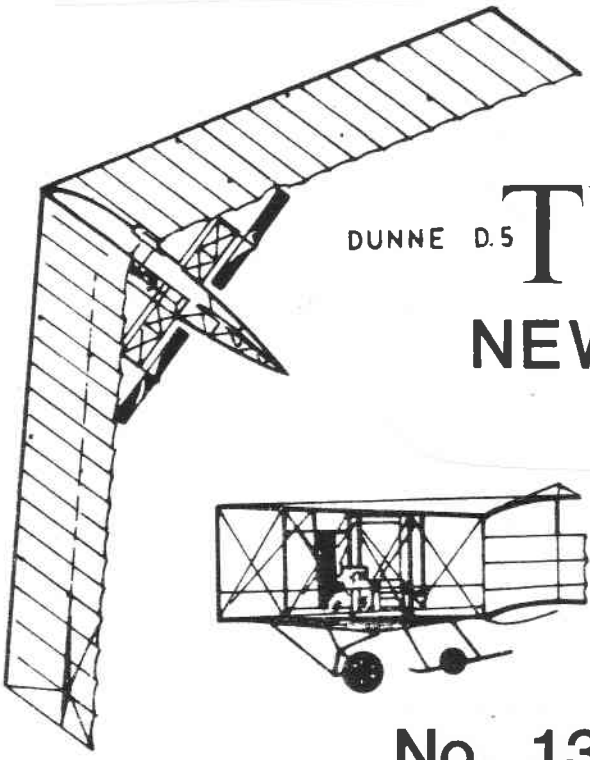
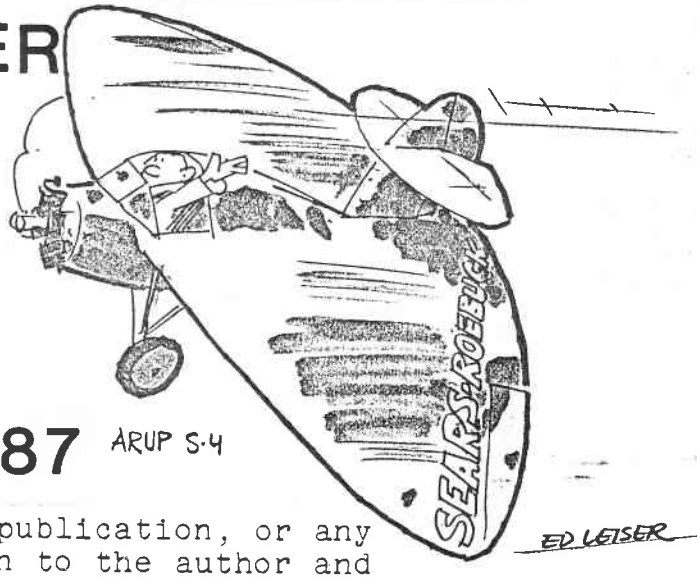


DUNNE D.5

TWITT NEWSLETTER



ARUP S-4

No. 13, July 1987

TWITT
(The Wing Is The Thing)
PO Box 20430
El Cajon, CA 92021

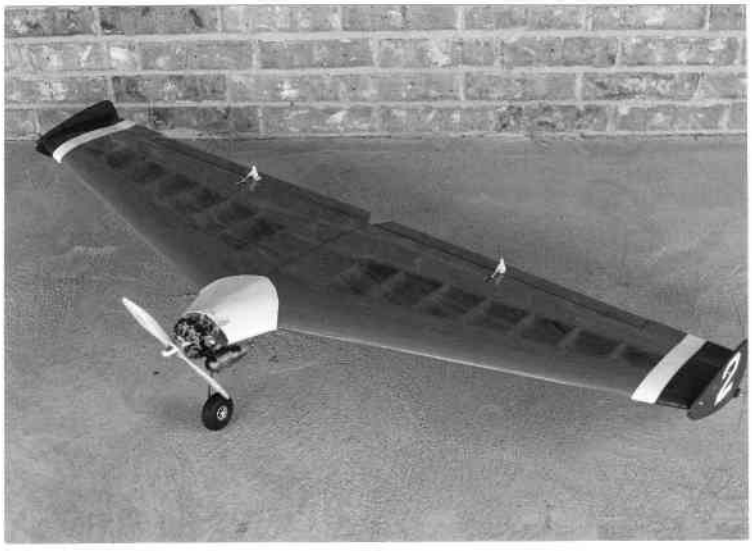
NEXT MEETING: Saturday, 18 July 1987, 1330 hrs, Hangar A-4, Gillespie Fld.

