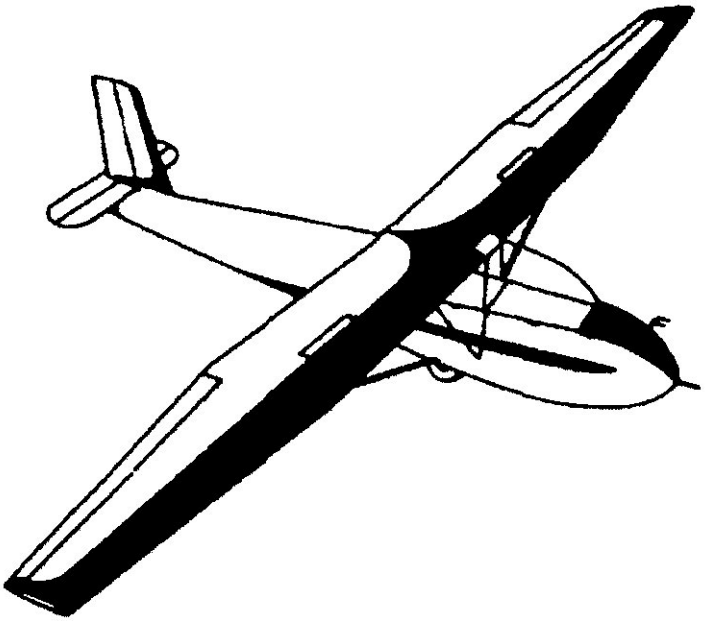
Note that the 2-33B manual is recognized by Schweizer (and the FAA) as the official flight manual for all variants of the 2-33. The 2-33B is significantly different from previous models, be sure the information you are referencing is appropriate for our 3-33A.

2-33 Base line version of the aircraft. the rudder does not extend above the vertical.

2-33A Same as 2-33 except the rudder overhangs the top of the vertical with an aerodynamic balance.

2-33B Extended forward fuselage to allow mote leg room in the back seat. Tow hook moved forward. Skid replaced with a wheel. Higher gross weight.



FAA Approved

SAILPLANE FLIGHT MANUAL (SFM)

for

THE SGS 2-33, 2-33A and 2-33B SAILPLANE

K & L SOARING, LLC

Issued: 3/78 FAA Approved: February 23, 2022
Revised: 02/15/22 Form No. SSP-PH-4

K & L Soaring, LLC

5996 State Route 224

Cayuta, NY 14824

SAILPLANE FLIGHT MANUAL (SFM)

for

THE SGS 2-33, 2-33A and 2-33B SAILPLANE

FAA Approved in Utility Category based on Applicable

Parts of FAR 21 and Basic Glider Criteria Handbook, 1962.

This document must be carried in the glider at all times.

FAA Type Design Approval: February 10, 1967

Type Certificate No. G2EA

FAA Approved By:

JOHN M COFFEY

Digitally signed by JOHN M COFFEY
Date: 2022.02.23 18:48:10 -05'00'

William Witzig

Manager, Northeast Flight Test Section, AIR-711

Federal Aviation Administration

Burlington, MA.

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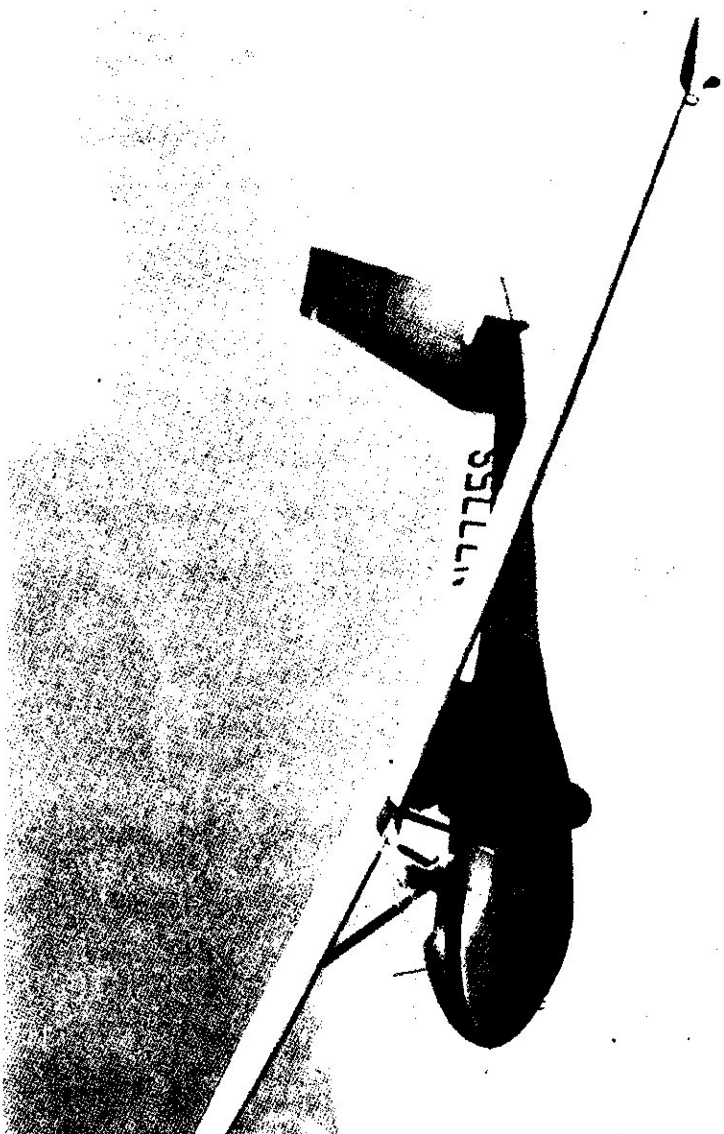
LOG OF REVISIONS

Revision Number and Date	Revised Pages	Description of Revision
1 2/15/22	All Pages	Complete Revision for FAA Approval of Manual & SGS 2-33B



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SECTION 1 - GENERAL DESCRIPTION

1.1 INTRODUCTION

This Sailplane Flight Manual (SFM) provides information useful to pilots and owners of the SGS 2-33, 2-33A or 2-33B sailplane. It provides recommended procedures for operating, flying and maintaining the aircraft. It is divided into 9 Sections.

This section of the SFM presents basic data and information of general interest to the pilot which is useful in loading, sheltering, handling and routine preflight checking of the sailplane. In addition, it provides definitions or explanations of symbols, abbreviations and terminology used in the manual.

This SFM is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used for operational purposes unless kept in a current status.

The SGS 2-33, 2-33A or 2-33B is a conventional two-place tandem, intermediate-training sailplane. Its construction is all metal with fabric cover on the fuselage and tail surfaces. It has a one-piece canopy for increased visibility. The wings are tapered in the outboard section, and have dive-brakes incorporated.

The SGS 2-33 and the 2-33A are the same except for the rudder used. The 2-33 uses rudder, P/N 26714-003, whereas 2-33A uses rudder, P/N 33700-001. The 33700-001 rudder is taller and incorporates a balance weight which overhangs the top of the fin. Serial Numbers 86 and up incorporated the balance rudder in factory production. Serial numbers prior to No. 86 may be converted to Model SGS 2-33A by changing the rudder and accomplishing the documentation of same in accordance with manufacturer's Service Letter No. SL-102-4

The 2-33B is the same as the 2-33A except that it has the tow hook located 24" forward of the 2-33A and a nose wheel replaces the skid. In addition, the 2-33B Fuselage is 5" longer just behind the front pilot to provide a large rear seating area with an adjustable seat. The canopy door and window are 9" wider at the wing intersection. The SGS 2-33 and 2-33A models are eligible to retrofit the forward release nose and wheel at K & L Soaring, LLC

1.2 GENERAL DATA

Fuselage Length - 25' 9" (26'2" B Model)

Wing Span - 51' 0"

Wing Area - 219.48 ft^2

Aspect Ratio - 11.85

Airfoil – NACA 43012A

Dihedral – 1.5°

Twist - 3° Washout

Dive Brake Area – 8.79 ft^2

Aileron Area – 18.24 ft^2

1.3 WEIGHTS

Maximum Gross Weight – 1040 lbs (1080 lbs*)

Maximum Takeoff Weight – 1040 lbs (1080 lbs*)

Maximum Landing Weight – 1040 lbs (1080 lbs*)

Standard Empty Weight – 640 lbs (660 lbs*)

(Weight of a typical sailplane with standard interior,

airspeed indicator, altimeter, vario and compass)

Maximum Useful Load – 400 lbs (420 lbs*)

(The difference between the max. takeoff weight

and the standard empty weight)

Wing Loading - 4.74 lb/ ft^2(1040 lbs G.W.) - 4.92 lb/ ft^2(1080 lbs G.W.)

*The SGS 2-33 & 2-33A have a gross weight of 1040 lbs. Both versions are eligible for a gross weight of 1080 lbs. provided they have 33928-001 kit installed and each wing panel weighs 155 lbs. or above. The SGS 2-33B has a gross weight of 1080 lbs.

1.4 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

CAS - Calibrated Airspeed means the indicated speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level. CAS values published in this Manual assume zero instrument error.

GS - Ground Speed is the speed of an aircraft relative to the ground.

IAS - Indicated Airspeed is the speed of an aircraft as shown in the airspeed indicator. See indicator manufacturer's calibration data for instrument error.

TAS - True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.

V_A - Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.

V_{NE} – Never Exceed Speed is the speed limit that may not be exceeded at any time.

V_C – Maximum Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.

V_S – Stalling Speed or the minimum steady flight speed at which the sailplane is controllable

V_{SO} – Stalling Speed or the minimum steady flight speed at which the sailplane is controllable in the landing configuration with dive brakes open.

$V_{L/D\ (Max.)}$ – Glide Ratio Speed is the airspeed which delivers the least loss of altitude in the longest possible horizontal distance.

$V_{min.\ sink}$ – Minimum sink speed is the airspeed which delivers the least loss in altitude (min. sink) in the longest possible time.

Demonstrated Crosswind Velocity – The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests.

Ref. Datum – An imaginary vertical plane from which all horizontal distances are measured for balance purposes.

Station – A location along the aircraft fuselage usually given in terms of distance from the reference datum.

Arm – The horizontal distance from the reference datum to the center of gravity (C.G.) of an item

Moment – The product of the weight of an item multiplied by its arm

Center of Gravity (C.G.) – The point at which a sailplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the sailplane.

C.G. Arm – The arm obtained by adding the sailplane's individual moments and dividing the sum by the total weight.

C.G. Limits – The extreme center of gravity locations within which the sailplane must be operated at a given weight.

Std. Empty Weight – Weight of a standard sailplane with basic flight instruments

Payload - Weight of occupant(s) and cushions/parachute

Useful Load – Difference between takeoff weight and standard empty weight

Max. Takeoff Weight – Max. weight approved for the start of the takeoff run.

Max Landing Weight – Max. weight approved for the landing touchdown.

SECTION 2 - LIMITATIONS

2.1 GENERAL

This Section of the SFM presents the various operating limitations, the significance of such limitations, instrument markings, color coding and basic information necessary for the safe operation of the airplane, standard systems and standard equipment.

2.2 AIRSPEED LIMITATIONS

NOSE STATIC SYSTEM ONLY

ALL SPEEDS ASSUME ZERO INSTRUMENT ERROR

SPEED		Solo	Dual		REMARKS
		790 lbs	1040 lbs	1080 lbs	
Maneuvering Speed V_A	mph	65	65	66	Do not make full or abrupt control movements above this speed.
Never Exceed Speed V_{NE}	mph	98	98	100	Do not exceed this speed in any operation.
Stalling Speed V_S	mph	34	38	39	The aircraft will not maintain normal flight below this speed.
Stalling Speed (D.B. Open) V_{SO}	mph	36	40	41	The aircraft will not maintain normal flight below this speed when dive brakes are open
Max. Aero Tow V_{TA}	mph	98	98	100	Do not tow behind an airplane above this speed.
Max. Ground Launch V_{TAW}	mph	69	69	70	Do not tow on any ground launch (auto, winch, etc.) above this speed.

2.3 AIRSPEED INDICATOR MARKINGS

MARKING	RANGE		SIGNIFICANCE
	1040 lbs	1080 lbs	
Green Arc	38-65 mph	39-66 mph	Normal Operating Range.
Yellow Arc	65-98 mph	66-100 mph	Operations must be conducted with caution and only in smooth air.
Red Line	98 mph	100 mph	Maximum speed for all operations

2.4 WEIGHT LIMITS

Maximum gross weight is 1040 lbs or 1080 lbs*

* See Section 1.2, Page 8 for 1080 lbs gross weight eligibility

2.5 CENTER OF GRAVITY LIMITS

The sailplane shall not be flown less than 78.20" aft of the datum nor more than 86.10" aft of the datum.

The datum used is 66.34" ahead of the wing leading edge when measured at the wing root. For complete weight and balance operational information, refer to Section 6.

2.6 MANEUVER LIMITS

Utility Category – all aerobatic maneuvers (except spins) are prohibited

2.7 FLIGHT LOAD FACTORS

Positive Load Factor – 4.67g (max. maneuver or gust limit)

Negative Load Factor – 2.56g (max. maneuver or gust limit)

Ultimate Positive Load Factor – 7.0g

Ultimate Negative Load Factor – 3.8g

Flight should be conducted within the flight envelope. Refer to Figure 2.1

2.8 AUTO/WINCH LAUNCH

For the 2-33B, the use of the forward release for winch or auto tows is prohibited.

2.9 UNDERSTANDING THE FLIGHT ENVELOPE

The FAA required design flight envelope is presented on the following page. On the horizontal axis are indicated velocities in miles per hour, and on the vertical axis are load factors expressed in "G" units.

The straight lines labeled "gust load factors" represent the effect of the FAA required 24 ft. per second gust on the sailplane as speed varies. They diverge from the one "G" situation where the glider would be at rest or in perfectly balanced level flight. The curved lines diverging from zero "G" represent forces which can be induced by moving the elevator (or other) control abruptly at various speeds. As you can see, the faster you fly the more effect moving your controls will have. Gusts will also have more effect as speed increases.

The speed for maneuvering with caution occurs where "G" loading from an abruptly moved control meets the 4.67 limit load factor. Assuming smooth and limited movement of the controls, the placard or "red-line" speed occurs where gusts could meet the 4.67 limit load factor without any maneuvering.

Normal placard speeds are reduced 10% from design speeds to provide an extra margin of safety. Thus, on the graph, the diagonal hatched area indicates speeds at which you must use caution in maneuvers. You should neither maneuver nor fly so fast as to expose your ship to loads within the cross-hatched area marked, "NO MANEUVER".

It can be inferred from the graph that abrupt maneuvering in gusty conditions is dangerous and can lead to very high "G" loads.

In normal operation the major cases of high "G" loads are tight spirals in thermals which would not normally exceed 2 or 2.5 G's. Winch or auto towing can produce high loads, but if the auto-winch placard speed is observed, this will be within safe limits. The best ground launch climb is obtained at speeds well below placard limits.

Figure 2-1 -Flight Envelope

SECTION 3 - EMERGENCY PROCEDURES

3.1 GENERAL

This Section of the SFM describes the recommended procedures for coping with various emergencies or critical situations. The 2-33, 2-33A, or 2-33B is a normal sailplane so all good flying practices, rules and the FAA Regulations should prevail.

3.2 ROPE BREAKS

In all cases, it is recommended to obtain/maintain flying speed before maneuvering toward a suitable landing area. As the 2-33, 2-33A or 2-33B is a normal sailplane in all respects, the specific rope break procedures should be as published for the airport at which the sailplane is flown.

3.3 IN-FLIGHT INSTRUMENT OR RADIO FAILURE

In case of electrical failure, check the master switch and the instrument switch for proper indication. In any case, if the instrument failure poses a hazard to further flight, the sailplane should be flown at its best glide speed and landed at the first convenience.

3.4 SMOKE OR FIRE

Smoking is prohibited in the 2-33, 2-33A or 2-33B. If smoke or fire occurs, all electrical switches should be turned off and the sailplane landed immediately.

3.5 EXCESSIVE SPEED

If airspeed exceeds redline on spin recovery, or for any other reasons, very slowly and carefully ease stick back and return to level flight attitude. Do not make an abrupt recovery. Dive brakes may be used smoothly and gently to slow excessive speeds.

3.6 DIVE BRAKE FAILURE

If dive brakes fail closed during flight, enter the traffic pattern at a lower than normal altitude and utilize slip as necessary to hold desired glide path. Use a lower than normal altitude and airspeed on final approach, slipping as necessary. The actual landing should be normal, however, the sailplane will float much longer before touch down.

If the dive brakes fail open during flight, enter the traffic pattern at a higher than normal altitude. If necessary, reduce the downwind and base legs in order to compensate for the increased sink rate.

3.7 ICE, SNOW OR FROST

Ice, frost or snow on a sailplane can be dangerous in that it greatly increases the stalling speed. All ice, frost or snow must be removed from the sailplane prior to flight. Do not attempt to takeoff with any ice, frost or snow on the wings.

Heavy scrapings of the ice, frost or snow from the wings is likely to scratch the sailplane's finish, or possible gouge the skin. It is best to gently wipe or scrape any excess precipitation, then let the sun melt the rest.

The 2-33, 2-33A or 2-33B should not flown into know icing conditions. If ice does form during flight, it is best to return to sunshine, and if the ice does not melt immediately, proceed at a higher than normal airspeed (to prevent an inadvertent stall) and make a precautionary landing.

SECTION 4 - NORMAL PROCEDURES

4.1 GENERAL

This section describes the recommended procedures for the conduct of normal operations for the 2-33, 2-33A or 2-33B. All of the required (FAA regulations) procedures and those necessary for safe operation of the sailplane as determined by the operating and design features of the sailplane are presented.

4.2 RECOMMENDED OPERATIONAL SPEEDS

The following airspeeds are those which are significant to the safe operation of the sailplane. These figures are for standard SGS 2-33, 2-33A or 2-33B flown at gross weight under standard conditions at sea level.

Performance for a specific SGS 2-33, 2-33A or 2-33B may vary from published figures depending upon the equipment installed, the condition of the sailplane and equipment, atmospheric conditions and piloting technique.

