

MODELS SGU 2-22C and "E"
FLIGHT - ERECTION - MAINTENANCE
MANUAL



AIRCRAFT CORP.

ELMIRA, N.Y.

INCL WT/BAL P. 8

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Form F-108

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GENERAL DESCRIPTION

The 2-22C is a conventional two-place tandem basic training plane manufactured by Schweizer Aircraft Corp., Elmira, New York. Its construction is all-metal with fabric cover.

The SGU 2-22E is basically the same but has increased headroom and vision in rear seat, plus a longer (spanwise) spoiler on wing.

Overall dimensions are: Length - 25' 8½"
Span - 43'
Height - 9'

Flight Controls:

1. Tow release knob

Front - located at center bottom of instrument panel
Rear - located at top left of front seat back

To release - pull red knob full out

2. Spoiler and brake lever

Front - located at left side of cockpit under instrument panel
Rear - located at center left of front seat back

To use spoiler - pull straight back. This control is spring loaded and must be held at all times. Wheel brake is actuated when last ½ inch of spoiler control is used.

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 and are conventional. They are toe pedals.

Rear - located at left and right of front seat.

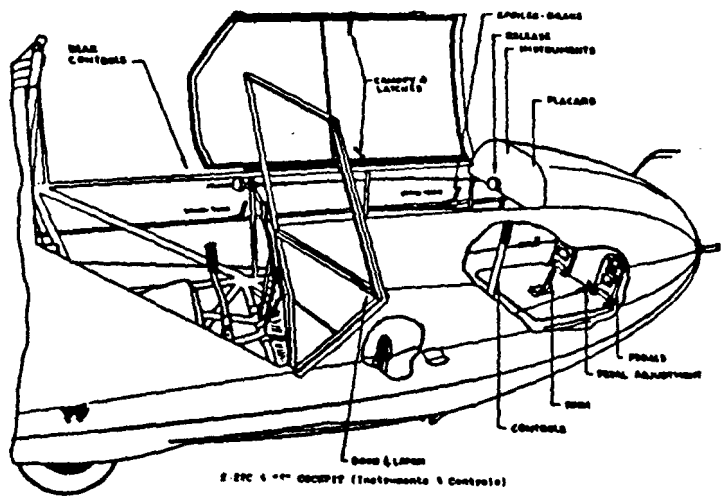
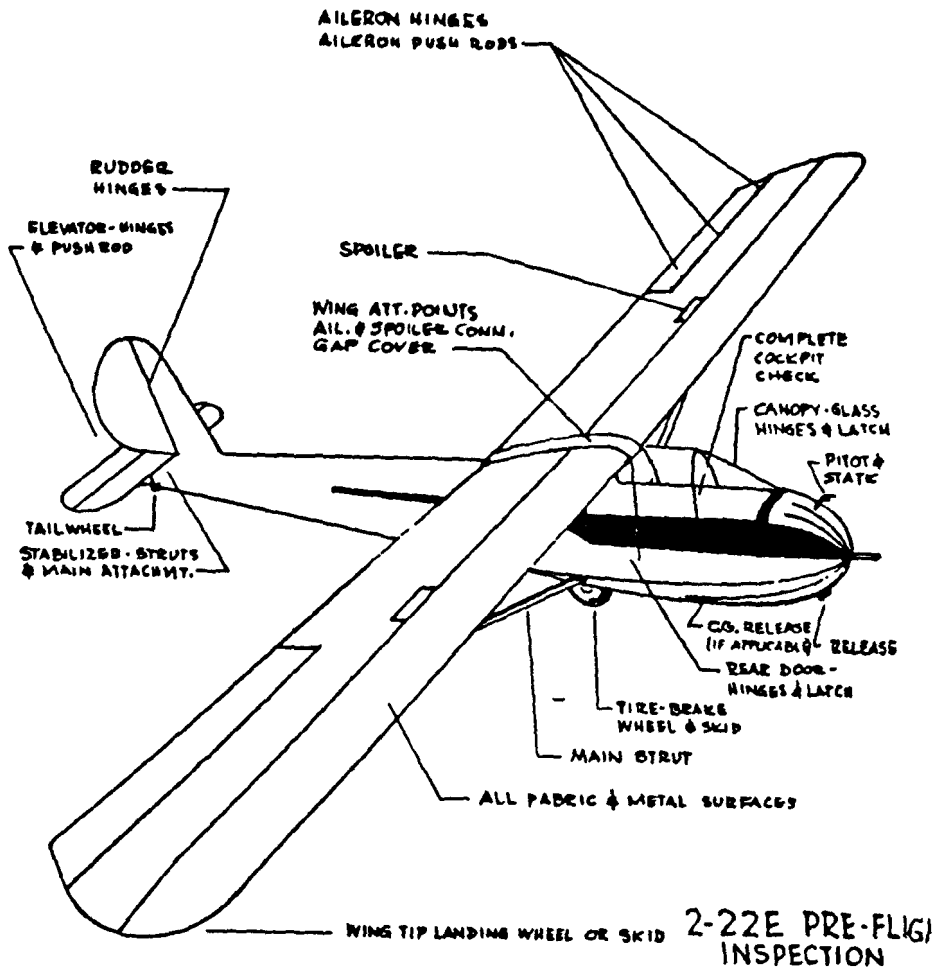
5. Trim Lever