Telephone: (619) 224-1497 before 10 AM or after 10 PM

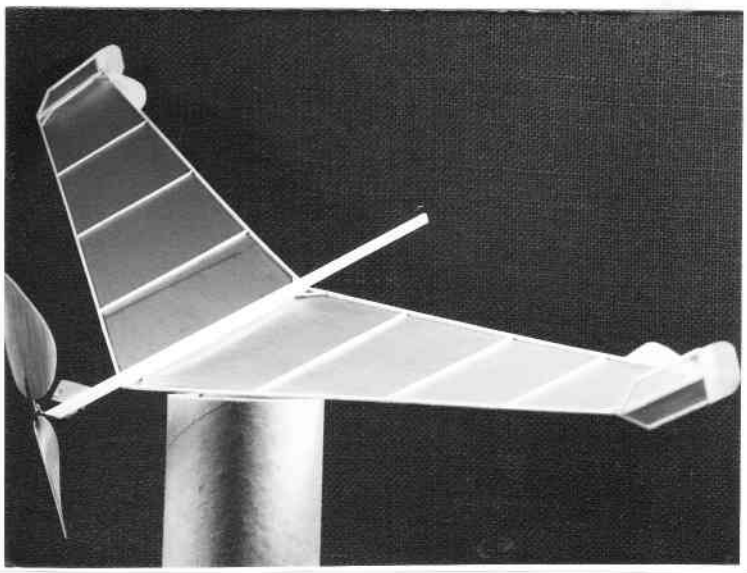
MINUTES OF 20 JUNE 1987 MEETING

The meeting opened with riveting video footage of the test flights of the larger of Don Westergren's two scale Space Shuttle Orbiter models. This machine has two engines, mounted "pushme-pullyou" style, the aft engine being cleverly concealed in a false rocket-nozzle shroud or "skirt." In the lively Q&A session that followed, Don discussed the peculiarities of the very-low-span tailless machine, and the additional problems of securing decent performance while retaining a faithful scale model. The first problem was that the machine would not rotate for takeoff; the real Shuttle's landing gear is designed for that purpose only--landing, that is. Don, who had made his landing gear a very accurate copy of the original, built an ingenious takeoff trolley for the model. Don noted, too, the peculiarities of any low-span wing, namely that it flies "behind the power curve" through a large part of its operating speed range. One consequence is that thrust:weight ratio needs to be about 1:1! Another problem is that the elevons do not have enough authority to counter engine torque at high angles of attack. Don had to leave before the end of the meeting but kindly left both Shuttle models in TWITT's custody until the following day.
Bob Fronius then took a few minutes to review TWITT's progress over the first year of its existence: the choice of a challenging and innovative design, completion of wing molds, assembling a library, snaring a string of expert speakers, publication of the newsletter, members and correspondents on four continents. He gave special thanks to Hernan Posnansky for his advocacy of active controls and his investment of time and money in the wing molds, to Bruce Carmichael for giving the group the benefit of his long-standing interest in flying wings, and to Marc de Piolenc for his technical translations and Newsletter work.
Bob Fronius then introduced Brad Powers, at the same time giving out copies of Mr. Powers' article "About the Size of It," which appeared in Model Aviation in January 1978 [the article was crowded out of our last Newsletter issue, so Bob printed it as a separate handout; those TWITTs who missed the meeting will get their copies in the mail]. Mr. Powers, a former Convair engineer, had written a letter to the Academy of Model Aeronautics, publisher of Model Aviation, trying to shed some light on the confusion then prevailing in modeling circles about the concept of dynamic similitude. One result was the article, a smooth introduction to the art of building a dynamically similar scale model, that is one whose behavior mimics that of the original. Mr. Powers reviewed his article, emphasizing some points which even engineers occasionally overlook (did you know that time scales with the square root of the scale factor?) and interspersing material drawn from his experience at Convair, where he worked with dynamic models of flying boats. Bob thanked Mr. Powers on TWITT's behalf, then invited Jerry Blumenthal to rise and speak. Jerry, a former builder of wind-tunnel models (also with Convair) is well-known in TWITT and EAA for his imaginative airplane concepts, but his topic was an engine design. His point of departure is the Caminez engine of the early Twenties,

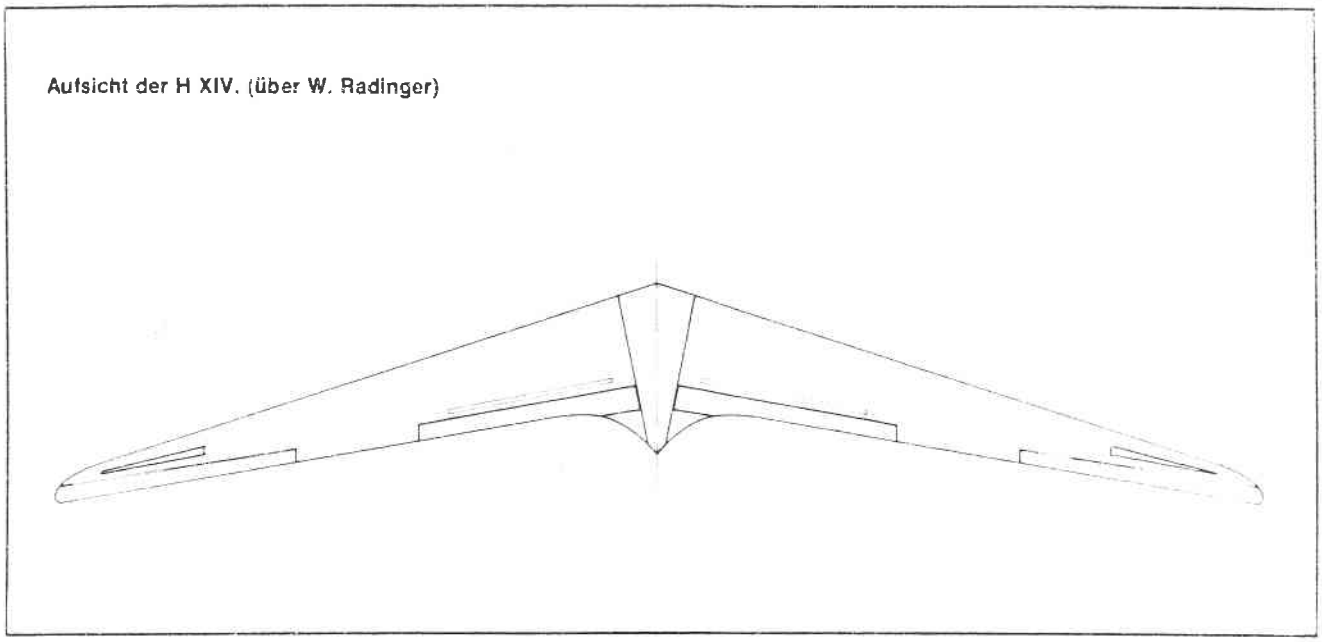
a four-stroke, four cylinder radial which converted piston thrust to output shaft torque through rollers bearing on a two-lobed cam attached to the shaft. A rhomboidal linkage connected the pistons and served to keep them in contact with the cam, synchronize their motions and distribute side-force among all four pistons. Jerry noted as a reason for the engine's commercial failure [even though it received a Type Certificate] problems connected with the linkage. Jerry proposed the following improvements to make the engine lighter and less bulky: change from a four-stroke to a two-stroke cycle employing crankcase scavenging; replace the single-roller-per-cylinder layout and linkage of the Caminez by providing each piston with a two-roller bogie or walking beam pivoted to the engine case, the rollers and pivot forming an isosceles triangle, the piston connecting rod "lower end" being articulated to the end of the walking beam opposite the roller. Because the walking beam would swing rather than reciprocate, the pistons would be oriented tangentially rather than radially. Jerry further proposed that the cam serve as a rotary induction valve. The engine illustrated by Jerry has three cylinders and a three-lobe cam; the pistons move in phase and fire simultaneously. Jerry left the calculations of structural loads, the shape of the cam lobes and other details for the entertainment of interested TWITTs. Floyd Fronius related some spectacular long-distance hang-glider flights accomplished recently at Bishop, California. Bruce Carmichael then rose to present gifts to Bob Fronius (Leading TWITT), June Wiberg (TWITTess with finesse) and Marc de Piolenc, in celebration of TWITT's first anniversary. Bob got a bottle of Tawny Port, June a pair of shell earrings from New Zealand and Marc got a novel, Lighter than Air, chosen because of his interest in dirigibles. The meeting then adjourned in order to do justice to June Wiberg's cake, on which she had faithfully reproduced, in icing, an engraving of a man flying an ornithopter that appeared in the 1985 Reno Air Races program...



