

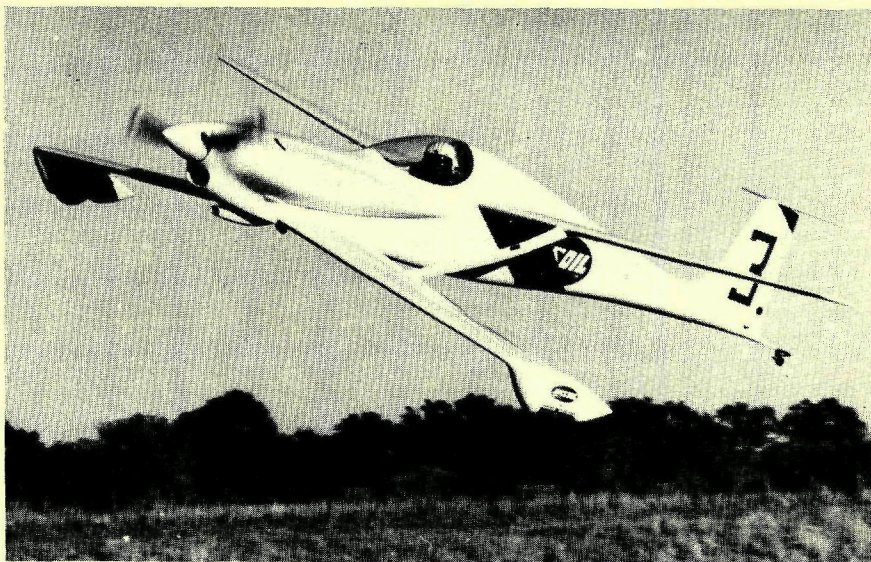
# And now the Rutan Laser . . .

WHEN competition racer Dan Mortensen wanted a new biplane to fly around the pylons, he knew just where to go for an aircraft: to Burt Rutan. The designer—renowned for his original and efficient shapes—came up with a machine to meet today's demanding racing specs. Mortensen hopes that the new Rutan Model 68 Laser will outrun the other racing "bipes". Already it has exceeded the current class record, writes **Howard Levy** from New York.

Earlier this month, Mortensen flew his aircraft round a 3km course laid out at Berkley, West Virginia, at an average speed of 234.62 m.p.h. The existing Class C1b record (for piston-engined aircraft weighing less than 2,200lb) has stood at 197.26kt/227.24 m.p.h. since 1966.

Bearing a similarity at first glance to Rutan's earlier Quickie design, Laser features a more powerful engine, is larger overall, and sports a small T-tail stabilator. Construction differs from previous Rutan types: the mouldless composite structure uses PVC foam as fuselage core material. The canard replaces the glassfibre used hitherto with carbonfibre, the higher strength being required to support the larger engine.

To meet biplane-racing regulations, the design features 75ft<sup>2</sup> wing area and interplane struts. The 3/4in-thick struts are faired to a 4.5in chord, and have been twisted to produce a



Burt Rutan's new Laser biplane racer will be flown by Dan Mortensen and is sponsored by AMS Oil

winglet effect giving inward lift on the lower wing. Three different benefits are said to accrue from the curved struts (see picture): low drag, flutter prevention, and landing load absorption.

In his preliminary design study, Rutan concluded that a near-zero wing camber is optimum for straight-and-level flight at a lift co-efficient of 0.09. In turns, the camber needs to be some 2.5 per cent to meet a required  $C_L$  of about 0.25. For optimum drag the more highly loaded canard wing requires a 3 per cent camber to give an 0.27  $C_L$  in turns.

## Optimum trim

Canard camber is automatically varied by trailing-edge deflection. This "elevator" provides 1 per cent camber in straightaways and 3 per cent in turns. As the pilot applies elevator for pitch control, drag is optimised by a horizontal trim surface mounted on the tail fin. Optimum trim setting is  $-2^\circ$  in straightaways and  $+2^\circ$  in turns.

The design was completed in 1979, and construction was undertaken in Sacramento sponsored by AMS Oil Corporation. It was built by members of two EAA Chapters with experience in composites and in reworking engines, and with the capability to turn out a first-class machine. Construction began in January last year and Mortensen completed a trouble-free first flight on August 4, 1981.

Laser's fuselage is narrower than that of conventional racers, but the cockpit frame is generous inside to allow easy pilot entry and exit. The canopy opening has been carefully contoured to reduce drag by providing a correct ramp angle at the front, rolled sides and a large smooth radius at the rear. The design is claimed to give a 40 per cent reduction in drag over a canopy with a "sharp-edged

hole". The cockpit is stressed to 22g, against the airframe's  $\pm 12g$  standard.

Powerplant is a 160 h.p. Lycoming IO-320-A2B engine driving a Hoffman composite propeller. Mortensen plans to test a Kevlar prop made by Ted Windedecker. Engine cooling intake is via a single inlet below the spinner. Outlets are on the top of each cylinder bank. These are faired aft to provide attached flow and maximum suction.

Rutan designed his aerofoils to take a 90° pylon turn at speeds of more than 175kt—not quite the speed of light, but he may yet have scored another winner.

## RUTAN LASER LEADING DATA

**Performance:** speed VNE 260kt; cruise 180kt; manoeuvre 140kt. **Fuel burn** 6.5 US gal/hr. **Weights:** empty 865lb; gross 1,126lb. **Dimensions:** span 20ft 5in (canard), 22ft 0in (rear); length 22ft 0in.

## AMS offers new oil for piston engines

THE Rutan Laser biplane racer is using Avoil, a new 100 per cent synthetic base engine oil being introduced by AMS Oil. Avoil is intended for piston-engined aircraft, and is destined to reach the market this year, along with a new filter. The combination is said to extend drain intervals, particularly because the filter will filter to only a few microns. The 20W-50 Avoil is claimed to dissipate heat more rapidly, to provide instant lubrication during start-up, has a  $-60^\circ\text{F}$  pour point to ease cold-weather starting, to reduce rust and corrosion, to resist oil thickening, to protect seals and to reduce spark-plug fouling.

## New racers divide biplane class

AIRCRAFT such as the AMS Oil-sponsored Rutan Laser and Don Beck's Sorceress have brought several changes in biplane racing, the most recent being the division into Sport and Racing Biplane classes. Standard sport biplanes now have their own championship. Racing biplanes such as the Sorceress and the Laser will compete only against themselves (i.e. canards and those with wings mounted directly into the fuselage without centre sections), says Dan Mortensen. When Mortensen and Burt Rutan got together to design a superior racer, the target numbers put into the computer were those of Sorceress. The first official Rutan-Sorceress race will be at Reno's National Championships (September 17-19). Mortensen raced against 16 aircraft at Reno last year with only a few hours of flight time on the machine, and came in third. He averaged 200kt, and during one heat hit a lap speed of 202kt, only to be penalised for cutting a pylon.