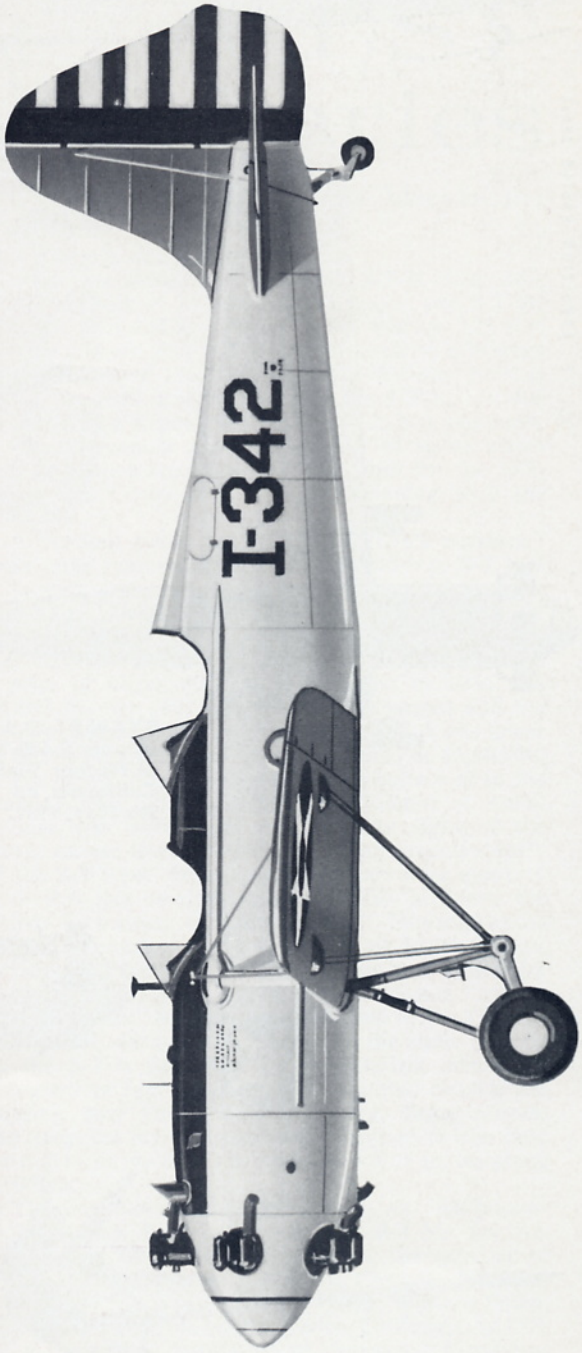
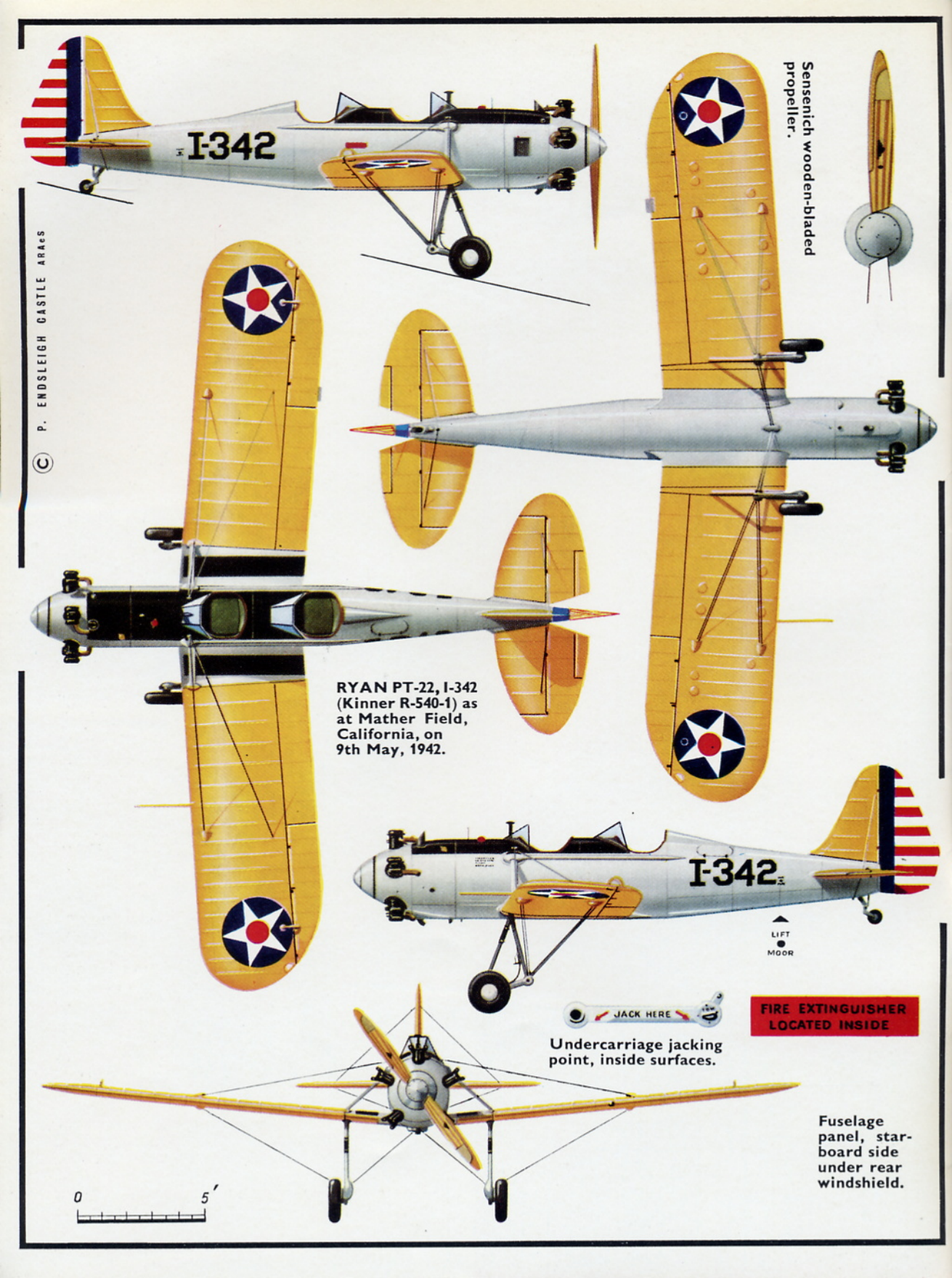
PROFILE
PUBLICATIONS