Front Only - located in center of floor board between pilot's knees. It is a bungee type, two position control. Use forward for solo and back for dual. It should be forward when towing either solo or dual.

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.



PREFLIGHT

WING:

- Check all strut fittings.
- Check all spoiler hinges and connections.
- Check all fabric attachments to D-tube.
- Check all aileron hinges, attach points and pushrods.

TAIL ASSEMBLY:

- Check all hinge points.
- Check pushrod attachment to elevator horn.
- Check stabilizer struts and stabilizer attachment to fuselage.
- Check rudder cable connection to rudder horn.
- Check tail wheel assembly.
- Check fuselage.

FUSELAGE:

- Check release.
 - Check all controls for free movement including release.
 - Check instruments.
 - Check canopy attach points.
 - Check safety belts and shoulder harnesses.
 - Check rear door and window attach points and catches.
 - Check fabric.
 - Check tire, wheel and brake.
 - Check static and pitot tubes for water or other foreign objects.
4. Check Tow Rope.

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 2-22C or 2-22E.
3. Never hook rope or wire to empty sailplane.

Winch or auto tows may be executed in the usual manner with either the forward or CG release, although the latter results in a higher altitude. There is no tendency to oscillate with either release. Maximum speed on 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 feet).
2. Level out before releasing.

Aero Towing:

1. Trim should be forward.
2. You will notice that aileron control is fairly heavy at fast towing speeds, but reduce to a reasonable level at slower speeds.

FREE FLIGHT

Flying Speeds - Best gliding speed (L/D) 18-1 at 40 mph-2 place
" " " (L/D) 18-1 at 38 mph-1place
Min. sinking speed 40 mph 3.3 FPS 2 place
" " " 38 mph 3.1 FPS 1 place

Placard Speeds - Dive - 90 mph (Maximum speed Indicated)
Aero Tow - 90 mph
Spoilers extended - 90 mph
Auto & 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 fall off to either direction. Buffeting occurs before the stall 31 mph solo, 34 mph dual.

SPINS - Although the older model 2-22 will not spin, the 2-22C and 2-22E will depending on the weight of pilots and equipment, etc. Care should be taken to avoid stalls and spins at low altitude by using extra air speed.

USEFUL LOADS - The placard on the instrument panel is stamped showing three weight combinations - see example below:

- a. "Minimum weight fwd. pilot, solo". This weight is to be strictly observed in order to maintain the c.g. within the aft limit.
- b. "Maximum weight aft pilot/220 lbs. fwd." This figure is an arbitrary one as it assumes a relatively heavy (220#) forward pilot. The sum of the two weights (220 + 198 per the example below) would be the total useful load of a particular sailplane. However, any combination of pilot weights above those shown in c. below, up to that total will maintain the c.g. within limits yet not exceed the aircraft's specified gross weight.
- c. "Minimum weight aft pilot/100 lbs. fwd." This figure shows a load combination assuming a relatively light pilot (100#) in the forward seat and is given as a quick reference to assure that the aft c.g. limit is not exceeded.

EXAMPLE

Maximum weight aft pilot/220 lbs. fwd. - 198 lbs.
 Minimum weight aft pilot/100 lbs. fwd. - 102 lbs.
 Minimum weight fw. pilot solo - 118 lbs.

