STRAIGHT ARROW

Piper fine-tunes its basic retractable.

BY SETH B. GOLBEY

THE alphanumerics that once adorned the model names of Piper Aircraft's 200-horsepower, four-seat retractable are gone. No more Arrow II, III, or IV. Now it's simply the Arrow (and Turbo Arrow). And with the fine-tuning Mr. Millar's company did after listening to the peeves and plaudits of owners and prospective owners, it's a fine machine. Yes, some folks think it

PHOTOGRAPHY BY MIKE FIZER

would be nice if the Arrow were faster, and many pilots would like Piper to bring back the excellent automatic gear extension system the airplane was born with, but, as is, it is one of the most comfortable and easy to fly light retractables available. The 1990 Arrow has profited from the lessons learned during the line's years of service.

For better or worse, the market for today's light general aviation airplane is dominated by flight schools, and Piper has been able to bring a number of models back from the brink of extinction on the basis of large orders from the likes of universities and airlines. Piper delivered 48 Arrows and 15 Turbo Arrows in 1989. Of the normally aspirated airplanes, 22 went to the University of North Dakota, eight to Korean Airlines, three to Purdue University, and two to Japan Airlines for training purposes. The remainder, including all the Turbo Arrows, was purchased as personal airplanes. (In total, about half of Piper's 600-plus airplanes delivered last year were destined for flight training.) The company projects sales of 36 PA–28Rs in 1990, 22 as training airplanes and 14 as personal airplanes.

When optimized for advanced flight instruction, the Arrow makes an excellent personal-use airplane as well. In its current iteration, the Arrow's best qualities shine as brightly as ever, while some less desirable traits have been successfully addressed. To appreciate how highly evolved this airplane is, it's useful to look at its development history.

The PA–28R-180 Cherokee Arrow was introduced in 1967 with a 180-hp Lycoming engine. The 200-hp Cherokee Arrow 200 was introduced in 1969. Later that year came 180- and 200-hp variants with minor improvements, known as the Cherokee Arrow B. For 1972, the 180-hp version was dropped from the lineup, and the Cherokee Arrow II was introduced.

The II was five inches longer—with the stretch coming between the front and rear seats for improved legroom—and had a larger stabilator, wider door, higher maximum takeoff weight, new flared wing tips (which increased span by 26 inches), new interior, and optional air conditioning. Evolutionary improvement continued: In 1973, the II got new seats and a padded instrument panel; in 1974, rounded window lines and improved nose-gear steering; in 1975, new vertically adjustable seats and optional soundproofing (in this year, too, the Cherokee tag was dropped); in 1976, improved engine TBO.

The next big step was in 1977, with the debut of the Arrow III. This airplane adopted the semitapered wing design that had been introduced on the Warrior in 1974 and adapted to the Archer II in 1976. Among other benefits, the new wing allowed fuel capacity to be increased from 48 to 72 usable gallons. A Continental-powered turbocharged version, the Turbo Arrow III, joined the lineup in 1977. In 1979, the stabilator was moved to the top of the tail, and the names were changed to Arrow IV and Turbo Arrow IV. The industry-wide decline in general aviation aircraft sales led to the discontinuation of the Arrow IV in 1982, but the Turbo Arrow IV soldiered on alone and essentially unchanged until 1989, when the current low-tail models were introduced.

Today's Arrow and Turbo Arrow are powered by 200-hp Textron Lycoming IO-360-C1C6 and Teledyne Continental TSIO-360-FB engines, respectively, each

with an 1,800-hour TBO, each an evolved version of the engine each airplane started with.

Few dead ends were encountered along the development trail, but three are worth noting. In 1969, Piper and Continental tested an Arrow with a 265-hp Tiara engine, and in 1985, Piper flew an Arrow with a single-piece windshield, low tail, and 220-hp Continental TSIO-360. Neither of these experiments led to significant changes in the Arrow line. The third dead end was the T-tail.