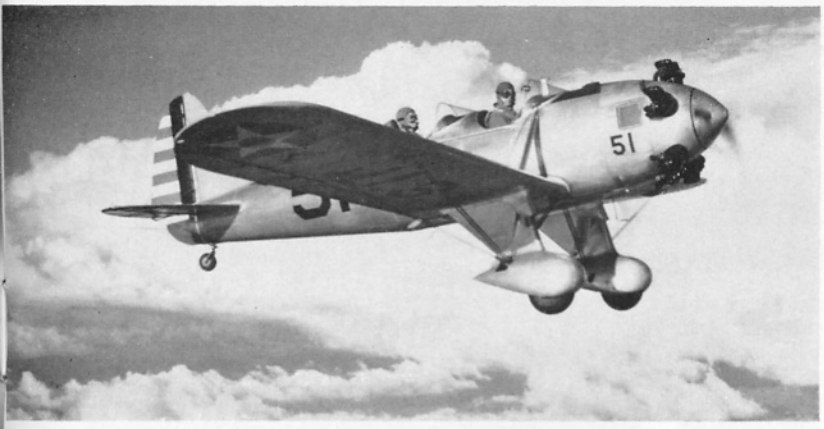
The Ryan PT/ST Series



NUMBER 158

RETAIL PRICE
UNITED KINGDOM TWO SHILLINGS
UNITED STATES & CANADA 50 CENTS





A dramatic and delightful flying study of the PT-20A.
(Photo: Ryan)

The Ryan PT/ST Series

by Mitch Mayborn

Sleek and shining, like a model turned from solid silver, the first Ryan S-T caught the attention and affection of the flying world in 1934 and has held it ever since. The S-T (for Sport-Trainer) first flew 8th June 1934 and embodied the features most desired by sportsmen and training schools alike; high performance, minimum and easy maintenance, low operating costs and a striking appearance.

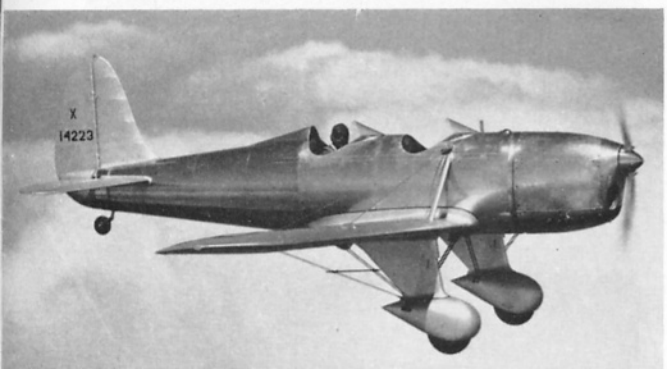
At the controls for the first S-T flight was John Fornasero, Ryan's Chief Pilot, who took off from Lindbergh Field, San Diego, California, the field which is still "home base" for Ryan.

The S-T was an open, two place, tandem cockpit, low wing type, principally of metal construction and powered by a Menasco B-4 Pirate engine of 95 h.p. The first S-T was c/n 101, X-14223 (later simply 14223, then NC-14223 as certification was granted).

However the basic S-T, like any great airplane, was not destined to remain "basic" very long. Shortly after the first one was built, they were adding horses to the 95 h.p. B-4 Menasco Pirate engine and the S-T became the S-T-A with a 125 h.p. C-4 Menasco. And, introduced in 1936 was the S-T-A Special with the 150 h.p. supercharged Menasco C-4S.

The planes were certificated as follows: S-T ATC, 541; S-T-A, 571; and S-T-A Special, 681. Engines were rated as follows: B-4, 95 h.p. at 2,000 r.p.m.; C-4, 125 h.p. at 2,175 r.p.m.; and C-4S, 150 h.p. at 2,275 r.p.m. All three versions landed with flaps at 42 m.p.h., but the top and cruising speeds varied. The S-T top speed was 140 m.p.h. at sea level, cruise at 120 m.p.h. at 2,000 ft.; S-T-A top speed 150 m.p.h. at sea level, cruise at 127 m.p.h. at 2,000 ft.; and the S-T-A Special top speed 160 m.p.h. at sea level, cruise at 135 m.p.h. at 2,000 ft.

The first Ryan S-T, c/n 101, in flight during 1934.
(Photo: Ryan)



Other versions included the S-T-B (c/n 109, X-14953) built in 1935 as a single seater, two S-T-W, c/n 337, NX-18920 powered by a Warner 125 h.p. Scarab and c/n 338, NX-18919 powered by a Warner Super-Scarab of 160 h.p. Both S-T-Ws were built in 1939. In 1940 a further variant the S-T-K, c/n 406 powered by a Kinner B-5 engine of 125 h.p. was built.

Export versions included the S-T-M series which was developed from the S-T-A-1, built for the U.S. Army Air Corps as a trainer, beginning with the XPT-16.

Advertised prices for the "Sportsman's Airplane" were quite reasonable. In 1936 the 95 h.p. S-T had a factory price of $3,985·00, or when taken as a "package deal" which included training for an Airline Transport Rating at the Ryan School of Aeronautics (operated by Ryan Aeronautical) it had a price of $4,642.00. The S-T-A list in 1936 was $4,685.00. By 1937 the prices had changed and the S-T was higher at $4,185.00, while the S-T-A was lower at $4,585.00 and the S-T-A Special listed at $5,185.00.

The trim S-T series proved to adapt quite well to the training rôle, and in 1938, Ryan School of Aeronautics was advertising the fact that eight of the eleven planes used there were "modern, metal ships", of the S-T type. Other potential users were quick to note this and several other countries acquired the planes for trainers, or "light fighters". Exported as the S-T-M, Mexico, Honduras, Union of South Africa, Guatemala, Netherlands East Indies and China all used the little Ryan. The S-T-M listed as a "trainer or light fighter" by Ryan, was powered by the 150 h.p. Menasco C-4S and was essentially the same aircraft as the S-T-A Special. When included, armament consisted of two machine guns mounted outside the landing gear strut below the wing, firing outside the propeller arc. Aircraft were shipped in one box, 19 ft. 11½ in. by 6 ft. 3 in. wide by 4 ft. 8 in. weighing 2,975 lb.