NOTE: Ballast must be added if minimum weights of pilots are less than placard.

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

<u>Example</u>	<u>SGU 2-22C or "E"</u>	
	<u>Solo</u>	<u>Dual</u>
Stalling speed - level flight	31 mph	32 mph
" " -30° bank	33.5 mph	34.5 mph
Buffeting	34-37 mph	35-38 mph
Spiralling Speed	38 mph	39 mph

Keep in mind that the steeper the spiral is, the greater the sink and stalling speed will be. Sometimes it is necessary to spiral 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 2-22C or "E" can be slipped both forward and while turning. 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. The airspeed should be kept between 45-50 mph for greatest rate of descent.

LANDING

Pattern - It is standard practice to fly a traffic pattern. Downwind and base legs and the approach. Extra speed is also used, depending upon 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 spoilers. Spoilers increase sink which in turn gives a steeper and more controllable 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 2-22C or "E" is 31 mph with spoilers closed and 34 mph with spoilers open. For dual flight, the speeds are 32 mph and 35 mph respectively.

It is unsafe, however, to make an approach with spoilers 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 either spoilers open or closed although it is preferable to land with them open. With spoilers on, 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 spoilers closed is executed by letting sailplane land itself at, or near, 40 mph. Be careful not to ease stick back after touching down. This will increase angle of attack and sailplane will become airborne again.

Taxing after touch down - Eventhough 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 needed.

Getting out of 2-22C or "E" - On the ground it is tail down when empty and nose down with pilot. When pilot gets out he should keep his weight on the side of the cockpit until he is in a position to lower tail gently.

FLIGHT PROCEDURES IN HIGH 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 speed at best L/D.

EXAMPLE

Speed at best L/D	40 mph
Wind Velocity	+ 15 mph
Desired Speed	55 mph

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

4. Land into the wind whenever possible. In crosswind landing crab into wind to maintain desired path overground and at last moment straighten ship to line of flight and touch down. Be careful while ship is rolling. Downwind landing in high winds - land with brake full on and maintain directional and lateral control as long as possible.

TIE DOWNS

The 2-22C or "E" 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.

WEIGHT & BALANCE, (for N2770Z Logbook entry):

Datum-Wing leading edge, AFT- +, FWD- -.
MAX CERTIFIED WT - 900 lbs

Measured EMPTY WT-560.5 lbs @ +28.7"
FWD PILOT: MAX-250 lbs; MIN-125 lbs (@ -23.0")
AFT PILOT @ +8"
USEFUL LOAD- 339.5 lbs

C.G. RANGE (for conservative Instruction-Data Sheet unavailable, Ctr. Calculated Fm. $\frac{1}{4}$ chord & extremes taken from Mfr's allowable MAX & MIN @ Fwd Pilot Station)

FWD - +11.50"
CTR - +15.125"
AFT - +19.25"

Measured When Levelled:

WHEEL -543 lbs @ +23.0"
TAIL - 17.5 lbs @ +205.5"

ERECTION & MAINTENANCE PROCEDURE

SGU 2-22C & 2-22E

A. Erection Procedure:

1. To remove aircraft from trailer:
Remove trailer from towing vehicle and block wheels.
2. Raise rear of trailer and block in position with saw-horse, 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, and raise block the front end.
8. Remove the rear tail wheel bracket to trailer jack attachment, bolt and support fuselage.
9. Remove front fuselage tie downs and carefully roll ship aft out of wheel well and off trailer into assembly position.
10. With fuselage in upright position, attach wing struts to fuselage with (2) AN7 (7/16") bolts and commercial safety pins.
11. 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 commercial safety pins in bolts.
12. Raise L.H. strut and attach to wing strut fitting with AN7 (7/16") bolt and safety with commercial safety pins.
13. Attach aileron push-rod to horn on fuselage using 3/16" bolt, nut and cotter or safety pin. Note: The trailing edge of aileron must line up with the trailing edges of wing. On the "E" Model, this connection is made with (2) AN393-11 Clevis Pins and (2) commercial safety pins

14. Pass spoiler cable thru opening in fuselage and attach to free end of spoiler cable in fuselage with (1) AN393-11 Clevis Pin and (1) commercial safety pin.
15. Repeat items 11. thru 14. for R.H. Wing.
16. Check items 11. thru 14. on each wing for proper installation and safetying.
17. Install wing gap cover. On the "C" Model, the gap cover is centered and hooked over the wing trailing edges then wrapped around the leading edge and hook engaged on fuselage crossbar. Tighten in place with thumb nut.