	Solo	Dual	
SPEED	**790 lbs**	**1040 lbs**	**1080 lbs**
Normal Aero Tow Speed		60-70 mph	
Normal Auto/Winch Speed		55-60 mph	
Normal Landing Approach Speed		55 mph	
Max. Demonstrated Crosswind Velocity		17 mph	
Best Gliding Speed (23:1)	45 mph	50 mph	52 mph
Minimum Sink Speed	38 mph @2.6 FPS	42 mph @3.1 FPS	44 mph @3.2 FPS
Stalling Speed – Level Flight	34 mph	38 mph	39 mph
Stalling speed - 30° bank	36.5 mph	41 mph	42 mph
Buffeting	34-37 mph	39-42 mph	40-43 mph
Spiraling Speed	39 mph	43 mph	44 mph

4.3 GROUND HANDLING TO AND FROM TIE DOWN

The sailplane should be towed by the nose tow hook with at least the upwind wing tip walked. When towing downhill at least one wing tip walker with a guard either at the nose, or on the opposite wing.

In high winds, use an attendant at each wing tip and have a pilot in the cockpit to hold the nose down and operate the dive brakes. It is also advisable to move the sailplane by hand backwards, if the wind is very high.

4.4 PRE-FLIGHT INSPECTION

CHECK ALL POINTS AS LISTED

1. Wing:
   a. Strut fittings
   b. Dive brake hinges and connections
   c. Aileron hinges and push rod attachments
   d. Check wing surface for dents and wrinkles

2. Tail Assembly:
   a. Hinge points, rudder and elevator
   b. Push rod attachment to elevator horn
   c. Stabilizer struts and stabilizer attachment to fuselage.
   d. Rudder cable connection to rudder horn
   e. Tail wheel assembly
   f. Check fabric surfaces for rips or tears

3. Fuselage:
   a. Release control
   b. Flight controls for free movement including release
   c. Instruments
   d. Canopy attach points and latch
   e. Safety belts and shoulder harnesses
   f. Rear door and window attach points and latches
   g. Check fabric for damage
   h. Nose skid or nose wheel, tire and brake
   i. Static and pitot tubes for water or other foreign objects

4. Tow Rope:
   a. Condition and attachment of rings

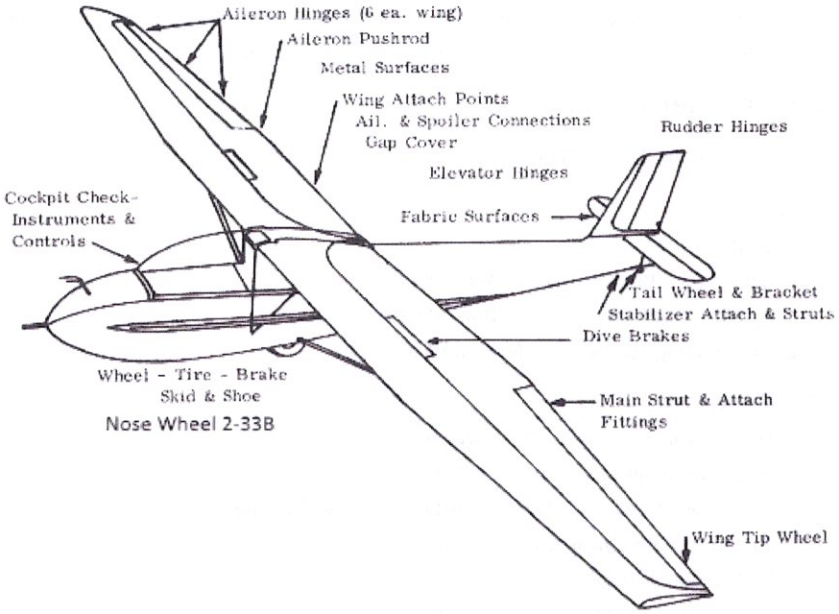


Figure 4-1

4.5 COCKPIT CHECKLIST BEFORE TAKEOFF

Altimeter and instruments - adjust seating

Belt and harness on and secured

Cable and tow release checked

Controls checked – trim set

Canopy - closed and latched

Dive brakes closed and locked

Emergency – check wind direction & velocity

4.6 COCKPIT CHECKLIST BEFORE LANDING

Wind, traffic and field surface check

Dive brakes – check for operation

Trim – set

Radio – call, if applicable

4.7 GENERAL AERO TOW TAKEOFF PROCEDURE

The takeoff roll is normal for nose-skid/nose-wheel equipped sailplanes. As soon as elevator control is gained, the skid/nose wheel should be lifted off the ground and the aircraft held in takeoff attitude. At about 35-40 mph the aircraft will takeoff by itself in this attitude. You will notice that aileron control is somewhat heavy at fast towing speeds, but they reduce to a normal level at slower speeds.

Note: Trim should be engaged and set to neutral (full forward for side or forward trim style) before takeoff.

Normal crosswind techniques apply which required judicious use of the aileron, rudder and elevator.

4.8 GENERAL WINCH OR AUTO TOW TAKEOFF PROCEDURE

Precautions:

1. Be sure equipment is suitable for purpose
2. Person driving car or operating winch should be experienced with equipment, and know towing characteristics of the SGS 2-33.
3. Never hook rope or wire to empty sailplane.

For the 2-33 & 2-33A, winch or auto tows may be executed in the usual manner using either the forward, or the CG release, although the latter should result in a higher altitude. There is no tendency to oscillate with either release. Maximum speed for auto, or winch tow, is 69 MPH.

For the 2-33B, winch or auto tows may only be executed in the usual manner using the CG release. The use of the forward release for winch or auto tows is prohibited. Maximum speed for auto, or winch tow, is 70 MPH.

CAUTION:

1. Do not climb at full back stick position until a safe height for stall recovery is reached (75 - 100 ft.).
2. Level out before releasing.

4.9 GENERAL LANDING PROCEDURE

Pattern: It is general practice to fly a traffic pattern. Downwind and base legs and final approach. Extra speed is also used depending on wind velocity and gust conditions. It is good practice to add 1 mph to airspeed for each mph of wind.

Dive- brakes: Approach should be made high, with use of dive brakes. Dive brakes increase drag, which in turn allows for a steeper and

more controlled glide path. They can also be used to lose altitude rapidly at any time during flight, or during a tow to take up slack, or to lower sailplane from a too-high position. When flying solo, the stalling speed of the 2-33 is 34 mph with dive brakes closed, and 36 mph with dive brakes open. For dual flight, the speeds are 38 mph and 40 mph at 1040 lbs. & 39 mph and 41 mph at 1080 lbs., respectively.

It is unsafe however, to make an approach with dive brakes open in the speed range of 38 - 45 mph as the descent rate is so great that a proper flare-out for landing is difficult.

Touch Down: Can be done with dive brakes either open or closed although it is preferable to land with them open. With dive brakes open, the glide path is quite steep, therefore, a flare-out must be executed 2 - 5 ft. above the ground at 43 - 47 mph. By holding a level attitude close to the ground, the sailplane will settle to a smooth, level touch-down. DO NOT FLARE OUT TOO HIGH - this will cause a very hard landing and may result in injury to occupants or sailplane.

Touch down with Dive-brakes Closed: Is executed by letting the sailplane land itself at, or near, 45 mph. Be careful not to ease the stick back after touchdown this will cause a steeper angle-of-attack and the sailplane will lift off. Opening the dive-brakes after touchdown will help keep the sailplane on the ground.

Taxiing after: touch down: Even though sailplane is on the ground, it should literally be flown to a stop with use of all controls. Wheel brake may be used if a quick stop is desired or necessary.

Getting out of the 2-33 On the ground it is tail down when empty, and nose down with pilot in the seat. When pilot gets out he should keep his weight on the side of the cockpit until he is in a position to lower the tail gently to the ground.

4.10 SLIPS

The SGS 2-33, 2-33A or 2-33B can be slipped both forward, and while turning. The slipping-turn is done in a normal manner, but due to limited rudder area, the forward slip must be done with very little low wing and full rudder.

Since most slipping is done on the landing approach, normal approach speed is recommended for best efficiency and safety in the maneuver. At least 50 feet above ground should be remaining when the slip recovery is initiated.

Judicious use of the effective dive brakes should relieve the need for slips close to the ground.

4.11 GLIDING PROCEDURES FOR HIGH WINDS

1. Be careful during ground handling operations. Keep tail high to and from tie down area.
2. Keep well up-wind of your landing area.
3. When going against wind, it is good practice to add wind velocity to air speed at best L/D.

EXAMPLE:

Speed at best L/D (solo)	45 mph
Wind velocity	+ 15 mph
Desired speed	60 mph

This speed will give a better glide angle than a slower approach.

4. Land into the wind whenever possible. In crosswind landing, crab into the wind to maintain desired path over the ground and at the last moment, straighten ship to line of flight and touch down. Be careful while the ship is rolling.

Downwind landing in high winds - Land with brake full on and maintain control as long as possible.

4.12 STALLS AND STALL REVCOVERIES

Stall entries, stalls and stall recoveries are normal in all respect. Most stalls are very gentle and straight ahead with no tendency to go off to either direction; however, if lack of coordination or turbulence affect the ship, the sailplane may drop one wing. Recovery from a stall is made by relaxing back pressure, and moving the stick slightly forward. Any turn can be corrected by coordinated use of rudder and aileron. If the stick is continued to be held back it will aggravate the stall, and a spin or secondary stall may develop.

4.13 SPINS AND SPIN REVCOVERIES

The 2-33, 2-33A or 2-33B will spin, depending on the weight of pilots and equipment, etc., Care should be taken to avoid stalls and spins at low altitude by using adequate air-speed.

Normal spin recovery techniques are as follows: Full opposite rudder and stick pushed forward slowly until rotation stops (1/4 to 1/2 turn).

Final Recovery - The attitude after the rotation stops will be a steep diving turn with airspeed building up rapidly.

1. Neutralize rudder.
2. Simultaneously, with coordinated controls, level the wings and ease the stick back being careful not to overload the sailplane. DO NOT use large and abrupt control input. Not until the sailplane is back at straight and level flight is the recovery completed.

4.14 SPIRALLING IN THERMALS

In order to remain aloft or gain altitude it is necessary to spiral. The diameter of a thermal is normally quite small; therefore, a fairly steep bank is required. Although this is general practice, it may not be necessary in areas where large diameter thermals are found. The best flying speed in any thermal, at any degree of bank, is a few miles per' hour above the stall and just above the buffet onset speed. (Note – Uncoordinated flight will yield higher buffet speeds.)

Keep in mind that the steeper the spiral, the higher the minimum-sink and stalling speed will be. Sometimes it is necessary to spiral very steeply and sacrifice slow speed and low sink to remain within the limits of the thermal. This is especially true in strong, small-diameter thermals.

4.15 AEROBATICS

All aerobatics (except spins) are prohibited.

4.16 FLIGHT CONTROLS

1. Tow release knob:

   Front – located at center bottom of instrument panel.

   Rear – located at located at top left of front seat back.

2. Dive Brake and Brake Lever:

   Front – located at left side of cockpit under instrument panel.

   Rear – located at center of left side of cockpit.

   To use dive brake, push forward and down and then straight back.

   The wheel brake is actuated only at the extreme aft position of the dive – brake/wheel brake control handle

Beginning with SGS 2-33A, Serial No. 500, a new main landing wheel, including a hydraulic brake installation (P/N 33216-2) is provided, superseding the mechanical brake. All 2-33B are equipped with hydraulic brakes.

The hydraulic brake is rigged so that it is actuated only at the extreme aft position of the divebrake/wheelbrake control handle.

3. Control Sticks:

   Front & Rear – are conventional and both are mounted on a single torque tube

4. Rudder Pedals:

   Front – located on left and right forward of floor board and are conventional. They are toe type pedals and are adjustable.

   Rear – located to left and right of front seat and are not adjustable.

   Late Serial Number 2-33A & 2-33B pedals are moved 2.25" forward and have adjustable cables and flip over pedal extenders on forward pedals.

5. Trim Lever:

   Front seat only – For (SN 1-199) it is located on floor forward of control stick between the rudder pedals. It is three positions from full forward to full rearward. For (SN 200-499) it is located on left side below dive brake lever. It is four positions from full forward to full rearward.

   For the floor and side trim versions the trim should be set at full forward prior to take-off. After take-off the desired trim can be set as needed.

   On 2-33A serial number 500 and up and SGS 2-33B, a ratchet-lock trim installation (P/N 33140G) is provided, superseding the bungee-type trim found on lower serial-number ships. The trim system is available for retrofit to earlier serial number sailplanes

   The trim control lever for the ratchet-lock trim system is located just forward and to the left of the front cockpit control stick. The system is integral with the forward control stick and torque tube assemblies.

   The trim is operated with the fingers of control stick hand by aft pressure on the locking lever. The control stick is then moved to the position which gives the desired airspeed, at which point the locking lever is released to engage the trim lock.

   Prior to take-off, the trim should be set (locked) at the elevator-neutral position which is checked by stick line-up with the trim placard neutral-arrow, located on the floorboard to the left of the control stick.

After take-off, the desired trim settings may then be obtained as noted above.

6. Instruments:

   Front only – ASI is required. Additional instruments may be added up to full panel as desired.

   NOTE: Instrument flight is prohibited, regardless of instrumentation.

4.17 WEIGHT & BALANCE

The placard weight(s) on the instrument panel must be strictly adhered to. This will ensure that center of gravity will be maintained in flight. The weights stamped are maximums and minimums which are easily compared with that of the pilot and passenger.

NOTE: Seat ballast must be added if minimum weight of pilot(s) is less than placard minimum.

For weight and balance data, refer to Section 6 (weight and Balance)

4.18 TIE DOWNS

The 2-33, 2-33A or 2-33B should never be left unattended in strong winds or gusty conditions. Tie down points are at each wing where main struts are attached and at tail wheel bracket. Be sure ropes and stakes used for tying down are adequate and in good condition.

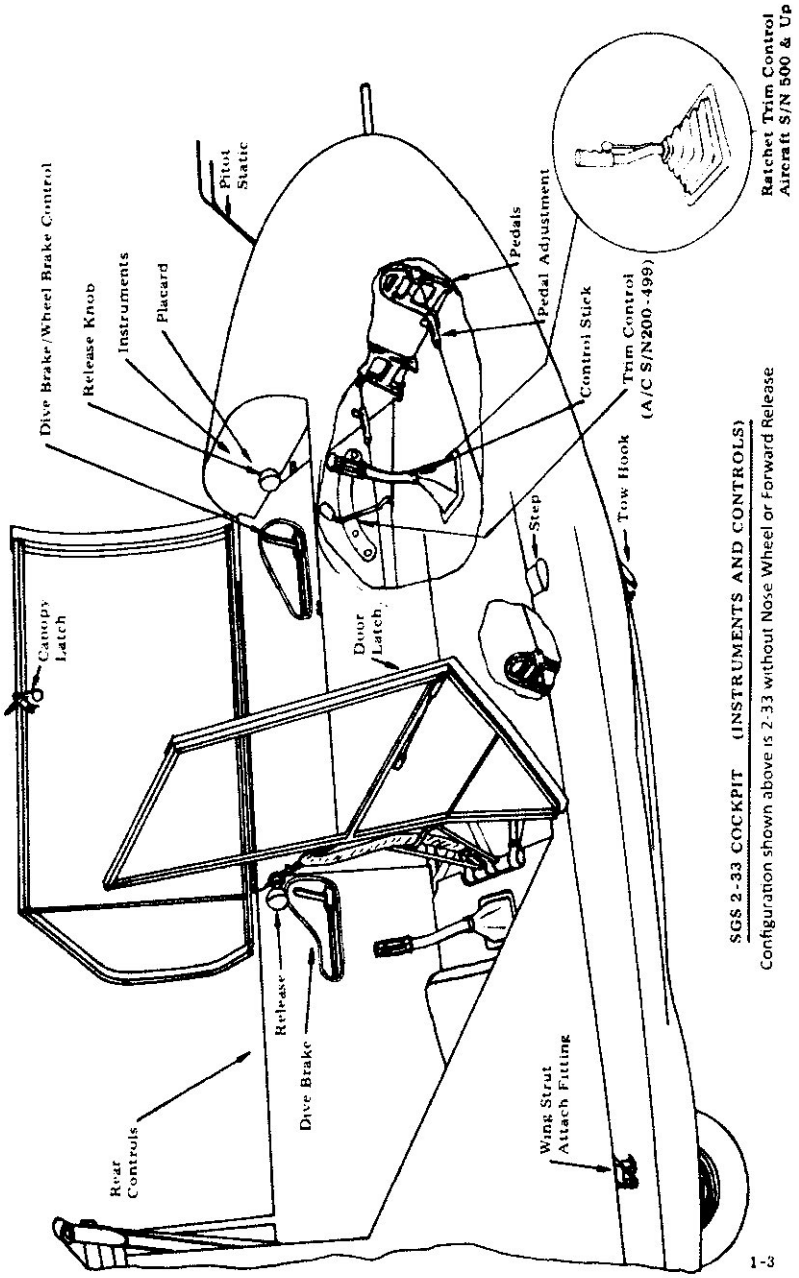

Dive Brake/Wheel Brake Control
Release Knob
Instruments
Placard
Pitot Static
Pedals
Pedal Adjustment
Control Stick
Trim Control (A/C S/N200-499)
Ratchet Trim Control Aircraft S/N 500 & Up
Tow Hook
Step
Canopy Latch
Door Latch
Release
Dive Brake
Rear Controls
Wing Strut Attach Fitting
SGS 2-33 COCKPIT (INSTRUMENTS AND CONTROLS)
Configuration shown above is 2-33 without Nose Wheel or Forward Release
1-3

Figure 4-2

SECTION 5 - PERFORMANCE

5.1 GENERAL

This section contains information on the gliding performance of the SGS 2-33, 2-33A, or 2-33B;

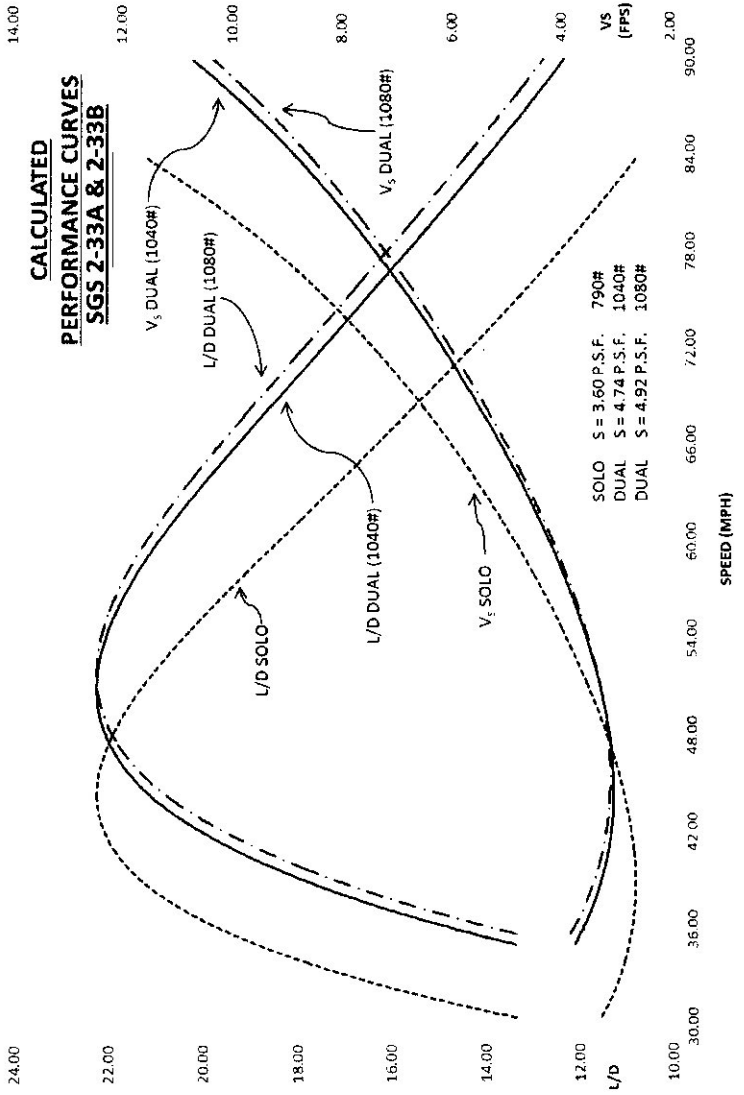


Figure 5-1

SECTION 6 - WEIGHT AND BALANCE CALCULATIONS

6.1 GENERAL

1. Allowable center of gravity (C.G.) range is between 78.20" aft of the datum and 86.10" aft of the datum.

The datum used is 66.34" ahead of the wing leading edge when measured at the wing root.

