perimental development program. The amount of data and design information at the time was almost non-existent.

The retractable engine configuration also presented many problems, but at the time of the preliminary design stage were considered to be capable of solution in that the design factors involved were straight-forward problems in mechanics and in the selection of a reliable actuating system.

the aligning of the propeller. The design of the engine is such that of every 180° of crankshaft travel the pistons are in the compression position, thus it is just a matter of indexing the propeller at the proper angular location. The duty cycle for extension or retraction is approximately twelve seconds. The engine is started by a pull-type cable starter mechanism that is integral with the engine. Fuel is provided to the carbu-

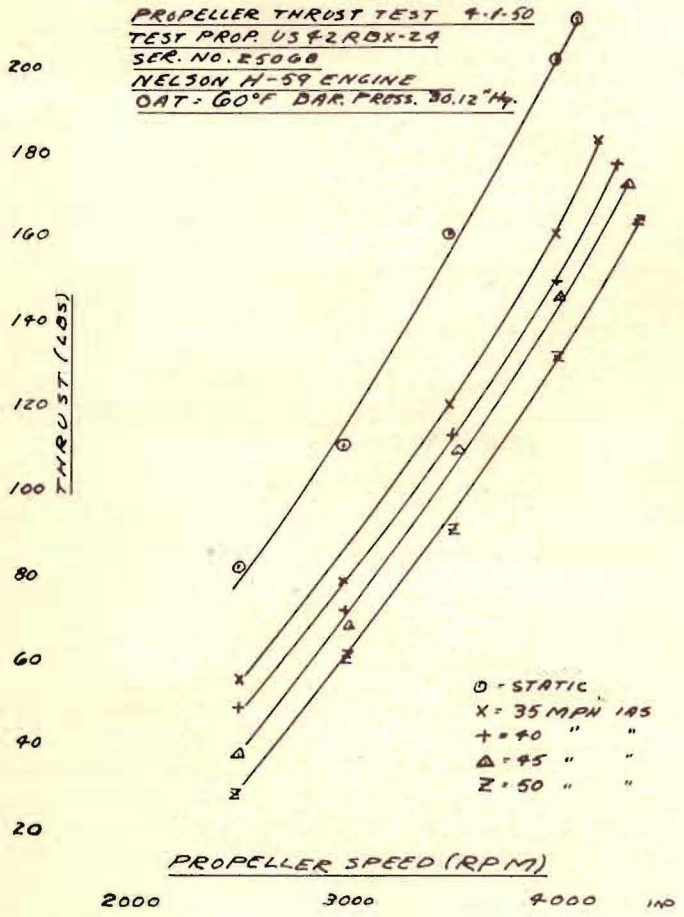

Fig. 7 — *The net thrust vs. RPM at various indicated air speeds for a representative test propeller.*

This configuration offered many advantages, such as adequate engine cooling, direct drive propeller, minimum fire hazard and accessibility for routine maintenance.

The retracting unit as it now appears consists of a folding type support structure which is actuated by an electro-hydraulic system. The access doors are also actuated by this same system and the operation sequence is completely automatic as is

retor by means of an electric fuel pump. Conventional throttle and spark controls are provided for engine operation. The fuel supply is limited to four gallons in the interests of weight considerations. The fuel provided will give approximately 45 minutes of full throttle operation and in continuous climb will net 10,000 feet of altitude.

TO BE CONCLUDED IN THE NEXT ISSUE OF SOARING

UNUSUAL GLIDERS

by PETER M. BOWERS

The addition of a 22 hp engine to Don Stevens' Bowlus Baby Albatross (Soaring, March-April '55, P19) points out one of Soaring's oldest problems—how to add utility to a sailplane by making it self-launching and self-retrieving. The need for a launching crew and a retrieve crew is one of the biggest deterrents to the growth of soaring as a popular sport. Most of a pilot's time is spent alone when he is aloft, but it takes a considerable number of people to get him up there, or to bring him back afterwards.

Powered gliders are nothing new—it's just that none of them has been able to overcome the double problems of being simultaneously an underpowered airplane and an overweight glider.

Grunau "Motor Baby"

There are three basic approaches to the power glider design. The first is to take an existing glider design and attach a removable engine to it so that it can be ferried from place to place. This is Don Stevens' approach, and the ship reverts to a pure sailplane, with all the usual problems of launching and retrieve. The Germans also tried this with standard pre-war designs such as their "Rhonadler," but the idea did not prove to be popular.

The second approach, again using a basic standard glider, is to add a permanent engine installation, building it into the airframe in such a way as to create as little drag as possible. See the photo of the German Grunau "Motor-Baby." The double disadvantages of this method are the added drag of the installation which interferes with soaring, and the extra weight of the power plant.

The third method, best typified by the Nelson "Hummingbird," is to design the ship from scratch with an auxiliary power plant in mind, and

(Continued on Page 23)