Some crusty old Arrow pilots swear they cannot distinguish any handling difference between the low-tailed and T-tailed versions. For the rest of us, the difference is obvious, particularly in the low-speed, near-the-runway regime, where the lack of prop wash over the stabilator can be character- (and muscle-) building. As Mark R. Twombly wrote in the June 1986 *Pilot*, "Pitch forces are much heavier on rotation and landing even with generous aft trim, and the stabilator is ineffective in raising the nose to increase propeller clearance while taxiing over soft ground or loose gravel." Most pilots who have sampled both tail configurations would agree. Many also complain about longer takeoff runs in the T-tailed machine. In any event, Piper chose to return the stabilator to its original position for the current airplane, and there haven't been many complaints.

From across the ramp, a brand-new Arrow could be mistaken for an Arrow III. The sharp-eyed observer would notice the absence of the short mast under the pilot's side window post that controlled the automatic gear-extension system on the older airplane. This system was unique at the time of its introduction and is highly regarded by owners (and FBOs with rental Arrows on the flight line) for its simplicity, reliability, and ease of use. In 1987, Piper mandated disconnection of the automatic feature in existing airplanes and eliminated it from new airplanes in an attempt by Piper's pre-Millar owner to limit product liability exposure. The next year, Piper issued a new service bulletin saying that if you hadn't disconnected the system, you could leave it connected, but if you had disconnected it, you could not reconnect it.

Aside from the change in tail configuration, the most noticeable difference in the new Arrow is the redesigned instrument panel. Piper is now equipping its light singles with a standardized flat black metal panel that, if it appears austere in a VFR-only Cadet, can be fully appreciated in an IFR-equipped Arrow.

The position of the basic six flight instruments is unchanged, but the manifold-pressure/fuel-flow gauge and the tachometer have been moved from their former positions above the pilot's right knee on the left of the power control quadrant (where view of them was sometimes impeded by the yoke) to the positions previously occupied by the number-one and -two nav heads. The EGT indicator is just below them.

The number-one nav head has moved to where the ADF head used to be (if you are accustomed to your LOC/GS indicator being to the right of the altimeter, this takes a little getting used to; an optional HSI solves the problem), with the number-two nav head below it. To the right of the number-two head and below the turn coordinator (a turn and slip indicator is optional) is the ADF head, except in airplanes in which the ADF head is integral to the ADF re-

ceiver; in this case, you pick up room for a Stormscope, moving map display, or other accessory equipment.