2. Maximum gross weight is 1040 lbs or 1080 lbs*

* See Section 1.2, Page 7 for 1080 lbs gross weight eligibility

6.2 CALCULATIONS

When preparing for any particular flight the pilot must answer two questions:

1. Is my weight and my passenger's weight within the maximum limits of gross weight for this flight? And
2. Is the sailplane properly balanced for this flight?

The following procedure is designed to help the pilot determine the actual weight and balance of his 2-33, 2-33A or 2-33B for any particular flight loading. To do this, we calculate the moments of the aircraft and each occupant using the equation weight X arm = moment (WA=M).

The sailplane must be balanced within forward and rearward C.G. limits when it is flown. These limits are defined at Sta. 78.20" for forward limit. And Sta. 86.10" for the rear limit. This figure is constant for all 2-33's. The weight and empty center of gravity of each specific 2-33 is determined at manufacture, or on any subsequent reweighing, so this information is available to any pilot from Form I-4427 or I-6015 to calculate his operational weight and balance. Also known are the arm (or distance aft of station "0") for optional ballast, the front pilot and the rear pilot. With this given information we can develop a form for calculating the actual arm (or c.g. location) for the sailplane for any particular loading.

Items Known:

Front Pilot Weight_____Sta. 43.80 (Sta. 38.8 for 2-33B)

Rear Pilot Weight_____Sta. 74.70 (Sta. 70.2 to 74.7 for 2-33B)

Sailplane Empty Weight_____ 2-33 s/n_____

Removable Ballast Weight_____ (19 ½ lbs. installed)

Baggage Capacity – None allowed

Sailplane Empty C.G._____ 2-33s/n_____

Limits: Forward: Sta. 78.20 (all 2-33's)

Rear: Sta. 86.10 (all 2-33's)

Wing Weights:

LH Wing: _____ RH Wing: _____

To Be Determined:

1. Whether the actual CG of the particular 2-33 to be flown will fall within the above limits.
2. Whether total gross weight is not greater than the maximum allowable 1,040 or 1,080 lbs. for any 2-33.

6.3 REMOVABLE BALLAST

Removable ballast(s) installations, part number 33011-001, 33011-013, 33019-001, or 33033-001 (Double Ballast Installation) have been developed for the SGS 2-33, 2-33A and 2-33B models to simplify the balance requirements necessary for relatively light weight pilot flying solo.

The installation consists of a canister assembly which is securely attached to the sailplane structure in a well forward location for maximum effectiveness. The ballast(s) proper, is a steel bar with a handle for convenience in inserting or removing from canister. A snap-in pin retains the ballast in place. For each ballast installation a special "Flight Limits" placard is installed and is stamped to show the resultant actual minimum and maximum pilot weights when the removable ballast is in place. These figures are calculated for each sailplanes based on the current weight and balance at the time the ballast is installed. It is calculated by using Form I-4606A (33011-001 or 33011-013), I-4606B (33019-001), or I-6025 (33033-001) depending upon ballast installation.

This installation provides a safe and convenient means of ballasting for flight for the light-weight pilot without the penalty of reduction of useful load, as would be incurred by a like amount of permanent ballast.

WEIGHT AND BALANCE CALCULATIONS

SGS 2-33, 2-33A or 2-33B

ITEM	Example Sailplane - Serial Number 369 (Refer to Form I-4427 for your aircraft) WEIGHT	ARM		MOMENT	My Sailplane - Serial Number _____ (Refer to Form I-4427 for your aircraft) WEIGHT	ARM	MOMENT
Sailplane empty weight & empty C.G.	612	96.12		58,825			
Front Pilot Weight	170	43.80	38.8	7,446		43.80	
Rear Pilot Weight	150	74.70	(70.2 - 74.7)	11,205		74.70	
Ballast, if used	0	13.05		0		13.05	
			(See Form I-4606A or B For Ballast Arm)				
Total Moment				77,476			
Total Weight	932						

Total Moment / Total Weight	=	77,476 / 932	=	83.13	Actual Flying C.G.	Total Momen / Total Weight	=		=	Actual Flying C.G.

This CG is between the limits of Sta. 78.20 and 86.10, and gross weight is less than 1040 lbs. or 1080 lbs., so this sailplane has a proper flight weight and balance loading.

1. Is this between the CG limits?

2. Is total weight less than 1040 lbs. or 1080 lbs.

H & L Soaring
5996 State Route 224
Cayuta, New York 14824

Weight & Balance
Form I-4427
Rev 7/2/14

2-33 Weight & Balance

Serial No.	369	Reg. No.	N33969	Date	Feb. 27, 1975

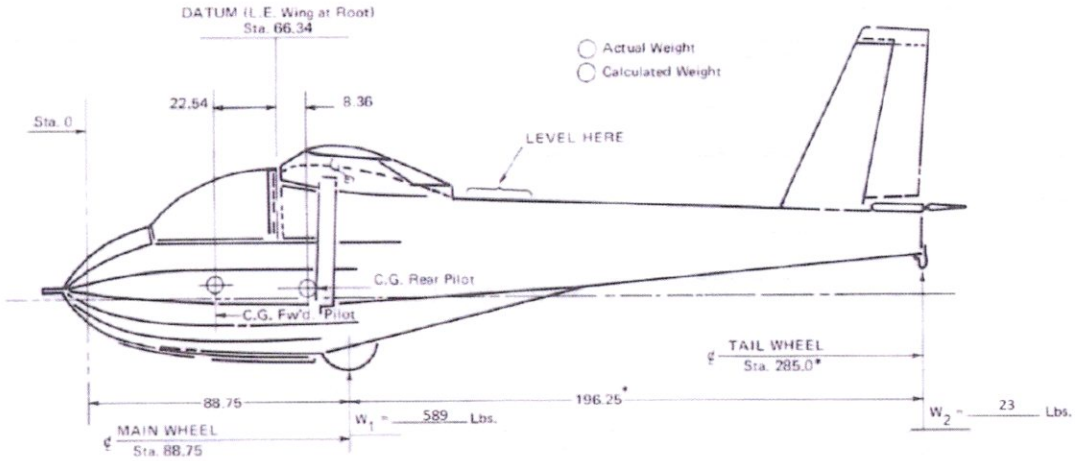


Figure 6-1 – 2-33 and 2-33A Weight & Balance

Empty Weight: $W_E = W_1 + W_2 =$ 589 + 23 = 612 lbs

C.G. Empty (Sta.): $CG_{EFT} = \frac{(W_2 \times 196.25^*)}{W_E} + 88.75 = \frac{(23 \times 196.25^*)}{612} + 88.75 =$ STA 96.12

Wing Panel Weights**:

_____ LH

_____ RH

SHIP AS WEIGHED INCLUDES EQUIPMENT LISTED ON I-4427 Sht. 3

Notes: See Glider Data Sheet No. G2EA – Fwd Pilot C.G. at Sta. 43.80 – Rear Pilot C.G. at Sta. 74.70

CLASS II, UTILITY: C.G. Limits – Sta. 78.20 to Sta. 86.10 or 11.86" to 19.76" Aft Datum

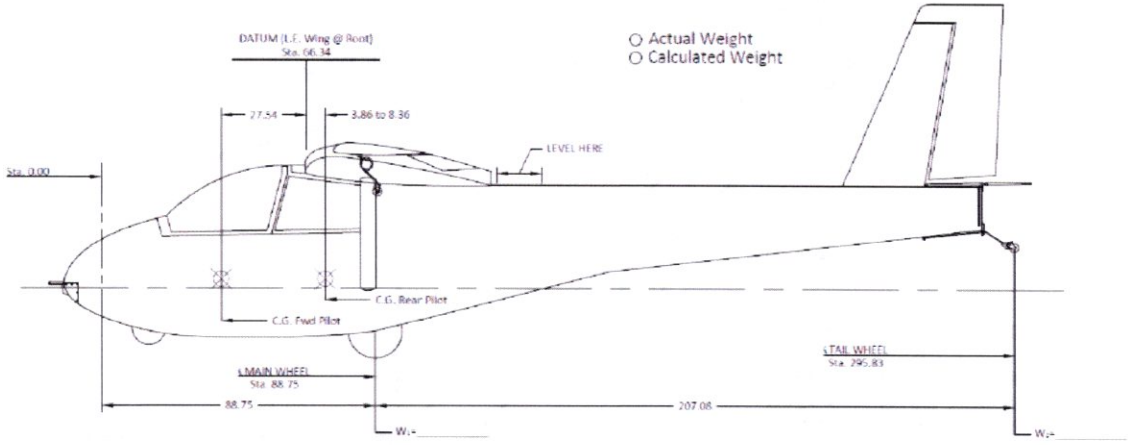
* If aircraft is equipped with spring tail wheel the 196.25" dimension changes to 207.08" and tail wheel Sta. 285.0 becomes 295.8

**Wing weight must be a minimum of 155# and aircraft must have 33928 kit installed to be eligible for 1080# gross weight.

K & L Soaring
5996 State Route 224
Cayuta, New York 14824

2-33B Weight & Balance

Serial No.		Reg. No.		Date	



Empty Weight: $W_E = W_1 + W_2 =$ _____ + _____ = _____ lbs

Wing Panel Weights*:

_____ LH

_____ RH

C.G. Empty (Sta.): $CG_{EFT} = \frac{(W_2 \times 207.08)}{Wg} + 88.75 = \frac{(\quad \times 207.08)}{(\quad)} + 88.75 =$ Sta. _____

SHIP AS WEIGHED INCLUDES EQUIPMENT LISTED ON I-6015 Sht. 3

Notes: See Glider Data Sheet No. G2EA – Fwd Pilot C.G. at Sta. 38.80 – Rear Pilot C.G. at Sta. 70.20 to 74.70

CLASS II, UTILITY: C.G. Limits – Sta. 78.20 to Sta. 86.10 or 11.86" to 19.76" Aft Datum

*Wing weight must be a minimum of 155# and aircraft must have 33928 kit installed to be eligible for 1080# gross weight.

Figure 6-2 - 2-33B Weight & Balance

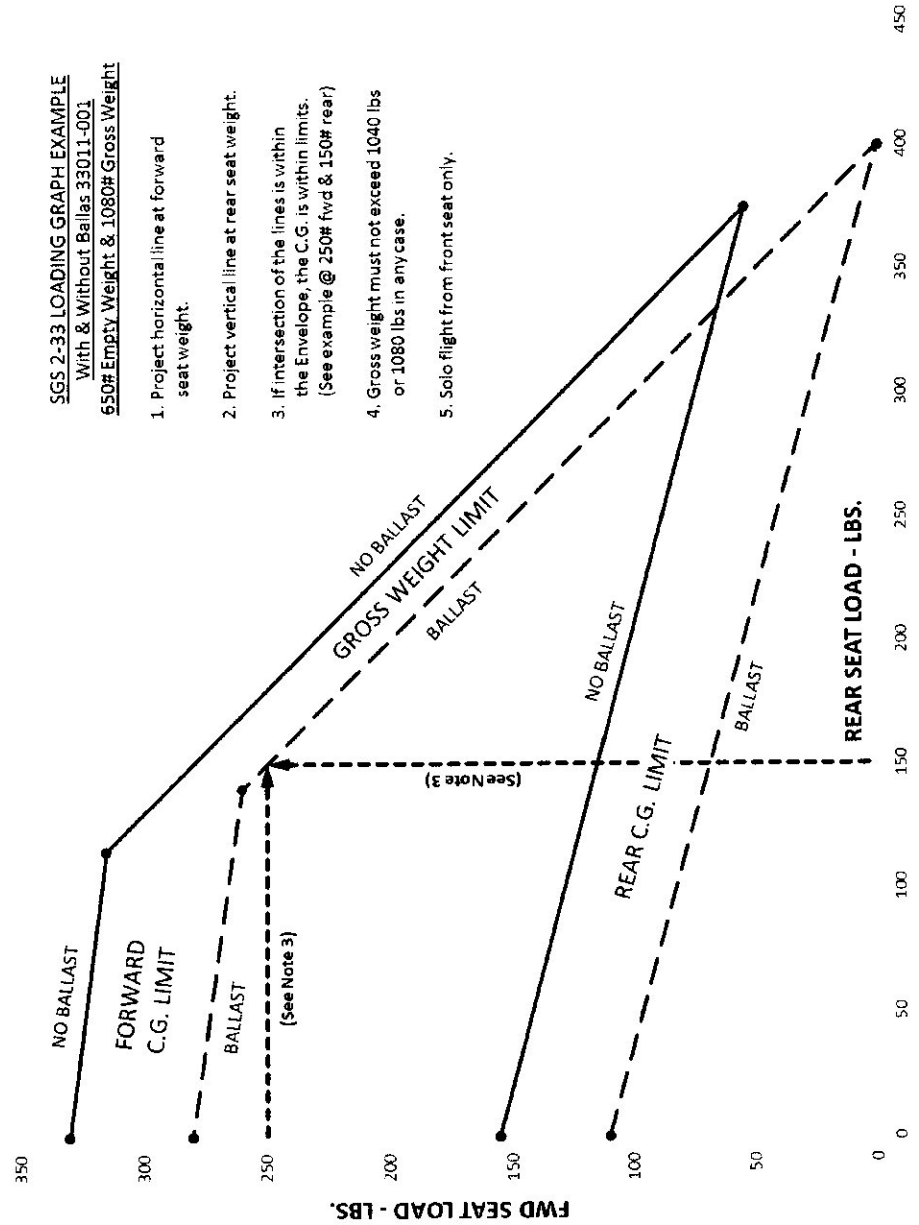


Figure 6-3 – Loading Chart

SECTION 7 - SYSTEM DESCRIPTION

7.1 GENERAL

The SGS 2-33, 2-33A or 2-33B is a conventional two-place tandem, intermediate-training sailplane. Its construction is all metal with fabric cover on the fuselage and tail surfaces. It has a one-piece canopy for increased visibility. The wings are tapered in the outboard section, and have dive-brakes incorporated.

7.2 DATA PLATE

The manufacturer's data plate is located on the back of the front seat. The serial number should always be used in referring to the sailplane in service matters

7.3 PITOT-STATIC SYSTEM

The pitot-static system supplies pressure to operate the airspeed indicator, altimeter, and optional variometer. Pitot and static pressures are picked up by the stainless steel pitot-static head that is mounted on the nose of the aircraft.

To prevent bugs and water from entering the pitot and static holes, a cover should be placed over the pitot-static head while the aircraft is moored. A partially or completed clogged pitot-static system will give erratic or zero readings on the instruments.

7.4 TOTAL ENERGY SYSTEM (OPT.)

The 2-33, 2-33A, or 2-33B can be fit with an optional total energy system on the vertical tail. This system can be connected one or more variometers in order to indicate the actual sink of the sailplane independent of short term changes in the airspeed. Contact K & L Soaring for 33922-001K retrofit kit.

7.5 ELECTRICAL SYSTEM (OPT.)

The electrical system shown in Figure 7-1 is optional and is only necessary based on customer requirements for the sailplane. All circuit breaker/fuse sizes should be based on instrument requirements provided by the manufacturer. All instruments should have a separate circuit breaker/fuse.

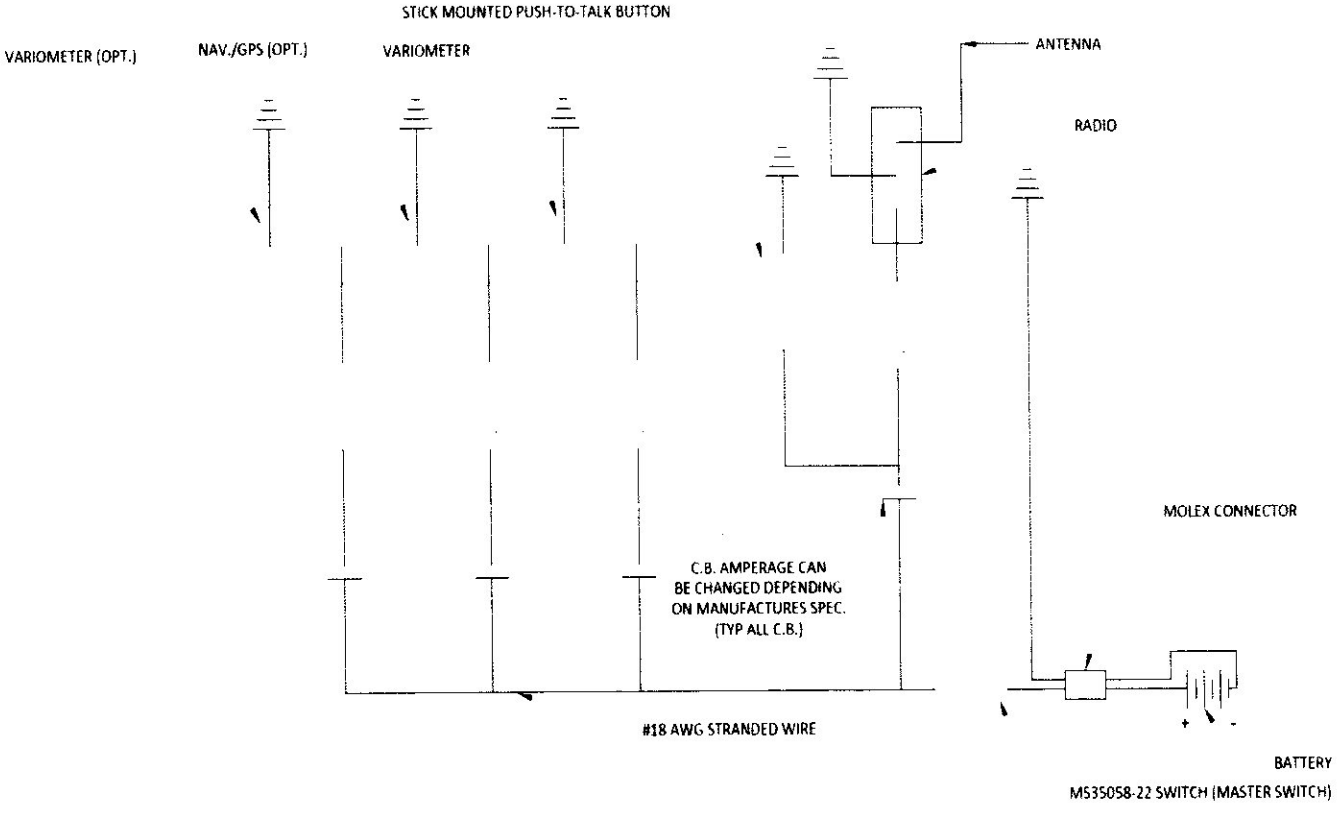


Figure 7-1 – Electrical System (Opt.)

