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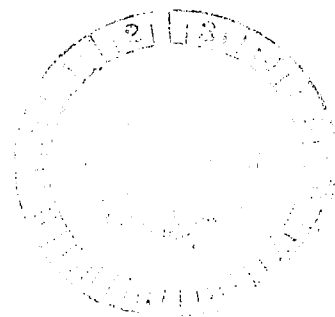
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Pilot Evaluation of Sailplane Handling Qualities

A. G. Bennett, Jr.

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Pilot Evaluation of Sailplane Handling Qualities

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Langley Research Center
under Grant NSG-1284



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1. INTRODUCTION

The performance of competition sailplanes as measured by maximum lift to drag ratio ($L/D_{\max}$) or average cross-country speed has shown a steady improvement with time as shown in Figure 1 (Reference 1). This performance improvement has been due to the continual evolution of airfoils and of fiberglass and metal structures to achieve low drag and high aspect ratio wings. The quest for high performance has had a profound effect upon the handling qualities of sailplanes. The increased $L/D_{\max}$ has increased the range of flight speeds. To minimize the trim drag, the static stability margin has been decreased which has increased control sensitivity and decreased pitch control force gradients. The very slender wing and fuselage structures have also introduced aeroelastic effects upon the sailplane control response characteristics.

There has been some concern voiced about the trends in high performance sailplane handling qualities. Poor handling qualities generally result in increased pilot workload which may compromise flight safety. Thus there is a strong interest in determining whether the current trends in sailplane performance improvement can continue while at the same time a high level of flight safety can be maintained.

The primary objective of this study was to make a qualitative evaluation of all aspects of high performance sailplane handling qualities and to define areas which require further study. To accomplish this objective at a modest cost, a round-robin flight evaluation of several sailplanes by several test pilots was conducted. The Cooper-Harper Rating Scale and pilots' comments

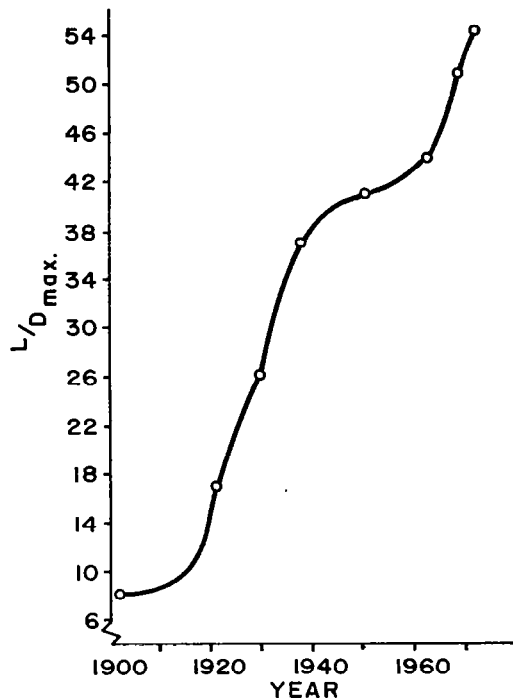


Figure 1. $L/D_{\max}$ Versus Time

were to be used to evaluate the sailplane handling qualities. The specific objectives of this study were:

1. Using the Cooper-Harper Rating Scale and pilot comments investigate the handling qualities of high performance sailplanes.
2. Obtain pilot opinion of handling quality characteristics to assist the formulation of airworthiness standards.
3. Develop a data base of pilot opinion which would be of value in the design of future sailplanes.
4. Delineate areas which warrant more quantitative study.

The development of high performance sailplanes has evolved in discrete stages with several sailplanes vying for the market at each stage. Thus it was determined that if the sailplanes developed since the early 60's were arranged into groups, then one sailplane from each group should be chosen for the evaluation session. The sailplane grouping logic is given as follows:

- Group 1: Borderline between utility and racing class, L/D_{max} mid 30's.
- Group 2: First sailplanes to use fiberglass structures. Represents technology in the late 60's. Most have camber changing flaps and/or drag chute.
- Group 3: Sailplanes developed in early 70's. Most numerous class in USA today, hence important.
- Group 4: Sailplanes developed during mid 70's. Just becoming available in substantial numbers. Most have landing flaps.
- Group 5: Very high performance, $L/D_{max} \approx 50$. Effect of large span on handling can be established by this class.
- Group 6: High performance two place. Used in transition to high performance single place sailplanes.

Test pilots for the flight session were chosen from NASA, FAA and the soaring community to ensure that a wide range of pilot backgrounds would be brought to bear upon the sailplane handling quality evaluations.

The text which follows describes the evaluation session and presents the analysis of the pilot opinion data. Chapter 2 describes the sailplanes, pilots and the flight session. Chapter 3 presents the analysis of the pilot

ratings and comments. The evaluation questionnaire, pilot ratings, and pilot comments are presented in the Appendices.

The sailplane owners are due a special thanks for lending their sailplanes for the flight test session. They were Mr. John Thompson, McCrory, Arkansas; Mr. Lanier Franz, Roanoke, Virginia; Mr. Dave Lawrence, Starkville, Mississippi; Mr. Marion Griffith, Dallas, Texas; Schweizer Aircraft Corporation, Elmira, New York; and the Air Force Flight Dynamics Laboratory, Dayton, Ohio. Many members of the Soaring Society of America gave this project unstinting support. Mr. Howard Ebersole, Associate Director of the RASPET Flight Research Laboratory, provided excellent organizational support in the sailplane preparation and in the flight session. The departmental staff support for this project was as usual, superb.

2. SAILPLANE FLIGHT TEST SESSION DESCRIPTION

2.1 Introduction

The flight test session had to satisfy several requirements and constraints. The round-robin evaluation format required that six sailplanes and seven test pilots must be on site simultaneously. To accommodate the pilots busy flight schedules, the flight session was organized to conduct the flight activities necessary to acquire the required data in a maximum of 7 days. The session was scheduled for the early May period to avoid conflicts with the soaring season, and yet to have the possibility of encountering soaring conditions. In all respects, the flight session was a complete success. There were no problems acquiring the sailplanes, the weather during the flight session was perfect, the test pilots were very enthusiastic, and cooperative, and all operations were conducted safely.

2.2 Evaluation Sailplanes

Within the previously mentioned groups of sailplanes, a ranking was made to determine which one had characteristics of most interest to this investigation. At the same time, only sailplanes with standard approved type certificates were considered. The soaring community was most cooperative in supporting the acquisition of the evaluation sailplanes.

Sailplane 1. This sailplane was chosen since it represents the transition to higher performance ships. It has a fixed horizontal stabilizer with a fairly large chord elevator. The fixed gear is ahead of the center of gravity. The sailplane is equipped with schemmp-Hirth type divebrakes.

Sailplane 2. This sailplane is equipped with camber changing flaps which are inter-connected with the ailerons. The landing gear is retractable and is ahead of the center of gravity. The sailplane has schemmp-Hirth type divebrakes, and a very short, straight control stick. The sailplane is placarded against intentional spins.

Sailplane 3. This sailplane was selected from Group 3. It has an all-moveable horizontal tail and a control stick which curves slightly toward the pilot. The ship is equipped with retractable landing gear ahead of the center

Table 1
Sailplane Dimensional Parameters

Parameters	Units	Sailplane					
		1	2	3	4	5	6
Wing Span	m	15.0	15.0	15.0	15.0	20.3	17.4
Wing Area	m ²	12.40	9.48	10.00	9.64	14.40	16.72
Aspect Ratio		18.1	23.6	22.5	23.3	28.6	18.0
MAC	m	0.885	0.687	0.704	0.681	0.756	1.069
Max Weight	kg	299	300	300/390	299/422	445/580	649
Wing Loading	n/m ²	234.6	311.2	325.6/383	306.4/430.9	301.6/392.6	378.3
Root Chord	m	1.232	0.940	0.955	0.914	0.980	1.483
Tip Chord	m	0.394	0.343	0.368	0.373	0.350	0.483
Fuselage Length	m	6.680	6.198	6.350	5.842	7.290	8.153
Fuselage Width	m	0.584	0.610	0.635	0.584	0.610	0.813
Hor. Tail Area	m ²	1.65	1.04	0.99	1.00	0.99	2.03
Hor. Tail Span	m	2.819	2.395	2.408	2.032	2.408	3.200
Elevator c_f/c		0.42	0.28	1.00	0.56	1.00	1.00
Vert. Tail Area	m ²	1.13	1.06	0.84	0.78	---	1.43
L/D max (Handbook)		32	39	35.2	37	49	34
Fwd C.G.	% $\bar{c}$	20	25	26	27.8	29	25
Aft C.G.	% $\bar{c}$	40	52	47	38.2	45	38
I _{yy} (Approx.)	kg m ²	186	186	204	186	407	1178

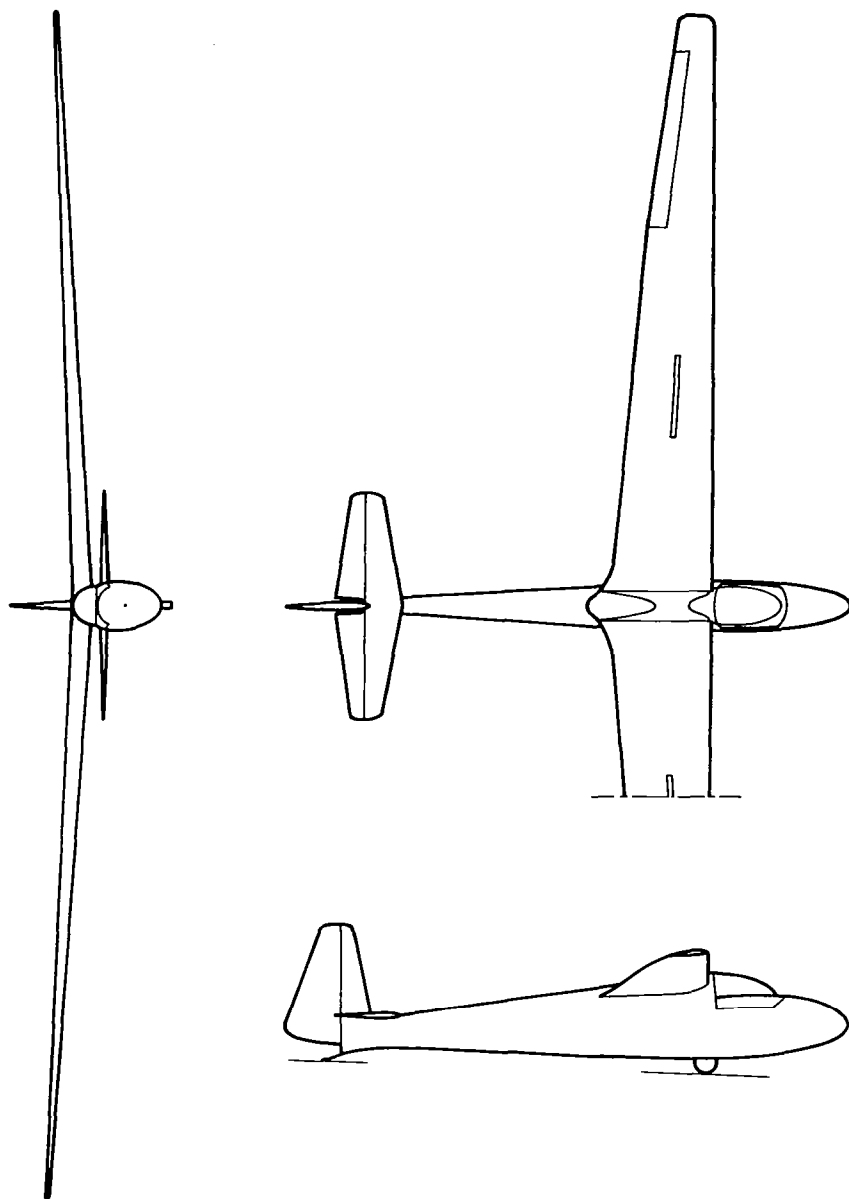


Figure 2. Three View of Sailplane 1.

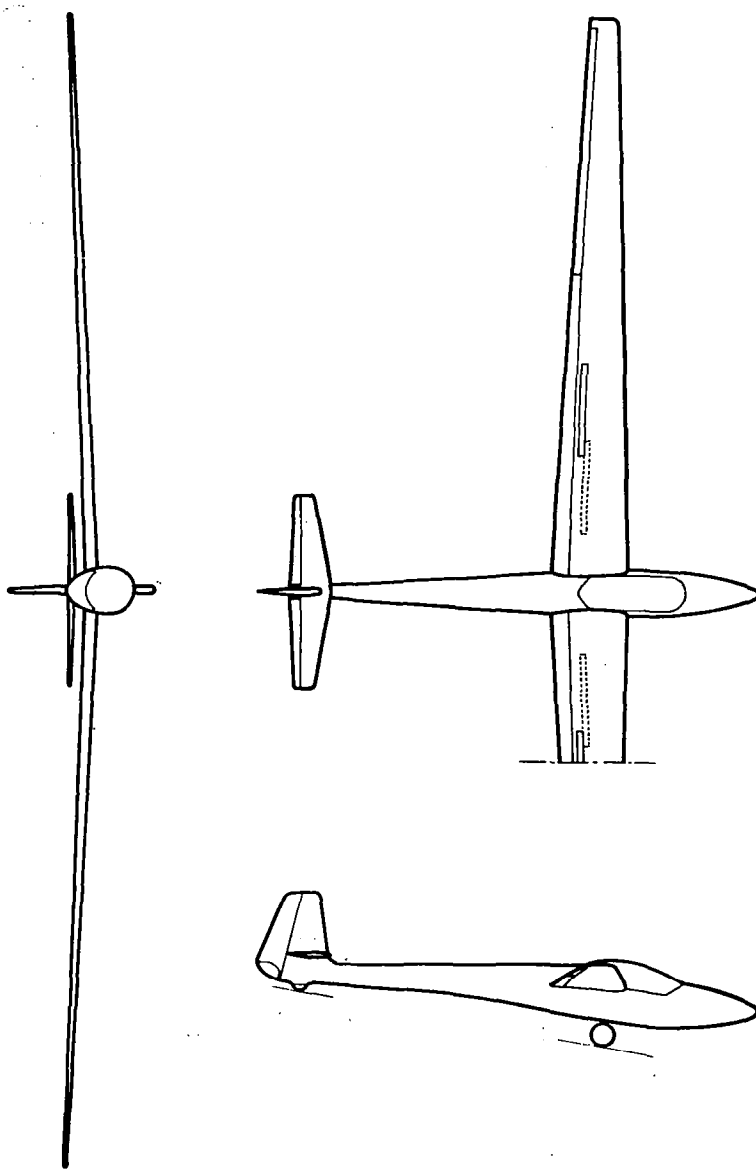


Figure 3. Three View of Sailplane 2.

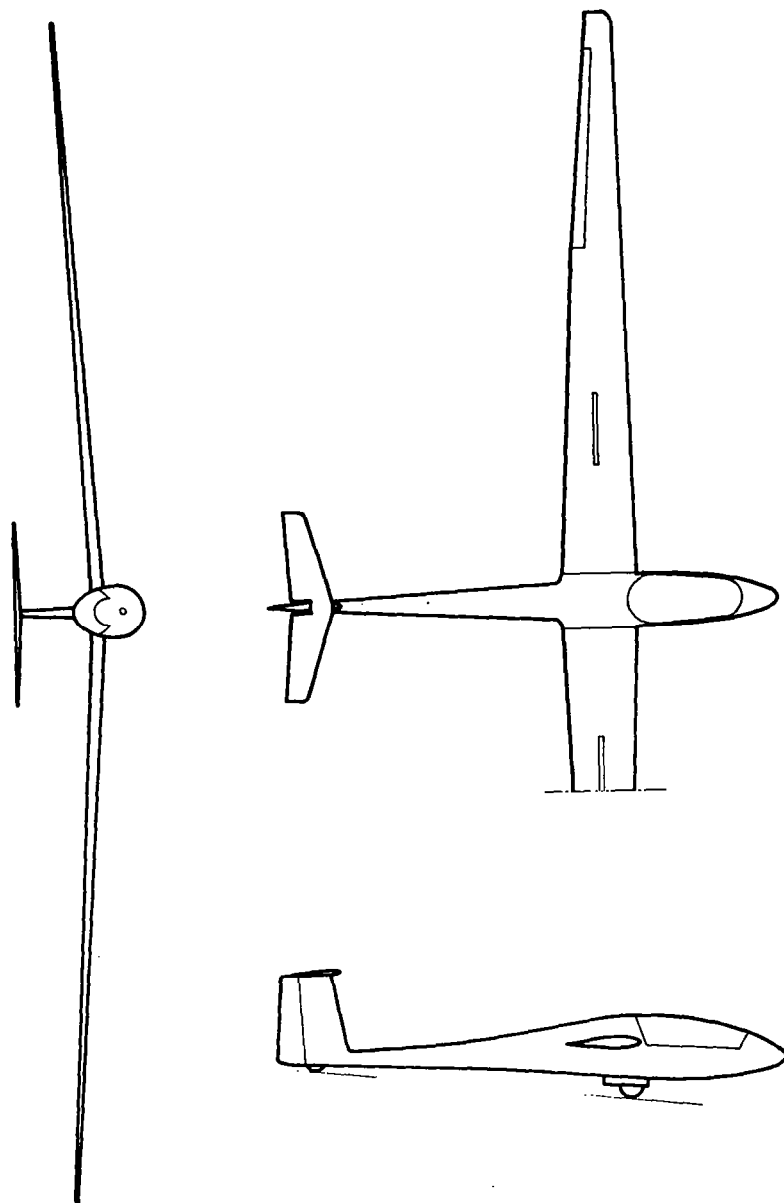


Figure 4. Three View of Sailplane 3.

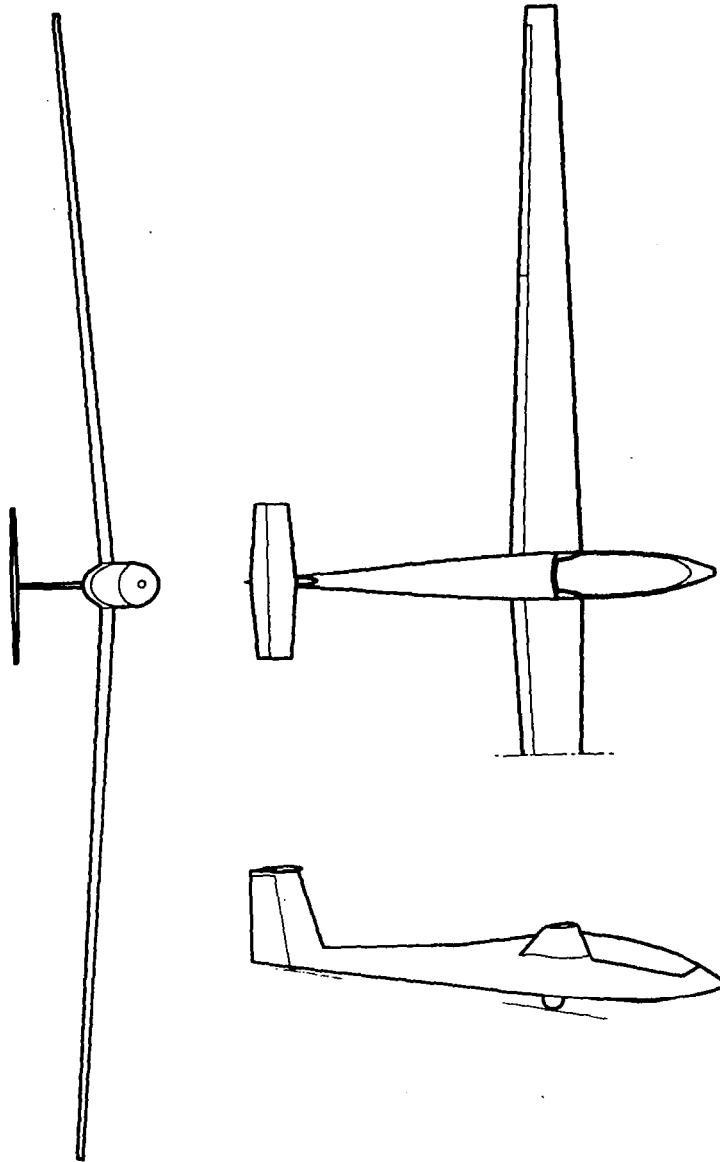


Figure 5. Three View of Sailplane 4.

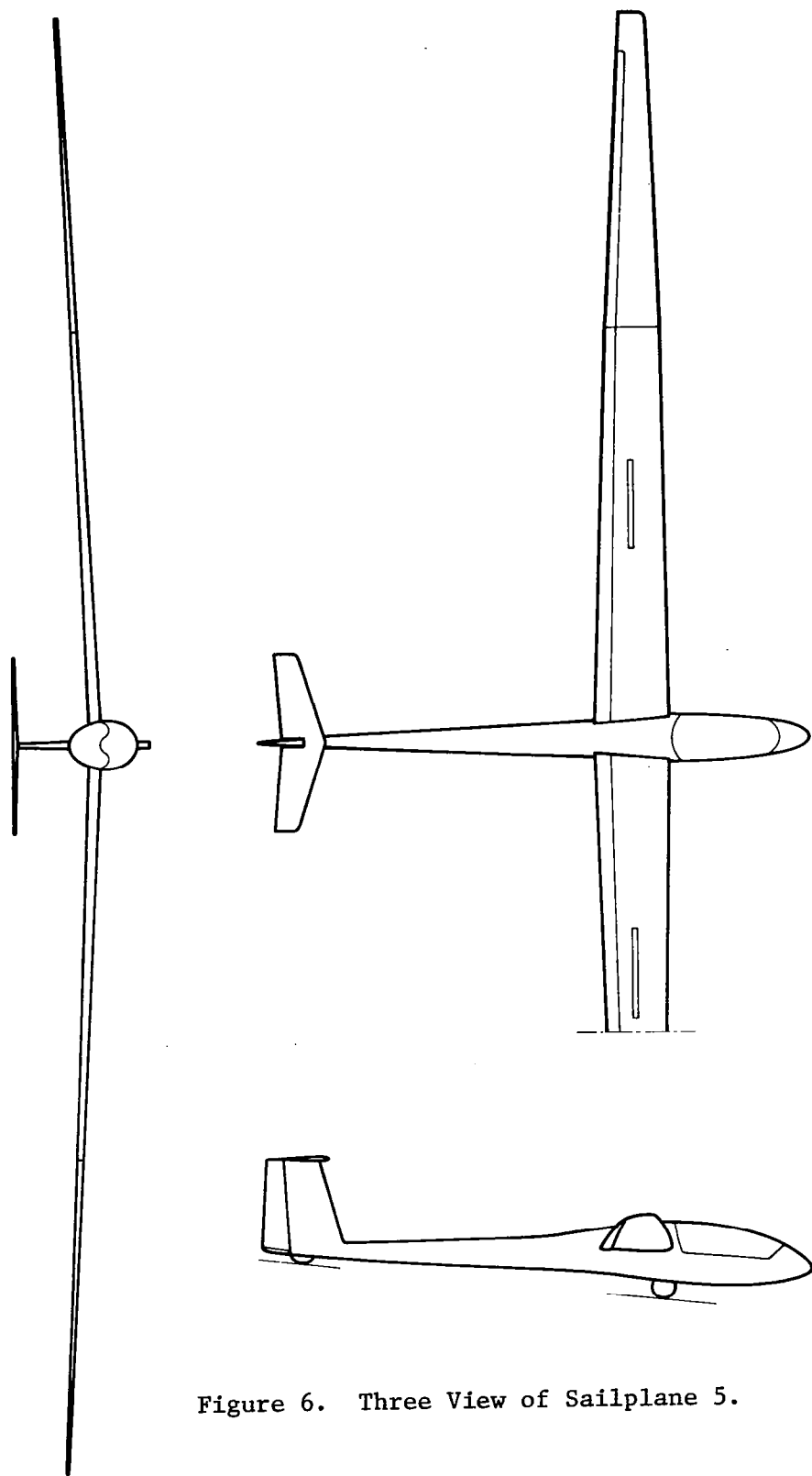


Figure 6. Three View of Sailplane 5.