On the "E" Model, 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, with the quick fasteners.

18. It is not necessary to remove the elevator and stabilizer of this aircraft for normal trailing purposes. However, if they are removed, the following method should be followed for re-assembly.
19. Place assembled elevator and stabilizer, as removed from trailer, into position and secure with AN4 bolts, 4160 416L Washers and AN365 428 nuts thru stabilizer at and rear spar fittings and fuselage attach fittings and install safety or cotter pins.
20. Place stabilizer struts in position and secure with 3/16" bolts, nuts and cotter or safety pins.
21. Connect elevator push-rod to elevator horn with 1/4" bolt, nut and cotter or safety pin. Use caution not to overtighten nut and cause binding of the elevator control.
22. Perform line inspection to determine that:
 - a. The foregoing has been satisfactorily accomplished.
 - b. That all controls move freely in the correct direction with no binding or lost motion.
 - c. That all control components are properly safetied.

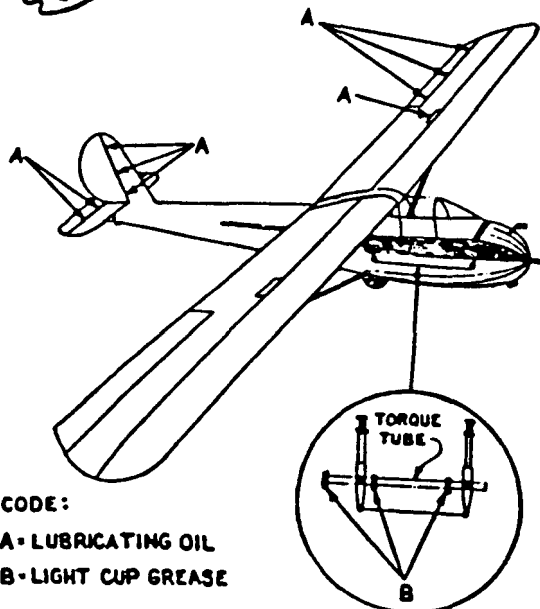
- d. That both spoilers open the same distance.
 - e. That ailerons are in neutral in conjunction with the stick position. NOTE: In view of the fact that the glider may have to be disassembled rather frequently in the field; the number of positive attachments are kept to the minimum. However, should the owner or operator be so inclined, all of the attachment fittings may be made with bolts nuts and cotter pins, replacing the clevis and safety pins specified.
23. The aircraft may be disassembled and placed on trailer by reversing the above procedure.
24. In disassembly procedure for 2-22C, L.H. rear window should be removed and stored in cockpit for trailer in. There is also minimum clearance over hinge portion of wing at the window of trailer. (L.H. Wing). The en-solite strips at the door jamb on the R.H. wing will also contact the trailer.

FORM F-107
10-4-60

LUBRICATION

TABLE
I

SGU 2-22



CODE:

A - LUBRICATING OIL
B - LIGHT CUP GREASE

GENERAL MAINTENANCE

General Maintenance

The sailplane can be serviced with a minimum of two lubricants: a good grade of lubricating oil and No. 2 cup grease.

1. Lubrication should be accomplished as follows: See Table I.

(a) Lubricating oil should be used on the following parts:

Aileron hinges

Elevator hinges

Rudder hinges

Spoiler hinges

(b) Cup grease should be used on the front and rear torque tube bearings.

(c) Lubricate at the following intervals:

(1) Oil hinges every 20 hours flying time or 6 months elapsed time, whichever is sooner.

(2) Grease torque tube bearings every 100 hours flying time.

(d) Rod end bearings - are the sealed type and require no lubrication under normal conditions.

(e) Control pulleys - are the sealed type and require no lubrication under normal conditions.

2. Leveling:

(a) To level fuselage laterally, prop up the wing tips and test for horizontal on fuselage members across seat, see Figure II.

(b) To level longitudinally, prop up the tail and test for horizontal on the top longeron of fuselage aft of wing, see Figure II.