SECTION 8 - SAILPLANE HANDLING, SERVICING & MAINTENACE

8.1 GENERAL

This section provides general guidelines relating to the handling, servicing and maintenance of the SGS 2-33, 2-33A or 2-33B sailplane.

K & L Soaring takes a continued interest in having the owner get the most efficient use from his or her sailplane and keeping it in the best mechanical condition. Consequently, K & L Soaring, from time to time issues Service Bulletins and Service Letters relating to the sailplane. These can be downloaded from www.klsoaring.com and the website should be checked periodically new versions and revisions

Service Bulletins are of special importance and should be complied with promptly. Depending on the nature of the bulletin, material and labor allowances may apply, and will be addressed in the body of the bulletin. Service Letters deal with product improvements and service hints pertaining to the sailplane.

8.2 SAILPLANE ASSEMBLY

A. TO REMOVE A/C FROM STANDARD SCHWEIZER OPEN TRAILER:

1. Remove trailer from towing vehicle and block wheels.
2. Raise rear of trailer and block in position with sawhorse, jack or other suitable means.
3. Remove wing-to-trailer tie-down from wing tip spring assembly on L.H. wing. (Note: R.H. wing is usually mounted on the L.H. side of trailer and L.H. wing on R.H. side of trailer. This is trailer configuration dependent.)
4. Remove upper wing-to-trailer attach pin, support the wing to prevent twisting.
5. Remove lower wing to trailer attach pin and remove wing from trailer and place on ground.
6. Repeat steps 1-5 for the R.H. Wing.
7. Remove blocking means from rear of trailer.
8. Raise and block the front end so that aft end of the trailer rests on the ground.
9. Remove the rear tail wheel bracket-to-trailer jack attachment, bolt and support fuselage. (Note: Use caution when removing the tail wheel bracket as the tail of sailplane will raise up if not held down.)
10. Remove front fuselage tie downs and carefully roll the ship aft out of wheel well and off trailer into assembly position.

B. ASSEMBLY OF THE AIRCRAFT:

1. With the fuselage in an upright position, attach wing struts to fuselage with (2) P/N 33916-005 (7/16") bolts and #2 Commercial safety pins. Optional attach hardware (2) P/N 33916-005 Bolt, (2) AN960-716 washer, (2) AN310 nut, and #2 Commercial safety pins. Second optional attach hardware (2) P/N 33428B-1 bolt special, (2) P/N 33428B-3 collar, (2) AN310-5 castle nut and safety with #2 commercial safety pins.

   NOTE: The wing and strut attach bolts must have a grip-length of 1-13/16" min., to avoid threads in bearing.

2. Lift and place L. H. wing in position and attach to fuselage with an 33916-005 (7/16") bolt in front fitting and an 33916-003 (3/8") bolt in rear fitting. Install #2 Commercial safety pins in bolts.
3. Raise L.H. strut and attach to wing strut-fitting with P/N 33916-005 (7/16") bolts and #2 Commercial safety pin. Optional attach hardware P/N 33916-005 Bolt, AN960-716 washer, AN310 nut, and #2 Commercial safety pin. Second optional attach hardware P/N 33428B-1 bolt, P/N 33428B-3 collar, AN310-5 castle nut and safety with #2 commercial safety pin.
4. Attach aileron push-rod to Bellcrank on fuselage. This connection is made with (1) AN393-25 Clevis Pin and (1) Commercial safety pin
5. Repeat above items 1 thru 4 for R.H. Wing. While sliding this wing in position, check to make sure that the dive-brake torque tube fittings are properly positioned to mesh (bolt into opposite slot), with dive-brakes on both wings closed.
6. Attach the dive-brake push tube (in fuselage) to the Bellcrank on the torque tube of the L.H. Wing. Use an AN393-21 pin and secure with #1 commercial safety pin. (Note: Dive Brake Handle should be in the unlock position in order to line the bellcrank up with wing T.T.)
7. Check items 1 thru 6 on each wing for proper installation and safetying.
8. The wing tip wheel is installed by inserting the ferrule on the spring assembly into a hole on the lower side of the wing. Secure in place using an AN3-6A bolt, with a washer under the head, screwed into a 10-32 nutplate which is fastened to the internal bracket assembly.
9. Install wing gap cover, the Plexiglas Assembly is put in place between the wing leading edges and secured with "airloc" studs. The aft gap-cover assembly is then hooked over the wing trailing edges, the

pierced-strap inserted in the take-up mechanism, and tightened with a screwdriver. The padding assembly is then put in place between the wing roots and secured to the root rib on each side.

C. INSTALLATION OF STABILIZER AND ELEVATOR:

1. It is seldom necessary to remove elevator and stabilizer of this aircraft for normal purposes. However, if they have been removed, the following method should be used for reassembly.
2. Place assembled elevator and stabilizer into position, with strut lugs on stabilizer on the bottom side. Secure with (2) AN4-13A bolts, (1) AN4-33A bolt, (3) AN960-416L washers and (3) AN365-428 nuts thru stabilizer front and rear spar fittings, and fuselage attach fittings.
3. Place stabilizer struts in position and secure each with AN3-7 bolts, AN960-10 washers, AN310-3 nuts and cotter pins.
4. Connect elevator push-rod to elevator horn with AN4-6 bolt, AN310-4 nut, AN960-416 washer and cotter pin. Use caution not to overtighten nut and cause binding of the elevator control.

D. INSTALLATION AND REMOVAL OF FIN AND RUDDER:

For normal handling and trailering, the Fin and Rudder Assembly are left attached to the fuselage. However, if an occasion arises where the Fin must be removed from the Fuselage, follow the procedure listed below.

1. Fin and Rudder Removal from Fuselage:
   a. Disconnect rudder cables from rudder horn.
   b. Remove screws attaching metal fairing to fin. This includes the AN520-10 screw and nut.
   c. Remove inspection hole covers from aft fuselage.
   *d. Remove the (5) AN3 bolts attaching fin to fuselage. (Note: If removing the vertical fin attachments bolts on an aircraft that has the spring tail wheel setup remove the spring tail wheel from the aircraft before removing vertical fin attach bolts.)
   e. Remove fin by lifting up, tilting it slightly to the right to clear the notch in the fin spar past the elevator push tube
2. Fin and Rudder Assembly Installation (reversal of procedure above):
   *a. The fin rear spar is attached to the fuselage by (4) AN3-5A bolts, (4) AN960-10 washers and (4) AN365-1032 nuts.
   b. The fin forward-fitting is attached to the fuselage by (1) AN3-14A bolt, (1) AN960-10 washer and (1) AN365-1032 nut.

c. The rudder cables are attached to the rudder horn by (2) AN3-6 bolts, (2) AN960-10 washers, (2) AN310-3 nuts and (2) AN380-2-2 cotter pins.

d. The fin fairing is installed with (10) #4 x ¼, "PK" screws, (1) AN520-10-54 screw, (1) AN960-10 washer and (1) AN365-1032 nut.

3. Rudder to Fin Assembly Installation (hinge hardware):
   a. At upper and center hinges – AN3-11 bolt, AN960-10 washer, AN310-3 nut and AN380-2-2 cotter pin.
   b. At lower hinge – AN4-11 bolt, AN960-416 washers (2 each side of male hinge inside female segment), AN310-4 nut (with washer) and AN380-2-2 cotter pin.

* On 2-33A (SN 508 and Subq), and all 2-33B's, the rear fin spar is attached using (4) each AN4-5A bolt, AN365-428 nut, AN960-416 washer (under nut), AN960-416L (under bolt head). Under Service Bulletin SB-102-33-2, all previous Ser. No's. may have the fin spar modified and use this hardware. See drawing 33924 for modification.

E. PERFORM LINE INSPECTION TO DETERMINE THAT:
   a. All controls move freely in the correct direction with no binding or lost motion
   b. All control components are properly safetied.
   c. Both dive brakes open equally and that wheel brake is actuated at the end of the control travel.
   d. That ailerons are in neutral, in conjunction with the stick position.

NOTES:

1. In view of the fact that the glider may have to be disassembled rather frequently in the field; the number of bolted attachments are kept to a minimum. However, should be owner or operator be so inclined, all of the attachment fittings may be made with appropriate AN bolts, nuts and cotter pins, replacing the clevis and safety pins specified. LSP-1 safety pin us an acceptable alternate for #1 and #2 commercial safety pins.
2. For trailering, the L.H. rear window should be removed and stored in the cockpit, as there is minimum clearance between window hinge and trailer. (L.H. Wing)

8.3 GENERAL MAINTENACE

The sailplane can be serviced with a minimum of lubricants; dry film lube or powdered graphite and No. 2 cup grease.

1. Lubrication: See Figure 8-1

   a. Lubricating oil or dry film lube should be used at the following points, except that in dry and dusty conditions, powdered graphite is recommended on the exposed hinge points.

Aileron Hinges	Elevator Hinges
Rudder Hinges	Dive-Brake hinges
*Torque Tube bearings	Dive-Brake Control Bellcrank

   b. Lubricate all oil, (or graphite) points, every 20 hours flying time or 6 months elapsed time, whichever is sooner.

NOTES:

1. Rod end Bearings and Control Pulleys – are the sealed type and require no lubrication under normal conditions

*2. The Torque Tube bearing may be lubricated with cup grease whenever the aircraft undergoes major disassembly.

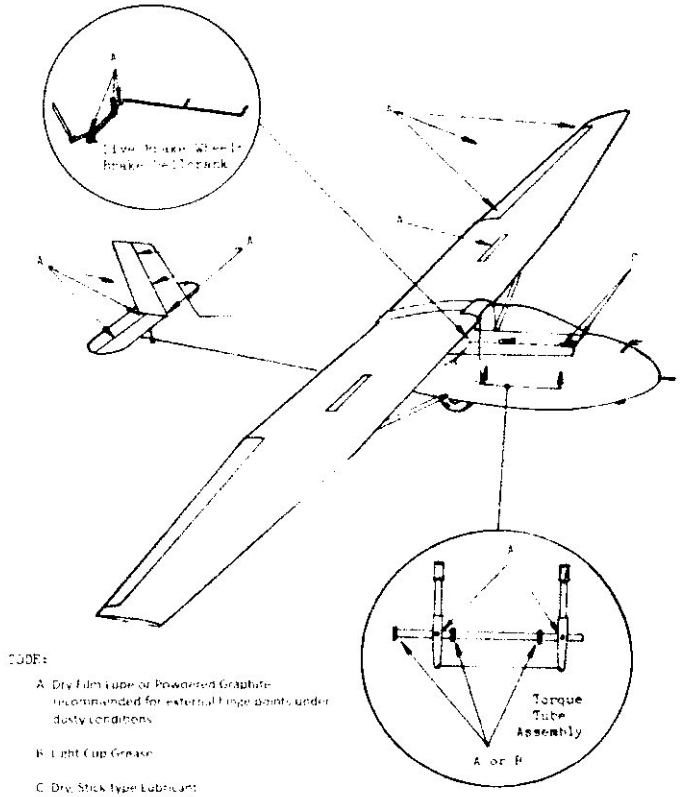


Figure 8-1 – Lubrication Chart

2. Leveling:
   a. To level fuselage laterally, prop up the wing tips and test for horizontal on fuselage members, see Figure 8-2.
   b. To level longitudinally, prop up the tail and test for horizontal on the top Longeron of fuselage aft of wing, see Figure 8-2.
3. Rigging:
   a. The proper dihedral angle of incidence are built into the wing and fuselage at the factory.

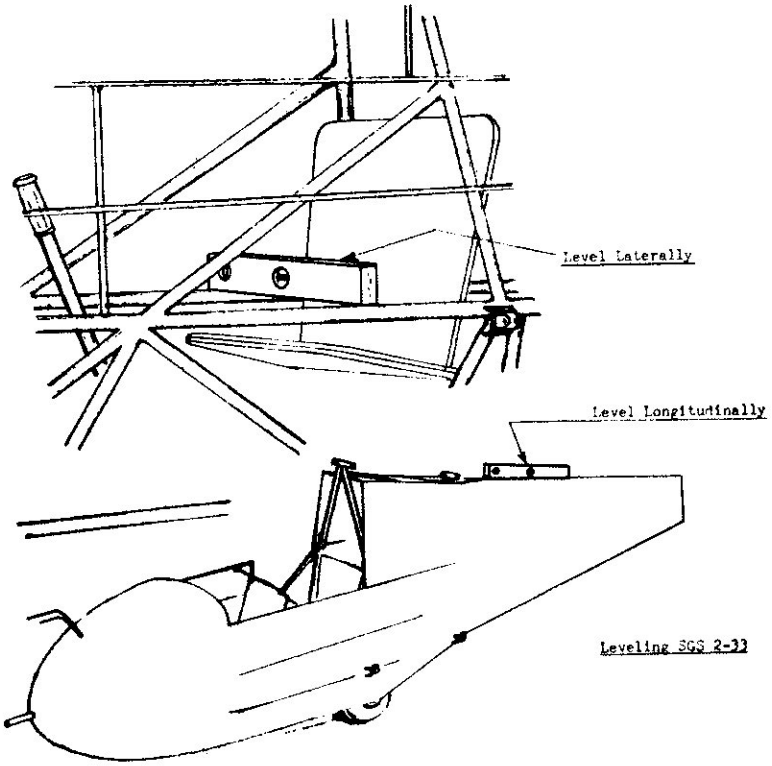


Figure 8-2

   b. Elevator and rudder control system rigging is accomplished by turnbuckles on the cables. Elevator cables are rigged to 30 ± 5 pounds tension. Rudder control system tension is maintained by springs on rudder pedals. Cables should be rigged with turnbuckle threads flush with the barrel. Double-wrap turnbuckles in accordance with FAA Manual No. AC43.13-1, Figure 4.5 or MS33591 clips. The static-unbalance limits of the 33700K-1 rudder, after covering and finishing is

complete, is 0 to 13 in./lbs. tail heavy, measured from the hinge center line.

c. The Dive-brake/wheel-brake control linkage should be rigged so that there is no slack or lost control motion when control is started. The wheel-brake cable is rigged so that the brake arm us actuated to the last 1 – 1 ½" of control rod travel (after the dive-brakes have been effectively opened.)

d. Tow release spring tension is checked by applying a force of 5-20 lbs. (10-30 lbs. for C.G. hook install) at the end of the release arm. The hook should then release. If tension is not within this tolerance, the spring should be replaced. See Figure 2 & Service Bulletin SA-001.

4. Control Surface Travels:

a. When control surface rigging has been disturbed, travel of the movable surfaces must be rechecked to assure that surface deflections are within specified tolerances. Approved travels for the various surfaces are shown below.

Control Surface	Travel	Tension
Elevator – 1040# GW	23° ± 2° Up	30# ± 5#
	23° ± 2° Down	
Elevator – 1080# GW	25° - 26° Up*	
	23° ± 2° Down*	
Rudder	30° ± 2° L & R	No Tension Except For Return Springs
Aileron	38° ± 2° Up	No Tension
	18° ± 2° Down	
Dive Brakes	85° ± 5° Upper Door	No Tension
	75° ± 5° Lower Door	

*Elevator must reach full up and down travel with trim engaged at forward and rearward most trim positions.

8.4 PREFLIGHT INSPECTION

1. Inspect the following for condition, operation, security of attachment and/or other signs of failure.
    a. Wing and attachment bolts.
    b. Struts and strut attachment bolts.
    c. Stabilizer struts and attachment bolts.

d. Stabilizer.
e. Elevator.
f. Fin.
g. Rudder.
h. Fuselage covering and structural tubing.
i. Control cables.
j. Controls and control system push rods.
k. Ailerons.
l. Dive-brakes and controls
m. Main wheel and brake.
n. Tire (maintain tire pressure at 28-30 psi main wheel; 35 psi nose wheel)
o. Tail wheel and bracket
p. Skid and skid shoe (Skid should be replaced if cracks or splits are evident. Shoe need not be replaced except for wear-through or breakage.)
q. Shoulder harness and safety belts.
r. Canopy
s. Release hook and release system.
t. Pitot system (After prolonged tie-down or exposure to rainy weather, remove lines from instruments and expel any water which may have collected in lines though them.)

CAUTION: DO NOT BLOW INTO PITOT TUBE WITH INSTRUMENTS CONNECTED.

8.5 ANNUAL, AND/OR 100 HOUR INSPECTION

1. Fuselage Group:
   a. Check control stick and torque tube assembly, lubricate torque tube support bearings. Inspect internal surface of torque tube for corrosion, clean and apply Paralketone if necessary.
   b. Check controls for ease of operation and excessive wear/slop.
   c. Check control cables for safety, corrosion, wear and security of attachment.
   d. Check elevator push tube for condition, wear, especially at fairlead and security of cable attachments. Also check fairlead for slippage in clamp.
   e. Check fuselage members for cracks misalignment and any other damage. Weld clusters for rust particularly in "cupped" areas without adequate drainage.

f. Note if primer has been scraped off any fuselage member leaving exposed metal, sandpaper lightly to remove rust or impurities and touch up with zinc chromate primer, Specification MIL-P-8585A.
g. Check cable pulleys for wear and attachment, replace if necessary.
h. Check fairleads for wear and attachment, replace if necessary.
i. Check fuselage fabric and finish for cracks and deterioration (check tensile strength, if below 35 pounds per inch fabric must be replaced.)

