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EXPERIMENTAL AIRCRAFT AND POWERPLANT NEWSFORUM FOR DESIGNERS AND BUILDERS



100 SUPER PULSAR

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Author Vance Jaqua (a graduate Engineer) has retired from almost 40 years of aerospace experience in design and analysis of turbojet and rocket propulsion components and systems. He is active in design and engineering support of kits for home constructed experimental aircraft. "The pay is a lot less, but more interesting and satisfying". He is also currently helping on an AIAA Wright replica program, and writes an occasional article on technical subjects.

SOME HISTORY

The Super Pulsar 100 is a logical extension of the long and distinguished Pulsar line. The story, of course, started with the pretty little Starlite, Mark Brown's winning entry in the EAA sponsored design contest for an Airborne Recreational Vehicle (ARV). This efficient little single place plane combined composite construction (fuselage) with more traditional wood construction for the wing. This was powered by a two cylinder, two-stroke engine which had been derived from snowmobile power plants, and developed into a capable aircraft propulsion unit by the ultralight community. This combination of simple light weight, economical, and efficient design obviously impressed the EAA judges, and it was awarded a popular first place in the competition. The plane was offered in kit form, and several examples still exist.

The next obvious step was the original two place Pulsar, with a similar structural philosophy, and a definite family resemblance, combining beauty of form with aerodynamic efficiency. The development of higher powered, liquid cooled two stroke engines met the need to power the heavier loading of the two-place plane, and kit sales have responded favorably to this new design. Many potential builders expressed the desire for four-stroke engine installations, and the Pulsar XP was developed, upgraded for the popular Rotax family of geared 4 cylinder 4 stroke engines.

Numerous other variants and upgrades have continued, including conversion to a total composite design, and hundreds of variants are being constructed and flown worldwide. During this time, Mark sold the rights for the

Pulsar to Skystar, better known for their excellent high wing "tube and rag" Kitfox family of airplanes. Skystar made several minor upgrades in both hardware and assembly manuals, and delivered a significant number of kits. However the fit between a "tube and rag" design and a composite kit was not a good match, and the rights to the Pulsar went on the market again.



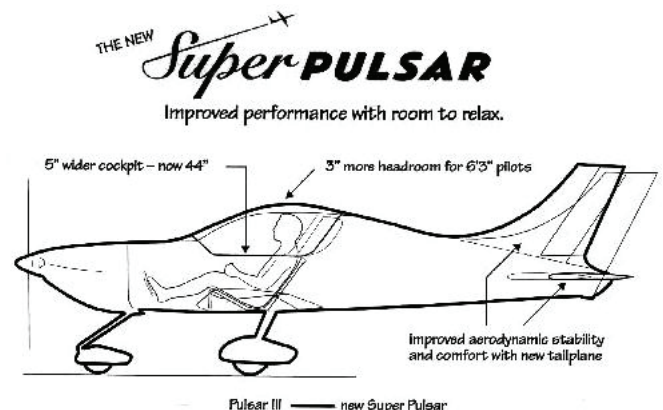
Solly Melyon of Pulsar Aircraft.

A NEW COMPANY

"Pulsar Aircraft", headed by Solly Melyon, has acquired the Pulsar kit program. The Pulsar planes have long been considered "one of the prettiest little airplanes around". However, "little" has always been the operative word, and the average oversized American aviation enthusiast was often driven to an alternate selection, because he just did not fit in the plane. The new management decided to directly address those limitations and a redesign plan for an upgraded new model was mapped. Also addressed in this revised approach was the often voiced desire to use a "real" airplane engine, meaning of course a Continental or Lycoming power plant.

A NEW DESIGN

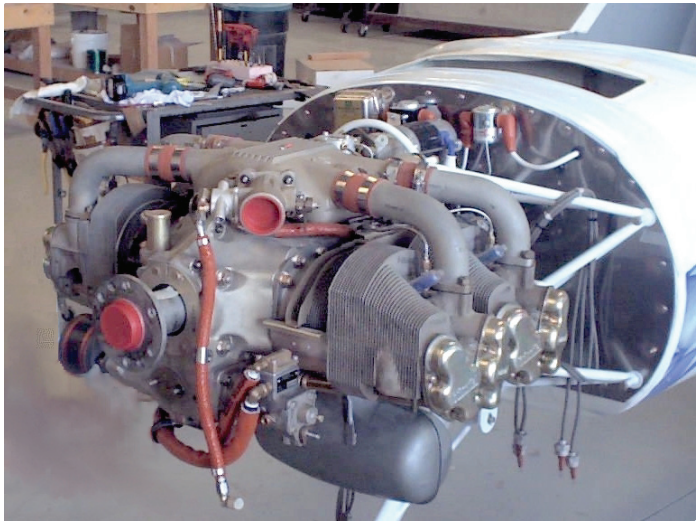
The major item for this rework was the increase in cockpit room. This required new tooling for molding the fuselage halves. This task was contracted to Rich Trickel at High Tech Composites in Oxnard California (the home of the KIS family of kit aircraft). An existing set of fuselage molds for a Pulsar 3 was used as the core portion of a new fuselage "plug" (the male master for making new female fabrication molds). Foam was built up and contoured on these parts to increase both the width and the height in the cockpit area. These areas were carefully "faired" into the fuselage contours to maintain the excellent aerodynamics and visual appeal of the original.