RAKETE BY DAN WALTON BEECHCRAFT ENGINEER

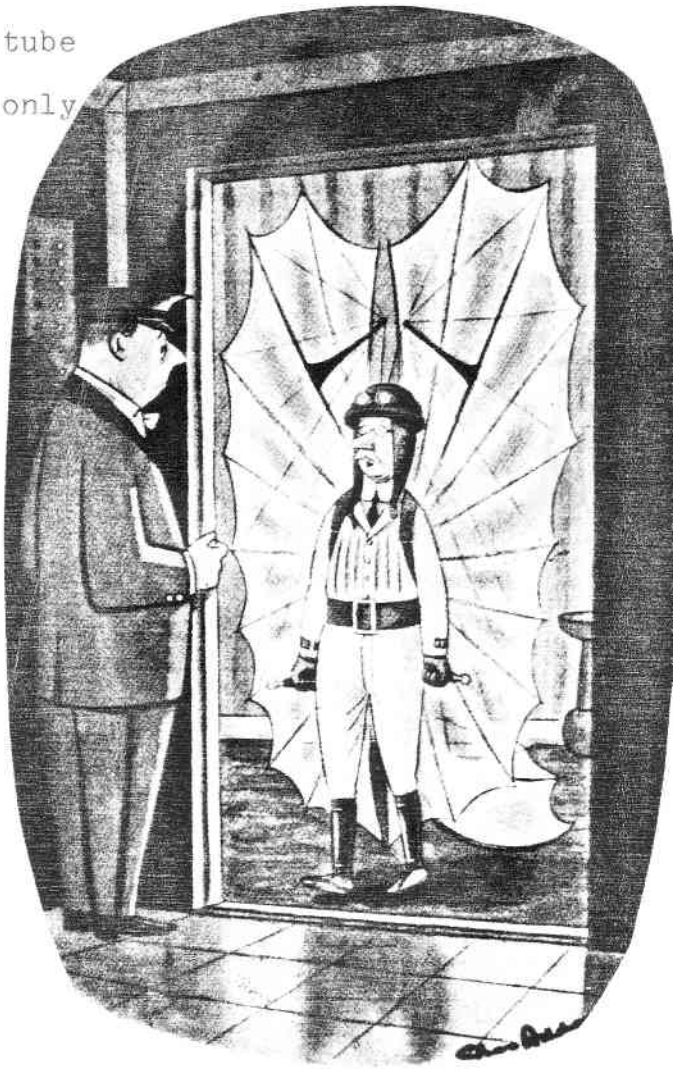


INDOORFLYONG
INDOOR FLYING WING SPAN 22" DAN WALTON



Data Sheet--Horten XIV

Mission:	Training
Construction:	
Center Section:	steel tube
Wing:	wood
Crew:	pilot only
Span (m):	16
L. E. Sweep (deg):	18
Taper Ratio	5
Root Thickness (%):	18
Root Chord (m):	2.0
Rib Spacing (m):	0.4
Wing Area (sq. m):	15.76
Aspect Ratio:	16.2
Pilot Position:	prone
Width of e te Section (m):	0.8
Width of Cockpit (m):	0.8
Height of Cockpit (m):	0.5
Empty Weight (kg):	150
Ballast (e.g. water) (kg):	---
Useful Load (kg):	80
Max. Flight Weight (kg):	230
Wing Loading (kg/m2):	14.6
Stall Speed (km/h):	41
Landing Speed (km/h):	41
Min. Sink (m/s):	0.55
at (km/h)	55
and (kg/m2)	14.6
Best Glide Ratio:	30
at (km/h)	70
and (kg/m2)	14.6
Never-Exceed Speed (km/h):	250



"The roof, please."

[From Horten and Selinger: Nurfluegel. Graz: Weishaupt, 1983. Data sheet translated by Marc de Piolenc]

PROGRAM OF THE 18 JULY MEETING

Thanks to TWITT Dave Martin, Editor of Kitplanes magazine, we will be able to show video footage of the Davis flying wing, a single-engine, single-seat machine designed along Northrop lines. Mr. Davis will fly the machine to Oshkosh this year and donate it to the EAA Museum; his next project is a two-seater, side-by-side.

Fortunato ("Tuto") FIGUEROA will discuss the effect of inlet pressure recovery on gas turbine engine performance. Tuto got his formal training at the National University of Peru MS Electromechanical Design 1942, MS Aeronautical Engineering 1943), McGill (ME Gas Turbine Design 1953) with a brief interlude (1944-46) to study jet propulsion and gas turbine design at MIT and Renssalaer Polytechnic Institute. He has worked for Canadair, Republic, Curtis-Wright, Garrett Airesearch and Teledyne Ryan. He is retired from the Peruvian Air Force with the rank of Captain. As you may suspect, he is primarily interested in propulsion and is well qualified to discuss it.

POSTPONED Karl SANDERS will discuss Alexander Lippisch's landmark paper, "The Development of Tailless Airplanes." The paper covers Lippisch's work up to WW II. It was translated into English by the US Government's technical intelligence teams after the War, but copies are available only through the Library of Congress at considerable cost. Even the original German paper, like many wartime publications, is hard to get in this country. The TWITT library has a copy of an abstract, in German, from the proceedings of the German Academy of Aeronautics.

A LIGHT APPROACH TO CONVENIENT ECONOMICAL SPORT SOARING
BY B.H.CARMICHAEL

PART II

POWER REQUIREMENTS-

LET US FIRST CALCULATE AN IDEAL DESIGN WE MIGHT OBTAIN WITH A GREAT DEAL OF EFFORT AND REFINEMENT

SPAN = 32 FEET EMPTY WEIGHT = 150 POUNDS $W/S = 3.2$ #/FT^2
$\bar{c}$ = 3.125 FEET PILOT WEIGHT = 170 POUNDS $W/S = \sqrt{1.79}$
AREA = 100 FEET GROSS WEIGHT = 320 POUNDS $W/b^2 = 0.313$

$$\text{SINKING SPEED} = \frac{K_w W/b^2}{\sqrt{W/S}} = \frac{14.6\ (.313)}{1.79} = 2.55 \text{ FT/SEC.}$$

$$\text{POWER FOR LEVEL FLIGHT} = \frac{(\text{WEIGHT})(\text{SINK})}{550\ N_p} = \frac{320(2.55)}{550\ (.74)} = 2.00 \text{ HP}$$

ADDITIONAL
POWER TO CLIMB AT 300FPM $= \frac{(\text{WEIGHT})(R/C)}{550\ N_p} = \frac{320 \times 5}{550 \times .74} = 3.93$ HP

TOTAL POWER IN CLIMB = 5.93 6 HP

WE COULD CRUISE AROUND LOOKING FOR THERMALS ON 2 HORSEPOWER AND CLIMB TO 2000 FT ABOVE GROUND IN LESS THAN 7 MINUTES ON ONLY 6 HORSEPOWER. THIS WOULD REQUIRE REDUCTION GEAR AND A LARGE PROPELLER DIAMETER TO ACHIEVE THE ASSUMED 75% PROPELLER EFFICIENCY. THESE REQUIREMENTS ADD TO COMPLEXITY, WEIGHT AND MAY ALSO FIGURE IN RELIABILITY AND RE-START POTENTIAL.