NOTE: The 2-33, 2-33A, or 2-33B was originally approved with "Ceconite 103" but since that fabric is no longer available the sailplane can be covered with "Ceconite 102", "Superflite SF102", or "Poly-Fiber Medium Weight". When using "Ceconite 102" use the "Ceconite Process"* procedure Manual No. 101, which can be procured from them for guidance in repair and maintenance of this fabric. When using any other fabrics make sure to use one of the many available STC approved fabric covering procedures that cover the SGS 2-33, 2-33A or 2-33B. Also the FAA Manual No. 43.13-1 (superseding CAM 18) is also used as a guide for testing and repairs – See Chapter 3

*Trademark Or Registered in U.S Patent Office and Canada.

j. Check canopy and rear doors for condition latches and attachment.
k. Check Plexiglas for cracks or excessive crazing.
l. Check safety belts, shoulder harness, brackets and bolts.
m. Check springs for corrosion, cracks and wear at ends.
n. Check trim system for wear and operation. If trims spring show excessive corrosion they should be changed.

Note For Ratchet Trim Equipped Sailplanes: Maintenance of the ratchet lock trim system is limited to maintaining security of attachments and periodic lubrication, with special attention to the spring-cartridge, per codes "A" and "B", Figure 8-1, Page 39. There are no field adjustments to be made to the trim system or the spring cartridge.

o. Dive-brake/wheel-brake mechanism, for wear, alignment and linkage attachment. Lubricate control rod at forward guide with dry stick type lubricant.

2. Landing Gear Group:
   a. Remove wheel, inspect brakes.
   b. Inspect main and nose wheel bearings for condition, repack.
   c. Check tire pressure (28-30 psi main wheel; 35 psi nose wheel)
   d. Inspect tire for wear and cuts.
   e. Inspect tail wheel and bracket for cracks and wear.

f. Inspect skid and shoe for cracks, wear and attachment.

Note 1: The SGS 2-33B model has a nose wheel in lieu of the skid. It is a split rim with a hub and bearings using a 4.80 – 4.00 tire and tube.

g. Inspect brake for wear and operation.
h. If equipped, inspect brake caliper for wear, operation & leaks.
i. If equipped, inspect master cylinder for wear, operation & leaks.
j. If equipped, inspect brake hose for wear, operation & leaks.

Note 2: The hydraulic brake main wheel is a split-rim type (Cleveland Model 40-78D or K & L Soaring Model 33218-001) incorporating a Cleveland Model 30-63D (includes torque plate) or K & L Soaring Model 33218-003 (needs 33218-007 torque plate) hydraulic brake. This is a disc type brake, actuated by a Gerdes Products A049-3P or K & L Soaring Model 33218-005 master cylinder located adjacent to the control bellcrank on the left hand side, aft of the rear seat. It is permissible to mix between the Cleveland & K & L Soaring part numbers for the brake system. (i.e. Use a Cleveland Brake with a K & L Soaring Wheel)

Note 3: The brake system is serviced with hydraulic fluid (specification MIL-H-5606, or equivalent) by removing the plastic plug from the top plate on the master cylinder and filling through this hole.

Note 4: To bleed the brake system, remove the bleeder-valve cap on the wheel brake assembly opposite the line-attach point. Actuate the brake master cylinder and while maintain pressure crack the bleeder-valve screw at the wheel brake to allow air to escape. Repeat this cycle, adding hydraulic fluid as necessary, until the air is exhausted. Check brakes for normal operation; then tighten the bleeder valve screw and replace the bleeder-valve cap. Also replace the plug in the brake master cylinder filler hole.

3. Empennage Group:
   a. Inspect stabilizer for condition and attachment.
   b. Inspect stabilizer fittings and bolts for wear and signs of failure.
   c. Inspect stabilizer struts for damage and security of attachment.
   d. Inspect elevator and hinges for condition and security of attachment.
   e. Inspect elevator horn for condition and pushrod for security of attachment.
   f. Inspect fin for dents, general condition and attachment.
   g. Inspect rudder and hinges for condition and security of attachment.

h. Check fabric and finish on stabilizer, elevator and rudder for cracks and deterioration. (check tensile strength, if below 35 pounds per inch fabric must be replaced.)

Note 1: See note under 1.i above

Note 2: The static-unbalance limits of the 33700K-1 rudder, after covering and finishing is complete, is 0 to 13 in./lbs. tail heavy, measured for the hinge center line.

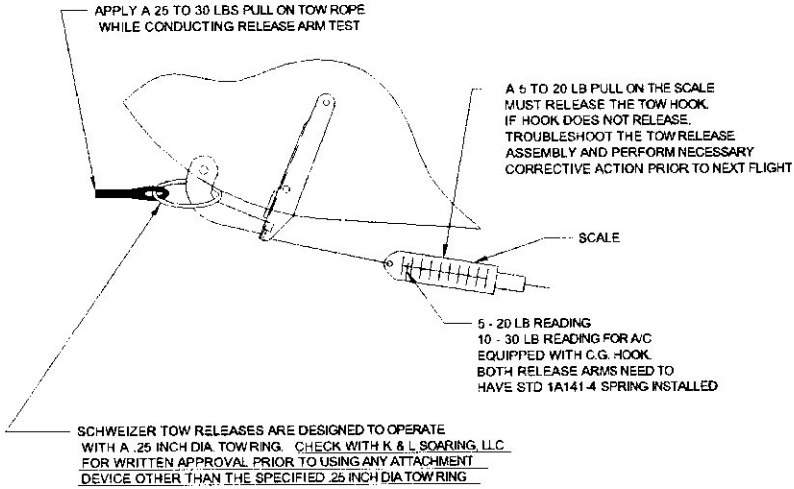
4. Wing Group:
   a. Remove wing gap cover, inspect wing attachment fittings and bolts for condition and security of attachment.
   b. Inspect aileron push roads for condition and security of attachment.
   c. Inspect dive brake linkage for corrosion, wear and security of attachment.
   d. Inspect wing struts, strut fittings and attachment bolts for condition and attachment.
   e. Inspect fixed surfaces for dents, corrosion, loose rivets and other signs of structural failure or damage.
   f. Inspect ailerons and hinges for condition, operation and attachment.
   g. Inspect ailerons bellcranks for condition, evidence of damage and attachment.
   h. Inspect dive brake mechanism and hinges for condition, operation and attachment.
   i. Inspect wing tip wheels for damage and attachment.
   j. Inspect push rod fairleads for wear or breakage and attachment.
   *k. Remove all access covers and doors and inspect inside of wing & spar for general condition. (Ref: 33431)
   *l. At strut access door, inspect main spar around each Hi-Shear or Bolt for cracks. Look at spar cap angles for cracks emanating from rivet holes.
   *m. Wing Strut, Main Spar & Rear Spar attach fittings must be removed and have NDT performed every 20 years

* Inspections are recommended for 1040# GW and required for 1080# GW

5. Tow Hook:
   a. Inspect hook for wear, cracks, roughness and attachment.
   b. Check mechanism for freedom of operation. Lubricate guide-tubes with a dry stick type lubricant.

c. Check release mechanism by applying force of 5-20 lbs. (10-30 lbs. for C.G. hook install). Ref Figure 8-3 below.

d. Check ring clearance between hook and fuselage when hook is closed, using a 2-1/4" O.D. ring made from 5/16" dia. Stock.



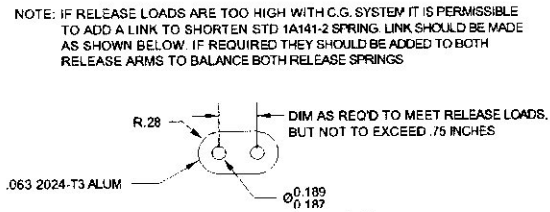
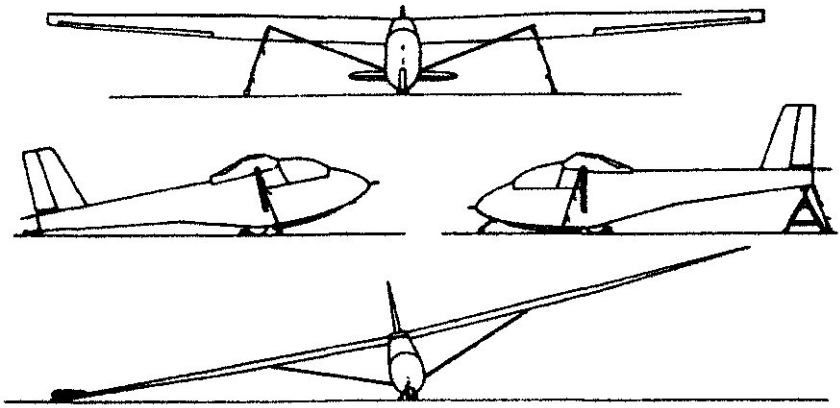


Figure 8-3

6. Cabin Group:
   a. Inspect instruments for range markings, zero readings and security of attachment.
   b. Inspect instrument panel for security of attachment.
   c. Inspect nameplate, decals for legibility and security of attachment. Check "Flight Limits" placard for correct Min./Max. Pilot weights per current weight and balance statement.
   d. Inspect air-vent for operation and security of attachment.
   e. Inspect seats for damage and security of attachment.

8.6 SAILPLANE TIE DOWNS



Many more sailplanes are damaged on the ground by the wind than in flying accidents. It is usually due to leaving the ship unsecured or using inadequate tie downs.

In the normal, tail down, ground position, the wing has a high angle of attack. A 2-22 or 2-33 (empty wgt. 500#), facing into the wind will be subjected to lift forces as shown:

WIND	LIFT	NET LIFT	WIND	LIFT	NET LIFT
30 mph	750	250#	60 mph	2,900	2,400#
40 mph	1,300	800#	70 mph	3,950	3,450#
50 mph	2,000	1,500#	80 mph	5,200	4,700#

Therefore, it is very important that adequate tie downs are provided. The following procedures are recommended:

1. Sheltered Area: Tail down, ropes (*), at wings and tail (***).
2. Unsheltered Area: Facing into prevailing wind. Rope at wings and tail, and chain tie down to release hook.
3. Unsheltered – High Wind Hazard: Tail supported on padded stand. Rope to wings and two ropes to tail. Short chain (5/16" welded link), tie down to tow hook.
4. Flight line Tie Down: Short chain tie down to tow hook (tail in air). Water filled tire tube on end of one wing.

NOTE:

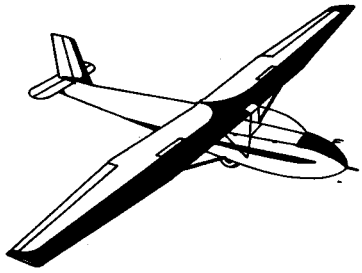
*Minimum size of recommended ropes – 5/16" nylon or 1/2" manila – renewed each season (Knots can reduce rope strength by 50%)

**Size and style of ground anchor will depend on soil composition and type of sailplane. In light sandy soils, anchor arm or chain longer and set deeper. A ground anchor should be able to withstand a vertical pull of at least 2,000#. Should not be located directly under tie downs.

***Rudder lock – recommended if control locks are not used. Ailerons and elevator can be secured with seat belts around control stick.

****Securing the spoilers or dive brakes open will decrease lifting forces

SECTION 9 - SUPPLEMENTS



THE 2-33 SAILPLANE

FLIGHT - ERECTION - MAINTENANCE

MANUAL

SCHWEIZER AIRCRAFT CORP.

ELMIRA, N.Y.

SCHWEIZER SGS 2-33 and 2-33A

FLIGHT - ERECTION - MAINTENANCE

MANUAL

The Model SGS 2-33A Sailplane is the same as Model SGS 2-33 except for the rudder used. SGS 2-33 uses rudder, P/N 26K714 -3, whereas Model SGS 2-33A uses rudder, P/N 33700K-1. The 33700K-1 rudder is taller and incorporates a balance weight in the upper forward end which overhangs the top of the fin. The static-unbalance limits of the 33700K 1 rudder, after covering and finishing is complete, is 10 to 13 in./lbs. tail-heavy, measured from the hinge center line.

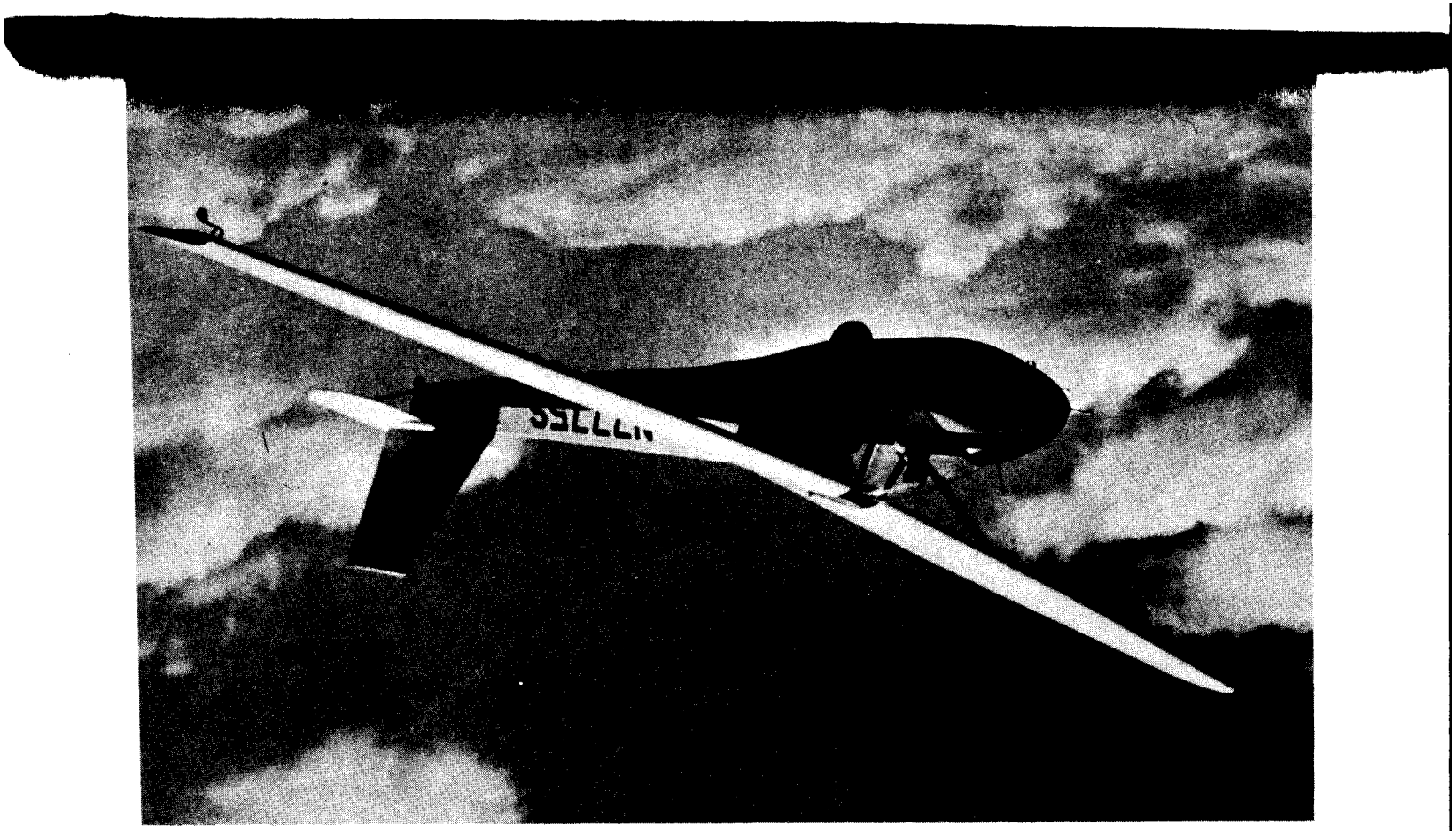
Serial Numbers 86 and up incorporate the balanced rudder in factory production. Serial numbers prior to No. 86 may be converted to Model SGS 2-33A by changing the rudder and accomplishing the documentation of same in accordance with manufacturer's Service Letter No. SL-102-4.

Flight, Erection and Maintenance instructions contained in this Manual are identical for both Models, SGS 2-33 and SGS 2-33A.

SCHWEIZER AIRCRAFT CORP.

BOX 147

ELMIRA, N. Y. 14902



Form F-114
2-67

GENERAL DESCRIPTION

The SGS 2-33 is a conventional two-place tandem, intermediate-training sailplane, manufactured by Schweizer Aircraft Corp., Elmira, New York. Its construction is all metal with fabric cover on the fuselage and tail surfaces. It has a one piece canopy for increased visibility. The wings are tapered in the outboard section, and have dive-brakes incorporated.

Overall dimensions are: Length - 25' 9"
Span - 51' 0"
Height - 9' 3-1/2"
Wing View - 219.48 sq.ft.
Aspect Ratio - 11.85-1

Flight Controls -

1. Tow release knob:
   Front - located at center bottom of instrument panel.
   Rear - located at tope left of front seat back.

   To release - pull red knob full out.

2. Dive Brake and Brake Lever:
   Front - located at left side of cockpit under instrument panel.
   Rear - located at center of left side of cockpit.