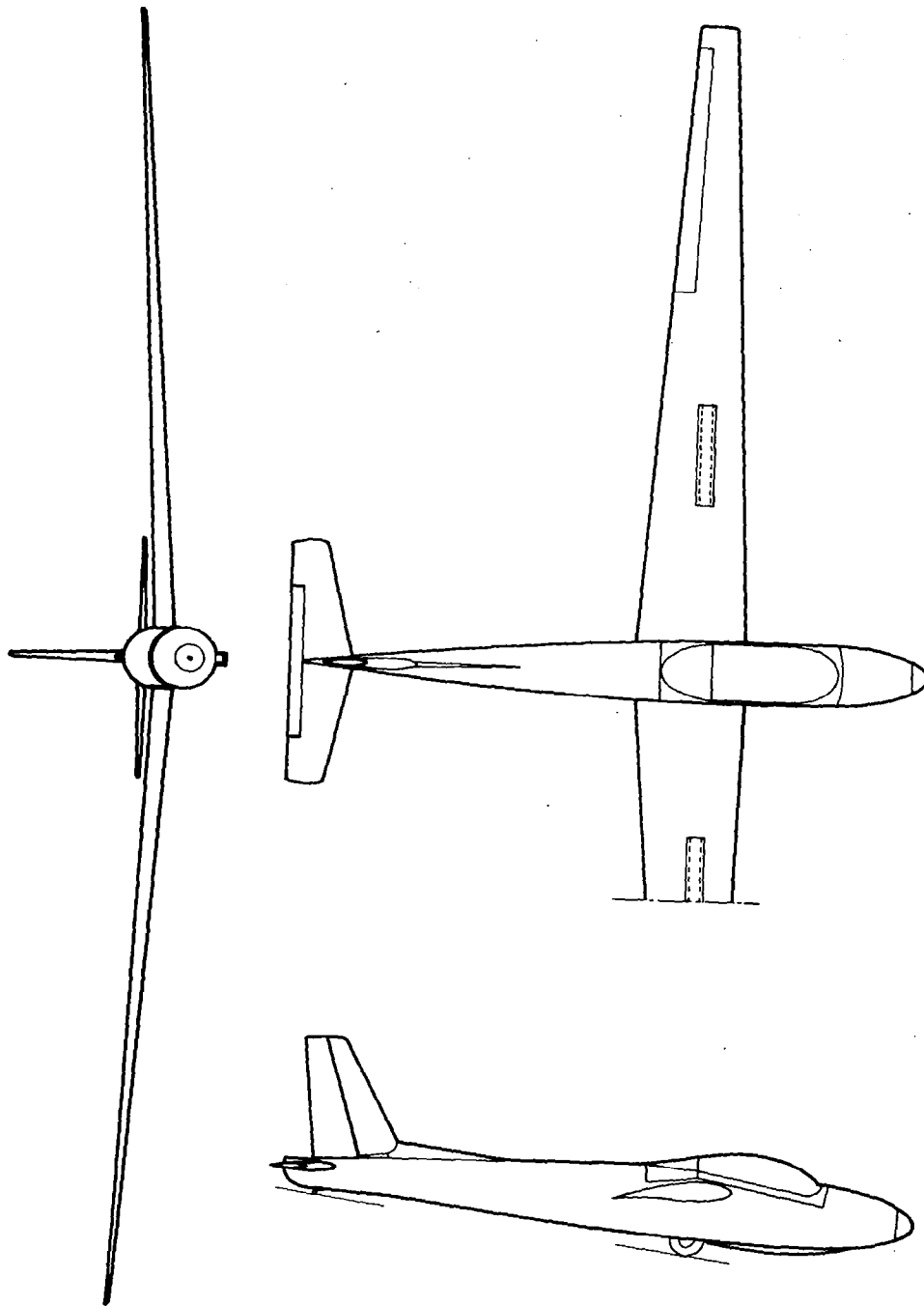


Figure 7. Three View of Sailplane 6.

of gravity, and has upper surface divebrakes. Intentional spins are prohibited with this sailplane.

Sailplane 4. This sailplane has a conventional fixed stabilizer and moveable elevator. The retractable landing gear is located slightly behind the center of gravity. The camber changing flaps, interconnected with the ailerons, can be positioned up to 90 degrees for landing.

Sailplane 5. This ship had the largest wing span among the evaluation sailplanes. The horizontal tail, control stick and landing gear arrangement was identical to that of sailplane 3. This ship is equipped with camber changing flaps interconnected with the ailerons, and with upper surface divebrakes.

Sailplane 6. This sailplane represented a typical, fairly high performance two seater. It features a fixed landing gear, an all moveable horizontal tail equipped with anti-servo tab and large counterbalanced dive brakes.

A three-view drawing of each sailplane is shown in Figures 2 through 7, and the principal geometric characteristics are presented in Table 1.

In general, each sailplane was in excellent mechanical condition. Since in some of the ships intentional spins were prohibited and/or some of the ships were not equipped with water ballast or drag chutes, the effect of these three-factors on the overall sailplane handling qualities was not evaluated.

2.3 Evaluation Pilots

Each evaluation pilot is affiliated with one of the following organizations: Soaring Society of America, Inc., the Federal Aviation Administration and the National Aeronautics and Space Administration. Table 2 indicates the number of flight hours as pilot in command of each pilot. Two of the pilots were professional experimental test pilots and had considerable experience with the Cooper-Harper rating scale. Four of the seven pilots had considerable sailplane cross-country and competition flying experience. Preceding the flight test sessions, these four pilots were asked to describe to the rest of the group in detail what they conceive to be the flight role or mission of

a high-performance sailplane. Thus, all of the pilots had a clear understanding of the broad mission for which this class of aircraft is designed.

Table 2
Evaluation Pilot Flight Experience

Aircraft Type	Pilot						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Sailplane	6500	1500	700	30	20	1500	20
SEL	500	500	200	600	200	1000	2450
MEL		1800		2600	3800	5000	1250
Jet Fighter		2500			1000		1500
Jet Transport		450		7000	3500	4000	550
Helicopter		50					250

2.4 Flight Session Preparation

To achieve the objectives of the evaluation session, several tasks were conducted prior to the session. An overriding consideration was the round-robin format for the session which required six sailplanes and seven pilots to be brought together for a one week period. Since the pilots were available for a limited time, it was most important that the sailplanes be properly prepared in advance of the session. A constraint upon the session date was that it must occur early in the year so that the borrowed sailplanes would not be away from the owners during contest activities.

The session data was scheduled for May 1 thru May 6, 1976, so that University students could assist in the flight operations. With the grant awarded February 16, 1976, this session date would allow time for sailplane acquisition, pilot selection, sailplane checkout, instrumentation development and flight session planning. The schedule was tight but all objectives were accomplished.

The acquisition of the sailplanes was found to be much easier than anticipated. A few phone calls to members of the soaring community quickly revealed that the sailplanes of interest were available in the southeastern region of the U.S. The owners were most interested in assisting in this investigation.

Prior to the flight session, all sailplanes except 4 and 5 were acquired with sufficient time for a thorough inspection, airspeed calibration check, and weight and balance check. Sailplanes 4 and 5 were delivered by evaluation pilots and had prior checkout.

Sailplane 6 was acquired early and was used as a testbed for formulating the evaluation tasks and for the development of a simple sailplane data acquisition system. A battery powered signal conditioning unit was developed to give a digital display of either stick position or stick force to the pilot. It was found that small low friction potentiometers could be quickly attached to the sailplane control linkages, but the press of other flight activities and difficulties with pilot data recording limited the utility of quantitative data recording during the flight session. The stick forces were too low for the stick force balance borrowed from Dryden Flight Research Center and also the balance was too bulky for high performance sailplane control sticks.

2.5 Flight Session

The flight session was conducted May 1 through May 6, 1976. The weather was ideal throughout the session with a wide range of convection conditions present. The pilots were allowed to fly each of the ships as required to complete the evaluation questionnaires. Cassette recorders were used to record inflight comments to be used later during the evaluations. A maneuver list was supplied to further support the evaluation.

A total of ninety-eight flights were made for a total of 80 flying hours. The sailplane evaluation forms were completed during the session to maximize evaluation effectiveness. The pilots were most cooperative and willing to participate. The session was very flight intensive, yet all objectives were accomplished without any mechanical or safety problems.

2.6 Pilot Opinion Sampling Instruments and Data Presentation

The primary objectives of this study were to (1) obtain pilot opinion of the handling qualities of current high performance sailplanes, (2) to aid in the formulation of certification criteria, (3) to provide some guidance in future designs, and (4) to delineate areas which require further study. The most cost effective method to accomplish this task was to stage a round-robin

flight session in which seven test pilots evaluated six sailplanes representing distinct groups. The detailed sailplane handling quality pilot opinion data was obtained with a questionnaire which used the Cooper-Harper Rating Scale and pilot comments.

Questionnaire I (Appendix A) was designed to record the pilot's rating and comments of the sailplanes' handling qualities, design and cockpit layout. Each test pilot completed a questionnaire for each sailplane that he flew. The questionnaire was configured to evaluate the pilots' opinion of the sailplane handling qualities over the entire operating envelope from takeoff to landing. Specifically, each flight consisted of a tow to an altitude of 2700 or 3300 meters (AGL) depending on the pilot's preference. Evaluation tasks in smooth air were carried out before the flight reached lower altitudes (1000-1200 meters AGL) where convective conditions were usually encountered. On the average, the duration of each flight was 45 minutes, although some thermalling flight evaluations lasted as long as two hours. Evaluations were made in both smooth air and in thermalling flight to determine if there were any significant pilot opinion differences between the smooth air test conditions and the usual operational environment, that is under convective conditions. A set of maneuvers listed in Table 3 was flown by each pilot to provide a basis for the evaluations. The pilots made comments on cassette recorders during each flight and these comments were transcribed by the pilots to the questionnaires. The questionnaire included evaluations of the design and cockpit layout.

The Cooper-Harper Rating Scale (Reference 2), widely used in the evaluation of handling qualities of powered aircraft, was adopted for this questionnaire. The attractive feature of the Cooper-Harper Rating Scale, Figure 8, is the decision tree structure which guides the pilot to a number for his rating value. For this initial study, the interpretation of the rating scale was broadened to be used in the evaluation of such sailplane characteristics as ease of assembly, inspection, and cockpit layout. The key to this interpretation was the assumption that the pilots would compensate for deficiencies in the design as they would for deficiencies in flight stability and control. It should also be noted that only two of the seven pilots had extensive previous experience with the Cooper-Harper rating scale.

Table 3
Evaluation Flight Tasks

A. Smooth Air Maneuver List

1. Evaluate take-off roll.
2. Evaluate tow characteristics; box tow plane.
3. Release, slow flight, stall entry, general characteristics.
4. Attain and maintain constant IAS:50-70-90 kts. Evaluate trim capability over speed range. Note friction, noise, and vibration level.
5. Evaluate return to trim at 60 and 90 kts IAS.
6. Evaluate stick free stability. Trim at 60 and 90 kts. Introduce 5 kts airspeed perturbation and release stick. Note rate of convergence or divergence, time period of oscillation.
7. Evaluate stick position and force gradients over speed range. Trim at 75 kts, decelerate slowly to near stall then accelerate to 100 kts.
8. Evaluate pitch altitude response to small stick pulses over speed range especially at high speed (may be combined with Item 7).
9. Evaluate stick forces during pull up from high speeds.
10. Time roll rate during turn reversal (from 45° to 45° bank) at min. sink speed and at 65 kts. Evaluate ease of maintaining constant airspeed and coordination (zero sideslip).
11. Evaluate steady sideslip. Note force levels during rudder over-balance.
12. Evaluate constant g turn, 45° bank, 60 kts, L and R.
13. Evaluate constant g turn, 60° bank, 70 kts, L and R.
14. Evaluate flight path control system, pattern, flare characteristics, ease of touchdown control, landing roll.

B. Convective Flight Maneuver List

1. Evaluate takeoff, possibly crosswind effects, and tow characteristics in turbulence.
2. Evaluate stall/spin (incipient spin only) characteristics. Note onset of pre-stall buffet.
3. Thermalling characteristics
 - a. Low speed turns
 - b. Stall-spin susceptibility, recovery
 - c. Control characteristics near other aircraft
4. Interthermal flight evaluation. Fly at max L/D speed plus 10 kts and at rough air airspeed or 100 kts IAS (whichever is lower).
5. Evaluate handling during secondary task.
6. Evaluate glide path control, touchdown and rollout characteristics in turbulence.

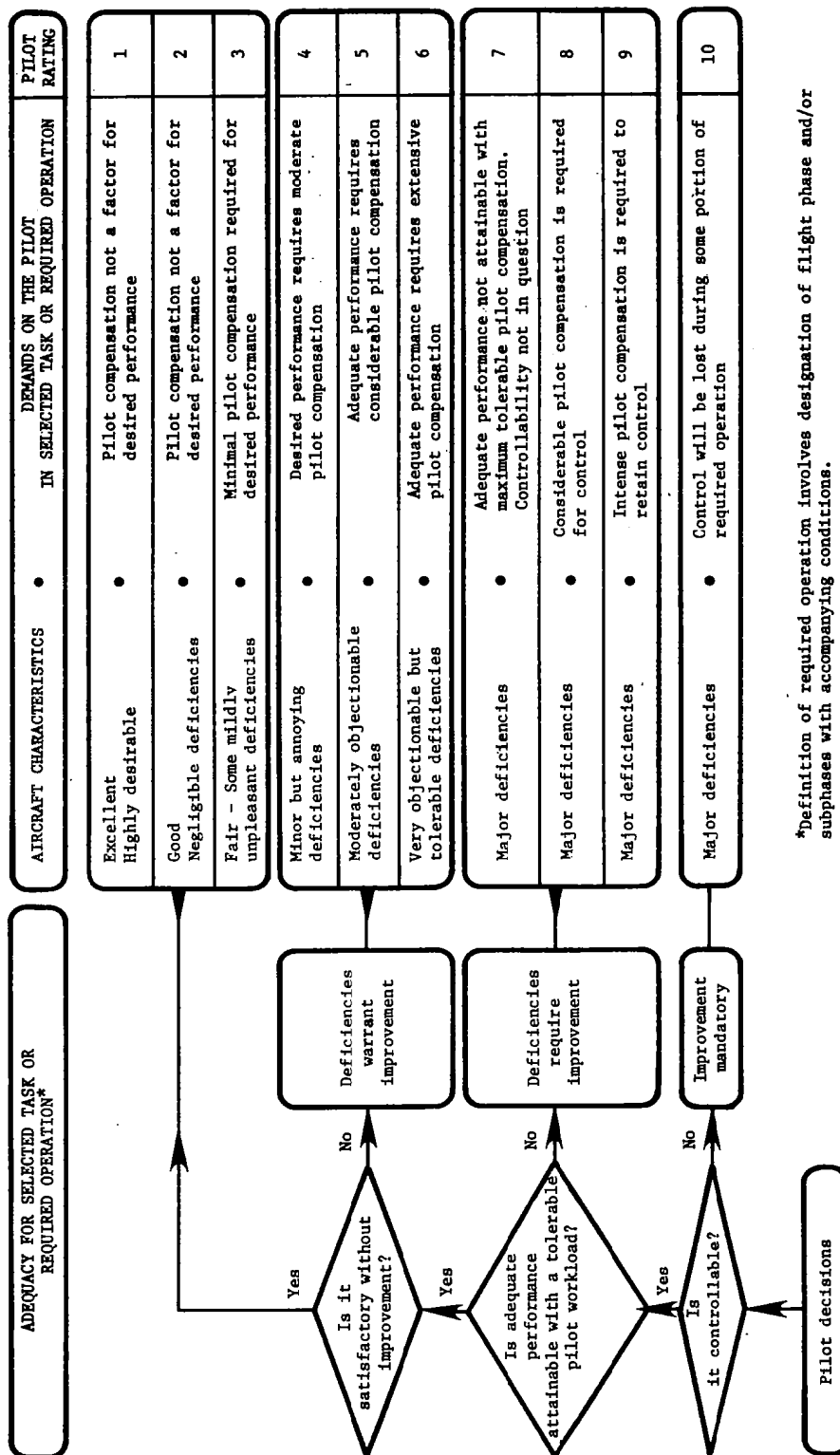


Figure 8. Cooper-Harper Rating Scale

Consequently, the other pilots had a tendency to use the Cooper-Harper Scale as a linear interval scale.

After the flight session was completed, the Cooper-Harper ratings and pilots' comments for each task of Questionnaire I were transcribed into a data file on the university mainframe computer to facilitate the analysis and presentation of the data. The Cooper-Harper Rating Scale, is not a linear scale, thus statistical techniques do not strictly apply. However, averages and standard deviations were computed to gain some measure of the consensus of pilot opinions. An average and standard deviation of all sub tasks for each pilot were computed to allow correlation of the average of sub tasks ratings with the major task rating. The pilots' responses to Questionnaire I are given in Appendix B. The format adopted was to group the responses of all pilots for all sailplanes covering a major area of interest such as longitudinal handling, etc. Extreme caution should be exercised in drawing conclusions from the numerically averaged ratings. As can be seen from the individual pilot ratings, different pilots used different standards of acceptance.

3. RESULTS AND DISCUSSION

3.1 Pilot Rating Summaries

The Cooper-Harper Rating Scale is a valuable tool in the evaluation of aircraft handling qualities. To provide a measure of the variability of the pilot's assignment of ratings, averages and standard deviations for each task were computed for each sailplane. Again, it must be emphasized that the Cooper-Harper Rating Scale is non-linear and thus statistical methods do not strictly apply. Table 4 presents a summary of the average and standard deviation of all pilot ratings of a task for each sailplane. These average readings should not be directly compared with the levels of acceptability shown on the Cooper-Harper scale, but are rather a gross indication. Average Cooper-Harper ratings greater than 3.5 (with no specific meaning attached) have been underlined to delineate areas where problems were noted by most of the pilots. The standard deviations are a measure of the variation in the pilot's rating of a particular task.

Pilot rating numbers without their accompanying pilot comments are of very little value. The individual pilot ratings and comments furnished in Appendix A are rather formidable in their volume and scope. The numerical summaries of Table 4, rather than being accepted by the reader at their Cooper-Harper rating scale face value, should be used as a guide to point out sections of particular interest in the appendix pilot rating information.

Sailplanes 4 and 6 received poor ratings in construction and rigging. Sailplanes 4 and 5 rated down in cockpit layout, sailplanes 3 and 5 in longitudinal handling qualities, and sailplane 6 in stall/spin characteristics. Sailplanes 3, 4, and 5 were given poor ratings in landing characteristics, and sailplane 6 in circling flight. Sailplane 1 received consistently higher ratings than all other aircraft, in every rating category, and was often cited as a benchmark of excellence for sailplane handling qualities. To gain more than this superficial information, the reader must refer to the individual pilot comments in the above areas, which provide an understanding of the reasons for the ratings.

Table 4. Rating Summary for Sailplanes

SAILPLANE													
TASK	1			2		3		4		5		6	
	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	
1	I. Design	2.50	.50	2.00	.71	2.00	.71	2.00	.71	5.00	1.00	4.50	2.50
2	A. Pilot Opin. of Const. Rigging	2.00	1.00	1.37	.41	2.25	.43	4.50	.50	1.88	.22	5.50	1.50
3	1. Ease of Inspection	3.00	.82	1.50	.50	2.75	1.30	2.50	.50	1.75	.43	3.00	.00
4	2. Safety of Control System	2.00	.00	2.50	1.12	1.75	.43	3.50	1.50	1.75	.43	2.00	.00
5	3. Ease of Assembly	2.33	.47	1.25	.43	1.75	.43	5.00	1.00	2.00	.00	6.00	1.00
6	B. Pilot Opinion of Cockpit Layout	3.60	.49	2.60	.80	1.80	.75	4.25	1.48	1.70	.60	2.00	1.00
7	1. Pilot Comfort	3.29	.88	2.14	.99	1.14	.35	2.33	.75	1.40	.49	1.67	.75
8	2. Control System Arrangement	3.29	1.39	2.71	.70	3.00	1.41	4.80	1.60	2.75	1.48	2.67	.94
9	3. Instrument Display	2.57	.49	2.33	1.11	1.50	.50	2.00	.63	1.60	.49	2.80	.75
10	4. Pilot Visibility	3.29	.88	1.43	.73	1.86	.73	1.83	1.07	2.00	.89	1.67	.47
11	5. Pilot Safety	2.75	.83	3.50	.50	3.50	1.12	1.60	.49	3.75	1.30	1.00	.00
12	II. Smooth Air Maneuvering	1.12	.22	2.40	.49	2.33	.47	2.00	.00	3.00	1.26	1.25	.43
13	A. Pilot Opin. of Initial Takeoff Roll	1.67	.94	2.75	.99	2.57	.73	2.67	1.60	3.20	1.17	1.80	.75
14	1. Towline Hookup	1.60	.49	2.17	.69	2.33	.94	1.17	.37	2.40	1.02	2.00	1.00
15	2. Control of Plane in Init. Roll	1.79	1.19	3.14	.99	2.57	.73	2.00	.58	3.20	1.17	1.83	1.07
16	B. Pilot Opinion of Tow	1.37	.41	2.20	.75	2.50	.50	2.20	.40	3.50	1.26	1.50	.50
17	1. Ease of Maintaining Position	1.43	.73	2.29	.70	2.29	.70	2.00	.00	2.80	1.33	1.67	.75
18	2. Aircraft Trim	3.50	1.34	2.57	.73	2.43	.49	2.50	1.26	2.20	.40	2.40	1.02
19	3. Control in Propwash	1.43	.73	2.14	.64	1.86	.64	2.17	.37	2.50	1.12	2.00	1.00
20	4. Release Characteristics	1.50	.50	1.67	.47	2.17	.69	1.80	.75	1.75	.43	1.83	.69

Table 4 (Continued)

TASK	SAILPLANE											
	1	2	3	4	5	6	1	2	3	4	5	6
	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV
C. Pilot Opinion of Long-Handling	1.25	.43	2.60	.49	4.10	1.11	3.20	.75	4.20	1.33	2.67	.94
1. Ease of Est & Main Con Airspeed	1.57	.90	2.43	.73	2.29	.45	2.67	.47	2.40	.80	2.00	.58
2. Plane Trim Sys. Over Speed Range	3.86	.64	3.00	.53	2.33	1.25	2.33	.94	2.60	1.20	2.60	1.02
3. Pitch Sensitivity	1.29	.45	2.29	.45	2.71	.70	2.17	.69	3.20	1.17	1.67	.47
4. Stick Force Gradient	1.57	.49	2.14	.99	2.29	1.03	3.17	1.07	2.80	1.17	2.33	1.25
5. Stick Fixed Stability	1.25	.43	1.50	.50	2.25	.43	2.00	.00	2.00	.00	2.00	.63
6. Stick Free Stability	1.17	.37	2.29	1.16	3.43	2.77	2.17	.69	4.20	2.93	2.20	.40
7. Return to Trim	1.83	.69	3.17	1.07	3.80	3.19	1.40	.49	4.25	3.42	1.80	.75
8. Maneuvering Response	1.29	.45	2.86	.35	2.71	.88	2.17	.90	3.60	1.62	2.00	.58
9. Phugoid Characteristics	1.60	.49	2.83	.69	5.29	2.60	2.40	.49	5.40	2.58	2.00	.00
10. Dive Recovery	1.71	.45	2.71	.88	4.00	2.00	2.20	.98	3.30	1.78	2.00	.00
D. Pilot Opinion of Lateral Handling	1.00	.00	2.80	.75	2.20	.51	2.20	.40	2.60	.80	2.00	.00
1. Aileron Force Gradient	1.43	.49	2.14	.64	1.86	.64	2.17	.37	2.20	.40	2.00	.00
2. Rudder Force Gradient	1.43	.49	1.86	.83	2.29	1.03	2.17	.37	2.60	.49	2.17	.37
3. Roll Rate over Speed Range	2.00	.93	2.14	.35	1.86	.64	2.58	.45	3.30	1.08	2.50	.76
4. Sideslip Characteristics	2.00	.76	2.83	.69	2.86	.64	2.17	.90	2.80	.75	2.60	.49
5. Ease of Turn Entry	1.29	.45	2.71	.70	1.86	.64	2.00	.58	2.60	1.02	2.20	.75
6. Yaw Due to Aileron	2.00	.58	2.67	.75	2.17	.69	2.40	.80	3.00	1.55	2.50	.50
7. Yaw Due to Roll	2.00	.63	3.40	.49	2.20	.75	2.25	.83	2.00	.00	2.33	.94
8. Ease of Main. 45° Bank Turn	1.43	.73	1.86	.64	1.64	.69	2.00	1.00	1.20	.40	2.58	1.24
9. Ease of Main. 60° Bank Turn	1.57	.73	2.14	.64	1.93	.78	2.00	1.00	1.60	.49	2.83	1.07
E. Pilot Opin. of Plane Stallspin Char.	1.88	.74	2.20	1.60	2.40	1.02	3.00	.63	2.20	.75	4.33	1.25
1. Rudder, Aileron Effect Dur. Stall	2.00	.53	1.12	1.12	1.86	.64	2.33	.75	2.00	.63	3.00	1.15
2. Stall Warning	2.43	.49	2.71	1.39	2.43	.90	2.50	.76	2.20	.98	2.33	1.25
3. Aggravated Stall-Tend to Spin	2.00	1.00	2.14	1.73	2.57	.90	3.00	.58	2.20	.98	4.00	1.15
4. Stick Force Gradient	1.57	.73	2.00	.76	2.57	.73	2.00	1.00	2.60	.49	2.33	1.25
5. Stall Recovery, Altitude Loss	1.33	.47	1.67	.75	2.14	.64	1.80	.75	1.80	.75	3.67	1.89
6. Spin Entry	1.75	.83	3.00	1.41	2.33	.94	2.67	.47	2.00	.71	4.50	1.12
7. Spin Recovery	1.00	.00	1.50	.50	2.00	1.00	1.50	.50	2.50	.50	2.00	1.00
8. Stall From Turn at Low Speed	1.50	.50	1.86	1.12	1.67	.47	2.25	1.09	2.00	1.10	4.00	2.52