WITH DIRECT DRIVE AND A SMALL PROPELLER DIAMETER IT MIGHT BE POSSIBLE TO STILL GET 50% PROPELLER EFFICIENCY IN WHICH CASE THE LEVEL FLT. POWER IS NOW 3, AND THE TOTAL POWER TO CLIMB AT 300 FT/MIN IS NOW 9.

PROPULSION-FEATURES -

THE NEAR TERM SELF LAUNCH SAILPLANE WILL BE GASOLINE POWERED, CHARACTERIZED BY HIGH NOISE AND VIBRATION LEVELS. THE ROUGH POWER IMPULSES GREATLY COMPLICATE FOLDING PROPELLER DESIGN. EXISTING FEATHERING PROPELLERS ARE VERY EXPENSIVE. THE CHALLENGE IS TO PROVIDE SELF LAUNCH WITH REASONABLE WEIGHT, COST, AND RELIABILITY AND TO MINIMIZE PROPULSION SYSTEM DRAG AT ZERO POWER. A SMALL HIGH RPM DIRECTLY DRIVEN PROPELLER MAY PROVIDE SUFFICIENT THRUST FOR SELF LAUNCH AND CLIMB BUT COULD, WHEN STOPPED, SERIOUSLY DETERIORATE THE GLIDE PERFORMANCE. RUTAN (FIG. 7) RETRACTS AND COVERS HIS SELF LAUNCH UNIT RETAINING FULL SOARING PERFORMANCE AT THE COST OF ADDITIONAL COMPLEXITY. CULVER AND MAUPIN (FIG. 8) IN A NON RETRACTABLE CONFIGURATION STOP THE PROPELLER VERTICALLY IN LINE WITH THE THICK POD TRAILING EDGE. A POSSIBLE REFINEMENT WOULD BE TO ENCLOSE A SIMILAR PROP LOCATION WITH SIDE WALLS WHICH CAN BE ROTATED OUTWARD 90° FOR GLIDE PATH CONTROL OR ROTATED FORWARD OUT OF THE WAY FOR PROPELLER OPERATION. (FIG 9) (NORM THOMPSON CONCEPT)

IN NON RETRACTABLE CONFIGURATIONS, THE PROPELLER CAN BE LOCATED: ON THE NOSE AS IN MANY MOTOR GLIDERS, BEHIND A POD, FORWARD OF A VERTICAL FIN MOUNTED ENGINE, OR BEHIND THE TAIL. (FIG. 8) THE FIRST MAY DEGRADE THE SOARING PERFORMANCE EXCESSIVELY AND THE LAST REQUIRES THE COMPLEXITY OF A LONG DRIVE SHAFT. THE ADVENT OF VERY LIGHT ENGINES MAKES THE FIN MOUNT FEASIBLE. PROPELLER AT THE REAR OF A POD REQUIRES TAIL MOUNTING ON TWIN OR SINGLE BOOMS. A SINGLE BOOM MAY BE LOCATED EITHER OVER OR UNDER THE PROPELLER. WITH A HIGH BOOM, PROPELLER DIAMETER CAN ONLY BE INCREASED BY WRAPPING THE PROP ABOUT THE BOOM, A POSSIBLE, BUT COMPLEX, ARRANGEMENT WITH SOME SAFETY WORRIES IF THE BEARINGS SIEZE. A NON FOLDING NON FEATHERING LARGE DIAMETER PROP WOULD REQUIRE UPPER BLADE SHIELDING WITHIN A DORSAL FIN WHILE SOARING. A LARGE DIAMETER SINGLE BLADED PROPELLER COULD HIDE IN A POD SLOT WITH A FREE SWIVELING FAIRING ON THE SHORT COUNTERWEIGHT. (FIG. 10) MR. HAUFF OF NEENAH, WISCONSIN, EXHIBITED A SELF LAUNCH SAILPLANE AT OSHKOSH IN PREVIOUS YEARS WITH AN OPPOSED 2-CYLINDER ENGINE IN THE NOSE WHICH COULD ROTATE 90° TO LAY THE FIXED PROPELLER ON TOP THE NOSE WITH THE PROPELLER ALIGNED WITH THE WIND (FIG. 10). DICK SCHREADER HAS ADOPTED AN EXTERNAL PROP LYING ON TOP THE CENTER FUSELAGE ALIGNED WITH THE WIND WHILE SOARING. IT ROTATES IN THE HORIZONTAL PLANE ON START UP AND LIFTS THE ENGINE AND MAST UP TO THE POWERED POSITION. WHEN THE ENGINE IS SHUT OFF, IT BLOWS BACK DOWN TO THE STOWED POSITION. THE MAST MOTION IS DAMPED BY HYDRAULICS. A VERY CLEVER INNOVATION.