The airplanes could be delivered by air. An interesting delivery flight of three new S-T-Ms for the Honduran Air Force took place in the summer of 1938. Three planes flown by Captain Malcolm Stewart of the Honduran Air Force, William Sloan, and Harry Cameron, left San Diego, California, on 13th June for a final destination of Toncontin Airport at Tegucigalpa, Honduras. The flight had been delayed a fortnight due to a revolution in Mexico and an understandable reluctance of that government to allow three foreign military aircraft to overfly Mexico in unsettled times.

A rare photograph of the 1939-vintage S-T-W powered by a Warner Super Scarab; the machine is c/n 338, X18919. (Photo: Peter M. Bowers)

The first part of the flight was uneventful, except that the engines were throttled back to 23 inches of mercury because they were brand new. However, Sloan related that on the leg from Tucson, Arizona to El Paso, Texas, which he had not flown before, "I unfolded my map to study the territory ahead. I should have known better than to attempt unravelling a section map in the cockpit. Suddenly "Woosh!" and overboard it went. I twisted frantically around and could see it plastered against my stabilizer, slowly showering the New Mexico landscape with piece after piece of map confetti. By almost standing on my head I could see the course line and read the land marks. This unorthodox system continued for the next 40 or 50 miles until finally the whole map parted company with the stabilizer". After this Sloan headed south and picked up the "iron compass" (railroad) and flew to El Paso.

THE ARMY TRAINING PROGRAMME

With the possibility of war beginning to figure in the thinking of the American military, it was announced in June, 1939 that the Ryan Aeronautical Company had received a contract totalling $96,275.00 for their XPT-16 trainer which was the military version of the basic S-T-A. The actual commercial designation for the XPT-16 was S-T-A-1.

The XPT-16 (39-717) was Ryan's entry into the U.S. military training programme and was a significant event in that it was the first monoplane used by the Army as a primary trainer. A thorough evaluation was undertaken and a further 15 aircraft were ordered as YPT-16. Power was the 125 h.p. Menasco L-365-1 (military designation for the C-4 engine) with the addition of an engine starter.

As military expansion increased, the Army designated Ryan, Stearman and Vultee as prime manufacturers of their standard trainers. The 15 YPT-16s were operated at Lindbergh Field, San Diego, California by the Ryan School of Aeronautics, which became the first of many Civilian Pilot Training (C.P.T.) Schools operated during the war.

First class of Air Corps Training Detachment to train in the YPT-16 began on 19th August, 1939. Prior to this all training had been given at the Air Corps Training Center at Randolph Field, Texas. So, the S-T continued to lead with new innovations. The basic programme was 12 weeks of flight instruction consisting of 65 hours flying time and 225 hours of ground school.

There followed a period of development of the basic S-T-A into what was to eventually become the PT-22 which was the most widely produced version of all of the Ryan planes. In 1940 an order was placed for 40 of a basically similar model designated PT-20. This was the same aircraft and engine as the YPT-16 with the principal outward difference being a larger cockpit with external longerons, which allowed more room for parachutes.

During 1941, and with the order of 100 PT-21 aircraft, the PT-20 and PT-16 types in service were modified to more or less standardize the aircraft then in service. The Kinner R-440-1 engine was installed

The S-T-A Special, NC17301, *powered by a Menasco C-4S engine.* (Photo: William T. Larkins)

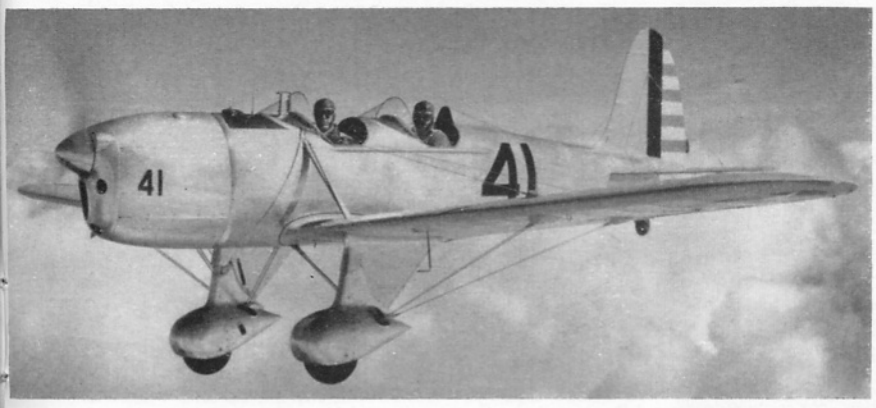
in a streamlined nose fairing with projecting, uncowled cylinders, and the wheel and tail fairings were removed as they gave trouble in the rugged service of a primary training school.

Twenty-seven PT-20 airplanes were converted to PT-20A and 16 of the YPT-16s became PT-16A. The PT-21 was delivered with the Kinner R-440-3 engine of 132 h.p. Metal wheel coverings were quickly discarded in service. The PT-20B was a Menasco-powered aircraft and three were so modified.

As the war tempo grew, the Army and Navy standardized on the S-T-3KR or PT-22 Recruit as an even more powerful trainer. Equipped with a 160 h.p. Kinner R-540-1 engine, and delivered without wheel spats or fairings over the gear struts, the PT-22 was otherwise identical to the PT-21. Navy designation for the PT-22 was NR-1 and 100 were produced.

PT-22s went into service at the C.P.T. schools across the country, including Ryan operated schools at San Diego and Tucson, Arizona. The Netherlands order for 25 S-T-3s was taken over by the Army in 1942 as the PT-22A. Modified after delivery, some 250 PT-22s were to become PT-22C with a change from the R-540-1 to the -3 engine.