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

FORM F-1
10-A-60

FIGURE
1

S.G.U. 2-22

SCALE

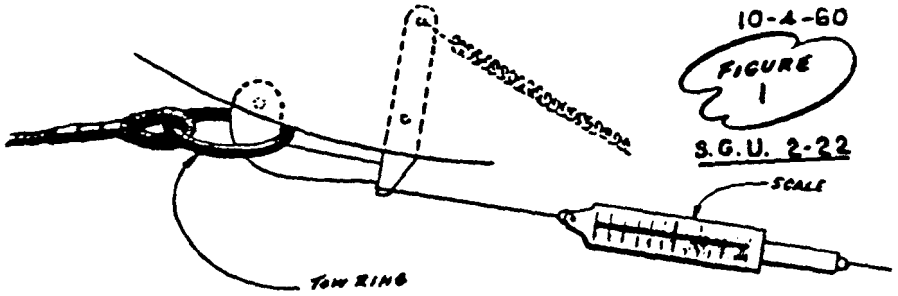
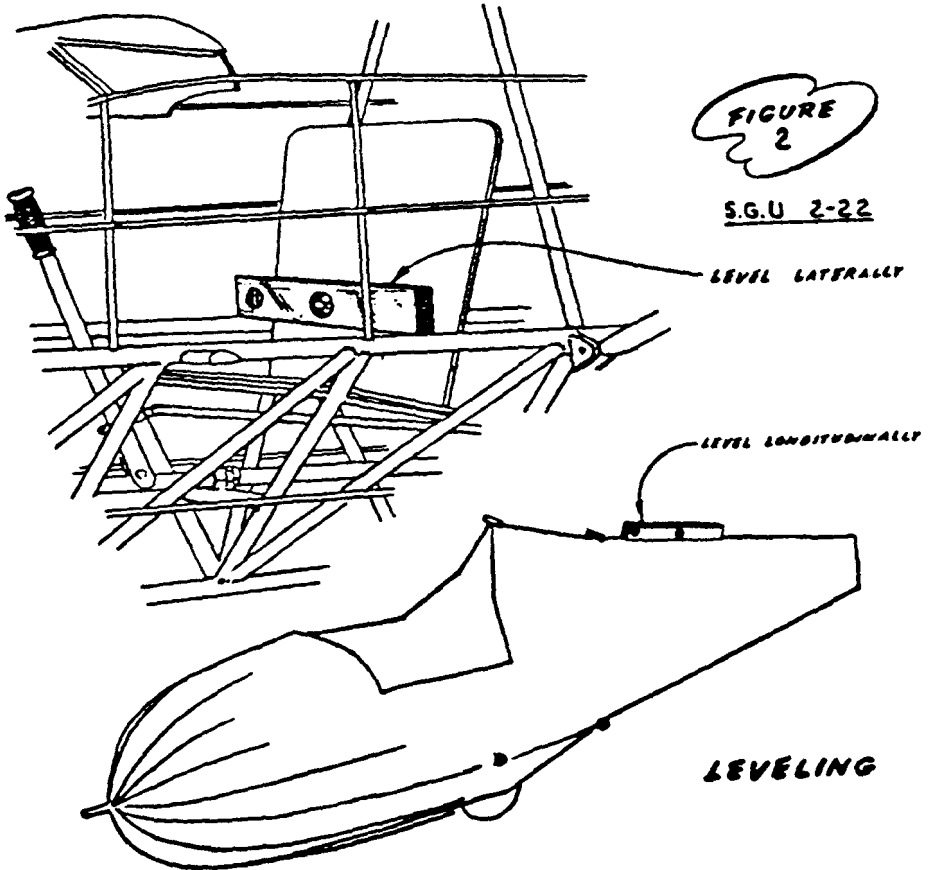


FIGURE
2

S.G.U. 2-22

LEVEL Laterally

LEVEL Longitudinally



rudder pedals. However, cables should be rigged with the turnbuckle threads flush with the barrel. Double safety turnbuckles in accordance with standard aircraft practices.

- (c) The spoiler cables have no initial tension. They should be rigged so that there is no slack or lost motion when control is started. Single safety turnbuckles in accordance with standard aircraft practices.
- (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 I.

Inspection (Preflight):

- 1. Inspect the following for condition, operation, security of attachment and 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) Spoilers and controls
 - (m) Main wheel and brake
 - (n) Tire (Maintain tire pressure at 15 lbs.)
 - (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 where there is excessive wear 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 by blowing through them. CAUTION: DO NOT BLOW INTO PITOT TUBE WITH INSTRUMENTS CONNECTED.