Table 4 (Continued)

SAILPLANE												
TASK	1		2		3		4		5		6	
	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV
F. Pilot Opin. of Plane Landing Char.	1.70	.40	2.75	1.30	3.20	.40	3.50	.50	2.90	.66	2.33	.47
1. Pilot Visibility	2.57	.90	1.43	.73	1.43	.49	1.50	.50	1.40	.49	1.00	.00
2. Glide Slope Control	1.57	.73	3.00	.93	2.57	.49	2.67	.47	2.40	.49	1.33	.75
3. Airs. Control, Airb. Ease of Mod.	2.14	.99	3.14	.99	3.14	.35	4.08	.61	2.60	.49	1.60	.80
4. Ease of Land. at Intended Spot	1.57	.49	2.57	.73	2.57	.73	3.87	.40	2.40	.49	1.50	.50
5. Ease of Control, Sink at Touch	1.50	.50	2.29	.88	2.43	.49	2.54	.85	2.40	.49	1.80	.40
6. Control During Rollout	1.43	.73	2.57	.73	4.00	2.38	1.67	.47	4.00	1.26	1.33	.47
III. Flight Characteristics in Convection	1.00	.00	2.50	.71	2.60	.49	2.62	.41	3.20	1.17	3.00	1.22
A. Pilot Opinion of Tow	1.50	.76	2.42	.84	2.42	.61	2.00	.00	3.87	1.43	2.25	.43
1. Ease of Maintaining Position	1.33	.75	2.50	.96	2.50	.50	2.00	.00	3.00	1.22	2.00	.00
2. Response to Vertical Currents	1.83	.69	2.50	.50	2.83	.69	2.00	.00	2.50	.50	2.00	.00
3. Release	1.80	.40	1.75	.43	2.00	.63	2.33	.47	2.00	.82	2.00	.00
B. Pilot Opinion of Circling Flight	1.00	.00	2.40	.97	2.00	.00	2.87	.74	2.30	.75	4.33	2.62
1. Low Speed Handling	1.17	.37	2.83	.90	2.00	.58	2.75	.83	2.40	.49	5.00	2.16
2. Stall-Spin Susceptibility	1.75	.38	2.33	1.37	2.00	.58	2.37	.41	1.60	.49	5.33	2.87
3. Ease of Centering Thermal	1.83	.69	2.33	.75	2.00	.58	2.75	.43	2.75	1.09	3.33	.47
4. Speed Control	1.50	.50	2.17	1.21	2.33	.47	3.25	1.09	2.20	.98	4.33	1.25
C. Pilot Opinion of Cruising Flight	1.60	1.20	2.20	.98	2.60	.97	2.37	.65	2.20	.98	1.67	.47
1. Ease of Controlling Airspeed	1.67	1.11	2.17	.69	2.33	.94	2.37	.65	2.60	1.36	1.50	.50
2. Pull up into Thermal	1.67	.47	2.00	1.15	2.00	.82	2.87	.89	2.00	.63	2.50	1.50
3. Ease of Pref. Secondary Tasks	1.50	.50	2.50	1.12	3.00	.82	2.50	.50	3.20	1.94	1.50	.50
4. Ride Quality	2.17	.80	2.17	.37	2.25	.56	2.75	.43	1.80	.75	2.50	.50
5. Ease of Main. Straight Flight	1.40	.49	2.33	1.11	1.50	.50	1.75	.43	1.60	.80	1.75	.43

3.2 Pilot Evaluation of Ease of Assembly, Inspection and Cockpit Layout

Although these factors are generally not regarded as an essential part of handling qualities, as, say, longitudinal stability, all three characteristics do influence the ease and precision with which the pilot is able to perform tasks for the overall mission of the sailplane. In rating these characteristics, the pilots tended to disregard the dichotomous structure of the Cooper-Harper scale; instead, they were asked to rate these factors on a linear scale from one to ten. Also, three of the pilots did not rate the ease of assembly and inspection since the flight test session did not provide enough time for them to become familiar with these characteristics.

The pilots who rated the ease of assembly and ease of control system inspection generally gave better ratings to the newer machines. These pilot ratings also confirmed the fact that frequent assembly/disassembly is part of the high-performance sailplane role and the ease of assembly should be a very important design objective.

Pilot comments on the cockpit layout show that there were wide variations among the six evaluation sailplanes. The pilots found visibility was adequate in all ships. They singled out poor ventilation, the use of curved control sticks, confusing or unhandy secondary control handles (such as trim and flap handles), need for good pilot protection as areas of concern. The variety of adverse comments indicates the need of some sort of standardization for the location, shape and color of the secondary control handles.

3.3 Pilot Opinion of Longitudinal Characteristics

Takeoff. Average pilot ratings ranged from 1.8 for sailplanes 1 and 6 to 3.2 for sailplanes 2 and 5. Sailplanes 1 and 6 were generally the most stable, had the highest stick forces, and had strong damping of the short period pitching oscillation. Pilots commented that sailplane 2 was more sensitive in pitch than they liked, and that they tended to overcontrol in pitch during takeoff. On sailplane 5, pilots reported disliking the stick bobbing force and aft when rolling over bumps. One pilot felt it necessary to maintain greater ground clearance while he was airborne and waiting for the towplane to accelerate to takeoff speed than with other gliders and that wing flexing resulted in undesirable excursions in fuselage-to-ground

clearance. Although he gave a pilot rating of 2, one pilot noted that on sailplane 4, the longitudinal stick feel-and-trim spring system had high and unsymmetric breakout forces which caused him to overcontrol.

Tow. Again, pilot ratings were best for sailplanes 1 and 6, averaging 1.4 for 1 and 1.5 for 6. The worst average rating was 3.5 for sailplane 5. Pilots strongly objected to inertially induced stick forces, and reported overcontrolling, and a feeling that a serious PIO could occur. When the tow speed was increased from the standard 70 knots to 80 knots, the over-control/PIO tendency was reported more severe. One pilot reported he was unwilling to fly left-handed while raising the landing gear on tow. Sailplane 2 was reported easily upset in rough air, requiring frequent small control corrections. It received several pilot ratings of 3. Sailplane 4 was reported sensitive and easy to overcontrol, receiving pilot ratings of 2 and 3.

Establishing and Maintaining Airspeed. Establishing and holding speed was rated satisfactory for all sailplanes. It was reported by one pilot to be difficult to make fine speed corrections in sailplane 4 due to high breakout forces (his pilot rating was 2 however). For sailplane 5, one pilot reported that a pitch correction tended to continue past the intended point and had to be arrested by a checking control input, (his pilot rating was 4).

Longitudinal Trimming. The trim system on sailplane 1 was rated unsatisfactory. Comments were that it was ineffective and inconvenient. The trim system of every sailplane was reported as inconvenient to use, but only sailplane 1 was rated unsatisfactory. Comments indicated that pilots were content to fly without trimming rather than use inconvenient trim devices, except in the case of sailplane 6 in which stick forces became excessive.

Pitch Sensitivity. Sailplanes 3 and 5 received some pilot ratings of 4 and 5 for oversensitivity. Sailplanes 2, 3, 4, and 5 were described as sensitive, but 2 and 4 did not receive poor pilot ratings for sensitivity.

Stick Force Gradient, Stick Fixed Stability, and Stick Free Stability.

These were not tasks, but requests for opinions on the suitability of the listed characteristics. In the absence of quantitative data and since the pilot comments were rather general, the responses to these three requests for pilot opinion are broadly summarized: sailplane 1 was well liked; numbers 2, 3, and 5 were characterized as having light stick forces, bordering on too

light, while sailplanes 4, and, even more so, 6, were judged to have too-heavy stick forces.

Return to Trim. The pilots were satisfied with the return-to-trim characteristics of all sailplanes, giving pilot ratings of 2 to 3. An exception to this was pilot 1 who apparently excited the phugoid mode on this test and rated phugoid damping. Two pilots felt the task had no relevance to their opinion of a sailplane's handling qualities. Early NACA flying qualities tests by Gilruth (Reference 3) also showed that the tendency to return to trim speed was relatively unimportant for visual flight.

Maneuver Response. Opinions diverged on the maneuvering responses of the six sailplanes. Sailplane 1, 4, and 6 were well liked by all pilots, receiving mostly 1 and 2 pilot ratings. Sailplane 2 received mostly 3 ratings and comments giving the impression it was more responsive than the pilots liked. Sailplanes 3 and 5 got mixed opinions. Sailplane 3 was rated 4 and sailplane 5 rated 5 due to low or nil stick-force-per-g by some pilots. Delayed g response due to the flexible wing was reported to cause difficulty in stabilizing rapidly applied g by one pilot.

Phugoid Characteristics. This was not a flying task susceptible to pilot rating. Nonetheless pilots expressed their opinions of the suitability of the characteristic. Pilots were satisfied with the lightly damped or neutral stick-free phugoids of sailplanes 1, 2, 4, and 6, while some pilots objected to the strongly divergent stick-free phugoids of sailplanes 3 and 5. The divergent motions appeared to be caused by a dynamical interaction between the sailplane phugoid mode and the pitch control system.

Dive Recovery. Sailplanes 1, 4, and 6 were regarded as satisfactory. Sailplane 2 was given satisfactory pilot ratings, but several comments suggested that it was more sensitive than desired. Sailplanes 3 and 5 were rated unsatisfactory by some pilots who commented that the stick forces were too light, and sometimes reversed during pull-outs.

Ease of Centering Thermal, and Speed Control in Circling Flight. All sailplanes were rated satisfactory for these tasks. Comments indicated that the high stick forces and heavy stability of sailplane 6 caused an undesirably high workload in circling at varying bank angles as is typically done in thermalling flight. On sailplane 3, comments noted that the very low or negative stick-force-per-g was very pleasant to fly and felt immediately

natural and comfortable during the thermalling task. On sailplane 5 the same comments were made, and additionally that in an established thermalling turn the stick could be moved as much as 7 cm aft without appreciably affecting the turn. This later characteristic was not felt objectionable.

Table 5
Sailplane Longitudinal Stability and Control Characteristics

<u>Sailplane</u>	<u>Control Forces</u>	<u>Trim</u>	<u>Static Longi- tudinal Stab.</u>	<u>Stick-Free Short Per. Damping</u>	<u>Stick Force Per G</u>	<u>Perceived Sensitivity</u>
1	Aerodynamic + Spring	Spring	Moderate	High	Mod- erate	Moderate
2	"	"	Lo	"	Lo	High
3	Spring + Bobweight	"	"	"	Nil	"
4	Aerodynamic + Spring	"	"	"	Lo	"
5	Spring + Bobweight	"	"	"	Nil	"
6	Aerodynamic	Tab	High	"	Mod- erate	Moderate

Table 6
Summary of Opinions on Longitudinal Handling Qualities

<u>Sailplane</u>	<u>Takeoff and Tow</u>	<u>Straight Flight</u>	<u>Maneuvering & Dive Pull-Out</u>	<u>Thermalling</u>
1	Well Liked	Well Liked	Well Liked	Well Liked
2	Satisfactory	Satisfactory	Satisfactory	Satisfactory
3	Satisfactory	Well Liked	Satisfactory	Well Liked
4	Satisfactory	Satisfactory	Satisfactory	Satisfactory
5	Satisfactory	Well Liked	Unsatisfactory	Well Liked
6	Well Liked	Well Liked	Well Liked	Satisfactory

Table 5 summarizes the longitudinal stability and control characteristics of the sailplanes evaluated and Table 6 summarizes the pilot opinion of longitudinal handling qualities for primary flight tasks. Table 6 shows that longitudinal characteristics best liked for thermalling are less well liked for takeoff, tow, maneuvering, and dive pull-out. From Table 5 it appears that increased stability and reduced sensitivity are beneficial to the first three tasks while lower stability and greater sensitivity are desirable for the last task. Table 6 shows that all the sailplanes had satisfactory or better longitudinal handling qualities for normal flying and thermalling, and that all but one were also satisfactory for maneuvering and dive pull-out. This was not surprising since all of the evaluation sailplanes were commercially successful in series production.

3.4 Sailplane Lateral-Directional Handling Qualities

Sailplane performance growth has not influenced lateral-directional handling qualities as much as the longitudinal handling qualities, although both have been degraded. The only serious lateral-directional problem apparent in current high performance sailplanes is in takeoff and landing, where low roll control and rudder power can lead to loss of directional control, especially in crosswinds. One cause is the placement of the landing wheel ahead of the C.G., which increases weather cock tendencies. Another is a raised C.G. coupled with a further aft and lower placement of the tow line attach point, which introduces a significant rolling moment with sailplane heading/tow line misalignment. This problem warrants further study to better define controllability during takeoff and landing.

Although pilot comments did not reflect any serious inflight problems, improvement in lateral-directional handling qualities, such as roll response quickening, increased roll control power, and reduction in rudder coordination requirements, would enhance performance in soaring flight, due to the importance of quickly acquiring and centering the thermals and of reducing pilot workload. Informal discussions with the evaluation pilots, as well as reported pilot comments, support this conclusion. Pilot opinions were mostly in the "excellent" to "minor but annoying deficiencies" region (pilot ratings 1 to 4).

Sailplane 1 was "excellent" to "good" (pilot rating 1 to 2) in almost every area. Pilot comments emphasized the good control harmony between rudder and aileron and ease of rudder-aileron coordination. Spiral stability was neutral, which was noted as beneficial for thermalling flight.

Sailplane 2 pilot ratings ranged from 2 to 4, with many comments about high rudder coordination workload in maintaining ball-in-the-center flight, both in turns and turn entries as well as level flight. Inadequate rudder control power was cited, as evidenced by insufficient rudder to maintain balanced flight in moderate rate turn entries. Spiral stability was slightly negative in thermalling configuration, which increased rudder-aileron coordination problems. Lateral-directional characteristics for this sailplane could be summarized as distracting and irritating. One pilot commented negatively on pitchup with sideslip, which is peculiar to this sailplane.

Pilot ratings for sailplanes 3, 4, and 5 fell in the 1 to 4 range. In average overall pilot ratings, sailplane 3 was slightly better than sailplanes 4 and 5, but ratings for each sailplane showed different areas of emphasis, as indicated in the following paragraphs.

Sailplane 3 lateral-directional control harmony and coordination was good. Comments ranged from "no problem" to "pleasant". Comments showed, however, that sailplane 1 was better. A comment for sailplane 3 on aileron effectiveness was that ailerons remained very effective even below stall speed.

The only complaints for sailplane 4 were due to the requirement for considerable top aileron in turning flight and mild objection to coordination workload in lateral maneuvering.

Sailplane 5 received good to excellent ratings for its ease of control in maintaining desired bank angles in turning flight. Several pilots objected to its low maximum roll rate of about 15 deg/sec, about 5 deg/sec less than that of all the other sailplanes, though 2 pilots commented that roll rate was surprisingly good for a sailplane of this large a wing span. Other comments indicated that the rudder force gradient was too high and noted too wide a deadband around neutral for airplane response to rudder inputs.

Sailplane 6 was judged as a training sailplane, suitable for transitioning into high performance ships. In this context, it received very good ratings, except for ease of maintaining desired bank angles and for control near the stall. Concerning turning flight, pilots commented that rudder forces were

too high relative to longitudinal stick forces and that unintentional overcontrolling in pitch produced frequent pre-stall airframe buffeting. Lateral control near stall was poor due to decaying roll control power with airspeed decrease.

Rudder overbalance, or "rudder lock" was a characteristic common to sailplanes 2, 3, and 5. The pilots did not find this unsafe or even annoying, except on sailplane 5; one pilot gave sideslips a rating of 4 due to this feature, noting that about 180 N pedal force was required to "unlock" the rudder and that large sideslip angles were possible. Control, however, remained good and very little buffeting occurred at the high sideslip angles. This is classified as a minor but annoying deficiency. Rudder overbalance on the other sailplanes required much less pedal force to unlock. It is concluded that although proportionally increasing rudder pedal force with rudder deflection is a desirable characteristic, rudder overbalance is not unsafe unless very high pedal forces or other overruling characteristics are involved. For instance, sailplane 2 encountered overbalance at about 1/2 rudder deflection and sailplanes 3 and 5 at about 3/4 deflection. These conditions were acceptable, but it might be that overbalance of significantly less rudder deflection would be unacceptable.

3.5 Sailplane Stall/Spin Characteristics

Cross-country soaring flight sometimes involves steep turns at low altitudes to take advantage of whatever lift may be available, avoiding landing unless absolutely necessary. Since optimum airspeed for thermalling flight is near the stall speed, stall and incipient spin characteristics are of prime importance in safety of flight.

Stall warning characteristics of the evaluation sailplanes were described as mild for sailplanes 1 through 5 and too much for sailplane 6. The airspeed stall warning band varied from 1 to 3 kts for the first 4 sailplanes, and were often in a form that could be masked by atmospheric turbulence. However, once the stall was recognized, recovery in most cases was easily and quickly effected by merely relaxing aft stick pressure and flying out of the stalled condition with little altitude loss. Sailplane 6, on the other hand, had a wide stall warning airspeed band of 10-12 kts, which caused stall buffet to

occur frequently at thermalling flight airspeeds. The pilots noted that this is an undesirable characteristic because familiarity with the stall warning buffet degrades its effectiveness and tends to cause the pilot to ignore the warning.

As to stall, incipient spin, and recovery characteristics, sailplanes 1, 2, 3, and 5 generally received good to excellent ratings with sailplane 1 being foremost. Good aileron control was noted, even below stall speed, and abused, cross-controlled stalls did not reveal undesirable qualities. Sailplane 4 recovered immediately with relaxation of aft stick force, but two pilots noted a definite autorotative (spin) tendency if recovery was not executed promptly with wing drop. Sailplane 6 showed a tendency to yaw and roll to the left and to pitch down from a cross-control stall and received lower ratings due to this characteristic toward spinning.

3.6 Sailplane Approach and Landing Characteristics

Once committed to landing, sailplanes cannot go up; it follows that one of the primary considerations in evaluating approach and landing characteristics is ease of glidepath control. Precision in touchdown control is paramount for landing in unprepared and restricted areas, a situation often encountered in cross-country soaring flight. It is therefore not surprising that most of the evaluation sailplanes were criticized for lack of spoiler, flap, or air-brake effectiveness and precision.

Sailplane 6 received the best ratings, in the fair to good category, largely because of the effectiveness of spoilers in controlling glidepath. For instance, one pilot noted that due to dive brake effectiveness, it was easy to make "difficult" landings. "Difficult" here means landings over obstructions into a limited landing area.

Sailplane 1 again received the best rating of all except sailplane 6, although it was noted that the divebrakes were somewhat ineffective. The same comment was made about sailplanes 2, 3, and 5. Sailplane 4 relied only on flaps for glidepath control. This concept was criticized on two points: large changes in pitch attitude with varying degrees of flap extension made precise glidepath control more difficult, and awkward placement, high force requirements, and complex flap control positioning requirements degraded precision of

glidepath control. Some pilots criticized the "suck-open" tendency of spoiler controls on the other sailplanes for the same reasons; the necessity to hold force to restrain spoiler control lever aft movement degraded precise control in pitch with light stick forces, especially if spoiler control forces were high.

It is concluded that more quantitative information should be gathered on primary glide path control capability and also interaction of glide path controls with primary flight controls.

3.7 Pilot Opinion and Certification Criteria

Pilot opinion specifies the characteristics pilots like in sailplanes. Certification criteria specify the characteristics thought by the certifying authority to be essential to their safe operation. There is no reason to expect that pilots will invariably prefer a safer characteristic to one less safe. The contribution to safety of a given characteristic sometimes being recognizable only by a complex analysis or demonstrated in accident patterns. However, in the absence of such analysis or evidence, it would seem sensible that criteria should conform in general to favorable pilot opinion.

General and specific examples of conflicting criteria and pilot opinion follow:

In general, pilots were willing to accept sailplanes that were somewhat more sensitive and less stable in pitch than they liked for take-off, tow, and dive recovery in order to get easy longitudinal maneuvering and low stick forces for soaring flight--the mission of a sailplane. In particular, the criteria specifying a return-to-trim within, say, 10 percent of trim speed was felt to be of no benefit, and when achieved through increased stick centering forces considered to be a harassment. In what way such a criterion is essential to safety is not clear.

The only undesirable characteristic exhibited by some of the high performance sailplanes was marginal control during takeoff and landing. Current certification requirements are vague in this area. A requirement of controllability during takeoff and landing in crosswinds up to a prescribed level would be appropriate.

The requirement that no rudder overbalance occur was considered by some pilots to be overly restrictive. They argued that the natural instinct to straighten out would be sufficient to cue the pilot to overcome the mild overbalance that commonly occurs on gliders at large sideslip angles.

The sailplanes flown illustrated the ways in which stalling behavior desirable for sailplanes differs from that desirable for power planes. First, pre-stall warning was found to be of little or no value because of the normal course of thermalling, the stall boundary is commonly exceeded--an alarm quickly loses its value when often sounded. In any case, regardless of the presence or absence of any pre-stall warning, the considerable loss of climb that would result from reacting to every momentary gust-induced stall warning is unacceptable to most sailplane pilots. They will maneuver as the thermal demands and accept brief occasional stalls. Because occasional stalls must be accepted, it is important that only the least reduction in angle-of-attack be sufficient to achieve an immediate unstall, and that very little loss in altitude and very minor upset accompany the stall. Fortunately, this was just the behavior observed for all the sailplanes except sailplane 6 which had considerable altitude loss and some roll and yaw upset. For deeper or more prolonged or abused stalls, traditional criteria appeared acceptable. Thus, a modification to the traditional criteria such that the initial stall replaced buffet as a warning, and the deeper or aggravated stall be treated as the stall for purposes of certification.

The drag modulation observed on the test sailplanes was felt to be generally insufficient and the operating forces for the drag devices were felt to be generally undesirable for both flaps and airbrakes. Additionally, the variation of divebrake or flap effectiveness during the flare, float and touchdown phase was felt to degrade the pilots' ability to control his landing accuracy. In view of the importance of accurate landings for sailplanes, it was felt that a rational basis should be established for future criteria.

4. CONCLUDING REMARKS

The handling qualities of six sailplanes were evaluated by seven pilots in a flight test session consisting of 98 flights. The term "handling qualities" was defined to be those broad characteristics or attributes which influence the ease and precision with which the pilot is able to perform tasks for the overall mission of the sailplane. In this context the evaluation pilots were instructed to regard cross-country flight under visual flight rules as the principal mission of the sailplane.

Sailplane characteristics were evaluated using the Cooper-Harper rating scale with additional comments. The pilot opinion data indicates the following:

1. The evaluation sailplanes were found generally deficient in the area of cockpit layout. Poor cockpit ventilation, the use of curved control stick, confusing secondary control handles and the need for better cockpit crashworthiness were cited as reasons for deficiency.
2. The pilots indicated general dissatisfaction with pitch sensitivity which in some cases was coupled with inertially induced stick forces. While all sailplanes were judged satisfactory for centering thermals and in the ease of speed control in circling flight, pilot opinions diverged on the maneuvering response, pull-out characteristics from a dive, and on phugoid damping. The pilots found that the tendency to return to trim airspeed is relatively unimportant for visual flight.
3. Lateral-directional control problems were noted mainly during takeoff and landing. Pilot comments indicate the desirability of overall improvements in roll response quickening, increasing roll control power and reduction in the rudder coordination requirement. Existing levels of rudder overbalance or "rudder lock" was not found unsafe or even annoying.
4. Five of the evaluation sailplanes had very narrow airspeed band in which perceptible stall warning buffet occurred. This was not objectionable, however, since stall recovery was easy. The pilots objected to the characteristics of wide airspeed band of stall warning followed

by a stall with yawing and rolling tendency and substantial loss of altitude during the stall.

5. Landing characteristics of the evaluation sailplanes were found generally objectionable. Ineffective divebrakes, and the necessity of exerting a force to restrain divebrake control lever were quoted by some of the pilots. Flap type glide path control was also rated deficient due to the large attitude changes accompanying flap deflections and to the excessive flap actuation forces.