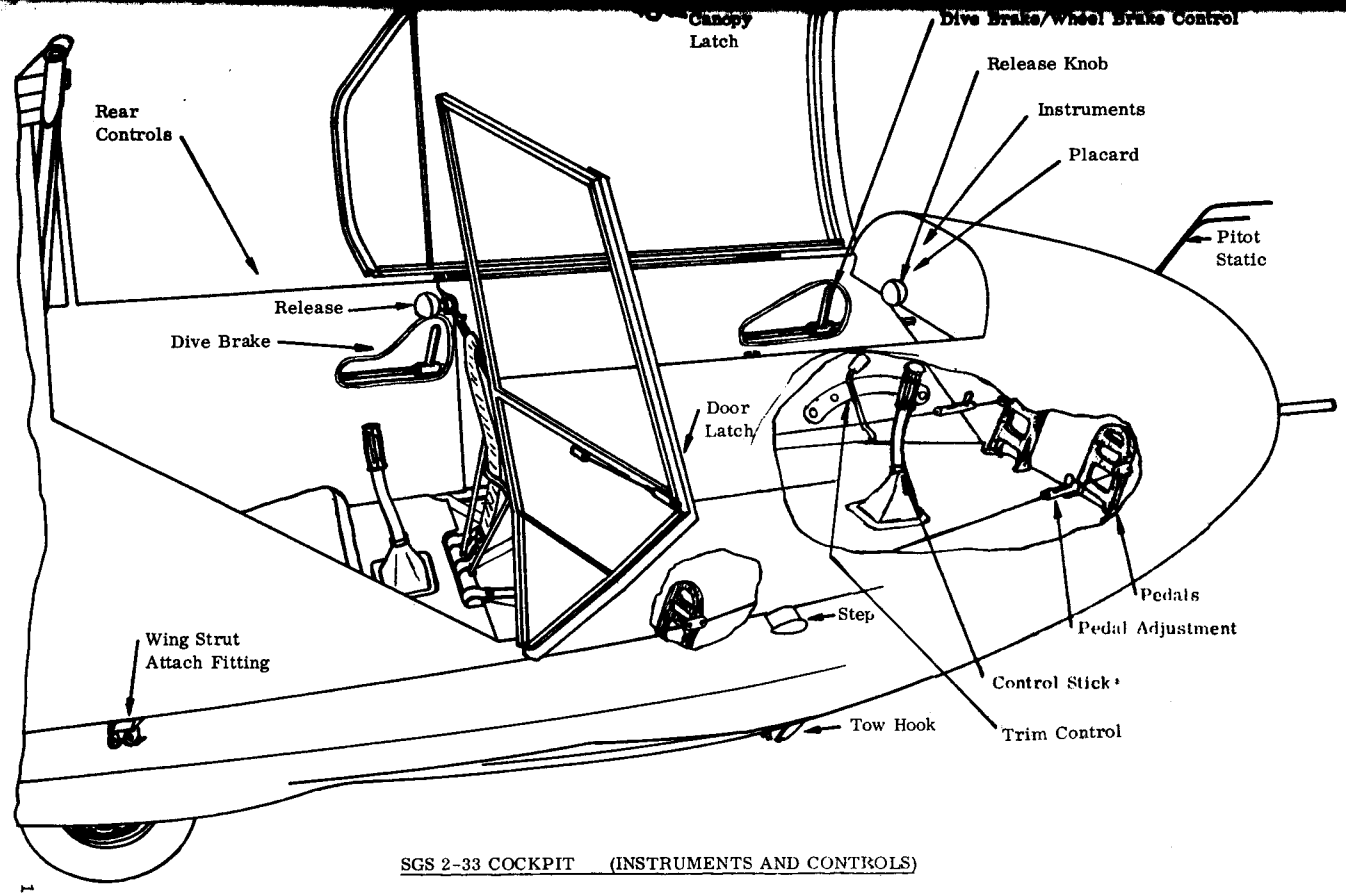
   To use dive brake, push forward and down and then straight back. The wheel brake is actuated only at the extreme aft position of the dive-brake/wheel brake control handle.

3. Control sticks:
   Front and Rear - are conventional and both are mounted on a single torque tube.

4. Rudder Pedals:
   Front - located on left and right forward of floor board and are conventional. They are toe type pedals and are adjustable.
   Rear - located to left and right of front seat and are not adjustable.

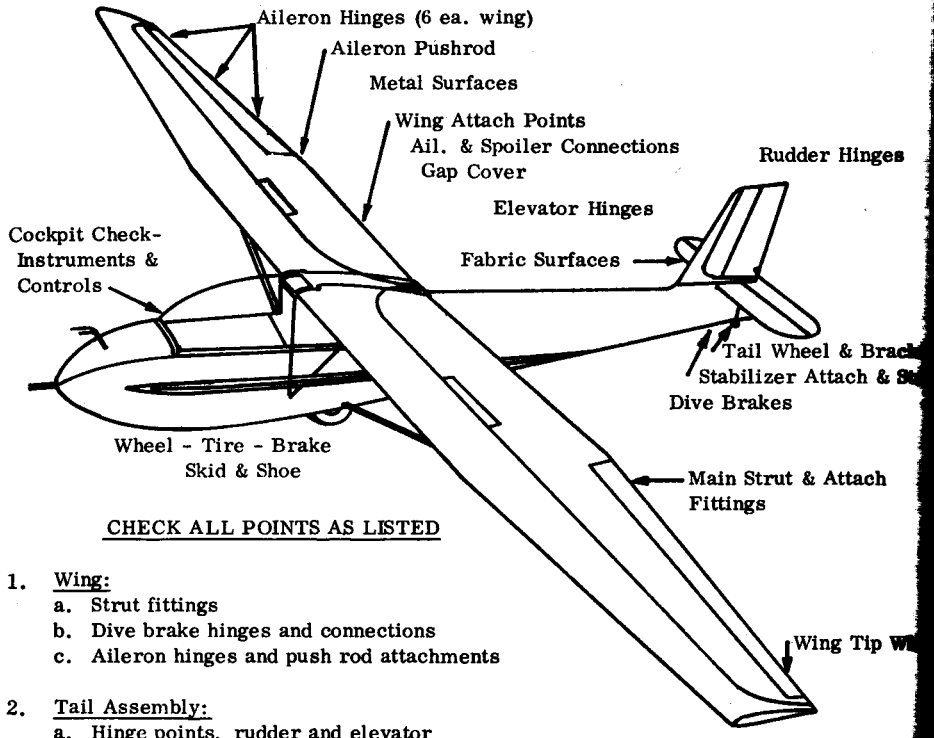
5. Trim Lever:
   Front only - located on left side below dive brake lever.
   Four positions from full forward to full rearward.
   Use as needed.

6. Instruments:
   Front only - ASI is required. Additional instruments may be added, up to full panel, as desired.
   NOTE: Instrument flight is prohibited, regardless of instrumentation.



SGS 2-33 COCKPIT (INSTRUMENTS AND CONTROLS)

PREFLIGHT INSPECTION



CHECK ALL POINTS AS LISTED

1. Wing:
   a. Strut fittings
   b. Dive brake hinges and connections
   c. Aileron hinges and push rod attachments

2. Tail Assembly:
   a. Hinge points, rudder and elevator
   b. Pushrod attachment to elevator horn
   c. Stabilizer struts and stabilizer attachment to fuselage.
   d. Rudder cable connection to rudder horn
   e. Tail wheel assembly

3. Fuselage:
   a. Release control
   b. Flight controls for free movement including release
   c. Instruments
   d. Canopy attach points and latch
   e. Safety belts and shoulder harnesses
   f. Rear door and window attach points and latches
   g. Fabric for damage
   h. Wheel, tire and brake
   i. Static and pitot tubes for water or other foreign objects.

4. Tow Rope:
   a. Condition and attachment of rings.

WINCH OR AUTO TOWS

Precautions:

1. Be sure equipment is suitable for purpose
2. Person driving car or operating winch should be experienced with equipment and know towing characteristics of the SGS 2-33.
3. Never hook rope or wire to empty sailplane.

Winch or auto tows may be executed in the usual manner using either the forward, or the CG release, although the latter should result in a higher altitude. There is no tendency to oscillate with either release. Maximum speed for auto, or winch tow, is 69 MPH.

CAUTION:

1. Do not climb at full back stick position until a safe height for stall recovery is reached (75 - 100 ft.).
2. Level out before releasing.

Aero Towing:

1. Trim (bungee lever) forward position recommended for solo take-off.
2. You will notice that aileron control is somewhat heavy at fast towing speeds, but they reduce to a normal level at slower speeds.

FREE FLIGHT

Flying Speeds:

Best gliding speed (L/D) 23-1 at 50 mph... 2 place
" " " (L/D) 23-1 at 45 mph... 1 place
Min. sinking speed 42 mph 3.1 FPS..... 2 place
" " " 38 mph 2.6 FPS..... 1 place

Flight Limits-speeds:

Dive - 98 mph
Aero Tow - 98 mph
Dive brakes extended - 98 mph
Auto or winch tow - 69 mph

Aerobatics:

Mild aerobatics to 80 mph can be done. Inverted flight prohibited.

Stalls:

Are very gentle and always straight ahead with no tendency to go off to either direction. Buffeting occurs before the stall 31 mph solo, 34 mph dual.

Spins

The 2-33 will spin, depending on the weight of pilots and equipment, etc., Care should be taken to avoid stalls and spins at low altitude by using adequate airspeed.

Useful Loads

The placard weight/s on the instrument panel must be strictly adhered to. This will insure that center of gravity will be maintained in flight. The weights stamped are maximums and minimums which are easily compared with that of the pilot and passenger.

NOTE:

Seat ballast must be added if minimum weight of pilot/s is less than placard minimum.

Spiralling in thermals

In order to remain aloft or gain altitude it is necessary to spiral. The diameter of a thermal is normally quite small, therefore, a fairly steep bank is required. Although this is general practice, it may not be necessary in areas where large diameter thermals are found. The best flying speed in any thermal, at any degree of bank, is a few miles per hour above the buffet-before-the-stall.

Example: SGS 2-33

	Solo	Dual
Stalling speed-level flight	31 mph	33 mph
" " -30° bank	33.5 mph	35.5 mph
Buffeting	34-37 mph	35-38 mph
Spiralling speed	38 mph	42 mph

Keep in mind that the steeper the spiral, the higher the minimum-sink and stalling speed will be. Sometimes it is necessary to spiral very steeply and sacrifice slow speed and low sink to remain within the limits of the thermal. This is especially true in strong, small-diameter thermals.

Slipping

The SGS 2-33 can be slipped both forward, and while turning. The slipping-turn is done in a normal procedure, but due to limited rudder area, the forward slip must be done with very little low wing and full rudder. The air speed should be kept between 45 - 50 mph for fastest rate of descent.

LANDING

Pattern

It is general practice to fly a traffic pattern. Downwind and base legs and finalapproach. Extra speed is also used depending on wind velocity and gust conditions. It is good practice to add 1 mph to airspeed for each mph of wind.

Spoilers

Approach should be made high, with use of dive brakes. Dive brakes increase sink, which in turn makes a steeper and more controllable glide path. They can also be used to lose altitude rapidly at any time during a flight, or during a tow to take up slack, or to lower sailplane from a too-high position. When flying solo, the stalling speed of the 2-33 is 31 mph with dive-brakes closed and 34 mph with dive-brakes open. For dual flight, the speeds are 33 mph and 35 mph, respectively.

It is unsafe, however, to make an approach with dive brakes open in the speed range of 36 to 43 mph as the rate of descent is so great that a proper flare-out for landing cannot be made.

Touch Down

Can be done with dive brakes either open or closed although it is preferable to land with them open. With dive brakes open, the glide path is quite steep, therefore, a flare-out must be executed 2 - 5 ft. above the ground at 43 - 46 mph. By holding a level attitude close to the ground, the sailplane will settle to a smooth, level touch-down. DO NOT FLARE OUT TOO HIGH - this will cause a very hard landing and may result in injury to occupants or sailplane.

Touch down with dive brakes closed

Is executed by letting the sailplane land itself at, or near, 40 mph. Be careful not to ease stick back after touch-down. This will cause a steeper angle of attack and the sailplane will lift off.

Taxiing after touch down

Even though sailplane is on the ground, it should literally be flown to a stop with use of all controls. Wheel brake may be used if a quick stop is desired or necessary.

Getting out of the 2-33

On the ground it is tail down when empty, and nose down with pilot in the seat. When pilot gets out he should keep his weight on the side of the cockpit until he is in a position to lower the tail gently to the ground.

GENERAL FLIGHT PROCEDURES IN STRONG WINDS

1. Be careful during ground handling operations.

   Keep tail high going to and from tie down area.

2. Keep well up-wind of your landing area.

3. When going against wind, it is good practice to add wind velocity to air speed at best L/D.

EXAMPLE

Speed at best L/D (solo)	45 mph
Wind velocity	+ 15 mph
Desired speed	60 mph

This speed will give a better glide angle than a slower approach.

4. Land into the wind whenever possible. In crosswind landing, crab into the wind to maintain desired path over the ground and at the last moment, straighten ship to line of flight and touch down. Be careful while the ship is rolling.

   Downwind landing in high winds - Land with brake full on and maintain control as long as possible.

TIE DOWNS

The 2-33 should never be left unattended in strong winds or gusty conditions. Tie down points are at each wing where main struts are attached and at tail wheel bracket. Be sure ropes and stakes used for tying down are adequate and in good condition.

2-33 FLIGHT ENVELOPE

In any aircraft, it is important to know the operating limits and only sensible to keep load factors at a minimum. The 2-33 has a limit load factor of 4.67 which should not be exceeded in operation. A safety factor of 1.5 is required which gives an ultimate load factor of 7.0. The 1.5 safety factor is for inadvertent conditions and material variations. (A normal airplane has a limit load factor of 3.8 and ultimate of 5.7.) Due to the light wing loading, the sailplane can develop a high load factor if speed limitations are not observed.

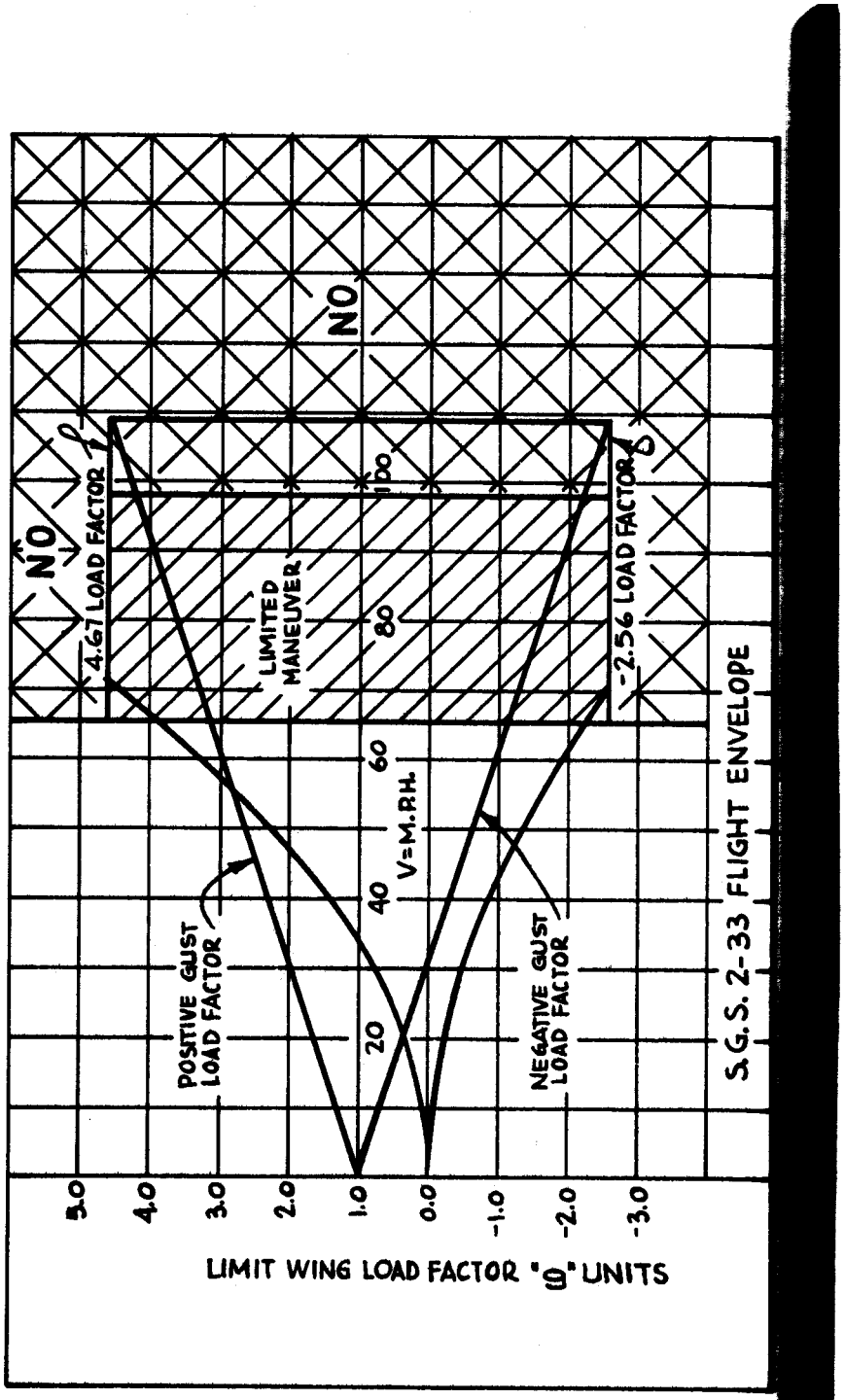
In the 2-33, at speeds over 65 mph, maneuver with caution. The maximum load factor to be attained in flight is 5.4 g. This could occur in abrupt maneuver at 70 mph.

Refer to the Flight Envelope Diagram. The area which is not cross hatched has no maneuvering limits. The diagonal hatched area requires caution in maneuvers, and the area marked "NO" should never be intentionally entered. In normal operation, the principle cases of high G loads are tight spirals in thermals which would not normally exceed 2 or 2.5 g. Winch or Auto Towing can produce high loads, but if the Auto-Winch placard speed is observed, this will be within safe limits. The best climb is obtained at speeds well below placard limits.

The glider is designed for 24 ft/sec gust at design V_D, 109 mph. The placard is 10% less, or 98 mph and should not be exceeded intentionally. This design speed could produce a gust load factor of 5.4. In extreme turbulence, such as in some clouds, and wave roll clouds, the gust values are much higher. In such cases, speed should be held to 10 to 15 mph, above stall to minimize the effect of violent gusts.

Negative limits are similar. See Flight Envelope.

While the 2-33 is capable of performing some aerobatic maneuvers, they are not recommended and inverted flight is not permitted.


NO
NO
NO
4.67 LOAD FACTOR
-2.56 LOAD FACTOR
LIMITED MANEUVER
100
80
60
40
20
V=M.P.H.
POSITIVE GUST LOAD FACTOR
NEGATIVE GUST LOAD FACTOR
S.G.S. 2-33 FLIGHT ENVELOPE
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
LIMIT WING LOAD FACTOR "n" UNITS

2-33A GROSS WEIGHT
and
BALANCE CALCULATIONS

When preparing for any particular flight the pilot must answer two questions:

1. Is my weight and my passenger's weight within the maximum limits of gross weight for this flight? and

2. Is the sailplane properly balanced for this flight?

The following procedure is designed to help the pilot determine the actual weight and balance of his 2-33A for any particular flight loading. To do this, we calculate the moments of the aircraft and each occupant using the equation weight X arm = moment (WA = M).