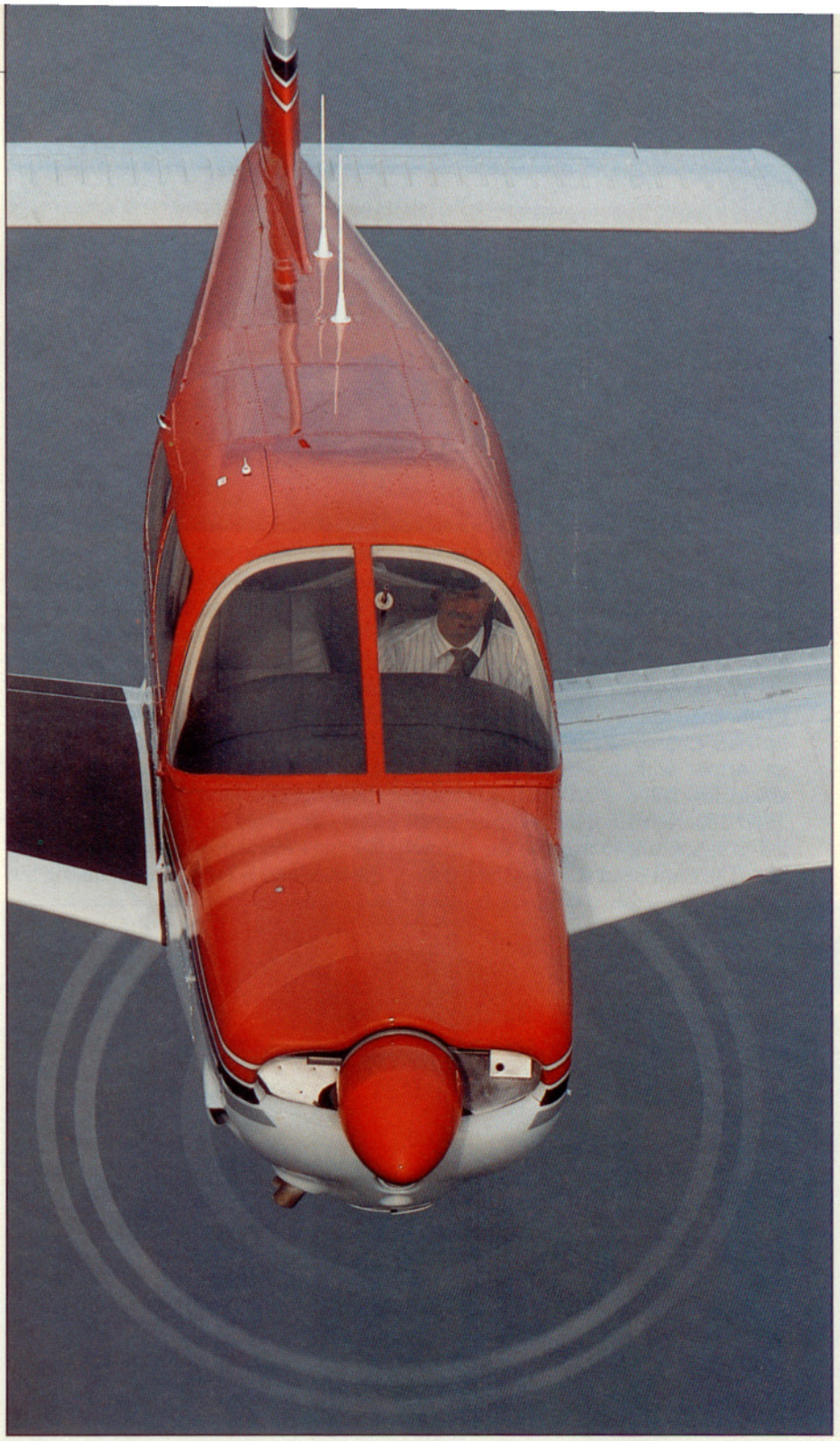
With more room for the switch panel under the left-hand avionics stack, the battery and alternator master switches, which in many PA–28s were placed together on a single split switch, are now separate. The old switches were lit only by external cockpit lights, which led more than one pilot to flip the wrong switch at night, but the internal lighting on the new switches is superb.

Other changes in the panel design are clear in the photograph on page 70.

Like many of the current generation of pilots, my early experience in an airplane with retractable landing gear and a constant-speed propeller came in an Arrow—in my case, a shiny new Cherokee Arrow 200. I have also sampled the T-tail version, but for me, the current Arrow (like the Arrow III) combines the best features of old and new in the low tail and the semitapered wing.

The pilot stepping up from a Cadet, Warrior, or Archer will be familiar with the handling qualities and most of the systems of the Arrow. The differences, however, go beyond the propeller and landing gear controls. For one, the fuel-injected engine calls for different procedures, particularly in starting. For another, the Arrow is a heavier airplane: At max takeoff weight, the normally aspirated Arrow is about eight percent heavier than an Archer and 19 percent heavier than a Cadet; a Turbo Arrow is about 14 percent and 25 percent heavier, respectively. Among other things, this translates into higher takeoff and approach speeds. Of course, the larger engine means higher cruise speeds (and greater fuel consumption) as well.