The present study shows the need for a more quantitative investigation of the factors influencing pitch control sensitivity such as precise measurements of stick forces due to both the aerodynamic hinge moments and the bobweight effects arising from the different horizontal tail configurations. Further study is required of lateral-directional control during takeoff and landing. More quantitative information should be gathered also on the various glide path control systems and the interaction of glide path controls with primary flight controls.

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Appendix A
Pilots' Questionnaire

Appendix A.
Questionnaire

SAILEPLANE EVALUATION

Pilot _____ Sailplane _____

Date _____ Flight No. _____

I. Design. ☐

A. Pilot Opinion of Construction & Rigging. ☐

1. Ease of Inspection. ☐

2. Safety of Control System. ☐

3. Ease of Assembly. ☐

4. Comments _____

B. Pilot Opinion of Cockpit Layout. ☐

1. Pilot Comfort. ☐

2. Control System Arrangement. ☐

3. Instrument Display. ☐

4. Pilot Visibility. ☐

5. Pilot Safety. ☐

6. Comments _____

II. Smooth Air Maneuvering. ☐

A. Pilot Opinion of Initial Takeoff Roll. ☐

1. Towline Hookup. ☐

2. Control of Sailplane During Initial Roll. . . ☐

3. Comments _____

B. Pilot Opinion of Tow. ☐

1. Ease of Maintaining Position. ☐

2. Aircraft Trim. ☐

3. Control in Propwash. ☐

4. Release Characteristics. ☐

5. Comments _____

C. Pilot Opinion of Longitudinal Handling. ☐

1. Ease of Establishing and Maintaining a
Constant Airspeed. ☐

2. Sailplane Trim System Over Speed Range. . . ☐

3. Pitch Sensitivity. ☐

4. Stick Force Gradient. ☐

5. Stick Fixed Stability. ☐

- 6. Stick Free Stability. ☐
- 7. Return to Trim. ☐
- 8. Maneuvering Response. ☐
- 9. Phugoid Characteristics. ☐
- 10. Dive Recovery. ☐

11. Comments _____

D. Pilot Opinion of Lateral Handling. ☐

- 1. Aileron Force Gradient. ☐
- 2. Rudder Force Gradient. ☐
- 3. Roll Rate Over Speed Range. ☐
- 4. Sideslip Characteristics. ☐
- 5. Ease of Turn Entry. ☐
- 6. Yaw Due to Aileron. ☐
- 7. Yaw Due to Roll. ☐
- 8. Ease of Maintaining 45° Bank Turn. ☐
- 9. Ease of Maintaining 60° Bank Turn. ☐

10. Comments _____

E. Pilot Opinion of Sailplane Stall-Spin Characteristics ☐

1. Rudder and Aileron Effectiveness During Stall ☐
2. Stall Warning. ☐
3. Aggravated Stall-Tendency to Spin. ☐
4. Stick Force Gradient. ☐
5. Stall Recovery, Altitude Loss. ☐
6. Spin Entry. ☐
7. Spin Recovery. ☐
8. Stall From Turn at Low Speed. ☐

9. Comments _____

F. Pilot Opinion of Sailplane Landing Characteristics. ☐

1. Pilot Visibility. ☐
2. Glide Slope Control. ☐
3. Airspeed Control, Airbrake Ease of Modulation ☐
4. Ease of Landing at Intended Spot. ☐
5. Ease of Controlling Sink at Touchdown. . . . ☐
6. Control During Rollout. ☐

7. Comments _____

III. Flight Characteristics in Convection.

☐

A. Pilot Opinion of Tow.

☐

1. Ease of Maintaining Position.

☐

2. Response to Vertical Currents.

☐

3. Release.

☐

4. Comments _____

B. Pilot Opinion of Circling Flight.

☐

1. Low Speed Handling.

☐

2. Stall-Spin Susceptibility.

☐

3. Ease of Centering Thermal.

☐

4. Speed Control.

☐

5. Comments _____

C. Pilot Opinion of Cruising Flight.

☐

1. Ease of Controlling Airspeed.

☐

2. Pull up into Thermal.

☐

3. Ease of Performing Secondary Tasks.

☐

4. Ride Quality. ☐

5. Ease of Maintaining Straight Flight. ☐

6. Comments _____

Appendix B
Cooper Harper Ratings and Pilots' Comments

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	PILOT	5	6	7	AVER.	STD DEV
1	1. DESIGN									
2	A. PILOT OPIN. OF CONST. & RIGGING									
3	1. EASE OF INSPECTION	.00	.00	3.00	.00	.00	2.00	.00	2.500	.500
4	2. EASE OF CONTROL SYSTEM	.00	4.00	3.00	.00	.00	1.00	.00	2.000	1.000
5	3. EASE OF ASSEMBLY	.00	2.00	3.00	.00	.00	2.00	.00	2.000	.000
74	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	.0	.0	2.7	.9	2.7	.5	.0	.0	2.4

COMMENTS

TASK	PILOT	COMMENTS
2	3	NOT AS GOOD AS GLASS SHIPS
3	3	HAVE TO REMOVE OVERWING FAIRING
4	3	GOOD
5	3	MODERATELY EASY
74	3	AFTER ASSEMBLY, INSPECTION IS DIFFICULT AT ELEVATOR AND WING PINS
74	3	/AILERON CONNECTION

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	PILOT	5	6	7	AVER.	STD DEV
1	1. DESIGN									
2	A. PILOT OPIN. OF CONST. & RIGGING									
3	1. EASE OF INSPECTION	2.00	1.00	3.00	.00	.00	2.00	.00	2.000	.707
4	2. EASE OF CONTROL SYSTEM	1.50	1.00	1.00	.00	.00	2.00	.00	1.375	.415
5	3. EASE OF ASSEMBLY	2.00	2.00	3.00	.00	.00	2.00	.00	1.500	.500
74	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.00	1.00	1.00	.00	.00	2.00	.00	1.250	.433

COMMENTS

TASK	PILOT	COMMENTS
74	3	EXCELLENT
74	3	APPEARS MECHANICALLY OF MARGINAL DURABILITY
74	3	POSSIBLE TO GET AILERON MOVEMENT WITH DISCONNECTED PUSH RODS
74	3	OUTSTANDING
74	3	HAD POOR HISTORY FOR RUDDER ACTIVATION SYSTEM. ELEVATOR, AILERON
74	3	AND FLAP SYSTEM IS EXCELLENT
74	3	AILERONS CONTROL RODS ENDS, CAN BE INSTALLED BUT NOT PINNED.
74	3	OTHERWISE IT IS BY FAR THE BEST ASSEMBLY OF ANY SAILPLANE.

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	PILOT	5	6	7	AVER.	STD DEV
1	1. DESIGN									
2	A. PILOT OPIN. OF CONST. & RIGGING									
3	1. EASE OF INSPECTION	2.00	1.00	2.00	.00	.00	3.00	.00	2.000	.707
4	2. EASE OF CONTROL SYSTEM	2.00	2.00	2.00	.00	.00	3.00	.00	2.250	.433
5	3. EASE OF ASSEMBLY	1.00	2.00	1.00	.00	.00	2.00	.00	1.750	.433
74	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.7	.5	2.0	.0	1.7	.5	.0	.0	2.1

COMMENTS

TASK	PILOT	COMMENTS
74	3	EXCELLENT
74	3	NOT AS EASY AS SAILPLANE 2 OR 5
74	3	UNABLE TO VISUALLY INSPECT AILERON CONNECTORS BEHIND SPAR
74	3	EXCELLENT
74	3	QUALITY OF CONSTRUCTION IS EXCELLENT--AILERON AND AIR BRAKE LINKAGES

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	PILOT	5	6	7	AVER.	STD DEV
1	DESIGN OF OPIN. OF CONST. & RIGGING	.00	.00	.00	.00	.00	.00	.00	5.000	1.000
2	A.1. LEASING OF INSTRUCTION	.00	.00	4.00	.00	.00	.00	.00	5.000	.500
3	1. LEASING OF INSTRUCTION	.00	.00	2.00	.00	.00	.00	.00	5.000	.500
4	2. LEASING OF INSTRUCTION	.00	.00	2.00	.00	.00	.00	.00	5.000	.500
5	3. LEASING OF INSTRUCTION	.00	.00	2.00	.00	.00	.00	.00	5.000	.500
74	AND STD. DEV. OF SURTASKS(FX 1+2+...)	.0	.0	.0	4.7	1.2	.0	.0	3.7	1.49

COMMENTS

70
71
72
73
74
75
76
77
78
79
80

NO DESIRABLE THAN MOST
BENDING OF HANDLE REQUIRED FOR FLAP ACTUATION OBJECTIONABLE
TOO MUCH WEIGHT TO HOLD OPEN. FOUND TRIM AND FLAP HANDLE
COMFORTABLE TO USE. EASILY BUILT UP OBJECTIONABLE.
ACTUATION CHARACTERISTICS LOCKING. FREQUENT ASSEMBLY/DISASSEMBLY
ACCIDENTALLY NOT COMPATIBLE WITH TASK, I.E. FREQUENT ASSEMBLY/DISASSEMBLY
MINIMUM TIME WITH PEOPLE

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	PILOT	5	6	7	AVER.	STD DEV
1	DESIGN NOT OPIN. OF CONST. & RIGGING	2.00	.00	2.00	.00	.00	2.00	.00	2.000	.000
2	A. PILOT OF INSPECTION	2.00	1.00	1.00	.00	.00	2.00	.00	1.875	.217
3	1. LEASE OF EQUIPMENT	2.00	2.00	1.00	.00	.00	2.00	.00	1.750	.433
4	2. LEASE OF CONTROL SYSTEM	1.00	2.00	1.00	.00	.00	2.00	.00	1.750	.433
5	3. LEASE OF ASSEMBLY	2.00	2.00	2.00	.00	.00	2.00	.00	2.000	.000
74	AND STD. DEV. OF SUBTASKS (EX 1,2,3,4)	1.7	5.2	0	1.7	5	0	0	1.8	.39

COMMENTS

OUTSTANDING
EXCELLENT-CONSTRUCTION-FAIRLY LARGE
HORIZONTAL TAIL SURFACE ATTACHMENT
HEAVY BUT SIMPLE ONCE TECHNIQUE IS UNDERSTOOD

SAIL PLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	PILOT	5	6	7	AVER.	STD DEV
1	I. DESIGN	.00	.00	.00	.00	.00	7.00	.00	4.500	2.500
2	A. 1. DESIGN OF OPT. OF CONST. & RIGGING	.00	.00	.00	.00	.00	7.00	.00	5.500	1.500
3	2. ANALYSIS OF INSPECTION	.00	.00	.00	.00	.00	7.00	.00	5.500	1.500
4	3. ASSESSMENT OF SAFETY OF CONTROL SYSTEM	.00	.00	.00	.00	.00	7.00	.00	5.500	1.500
5	4. ASSESSMENT OF EASE OF ASSEMBLY	.00	.00	.00	.00	.00	7.00	.00	5.500	1.500
74	74. AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,3,4,5)	.00	.00	.00	.00	.00	4.0	2.2	3.7	1.80

COMMENTS

74
74
74
74
74
74

EXCELLENT DESIGN, RIGGING IS MORE DIFFICULT THAN MOST, GOOD
GOOD SOLID CONTROL SYSTEM.
SAFE TO USE.
THIS IS SIMPLY NOT DESIGNED FOR ASSEMBLY/DISASSEMBLY
NECESSARY FOR A SAILPLANE.

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	3.00	3.00	4.00	.00	.00	4.00	4.00	3.600	.490
7	1. PILOT COMFORT	4.00	3.00	4.00	2.00	4.00	4.00	2.00	3.286	.881
8	2. CONTROL SYSTEM ARRANGEMENT	4.00	3.00	3.00	1.00	3.00	4.00	6.00	3.286	1.385
9	3. INSTRUMENT DISPLAY	3.00	3.00	2.00	2.00	3.00	3.00	3.00	3.286	.495
10	4. PILOT VISIBILITY	3.00	3.00	3.00	2.00	4.00	3.00	5.00	3.286	.881
11	5. PILOT SAFETY	3.00	4.00	3.00	.00	.00	5.00	.00	3.750	.829
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	3.0	.6 3.2	.4 3.0	.6 1.7	.4 3.5	.5 3.8	.7 4.0 1.6 3.2		1.01

COMMENTS

FAIR UNCOMFORTABLE
 VERY LOW IN AIR
 2. PILOT COMFORTABLE CHANGING TYPE
 3. INSTRUMENT DISPLAY WITH FULL ALERON THROW
 4. INSTRUMENT DISPLAY WITH FULL ALERON THROW
 5. INSTRUMENT DISPLAY WITH FULL ALERON THROW
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 100. INSTRUMENT DISPLAY WITH FULL ALERON THROW

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	2.00	2.00	3.00	.00	.00	4.00	2.00	2.600	.800
7	1. PILOT COMFORT	1.00	2.00	4.00	1.00	3.00	2.00	3.00	2.413	.790
8	2. CONTROL SYSTEM ARRANGEMENT	2.00	2.00	3.00	3.00	4.00	2.00	3.00	2.733	1.706
9	3. INSTRUMENT DISPLAY	1.00	1.00	3.00	1.00	2.00	4.00	2.00	2.733	1.706
10	4. PILOT VISIBILITY	1.00	1.00	1.00	1.00	2.00	3.00	1.00	1.429	.528
11	5. PILOT SAFETY	3.00	4.00	3.00	3.00	4.00	4.00	.00	3.500	.500
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.6	.8 2.2 1.1 2.8 1.0 1.8 1.0 3.2	.7 3.0	.9 2.0	.7 2.4				1.07

COMMENTS

NOT VERY COMFORTABLE
 ARM OUTSTRETCHED
 TRIM LEVER IN POOR LOCATION--STICK TOO FAR FWD.
 TRIMMER TOO FAR BACK, HARD TO REACH AND HARD TO OPERATE
 AVERAGE
 FACTORY STICK IS OK. TEST SHIP HAD A NON-STANDARD TYPE.
 ELECTRIC VARIO INOPERATIVE
 SHORTAGE OF INSTRUMENT/RADIO SPACE.
 VERY GOOD
 INADEQUATE PILOT PROTECTION DUE TO MINIMAL STRUCTURE
 VERY LIGHT STRUCTURE
 NOT A STRONG FEATURE OF THIS GLIDER
 SEAT BELT INSTALLATION WAS SUCH THAT SEAT BELT ADJUSTMENT WAS VERY
 DIFFICULT AND PROBABLY IMPOSSIBLE IN FLIGHT.
 POOR PROTECTIVE STRUCTURE. SEAT BELTS HARD TO ADJUST. BRAKE CAN COME
 SHORT OF DETENT EVEN AFTER ADJUSTMENT.
 CONTROL STICK (NON-STD) TOO FAR FWD. TRIM LOCATION POOR. DIFFICULT
 TO REACH THE TRIM LEVER BECAUSE OF NARROW COCKPIT. ALSO TRIM WAS
 FROM DETENT TO DETENT. THE DETENT SPACING WAS SUCH THAT IT DID NOT
 ALLOW TRIM A/S ADJUSTMENT. RUDDER ADJUSTMENT WAS EXCELLENT.
 GOOD RUDDER ADJUSTMENT.
 SAFETY--ADDITIONAL FIBERGLASS STRUCTURE IN THE FORM OF KEEL OR
 STRINGERS (LONG) WOULD IMPROVE LEG/FOOT SAFETY OF NOSE IMPACT
 INCIDENTS/ACCIDENTS.
 TRIM CONTROL PLACEMENT AWKWARD TO USE

TASK	DESCRIPTION OF TASKS															
	1	2	PILOT		4	5	6	7	AVER.	STD DEV						
B. PILOT POSITION OF COCKPIT LAYOUT																
6.	3.00	1.00	3.00	3.00	.00	.00	1.00	3.00	1.909	.748						
7.	3.00	1.00	3.00	3.00	.00	.00	1.00	3.00	1.909	.748						
8.	3.00	1.00	3.00	3.00	.00	.00	1.00	3.00	1.909	.748						
9.	3.00	1.00	3.00	3.00	.00	.00	1.00	3.00	1.909	.748						
10.	3.00	3.00	3.00	3.00	.00	.00	3.00	3.00	1.957	.740						
11.	3.00	3.00	3.00	3.00	.00	.00	3.00	3.00	1.957	.740						
C. PILOT SAFETY																
75.	2.0	.9	1.7	.8	2.0	.6	1.8	1.0	2.0	.9	3.4	1.9	2.2	1.6	2.2	1.29

TASK PILOT

COMMENTS

[illegible]

TASK	DESCRIPTION OF TASKS					PILOT					7	AVER.	STD DEV			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
B. PILOT OPINION OF COCKPIT LAYOUT																
1. PILOT COMFORT	.00	.00	4.00	.00	.00	6.00	5.00	4.350	1.872							
2. PILOT SYSTEM ARRANGEMENT	.00	2.00	2.00	.00	.00	4.00	.00	2.350	1.408							
3. INSTRUMENT DISPLAY	.00	.00	3.00	.00	.00	.00	.00	1.800	1.000							
4. PILOT VERTICALITY	.00	.00	.00	.00	.00	.00	.00	1.800	1.000							
5. PILOT SAFETY	.00	4.00	2.00	1.00	1.00	2.00	.00	1.600	1.067							
75. AVER. AND STD. DEV. OF SUBTASKS (FX 1,2,...)	.00	.00	2.7	.9	2.8	1.7	1.6	.8	2.0	.6	3.0	1.3	3.0	2.3	2.5	1.50

TASK	PT/OT
1. Review the case history and physical examination findings.	1.0
2. Review the laboratory and imaging studies.	1.0
3. Formulate a differential diagnosis.	1.0
4. Develop a management plan.	1.0
5. Implement the management plan.	1.0
6. Evaluate the patient's response to treatment.	1.0
7. Document the patient's progress.	1.0
8. Communicate with the patient and family.	1.0
9. Collaborate with other healthcare providers.	1.0
10. Provide patient education.	1.0
11. Participate in quality improvement activities.	1.0
12. Stay current in the field.	1.0
13. Maintain professional conduct.	1.0
14. Participate in continuing education.	1.0
15. Contribute to the healthcare team.	1.0
16. Provide excellent patient care.	1.0
17. Maintain accurate records.	1.0
18. Follow infection control protocols.	1.0
19. Adhere to legal and ethical standards.	1.0
20. Demonstrate leadership skills.	1.0
21. Manage time effectively.	1.0
22. Work well under pressure.	1.0
23. Communicate clearly and concisely.	1.0
24. Listen actively and empathetically.	1.0
25. Show initiative and creativity.	1.0
26. Be a team player.	1.0
27. Take responsibility for your actions.	1.0
28. Be open to feedback.	1.0
29. Show respect for all patients.	1.0
30. Maintain a positive attitude.	1.0
31. Stay organized.	1.0
32. Be punctual.	1.0
33. Dress professionally.	1.0
34. Use appropriate language.	1.0
35. Follow safety protocols.	1.0
36. Report incidents promptly.	1.0
37. Participate in safety drills.	1.0
38. Keep equipment in good working order.	1.0
39. Follow standard precautions.	1.0
40. Use personal protective equipment correctly.	1.0
41. Perform hand hygiene frequently.	1.0
42. Cover your mouth and nose when coughing or sneezing.	1.0
43. Avoid touching your face.	1.0
44. Stay up to date on vaccinations.	1.0
45. Practice good nutrition and exercise habits.	1.0
46. Get enough sleep.	1.0
47. Manage stress effectively.	1.0
48. Seek help when needed.	1.0
49. Be a role model for others.	1.0
50. Contribute to a positive work environment.	1.0
51. Show appreciation for others.	1.0
52. Be a good listener.	1.0
53. Communicate your needs clearly.	1.0
54. Set boundaries.	1.0
55. Practice self-care.	1.0
56. Stay motivated.	1.0
57. Be resilient.	1.0
58. Stay focused.	1.0
59. Be proactive.	1.0
60. Take initiative.	1.0
61. Be a problem solver.	1.0
62. Stay calm under pressure.	1.0
63. Be a team player.	1.0
64. Communicate effectively.	1.0
65. Listen actively.	1.0
66. Show empathy.	1.0
67. Be respectful.	1.0
68. Follow instructions.	1.0
69. Be punctual.	1.0
70. Dress appropriately.	1.0
71. Use proper grammar.	1.0
72. Write clearly.	1.0
73. Speak clearly.	1.0
74. Listen carefully.	1.0
75. Show interest.	1.0
76. Be polite.	1.0
77. Be honest.	1.0
78. Be trustworthy.	1.0
79. Be reliable.	1.0
80. Be a good role model.	1.0
81. Be a good example.	1.0
82. Be a good citizen.	1.0
83. Be a good neighbor.	1.0
84. Be a good friend.	1.0
85. Be a good family member.	1.0
86. Be a good community member.	1.0
87. Be a good citizen.	1.0
88. Be a good neighbor.	1.0
89. Be a good friend.	1.0
90. Be a good family member.	1.0
91. Be a good community member.	1.0
92. Be a good citizen.	1.0
93. Be a good neighbor.	1.0
94. Be a good friend.	1.0
95. Be a good family member.	1.0
96. Be a good community member.	1.0
97. Be a good citizen.	1.0
98. Be a good neighbor.	1.0
99. Be a good friend.	1.0
100. Be a good family member.	1.0
101. Be a good community member.	1.0
102. Be a good citizen.	1.0
103. Be a good neighbor.	1.0
104. Be a good friend.	1.0
105. Be a good family member.	1.0
106. Be a good community member.	1.0
107. Be a good citizen.	1.0
108. Be a good neighbor.	1.0
109. Be a good friend.	1.0
110. Be a good family member.	1.0
111. Be a good community member.	1.0
112. Be a good citizen.	1.0
113. Be a good neighbor.	1.0
114. Be a good friend.	1.0
115. Be a good family member.	1.0
116. Be a good community member.	1.0
117. Be a good citizen.	1.0
118. Be a good neighbor.	1.0
119. Be a good friend.	1.0
120. Be a good family member.	1.0
121. Be a good community member.	1.0
122. Be a good citizen.	1.0
123. Be a good neighbor.	1.0
124. Be a good friend.	1.0
125. Be a good family member.	1.0
126. Be a good community member.	1.0
127. Be a good citizen.	1.0
128. Be a good neighbor.	1.0
129. Be a good friend.	1.0
130. Be a good family member.	1.0
131. Be a good community member.	1.0
132. Be a good citizen.	1.0
133. Be a good neighbor.	1.0
134. Be a good friend.	1.0
135. Be a good family member.	1.0
136. Be a good community member.	1.0
137. Be a good citizen.	1.0
138. Be a good neighbor.	1.0
1	

COMMENTS

GOOD COCKPIT IS SMALL. MY HEAD ALMOST TOUCHES THE CANOPY WHICH CAN LEAD TO SOME BUMPS IN TURBULENCE. FOR 1.396RAD FLAP TO COMPLEX FLAP CONTROL ANKWARD, EXCESSIVE FORCES, SUSCEPTIBLE TO MIS-USE FLAPS UNHANDY, NOT PUT UP BEFORE LANDING FLAP OPERATED) (SOARING FLAP, TRIM HANDLE, AND BRAKE SHOULD BE IMPROVED) FLAP HANDLE, TRIM HANDLE, FROM PILOT. FLAP CONTROL IS TOO COMPLICATED TRIM FORCES ARE TOO HIGH AT MAX FLAP SPEEDS. AND TRIM CONTROL IS A LITTLE ANKWARD TO REACH AND TO MOVE PRECISELY. OPERATION OF FLAP HANDLE. REQUIRES ABOUT 80-90 % OF PILOT APPLICATION. TOW RELEASE NOT NEEDED. LOOKS LIKE AN AIRVENT. THE COCKPIT LAYOUT AND HANDLES THEREABOUTS NOT NEEDED. THE COCKPIT LAYOUT AND HANDLES WHERE VISIBILITY DESTINABLE, APPEARANCE IS POOR (INTERIOR) WHILE VISIBILITY DESTINABLE, APPEARANCE IS POOR (INTERIOR) TRIM CONTROL IS USE TO FAR FWD. LANDING FLAP POSITION DUE TO ANKWARD PLACEMENT ON TOW, BREAKOUT FORCE IN

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	2.50	2.00	2.00	.00	.00	1.00	1.00	1.700	.600
7	1. PILOT COMFORT	1.00	2.00	2.00	.00	.00	1.00	1.00	1.400	.490
8	2. CONTROL SYSTEM ARRANGEMENT	1.00	2.00	2.00	.00	.00	1.00	1.00	2.750	1.479
9	3. INSTRUMENT DISPLAY	1.00	2.00	2.00	.00	.00	1.00	1.00	1.600	.490
10	4. PILOT VISIBILITY	3.00	2.00	1.00	.00	.00	3.00	1.00	2.000	.894
11	5. PILOT SAFETY	3.00	3.00	3.00	.00	.00	6.00	.00	3.750	1.299
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	2.2	1.0	2.2	.4	2.0	.6	.0	.0	2.2

TASK	PILOT	COMMENTS
6	1	DRAG CHUTE DEPLOYMENT LEVER IN ANKWARD POSITION
7	1	CONTROL STICK AND RELEASE LEVER TOO FAR FWD
8	1	VERY LARGE COMFORTABLE COCKPIT GENERALLY WELL LAID OUT. TRIMMER'S
8	1	HARD TO OPERATE AND HIGHLY ANNOYING. DRAG CHUTE KNOW SUSCEPTIBLE
8	1	TO INADVERTENT OPERATION.
8	1	EXCELLENT COCKPIT LAYOUT
8	1	ELEVATOR OFFSET SO AS TO GIVE MOMENTUM TO UP ELEVATOR WHEN YOU HIT
8	1	A POSITIVE LGL. TOW RELEASE TOO FAR FWD.
8	1	END VISIBILITY MARGINAL DURING TOW
10	1	EXCELLENT
10	1	VIEW OF TOWPLANE OK, BUT COULD BE IMPROVED.
10	1	COCKPIT CONSTRUCTION MINIMAL IN STRENGTH
11	1	NOT AS SAFE AS SOME
11	1	EXCESSIVE BALLAST IN NOSE COULD BE CONVERTED INTO GLASS TO IMPROVE
11	1	PILOT'S LEG PROTECTION.
11	1	PILOT COMFORT IS EXCELLENT. VENTILATION SHOULD RE BETTER. VENT AIR
11	1	CAUSAL SHOULD HAVE BEEN PROVIDED.
75	1	EXCELLENT CONTROL PLACEMENT, SEAT DESIGN AND VISIBILITY. FLAP AND
75	1	SPEED BRAKE CONTROLS ARE WELL LOCATED AND CONVENIENT TO USE.