The first XPT-16, 39-717, *in aerobatic flight; the PT-16 was the first monoplane trainer type to appear on the U.S. Army Air Corps inventory.* (Photo: Ryan)



The main external point of difference between the PT-16 and the PT-20 (illustrated here) was the PT-20's external longeron.
(Photo: Ryan via P. M. Bowers)

The PT-16A was powered by a Kinner R-440-1 in place of the Menasco L-365-1; the YPT-16's wheel and tail fairings were also removed. (Photo: Peter M. Bowers)

In 1942 production ended on the S-T series. At this time Ryan was given a contract to develop a version of the trainer using non-strategic materials. The result was the S-T-4, which was virtually a new airplane built almost entirely of plastic-bonded wood. Five of these were delivered in 1942-3 as YPT-25. Production was not undertaken.

Other variants included the ST-3S, which was actually the first PT-21 (N18925, c/n 1000) equipped with Edo floats. The S-T-3KR was the civilian version of the PT-21/22 and was assigned ATC No. 749. Civil designation for the Kinner R-540 was R-55, rated 160 h.p. at sea level at 1,800 r.p.m.

PILOT REPORT AND COMPARISON S-T AND PT-22

In early 1967, there are still over 100 of the PT-22 type airplanes licensed to fly in the U.S.A. The term "PT-22 type" is used loosely as many have been extensively modified and additionally there are a very few PT-21, NR-1 and even a single PT-20 still around although they, too, often do not represent their original configuration. The S-T series, including the S-T-A and S-T-A Special and S-T-M is still flying in the U.S. and Australia although in much reduced numbers.

With this large a number still flying, or restorable, and the occasional strong differences of opinion between fans the two types, it is interesting to offer a current analysis of the differences and flying characteristics. The further thought should be borne in mind that in today's world of tricycle gear, high horsepower and low wing loadings, most of the "old" airplanes still flying get strange reputations never considered when the planes were new and operational. In their heyday, the S-T (Sport-Trainer) and PT (Primary Trainer) performed admirably with pilots of no experience at all. Now they are often tagged "vicious", or hard to handle "killers" or "unreliable".

The writer's introduction to flying the PT-22 was gained at the stick of PT-22, c/n 1969, N7621, owned by Dr. Jim Almand of Grand Prairie, Texas, and my first impression was that it took about 100 pumps on the throttle to prime the engine, then: BRAKES! CONTACT! And the engine took to life with a grumble of noise and smoke.

Three real "experts" on these planes came forward to offer their thoughts. They include Mr. Bill Hodges, president of the PT-22 club of the Antique Airplane Association and former owner of several PT-22s; Mr. Everett Cassagneres, president of the Ryan Club of the AAA and former owner of S-T, c/n 117, N14985; and Mr. Bill Dodd, member of AAA and owner of S-T-M, c/n 302, N11D.

Bill Dodd stated "They said (of our S-T-M) it would turn violently on takeoff without warning; it would snap roll on downwind approach without warning, or it would land like a 'streamlined' brick and be too hot for even a good pilot". He added, "On our first flight we gave it the gun and away we went! It was a little loose on the rudders at first, but then firmed up and started to go down the runway halfway straight and we were in the air". Everett Cassagneres adds about the takeoff, "Open the throttle slowly as she will swing quite a bit from torque. You have to stay on your toes until the tail comes up and the rudder is effective".

"The throttle opens the engine to 1,850 r.p.m. and you apply enough right rudder to counteract the torque. Raise the tail as speed comes up to see where you are going. After lift off, adjust r.p.m. to 1,680 and airspeed to 80 m.p.h. for climbout. Take off run was from 650 to 700 feet" concludes Hodges.

"The S-T climbs out at about 65 m.p.h.", Cassagneres said, adding, "With 12 turns on the flap crank (about 15°) it takes off with two people on board in 500 feet. Cruise with 1,950 r.p.m. from the Menasco D4-87 engine of 134 h.p., will give an indi-

Random mixture of PT-20A and YPT-16 aircraft in "tie-down area"; essentially the same aircraft by this stage, they display mixed propeller installations. Some of each type have metal airscrews with no spinners and wooden airscrews with spinners.
(Photo: Ryan via P. M. Bowers)

cated airspeed of 110-112 m.p.h. Stall at 55 m.p.h. is clean, but you will use a lot of aileron".

Both the S-T and PT are excellent airplanes for aerobatics. Relating to the PT-22, Bill Hodges says, "At 3,000 ft., the motor is turning easily at 1,650 r.p.m., showing 116 m.p.h. Climb to altitude was at 800 ft. per min. in climbing turns. Clear the area for aerobatics. Diving slightly you get 130 m.p.h. for an inside loop; 100 m.p.h. for a snap-roll; 130 m.p.h. for a slow-roll; half roll and reverse; Immelman at 150 m.p.h.; Cuban eight at 150 m.p.h. and a 3-turn (maximum) spin. The PT-22 is stressed for all normal positive manoeuvres, but is restricted against negative ones." Hodges concluded the PT-22 flight, "Carburettor heat on and throttle back as you make descending turns to traffic pattern altitude. Switch to reserve tank and carburettor heat off as you line up for landing, remembering to keep a sharp look for other traffic (remember the long nose). Final approach is at 80 m.p.h. carrying a little power for a wheel landing for better visibility and control."

Cassagneres said that the S-T, "Snap rolls so fast that shortly after you start one it is time to begin recovery. Dive to 145 m.p.h. to do a good clean loop."

Speaking of aerobatics, Dodd said, "As far as aerobatic manoeuvres go, the S-T will do them all, both inside and outside, both basic and advanced. The airfoil, which is NACA 2412, has a good curve to the bottom for excellent outside loop and inverted flight characteristics. It has a very good rate of roll, which surprises most people who think that single stock ailerons can't be too effective. Inside and outside loops can be pulled through 400-500 foot circles. The S-T is stressed for a positive and negative "G" factor of 10. It takes a lot of pull to exceed 6.

"Stalling from any attitude, even inverted, is a delight. It simply stalls and drops off lazily and recovers quickly with any help at all. If, however, it is held in tight, it will reluctantly begin to spin. Then it really winds up." Continuing the spin, "You count the number of spin turns like this: 'one, three, seven, . . . 18, . . . 42 . . .' You don't have to be alarmed though—at least not after the first time, because with recovery controls applied, it stops spinning after half a turn." He added, "The stall and quick spin recovery once again prove that this is definitely not a violent airplane. If you were to apply one word to the Ryan S-T, it would have to be 'predictable'."