Power and speed management, however, are uncomplicated. We flew a new, normally aspirated 1989 Arrow for this report with Dan Reece, manager of Piper's Flite Centers. He suggested using 10 degrees (one notch) of flaps for takeoff, accelerating to 70 KIAS, then rotating to seven degrees nose up. This reduces the runway used, compared to a flaps-up takeoff, and the gentle rotation makes it easy to achieve the max-gross, gear-down, best-rate-of-climb speed (Vy) of 78 KIAS. On climb-out, retract the gear, raise the flaps, reduce power to 2,500 rpm, and trim for the gear-up Vy of 90 KIAS (96 for the Turbo Arrow). For better visibility over the nose and improved engine cooling, let the speed build to 104 to 110 or even 120. (Best angle, Vx, is 72 gear-down and 78 gear-up at max takeoff weight.) Maximum gear retraction speed is 107 KIAS.



In the traffic pattern, lower the gear (max extension speed, 129 KIAS) and 10 degrees of flaps (max extension speed, 103 KIAS) on downwind and trim for 100 KIAS. Lower the second notch of flaps on base and trim for 90. Full flaps for final, trim for 80 (75 for a short-field landing), and move the prop control full forward. Work load is low: If you judge the wind correctly and make your turns in the right places, little or no power adjustment is necessary. Hold 80 over the threshold, then rotate to the landing attitude, reduce power, and set her down. Properly flown, the Arrow makes arguably the nicest landings of any of Piper's light singles. That final approach speed might seem high to some, but it works well and keeps you configured for a go-around. We executed a go-around from 100 feet agl—full power, pitch up,

gear up, milk off the flaps, and climb out—and the transition was easy.

In the terminal environment, the Arrow shows off its flexibility. Piper recommends shooting an instrument approach at 120 KIAS, which allows you to fit in with high-speed traffic at busy airports. Try 25 inches of manifold pressure and 2,400 rpm through the procedure turn. To descend, reducing manifold pressure by five inches or extending the gear will result in an approximately 500-fpm descent. When the field is in sight, extend full flaps and adjust the power. With the gear down and power back, the airplane slows—and descends—quickly. The missed approach procedure is full power, pitch up, gear up, and climb at 100 KIAS. If other aircraft on the approach are not a factor and you'd rather not use 120 KIAS, you can slow down to a more leisurely 100, or somewhere in between. In any case, the Arrow is rock-solid on instruments—indeed, one of the nicest airplanes I've ever flown on the gauges.

The airplane offers flexibility in planning cross-country trips, as well. The normally aspirated Arrow can be flown at a 55-percent power, long-range, best-economy setting, yielding an 875-nm range with 45-minute reserves at 122 knots while burning eight gallons an hour. Or you could go for a 75-percent power, high-speed, best-power setting and fly 725 nm at 143 knots on 11.6 gph. The Turbo Arrow offers 154 knots over 860 nm on 9.2 gph at a 55-percent power, best-economy setting to 172 knots over 675 nm on 14 gph at a 75-percent power, best-power setting. For average trips, 65-percent power and a best-economy mixture setting offers a range of 845 nm at 129 knots on 9.2 gph in the Arrow and 830 nm at 164 knots on 10.8 gph in the Turbo Arrow.

With full fuel, an Arrow can carry about 716 pounds of people and bags. With four 170-pound people and 200 pounds of bags (the baggage compartment's limit), fuel load would be about 45 usable gallons, or enough for about four hours, plus reserves. A Turbo Arrow can carry about 800 pounds with full fuel, or about 59 usable gallons loaded as above, enough for about five hours, plus reserves. (These figures are based on standard empty weight.)

The 1990 Arrow's base price of $126,900 is 11 percent higher than the 1989 model's $114,300 (the Turbo Arrow, at $136,900, is 14 percent higher than 1989's $120,300); the increase is due mainly to a longer list of standard equipment, now including a basic avionics package comprising a Bendix/King KX 155 nav/com, KI 208 VOR/LOC indicator, KT 76A transponder with Narco AR-850 altitude encoder, Telex 100T hand microphone, radio speaker, mike/phone jacks, and headset.