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	.00	.00	3.00	.00	.00	1.00	.00	2.000	1.000
7	1. PILOT COMFORT	.00	2.00	3.00	.00	1.00	1.00	3.00	1.667	.745
8	2. CONTROL SYSTEM ARRANGEMENT	.00	2.00	3.00	.00	1.00	4.00	1.00	2.667	.943
9	3. INSTRUMENT DISPLAY	.00	2.00	3.00	.00	2.00	3.00	2.00	2.800	.748
10	4. PILOT VISIBILITY	.00	2.00	1.00	.00	1.00	2.00	4.00	1.667	.471
11	5. PILOT SAFETY	.00	1.00	1.00	.00	1.00	1.00	1.00	1.000	.000
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	.0	.0	1.7	.4	2.0	.9	1.8	.7	1.6

TASK	PILOT	COMMENTS
6	3	EXCELLENT
7	3	TRIM WHEEL SHOULD BE ON LEFT
7	3	TRIM WHEEL LOCATED ON WRONG SIDE OF COCKPIT.
7	3	TRIM WHEEL TOO FAR FWD., TRIM WHEEL ON WRONG SIDE.
7	3	TOW RELEASE SHOULD BE OFF TO LEFT SIDE; TRIM WHEEL ON LEFT SIDE
7	3	TRIM CONTROL SHOULD BE ON LEFT SIDE OF COCKPIT. STICK TOO FAR FWD
7	3	AT MOST FWD POSITION
7	3	FAIRLY POOR ON THIS GLIDER, SHOULD HAVE COMPENSATED VARIOMETERS
7	3	NON STANDARD
7	3	EXCELLENT
7	3	VERY SUBSTANTIAL COCKPIT STRUCTURE
7	3	TRIM WHEEL SIDE AND HARD TO USE
75	3	GOOD, SAFE DESIGN FEATURES IN COCKPIT. I WOULD QUESTION SOME OF THE
75	3	AERODYNAMIC COMPROMISES MADE FOR THE SAKE OF ROOMINESS
75	3	CONTROL TRAVELS IS MUCH TOO EXTENSIVE FOR RUDDER, AILERON, ELEVATOR,
75	3	AND DIVE BRAKES

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT							AVER.	STD DEV
		1	2	3	4	5	6	7		
12	II. SMOOTH AIR MANEUVERING	1.50	1.00	1.00	.00	.00	1.00	.00	1.125	.217
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	1.00	1.00	1.00	.00	3.00	1.00	3.00	1.667	.943
14	1. TOWLINE HOOKUP	1.00	1.00	2.00	.00	2.00	1.00	2.00	1.600	.490
15	2. CONTROL OF PLANE IN INIT. ROLL	1.00	1.00	1.00	2.00	4.50	1.00	2.00	1.786	1.191
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.0	.0	1.0	.0	3.2	1.3	1.0	.0	1.7

COMMENTS

TASK	COMMENTS
76	EXCELLENT CHARACTERISTICS IN THIS PHASE OF THE FLIGHT
76	ON ONE TOW I HAD FULL FORWARD STICK AND WAS STILL GOING UP WHILE
76	TOWPLANE WAS STILL ON GROUND. PROBABLY SHOULD HAVE RELEASED.
76	NO PROBLEMS IN TAKE OFF, INCLUDING LIGHT CROSSWIND 9KTS, 45DEG TO RWY

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT							AVER.	STD DEV
		1	2	3	4	5	6	7		
12	II. SMOOTH AIR MANEUVERING	2.00	2.00	3.00	.00	.00	2.00	3.00	2.400	.490
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	1.50	2.00	3.00	.00	4.00	4.00	2.00	2.750	.990
14	1. TOWLINE HOOKUP	1.00	2.00	2.00	.00	3.00	3.00	2.00	2.167	.687
15	2. CONTROL OF PLANE IN INIT. ROLL	2.00	2.00	4.00	4.00	4.00	4.00	2.00	3.143	.990
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.5	.5	2.0	.0	3.0	1.0	4.0	.0	2.7

COMMENTS

TASK	COMMENTS
76	SOME TENDENCY TO DROP WING AT START. DON'T LIKE TO HAVE TO MOVE
76	FLAPS DURING T.O. ROLLTOP AT START, TO NEUTRAL FLAP OPERATING
76	WING IS EXCELLENT.
76	THERE IS A TENDENCY TO DROP A WING ON ROLLOUT. STICK LOCATION IS
76	INSUFFICIENT. RUDDER, LOCATION OF CONTROL STICK, CONTROL STICK SHORT
76	TRAVEL, LACK OF CONTROL FORCES, AND LACK OF SAILPLANE 2 EXPERIENCE
76	RESULTED IN POOR T.O. CONTROL. INITIAL ROLL, FELT LIKE NOT ENOUGH
76	RUDDER. ALWAYS DRAGGED STICK TOO FAR FORWARD. IN THE NEGATIVE
76	ALL DRAGS TO BE SPECIFIED AT FIRST EVEN WITH FLAPS IN. THE NEGATIVE
76	NO PROBLEMS IN TAKEOFF, INCLUDING LIGHT CROSSWIND 19KTS, 785RAD TO RW

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV			
12	II. SMOOTH AIR MANEUVERING	3.00	.00	2.00	.00	.00	2.00	.00	2.333	.471			
13	A. PILOT OPIN. OF INITIAL TAKEOFF RLL	2.00	3.00	2.00	2.00	2.00	4.00	3.00	2.671	.728			
14	1. CONTROL OF PLANE IN INIT. ROLL	3.00	3.00	1.00	.00	2.00	4.00	3.00	2.333	.923			
15	2. CONTROL OF PLANE IN INIT. ROLL	2.00	4.00	2.00	2.00	2.00	3.00	3.00	2.571	.728			
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	2.5	.5	3.0	1.0	1.5	.5	2.0	.0	3.5	.5	2.5	.84
TASK	PILOT	COMMENTS											
13	6	PILOT USUALLY PUMPS ELEVATOR											
14	5	POOR LOCATION											
14	1	PULLED ON ROPE EXTENSION BECAUSE HANDLE TOO FAR FWD.											
15	1	VISIBILITY AND DIRECTIONAL CONTROL LIMITED											
15	1	CROSS WIND CAPABILITY MARGINAL											
15	1	6,7,9 DIVERGES, TOO DANGEROUS, EXTREME											
15	1	RUDDER WEAK DURING ROLL. EASY TO DROP WING TO GROUND											
76	3	NO PROBLEM WITH INITIAL TAKEOFF ROLL											
76	4	ON TAKEOFF ROLL WITH AIR VENT OPEN, SAND AND ROCKS WERE BLOWN											
76	4	THROUGH THE VENT INTO THE COCKPIT BY THE TOWPLANE.											

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV	
12	II. SMOOTH AIR MANEUVERING	.00	.00	2.00	.00	2.00	2.00	2.00	2.000	.000	
13	A. PILOT OPIN. OF INITIAL TAKEOFF RLL	.00	3.00	6.00	1.00	2.00	2.00	2.00	2.667	1.599	
14	1. CONTROL OF PLANE IN INIT. ROLL	.00	1.00	2.00	1.00	2.00	2.00	2.00	1.167	.373	
15	2. CONTROL OF PLANE IN INIT. ROLL	.00	3.00	2.00	1.00	2.00	2.00	2.00	2.000	.577	
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	.0	.0	2.0	1.0	2.0	.0	1.0	.5	1.5	.64
TASK	PILOT	COMMENTS									
14	3	EXCELLENT AERODYNAMICALLY, CONFUSING FOR PILOT SINCE HE ALWAYS PULLS									
14	3	RELEASE FOR HOOKUP.									
14	3	GOOD									
14	3	REQUIREMENT TO START T.O. WITH FLAP UP, THEN PUT NEUTRAL IS									
14	3	UNDESIRABLE, SOME TENDENCY TO DROP WING AT START OF ROLL									
14	3	WHEN THE TAILWHEEL BECOMES TAUT									
14	3	THERE IS ADEQUATE CONTROL DURING T.O. TO MAINTAIN WINGS LEVEL EVEN									
14	3	IN CROSSWINDS OF AT LEAST 10KTS.									
14	3	IS ABOUT TWICE THE AFT BREAKOUT FORCE, WHEN THE STICK IS MOVED AFT									
14	3	TO FWD, THE FWD BREAKOUT FORCE IS RELATIVELY SO HEAVY THAT IT FEELS									
14	3	AS IF A STOP HAS BEEN ENCOUNTERED. THIS UNBALANCED BREAKOUT FORCE									
14	3	CAUSED ME TO OVERCONTROL IN PITCHDOWN ON ONE TAKEOFF. IT HAS BEEN									
14	3	SUGGESTED (PILOT 4) THAT WITH LONG, TRIM CONTROL ALMOST FULL FWD.									
14	3	(AS REQD ON T.O.), BREAKOUT FORCES ARE UNEVEN FORE AND AFT AS AN									
14	3	INHERENT CHARACTERISTIC OF THE FEEL SPRING MECHANISM.									

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV				
12	II. SMOOTH AIR MANEUVERING	2.00	5.00	2.00	.00	.00	2.00	4.00	3.000	1.265				
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	2.00	4.00	2.00	.00	.00	5.00	3.00	3.200	1.166				
14	1. TOWLINE HOOKUP	3.00	2.00	1.00	.00	.00	4.00	2.00	2.400	1.020				
15	2. CONTROL OF PLANE IN INIT. ROLL	2.00	4.00	3.00	.00	.00	5.00	2.00	3.200	1.166				
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	2.5	.5	3.0	1.0	1.0	.0	.0	4.5	.5	2.0	.0	2.8	1.17
TASK	PILOT	COMMENTS												
13	0	RUDDER INEFFECTIVE, FLAP/AILERON MOVEMENT NECESSARY TO CONTROL												
13	1	WING LEVEL												
14	1	TOW RELEASE TOO FAR FROM PILOT'S SHOULDER. TOW HOOK TOO FAR AFT												
14	1	CAUSING PITCH TENDENCY												
14	1	VIBRATING TOWLINE												
14	1	DIRECTIONAL CONTROL LIMITED												
15	1	AILERONS WEAK, RUDDER WEAK, LIMITED CROSSWIND CAPABILITY												
15	1	THE USE OF UP-FLAP TO IMPROVE AILERONS IN CROSSWIND IS AN UNDESIRABLE												
76	1	PROCEDURAL COMPLICATION. THE UNBALANCED LONGITUDINAL CONTROL												
76	1	CIRCUIT CAUSES THE STICK TO BOUNCE FORE AND AFT WHILE ROLLING OVER												
76	1	BUMPY GROUND												
76	1	NO SIGNIFICANT PROBLEMS. SLIGHT BOUNCE ON TAKEOFF WHICH COULD BE												
76	1	ATTRIBUTED TO WING FLEXING, PROBABLY IT WAS PILOT ERROR, IN ANY												
76	1	CASE, AFTER LIFT OFF TOWPLANE SHOULD BE FOLLOWED HIGHER THAN WITH												
76	1	OTHER SAILED PLANES.												
76	1	CROSSWINDS A MAJOR PROBLEM. MAX VECTOR PROBABLY ABOUT 15KNOTS.												
76	1	NO PROBLEMS ON TAKEOFF(STEARMAN TOW)												

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVR.	STD	DEV
16	B. PILOT OPTION OF TOW	1.50	1.00	2.00	.00	.00	1.00	.00	1.375	.415	
17	1: EASE OF MAINTAINING POSITION	1.00	1.00	1.00	2.00	3.00	1.00	1.00	1.429	.728	
18	2: AIRCRAFT TRIM	2.00	5.00	1.00	4.00	4.50	4.00	4.00	1.500	1.336	
19	3: CONTROL IN PROPWASH	1.00	1.00	1.00	2.00	3.00	1.00	1.00	1.429	.728	
20	4: RELEASE CHARACTERISTICS	1.00	.00	2.00	1.00	2.00	1.00	2.00	1.500	.500	
77	AVR. AND STD. DEV. OF SUBTASKS(EX 1.2,...)	1.3	.4	2.3	1.2	1.3	.4	2.2	1.1	3.1	1.27
77	COMMENTS	INSUFFICIENT ELEVATOR TRIM. REQUIRES ABOUT 13N CONSTANT PUSH FORCE TO MUCH FORWARD STICK TO MAINTAIN POSITION. INEFFECTIVE-UNSATISFACTORY POOR NONEXISTENT MAX TRIM SPEED 45-50KTS, HOWEVER FORCES ARE LIGHT THROUGH SPEED RANGE EXCELLENT RESPONSIVE--WELL DAMPED--LIGHT CONTROL FORCES EXTREMELY--GOOD HARMONY--OUTSTANDING GLIDER CANNOT BE TRIMMED ON TOW. WOULD BE TIRESOME AS A CROSS-COUNTRY TOW CONSTANT FORWARD FORCE ON STICK TRIM-REQUIRED 13-18N FWD FORCE IN TOW. CONTROL VERY GOOD IN TOW. BOXING SAILPLANE IS SIMPLE TASK, WINGS LEVEL(ADEQUATE RUDDER CONTROL)									

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVR.	STD	DEV
16	B. PILOT OPTION OF TOW	1.00	2.00	3.00	.00	.00	2.00	3.00	2.200	.748	
17	1: EASE OF MAINTAINING POSITION	1.00	2.00	2.00	3.00	3.00	2.00	3.00	2.286	.700	
18	2: AIRCRAFT TRIM	1.00	3.00	3.00	3.00	3.00	2.00	2.00	2.571	.728	
19	3: CONTROL IN PROPWASH	1.00	2.00	3.00	2.00	3.00	2.00	2.00	2.143	.639	
20	4: RELEASE CHARACTERISTICS	1.00	.00	2.00	1.00	2.00	2.00	2.00	1.667	.471	
77	AVR. AND STD. DEV. OF SUBTASKS(EX 1.2,...)	1.0	.0	2.3	.5	2.5	.4	2.2	.4	2.2	.72
77	COMMENTS	INSUFFICIENT RUDDER TO BOX TOWPLANE INEFFECTIVE BUT HARD TO OPERATE FRICTION FORCE IS SUFFICIENT SUFFICIENT TRIM AVAILABLE HOWEVER EACH DETENT RESULTED IN AT LEAST 4KT INCREMENTS DIRECTIONAL-COULD NOT BOX TOW VERY WELL FAIRLY LARGE AILERON DEPLECTIONS ARE REQUIRED. ALWAYS NEED PUSH FORCES ON STICK TOUCHY IN DIRECTIONAL REQUIRED FOR DIRECTIONAL-LATERAL CONTROL SOME CONCENTRATION REQUIRED FOR DIRECTIONAL-LATERAL CONTROL HANDLES EXCELLENTLY. EASILY UPSET BY DRAUGHTS BUT EASILY RESTORED BY CONSOLE LIGHT RUDDER FORCES. GEAR RETRACTION FORCES ARE HEAVY, PLEASE PORTABLE STICK OVERROOT WHEN MOVING BACK TO CENTER FROM THE LINE OF TOW. CURVED STICK COULD BE THE REASON FOR THE RUDDER REACTION. UNPLEASANT STICK FORCES EXCESSIVE FRICTION. POOR VISIBILITY TO FLY WAS IN ROUGH AIR. HAD TO WORK TO RETURN TO CORRECT POSITION. NON-STANDARD STICK TOO FAR FORWARD RESULTING IN TROUBLE HOLDING NOSE DOWN AT HIGH TOW SPEEDS. ADEQUATE RUDDER CONTROL TO BOX TOWPLANE WITH WINGS LEVEL. SMALL BUT FREQUENT STICK AND RUDDER INPUTS REQUIRED IN NORMAL TOW.									

TASK	1	2	PILOT	4	5	6	7	AVER.	STD DEV
DESCRIPTION OF TASKS									
B. PILOT OPTION OF TOW	2.00	3.00	3.00	3.00	.00	3.00	2.00	2.500	.500
1. CASE OF MAINTAINING POSITION	2.00	2.00	3.00	3.00	.00	3.00	1.00	2.286	.700
2. CASE OF LEFT TURN	5.00	2.00	3.00	3.00	.00	3.00	2.00	3.429	.400
3. CASE OF RIGHT TURN	5.00	2.00	3.00	3.00	.00	3.00	2.00	3.429	.400
4. CASE OF RELEASE IN PROPWASH	5.00	2.00	3.00	3.00	.00	3.00	2.00	3.429	.400
5. CASE OF RELEASE IN PROPWASH	5.00	2.00	3.00	3.00	.00	3.00	2.00	3.429	.400
6. CASE OF RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
7. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
8. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
9. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
10. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
11. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
12. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
13. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
14. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
15. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
16. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
17. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
18. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
19. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
20. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
21. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
22. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
23. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
24. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
25. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
26. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
27. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
28. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
29. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
30. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
31. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
32. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
33. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
34. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
35. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
36. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
37. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
38. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
39. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
40. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	3.00	2.00	2.00	2.167	.687
41. RELEASE CHARACTERISTICS	1								

[illegible]

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT	3	4	5	6	7	AVER.	STD DEV
16	B. PILOT OPTION OF TOW	.00	2.00	3.00	.00	2.00	2.00	2.00	2.00	2.000	.400
17	1. EASY TO MAINTAIN POSITION	.00	1.00	3.00	.00	2.00	2.00	2.00	2.00	2.000	.000
18	2. AIRCRAFT IN PROPWASH	.00	2.00	3.00	.00	2.00	2.00	2.00	2.00	2.000	.000
19	3. CONTROL CHARACTERISTICS	.00	2.00	3.00	.00	2.00	2.00	2.00	2.00	2.000	.000
20	4. RELEASE CHARACTERISTICS	.00	.00	3.00	.00	2.00	2.00	2.00	2.00	2.000	.000
21											
22											
23											
24											
25											
26											
27	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,3,4)	.00	.00	1.7	.5	3.0	.7	2.0	.4	2.5	.9
28											
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COMMENTS

THIS AIRPLANE WAS EASY TO LOCK IN POSITION.
CENTERING SPRING IS ANNOYING.
ADEQUATE BUT DIFFICULT TO ACTUATE TRIM LEVER TO OBTAIN PRECISE
SETTINGS AND LEVER LOCATED TOO FAR FROM PILOT.
THE TRIM WAS VERY GOOD
EXCELLENT BUT NOISY
FELT SOLID, NOTED DURING TOW THAT NOSE UP BREAKOUT FORCE LESS THAN
NOSE DOWN. NOSE DOWN FELT LIKE A LSTOPC.
GOOD
HANDLING DURING TOW IS GOOD, ONLY ANNOYING CHARACTERISTIC IS NOISF
POSITION. TRIM FORCE CAUSES UNWANTED PITCH CHANGES (ATTITUDE)
STROKING WHEN HITTING A GUST WHICH INCREASES/DECREASES AIRSPEED.
ON TOW CONTROL MORE THAN ADEQUATE TO MAINTAIN WING SEMISPAN LATERAL
DUEST FROM TOWPLANE WITH WINGS LEVEL

TASK	PILOT	5	7	4	2.5	.9	1.7	.4	2.1	.80
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[illegible]

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV					
16	B. PILOT OPTION OF TOW	2.00	4.50	2.00	.00	.00	4.00	5.00	3.500	1.325					
17	1. EASE OF MAINTAINING POSITION	1.00	3.00	2.00	.00	.00	3.00	2.00	2.800	1.400					
18	2. AIRCRAFT TRIM	2.00	2.00	2.00	.00	.00	3.00	2.00	2.200	.400					
19	3. CONTROL IN PROWASH	1.00	2.00	2.00	.00	.00	3.00	4.00	2.500	1.116					
20	4. RELEASE CHARACTERISTICS	1.00	2.00	2.00	.00	.00	3.00	2.00	1.750	.433					
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.3	.4	2.3	.5	2.0	.0	.0	.0	2.7	.4	3.2	1.3	2.3	1.00

COMMENTS

TASK	PILOT	COMMENTS
17	1	FWD VISIBILITY LIMITED
18	1	TRIMMED ON TOW BUT TOWROPE RUBS SIDE OF FUSELAGE DUE TO POS. OF RELEASE
19	1	CONTROL PROBLEM IN TURBULENCE. PILOT WAS FAIRLY CLOSE TO A SERIOUS PITCH
19	1	CONTROL PROBLEM AT TIMES. PILOT INDUCED OSCILLATION. I WAS UNABLE
19	1	TAKE RIGHT HAND WHILE LEFT HAND, EVEN IN SMOOTH AIR.
19	1	AS USUAL, WE THINK A VERY SENSITIVE PITCH CONTROL, I WAS VERY CONSCIOUS
19	1	WOULD BE UNPLEASANT. I LOOKED AT THE NEGATIVE STICK FORCE/ICE GIVES
19	1	TOWS OK AT 70 KTS. AT 80 KTS THE NEGATIVE STICK FORCE/ICE GIVES
19	1	THE IMPRESSION OF HAVING A VERY SENSITIVE PITCH CONTROL. MOST UNPLEASANT
19	1	ON TOW WHERE PITCH SPEEDING TASK IS LIGHTER.
19	1	INITIAL TOW SPEED 60 KTS. FEEL MORE COMFORTABLE WITH ONE NOTCH DOWN
19	1	FLAPS. NO BOXING OF TOWPLANE WAS ATTEMPTED. VERY EASY TO STAY IN
19	1	POSITION. FEET ON RUDDER PEDALS. YAWS ABOUT ONE WING SPAN TO EITHER
19	1	SIDE OF TOWPLANE. CONTROLLABLE WITH RUDDER.
19	1	POOR HARMONY. VERY SENSITIVE ELEVATOR WITH RELATIVELY HEAVY,
19	1	SLUGGISH AILERONS. BOXING TOW TO SIDE WITH FULL RUDDER. WINGS LEVEL
19	1	ABOUT 1/2 SEMISPAN FROM TOWPLANE

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV					
16	B. PILOT OPTION OF TOW	.00	1.00	2.00	.00	.00	2.00	1.00	1.500	.500					
17	1. EASE OF MAINTAINING POSITION	.00	1.00	2.00	.00	.00	2.00	1.00	1.667	.745					
18	2. AIRCRAFT TRIM	.00	.00	2.00	.00	.00	4.00	1.00	2.400	1.020					
19	3. CONTROL IN PROPWASH	.00	1.00	1.00	.00	.00	2.00	2.00	2.000	.687					
20	4. RELEASE CHARACTERISTICS	.00	1.00	3.00	1.00	2.00	2.00	2.00	1.833	.687					
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	.0	.0	1.0	.0	2.0	.7	1.5	.5	2.5	.9	2.0	1.2	2.0	.91

COMMENTS

TASK	PILOT	COMMENTS
17	1	EXCELLENT
18	1	FWD STICK, ARM OUTSTRETCHED
19	1	GOOD ENOUGH NOSE DOWN TRIM
19	1	NO TAIL WASH AS LAS WITH SINGLE PILOT
19	1	BETTER THAN MOST
19	1	NOT TOO EASY TO TOW. AILERONS OSCILLATE OCCASIONALLY IN PROPWASH
19	1	EX. TURN EASY. THIS IS GOOD. SUPER
19	1	VERY GOOD TOW CHARACTERISTICS, NOISIER THAN OTHERS.
19	1	RUDDER FOR TOW. HIGH TOW. GOOD HARMONY
19	1	UNABLE TO HOLD TOW. GOOD TO HOLD FWD FORCE CONTINUOUSLY. VERY
19	1	GOOD IN HOLDING STABLE TOW POSITION, HOWEVER.

