SOME COMMENTS ON SAILPLANE DESIGN

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INTRODUCTION

A sailplane is many things. It is a very complicated kind of sculpture, an intricate shell made of fine materials wrought into a closely disciplined form. It is mathmetics and engineering made tangible. It represents a lot of work and a good bit of money.

Since there are easier and safer sports than soaring and since it is a hard way to make a living, one need not be surprised that a degree of rationalization is aften employed to ease the creation of a sailplane.

Yet, new designs are brought forth as if other things were unimportant, as if sailplanes were a kind of poetry —as indeed they are, even when generated by those who are uncomfortable in the presence of expressed emotion.

These gracefully proportioned machines have been evolved in just a few years to be lean and clean enough to rise lightly in gently moving air, strong enough to challenge wild storms, balanced to respond to the tiller's wish and to the forces of nature.

This paper attempts to look into and to present some of the basic philosophy underlying sailplane design. to examine some of the motives behind design decisions, to permit a greater comprehension of the factors involved in compromises between aerodynamics, human experience, structural integrity and aesthetics.

HUMAN FACTORS

Everything that one does is an element of his personality. The summation of a person's actions reveals his character. This is why one can judge sailplanes and can express their characteristic in terms such as: "Honest," "Tricky," "Snazzy" or "Darling." These assessments are and can only be a reflection of the designer.

A desirable characteristic for a sailplane for general use is "Considerate"; observant and respectful of the rights and feelings of others.

This can be interpreted to mean that "considerate" sailplanes should be designed to hold long, short, heavy, light, male and female people ranging in age from 14 to 80.

These extremes should be fit into the cockpit so that the movement of the overall center of gravity of the glider lies in a range that is safe and comfortable to fly. To achieve this there should be plenty of rudder pedal adjustment for a relatively small seat adjustment. This is not hard to do. It is, proportionally, a small fraction of the total effort and is quite obviously desirable.

But of course, this is not all of the story: One should be able to get in and out without gymnastics. He should find controls and equipment easily available to him. He should be as safe as human ingenuity can ensure, he should be comfortable if lightly or heavily dressed. Adequate, controlled ventilation is necessary and very good visibility. All of this is possible within a strong cabin of reasonable size, of low aerodynamic drag and good proportions. Weight need not be excessive, nor cost, nor effort.

What one mostly gives up if he provides the above listed advantages, is a degree of aerodynamic and structural fanaticism.

SEATS AND SEATING vs. PERFORMANCE

The arrangement of seats is basic, for this influences the whole theme of the sailplane. There are generally three types: single place, single place with a "rumble seat," and two-seaters. Each type has its proponents; it is pertinent to look at each and to examine the various goals and penalties. One finds that he's still involved with human psychology at a working level: there are those who want to be alone; others get more pleasure from instructing and flying with family and friends. In between are those who produce the 1½ place aircraft. Assuming equally safe configurations, one approaches this part of the picture to assay the value of each form from the standpoints of performance, usefulness and limitations.

To be objective, it is necessary to set forth the certain premises concerning and defining "adequate performance": A study of contest results almost always brings out the overwhelming influence of pilot skill. Consistency of certain pilots in winning meets pretty well rules out luck as the big factor, though a winning pilot himself may recall all too vividly how he caught a thermal just as he turned on to final and how it saved the meet for him. He may not realize that less skilled pilots would not or could not use this low lift and that simiar saves occur (randomly, of course) to every competitor. From another viewpoint, it is also true that the finest machine does not always win the meet and that, if it does, a much poorer craft is often but a few points behind the winner. *These* facts are very disproportionate to luck and glide ratio. The pilot's ability is the dominating factor; performance is important also, but not to the point where it becames financially or structurally out of balance, or requires too much maintenance.

It would seem then that a soaring craft of, say, 36 or 38 to 1 glide

ABOUT THE AUTHOR

Vic Saudek, 45, saw his first sailplane in 1932 at the Haller-Hirth Co. at Pittsburgh, Pa. He attended the 4th (1933) U.S. Nationals as crew member for Martin Schempp and has remained active in soaring since then. After graduation from Carnegie Institute of Technology in 1939 as a mechanical/aeronautical engineer he worked for a couple of months with Stan Corcoran at Frankfort, Mich., then moved to North American Aviation, Pratt Read, All American Engineering, Ludington Griswold and Hughes Aircraft Co. His experience ranges from toys to warheads from airplanes to guided missiles to mining machinery.

He was project supervisor of the Sierra Wave Project, and also directed and edited the SCSA Strato Sailplane report. In 1956 he presented a paper on strato sailplanes at the VIth OSTIV Congress at St. Yan, France. For the past seven years he has done consulting engineering, is slowly developing his Lenticularis line of sailplanes with a couple of other enthusiasts.