bility of attaining low energy loss flight. We owe to the perfectionists in soaring the advances made in reducing the drag and power requirements of conventional airplanes. There is now flying in America a sailplane, RJ-5 (Ref. 3) which is capable of cruising at 50 miles per hour with a power requirement of only 2.33 H. P. If the weight of this craft could be reduced from 690 pounds to 250 pounds, the power required would be only 1.18 H. P. With such a craft, of course, only short flights would be possible.

In Italy in 1937, a research team, Bossi and Bonomi, (Ref. 4) attacked the problem of muscle flight from basic considerations. They designed a machine driven by two propellers which required a thrust power of only 0.83 H. P. A sustained flight of 800 meters distance was actually flown with it, but it did not take off with muscle power alone. One point which the Italian researchers overlooked was the relatively low propulsive efficiency of the tractor propellers used on this machine. Another serious deterrent to the sustained flight of this machine was the fact that only the legs were used for power, the arms being needed for control. Despite these criticisms, we can consider the work of Bossi and Bonomi, which was methodically executed, as a fine contribution to this field.

One very important concept of aerodynamic theory should permit the reduction of power required. If one flies near the earth's surface, the drag due to the generated lift is reduced considerably. If one flies at one tenth the span above the ground the power required for lift generation is 50% of that at a great height above the ground.

Recently some measurements (Ref. 5) on the aerodynamic properties of soaring birds yielded the interesting fact that birds apparently enjoy a laminar flow over their entire surface. This conclusion was based on the extremely low drag which the bird possesses. If we understood fully the mechanism for such low drag flows, we could design a muscle powered machine capable of flying on 0.78 H. P., not including the ground effect. Such a flying machine would have the following characteristics:

a. span, 40 feet
b. chord, 5 feet
c weight flying, 300 pounds
d. speed of flight, 18 miles per hour, (minimum)
e. maximum glide ratio, 37
f. minimum sinking speed, 1.4 feet per second, (At one span altitude)
g. wetted area, 600 square feet
h. drag coefficient, 0.00465.

Near the ground the power required would be only 0.45 H. P. Since man can develop for 20 seconds 1.3 H. P. there would be a sufficient power for take-off. Even if a propulsion efficiency of only 50% were obtained, human powered muscle flight would be possible with this machine.

The technique of maintaining a laminar flow over the entire surface of an airplane is now at least defined in direction. It has been found (Ref. 6) that suction through a perforated wing surface stabilizes the laminar flow so that the low friction of laminar flow can be achieved. Since this process requires very little power for suction, it would be possible to obtain it from the pedalling of the man in such a muscle-powered machine. See illustrations on back cover.

For this machine an empty weight of 120 pounds is allowed. Even so an extremely efficient structure is needed for the wing and fuselage. There is available a new development called sandwich construction which utilizes two layers of fibreglass cloth supported in a very low density porous plastic. In this structure, the two skins are spaced so far apart by the plastic that an efficient compression element results. With this construction the fixed wing aircraft powered by man should be possible of attainment.

In summary, this paper reviews the possibilities of achieving human muscle-powered flight in the near future. Recent advances in aerodynamics and structures give definite indication that human muscle-powered flight should be possible within the 500 years of the birth of its inventor, Leonardo da Vinci.

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ODESSA CAMP

E. J. Reeves, president of Texas Soaring Ass'n, announces that TSA will have a tow plane available at Ector County Airport at Odessa, Texas, from Aug. 1st up until the start of the National Contest at Grand Prairie, Aug. 19th. All pilots are invited to try to duplicate the superior performances of last year's camp.

Just drive into town, find your own tourist court accommodations, and then drive out to the field with your sailplane and make your own arrangements for hangarage. If Mr. and Mrs. Glen Flournoy are still managing the airport you will be greeted as if you had just come home.

There will be no registration fee; no registration, in fact. There will not even be an organized welcoming committee. The Odessa Chamber of Commerce has a very active aviation committee interested in making Odessa the soaring center of the world, and a call will bring some of them out to give you a hand. When you go past Odessa Spring Co. on the main highway stop in to say hello to Jack Stafford, world champion non-flying soaring enthusiast, who can answer all your questions.

Official observers for record attempts will, no doubt, be found through the Chamber of Commerce Aviation Committee.

If you need a reminder of what conditions at Odessa can be, get out your Sept.-Oct. 1951 issue of SOARING and drool some more. There will be a small charge for the use of the tow plane.