The sailplane must be balanced within forward and rearward C.G. limits when it is flown. These limits are defined at Sta. 78.20" for the forward limit, and Sta. 86.10" for the rear limit. This figure is constant for all 2-33's. The weight and empty center of gravity of each specific 2-33 is determined at manufacture, or on any subsequent reweighing, so this information is available to any pilot from Schweizer Form I-4427 to calculate his operational weight and balance. Also known are the arm (or distance aft of Station "O") for the optional ballast, the front pilot and the rear pilot. With this given information we can develop a form for calculating the actual arm (or c.g. location) for the sailplane for any particular loading.

Items Known:

Front Pilot Weight_____ Sta. 43.80

Rear Pilot Weight_____ Sta. 74.70

Sailplane Empty Weight_____ 2-33 s/n _____

Removable Ballast Weight - 0 or 26 lbs. (all 2-33's) Sta. 14.75

Baggage Capacity — None allowed.

Sailplane Empty C.G. _____ 2-33 s/n _____

Limits: Forward: Sta. 78.20 (all 2-33's)

Rear: Sta. 86.10 (all 2-33's)

To Be Determined:

1. Whether the actual CG of the particular 2-33 to be flown will fall within the above limits.

2. Whether total gross weight is not greater than the maximum allowable 1,040 lbs. for any 2-33.

WEIGHT AND BALANCE CALCULATIONS

SGS 2-33 or 2-33A

Example Sailplane Serial Number 369
(See Form I 4427 on next page)

My Sailplane - Serial Number _____
(Refer to Form I-4427 for your aircraft)

ITEM	WEIGHT	ARM	MOMENT	WEIGHT	ARM	MOMENT
Sailplane empty weight & empty C.G.	612	96.12	58,825			
Front Pilot Weight	170	43.80	7,446		43.80	
Rear Pilot Weight	150	74.70	11,205		74.70	
Ballast, if used	0	14.75	- 0 -		14.75	
Total Moment			77,476			
Total Weight	932					

Total Moment / Total Weight = 77,476 / 932 = 83.13 Actual flying CG

Total Moment / Total Weight = _____ = Actual flying CG

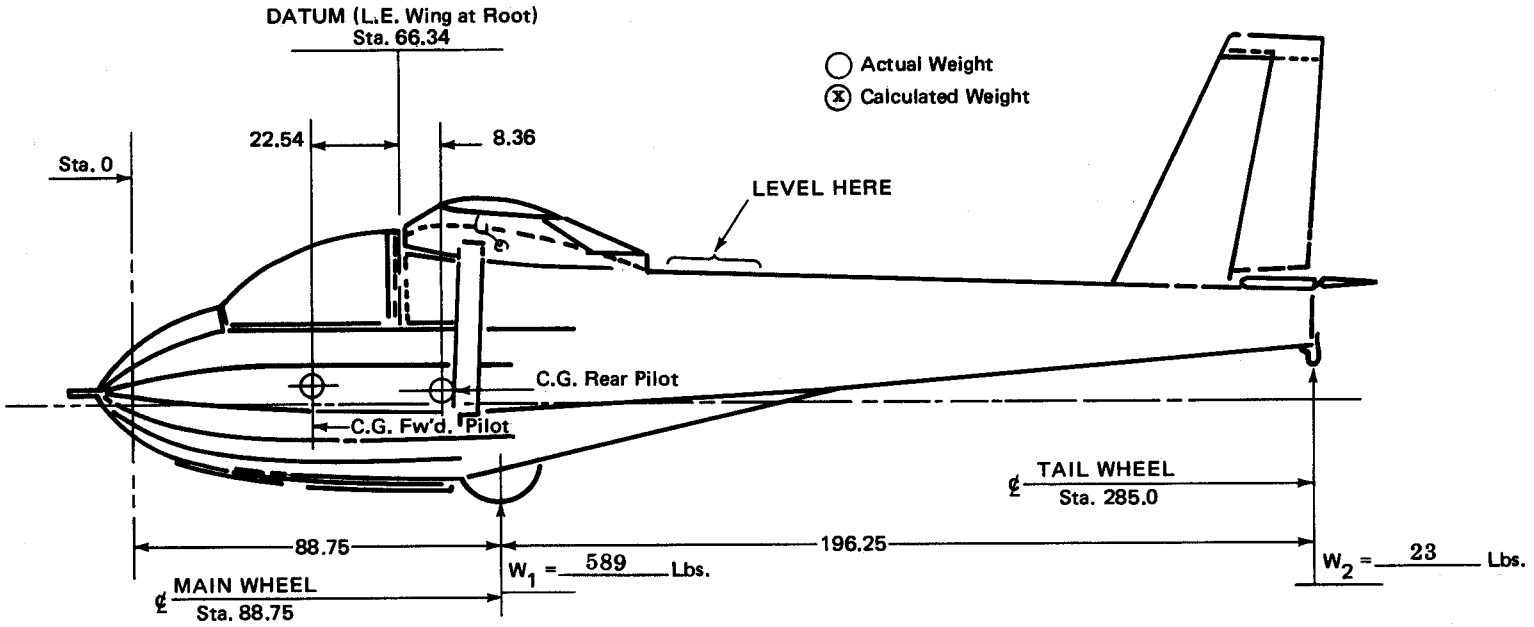
This CG is between the limits of Sta. 78.20 and 86.10, and gross weight is less than 1,040 lbs:, so this sailplane has a proper flight weight and balance loading.

1. Is this between the CG limits?
2. Is total weight less than 1,040 lbs. ?

SCHWEIZER AIRCRAFT CORPORATION
ELMIRA, NEW YORK 14902

Form I-4427-1

WEIGHT & BALANCE, MODEL NO. SGS 2-33A SER. NO. 369 REG. NO. N-33969 DATE February 27, 1975



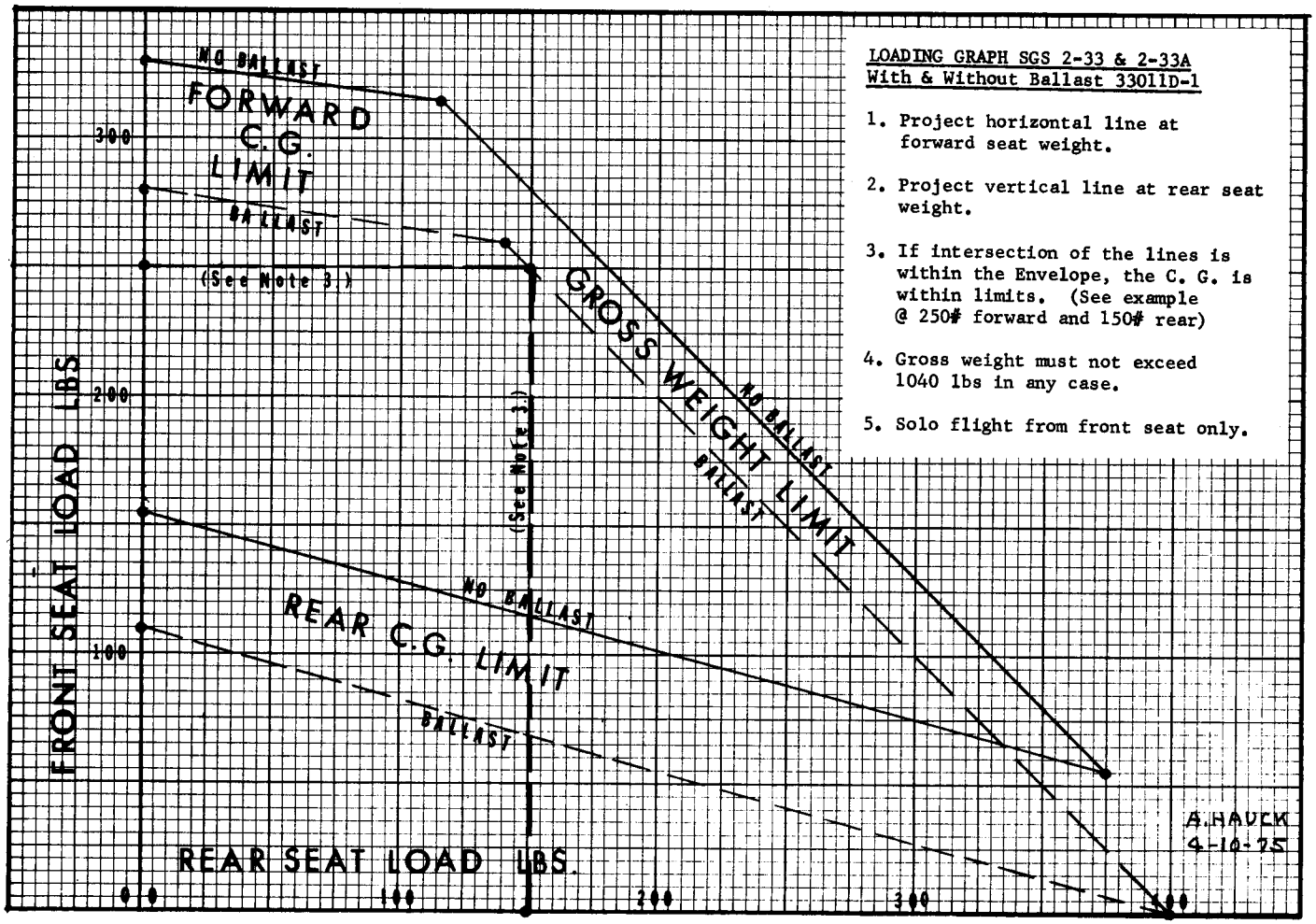
Empty Wt. = $W_1 + W_2$ = 589 + 23 = 612 Lbs.

Empty C.G. (Sta.) = $\frac{W_2 \times 196.25 + 88.75}{W_1 + W_2}$ = $\frac{23 \times 196.25}{612} + 88.75$ = Sta. 96.12

SHIP AS WEIGHED INCLUDES EQUIPMENT LISTED ON I-4427-3

NOTES: See Glider Data Sheet No. G2EA - Fw'd Pilot C.G. at Sta. 43.80 - Rear Pilot C.G. at Sta. 74.70

CLASS II, UTILITY: C.G. Limits - Sta. 78.20 to Sta. 86.10, or, 11.86" to 19.76" Aft Datum.


LOADING GRAPH SGS 2-33 & 2-33A
With & Without Ballast 33011D-1
1. Project horizontal line at forward seat weight.
2. Project vertical line at rear seat weight.
3. If intersection of the lines is within the Envelope, the C. G. is within limits. (See example @ 250# forward and 150# rear)
4. Gross weight must not exceed 1040 lbs in any case.
5. Solo flight from front seat only.
NO BALLAST
FORWARD C.G. LIMIT
BALLAST
(See Note 3)
GROSS WEIGHT LIMIT
NO BALLAST
BALLAST
(See Note 3)
NO BALLAST
REAR C.G. LIMIT
BALLAST
FRONT SEAT LOAD LBS
300
200
100
REAR SEAT LOAD LBS.
0
100
200
300
100
A.HAUCK
4-10-75

SCHWEIZER AIRCRAFT CORP.
ELMIRA, NEW YORK 14902

Form F-114
2-67

ERECTION AND MAINTENANCE INSTRUCTIONS

MODEL SGS 2-33

SGS 2-33 - ERECTION PROCEDURE

A. TO REMOVE A/C FROM TRAILER:

1. Remove trailer from towing vehicle and block wheels.
2. Raise rear of trailer and block in position with sawhorse, jack or other suitable means.
3. Remove wing-to-trailer tie-down from wing tip skid brace from L. H. wing. (Note: R. H. wing is mounted on the L. H. side of trailer and L. H. wing on R. H. side of trailer.)
4. Remove upper wing-to-trailer attach pin, support the wing to prevent twisting.
5. Remove lower wing to trailer attach pin and remove wing from trailer and place on ground.
6. Repeat steps 3 thru 5 for R. H. wing.
7. Remove blocking means from rear of trailer. Raise and block the front end so that aft end of the trailer rests on the ground.
8. Remove the rear tail wheel bracket-to-trailer jack attachment, bolt and support fuselage.
9. Remove front fuselage tie downs and carefully roll the ship aft out of wheel well and off trailer into assembly position.

B. ASSEMBLY OF THE AIRCRAFT:

1. With the fuselage in an upright position, attach wing struts to fuselage with (2) AN7 (7/16") bolts and #2 Commercial safety pins.

   NOTE: The wing and strut attach bolts must have a grip-length of 1-13/16" min., to avoid threads in bearing.

2. Lift and place L. H. wing in position and attach to fuselage with an AN7 (7/16") bolt in front fitting and an AN6 (3/8") bolt in rear fitting. Install #2 Commercial safety pins in bolts.

B. Assembly of the Aircraft (cont'd.)

3. Raise L. H. strut and attach to wing strut-fitting with P/N 32428B-1 bolt (special, P/N 33428B-3 collar, AN310-5 castle nut. Safety with #2 commercial safety pin.

4. Attach aileron push-rod to bellcrank on fuselage. This connection is made with (1) AN393-25 Clevis Pin and (1) Commercial safety pin.

5. Repeat above items 1 thru 4 for R. H. Wing. While sliding this wing in position, check to make sure that the dive-brake torque tube fittings are properly positioned to mesh (bolt into opposite slot), with dive-brakes on both wings closed.

6. Attach the dive-brake push tube (in fuselage) to the bellcrank on the torque tube of the L. H. Wing. Use an AN393-21 pin and secure with a #1 commercial safety pin.

7. Check items 1 thru 6 on each wing for proper installation and safetying.

8. The wing tip wheel is installed by inserting the ferrule on the spring assembly into a hole in the lower side of the wing. Secure in place using an AN3-6A bolt, with a washer under the head, screwed into a 10-32 nut plate which is fastened to the internal bracket assembly.

9. Install wing gap cover, the Plexiglass Assembly is put in place between the wing leading edges and secured with the "airloc" studs. The aft gap-cover assembly is then hooked over the wing trailing edges, the pierced-strap inserted in the takeup mechanism and tightened with a screwdriver. The padding assembly is then put in place between the wing roots and secured to the root rib on each side.

C. INSTALLATION OF STABILIZER AND ELEVATOR:

1. It is seldom necessary to remove the elevator and stabilizer of this aircraft for normal purposes. However, if they have been removed, the following method should be used for reassembly.

2. Place assembled elevator and stabilizer into position, with strut lugs on stabilizer on the bottom side. Secure with AN4 bolts, AN960-416L washers and AN365-428 nuts thru stabilizer front and rear spar fittings, and fuselage attach fittings.

C. Installation of Stabilizer and Elevator (cont'd.)

3. Place stabilizer struts in position and secure each with 3/16" bolts, AN960-10 washer, AN310 nut and cotter pin.

4. Connect elevator push-rod to elevator horn with AN4-6 bolt, AN310-4 nut, AN960-416 washer and cotter pin. Use caution not to overtighten nut and cause binding of the elevator control.

D. INSTALLATION AND REMOVAL OF FIN AND RUDDER:

For normal handling and trailering, the Fin and Rudder Assembly are left attached to the fuselage. However, if an occasion arises where the Fin must be removed from the Fuselage, follow the procedure listed below.

1. Fin Removal from Fuselage:
   a. Disconnect rudder cables from rudder horn.
   b. Remove screws attaching metal fairing to fin. This includes the AN520-10 screw and nut.
   c. Remove inspection hole covers from aft fuselage.
   d. Remove the (5) AN3 bolts attaching fin to fuselage.
   e. Remove fin by lifting up, tilting it slightly to the right to clear the notch in the fin spar past the elevator push tube.

2. To install the Fin and Rudder Assembly reverse the procedure outlined in a. through e. above.

   a. The fin rear spar is attached to the fuselage by (4) AN3-5A bolts, (4) AN960-10 washers and (4) AN365-1032 nuts.
   b. The fin forward-fitting is attached to the fuselage by (1) AN3-14A bolt, (1) AN960-10 washer and (1) AN365-1032 nut.
   c. The rudder cables are attached to the rudder horn by (2) AN3-6 bolts, (2) AN960-10 washers, (2) AN310-3 nuts and (2) AN380-2-2 cotter pins.
   d. The fin fairing is installed with (10) #4 x 1/4, Type Z, "PK" screws, (1) AN520-10-54 screw, (1) AN960-10 washer and (1) AN365-1032 nut.

3. In case the rudder has been removed from the fin, the hinge hardware for re-assembly is as follows:

   a. At upper and center hinges - AN3-11 bolt, AN960-10 washer, AN310-3 nut and AN380-2-2 cotter pin.
   b. At lower hinge - AN4-11 bolt, AN960-416 washers (2 each side of male hinge inside female segment), AN310-4 nut (with washer) and AN380-2-2 cotter pin.

E. PERFORM LINE INSPECTION TO DETERMINE THAT:

a. All controls move freely in the correction direction with no binding or lost motion.
b. All control components are properly saftied.
c. Both dive brakes open equally and that wheel brake is actuated at the end of the control travel.
d. That ailerons are in neutral, in conjunction with the stick position.

NOTES:

1. In view of the fact that the glider may have to be disassembled rather frequently in the field; the number of bolted attachments are kept to a minimum. However, should the owner or operator be so inclined, all of the attachment fittings may be made with appropriate AN bolts, nuts and cotter pins, replacing the clevis and safety pins specified. LSP-1 safety pin is an acceptable alternate for #1 and #2 commercial safety pin.

2. For trailering, the L. H. rear window should be removed and stored in the cockpit, as there is minimum clearance between window hinge and trailer. (L. H. Wing)

SGS 2-33 - GENERAL MAINTENANCE

The sailplane can be serviced with a minimum of lubricants; a good grade of lubricating oil or powdered graphite and No. 2 cup grease.

1. Lubrication: See Figure 1.

a. Lubricating oil should be used at the following points, except that in dry and dusty conditions, powdered graphite is recommended on the exposed hinge points.