The present writer asked Dodd about how they would take all this skywork and he said, "Most models of S-Ts that I've flown indicate between 110 and 120 m.p.h. depending on horsepower and props. The specifications list the dive limit speed at 156 m.p.h. However, many instructors who operated Menasco-powered Ryan trainers during the war, say that they saw 215-220 indicated many times when students went to sleep during aerobatics. And too, we have personally had ours up to 210 to test the truth of this. The wings flap a bit, the wires sing like banshees, the wing whistles, but there was no big vibration or buffeting, and it coasted out to a more comfortable speed."

He went on to say, "Excessive speed just isn't needed for most manoeuvres. Snap rolls start at 95, loops at 120-125, Immelmans at 140 and outside loops at 150."

So the plane works well, but what about that engine? Tex Rankin, 1937 International Aerobatic Champion once said, "Here's my experience with

An S-T-M-S2 in Netherlands East Indies service, with optional float undercarriage installation. (Photo: Ryan)

Menasco engines during the past two and a half years. I flew with the first engine without even a top overhaul. Much of this time was under wide open throttle on aerobatic and race flying. After I sold the ship, it was flown another 100 hours before being overhauled. My second Menasco, which I am still using, has flown more than 600 hours, mostly on acrobatic work. I used this engine in winning the International Aerobatic Competition and on 26 acrobatic exhibitions throughout the U.S. and Canada. Many of the manoeuvres require over 3,000 r.p.m. I don't believe anyone ever abused an engine half as much as I abuse the Menasco, but in more than 1,000 hours of flying with these engines, I have never had a forced landing due to engine failure."

"It doesn't come in like a brick and doesn't land especially hot", said Dodd. "Without flaps, it

The first basic design change produced the S-T-3; shown here is c/n 1000, NX18925. *The first two S-T-3's, ordered as the PT-21 and NR-1 respectively, were never military aircraft.* (Photo: Ryan)

A line-up of Guatemalan Air Force S-T-M trainers. (Photo: Ryan)

approaches best at about 75 m.p.h. indicated. The attitude is almost straight and level with the rate of descent not at all excessive. Touchdown is about 50 m.p.h. If you want to come down more steeply and at a slower speed, you can choose 10, 20, 30 or 45 degrees of flaps by pulling on the conveniently located manual flap handle on the right. Just depress the button at the top of the handle and let go when you get to the slot you want. To release, simply reverse the process. It is wise to make a habit of wiggling the handle after pulling on flaps to make sure it has locked solidly. Once long ago I didn't do that and at 20 feet on flareout the flaps popped back to 0. There was no emergency. The S-T simply sank a little and floated faster and farther down the runway. So once again we have an example of the Ryan not doing something violent." The actual touch down is very soft because the gear features long travel oleo shock struts and 18″ ×8″ ×3″ (15 pounds fully inflated) tyres.

Cassagneres: "You can bring her in with full flaps (45°) and over the fence at about 70, engine at idle, flare out at about 5 feet and touch down about 55. This can be done in a 3-point attitude on grass, but on a hard surface you have to be sharp. I usually flare out with the bottom of the wheels about 18 inches above the surface then feel her on slightly tail low. When the wheels touch, get the tail up and gradually walk the tail down. It lands much like a DC-3 in this respect."

"The first real lesson about the Ryan and hard surface runways is it is somewhat sensitive and skittish. The one real 'trick' in learning to fly the S-T is how to use the brakes on landing," stated Bill Dodd. "On landing everything is smooth and normal after touchdown until you slow down, at which point the nose wants to wander which requires quick alternate rudder action. Everything is again O.K. until you begin to realise you need a little assistance from the brakes. The trouble is that the brakes are supposed to be activated by your heels on a tube with a pad at the end that curves down and to the middle from the rudder pedal. The trouble is you can't get your heels on the brakes while you are alternating rudders because the brake arm travels with the pedal and when a pedal is forward the brake is up in a position that no human foot can reach. You must get the rudder pedals centred and put both heels on the brakes at the same time. Once you learn this, life becomes relatively simple again. You can of course, ride it on out without brakes, especially if you are an accomplished Mambo dancer. It doesn't work too well to put your heels on the brakes on final so as to be prepared. You can't move the rudder enough and you usually end up applying brakes on touchdown".

The beautiful Ryan S-T and the handsome PT-22 series of airplanes are still around, and if those who love old airplanes have anything to say about it, they will be for a long time to come.

Ahead of their time in 1934, with the all metal monocoque fuselage, stamped metal ribs, completely faired gear, and beautifully streamlined, the Ryan S-T has set a high standard for sport airplanes that few have equalled since.

S-T CONSTRUCTION DETAILS

Fuselage—The fuselage is of metal construction with a thick gauge alclad skin, eliminating entirely internal stiffeners. Motor cowling, fillets, fairing, and wheel pants are also made of alclad.

The NR-1 was the Navy equivalent of the PT-21 and the civil S-T-3. (Photo: Ryan via P. M. Bowers)

The first S-T-3 converted to S-T-3S configuration with Edo floats. (Photo: Ryan)

Wings—The wings are constructed of aluminum alloy ribs, steel compression members and spruce spars with fabric covering. The entire nose of the wing is covered with 17-ST aluminium alloy carried well back of the front spar.

Aileron construction incorporates a steel tube spar with aluminium alloy ribs. The leading edge is covered with 17-ST alloy. Ailerons are balanced by locating the hinges behind the leading edge. Differential action is used. Flaps are provided with an improved control. A direct acting lever located on the right side of the cockpit provides split-second adjustment to any one of three positions, making it possible to apply and release the flap instantly during approaches.

Accommodation—Pilot and passenger cockpits are equipped with metal seats designed for seat type parachutes or the thick kapok-filled cushions.

Tail Unit—All tail surfaces are built up from aluminium alloy tubes and stamped ribs. Covering is fabric. Trimming tabs on both elevators provide for longitudinal balance and may be operated from either cockpit.