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT	4	5	6	7	AVER.	STD DEV							
21	C. PILOT OPINION OF LONG. HANDLING	2.00	1.00	1.00	3.00	3.00	1.00	1.00	1.250	.433							
22	EASE OF ENTRY & MAIN CONTROLS	3.00	1.00	1.00	3.00	3.00	1.00	1.00	1.571	.904							
23	PLANE TRIM STABILITY	3.00	1.00	1.00	3.00	3.00	1.00	1.00	1.571	.904							
24	PLANE TRIM STABILITY	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.286	.495							
25	STICK FORCE GRADIENT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.571	.904							
26	STICK FORCE GRADIENT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.571	.904							
27	STICK FORCE GRADIENT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.571	.904							
28	STICK FORCE GRADIENT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.571	.904							
29	STICK FORCE GRADIENT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.571	.904							
30	STICK FORCE GRADIENT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.571	.904							
31	STICK FORCE GRADIENT	1.00	2.00	1.00	1.00	2.00	1.00	2.00	1.600	.490							
78	AVR. AND STD. DEV. OF SUBTASKS (EX 1,2,...)	1.5	.8	1.6	1.3	1.6	.7	1.6	1.1	2.3	.6	1.6	1.0	2.1	.8	1.7	.96

TASK	PILOT	COMMENTS
21	4	EASY TO OBTAIN, BUT HAD TO HOLD A FORCE AT SPEEDS ABOVE 48KTS.
22	3	VERY EASY TASK
23	3	TRIMMER UNSATISFACTORY
24	4	NOT NEEDED
25	4	MAX TRIM SPEED 48KTS.
26	4	COULD ONLY TRIM TO 61 IAS
27	4	INSTEADICENT NOSE DOWN TRIM FOR MAX AIRSPEED
28	4	STEADY STATE SPEED WITH FULL FWD TRIM AT 55KTS-NEEDS FULL TRIM CAP.
29	3	EXCELLENT
30	3	NO PROBLEMS AT ALL IN OVER 161 OR UNDESIRABLE RESPONSE
31	3	EXCELLENT
78	3	LIGHT BUT GOOD-RARELY BOTHER TRIMMING WHILE SOARING
22	3	VERY GOOD
23	3	TRIMMER INOPERATIVE
24	3	VERY GOOD
25	3	THIS TO ME IS EVIDENCED BY STICK FORCE GRADIENT
26	3	TRIMMER INOPERATIVE BUT PROBABLY WOULD RETURN TO TRIM
27	3	MAXIMUM OF TRIM
28	3	EXCELLENT
29	3	EXCELLENT
30	3	EXCELLENT
31	3	EXCELLENT
78	3	NEUTRAL
22	3	NEUTRAL
23	3	NEUTRAL
24	3	NEUTRAL
25	3	NEUTRAL
26	3	NEUTRAL
27	3	NEUTRAL
28	3	NEUTRAL
29	3	NEUTRAL
30	3	NEUTRAL
31	3	NEUTRAL
78	3	NEUTRAL

TOO LIGHT STABILITY CAUSES G TO BUILDUP DURING DIVE ACCEL.

STICK FORCE REQUIRED

IN TURNING FLIGHT AT 52KTS POSITIVE AND OK

1-18NAT. IN TURNING FLIGHT AT 52KTS POSITIVE AND OK

STABILITY INDUCED DURING DIVE RECOVERY LEADS TO EASE OF OVER 6

EXCELLENT LONGITUDINAL STABILITY, VERY PERCEPTIBLE STICK TRAVEL AND

FORCE REQUIRED FOR SPEED CHANGE. NON LINEAR RESPONSE DURING PRECISE

ATTITUDE CHANGE (SLOWER RESPONSE TO PUSH THAN TO PULL).

STICK FORCE PER 161 EXCELLENT

STICK FORCE PER 161 EXCELLENT

STICK FORCE PER 161 EXCELLENT

STICK FORCE PER 161 EXCELLENT

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STICK FORCE PER 161 EXCELLENT

STICK FORCE PER 161 EXCELLENT

STICK FORCE PER 161 EXCELLENT

STICK FORCE PER 161 EXCELLENT

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV						
C.	PILOT OPIN OF LONG, HANDLING	.00	2.00	4.00	.00	3.00	4.00	3.00	3.200	.748						
1.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.473						
2.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.943						
3.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.687						
4.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	1.067						
5.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.000						
6.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.687						
7.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.498						
8.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.498						
9.	STICK FEEL	.00	.00	.00	.00	.00	.00	.00	3.200	.498						
10.	DIVE RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.200	.980						
78	AVER. AND STD. DEV. OF SUBTASKS(1,2,...)	.0	.0	2.1	.3	2.6	.8	1.6	.8	2.2	.6	2.9	1.0	2.2	.6	2.3
TASK	PILOT															
3	3	OCCASIONAL OVERSHOOT IS EXPERIENCED WHEN CHANGES ARE ATTEMPTED														
4	4	IAS EASY TO OBTAIN, HOWEVER, IT IS DIFFICULT TO ACTUATE TRIM LEVER														
5	5	FOR MAINTAINING IAS														
6	6	HARD TO ADJUST. PRECISELY														
7	7	ABLE TO TRIM THROUGHOUT REQD TRIM RANGE														
8	8	VERY GOOD														
9	9	VERY SENSITIVE														
10	10	FOUND CENTERING SPRING ANNOYING														
11	11	FORCE GRADIENT IS THE RESULT OF WORKING AGAINST SPRINGS. THIS														
12	12	RESULTS IN FORCES AS HIGH AS 18-22N. DURING ALL MANEUVERS, EXCEPT														
13	13	T.O., LANDING, AND STICK FORCE/VEL. VERY LIGHT FORCES WOULD BE														
14	14	MORE DESIRABLE.														
15	15	LIGHT BUT OK														
16	16	NONLINEARITY OBSERVED GOING BACK FROM 57 TO 52 OK. STARTING FROM														
17	17	48 OSCILLATION BEGAN. SAME AS STICK FIXED														
18	18	POSITIVE STICK FORCE/VE GRADIENT														
19	19	DID NOT DO														
20	20	GOOD														
21	21	VERY PLEASANT IF SAME TRIM SPEED IS DESIRED AT END OF MANEUVER														
22	22	POSITIVE FORCE GRADIENT WITH LGL.														
23	23	OK														
24	24	NEUTRAL														
25	25	NEUTRAL--APPROX. 16SEC PERIOD														
26	26	APPROX. 20 SEC PERIOD MODERATELY DAMPED														
27	27	LIGHT BUT NO SURPRISES														
28	28	GOOD NO PROBLEM														
29	29	POSITIVE FORCE GRADIENT WITH LGL.														
30	30	GIVES IMPRESSION OF LIGHT STABILITY WITH STIFF, INSENSITIVE STICK.														
31	31	QUICK, LIGHT BUT CONSISTENT. PLEASANT TO FLY														
32	32	WHEN RETURNING FROM OFF TRIM CONDITION, PHUGOID OSCILLATION WAS														
33	33	EXCITED IN 2 OF 3 CASES.														
34	34	STICK FORCE PER 1G 700 LIGHT. STICK FORCE PER DISPLACEMENT MAY BE														
35	35	OK. STICK FORCE GRADIENT IN BOTH 1G/L AND MANEUVERING FLIGHT.														
36	36	HIGH STICK FORCE GRADIENT IN FREE FLIGHT, MUCH OF THE REQUIRED PITCH CONTROL ACTING DETENT.														
37	37	IN SMALL DEFLECTIONS AROUND THE STRONG CENTERING SPRING RESPONSE														
38	38	THE PILE IS DEPRIVED OF TRUE ARTIFICIAL FEEL FOR AIRPLANE RESPONSE														
39	39	TO THEM SMALL INPUTS BY THE ARTIFICIAL BREAK FORCES. THIS IS A														
40	40	PREVIOUSLY ENCOUNTERED IN RESEARCH SIMULATORS. IT DOES NOT														
41	41	PERFECTLY AFFECT AIRPLANE CONTROL (WITH POSSIBLE EXCEPTING OF TOW														
42	42	PITCH INPUTS BUT IT CAUSES HIGHER PILOT WORKLOAD IN ITERATING SMALL														
43	43	PITCH INPUTS AND IS IRRITATING.														
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***** 2FROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV						
C.	PILOT OPIN OF LONG. HANDLING															
1.	EASE OF TEST & MAIN CON AIRSPEED	5.00	6.00	2.00	.00	.00	4.00	4.00	4.200	1.327						
2.	EASE OF TEST & MAIN CON SPEED RANGE	2.00	2.00	2.00	.00	.00	4.00	4.00	2.400	.800						
3.	PLAIN POSITIVE GRADIENT	2.00	2.00	2.00	.00	.00	5.00	5.00	3.600	1.200						
4.	STICK FORCE GRADIENT	1.00	2.00	2.00	.00	.00	4.00	4.00	2.800	1.166						
5.	STICK FORCE STABILITY	10.00	2.00	2.00	.00	.00	4.00	4.00	2.800	.000						
6.	RETURN FROM TRIM	10.00	2.00	2.00	.00	.00	4.00	4.00	4.200	3.419						
7.	STICK FREE STABILITY	10.00	2.00	2.00	.00	.00	4.00	4.00	3.250	3.419						
8.	MANEUVERING RESPONSE	10.00	6.00	2.00	.00	.00	5.00	5.00	3.600	1.625						
9.	PHUGOID CHARACTERISTICS	10.00	6.00	2.00	.00	.00	5.00	5.00	3.600	1.625						
10.	DIVE RECOVERY	2.00	6.50	2.00	.00	.00	5.00	4.00	3.300	1.778						
78	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	4.5	3.7	3.4	2.0	2.4	.5	.0	.0	.0	3.0	.9	3.7	1.3	3.4	2.14

TASK	PILOT	COMMENTS
21	7	PITCH RESPONSE TO CONTROL INPUTS IS LIKE ACCELERATION COMMAND - CHECKING MOTION FOLLOWS MOST STICK INPUTS - OVERSHOOT TENDENCY
22	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
23	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
24	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
25	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
26	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
27	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
28	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
29	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
30	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
31	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
78	7	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3

TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT	3	4	5	6	7	AVER.	STD DEV
21	C. PILOT OPIN OF LONG. HANDLING	.00	.00	.00	.00	.00	.00	.00	.00	2.667	.943
22	1. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
23	2. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
24	3. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
25	4. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
26	5. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
27	6. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
28	7. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
29	8. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
30	9. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
31	10. LOSS OF STICK CONTROL	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577
70	AVER. AND STD. DEV. OF SUBTASKS (EX 1,2,..)	.00	.00	.00	.00	.00	.00	.00	.00	2.000	.577

TASK	PILOT	COMMENTS
21	1	VERY EASY WITHIN TRIM RANGE.
22	1	POWERFUL AND POSITIVE
23	1	MAX TRIM SPEED 74 KTS
24	1	NO TRIM BEYOND 70
25	1	GOOD, BUT GOOD FOR TRAINER
26	1	EXCESSIVE
27	1	FOR AIRSPEED TOO POWERFUL
28	1	HIGH, BUT GOOD FOR TRAINER
29	1	QUITE STABLE
30	1	APPEARS TO BE POSITIVE
31	1	POSITIVE
32	1	EXCESSIVE, HEAVY FORCES ARE REQUIRED TO CHANGE AIRSPEED
33	1	POSITIVE
34	1	QUALITATIVELY GOOD
35	1	GOOD FREE RETURN
36	1	+2-3 KTS
37	1	TOO STRONG A TENDENCY
38	1	VTRIM 52 KTS, LOW 50 HIGH 54, VTRIM 65 KTS LOW 58 HIGH 79
39	1	GOOD POSITIVE
40	1	SOMEWHAT SLOW
41	1	POSITIVE STICK FORCE/LEG
42	1	LIGHTLY DAMPED
43	1	UNSTABLE PHUGOID AT 60 KTS
44	1	NEUTRAL
45	1	VTRIM 52 KTS 22 SEC PERIOD, VTRIM 65 KTS 26 SEC PERIOD
46	1	GOOD ON A LIGHT FOR TRAINER
47	1	GOOD ON A HEAVY FOR TRAINER
48	1	STICK GRADIENTS ARE LITTLE TOO HEAVY. SOME BUZZING WELL INTO
49	1	STICKING UP AND DOWN. SOME BUZZING WELL INTO
50	1	STICKING UP AND DOWN. SOME BUZZING WELL INTO
51	1	STICKING UP AND DOWN. SOME BUZZING WELL INTO
52	1	STICKING UP AND DOWN. SOME BUZZING WELL INTO
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68	1	STICKING UP AND DOWN. SOME BUZZING WELL INTO
69	1	STICKING UP AND DOWN. SOME BUZZING WELL INTO
70	1	STICKING UP AND DOWN. SOME BUZZING WELL INTO

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLING	1.00	1.00	1.00	.00	.00	.00	.00	1.000	.000
33	1. AILERON FORCE GRADIENT	1.00	1.00	1.00	.00	.00	.00	.00	1.429	.495
34	2. RUDDER FORCE GRADIENT	1.00	1.00	2.00	.00	.00	.00	.00	1.429	.495
35	3. ROLL RATE OVER SPEED RANGE	1.00	1.00	1.00	.00	.00	.00	.00	2.000	.726
36	4. SIDESLIP CHARACTERISTICS	1.00	1.00	2.00	.00	.00	.00	.00	2.000	.726
37	5. EASE OF TURN ENTRY	1.00	1.00	2.00	.00	.00	.00	.00	2.000	.457
38	6. EASE OF TURN EXIT	1.00	1.00	2.00	.00	.00	.00	.00	2.000	.457
39	7. YAW DUE TO ROLL	2.00	3.00	1.00	.00	.00	.00	.00	2.000	.632
40	8. EASE OF MAIN. 0.785RAD BANK TURN	1.00	1.00	1.00	.00	.00	.00	.00	1.429	.728
41	9. EASE OF MAIN. 1.047RAD BANK TURN	1.00	1.00	1.00	.00	.00	.00	.00	1.429	.728
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.3	.5 1.2	.6 1.4	.5 1.7	.7 2.2	.4 1.9	.8 2.0	.8 1.7	.72

COMMENTS

TASK	PILOT	COMMENTS
32	3	VERY PLEASANT
33	3	CONTROL HARMONY VERY GOOD
34	3	OCCASIONALLY TOO LIGHT
35	3	EXCELLENT
36	3	ABOUT .209 TO .262 RAD./SEC AT SPEEDS CHECKED
37	3	.38 RAD/SEC AT 39 IAS, .463 RAD/SEC AT 57 IAS
38	3	RUDDER FORCE REVERSED BUT GOOD OTHERWISE
39	3	APPROX .262 RAD BANK REQD FOR MAX RUDDER DEFLECTION FOR CONSTANT HEADWIND
40	3	POSITIVE STABILITY HOWEVER A/S BLANKS OUT WITH YAW
41	3	RUDDER LOCKS
79	3	STEADY HEADING SIDESLIP--RUDDER FORCE GRADIENT LIGHTENS AFTER ABOUT 1/2 TURN, BUT NO REVERSAL. FULL RUDDER REQUIRES .262 RAD BANK--SLIGHT PITCH UP--LIGHTLY POSITIVE DIHEDRAL EFFECT
32	3	VERY EASY
33	3	VERY EASY RUDDER REQUIRED FOR INITIAL ROLL, SLIGHTLY MORE FOR LATER
34	3	VERY NOTICEABLE, BUT STILL IT IS POSSIBLE TO MAKE A GOOD TURN WITH
35	3	AILERONS ONLY
36	3	VERY EASY TO MAINTAIN COORDINATED CONTROL
37	3	ABOUT .262 RAD RUDDER FIXED
38	3	CAN PICK UP LOW WING WITH RUDDER--.262 RAD ROLL IN 5 SEC WITH FULL
39	3	RUDDER AT 39 IAS
40	3	ONE OF THE BEST
41	3	GOOD--SLIGHT AMOUNT OF TOP STICK REQUIRED
79	3	EXCELLENT
32	3	SAME AS D.8
33	3	VERY LIGHT AND RESPONSIVE
34	3	SUPERB COORDINATION IN MANEUVERING FLIGHT
35	3	EXCELLENT FOR THERMALING
36	3	SPRINT STABILITY NEUTRAL--VERY GOOD--PITCH ROLL CONTROL AND RESPONSE
37	3	HARMONY IS VERY GOOD

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV							
32	D. PILOT OPINION OF LATERAL HANDLING	2.00	2.00	3.00	.00	.00	3.00	4.00	2.800	.748							
33	1. AILERON FORCE GRADIENT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.143	.639							
34	2. AILERON FORCE GRADIENT RANGE	3.00	2.00	1.00	1.00	1.00	1.00	1.00	1.143	.639							
35	3. STICK FEEL CHARACTERISTICS	3.00	2.00	3.00	3.00	3.00	3.00	3.00	2.143	.748							
36	4. STICK FEEL TO AILERON	2.00	2.00	2.00	3.00	3.00	3.00	4.00	2.143	.748							
37	5. YAW DUE TO ROLL	2.00	2.00	2.00	3.00	3.00	3.00	4.00	2.143	.748							
38	6. YAW DUE TO ROLL	2.00	2.00	2.00	3.00	3.00	3.00	4.00	2.143	.748							
39	7. EASE OF MAIN. 1.047RAD BANK TURN	1.00	2.00	2.00	2.00	2.00	1.00	2.00	1.143	.639							
40	8. EASE OF MAIN. 1.047RAD BANK TURN	2.00	2.00	2.00	2.00	2.00	1.00	2.00	1.143	.639							
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.9	.7	2.1	.3	2.1	.6	2.5	.9	2.8	.6	2.1	.8	3.0	.8	2.4	.80

TASK	COMMENTS
32	EXCESSIVE FRICTION
33	CONTROL HARMONY NOT GOOD--FOR LONG PERIODS OF TURNING FLT. IT BECAME OBVIOUS THAT AILERON FORCES ARE TOO HEAVY.
34	JUST ABOUT RIGHT FOR PURE ROLL
35	VERY PLEASANT
36	RUDDER NOT EFFECTIVE ENOUGH AT LOW SPEEDS WHEN EXECUTING RAPIDLY APPROX 3.5 SEC AT THERMALLING SPEEDS
37	ABOUT 349RAD/SEC AVERAGE
38	ABOUT 78IAS .489RAD/SEC, VTRIM 52IAS .384RAD/SEC
39	NOT CHECKED
40	AIR SPEED GOES WILD--NO PROBLEM. RUDDER FORCE REVERSES VERY LITTLE BANK REQUIRED FOR MAXIMUM RUDDER DEFLECTION FOR CONSTANT HEADING FLT.
41	RUDDER OVERBALANCES BUT NO PROBLEM.
42	VTRIM 48 DELAPES, SPIRAL STABILITY SLIGHTLY NEGATIVE. MODERATE PITCHUP--UNUSUAL. RUDDER OVER BALANCE ABOUT 1/2 DEFLECTION
43	RUDDER INSUFFICIENT BUT EVEN SO, THE TURN ENTRY WAS GOOD
44	NOT TOO EASY
45	HAVE TO WORK AT RUDDER TO COORDINATE
46	VERY DIFFICULT TO KEEP YAW STRING CENTERED
47	RUDDER KEEP WORKING TO CENTER OF YAW STRING
48	CAN BE DOWN HANDS OFF
49	FAIRLY DIFFICULT AT LOWER SPEEDS
50	NO FLEEVATOR FORCE
51	WORKS TO COORDINATE
52	FEELS OK KING WALK
53	FAIRLY COORDINATE
54	NO FLEEVATOR FORCE
55	NO FLEEVATOR FORCE
56	NO FLEEVATOR FORCE
57	NO FLEEVATOR FORCE
58	NO FLEEVATOR FORCE
59	NO FLEEVATOR FORCE
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72	NO FLEEVATOR FORCE
73	NO FLEEVATOR FORCE
74	NO FLEEVATOR FORCE
75	NO FLEEVATOR FORCE
76	NO FLEEVATOR FORCE
77	NO FLEEVATOR FORCE
78	NO FLEEVATOR FORCE
79	NO FLEEVATOR FORCE

SAILPLANE 3 DATA

[illegible]

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
D.	PILOT OPINION OF LATERAL HANDLING									
32	1. AILERON FORCE GRADIENT	2.00	3.00	2.00	.00	.00	4.00	2.00	2.600	.800
33	2. AILERON FORCE GRADIENT	2.00	2.00	2.00	.00	.00	3.00	3.00	2.200	.400
34	3. ROLL RATE OVER SPEED RANGE	2.00	3.00	3.00	.00	.00	5.00	4.00	3.300	1.077
35	4. SIDESLIP CHARACTERISTICS	2.00	4.00	3.00	.00	.00	2.00	2.00	2.800	.748
36	5. EASE OF TURN ENTRY	2.00	2.00	1.00	.00	.00	4.00	3.00	2.600	1.020
37	6. YAW DUE TO ROLL	2.00	2.00	1.00	.00	.00	6.00	3.00	3.000	1.549
38	7. YAW DUE TO MAIN	1.00	2.00	1.00	.00	.00	2.00	2.00	2.000	.000
39	8. EASE OF MAIN	2.00	1.00	1.00	.00	.00	2.00	2.00	2.000	.400
40	9. EASE OF MAIN	2.00	1.00	1.00	.00	.00	2.00	2.00	1.600	.490
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.9	.3	2.2	.9	1.9	.8	.0	.0	1.06
TASK	PILOT	COMMENTS								
33	3	PLEASANT, FAIRLY LARGE TOP AILERON REQUIRED.								
34	3	LITTLE TOO HIGH OUTSIDE THE DEADBAND.								
35	3	TOO HEAVY (NOT ENOUGH MECHANICAL ADVANTAGE)								
36	3	50KTS. 105RAD FLAP, 4 SEC AT 60KTS 0 FLAP								
37	3	SLOW BUT SURPRISINGLY GOOD.								
38	3	HEAVY, STABLE 60KT FLAP 0 262RAD/SEC								
39	3	LOCKS-ABOUT 178N AILERON FORCE REQD TO UNLOCK AT 70KTS. VERY LARGE								
40	3	RUDDER OVERBALANCE AT 3/4 DEFLECTION								
41	3	LARGER AILERON AND RUDDER INPUTS REQD.								
79	3	RUDDER SUFFICIENT TO BALANCE 3								
79	3	ABOUT THE SAME AS SAILPLANE 3								
79	3	CAN BE BALANCED WITH RUDDER AT THERMALING SPEEDS.								
79	3	EXCELLENT								
79	3	IF SIZE AND SPAN OF SHIP WERE TAKEN INTO CONSIDERATION THE 2 RATINGS								
79	3	WOULD BE BETTER								
79	3	SAILPLANE 3 LATERALLY FOR ITS SIZE								
79	3	FOR SAILPLANE 3 LATERALLY FOR ITS SIZE								
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79	3									

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLING	.00	.00	2.00	.00	.00	2.00	2.00	2.000	.000
33	1. RUDDER FORCE GRADIENT	.00	.00	2.00	.00	2.00	2.00	2.00	2.000	.000
34	2. ROLL RATE OVER SPEED RANGE	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
35	3. ROLL RATE CHARACTERISTICS	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
36	4. SIDESLIP CHARACTERISTICS	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
37	5. EASE OF TURN ENTRY	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
38	6. YAW DUE TO ROLL	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
39	7. YAW DUE TO ROLL	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
40	8. EASE OF MAIN. 0.785RAD BANK TURN	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
41	9. EASE OF MAIN. 1.047RAD BANK TURN	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
79	AVER. AND STD. DEV. OF SUBTASKS (EX 1,2,3,4)	.0	.0	2.4	.5	1.9	.6	2.4	.5	2.6
					.4	3.2	1.2	2.1	.6	2.4
										.81