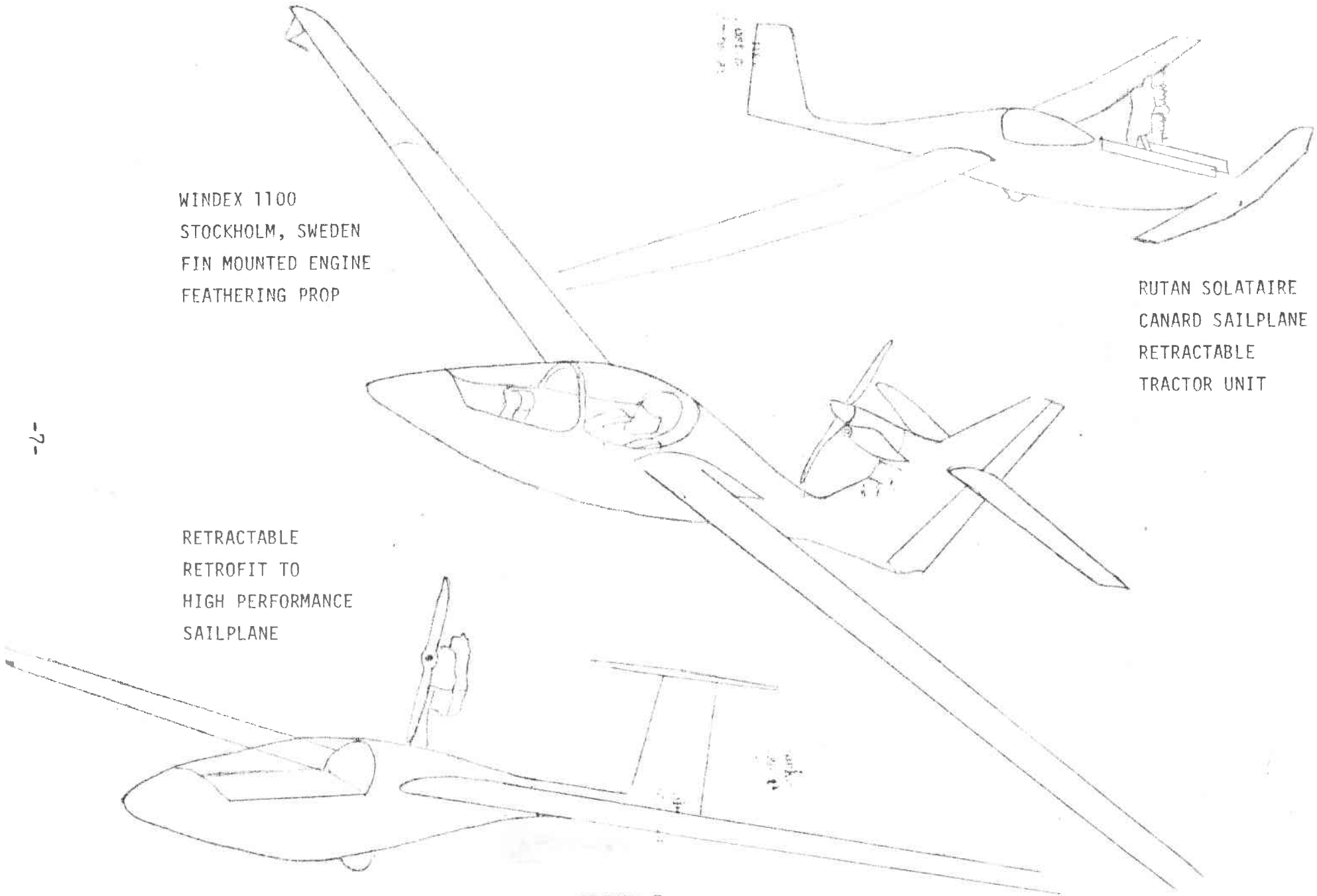
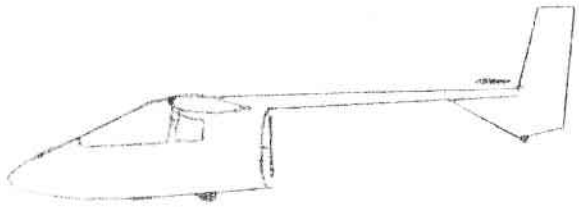
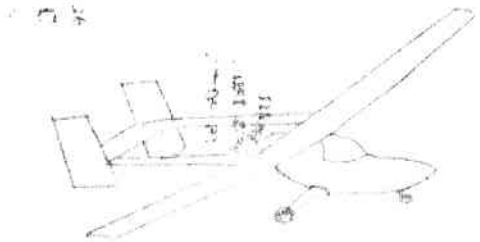

WINDEX 1100
STOCKHOLM, SWEDEN
FIN MOUNTED ENGINE
FEATHERING PROP
RUTAN SOLATAIRE
CANARD SAILPLANE
RETRACTABLE
TRACTOR UNIT
RETRACTABLE
RETROFIT TO
HIGH PERFORMANCE
SAILPLANE