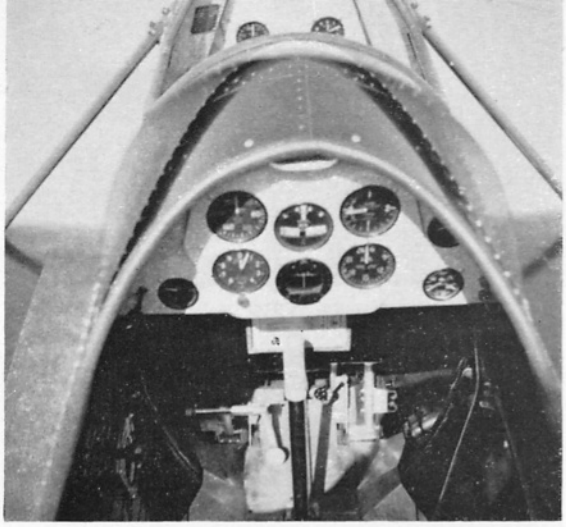
Landing Gear—The landing gear is the treadle type employing airwheels, mechanical brakes and long stroke shock absorbers. An eight inch streamlined pneumatic tail wheel is mounted on a trombone type rubber shock absorber and is full swiveling.

Dual controls are standard with front cockpit controls removable. Brake pedals, heel operated, are mounted on both sets of rudder pedals.

S-T-3 (PT-21, NR-1, PT-22) CONSTRUCTION DETAILS

Wings—Low-wing wire-braced monoplane. Wing section NACA 2412. 4° 10′ sweepback, 3° incidence and 4° 30′ dihedral. Wing-stubs of riveted aluminium-alloy construction with strut-braced front spar, cantilever rear spar,

A rare flying view of the only S-T-K, c/n 406, NX18924; *built in 1940, the machine was powered by a 125 h.p. Kinner B-5 engine.* (Photo: Ryan)



The cockpit of S-T-M, c/n 302; visibility is excellent because of the oval fuselage section. (Photo: Bill Dodd)

and metal covering. Outer wings have spruce spars, stamped aluminium-alloy ribs, 24ST "Alclad" covering over leading-edge back to front spar and final fabric covering over all. Streamline tie-rod bracing to fuselage and landing gear. Ailerons and flaps have aluminium-alloy frames and fabric covering.

Fuselage—Oval metal monocoque. Structure consists of nine aluminium-alloy bulkheads and six pieces of pre-formed 24ST "Alclad" skin.

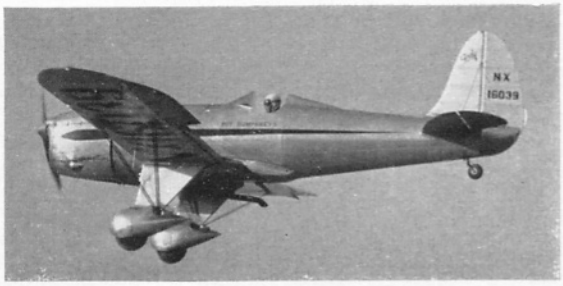
Tail Unit—Braced monoplane type. Aluminium-alloy framework covered with fabric. Rudder trim-tab adjustable on ground.

Landing Gear—Treadle type with fixed portion acting as anchorage for flying wires. Long-stroke oleo shock-absorber struts. Brakes may be operated hydraulically or mechanically. Oleo-sprung steerable tail-wheel.

Accommodation—Tandem open cockpits with complete dual controls and duplicated instruments. Adjustable seats adapted for the standard U.S. Army-type parachute. Baggage compartment accessible from exterior.

S-T-4 (YPT-25) CONSTRUCTION DETAILS

Wings—Low-wing cantilever monoplane. Two-to-one taper ratio. Wing incidence (root) 4°. Dihedral 5°. Sweepback (leading-edge) 4° 03′. All-wood monospar wing structure in five sections comprising centre-section, two outer sections and two removable wing-tips. Structure consists of single wood spar, built-up wooden girder ribs, plywood-covered nose torque box extending from spar over leading-edge, and a final covering of light-weight fabric. Root ends of wing spar reinforced with hardwood blocks. Outer wing attached to centre-section at four points at spar root and one at leading-edge. All ribs, spar flanges and spar assemblies are brought to size from contour plates by routers and shapers to eliminate hand-finishing and to ensure accuracy with speed. Statically-balanced ailerons on outer section have wood spars and ribs and are fabric-covered. Starboard aileron has tab adjustable on ground. Electrically-operated perforated centre-section flap has wood spar and plywood skin.



S-T-A, c/n 128, NX16039, *in the landing approach; note lowered flaps, faired-over front cockpit and smoke installation.* (Photo: William T. Larkins)

Fuselage—Ovoid-section monocoque built up of ten laminated bulkheads and a stressed plywood skin. No. 1 bulkhead has black walnut plates at the four engine-mounting points. No. 2 bulkhead which carries torque tube joining leading-edges of outer wings has black walnut inserts at every other lamination. No. 3 bulkhead, in three parts, is slotted to receive centre-section spar.

Tail Unit—Cantilever monoplane type. All-wood framework with plywood-covered fixed surfaces and fabric-covered horn-balanced elevators and rudder. Controllable tab operated from either cockpit in starboard elevator. Fixed trailing-edge tab in rudder for directional balance.

Landing Gear—Fixed cantilever type without fairings. Welded truss assembly bolted to centre-section spar. Long-travel oleo shock-absorbers. Hayes wheels and hydraulic brakes. Oleo-sprung tail-wheel steerable from either cockpit, full swiveling beyond steering angles.

Accommodation—Tandem open cockpits with complete dual controls and instruments. Streamline steel tube turn-over post between cockpits bolted to centre-section spar. Safety seat-belts and shoulder harness. Blind-flying hood. Full night-flying equipment. Baggage compartment behind rear cockpit with access from within cockpit.

