 GA aircraft powered by either Pratt

New small turbofans prompt seven new designs

	Adam A700	ATG Javelin	Avocet Projet	Cessna Mustang	Diamond D-Jet	Eclipse 500	Safire Safire Jet
Max cruise speed, kt	340	528	365	340	315	375	380
Max operating alt	FL410	FL490	FL410	FL410	FL250	FL410	FL410
Full-fuel payload, lb	725	490	710	800	880	750	780
NBAA IFR range, nm	1,100	1,250	1,200	1,050	1,320	1,280	1,100
Takeoff distance ISA, SA	2,950 ft	3,000 ft	3,000 ft	3,120 ft ****	2,320 ft	2,150 ft	2,950 ft
Max takeoff weight	7,000 lb	4,950 lb	7,160 lb	8,200 lb	4,750 lb	5,640 lb	6,250 lb
Cabin length, approx.	12.7 ft	2-place	11.2 ft	14.3 ft	11.6 ft	9.5 ft	10.1 ft
Cabin height	51.6 in	tandem	57 in	54 in	57.6 in	50 in	55 in
Cabin width	54 in	34.5 in	58.3 in	56 in	57.6 in	56 in	56.5 in
Cabin volume	245 cu ft	unknown	259 cu ft	300 cu ft	unknown	160 cu ft	218 cu ft
Baggage volume	25 cu ft	25 cu ft	47 cu ft	45 cu ft	unknown	26 cu ft	36 cu ft
Engines	FJ33	FJ33	unknown	PW615F	FJ33***	PW610F	FJ33
Thrust	1,100 lb	1,500 lb	unknown	1,350 lb	1,400 lb	900 lb	1,100 lb
Anticipated price	$1.995M	$2.2M	$2M	$2.395M	$0.850M	$0.975M	$1.4M
First flight	July 2003	2Q 2004	mid-2005	2Q 2005	4Q 2004	August 2003	mid-2004
Anticipated certification	4Q 2004	4Q 2005	4Q 2006	mid-2006	1Q 2006	1Q 2006	mid-2006
Orders placed, approx.	starting	50	135	330	50	2,100*	31/225**
Next delivery position	2005	4Q 2006	mid-2007	mid-2009	4Q 2006	3Q 2008	1Q 2008

Anticipated prices are approximate and may not reflect the cost at time of actual delivery
*1,500 orders are from "sky cab" or commercial operators
**31 firm orders, 225 refundable deposits
***single engine
****balanced field length
All specifications based on manufacturers information

& Whitney or Williams advanced small turbines will be required to satisfy buyer demand over the next 10 to 15 years. Other forecasters predict that numbers in the range of 6,500 to 10,000 units will be sold from 2006 through 2020. When these aircraft are available, which could be as early as 2005 but certainly within the next two to three years, they will bring a new level of excitement and capability to the traditional general aviation community.

From dream to reality

Aircraft design has never been easy. Many great aeronautical ideas, embodied in sleek lines that promised successful flight, failed to produce a viable aircraft because of a multitude of factors. Capital is always an issue, in part because the manufacturer does not control the pace of certification. That is in the hands of the FAA, and without a certificated aircraft and a certificated production process, orders cannot be converted into cash.

For the emerging class of GA aircraft powered by advanced small turbofans, other challenges also loom large. First and most pivotal is the successful introduction (i.e., the initial operating experience, or IOE) of a large number of new-technology aircraft, many flown by owner-pilots experienced neither in jets nor in operations in the flight levels, into the aviation system. The aviation community must avoid the problems encountered when other GA aircraft of new and advanced design entered the marketplace.

Lest we forget, the experience of GA pilots transitioning to the first Beechcraft Bonanza Model 35 from simpler and less sophisticated Stinson Voyagers and Fairchild Model 24s immediately after World War II was not pretty. The added speed and range performance of the Bonanza exposed owner-pilots to weather conditions that taxed their ability to control the aircraft, particularly in instrument meteorological conditions. When the Model 35 was introduced in 1946, only a handful of GA pilots possessed instrument proficiency. A similar pattern of accidents emerged when the Lear Jet was introduced in the mid-1960s. Professional pilots who were proficient in Model 18 Twin Beeches and Douglas DC–3s found the significantly higher performance of the Lear a formidable challenge, resulting in 23 accidents of Model 23 Lear Jets during the first three years of the aircraft's integration into the business aviation community.