The best airplane in its class – take it to the air in 600 hours!



Aerodynamic changes were primarily related to the rear empennage. The vertical was moved forward on the fuselage to minimize the possibility of “blanking” in a spin situation. The fin area was increased to account for the reduced lever arm, and the fin structure was incorporated into the fuselage shell halves. A one-piece horizontal stabilizer now replaces the previous two-piece tube mounted assembly, and is moved back on the fuselage to increase the horizontal tail volume coefficient. This change further increases pitch stability and effectiveness. This further aft position also reduces potential rudder “blanking” in a spin situation. The horizontal assembly structure was directly adapted from the proven KIS two place aircraft, (which has been made a part of the Pulsar line as the “Pulsar Sport 150”).



Continental IO-240, rated at 125 BHP @ 2800 RPM.



The integral vertical fin can be seen in this view of the molds, with the initial layers of pre-impregnated cloth in place.

The move to the larger more powerful engines has involved the inevitable increase in empty and rated gross weight of the aircraft, and structural revisions have been included to this end. Additional layers of structural cloth have been incorporated into the buildup of the fuselage components, particularly in the front and cockpit areas for the heavier engines. The main wing spar has been strengthened, incorporating carbon fiber spar caps to provide added “G” force capability at the higher loads.

NEW ALUMINUM MAIN GEAR

One of the reported problem areas for the recent Pulsar examples has been the main gear of the tricycle landing gear configuration. Numerous reworks have been initiated by several Pulsar builders, so this component was redesigned as a part of the Super Pulsar concept. A classic one-piece aluminum spring gear assembly as used in many other current designs has replaced the two-piece composite gear of the previous design. This configuration is rugged enough to resist most foreseeable landing conditions up to the rigorous FAR 23 conditions (which resemble an only partially controlled crash). Installation has been significantly simplified, as well as any maintenance or repair in the field.

ENGINES

As mentioned earlier, one of the goals was to provide an airplane kit which used a “real airplane motor”. To this end, the prototype Super Pulsar 100 is fitted with a Teledyne Continental IO-240. This is a relatively new, 240 cubic inch, four cylinder, fuel injected engine, which develops 125 BHP at 2800 RPM. With this power, a well built example of this plane should be capable of 200 miles per hour top speed performance. This same mounting and cowl system will accept virtually all versions of the ubiquitous O-200 engine, and a tuned version of an O-200 engine with electronic ignition has been shipped to one of the customers. Other engines for which mounts and cowlings are being studied include the O-235 Lycoming engines, the six cylinder Jabiru and Corvair, and a four cylinder geared engine VW derivative called the Aeromaxx, reported to develop 118hp @ 5000 RPM. Weight is kept down with the use of Nikasil cylinders. Many other engines in the 100 to 130hp class could potentially be employed, but these are the only ones in current programs.



Unlike most VW conversions, the Aeromaxx engine drives the propeller off the flywheel end of the engine, not the more failure prone pulley end.