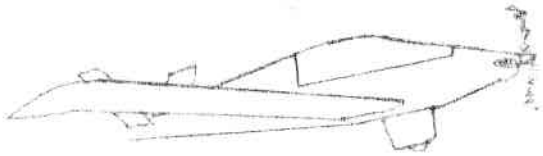
FIGURE 7



PROP UNDER BOOM
CULVER MAUPIN WINDROSE



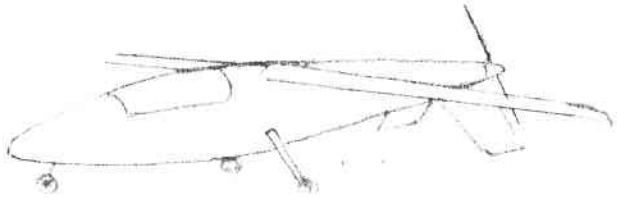
APPLEBAY Z 1A



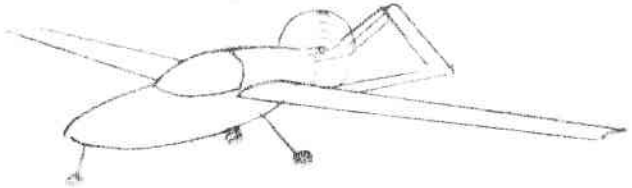
PROP ON NOSE
MONNETT MONI

PROP BETWEEN TWIN BOOMS

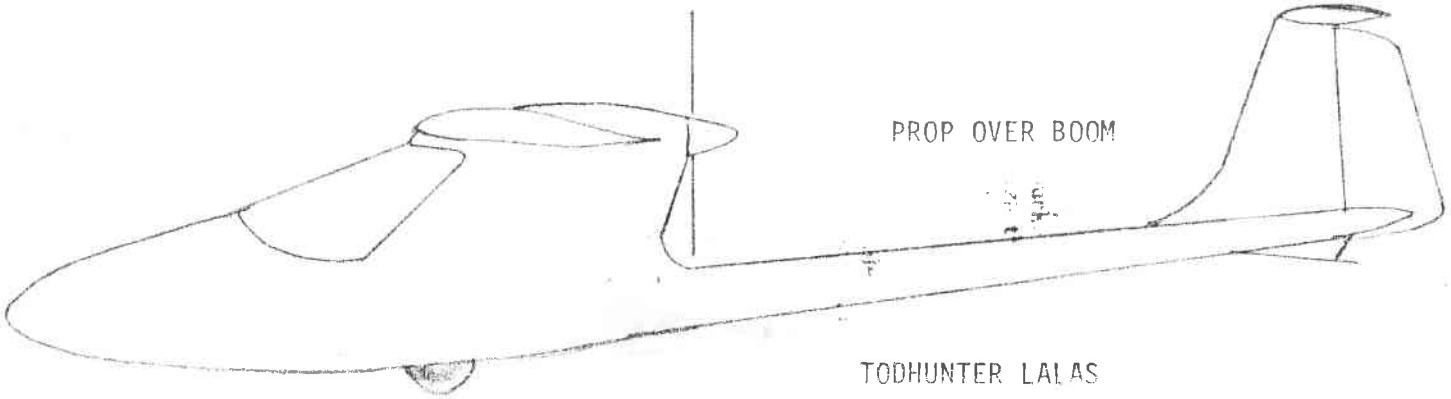
PROP AROUND BOOM
CHEMNITZ



PROP BEHIND TAIL
LESHER & TAYLOR



LAISTER-CLEARY
ZIPPER



PROP OVER BOOM

TODHUNTER LALAS
BLUE WREN - AUSTRALIA

FIGURE 8

HIDING THE PROP

NOPM THOMPSON CONCEPT

SOARING FLIGHT

GLIDE PATH CONTROL

SELF LAUNCHING

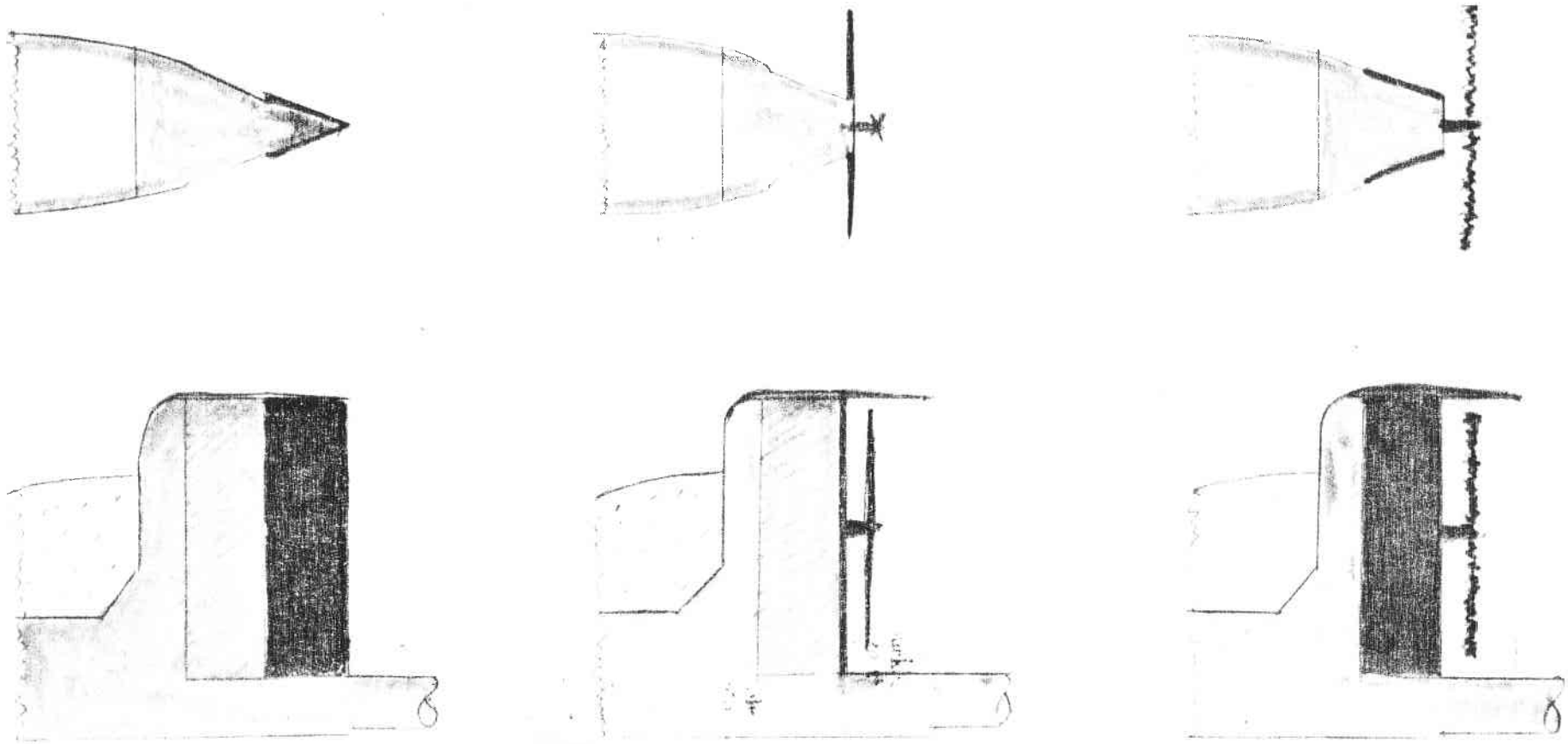
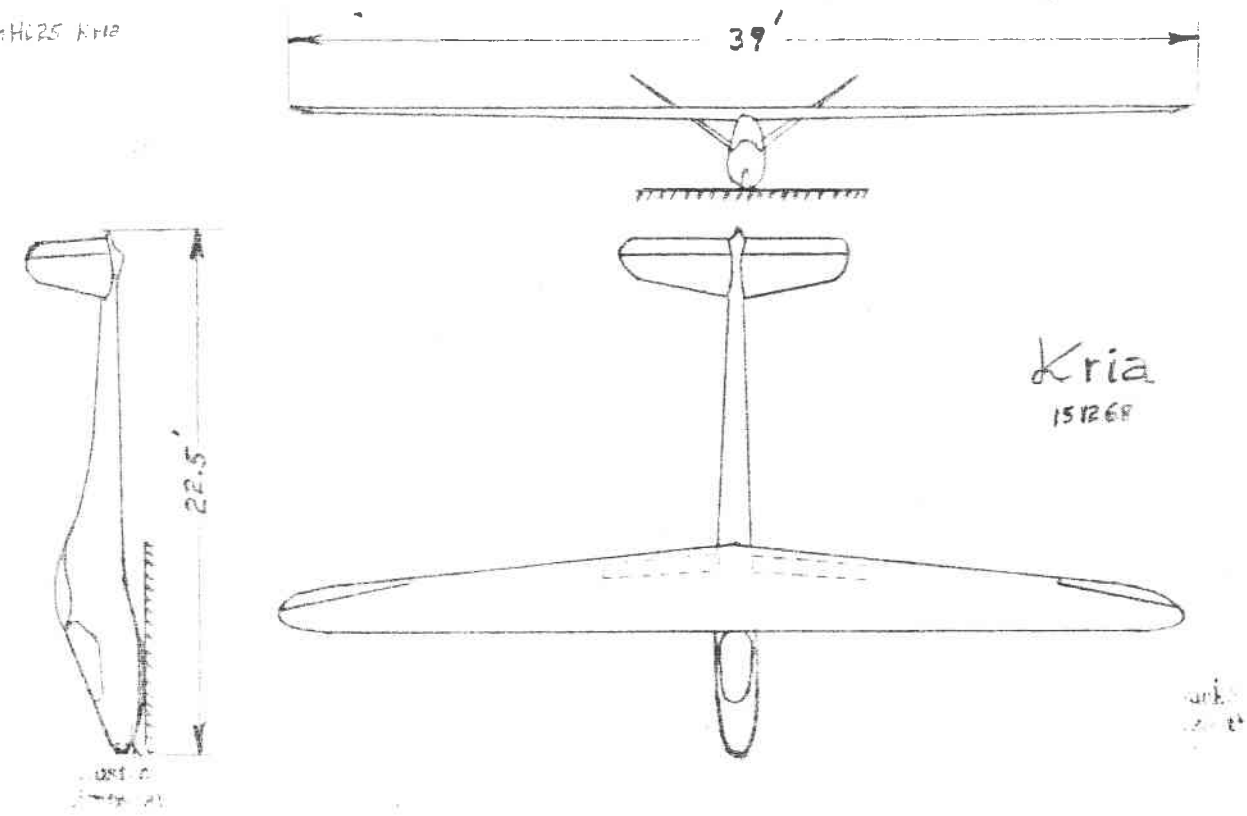