COMMENTS

TASK	COMMENTS	PILOT
32	FEELS BETTER THAN PITCH STICK GRADIENT	3
33	GOOD	3
34	TOO HEAVY	3
35	GOOD RUDDER FORCE TO COORDINATE	3
36	VTRIM 52IAS .314RAD/SEC, VTRIM 78IAS .454RAD/SEC	3
37	SLIGHT PITCH/ROLL COUPLING-ALSO RUDDER A LITTLE WEAK	3
38	LOWER SINK RATE THAN OTHERS	2
39	10DEG BANK WITH FULL RUDDER APPROX. .17RAD BANK FOR FULL RUDDER, SLIGHT	4
40	LOCK. LOSE AIRSPEED AFTER APPROX. .17RAD BANK FOR FULL RUDDER, SLIGHT	4
41	SLIGHT PITCH DOWN WITH SIDESLIP. .17RAD BANK FOR FULL RUDDER, SLIGHT	7
42	AT A LITTLE SLOW NEAR STALL.	7
43	VERY GOOD	7
44	ABOUT AVERAGE	2
45	VERY GOOD	2
46	BECAUSE OF HEAVY RUDDER FORCES, APPROX 89N IN MAINTAINING TURN	4
47	NEUTRAL LOW AMPLITUDE, LONG PERIOD	5
48	STICK FORCE/LGT APPROX 9N	7
49	VERY GOOD	3
50	BUFFETING	3
51	SAME AS .785RAD BANK	4
52	STICK FORCE/LGT APPROX 22N	7
53	EXCELLENT EXCEPT NEAR STALL	7
54	EXCELLENT LATERAL-DIRECTIONAL CHARACTERISTICS MIXED SOMEWHAT BY	7
55	BUFFETING COORDINATE 9000 ROLL RESPONSE TO UNHARMONIOUS FORCE ONLY ABOUT 80N	7
56	HARD TO COORDINATE 9000 ROLL RESPONSE TO UNHARMONIOUS FORCE ONLY ABOUT 80N	7
57	BUT SEEMS HIGH RELATIVE TO STICK, BUT STICK FORCE/LGT	7
58	45 AND 60DEG- BANK LESS THAN EASY TO CONTROL, BUT STICK FORCE/LGT	7
59	VERY LIGHT RESULTING IN OVERCONTROLLING ELEVATOR AND GETTING STALL	7
60	BUFFETING FREQUENT COORDINATION REED WOULD NOT BE ACCEPTABLE IN A	7
61	VERY GOOD- RUDDER COORDINATION REED WOULD NOT BE ACCEPTABLE IN A	7
62	POWERED AIRPLANE, BUT AS SAILPLANES 60.....	7

SAILPLANE 1 DATA

[illegible]

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS								PILOT	1	2	3	4	5	6	7	AVER.	STD DEV							
E.	PILOT OPIN OF PLANE STALLSPIN CHAR																								
42	1. RUDDER/AILERON EFFECT DUR. STALL									1.00	1.00	3.00	.00	.00	.00	.00	1.00	2.200	1.600						
43	2. STALL WARNING									1.00	1.00	3.00	1.00	.00	.00	.00	1.4	2.257	1.385						
44	3. AGGRAVATED STALL-TEND TO SPIN									1.00	1.00	3.00	1.00	.00	.00	.00	1.7	2.143	1.325						
45	4. STALL FORCE GRADIENT									1.00	1.00	3.00	2.00	.00	.00	.00	2.0	2.000	1.256						
46	5. STALL RECOVERY, ALTITUDE LOSS									1.00	.00	2.00	1.00	2.00	.00	.00	1.2	1.667	1.745						
47	6. SPIN ENTRY									1.00	.00	2.00	1.00	.00	.00	.00	1.2	1.500	1.414						
48	7. SPIN RECOVERY									1.00	1.00	2.00	1.00	.00	.00	.00	1.5	1.500	1.500						
49	8. STALL FROM TURN AT LOW SPEED									1.00	1.00	2.00	1.00	3.00	.00	4.0	1.857	1.325							
50																									
80	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)									1.0	.0	1.0	.0	2.2	.4	1.5	.8	2.5	.5	4.3	1.0	1.6	1.0	2.1	1.27

COMMENTS

TASK	PILOT	COMMENTS
42	3	DURING STALLS RUDDER POOR, AILERON FAIRLY GOOD
43	3	ADDITIONAL, SOME OF IT IS IN THE FORM OF CHANGING NOISE CHARACTER.
44	7	NO BUFFET WARNING-DIRECTIONAL STABILITY APPARENTLY DETERIORATES!
45	7	WANDERS IN YAW
46	3	NONE FOUND
47	3	ABOUT AVERAGE
48	3	15M. PILOT SPIN FAIRLY MILD
49	3	FAST RECOVERY
50	3	JUST RELAX AFT STICK FORCE
80	3	NOT PROBLEM
80	3	PILOT OPIN STALL THERE IS A TENDENCY OF ROLL OSCILLATIONS.
80	3	EASY STALL RECOVERY FROM EITHER TURN DIRECTION.
80	3	STALL WARNING AND SUDDEN BREAK MAKE SHIP UNDESIRABLE
80	3	VERY SENSITIVE THERMAL SOARING FOR A LOW TIME PILOT
80	3	VERY EXCESSIVE STALLS TURNING AND 1 LGT STICK CAN RE HELD FULL AFT
80	3	AND PLANE CAN BE REVERSED IN BANK--CAN BE FLOWN INDEFINITELY
80	3	AND HELD

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV							
E.	PILOT OPIN OF PLANE STALLSPIN CHAR	2.00	2.00	3.00	.00	.00	4.00	1.00	2.400	1.020							
42	1. RUDDER-AILERON EFFECT DUE STALL	1.00	2.00	2.00	2.00	2.00	3.00	1.00	1.857	.639							
43	2. STALL WARNING	1.00	2.00	3.00	3.00	3.00	3.00	1.00	2.429	.904							
44	3. AGGRAVATED STALL-TEND TO SPIN	2.00	2.00	3.00	3.00	2.00	4.00	1.00	2.571	.728							
45	4. STICK FORCE GRADIENT	2.00	2.00	3.00	3.00	2.00	3.00	1.00	2.143	.639							
46	5. STALL RECOVERY, ALTITUDE LOSS	.00	.00	3.00	.00	.00	3.00	1.00	2.333	.943							
47	6. STALL RECOVERY	2.00	1.00	2.00	.00	.00	3.00	1.00	2.000	1.000							
48	7. STALL FROM TURN AT LOW SPEED	2.00	1.00	2.00	.00	2.00	2.00	1.00	1.667	.471							
80	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,3,4,5,6,7)	1.8	.7	1.8	.4	2.6	.5	2.4	.5	2.2	.4	3.1	.6	1.5	1.0	2.2	.83
TASK	PILOT	COMMENTS															
43	3	3 KTS															
44	4	ADRY LIGHT AIRFRAME BUFFET APPROX. 2KTS ABOVE STALL.															
44	4	VERY LIGHT BUFFETING CLOSE (3KTS) TO STALL															
44	4	NO WARNING															
45	3	IT IS PRESENT IN THE GLIDER															
45	3	WITH FULLY DEVELOPED STALL, A/C ROLLS OFF ON LEFT WING AND NOSE															
45	3	DROPS OFF ON WING AND ROTATES, EASY TO CONTROL															
45	3	FALLS OFF ON WING AND ROTATES, EASY TO CONTROL															
45	3	COULD BE IMPROVED--NOT ENOUGH FORCE															
46	1	GOOD															
46	1	NOT REALLY GOOD CUE FOR IMMINENT STALL															
46	1	VERY LIGHT															
46	1	15 METERS															
47	3	LITTLE LOSS IN ALTITUDE															
47	3	ALTITUDE LESS THAN 30M.															
47	3	15M/100 STALL AT 42KTS															
47	3	FAIRLY ABRUPT FALL-OFF TO ONE SIDE															
48	3	NONE															
48	3	NONE															
48	3	FAIRLY ABRUPT FALL-OFF TO ONE SIDE															
49	3	SLOWER THAN OTHERS															
49	3	UNABLE TO STALL DUE TO LACK OF UP CONTROL TRAVEL.															
49	3	AILERON REMAINS EFFECTIVE THROUGHOUT STALL.															
49	3	FAIRLY QUICKLY. DOES NOT RESPOND TO CORRECTIVE ACTION AS READILY															
50	3	AS SAILPLANE 2															
50	3	STALL CHARACTERISTICS EXCELLENT-AILERONS EFFECTIVE THROUGHOUT STALL-															
50	3	STICK HOLD FULL AFT AND USE RUDDER AND AILERONS FOR CONTROL															
50	3	FOR SOME TIME.															

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
E.	PILOT OPIN OF PLANE STALL	.00	.00	.00	.00	.00	.00	.00	3.003	.532
43	1. RUDDER, ALLECON EFFECT DUE TO SPIN	.00	.00	.00	.00	.00	.00	.00	3.003	.532
44	2. STALL WARNING ALL-TEND TO SPIN	.00	.00	.00	.00	.00	.00	.00	3.003	.532
45	3. AGGRAVATED LOSS OF ALTITUDE	.00	.00	.00	.00	.00	.00	.00	3.003	.532
46	4. BACK LOGIC RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
47	5. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
48	6. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
49	7. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
50	8. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
51	9. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
52	10. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
53	11. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
54	12. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
55	13. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
56	14. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
57	15. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
58	16. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
59	17. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
60	18. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
61	19. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
62	20. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
63	21. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
64	22. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
65	23. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
66	24. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
67	25. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
68	26. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
69	27. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
70	28. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
71	29. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
72	30. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
73	31. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
74	32. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
75	33. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
76	34. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
77	35. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
78	36. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
79	37. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
80	38. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
81	39. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
82	40. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
83	41. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
84	42. TURN IN RECOVERY	.00	.00	.00	.00	.00	.00	.00	3.003	.532
85	43. TURN IN RECOVERY	.00	.00							

COMMENTS

GOOD WARNING OCCURS APPROX. 2 KTS ABOVE STALL.
NONE LIGHT BUFFERS STALL V STALL 30 KTS FLAP 0
NO DRAGS UNCONTROLLABLE, BUT NI ABRUPT WING DROP
UNABLE TO HAVE TENDENCY TO SPIN WITH FLAPS.
UNUSUALLY FEELING OF BEGINNING AUTOROTATION
LOWLY POSITIVE GRADIENT
NEGATIVE ALT LOSS
LESS THAN 15M
ABOUT 24M NI
IMMEDIATE DO DUE TO LIMITED STICK TRAVEL.
UNABLE TO DO DUE TO LIMITED STICK TRAVEL.
ALT LOSS ABOUT 61 METERS.
GOOD NO OBJECTIONABLE CHARACTERISTICS
WING DROP FOLLOWING ABUSED STALL IS UNCONTROLLABLE AND IS FOLLOWED
BY AUTOROTATION TENDENCY.

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
42	E. PILOT OPTN OF PLANE STALLSPIN CHAR	2.00	3.00	2.00	.00	.00	3.00	1.00	2.200	.740
43	1. RUDDER,AILERON EFFECT DUR. STALL	2.00	3.00	2.00	.00	.00	3.00	1.00	2.200	.632
44	2. STALL WARNING	1.00	2.00	2.00	.00	.00	2.00	4.00	2.200	.980
45	3. STALL WARNING STALL-TEND TO SPIN	2.00	2.00	2.00	.00	.00	3.00	1.00	2.200	.490
46	4. STICK FORCE GRADIENT	2.00	3.00	2.00	.00	.00	3.00	1.00	1.800	.707
47	5. STALL RECOVERY, ALTITUDE LOSS	.00	1.00	2.00	.00	.00	2.00	1.00	2.000	.500
48	6. STALL RECOVERY	1.00	3.00	2.00	.00	.00	2.00	1.00	2.500	1.095
49	7. STALL FROM TURN AT LOW SPEED	1.00	4.00	2.00	.00	.00	2.00	1.00	2.000	.85
80	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.7	.5	2.6	.9	2.0	.0	.0	.0	2.1

COMMENTS

TASK PILOT

42 OK UNTIL NEARLY FULL AFT STICK REACHED
 43 BUFFET PROGRESSIVE WITH AFT STICK MOVEMENT
 44 VERY POSITIVE LANDING FLAPS--VERY LIGHT BUFFET JUST BEFORE STALL
 45 STALL SPIN RECOVERY--STICK MOTIONS REQD NEAR STALL. AT STICK POSITION
 46 LARGE LONGITUDINAL STOP, SHIP WILL ENTER SPIN.
 47 WITHIN 5CM OF AFT STOP, SHIP WILL ENTER SPIN.
 48 NONE
 49 ABUSED STALL RESULTS IN EVENTUAL WING DROP BUT NO INCIPENT SPIN
 50 LIGHT
 51 GOOD BUT NOT IN TURNS
 52 12 METERS
 53 SMALL 15M IF WING ALLOWED TO DROP
 54 ABOUT 15M IF WING ALLOWED TO DROP
 55 RELATIVELY RESISTANT
 56 BELOW INCIPENT SPIN QUICKLY STOPPED SINCE AILERON REMAINS EFFECTIVE
 57 BEYOND THE STALL
 58 OK WITH STICK RELEASED, NOT INSTANT RECOVERY, BUT FAIRLY PROMPT
 59 NOT TRIED
 60 CONSIDERABLE LOSS OF STICK FORCE GRADIENT UNDER CG.
 61 WINDS TO JUST PICK UP SPEED AND FLY OUT
 62 NO TENDENCY TO FALL OFF TO EITHER SIDE AFTER STALL. STALL WARNING
 63 IS IN THE FORM OF INCREASING TAIL SHAKE. OVERALL IMPRESSION OF
 64 STALL AND INCIPENT SPIN: BETTER THAN MOST
 65 AILERONS HAVE LOW BUT POSITIVE EFFECTIVENESS THROUGH STALL--EXCELLENT
 66 STALL CHARACTERISTICS

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT	4	5	6	7	AVER.	STD DEV							
43	E. PILOT OPIN OF PLANE STALL SPIN CHAR	.00	.00	3.00	.00	.00	6.00	4.00	4.333	1.247							
44	1: BUDDER AILERON EFFECT DUE STALL	.00	5.00	2.00	2.00	2.00	4.00	3.00	3.000	1.353							
45	2: STALL WARNING	.00	1.00	2.00	4.00	2.00	4.00	1.00	2.533	1.247							
46	3: AGGRAVATED STALL-TEND TO SPIN	.00	5.00	3.00	3.00	3.00	6.00	4.00	4.000	1.353							
47	4: STICK FORCE GRADIENT	.00	1.00	2.00	2.00	2.00	5.00	2.00	2.333	1.247							
48	5: STALL RECOVERY, ALTITUDE LOSS	.00	5.00	2.00	2.00	2.00	7.00	4.00	3.567	1.886							
49	6: SPIN ENTRY	.00	5.00	3.00	.00	.00	6.00	4.00	4.500	1.118							
49	7: SPIN RECOVERY	.00	5.00	3.00	.00	.00	9.00	1.00	2.000	1.000							
50	8: STALL FROM TURN AT LOW SPEED	.00	5.00	2.00	2.00	2.00	9.00	4.00	4.000	2.517							
80	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	.0	.0	3.9	1.8	2.4	.5	2.5	.8	2.2	.4	5.9	1.6	2.9	1.3	3.3	1.75

COMMENTS

TASK PILOT

43	WEAK JUST ABOVE STALL-INEFFECTIVE AFTER STALL	3
44	GOOD	4
45	STALL WARNING CONSISTED OF AIRFRAME RUFFET THAT BECAME APPARENT 8-10 SECONDS ABOVE STALL. IF THERMALING IS CONDUCTED CONSTANTLY IN STALL BUFFET THEN THE PILOT WILL IGNORE THE STALL BUFFET. NORMAL STALL BUFFET SHOULD NOT OCCUR ABOVE THERMAL SPEED.	4
46	YES TENDS TO ROLL LEFT AND NOSE PITCHES DOWN AT THE STALL.	4
47	RECOVERY IS GOOD. TENDENCY TO SPIN	4
48	TAIL PLANE WANTS TO GO COVER THE TOP OF A RIGHT TURN AND DIG IN FURTHER TO THE LEFT FROM A LEFT TURN (FEET ON THE FLOOR, CROSS-CONTROLLED STALLS)	5
49	GOOD	7
50	NOT MEASURED BUT CONSIDERABLE	7
80	LESS THAN 61M.	3
	LESS THAN 61M.	4
	AGGRAVATED STALL 61-91M.	5
	MODERATE ENTRY RATE BUT POSITIVE ENTRY	7
	FAIRLY QUICK	3
	WELL	3
	ADEQUATE STALL WARNING, ABRUPT NOSE SLICE FOLLOWS SOME LATERAL OSCILLATIONS JUST PRIOR TO STALL.	3
	STICK FORCES DO NOT TELL YOU THAT YOU ARE ABOUT TO ENCOUNTER THE MORE THAN 1.5 G. IT DOES SEEM TO INCREASE NEAR THE STALL AT 2 G. HAS A TENDENCY TO YAW, ROTATE AND [BURY] THE NOSE FROM A CROSS-CONTROLLED, ABUSED STALL	3
		6
		7

SAILPLANE 1 DATA

[illegible]

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	4	5	6	7	AVER.	STD DEV							
F.	PILOT OPIN. OF PLANE LANDING CHAR.	2.00	.00	2.00	.00	.00	5.00	2.00	2.750	1.299							
51	1. PILOT VISIBILITY	1.00	1.00	2.00	.00	.00	3.00	1.00	1.429	.728							
52	2. GLIDE SLOPE CONTROL	3.00	3.00	3.00	2.00	1.00	5.00	3.00	3.000	.926							
53	3. EASE OF LAND. AT INTENDED SPOT	3.00	2.00	3.00	4.00	2.00	5.00	3.00	3.143	.990							
54	4. EASE OF CONTROL. SINK AT TOUCH.	2.00	2.00	2.00	3.00	2.00	4.00	2.00	2.571	.728							
55	5. EASE OF CONTROL DURING ROLLOUT	1.00	2.00	2.00	3.00	3.00	4.00	2.00	2.286	.881							
56	6. CONTROL DURING ROLLOUT	2.00	2.00	2.00	3.00	3.00	4.00	2.00	2.571	.728							
81	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,4,5)	2.2	.9	2.0	.6	2.3	.5	2.7	.9	2.0	.6	4.2	.7	2.2	.7	2.5	1.01
TASK	PILOT	COMMENTS															
51	3	GOOD															
52	3	AIRBRAKES A LITTLE WEAK															
53	3	COULD USE MORE EFFECTIVE DIVE BRAKES															
54	3	VERY LOW FORCE GRADIENT RESULTS IN OVERCONTROL.															
55	4	CONTROL LOCK VERY POOR. UNLOCKING OF AIRBRAKES RESULTS IN FORCE IS															
56	4	REQUIRED TO CLOSE THE AIRBRAKES. I FEEL THAT YOU SHOULD BE ABLE															
57	4	TO SELECT AIRBRAKE RAPIDLY AND IT WILL REMAIN AT SELECTED POSITION															
58	4	WHEN THE CONTROL IS RELEASED.															
59	4	HAVE TO HOLD AGAINST FURTHER EXTENSION WHICH I PREFER TO HOLDING WITH															
60	4	GOOD															
61	5	AIRBRAKES COULD BE MORE EFFECTIVE															
62	5	LONGITUDINAL OK -DIRECT WIND EFFECT															
63	5	VERY LOW FORCE GRADIENT															
64	5	BENT AFTER THAT PLANE															
65	5	DIRECT IONAL TAKES A LITTLE EFFECTIVE															
66	5	2.4 RUDER INADEQUATE DIVE BRAKE EFFECTIVENESS. 6, SOME CONCENTRATION															
67	5	REAR DURING CHUTE															
68	5	TO HOLD AGAINST FURTHER EXTENSION WHICH I PREFER TO HOLDING WITH															
69	5	GOOD															
70	5	AIRBRAKES COULD BE MORE EFFECTIVE															
71	5	LONGITUDINAL OK -DIRECT WIND EFFECT															
72	5	VERY LOW FORCE GRADIENT															
73	5	BENT AFTER THAT PLANE															
74	5	DIRECT IONAL TAKES A LITTLE EFFECTIVE															
75	5	2.4 RUDER INADEQUATE DIVE BRAKE EFFECTIVENESS. 6, SOME CONCENTRATION															
76	5	REAR DURING CHUTE															
77	5	TO HOLD AGAINST FURTHER EXTENSION WHICH I PREFER TO HOLDING WITH															
78	5	GOOD															
79	5	AIRBRAKES COULD BE MORE EFFECTIVE															
80	5	LONGITUDINAL OK -DIRECT WIND EFFECT															
81	5	VERY LOW FORCE GRADIENT															
82	5	BENT AFTER THAT PLANE															
83	5	DIRECT IONAL TAKES A LITTLE EFFECTIVE															
84	5	2.4 RUDER INADEQUATE DIVE BRAKE EFFECTIVENESS. 6, SOME CONCENTRATION															
85	5	REAR DURING CHUTE															
86	5	TO HOLD AGAINST FURTHER EXTENSION WHICH I PREFER TO HOLDING WITH															
87	5	GOOD															
88	5	AIRBRAKES COULD BE MORE EFFECTIVE															
89	5	LONGITUDINAL OK -DIRECT WIND EFFECT															
90	5	VERY LOW FORCE GRADIENT															
91	5	BENT AFTER THAT PLANE															
92	5	DIRECT IONAL TAKES A LITTLE EFFECTIVE															
93	5	2.4 RUDER INADEQUATE DIVE BRAKE EFFECTIVENESS. 6, SOME CONCENTRATION															
94	5	REAR DURING CHUTE															
95	5	TO HOLD AGAINST FURTHER EXTENSION WHICH I PREFER TO HOLDING WITH															
96	5	GOOD															
97	5	AIRBRAKES COULD BE MORE EFFECTIVE															
98	5	LONGITUDINAL OK -DIRECT WIND EFFECT															
99	5	VERY LOW FORCE GRADIENT															
100	5	BENT AFTER THAT PLANE															

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV							
F.	PILOT OPIN. OF PLANE LANDING CHAR.	3.00	3.00	3.00	.00	.00	4.00	3.00	3.200	.400							
1.	PILOT VISIBILITY	2.00	1.00	1.00	.00	.00	3.00	1.00	1.429	.493							
2.	GLIDE SLOPE CONTROL	3.00	3.00	3.00	.00	.00	3.00	3.00	3.571	.493							
3.	AIRS. CONTROL. AIRB. EASE OF MOD.	3.00	3.00	4.00	.00	.00	3.00	2.00	3.143	.750							
4.	AIRS. OF LAND. AT INTENDED SPOT	3.00	3.00	4.00	.00	.00	3.00	2.00	3.143	.750							
5.	EASE OF CONTROL. SINK AT TOUCH.	3.00	3.00	2.00	.00	.00	2.00	2.00	2.429	.493							
6.	CONTROL DURING ROLLOUT	2.00	3.50	2.00	.00	.50	4.00	4.00	4.000	2.573							
61	AVER. AND STD. DEV. OF SUBTASKS (EX 1,2,...)	2.7	.5	2.6	.8	2.5	1.0	2.5	1.0	3.4	2.7	2.8	.7	2.3	.9	2.7	1.33

COMMENTS

TASK PILOT

52 EXCELLENT
53 AIR BRAKES A LITTLE WEAK
54 VERY LOW FORCE GRADIENT RESULTS IN SOME PORPOSING PRIOR TO FLARE.
55 LIGHT SUCK-OPEN FORCES
56 VERY GOOD CONTROL, BUT FAST
57 AIR BRAKE HAS A TENDENCY, AFTER BEING UNLOCKED TO FLOAT TO APPROX.
3/4 EXTENDED POSITION. I FELT THE AIR BRAKE SHOULD HAVE THE
CAPABILITY OF POSITION MOVEMENT BUT THE AIR BRAKE SHOULD REMAIN IN
THE SELECTED POSITION. SPOILER EXTENSION AT 55 KTS.
51 SLOWLY DOWN WITH SOME
52 AIR BRAKES AS SOME
53 AIR BRAKES COULD BE MORE EFFECTIVE
54 EASY TO CONTROL IN PITCH IN TURBULENCE
55 GOOD LOW FORCE GRADIENT RESULTS IN SOME VERTICAL OSCILLATION DURING
56 THE FLARE
57 RUDDER FAIR--AILERONS FAIR
51 GOOD
52 BRAKE CONTROL ANKWARD TO APPLY WITHOUT TAKING HAND FROM CONTROL STICK
53 HOWEVER, FULL BRAKE APPLICATION RESULTED IN ONLY MINOR BRAKING ACTION
54 LOST CONTROL DURING ONE OF LANDINGS.
55 MINIMUM RUDDER AND TAILSKID FOR DIRECTIONAL CONTROL. A STEERABLE
56 TAIL WHEEL WOULD HELP.
57 2,3,4,5 COULD BE IMPROVED WITH MORE POWERFUL DIVE BRAKE
51 FAIR CROSSWIND CAPABILITY
52 FAIRLY EASY TO MAKE GOOD LANDING. TOUCHES DOWN AT HIGHER SPEEDS
53 THAN ONE WOULD LIKE TO.
54 LIMITED YAW CONTROL ON ROLLOUT.