An optional operational and interior package, including deluxe interior appointments, soundproofing, external power receptacle, wing-tip recognition lights, tail fin strobe, and other nice-to-haves, adds $4,125 to the basic equipped price. The basic avionics package can be exchanged for a deluxe avionics package including twin KX 165 nav/coms, KI 206 VOR/LOC/GS indicator, KI 202 VOR/LOC indicator, KMA 24 audio/marker beacon panel, KR 87 ADF, KAP 100 autopilot with VOR/LOC coupling, electric trim, and other goodies; list price, $25,510. With both deluxe equipment packages, the Arrow's bottom line is $152,900; the Turbo Arrow's, $162,900. And the list of other optional equipment will suit just about any requirements of a new owner.

In its current iteration, the Arrow's best qualities shine as brightly as ever, whether in service for flight instruction or as a personal-use airplane.

A word on nomenclature: The model designation tells you a lot about an Arrow, if you know how to read it. A low-tail Arrow is a PA–28R; one with a T-tail, a PA–28RT. PA–28R-200s are 200-hp airplanes with the old-style constant-chord wing; since 1977, the designation has been -201 to denote the semitapered airfoil. And if it's a -201T, it's a turbocharged model. The current models are designated PA–28R-201 and -201T, just as the Arrow IIIs were.

While the Arrow is not a difficult airplane to fly, no pilot can consider himself proficient without a thorough understanding of systems and procedures. Recognizing the importance of initial and recurrent training, Piper offers ground and flight instruction for all of its airplanes (even some that are long out of production). The purchase price of a new Piper includes instruction for one pilot at the company's training center in Vero Beach, Florida. (Current owners can take the Arrow course for $400.) The classroom portion, which takes a day and a half, includes discussions of airplane systems, ground and flight operation, weight and balance computation, normal and emergency procedures, performance and limitations, risk factors, pilot judgment and decision making, and minor service and maintenance. This is followed by flight training that can qualify as a biennial flight review and an instrument competency check (if desired, for instrument-rated pilots). Time permitting, simulator time on Piper's Frasca 141 (an excellent instrument training device) can be scheduled. A factory tour and customer reception are thrown in for good measure.

Classes are limited to 12 "students" to encourage active participation; the four of us who signed up for the one held last December represented a good cross-section of Arrow experience. One student was a Piper engineer seeking to broaden his knowledge of the product line; one had owned his Arrow IV for several years; one, a newly minted private pilot trained in Cadets, had just bought a new Arrow but had never flown one; and I hadn't flown one for almost a year. Together, we managed to ask a lot of questions the average CFI giving a check-out would have trouble answering; Piper's "personal aviation specialists" Frank Bernaby and Barton Jones fielded them without problem, however. If you do stump the instructors, Piper has specialists on hand to find the answers. One of the best features of the class is that various airplane components are available to examine. A cutaway turbocharger, for example, helped clarify some of the fine points of the lecture.

Arrow training courses for 1990 are scheduled for March 5–7, May 21–23, July 9–11, and October 22–24. Contact Alice Snead, Training Center Coordinator, at 407/567-4361, extension 2370 (or write to her at Piper Aircraft Corporation, 2926 Piper Drive, Vero Beach, Florida 32960), for details on these or other factory training courses.