FIGURE 9

Die Firth HS25 Kria



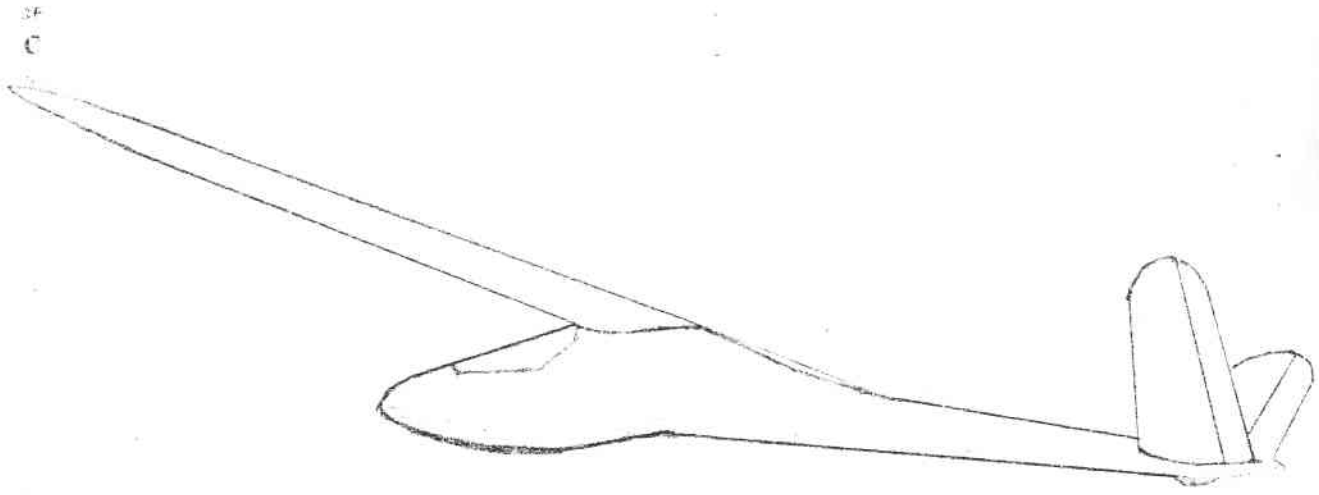


FIGURE 1D

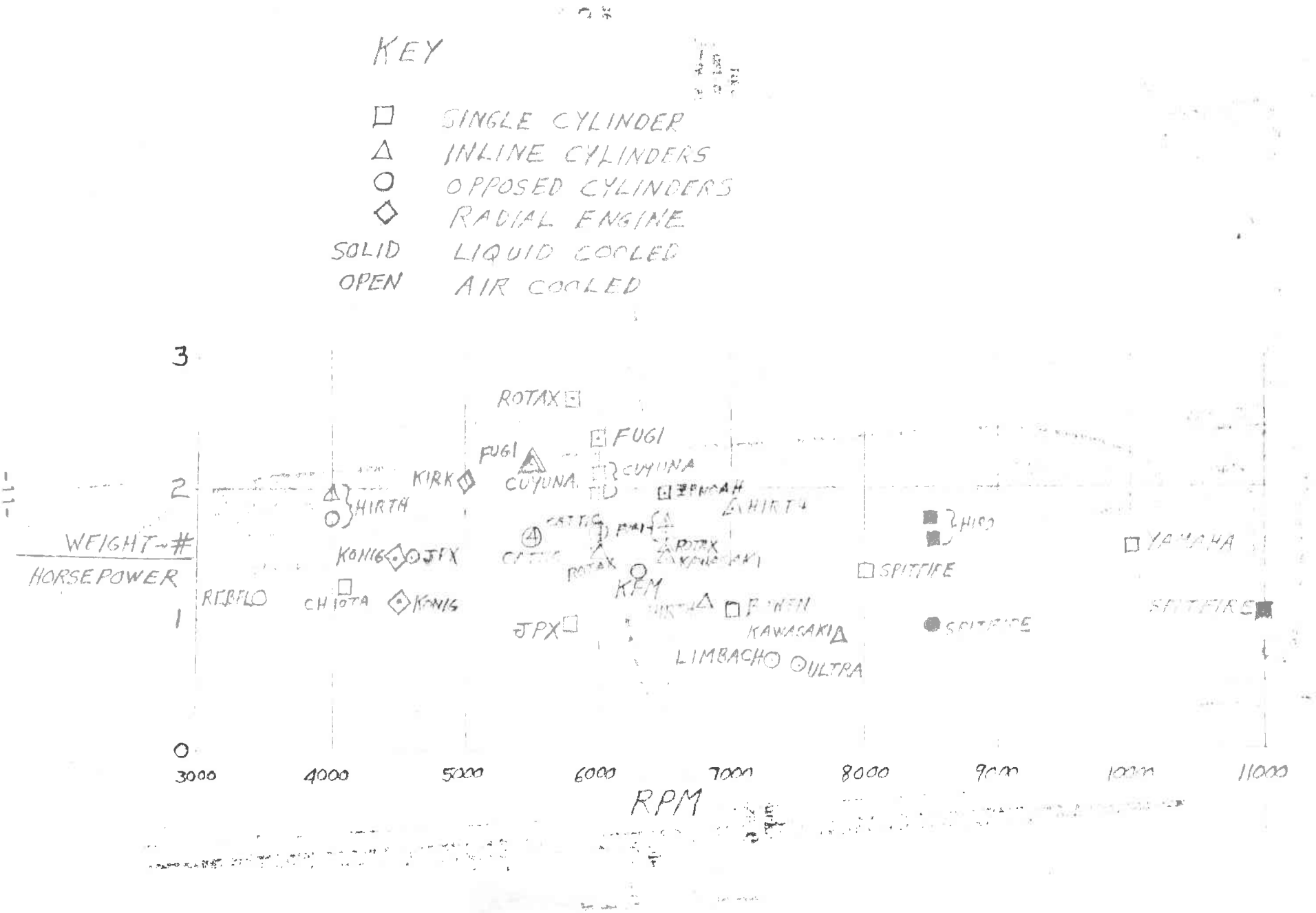


FIGURE 11- TWO CYCLE ENGINE SPECIFIC WEIGHTS

THE "DEAF HAWK" FLYS

On June 23, 1985, Bernard Gross, an S.H.A. Member from Palmdale, California assembled his Marske "Pioneer II" for its first test flight.