D. Inspection (Annual and/or 100 hr.):
(Inspection Form available on request)

1. Fuselage Group

- (a) Check control stick and torque tube assembly. Grease torque tube support bearings.
 - (1) Inspect internal surface of torque tube for corrosion, clean and apply Paraloketone, 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.
- (i) Check fuselage fabric and finish for cracks and deterioration (check tensile strength, if below 35 lbs fabric must be replaced.)
- (j) Check canopy and rear door for condition and attachment.
- (k) Check plexiglass for cracks or excessive crazing.
- (l) Check safety belts, shoulder harness, brackets and bolts.
- (m) Check springs for corrosion, cracks and wear at end

- 1) Check bungee control latch plate, if badly worn replace with steel plate.

anding Gear Group:

- a) Remove, wheel, inspect for cracks.
- b) Inspect wheel bearings for condition, repack.
- c) Check tire pressure (15 lbs.)
- 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.

ppennage 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 condition and attachment.
- g) Inspect rudder and hinges for condition and security of attachment.
- h) Check fabric and finish for cracks and deterioration. (Check tensile strength, if below 35 lbs. fabric must be replaced.) Intermediate grade fabric (TSO C-14) is used.

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 spoiler cables 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 corrosion, loose rivets and other signs of structural failure or damage.
- (f) Inspect ailerons and hinges for condition, operation and attachment.
- (g) Inspect spoiler and hinges for condition, operation and attachment.
- (h) Inspect bell cranks for condition, evidence of damage and attachment.
- (i) Inspect wing tip skids for excessive damage and attachment.
- (j) Inspect pushrod and cable fairleads for wear or breakage and attachment.
- (k) Check fabric and finish for cracks and deterioration. (Check tensile strength, if below 35 lbs. fabric must be replaced.) Use intermediate fabric (TSO C-14)

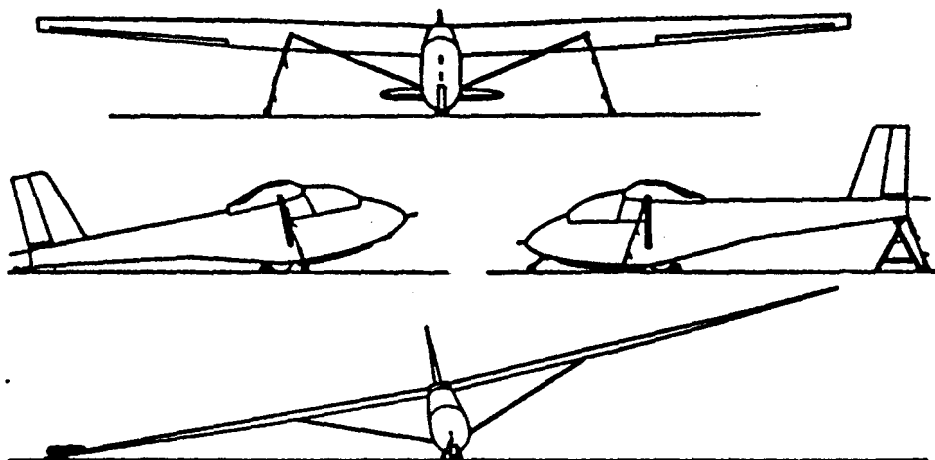
5. Tow Hook:

- (a) Inspect hook for wear, cracks, roughness and attachment.
- (b) Check mechanism for freedom of operation.
- (c) Check release mechanism by applying a force of 6-12 lbs. as outlined in paragraph B 3(d).
- (d) Check ring clearance between hook and fuselage when hook is closed, with a ring made from 5/16" dia. stock. Proper O.D. for ring is 2.25 inches.

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 placards, nameplates, decals for legibility and security of attachment.
- (d) Inspect air vent for operation and security of attachment.
- (e) Inspect seats for damage and security of attachment.

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. 600#), facing into the wind will be subjected to lift forces as shown:

<u>WIND</u>	<u>LIFT</u>	<u>NET LIFT</u>	<u>WIND</u>	<u>LIFT</u>	<u>NET LIFT</u>
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	1,600#	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. 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 - 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.

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

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