Aileron hinges	Elevator hinges
Rudder hinges	Dive-Brake hinges
*Torque Tube bearings	Dive-Brake Control bellcrank

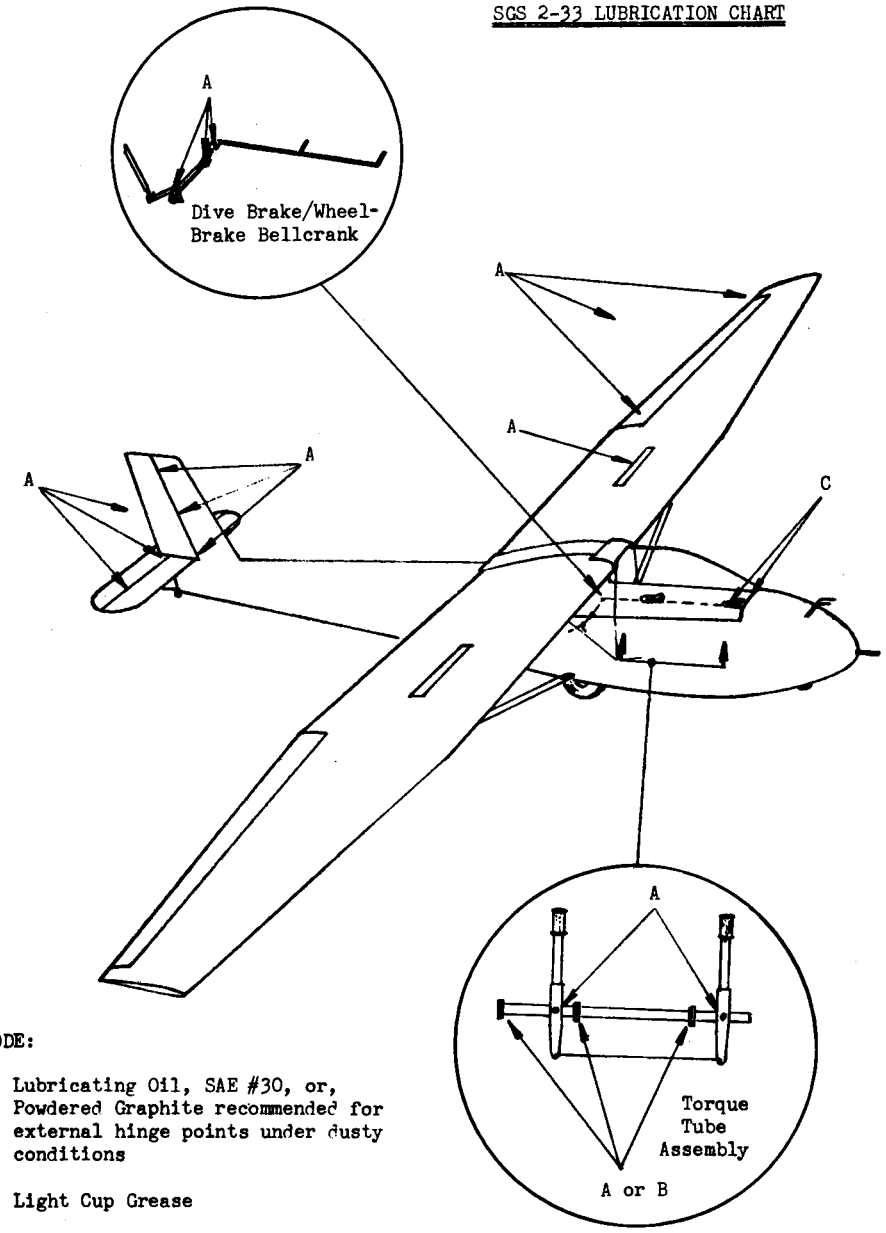
b. Lubricate all oil, (or graphite) points, every 20 hours flying time or 6 months elapsed time, whichever is sooner.

NOTES:

1. Rod end Bearings and Control Pulleys - are the sealed type and require no lubrication under normal conditions.

*2. The Torque Tube bearings may be lubricated with cup grease whenever the aircraft undergoes major disassembly.

SGS 2-33 LUBRICATION CHART



CODE:

A. Lubricating Oil, SAE #30, or, Powdered Graphite recommended for external hinge points under dusty conditions

B. Light Cup Grease

C. Dry, Stick-type Lubricant

FIGURE 1.

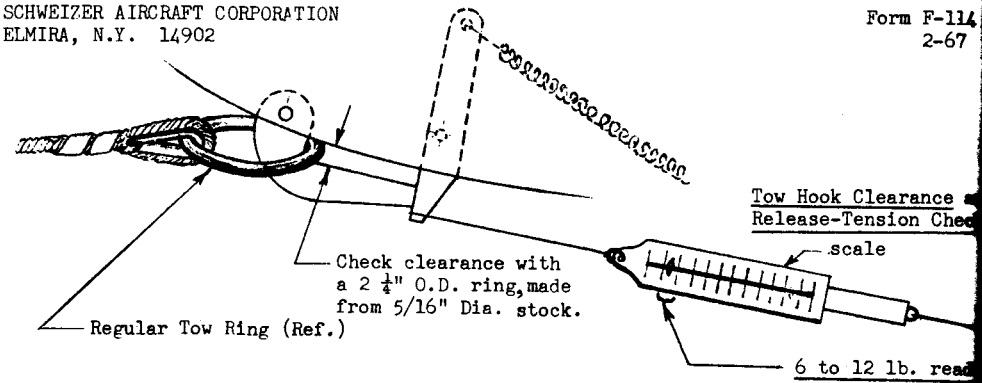


FIGURE 2.

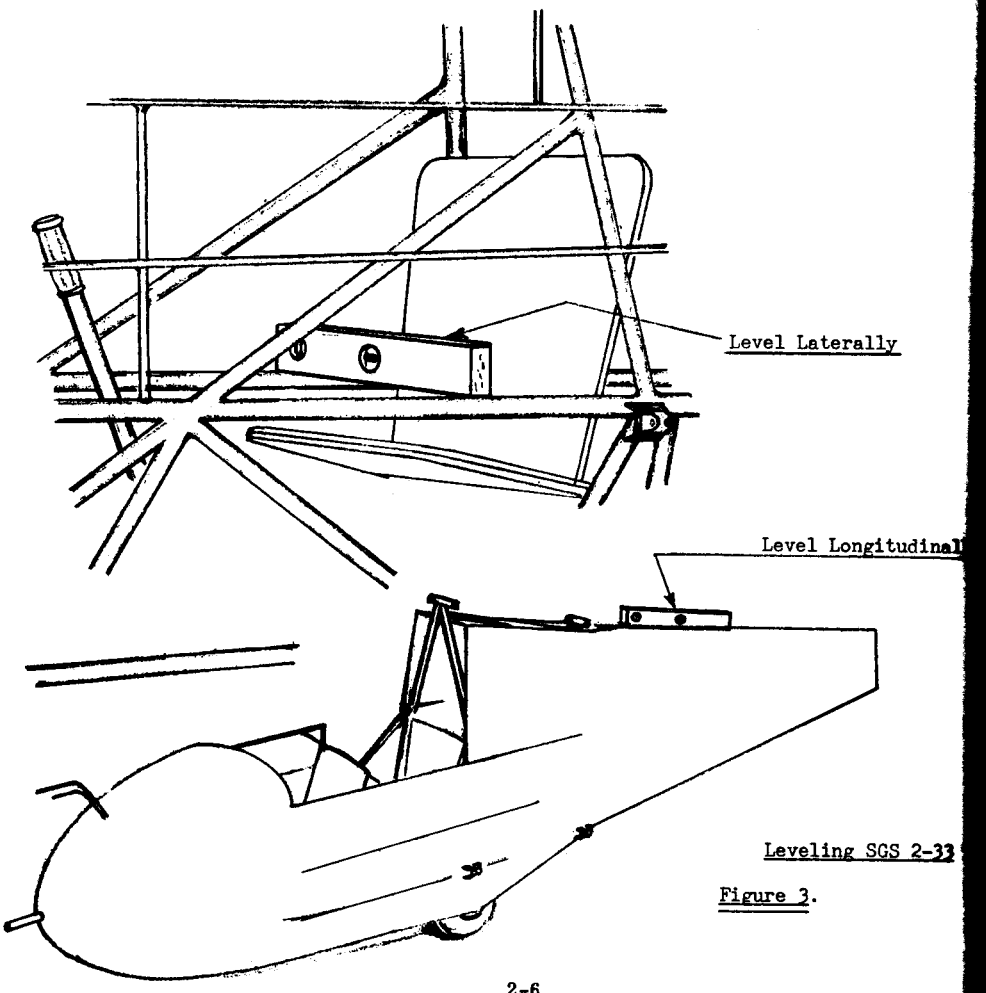


Figure 3.

2. Leveling:

   a. To level fuselage laterally, prop up the wing tips and test for horizontal on fuselage members, see Figure 3.
   b. To level longitudinally, prop up the tail and test for horizontal on the top longeron of fuselage aft of wing, see Fig. 3.

3. Rigging:

   a. The proper dihedral angle and angle of incidence are built into the wing and fuselage at the factory.
   b. Elevator and rudder control system rigging is accomplished by turn-buckles on the cables. Elevator cables are rigged to 30 $\pm$ 5 pounds tension. Rudder control system-tension is maintained by springs on rudder pedals. Cables should be rigged with turnbuckle threads flush with the barrel. Double-wrap turn-buckles in accordance with FAA Manual No. AC43.13-1, Figure 4.5, or MS33591.
   c. The Dive-brake/wheel-brake control linkage should be rigged so that there is no slack or lost motion when control is started. The wheel-brake cable is rigged so that the brake arm is actuated at the last 1-1 1/2" of control rod travel (after the dive-brakes have been effectively opened.)
   d. Tow hook release spring tension is checked by applying a force of 6-12 lbs. at the end of the release arm. The hook should then release. If the tension is not within this tolerance, the spring should be replaced. See Figure 2.

PREFLIGHT INSPECTION:

1. Inspect the following for condition, operation, security of attachment and/or other signs of failure.

   a. Wing and attachment bolts.
   b. Struts and strut attachment bolts.
   c. Stabilizer struts and attachment bolts.
   d. Stabilizer.
   e. Elevator.
   f. Fin.
   g. Rudder.
   h. Fuselage covering and structural tubing.
   i. Control cables.
   j. Controls and control system push rods.
   k. Ailerons.
   l. Dive-brakes and controls.
   m. Main wheel and brake.
   n. Tire (maintain tire pressure at 15 lbs.)

Preflight Inspection (cont'd.):

o. Tail wheel and bracket.
p. Skid and skid shoe (Skid should be replaced if cracks or splits are evident. Shoe need not be replaced except for wear-through or breakage.)
q. Shoulder harness and safety belts.
r. Canopy.
s. Release hook and release system.
t. Pitot system (After prolonged tie-down or exposure to rainy weather, remove lines from instruments and expel any water which may have collected in lines through them.)

CAUTION: DO NOT BLOW INTO PITOT TUBE WITH INSTRUMENTS CONNECTED.

ANNUAL, AND/OR 100 HOUR INSPECTION, SGS 2-33

1. Fuselage Group:

a. Check control stick and torque tube assembly, lubricate torque tube support bearings. Inspect internal surface of torque tube for corrosion, clean and apply Paralketone if necessary.

b. Check controls for ease of operation.

c. Check control cables for safety, corrosion, wear and security of attachment.

d. Check elevator push tube for condition, wear, especially at fairlead and security of cable attachments. Also check fairlead for slippage in clamp.

e. Check fuselage members for cracks, misalignment and any other damage. Weld clusters for rust particularly in "cupped" areas without adequate drainage.

f. Note if the primer has been scraped off any fuselage member leaving exposed metal, sandpaper lightly to remove rust or impurities and touch up with zinc chromate primer, Specification MIL-P-8585A.

g. Check cable pulleys for wear and attachment, replace if necessary.

h. Check fairleads for wear and attachment, replace if necessary.

1. Fuselage Group (cont'd.)

i. Check fuselage fabric and finish for cracks and deterioration (check tensile strength, if below 35 pounds per inch fabric must be replaced.)

NOTE: A synthetic fabric "Ceconite 103" manufactured by Cooper Engineering Co., Box 3428, Van Nuys, California 91405, is used on the aircraft. The "Ceconite Process"* procedure Manual No. 101" should be procured from them for guidance in repair and maintenance of this fabric. FAA Manual No. AC43.13-1 (Superseding CAM 18) is also used as a guide for testing and repairs - See Chapter 3.
*Trade Mark R Registered in U. S. Patent Office and Canada.

j. Check canopy and rear door for condition latches and attachment.

k. Check plexiglas for cracks or excessive crazing.

l. Check safety belts, shoulder harness, brackets and bolts.

m. Check springs for corrosion, cracks and wear at ends.

n. Check bungee control latch plate, if badly worn, replace.

o. Dive-brake/wheel-brake mechanism for wear, alignment and linkage attachment. Lubricate control rod at forward guide with a dry stick-type lubricant.

2. Landing Gear Group:

a. Remove wheel, inspect for brakes.
b. Inspect wheel bearings for condition, repack.
c. Check tire pressure (15 lbs. sq. in.)
d. Inspect tire for wear and cuts.
e. Inspect tail wheel and bracket for cracks and wear.
f. Inspect skid and shoe for cracks, wear and attachment.
g. Inspect brake for wear and operation.

3. Empennage Group:

a. Inspect stabilizer for condition and attachment.
b. Inspect stabilizer fittings and bolts for wear and signs of failure.
c. Inspect stabilizer struts for damage and security of attachment.
d. Inspect elevator and hinges for condition and security of attachment.
e. Inspect elevator horn for condition and pushrod for security of attachment.
f. Inspect fin for dents, general condition and attachment.
g. Inspect rudder and hinges for condition and security of attachment.

3. Empennage Group cont'd.

h. Check fabric and finish on stabilizer, elevator and rudder for cracks and deterioration. (Check tensile strength, if below 35 pounds per inch fabric must be replaced.)

See Note under D. 1. i., above

4. Wing Group:

a. Remove wing gap cover, inspect wing attachment fittings and bolts for condition and security of attachment.

b. Inspect aileron push rods for condition and security of attachment.

c. Inspect dive brake linkage for corrosion, wear and security of attachment.

d. Inspect wing struts, strut fittings and attachment bolts for condition and attachment.

e. Inspect fixed surfaces for dents, corrosion, loose rivets and other signs of structural failure or damage.

f. Inspect ailerons and hinges for condition, operation and attachment.

g. Inspect aileron bellcranks for condition, evidence of damage and attachment.

h. Inspect dive brake mechanism and hinges for condition, operation and attachment.

i. Inspect wing tip wheels for damage and attachment.

j. Inspect push rod fairleads for wear or breakage and attachment.

5. Tow Hook:

a. Inspect hook for wear, cracks, roughness and attachment.

b. Check mechanism for freedom of operation. Lubricate guide-tubes with a dry stick-type lubricant.

c. Check release mechanism by applying a force of 6-12 lbs. Ref. paragraph B. 3. d. and Figure 2.

d. Check ring clearance between hook and fuselage when hook is closed, using a 2-1/4" O.D. ring made from 5/16" dia. stock.

ANNUAL/100 HOUR INSPECTION cont'd.

6. Cabin Group:

   a. Inspect instruments for range markings, zero reading and security of attachment.

   b. Inspect instrument panel for security of attachment.

   c. Inspect nameplate. decals for legibility and security of attachment. Check "Flight Limits" placard for correct Min./Max. Pilot weights per current weight and balance statement.

   d. Inspect air-vent for operation and security of attachment.

   e. Inspect seats for damage and security of attachment.

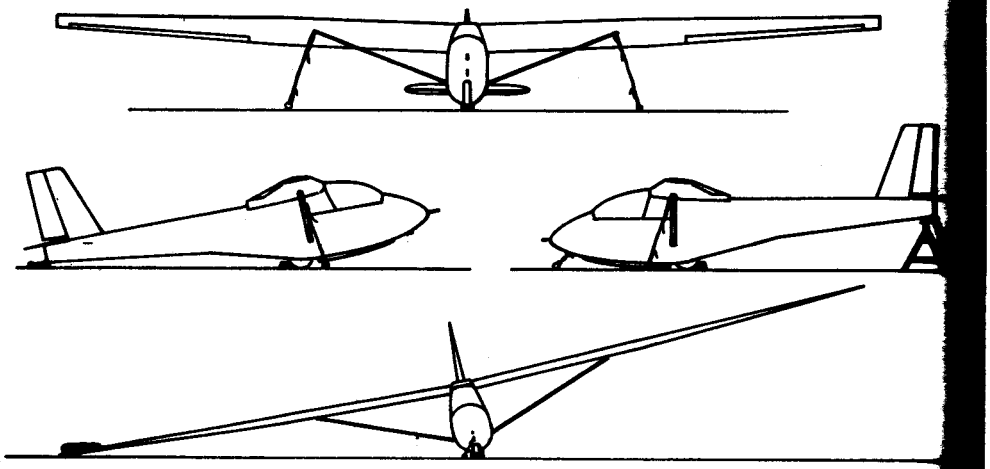
REMOVABLE BALLAST FOR SGS 2-33 and 2-33A

A removable ballast installation part number 33011D has been developed for the SGS 2-33 and 2-33A models to simplify the balance requirements necessary for a relatively light weight pilot.

The installation consists of a cannister assembly which is securely attached to the sailplane structure in a well forward location for maximum effectiveness. The ballast proper, is a cast lead bar with a handle for convenience in inserting or removing from the cannister. A snap-in pin retains the ballast in place. For each ballast installation, a special "Flight Limits" placard is installed and is stamped to show the resultant actual minimum and maximum pilot weights when the removable ballast is in place. These figures are calculated for each sailplane based on the current weight and balance at the time the ballast is installed.

This installation provides a safe and convenient means of ballasting for flight for the light-weight pilot without the penalty of reduction of useful load, as would be incurred by a like amount of permanent ballast.

SAILPLANE TIE DOWNS



Many more sailplanes are damaged on the ground by the wind than in flying accidents. It is usually due to leaving the ship unsecured or using inadequate tie downs.

In the normal, tail down, ground position, the wing has a high angle of attack. A 2-22 or 2-33 (empty wgt. 500#), facing into the wind will be subjected to lift forces as shown:

WIND	LIFT	NET LIFT	WIND	LIFT	NET LIFT
30 mph	750	250#	60 mph	2, 900	2, 400#
40 mph	1, 300	800#	70 mph	3, 950	3, 450#
50 mph	2, 000	1, 500#	80 mph	5, 200	4, 700#

Therefore, it is very important that adequate tie downs are provided. The following procedures are recommended:

1. Sheltered Area: Tail down, ropes (*), at wings and tail (***).
2. Unsheltered Area: Facing into prevailing wind. Rope at wings and tail, and cha tie down to release hook.
3. Unsheltered - High Wind Hazard: Tail supported on padded stand. Rope to win and two ropes to tail. Short chain (5/16" welded link), tie down to tow hook.
4. Flightline Tie Down: Short chain tie down to tow hook (tail in air). Water filled tire tube on end of one wing.

NOTE: *Minimum size of recommended ropes - 5/16" nylon, or 1/2" manila - rene each season. (Knots can reduce rope strength by 50%.)

** Size and style of ground anchor will depend on soil composition and type of sail- plane. In light sandy soils, anchor arm or chain longer and set deeper. A gro anchor should be able to withstand a vertical pull of at least 2, 000#. Should not located directly under tie downs.

*** Rudderlock - recommended if control locks are not used. Ailerons and elevator can be secured with seat belt around control stick.

****Securing the spoilers or dive brakes open will decrease lifting forces.