Startling appearance of a PT-22 with a Lycoming 0-435-1 engine from an L-5A, a Bonanza constant speed propeller and a new cowling. The machine is c/n 2234, N56209.
(Photo: William T. Larkins)

PT-22, N48929, *in flight; a cruise at 1,650 r.p.m. and 3,000 feet gives an indicated airspeed of 116 m.p.h.*
(Photo: William T. Larkins)

RYAN S-T SERIES

C/N	Registration	Type	Yr. Blt.
101	X14223	S-T	'34
102	14909	S-T-A	'35
103	14910	S-T-A	'35
104	14911	S-T	'35
105	14912	S-T-A	'35
106	14913	S-T-A	'35
107	14914	S-T-A	'35
109	X14953	S-T-B	'35
110	14954*	S-T-A	'35
111	14955	S-T-A	'35
112	14956	S-T-A	'35
113	14957	S-T-A	'35
114	14982*	S-T-A	'36
115	14983*	S-T-A	'36
116	14984*	S-T-A	'36
117	14985*	S-T	'36
118	1151*	S-T-A	'36
120	16031	S-T-A	'36
121	16032	S-T-A	'36
122	16033	S-T-A	'36
123	16034	S-T-A	'36
124	16035	S-T-A	'36
125	16036	S-T-A	'36
126	16037	S-T-A	'36
127	16038	S-T-A	'36
128	16039*	S-T-A	'36
129	16040	S-T-A	'36
130	16041	S-T-A	'36
135	17301	S-T-A	'36
136	17302	S-T-A	'36
140	17306	S-T-A	'37
144	17344	S-T-A	'37
148	17345*	S-T-A	'37
149	17346*	S-T-A	'37
150	17347	S-T-A	'37
151	17348*	S-T-A	'37
152	17349	S-T-A	'37
154	633X*	S-T-A	'37
156	17352*	S-T-A Spec.	'37
157	17353*	S-T-A	'37
159	17354	S-T-A	'37
160	17355	S-T-A	'37
162	17357	S-T-A	'37
163	17358	S-T-A	'37
164	17359*	S-T-A	'37
165	17360	S-T-A	'37
166	17361*	S-T-A	'37
167	17362*	S-T-A	'37
168	17363	S-T-A	'37
170	17365	S-T-A	'37
171	17366	S-T-A	'37
172	17367*	S-T-A	'37
173	17368	S-T-A Spec.	'37
174	17369*	S-T-A Spec.	'37
175	17370	S-T-A	'37
176	17371	S-T-A	'37
177	17364	S-T-A	'38
179	18901	S-T-A	'38
181	18903	S-T-A Spec.	'38
184	7828C*	S-T-A Spec.	'38
188	18904*	S-T-A	'38
192	17350*	S-T-A Spec.	'38
193	17351*	S-T-A Spec.	'38
195	17349*	S-T-A Spec.	'38
197	49002*	S-T-A Spec.	'38
198	18902*	S-T-A Spec.	'38
302	11D*	S-T-M	'39
304	10535*	S-T-M	'39
306	18907	S-T-A	'39
312	18922*	S-T-A	'39
322	18923*	S-T-A	'39
337	X18920	S-T-W	'39
338	X18919	S-T-W	'39
339	18921*	S-T-A Spec.	'39
355	9E*	S-T-A	'39
406	X18924	S-T-K	'40

** Denotes registration is still carried in FAA files. However, it does not always indicate the aircraft is still active.*

ATC Certification Nos.

S-T ATC 541 Menasco B-4.

S-T-A ATC 571 Menasco C-4.

S-T-A Special ATC 681 Menasco C-4S.

Right: *PT-22, c/n 1644,* N246R (*formerly* N47081) *converted into a biplane; the aircraft crashed and killed the owner, Cliff Winters, during an airshow.* (Photo: Peter M. Bowers)

ARMY AIR CORPS SERIAL NUMBERS
XPT-16: 39-717
YPT-16: 40-040/054
PT-20: 40-2387/2416
PT-21: 41-1881/1980
PT-22: 41-15173/15745 and 41-20591/21040
YPT-25: 42-8703/8707

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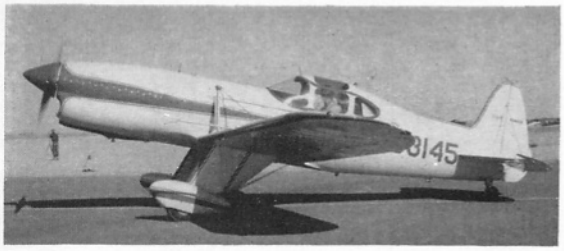

Three converted Ryans: (top) *PT-22, c/n 1418 with 220 h.p. Continental engine and Twin Cessna cowling;* (middle) *a Ranger-powered Ryan of unknown origins; and* (below) *PT-22, c/n 2056,* N60155, *with Continental R-670-4 engine.*
(Photos: Bowers, Bowers, Leo Kohn)

STATUS OF RYAN AIRCRAFT

Type	Engine	Active	Inactive	Total
PT-20	Kin 160	0	1	1
S-T-A	Men 125/160	13	16	29
S-T-3KR	Cont 250	0	3	3
S-T-3KR	Lyc 190/300	1	3	4
S-T-3KR	Fairchild 200	0	1	1
S-T-3KR	Kin 100/160	120	147	267
S-T-M	Men 150	1	1	2

(from "Statistical Study of U.S. Civil Aircraft"—January 1961)