Bernie chose Crystalaire Airport close to his house for the test flight, and there, made nine auto tow "control test" runs down the runway. Everything felt good to Bernie, so the next flight was a 3000' aero tow. "It flew very beautifully with all controls very positive, and no pitch problems!", said Bernie. Possible pitch problems on tow were minimized by the use of a "Y" harness with dual tow hooks in the leading edges of both wings. The large rudder was very effective and the first aero tow went well. Bernie decided not to thermal on the first flight although he said it will do well in small thermals.

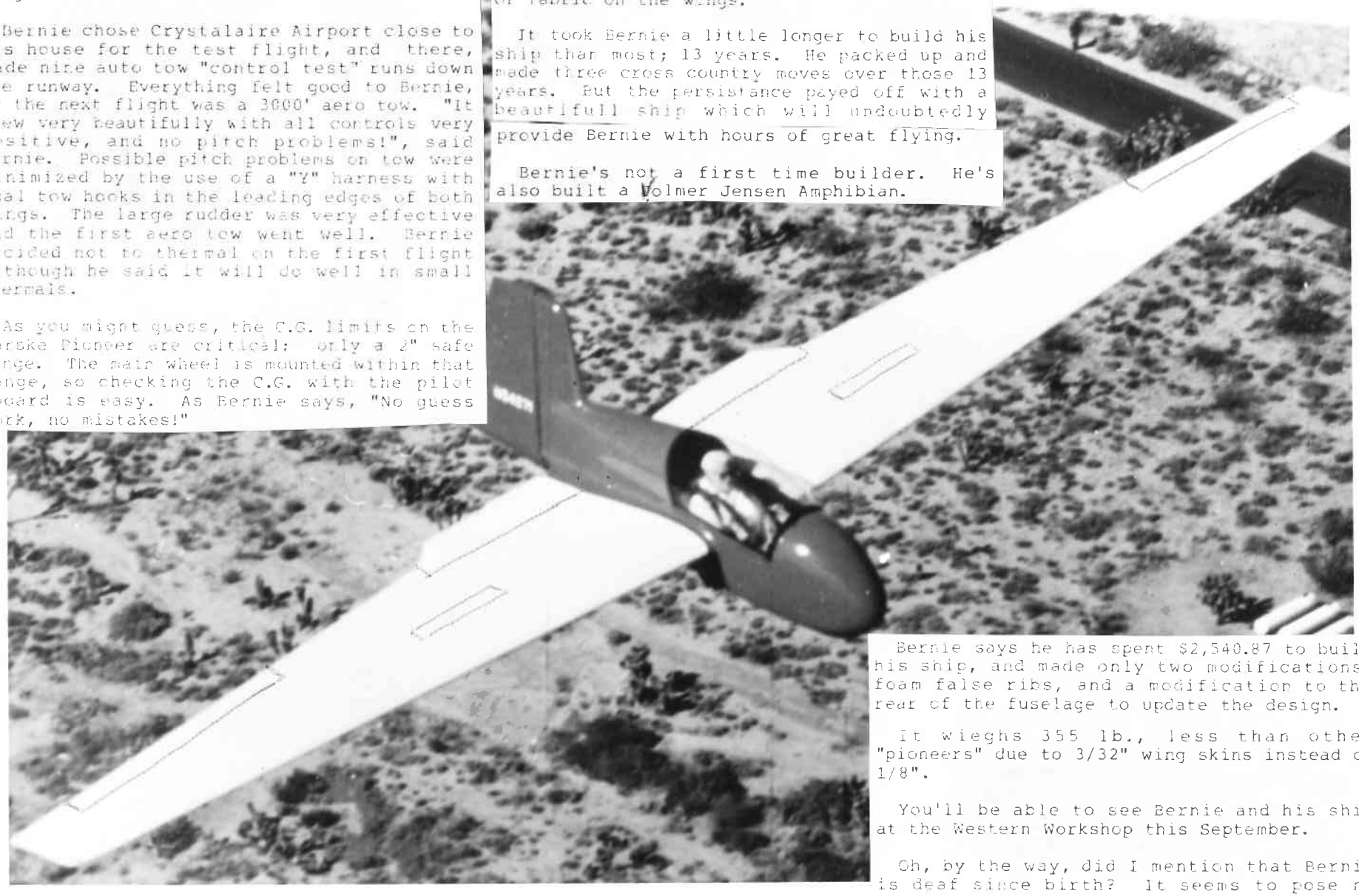
As you might guess, the C.G. limits on the Marske Pioneer are critical: only a 2" safe range. The main wheel is mounted within that range, so checking the C.G. with the pilot aboard is easy. As Bernie says, "No guess work, no mistakes!"

The traffic pattern felt the same as any conventional sailplane and Bernie landed smoothly with no bounces. Many airport "experts" at Crystalaire that day couldn't believe how well Bernie's wing seemed to fly. The only problem that required attention after the test flight was some re-shrinking of fabric on the wings.

It took Bernie a little longer to build his ship than most; 13 years. He packed up and made three cross country moves over those 13 years. But the persistance payed off with a beautifull ship which will undoubtedly provide Bernie with hours of great flying.

Bernie's not a first time builder. He's also built a Volmer Jensen Amphibian.

GROSS-MARSKE PIONEER II



Bernie says he has spent $2,540.87 to build his ship, and made only two modifications; foam false ribs, and a modification to the rear of the fuselage to update the design.

It wieghs 355 lb., less than other "pioneers" due to 3/32" wing skins instead of 1/8".

You'll be able to see Bernie and his ship at the Western Workshop this September.

Oh, by the way, did I mention that Bernie is deaf since birth? It seems to pose no problem for him. Congratulations Bernie!

SHAp TALK