Although not as dramatic, other segments of aviation also experienced difficulties as professional pilots transitioned to jets. Introduction of single-pilot models of the Citation resulted in a higher number of accidents than expected. Even today's piston-powered aircraft are not immune. Most recently, accidents have occurred as pilots transitioned into the Cirrus SR20 with its impressively advanced avionics and features.

The problems encountered with more capable aircraft rest not with the design as much as with the operator's expectations stemming from the aircraft's advanced features, and with his or her training in how best to manage those expectations.

A second issue is insurability of owner-pilots. Rates, limits of coverage, and even the ability to obtain *any* insurance for single-pilot operations will depend upon how the major insurance underwriters and their agents perceive the accident risk. The anticipated large volume of small jets in this new class presents underwriters with the prospect that there will be more claims even if the rate of mishaps is similar to that of current aircraft. Adding to that volume issue is the underwriters' lack of experience with typical owner-pilots operating turbofan aircraft above FL290.

Currently, owner-pilots desiring coverage for single-pilot operations in jet equipment face noticeably higher rates and lower coverage limits than their fellow aviators who are paid for their services and fly with a second crewmember. It is not unusual for an owner-pilot desiring single-pilot coverage in jet equipment to be quoted hull rates that are three to four times what he or she was paying on a cabin-class piston twin. Liability limits also are likely to be lower, and typically there is a requirement that the owner-pilot fly with a highly experienced jet pilot for 100 hours or more.

Avocet Projet

Adam A700

Obviously, the initial accident and incident record of this class of new GA jets will determine how underwriters respond. Until sufficient operational history is available, however, adequate insurance coverage at reasonable rates will be an issue.

A third issue, also related to how successfully these new aircraft are flown by owner-pilots, will be acceptance by the airline community and the FAA. In reality, scheduled airlines lobbying through the Air Transport Association of America (ATA) and airline pilots lobbying through the Air Line Pilots Association (ALPA) exert significant influence on the design and implementation of airspace above FL290. Those associations appear to accept business jet operations in the flight levels today because corporate pilots are well trained, the safety record of business jets flown by two-person salaried crews is the best in all aviation, and the typical business jet has performance equal or superior to the typical airliner. If the airline community perceives the presence of owner-pilots operating above FL290 as a risk, expect push-back and possible airline pressure on the FAA to respond. Also, if the presence of a significantly higher number of relatively slow (Mach 0.6 to 0.7) aircraft operating above FL290 impacts ATC flow, there may be proposals to restrict traffic along certain routes. In either case, the FAA could respond with re-

vised training standards, tougher type rating rides (all jets require a type rating), and/or operational restrictions.

As a very rough rule of thumb, controllers are able to accommodate aircraft that can maintain indicated airspeeds of at least 250 knots at higher altitudes. Operating slower than 250 KIAS, however, presents challenges that can result in spacing issues and route deviations. All the preliminary specifications for the new smaller jets suggest that these aircraft will be able to indicate 250 knots or faster below FL250. At FL300, 250 knots equates to about 360 knots true airspeed. To achieve 250 KIAS at FL350, an aircraft needs to have a true airspeed of about 380 knots. Because of their range, size, and use as sky cabs, the typical stage lengths for these aircraft will be about 500 to 600 miles, which suggests that they are unlikely to be cleared to higher altitudes regardless of their cruise performance. Provided they are operated safely, smaller jets should be able to fit into the existing ATC system without difficulty.

ATG Javelin


Cessna Mustang


Eclipse 500

However, controllers and the airlines as well as corporations operating business jets with salaried two-person crews will be mindful and most likely intolerant of operational errors committed by pilots of this new class of small jet. At this year's annual convention of the National Business Aviation Association, an experienced corporate pilot was overheard saying that owner-pilots flying this class of aircraft should be limited to altitudes below FL290 and allowed to operate only on Sundays. If there is a rash of accidents during the IOE of smaller jets, regardless of who is piloting these aircraft, there will be community reaction that could harm the successful growth of the market for sky cabs as well as the market for owner-flown jets.

None of these challenges—safe operations, insurability, and community acceptance—are showstoppers. The market for the higher capability of new-technology aircraft powered by advanced turbofans

What's in a name?