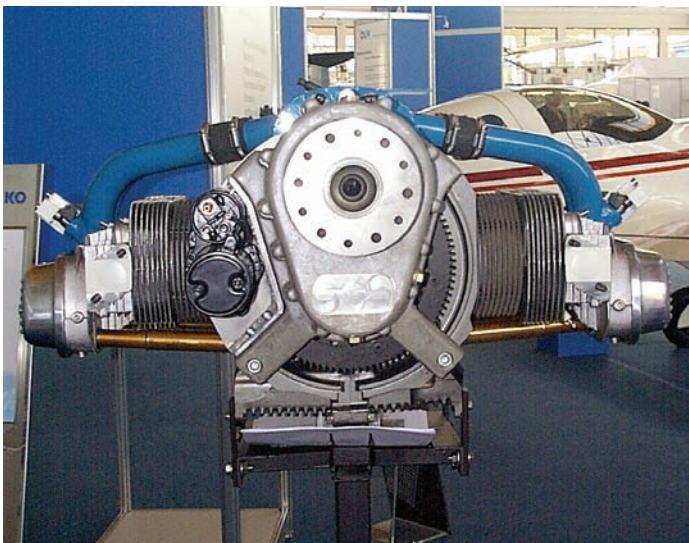


AEROMAXX SPECIFICATIONS

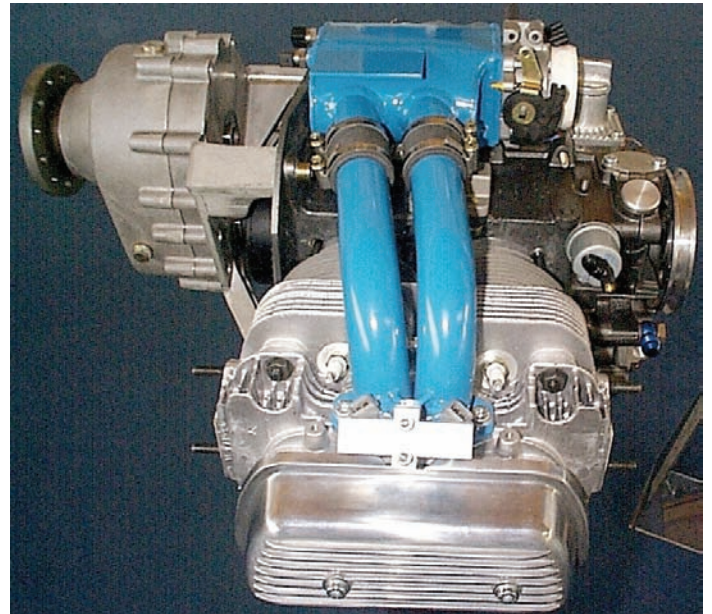
Maximum Power	118hp / 5000 RPM
Propeller RPM	2525 RPM
Torque (at the prop)	230 ft / lbs @ 5000
PSRU	1:1.98 (2525 RPM)
Ignition	Dual electronic ignition
Fuel system	Computerized multi-port EFI
Displacement	1998 cm / 122 cu. in.
Compression ratio	10.5:1
Fuel min. octane	Auto 93 Oct./AVGAS 100 LL
Alternator	14 V - 14A, (optional 35A)
Oil pressure	Max. 7 bar; min 1bar, 2500 RPM
Oil temperature	Max. 212° F; min 122° F
Dry Weight	165 lbs.
Estimated TBO is	1200 hours
Introductory Price\$10,950.00	

Additional Features:

- Air-cooled.
- 4 cylinder / boxer (horizontally opposed).
- Built in beveled gear reduction unit.
- Built in elastic harmonic balancer.
- Hollow crankshaft for constant speed propeller.
- Weight – 165 lbs.
- Nikasil aluminum cylinders.
- Aluminum crankcase (as opposed to magnesium).
- Forged steel crankshaft.
- Aluminum valve covers.



The Aeromaxx engine on display at the Aero2003 Airfare in Friedrichshafen, Germany



Another view of the Aeromaxx engine.

PULSAR XP

When Pulsar Aircraft took control of the operation, the primary plan was to drop the existing XP configuration, and proceed directly to the upgraded version. In retrospect, it would appear that this was not the best marketing approach. Significant demand exists for the smaller aircraft, so rather belatedly a slightly upgraded version of the Pulsar XP has been added to the available line of kits. The tooling still exists for those components, and a viable market still appears to exist. The only significant change is in the use of a one-piece aluminum main gear, similar to, but lighter than, the Super Pulsar 100 main gear. This kit will be aimed at the 85 HP Rotax and the four-cylinder Jabiru power plants, and will fill the market for a smaller, compact, and efficient high performance aircraft in the same manner as the original Pulsar XP.

There is no plan to revive the two stroke versions of the design, although the company management has assured me that parts and support for all the previous designs will be provided where possible.

AIRPLANES PREVIOUSLY KNOWN AS KIS, AND PLANNED DEVELOPMENTS

Pulsar Aircraft has also purchased the rights and tooling for the aircraft kits previously marketed by Tri-R Technologies under the KIS name (see photo below). The two place KIS designs are being marketed as the "Pulsar



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A short list of fast-build options for the Super Pulsar 100 includes the composite fuselage shells bonded together with vertical stabilizer spar and rear bulkhead bonded in place. The price for this labor saving option is \$ 750.00. The reported amount of time saved is 25 hrs. The wings can also be purchased structurally complete, with fuel tanks pressure tested at the factory. To complete the wings, you will need

to install the aileron and flaps bell crank, pushrod tubes, route any electrical wires and install navigation & strobe lights (optional) in the wing tips. Bonding the bottom composite skin into place comes next. Price for the fast build wing kit - \$3,250.00 NOTE: Most builder opt for both of these options, and receive a discounted price: \$ 3,500.00 for both fast-build options.