SAILPLANE 4 DATA

[illegible]

EXCELLENT FLARE THEN FLOATS IF SPEED IS TOO HIGH
EXCELLENT FLARE BUT DRAG RESULTS IN LARGE PITCH ANGLES
EXCELLENT FLARE BUT HANDLING UNHANDY
EXCELLENT FLARE BUT SPEEDS; IT WOULD BE OBJECTIONABLE
AND AIR BRN REQUIRED CONSEQUENCE OF HANDLING LOCATION AND TRAVEL
DIFFICULT TO OBTAIN MAX. FLAP TRAVEL. FORCES VERY HIGH AT MAX.
FLARE DURING FLARE REQUIRED AT FLARE ENTRY POINT IF DROP-IN OR
LONGER FLARE TO BE AVOIDED
EFFECTIVE EVALUATION OF THE FLAP SYSTEM
LINE THAT IT IS OK IN MOST SITUATIONS
THE AIR BRAKE (IF IS) IS VERY DIFFICULT TO MANIPULATE. I.E. TAKES
A LONG TIME TO PUT IT WHERE I WANT TO MAINTAIN IT AS. IN ADDITION,
AT A RIGHT ANGLE ATTITUDE CHANGES DRASTICALLY TO WHERE I AM UNCERTAIN
OF A FLARE PATH.
FROM FLAPS -4 TO LANDING BRKES CAUSES HIGH STICK
CHANGES OF FLAP CONTROL REQUIRES VERY HIGH FORCES TO DEPLOY AROUND
900RAD.
SET-UP
PHYSICAL HOLDABLE TO SELECT 1.396RAD FLAPS IN FINAL STAGE OF APPROACH
HAVE TO USE HIGH FORCE ON FLAP HANDLE TO EXECUTE GLIDE PATH AND LOG.
PREPARE TO LAND. INPUTS WITH RIGHT HAND TO SELECTED LANDING
ON THIS FINAL LANDING, I MADE A HIGH BASE LEG AND SELECTED LANDING
ON AIS. WHICH BLEND OFF RAPIDLY DURING FLARE. I CONSIDER THIS AN
IMPRECISE METHOD. IT DOES NOT OFFER THE PRECISION IN
AWKWARD PATH CONTROL WHICH IS AVAILABLE WITH THE METHOD OF CONTROLLING
FLARE SPEED WITH MODULATION OF A DRAG DEVICE THROUGHOUT THE APPROACH.

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	4	5	6	7	AVER.	STD DEV
51	F. PILOT OPIN. OF PLANE LANDING CHAR.	2.50	4.00	3.00	.00	.00	2.00	3.00	2.900	.663
52	1: PILOT VISIBILITY	2.00	1.00	1.00	.00	.00	2.00	1.00	1.000	.490
53	2: GLIDE SLOPE CONTROL	2.00	3.00	2.00	.00	.00	2.00	3.00	2.400	.490
54	3: AIMSE. OF LAND. A. INTENDED SPOT	2.00	2.00	3.00	.00	.00	2.00	3.00	2.600	.490
55	4: EASE OF CONTROL. SINK AT TOUCH.	2.00	3.00	3.00	.00	.00	2.00	2.00	2.000	.490
56	5: EASE OF CONTROL. SINK AT TOUCH.	2.00	3.00	3.00	.00	.00	2.00	2.00	2.000	.490
57	6: CONTROL DURING ROLLOUT	2.00	4.00	3.00	.00	.00	2.00	2.00	2.000	1.265
81	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	2.2	4.2	2.7	2.5	1.0	2.7	1.5	2.5	1.02

COMMENTS

TASK	PILOT	COMMENTS
51	5	EXCELLENT
52	5	COULD USE A LITTLE MORE AIR BRAKE
53	5	USE OF PARACHUTE NOT INCLUDED IN EVALUATION
54	5	DOWNWIND BRAKE EXTENSION-6000
55	5	GOOD EXCEPT SOME SPOILER EXTENSION-6000
56	5	GOOD BUT POLE FOR A LONG TIME
57	5	FLY SMOOTHLY
58	5	FLY SMOOTHLY
59	5	FLY SMOOTHLY
60	5	FLY SMOOTHLY
61	5	FLY SMOOTHLY
62	5	FLY SMOOTHLY
63	5	FLY SMOOTHLY
64	5	FLY SMOOTHLY
65	5	FLY SMOOTHLY
66	5	FLY SMOOTHLY
67	5	FLY SMOOTHLY
68	5	FLY SMOOTHLY
69	5	FLY SMOOTHLY
70	5	FLY SMOOTHLY
71	5	FLY SMOOTHLY
72	5	FLY SMOOTHLY
73	5	FLY SMOOTHLY
74	5	FLY SMOOTHLY
75	5	FLY SMOOTHLY
76	5	FLY SMOOTHLY
77	5	FLY SMOOTHLY
78	5	FLY SMOOTHLY
79	5	FLY SMOOTHLY
80	5	FLY SMOOTHLY
81	5	FLY SMOOTHLY

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	3	4	5	6	7	AVER.	STD DEV
51	F. PILOT OPIN. OF PLANE LANDING CHAR.	.00	.00	2.00	.00	.00	2.00	3.00	2.333	.471
52	1: PILOT VISIBILITY	.00	1.00	1.00	.00	1.00	1.00	1.00	1.000	.000
53	2: GLIDE SLOPE CONTROL	.00	1.00	3.00	.00	1.00	1.00	1.00	1.333	.705
54	3: AIMSE. OF LAND. A. INTENDED SPOT	.00	.00	2.00	.00	1.00	1.00	2.00	1.500	.808
55	4: EASE OF CONTROL. SINK AT TOUCH.	.00	2.00	1.00	.00	1.00	2.00	2.00	1.500	.808
56	5: EASE OF CONTROL. SINK AT TOUCH.	.00	2.00	2.00	.00	1.00	2.00	2.00	1.800	.400
57	6: CONTROL DURING ROLLOUT	.00	2.00	1.00	.00	1.00	2.00	1.00	1.333	.471
81	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	.0	1.6	5.1	7.1	1.0	1.5	.5	1.4	.60

COMMENTS

TASK	PILOT	COMMENTS
51	5	EXCELLENT
52	5	GOOD-DUE TO DIVE BRAKE EFFECTIVENESS IT IS EASY TO MAKE DIFFICULT
53	5	LANDING POOR IF NOT GREASED WELL, VERY POOR
54	5	EXCELLENT-BUT ONE HAS TO BE CAREFUL WITH BRAKES NEAR THE GROUND
55	5	SLIGHT PITCH DOWN WITH SPOILER EXTENSION(GOOD CHARACTERISTIC)
56	5	VERY GOOD EXCEPT AS NOTED
57	5	VERY GOOD
58	5	VERY GOOD
59	5	VERY GOOD
60	5	VERY GOOD
61	5	VERY GOOD
62	5	VERY GOOD
63	5	VERY GOOD
64	5	VERY GOOD
65	5	VERY GOOD
66	5	VERY GOOD
67	5	VERY GOOD
68	5	VERY GOOD
69	5	VERY GOOD
70	5	VERY GOOD
71	5	VERY GOOD
72	5	VERY GOOD
73	5	VERY GOOD
74	5	VERY GOOD
75	5	VERY GOOD
76	5	VERY GOOD
77	5	VERY GOOD
78	5	VERY GOOD
79	5	VERY GOOD
80	5	VERY GOOD
81	5	VERY GOOD

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION									
59	A. PILOT OPINION OF TOW	1.00	1.00	1.00	.00	.00	1.00	.00	1.000	.000
60	1. EASE OF MAINTAINING POSITION	1.00	1.00	1.00	.00	.00	2.00	1.00	1.500	.764
61	2. RESPONSE TO VERTICAL CURRENTS	1.00	2.00	1.00	.00	.00	1.00	2.00	1.333	.743
62	3. RELEASE	1.00	.00	2.00	.00	2.00	2.00	2.00	1.833	.687
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.0	.0	1.5	.5	1.3	.5	.0	.0	2.7
							.5	1.7	.5	1.7
									.5	1.6

COMMENTS

PITCH PRIMARILY--LAT/DIR-2
NO DIFFICULTY WAS EXPERIENCED DUE TO PRESENCE OF VERTICAL CURRENTS
HAD TO USE SLIGHT FORWARD STICK FORCE DURING TOW--TRIM NOT ADEQUATE
FORCE WAS VERY LOW HOWEVER

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION									
59	A. PILOT OPINION OF TOW	1.50	2.00	3.00	.00	3.50	2.00	3.00	2.500	.707
60	1. EASE OF MAINTAINING POSITION	1.00	2.00	2.00	.00	3.00	2.00	4.00	2.417	.837
61	2. RESPONSE TO VERTICAL CURRENTS	2.00	3.00	3.00	.00	2.00	2.00	4.00	2.500	.957
62	3. RELEASE	1.00	3.00	2.00	.00	2.00	2.00	3.00	2.500	.500
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.3	.5	2.5	.5	2.7	.5	.0	.0	2.5
							.5	2.0	.0	3.0
								.8	2.3	.77

COMMENTS

GOI TO STAY WITH IT, DIRECTIONAL MOST OBVIOUS
GOI SOME TOW ROPE REBOUNDING
I BELIEVE THAT THE BOUNCY RIDE IN TURBULENCE IS CAUSED BY WING FLX
I WOULD RATE THE SAILPLANE ABOUT THE SAME HERE AS IN SMOOTH AIR.

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION									
59	A. PILOT OPINION OF TOW	2.00	3.00	2.00	.00	.00	3.00	3.00	2.600	.490
60	1. EASE OF MAINTAINING POSITION	1.50	3.00	2.00	.00	3.00	2.00	3.00	2.417	.607
61	2. RESPONSE TO VERTICAL CURRENTS	3.00	4.00	2.00	.00	3.00	2.00	3.00	2.500	.500
62	3. RELEASE	1.00	4.00	3.00	.00	3.00	2.00	2.00	2.833	.687
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	2.0	.8	3.5	.5	2.3	.5	.0	.0	2.7
							.5	2.0	.0	2.7
								.5	2.5	.70

COMMENTS

MODERATE CONTROL ACTIVITY REQD.
NO PROBLEMS
SOME TENDENCY OF NOSE TO PORPOISE.
TENDENCY TO PITCH WHEN ENCOUNTERING TURBULENCE
NO PROBLEMS
NOISY
SOME STICK INSTABILITY IN TURBULENCE
HIGH WORKLOAD IN RUDDERS ANDAILERONS

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION									
59	A. PILOT OPINION OF TOW	.00	2.00	2.50	.00	.00	3.00	3.00	2.625	.415
60	1. EASE OF MAINTAINING POSITION	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
61	2. RESPONSE TO VERTICAL CURRENTS	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
62	3. RELEASE	.00	2.00	3.00	.00	.00	2.00	2.00	2.000	.471
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0	.0 2.0	.0 2.3	.5	.0	.0 2.0	.0 2.0	.0 2.1	.29

COMMENTS

TASK	PILOT
60	3
62	3
82	3

NO PROBLEM AT ALL
NOISY
GOOD
NO SIGNIFICANT DIFFERENCE FROM STILL AIR

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION									
59	A. PILOT OPINION OF TOW	2.00	5.00	2.00	.00	.00	4.00	3.00	3.200	1.166
60	1. EASE OF MAINTAINING POSITION	1.50	2.00	.00	.00	.00	3.00	5.00	3.000	1.225
61	2. RESPONSE TO VERTICAL CURRENTS	2.00	2.00	.00	.00	.00	3.00	3.00	2.500	.800
62	3. RELEASE	1.00	.00	.00	.00	.00	3.00	2.00	2.000	.816
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.7	.5 2.0	.0	.0	.0	.0 3.0	.0 3.3	1.2 2.5	.99

COMMENTS

TASK	PILOT
59	2
60	2
62	2
82	2
82	2
82	2
82	2

OK AT 70KTS, AT 80KTS WORSE THAN IN SMOOTH AIR. MUST FLY WITH STICK RIGID. FLY PITCH BY PRESSURE, MUST FLY BY POSITION.
CANNOT FLY PITCH BY PRESSURE, MUST FLY BY POSITION.
NO ROUGH AIR TOW MADE.
NO AND ROLL RATES MAKE STAYING BEHIND TOWPLANE DIFFICULT IN ROUGH THERMALS.
LATERAL POSITIONING IS AN EASY TASK; PITCH IS DIFFICULT DUE TO OVERCONTROL TENDENCY

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION									
59	A. PILOT OPINION OF TOW	.00	3.00	2.00	.00	.00	5.00	2.00	3.000	1.233
60	1. EASE OF MAINTAINING POSITION	.00	2.00	2.00	.00	.00	2.00	2.00	2.250	.000
61	2. RESPONSE TO VERTICAL CURRENTS	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
62	3. RELEASE	.00	.00	2.00	.00	.00	2.00	2.00	2.000	.000
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0	.0 2.0	.0 2.0	.0	.0	.0 2.0	.0 2.0	.0 2.0	.00

COMMENTS

TASK	PILOT
61	3
62	3
82	3
82	7

NOT EXCESSIVE
SAME AS SMOOTH AIR
AIRSPEED BLEEDS OFF QUICKLY DURING PULLUP, REQUIRING PILOT ATTENTION
HIGHER WORKLOAD THAN IN SMOOTH AIR, OF COURSE, BUT NO UNUSUAL CHARACTERISTICS DUE TO TURBULENCE

SAILPLANE 1 DATA

COMMENTS

SATI PLANE 2 DATA

COMMENTS

82

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	2.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
64	1. LOW SPEED HANDLING	1.00	2.00	3.00	.00	2.00	2.00	2.00	2.000	.577
65	2. STALL-SPIN SUSCEPTIBILITY	2.00	2.00	2.00	.00	2.00	3.00	1.00	2.000	.577
66	3. EASE OF CENTERING THERMAL	1.00	2.00	2.00	.00	2.00	2.00	3.00	2.000	.577
67	4. SPEED CONTROL	2.00	2.00	3.00	.00	2.00	2.00	3.00	2.333	.471
83	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,3..)	1.5	.5	2.0	.0	2.5	.5	.0	2.0	.5
84	PILOT									
85	COMMENTS	PLEASANT, ALTHOUGH STICK FORCES ON THE LIGHT SIDE								
86		NO STALL-SPIN TENDENCY OBSERVED WHILE THERMALING								
87		COMFORTABLE								
88		BETTER THAN SAILPLANE 2								
89		WILL OCCASIONALLY SELF-TIGHTEN DURING STRONG UP-GUSTS. CAN TIGHTEN								
90		ITSELF INTO STALL IN STRONG GUST								
91		ONE FEELS IMMEDIATELY AT HOME IN THE SHIP								
92		GOOD CONTROL HARMONY AT SOKTS BUT POOR AT HIGHER SPEEDS, RUDDER								
93		COORDINATION AND AIRSPEED CONTROL CREATE FAIRLY HIGH WORKLOAD.								
94										

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	.00	2.00	2.50	.00	.00	3.00	4.00	2.875	.740
64	1. LOW SPEED HANDLING	.00	2.00	2.00	.00	.00	3.00	4.00	2.750	.829
65	2. STALL-SPIN SUSCEPTIBILITY	.00	2.00	2.50	.00	.00	3.00	3.00	2.375	.415
66	3. EASE OF CENTERING THERMAL	.00	2.00	3.00	.00	.00	3.00	3.00	2.750	.433
67	4. SPEED CONTROL	.00	2.00	3.00	.00	.00	5.00	3.00	3.250	1.090
83	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,3..)	.0	.0	2.0	.0	2.6	.4	.0	2.0	.81
84	PILOT									
85	COMMENTS	GOOD								
86		NO UNDESIRABLE CHARACTERISTICS NOTED								
87		TENDED TO OVERCONTROL WITH RUDDER								
88		NOT AS GOOD AS SAILPLANE 1								
89		I DON'T FIND TRIMMER OBJECTIONABLE. WING-ROCK IS BOTHERSOME								
90		WHENEVER BUFFET ENCOUNTERED IN GUSTY THERMALS, RUDDER								
91		QUITE GOOD IN CIRCLING FLIGHT, THOUGH NOT AS GOOD AS SAILPLANE 1								
92		GUSTS CAUSE NOSE TO CHANGE ATTITUDE UP AND DOWN. THIS TENDENCY								
93		MUST BE BROUGHT NOSE TO CHANGE ATTITUDE UP AND DOWN. THIS TENDENCY								
94		EXCESSIVE TOP ALLEKON REQUIRED.								

SAILPLANE 5 DATA

[illegible]

SAILPLANE 6 DATA

[illegible]

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV							
68	C. PILOT OPINION OF CRUISING FLIGHT	1.00	1.00	1.00	.00	.00	4.00	1.00	1.600	1.200							
69	1. EASE OF CONTROLLING AIRSPEED	1.00	1.00	1.00	.00	2.00	4.00	1.00	1.667	1.479							
70	2. PULL UP INTO THERMAL	1.00	1.00	2.00	.00	2.00	2.00	2.00	1.867	1.479							
71	3. EASE OF PERF. SECONDARY TASKS	1.00	1.00	1.00	.00	2.00	2.00	2.00	1.500	1.500							
72	4. RIDE QUALITY	1.00	2.00	4.00	.00	2.00	2.00	2.00	2.167	1.500							
73	5. EASE OF MAIN. STRAIGHT FLIGHT	1.00	2.00	1.00	.00	.00	2.00	1.00	1.400	1.490							
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.0	.0	1.4	.5	1.8	1.2	.0	.0	2.0	.0	2.4	.8	1.6	.5	1.7	.79

COMMENTS

TASK	PILOT	COMMENTS
69	5	BELOW 611AS+73 ABOVE 611AS DUE TO TRIM
70	3	UNABLE TO TRIM TO HIGH SPEEDS; I.C. ABOVE 61KTS.
71	3	SPEED BLEEDS OFF QUICKLY. HAVE TO WATCH IT.
72	3	EXCELLENT
73	3	GOOD, BUT SMALL, UNCOMFORTABLE COCKPIT DEGRADES IT
84	7	EXCELLENT
84	7	LARGE ATTITUDE CHANGES WITH AIRSPEED
84	7	VERY LOW WORKLOAD. OVERALL, THE BEST FLYING OF ALL SAILPLANES
85	7	THEY SHOULD ALL FLY THIS WAY

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS										PILOT 3		1	2	4	5	6	7	AVER.	STD DEV						
68	C. PILOT OPINION OF CRUISING FLIGHT										2.00	2.00	.00	.00	2.00	4.00	2.200	.980								
69	1. EASE OF CONTROLLING AIRSPEED										2.00	2.00	.00	.00	2.00	3.00	2.167	.687								
70	2. PULL UP INTO THERMAL										1.00	1.00	.00	.00	2.00	4.00	2.000	1.155								
71	3. EASE OF PERF. SECONDARY TASKS										1.00	1.00	.00	.00	3.00	4.00	2.500	1.118								
72	4. RIDE QUALITY										2.00	2.00	.00	.00	3.00	3.00	2.167	1.373								
73	5. EASE OF MAIN. STRAIGHT FLIGHT										1.00	1.00	.00	.00	4.00	3.00	2.333	1.106								
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)										1.2	.4	1.4	.5	2.0	.6	.0	.0	2.8	.4	2.6	.8	3.4	.5	2.2	.96

COMMENTS

TASK	PILOT	COMMENTS
70	3	VERY PLEASANT
71	3	DIFFICULT
72	3	GOOD
73	3	NO PROBLEM
73	3	DIRECTIONALLY LOOSE
84	3	NOSE WANDERS, BUT NOT SO AS TO DETRACT FROM MISSION
84	3	BOUNCY BECAUSE OF AIRSPEEDS. NEGATIVE FLAPS RESULT IN QUICK AIRSPEED
84	3	CHANGES (QUICKER THAN SAILPLANE 5) WITH NO ATTITUDE OR SOUND CHANGES.
85	3	THIS FEATURE MAY MAKE SHIP DIFFICULT FOR TRANSITIONING.

SAILPLANE 3 DATA

[illegible]

SAILPLANE 4 DATA

[illegible]

***** ZEROS INDICATE NO RATING BY PILOT *****

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	1.00	3.00	1.00	.00	.00	3.00	3.00	2.200	.980
69	1. EASE OF CONTROLLING AIRSPEED	1.00	3.00	2.00	.00	.00	3.00	3.00	2.600	1.366
70	2. PULL UP INTO THERMAL	2.00	3.00	1.00	.00	.00	2.00	2.00	2.000	.632
71	3. EASE OF PERF. SECONDARY TASKS	1.00	6.00	1.00	.00	.00	4.00	4.00	3.200	1.939
72	4. RIDE QUALITY	1.00	2.00	1.00	.00	.00	2.00	3.00	1.800	.748
73	5. EASE OF MAIN. STRAIGHT FLIGHT	1.00	1.00	1.00	.00	.00	3.00	2.00	1.600	.800
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.2	4.2	1.7	1.2	.4	.0	.0	3.2	1.2
85	COMMENTS	.7 2.2 1.34								
69	AT HIGH CRUISING SPEEDS, UNABLE TO TRIM. POSITIVE GAC GIVES NOSE UP									
70	INPUT TO STICK									
71	SPECTACULAR DUE TO LARGER KINETIC ENERGY OF GLIDER									
72	MUST HOLD STICK RIGID, NOT UNPLEASANT IF CONTROL TASK IS VERY									
73	OPEN LOOP.									
74	OK									
75	EXCELLENT									
76	EXCELLENT									
77	CAN'T LET GO OF STICK									
78	IN TURBULENCE, IN THE APPROACH CONFIGURATION, FULL OF RUDDER ACTIVITY									
79	IS REQUIRED. SLOWER ROLL RATE IS NOTICEABLE, LOT OF RUDDER ACTIVITY									
80	WAS NEEDED IN THIS PHASE OF FLIGHT.									
81	AT 85-90 KTS PENETRATION SPEED, QUIET EXCEPT FOR LIGHT RATTLE IN									
82	WINGS: ATTENTION TO AIRSPEED(PITCH) CONTROL LEAVES LITTLE TIME FOR									
83	SECONDARY TASKS; TURBULENCE CAUSES CONTINUAL SMALL PITCH UPSETS.									

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	1	2	PILOT 3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	.00	.00	1.00	.00	.00	2.00	2.00	1.667	.471
69	1. EASE OF CONTROLLING AIRSPEED	.00	1.00	1.00	.00	.00	2.00	2.00	1.500	.500
70	2. PULL UP INTO THERMAL	.00	1.00	2.00	.00	.00	2.00	2.00	1.500	.500
71	3. EASE OF PERF. SECONDARY TASKS	.00	1.00	1.00	.00	.00	2.00	2.00	1.500	.500
72	4. RIDE QUALITY	.00	2.00	1.00	.00	.00	2.00	2.00	1.500	.500
73	5. EASE OF MAIN. STRAIGHT FLIGHT	.00	1.00	2.00	.00	.00	2.00	2.00	1.750	.433
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0	1.2	1.8	.7	.0	2.8	2.0	1.9	.92
85	COMMENTS									
69	EXCELLENT									
70	SHOULD BE VERY MODERATE IN THIS GLIDER									
71	AIRSPEED DECREASES VERY RAPIDLY									
72	QUICK, EASY BECAUSE OF LARGE STABILITY									
73	NOT AS SOFT AS GLASS SHIP, NOISY									
84	GOOD									
85	LARGE ATTITUDE CHANGES WITH AIRSPEED; NOISY AT TIMES									
86	SAME GENERAL COMMENTS AS FOR CIRCLING FLIGHT									

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16. Abstract Seven test pilots flew six sailplanes in a round-robin evaluation of sailplane handling qualities. An evaluation was made of the handling qualities over the sailplane operational envelope using the Cooper-Harper Rating Scale and pilot comments as the evaluation instrument. The sailplanes were chosen to represent the range of handling and performance characteristics of high performance sailplanes in current use. The evaluation sailplanes were found generally deficient in the area of cockpit layout. The pilots indicated general dissatisfaction with high pitch sensitivity especially when coupled with inertially induced stick forces. While all sailplanes were judged satisfactory for centering thermals and in the ease of speed control in circling flight, pilot opinions diverged on the maneuvering response, pull-out characteristics from a dive, and on phugoid damping. Lateral-directional control problems were noted mainly during takeoff and landing for most sailplanes with the landing wheel ahead of center of gravity. Pilot opinion of in-flight lateral-directional stability and control was generally satisfactory. Five of the evaluation sailplanes exhibited a very narrow airspeed band in which perceptible stall warning buffet occurred. However, this characteristic was considered not objectionable when stall recovery was easy. The pilots objected to the characteristics of a wide airspeed band of stall warning followed by a stall with yawing and rolling tendency and substantial loss of altitude during the stall. Glide path control for the evaluation sailplanes was found to be generally objectionable.					
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