In many ways, the Arrow is the perfect step-up airplane for the pilot seeking the advantages that retractable landing gear, a constant-speed propeller, and, perhaps, turbocharging offer. A Mooney 201 may be faster and less expensive, but it is also less comfortable and more challenging to fly. One pilot I spoke to put it this way: "I've put in a lot of time and taken a lot of training in

Piper aircraft. I would consider the transition to a Mooney to be a real big step. But I was very comfortable stepping up to the Arrow." The fact that Piper has delivered almost 6,800 Arrows over the years implies that many pilots concur. Credit Stuart Millar and his people with continuing the evolution of an airplane that is capable, comfortable, and truly a pleasure to fly. Bereft of alphanumerics, it may be just an Arrow, but to my mind, it's just right. □

Piper PA-28R-201 Arrow		Piper PA-28R-201T Turbo Arrow
$126,900	1990 base price	$136,900
	Specifications	
Textron Lycoming IO-360-C1C6, 200 hp @ 2,600 rpm	Powerplant	Teledyne Continental TSIO-360-FB, 200 hp @ 2,575 rpm
1,800 hr	Recommended TBO	1,800 hr
McCauley, two-blade, contant-speed, 76-in diameter	Propeller	Hartzell, two-blade, constant-speed, 76-in diameter
24.7 ft	Length	25 ft
7.9 ft	Height	7.9 ft
35.4 ft	Wingspan	35.4 ft
170 sq ft	Wing area	170 sq ft
16.2 lb/sq ft	Wing loading	17 lb/sq ft
13.7 lb/hp	Power loading	14.5 lb/hp
4	Seats	4
93.25 ft	Cabin length	93.25 ft
41.75 ft	Cabin width	41.75 ft
44.75 ft	Cabin height	44.75 ft
1,612 lb	Empty weight	1,667 lb
2,760 lb	Max ramp weight	2,912 lb
2,750 lb	Max takeoff weight	2,900 lb
1,148 lb	Useful load	1,245 lb
716 lb	Payload w/full fuel	813 lb
77 gal (72 gal usable)	Fuel capacity	77 gal (72 gal usable)
462 lb (432 lb usable)		462 lb (432 lb usable)
8 qt	Oil capacity	8 qt
200 lb, 26 cu ft	Baggage capacity	200 lb, 26 cu ft
	Performance	
1,025 ft	Takeoff distance, ground roll	1,110 ft
1,600 ft	Takeoff distance over 50-ft obstacle	1,620 ft
17 kt	Max demonstrated crosswind component	17 kt
831 fpm	Rate of climb, sea level	940 fpm
152 kt	Max level speed, sea level	154 kt
143 kt	Max level speed, optimum altitude	178 kt
	Cruise speed/Endurance (45-min rsv), std fuel (fuel consumption)	
135 kt/6.75 hr (61.2 pph/10.2 gph)	@ 75% power, best economy optimum altitude	168 kt/5.75 hr (70 pph/12 gph)
129 kt/7.55 hr (55.2 pph/9.2 gph)	@ 65% power, best economy optimum altitude	164 kt/6.45 hr (64.8 pph/10.8 gph)
122 kt/8.75 hr (48 pph/8 gph)	@ 55% power, best economy optimum altitude	154 kt/7.55 hr (55.2 pph/9.2 gph)
16,200 ft	Service ceiling*	20,000+ ft
1,525 ft	Landing distance over 50-ft obstacle	1,560 ft
615 ft	Landing distance, ground roll	645 ft
	Limiting and Recommended Airspeeds	
78 KIAS	Vx (best angle of climb)	78 KIAS
90 KIAS	Vy (best rate of climb)	96 KIAS
118 KIAS	Va (design maneuvering)	119 KIAS
103 KIAS	Vfe (max flap extended)	103 KIAS
129 KIAS	Vle (max gear extended)	129 KIAS
	Vlo (max gear operating)	
129 KIAS	Extend	129 KIAS
107 KIAS	Retract	107 KIAS
146 KIAS	Vno (max structural cruising)	146 KIAS
183 KIAS	Vne (never exceed)	183 KIAS
65–75 KIAS	Vr (rotation)	70–77 KIAS
60 KIAS	Vs1 (stall, clean)	63 KIAS
55 KIAS	Vso (stall, in landing configuration)	56 KIAS

* 20,000 ft is max approved altitude for Turbo Arrow

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.