Pulsar Super Cruiser

Sport 150" line (a possible contender for LSA?) with some minor design changes planned. The very capable, four place "Cruiser" (pictured above) is now known as

the "Pulsar Super Cruiser", and remains one of the most capable designs in its class. An upgraded version of the four-place Cruiser is in the prototype construction phase. This utilizes a repositioned wing with an upgraded spar for 6 "G" capability at a higher gross weight, and power-

SUPER PULSAR 100 SPECIFICATIONS

Wing span	25'
Wing area	80 sq ft
Aspect ratio	7.8:1
Wing loading	17.5 lb/sq ft
Load limits	+9, -6 g
Length	20'
Height	5'11"
Cabin width	44"
Cargo	60 lb.
Fuel	38 gal

Engine	Pulsar Power	Rotax	Jabiru	Continental	Rotax
Model	Turbo 120	914 Turbo	3300	IO-240	912 S
Gross Weight	1400 lbs	1400 lbs	1400 lbs	1400 lbs	1400 lbs
Empty Weight	750 lbs	750 lbs	700 lbs	800 lbs	700 lbs
Useful load	650 lbs	650 lbs	700 lbs	600 lbs	700 lbs
Cruise Range	1250 sm	1250 sm	1250 sm	1250 sm	1250 sm
Solo ROC	2200 fpm	2200 fpm	1500 fpm	1700 fpm	1500 fpm
Vne	220 mph	220 mph	220 mph	220 mph	220 mph
Cruise	225 mph	208 mph	190 mph	200 mph	180 mph
Vs1 (fe)	55 mph	55 mph	55 mph	57 mph	52 mph
Take off roll solo w/ flaps	500'	500'	700'	800'	700'
Landing roll	800'	800'	800'	800'	800'



plants in the 300 BHP class. Tail feathers are also increased in size, and restyled to go with the higher performance level. This would not replace the Cruiser, but offer added option if the market appears sound. Engineering work has been initiated on a long-wing motor-glider version of the basic Pulsar airframe.



Super Pulsar 100 cockpit. Note the wide 44" shoulder room and full IFR panel.

PRICES AND FURTHER INFORMATION

The Pulsar aircraft web page www.pulsaraircraft.com is suggested as a source of additional information and complete pricing with options. Base price for all four kits:

- SUPER CRUISER \$34,950
- SUPER PULSAR 100 \$26,950
- PULSAR 150 (KIS) \$24,950
- PULSAR XP \$22,950

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On display in the Pulsar booth at Oshkosh 2003 was a William Wynne Corvair engine on a Pulsar firewall mock-up.

April Surprise from Sonex, Ltd. is no joke!

**By John P. Moyle
Associated Editor**

Another new variation of the popular Sonex light sport aircraft has been unveiled by the Oshkosh, Wisconsin based light sport aircraft company Sonex, Ltd, on April Fool's day of all days!. A cleverly hidden truth in the "leak" leading up to the announcement, that there would be a retractable gear version of the current model had most Internet list followers laughing out loud. But the well timed spoof took a different direction than anyone suspected!

The fact is that they have mated the original Jabiru 3300 powered prototype aircraft with amphibious floats from Chip Irwin's famous Czech Aircraft Works. This Czech Republic based firm has been manufacturing high quality aluminum floats for years, and has even equipped the Schneider Cup Championship aircraft. (a Zenith Zodiac with a Rotax 912)

Besides the full series of floats with retractable landing gear, suitable for a wide spectrum of light planes, Czech Aircraft Works also builds "ready to fly" Zenith designs, as well as the Symphony 160 (a Glastar clone).

Why has John Monnett ventured into yet another realm of flight, having already won our hearts with the Sonex, Waiex, and Xenos?? Might it be that he lives a very short distance from Lake Winnebago?? Could it be that he wants to fish in the pristine waters of nearby Canada?? Possibly, but my money is on the fact that Mr. Monnett is an inveterate racer, and knowing that the Schneider Cup rests on Chris Heinz's mantle may be the motivating issue here.

After all, floats on such a simple little aircraft certainly isn't a "Reality Czech".



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