	DIMENSIONS; WEIGHTS								ENGINE
MODEL	Span	Length	Height	Wing Area / Power Loading	Empty Wt. lb.	Gross Wt. lb.	Useful Wt. lb.	Fuel	Mftr., model, h.p., r.p.m. & altitude
S-T	29′ 11″	21′ 5·37″	6′ 11″	124′ / 16·6 lb./h.p.	1,023	1,575	No Baggage 552	24 gal. 2 gal.oil	Menasco B4 95 h.p. 2,000 r.p.m.
S-T-A	29′ 11″	21′ 5·37″	6′ 11″	124′ / 12·6 lb./h.p.	1,023	1,575	552	24 gal. 2 gal.oil	Menasco C4 125 h.p. at 2,175 r.p.m.
S-T-A Special	29′ 11″	21′ 5·37″	6′ 11″	124′ / 12·6 lb./h.p.	1,046	1,575	529	24 gal. 2 gal.oil	Menasco C4S 150 h.p. 2,260 r.p.m. at 2,000 ft.
S-T-B	29′ 11″	21′ 5·37″	6′ 11″	124′ / 16·6 lb./h.p.	—	—	—	—	—
S-T-W	—	21′ 5·37″	6′ 11″	— / —	—	—	—	—	Warner (Radial)
XPT-16	30′ 0″	21′ 6″	—	124′ / —	1,100	1,600	—	—	Menasco L-365 125 h.p. (C-4)
YPT-16	30′ 0″	21′ 6″	10′ 1″	124′ / —	1,100	1,600	—	—	Menasco L-365 125 h.p. (C-4)
PT-16A	30′ 0″	21′ 6″	—	— / —	—	1,800	—	—	Kinner R-440-1 132 h.p.
PT-20	30′ 0″	21′ 4″	7′ 2″	— / —	—	1,635	—	—	Menasco L-365 125 h.p. (C-4)
PT-20A	30′ 0″	20′ 11⅜″	7′ 2″	— / —	—	1,650	—	—	Kinner R-440-1 132 h.p.
PT-20B	30′ 0″	21′ 3″	7′ 2″	— / —	—	1,650	—	—	Menasco D-4 125 h.p.
S-T-M	29′ 11″	21′ 5·37″	6′ 11″	124 sq. ft. / 12·8 lb./h.p.	1,058	1,600	542	24 gal. 2 gal.oil	Menasco C4S 150 h.p. 2,260 r.p.m. at 3,000 ft.
PT-21	30′ 1″	22′ 6″	6′ 10″	134·25 sq. ft. / 13·8 lb./h.p.	1,278	1,825	547	24 gal. 3 gal.oil	Kinner R-440-3 132 h.p.
NR-1	30′ 1″	22′ 6″	6′ 10″	134·25 sq. ft. / 13·8 lb./h.p.	1,278	1,860	547	24 gal. 3 gal.oil	Kinner R-441-B5 125 h.p.
S-T-M-S2	29′ 11″	22′ 8½″	7′ 4½″	124 sq. ft. / 12·8 lb./h.p.	1,311	1,828	517	24 gal. 3 gal.oil	Menasco C-4S 150 h.p. 2,260 r.p.m. at 3,000 ft.
S-T-3KR	30′ 1″	22′ 5″	7′ 2″	134·25 sq. ft. / 11·4 lb./h.p.	1,272	1,825	553	24 gal. 3 gal.oil	Kinner R-54 160 h.p. 1,850 r.p.m.
PT-22	30′ 1″	22′ 5″	7′ 2″	13·8 lb./sq. ft. / 11·6 lb./h.p.	1,307·5	1,860	552·5	24 gal. 144 lb.	Kinner R-540-1 160 h.p. 1,850 r.p.m. at sea level. 65 oct. min.
PT-22A	30′ 0″	22′ 6″	7′ 2″	— / —	—	1,850	553	24 gal. 144 lb.	Kinner R-540-1 160 h.p.
PT-22C	30′ 1″	22′ 5″	7′ 2″	— / —	—	1,860	553	24 gal. 144 lb.	Kinner R-540-3
Seaplane S-T-3S	30′ 1″	23′ 7·62″	8′ 5″	134·25 sq. ft. / 15·05 lb./sq. ft.	1474·5	2,021	546·5	24 gal. 144 lb.	Kinner R-55 160 h.p. 1,850 r.p.m. at sea level
YPT-25 S-T-4	32′ 10½″	24′ 3¼″	6′ 7¾″	161·2 sq. ft. / 9·7 power	—	1,800	—	27 gal.	Lycoming O-435-1 185 h.p.

DATA TABLE—CONTINUED FROM PAGE 10.

MODEL	PERFORMANCE									REMARKS
	Max. Speed m.p.h.	Cruise Speed m.p.h.	Stall-Flaps / No Flaps	Service Ceiling	Max. Altitude	Rate of Climb	Range Miles	Date Introduced	No. Built or Modified	
S-T	140	120	42 / 48	15,500′	—	800 f.p.m.	400	June 8th 1934 1st flight	—	
S-T-A	150	127	42 / 48	17,500′	—	1,200 f.p.m.	350	—	—	
S-T-A Special	160	135	42 / 48	21,000′	—	1,400 f.p.m.	350	—	—	
S-T-B	—	—	— / —	—	—	—	—	—	1	
S-T-W	—	—	— / —	—	—	—	—	—	2	
XPT-16	131	—	— / —	—	—	—	—	Ordered 1939 Del. 1939	1	S-T-A-1
YPT-16	128	—	— / —	15,000′	—	15 min. to 10,000′	350	Ordered 1940 Del. 1940	15	As XPT-16 + Engine Starter.
PT-16A	134	—	— / —	—	—	—	—	Converted 1940	(14)	YPT-16 modified W/Kinner engine.
PT-20	132	—	— / —	—	—	—	—	Ordered 1940 Del. 1941	30	Similar to YPT-16 W/changes. S-T-M
PT-20A	135	—	— / —	—	—	—	—	Converted 1941	(27)	Converted PT-20.
PT-20B	130	—	— / —	—	—	—	—	Converted 1941	(3)	PT-20 W/Menasco.
S-T-M	160	135 at 3,000′	42 / 50	21,000′	—	1,400 f.p.m.	375	—	—	
PT-21	123	112	— / —	11,900′	13,900′	680 f.p.m.	340	Ordered 1941 Del. 1941	100	
NR-1	123	112	— / —	11,900′	13,900′	680 f.p.m.	340	Ordered 1941 Del. 1941	100	
S-T-M-S2	122	108	ldg. 59 m.p.h. / —	12,250′	14,280′	700 f.p.m.	246	—	—	Same as S-T-M + some changes. See Acca list.
S-T-3KR	129	120	ldg. 57 m.p.h. / —	15,800′	—	—	266	—	—	Type Certificate 749 (CAR 4a).
PT-22	128	116	62 / 64	14,800′	16,600′	860 f.p.m.	325	Ordered 1941 Del. 1941	1023	
PT-22A	125	—	— / —	—	—	—	—	Ordered 1942 Del. 1942	25	On contract from Netherlands.
PT-22C	125	—	— / —	—	—	—	—	—	(250)	Modified after delivery.
Seaplane S-T-3S	113	99	— / —	9,850′	12,000′	588 f.p.m.	224	—	—	
YPT-25 S-T-4	149	75% pwr. 134	— / —	20,300′	21,900′	1,590 f.p.m.	378	Ordered 1942 Del. 1942	5	Plywood fuselage. Final development. 5 built.

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