What to call this new class of small jet? No one appreciates the handle of *micro-jet*. It suggests something somewhat fragile, such as a microlight homebuilt aircraft. *Minijet* has the same connotation. Some have suggested *personal/business jet*, but the initials PBJ sound a bit too sweet and somewhat sticky. Since these new aircraft are powered by *Small Turbines* and they will be capable of operating from nearly *All Runways* available to general aviation, perhaps the name should be *STAR Jet*? —JWO

Diamond D-Jet

Safire Jet

will not be denied. But as a community, we must assure that the introduction of this advanced class of small jets avoids the problems associated with other designs that offered additional capabilities.

Training

Training is the route to achieving the exciting potential of advanced GA aircraft. It addresses the three issues of successful IOE, insurability, and acceptance by the sophisticated air transportation community and the FAA. Each manufacturer engaged in marketing this class of aircraft recognizes training's critical role. Some are looking for training partners. Others are integrating training into their sales and marketing programs.

Training for small jet aircraft flown by owner-pilots, however, must offer more than the traditional elements of knowledge and skill. It must also inculcate within each owner-pilot a safety attitude that is similar to the culture embraced and lived every day by the professional aviator. Culture is what we do when no one is looking; safety practices must be followed with a discipline as regular as breathing.

Whether or not one flies for a living, operating advanced aircraft in the flight levels demands professional performance, which is within the grasp of the well-trained owner-pilot. Since each of the small-jet designs incorporates advanced CNS (communications, navigation, and surveillance) capabilities and a relatively low-cost yet sophisticated flight management system, and since most operations will involve use of the aircraft's autopilot, effective avionics training is paramount to the successful integration of this class of aircraft into the National Airspace System.

While it is tempting to suggest that flat-panel displays will cleverly integrate all the attitude and position data a pilot requires to fly safely, no system is sufficiently intuitive to preclude the need for in-depth training. Avionic manufacturers must develop training programs and computer-based aids that enable an owner-pilot to fully understand his or

her aircraft's systems. For example, there should be CDs developed for home computers so that operators can maintain proficiency with the aircraft's systems and practice typical flight profiles prior to entering their aircraft.

New training businesses are forming to assist owners transitioning to jets approved for single-pilot operations. Most involve a mentoring program that includes ground school, initial and recurrent training, plus considerable line-oriented flight time with an experienced jet captain who is able to provide oversight during the owner's initial operating experiences. Insurance companies are likely to require such mentoring and/or oversight before they are willing to provide coverage. Other schemes are under consideration, such as requiring the owner to obtain approval from a qualified dispatcher designated by either the manufacturer or the insurance company prior to each flight.

Paced by advanced small-turbine powerplants, led by innovative entrepreneurs, and facilitated by training programs designed to nurture a strong safety culture, an exciting new era of general aviation is under way. There is recognition by the general aviation community, however, that the initial and subsequent operating experiences of smaller jets must be safe and without incident. The success of this new class of aircraft depends upon it. AOPA

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i Links to additional information about light jets may be found on AOPA Online (www.aopa.org/pilot/links.shtml). Keyword search: light jets.

Powerplants pace aviation advances

Throughout the history of flight, advances in powerplants have set the pace of aviation. The Wrights would not have achieved powered flight without the creativity of Charles Taylor, a skilled mechanic who hand-built the 16-horsepower, 180-pound engine that propelled their *Flyer* at Kitty Hawk, North Carolina, 100 years ago. Speed, climb capability, altitude performance, and range of World War II aircraft advanced with the introduction of improved superchargers and propellers as well as high-octane fuel. Jet engines launched a new era, and the world of flight has never been the same.

While corporate aviation has enjoyed the benefits of jet propulsion since the early 1960s, general aviation has been limited to reciprocating engines and turboprops for most owners and pilots. Only a few individuals own and operate business jets, and even fewer are insured to fly them without the services of a professional copilot. But that situation is about to change, when one or more of the seven announced jet aircraft powered by the first advanced small-turbine engines becomes available, possibly as early as 2005 and certainly no later than 2006.

Within the near future, turbofan powerplants in the 900-to-1,500-pound-thrust range will be fully developed and certified. Pratt & Whitney says its 1,350-pound thrust PW615F will be certified during the fourth quarter of 2005 and its 900-pound thrust PW610F during the first quarter of 2006. Williams International expects to have its FJ33 fanjet family, designed to produce thrust in the 1,000-to-1,500-pound range, certified by 2005. While other engine manufacturers have yet to announce designs of comparable thrust, if projections of demand for small jet aircraft are correct additional companies could enter the market.

—JWO