Pre Inspections

1. Airframe
    a. Stick:
        i. Clear
        ii. no FOD
        iii. tight
    b. Rudder:
        i. No FOD
        ii. Shoes don't catch on anything
        iii. floorboards in place
    c. Brakes (parking and toe)
        i. Firm – not spongy
        ii. Fluid stays up after pumping
        iii. No bleed down
        iv. No Lockup
    d. Gear – ready
    e. Control Surfaces
        i. Proper direction
        ii. Proper deflection to stops (remember the rudder)
        iii. Check hinge play
        iv. Cables proper tension (what happens if the trim cable breaks?)
        v. Check safety wire, pins, torque
    f. Instrument Panel
        i. Everything Secure
    g. Carbon Monoxide
        i. Detector in place
    h. Engine Controls
        i. Friction locks operate as expected
        ii. ¼ inch of cushion at full travel
        iii. Secured at least every 24 inches of run
        iv. Large area washers at ball sockets
    i. Static System
        i. Airspeed Leak check
            1. Long surgical tubing on pitot
            2. VERY slowly roll up tubing
            3. Pinch closed at cruise speed
            4. Should remain steady for 1 minute
        ii. Static leak check
            1. Tape over one static port
            2. Roll tubing and pinch off
            3. Attach 2' of surgical tubing to other static port
            4. Slowly unroll
            5. Altimeter up
            6. VSI climb
            7. Airspeed might show a little
            8. Altimeter at 2000' – Stop & pinch line for a minute
            9. Altimeter will go down slightly at first then stop
            10. VSI level
        iii. Go to Mankato for certification check.

j. Fuel System
    i. Flush with 100LL several times
    ii. Install new fuel filter every hour for first 5 hours
    iii. Check fuel vents open
    iv. Level aircraft and calibrate gauges
    v. Pressurize with fuel pump
    vi. Check for leaks
    vii. From Glasair glider in Glasair Forum -- I would consider a cooling shroud a necessity for the filter and highly desirable for the fuel pump - also fire sleeve on the fuel lines. Do a fuel flow test. Did you follow the string here about rubber flap in improperly installed fuel hose ends? Take 'em off and look through them against a strong light. Make sure your fuel tanks aren't pulling a vacuum - properly vented - gas caps sealed so slip stream doesn't pull vacuum in tanks. Check the vent exits to be certain they provide slight pressure to tank and not suction in slip stream. Check finger screen in tank for clog. Check proper operation of fuel valve. I've heard of filter bowl drain pulling in air if any restriction in fuel lines. Also fuel line fittings that may let air in when in suction but won't leak just sitting there. etc etc. Check engine fuel pump for proper operation. Intermittent problems are the toughest to trouble shoot.

k. Avionics
    i. Check transmit/receive on all freqs
    ii. Check antenna security
    iii. Test ELT
    iv. Check engine grounding

l. Cowling and Inspection Panels
    i. Secure
    ii. Spinner

2. Paperwork
    a. On Board
        i. Wgt & Balance
        ii. Airworthiness
        iii. Registration
        iv. Operating Limitations
        v. Placards
    b. Checklists
    c. POH
    d. Aircraft Logbooks (3)
    e. Powerplant:
    f. Engrave dipstick
    g. Check oil
    h. Engine runs
        i. Fire Extinguisher
        ii. Tied to Tree
        iii. Chocked
        iv. Ear/Eye protection
        v. X-check with external oil pressure and temp gauges
        vi. Cool downs – check for: (at least 1 hour)
            1. Check fuel & oil leaks
            2. Loose connections

3. Hot spots on cylinders (burnt paint)
4. Change oil & filter after 2 hours and check for metal
5. Change fuel filter and check for FOD
6. Check fuel sumps

- i. Engine runs 2
    - i. Mixture and idle speed check
        1. Warm up engine
        2. Set idle RPM
        3. Slowly pull mixture to idle cut-off
        4. Just before engine quitting it should increase RPM by about 50. If not the idle mixture is set too lean. If greater than 50 RPM, it is too rich.
        5. Consider increasing idle RPM 100 over normal to prevent quitting during tests.
    - ii. Mags
        1. ~50 RPM drop each
        2. Even CHT drops
- j. Propeller
    - i. Wax it
    - ii. Check bolt torque every hour for first 10 hours
    - iii. Check bolt torque every 5 hours after that.
    - iv. Check track after torquing (page 19 of Glasair flight test manual)
    - v. Initial Run-up(From Owner's Manual 115N)
        1. Cycle prop – full range
        2. Repeat > 3 times
        3. Verify proper operation
    - vi. Static RPM Check
        1. Use calibrated tach
        2. Back the governor Maximum RPM Stop OUT one turn
        3. Start engine
        4. Advance prop control to MAX RPM then retard 1 inch
        5. SLOWLY advance throttle to max
        6. SLOWLY advance prop to stabilized RPM
            - i. If stabilizes at 2700 RPM – great
            - ii. If not – Stop Engine & adjust low pitch stop
        7. Stop Engine
        8. Return governor to Max RPM stop to original place

3. Fuel Flow Checks (from ASA testing home builts and Glasair flight test manual)
    - a. Chocked
    - b. Block up nose gear -- Point nose 5° higher than anticipated highest climb angle plus 15° for AOA at stall. (17-20°)
    - c. Minimum fuel in tanks
        - i. Put in just enough fuel that it runs out at engine
        - ii. When it quits running, that's the "unusable fuel".
        - iii. Do this for both tanks.
    - d. Cap the line with thumb
    - e. Add ~1.5 gal fuel
    - f. Put bucket under line
    - g. For header tank:
        - i. Start timer and release thumb until 1 gal in bucket

h. For wing tank
    i. Turn on fuel pump
    ii. Start timer and release thumb until 1 gal in bucket
i. Should pump 0.34 gal/min (ref page 17 of Glasair flight test manual)
    i. .55 x 180hp = 99 lbs/hr
    ii. Add 1.25 fudge factor for 123.75 lbs/hr
    iii. 20.625 gal/hr or .34375 gal/min

4. Compression Check – before taxi tests

Taxi Checks

1. Checks
    a. Tracks straight
    b. Adequate directional control at 20% below takeoff speed
    c. Check engine cooling
    d. Conditions and checks braking
    e. Predict flight trim and handling characteristics
    f. Pilot gets feel of controls
2. Slow taxi
    a. Low fuel load
    b. Condition the brake pads
    c. Practice taxiing
    d. Swing compass
    e. Calibrate G3X
    f. Do instrument checks of ADI, HSI, turn needle, ball
    g. Monitor engine instruments
3. High Speed Taxi
    a. Up to 40 knots
    b. 5 knot faster on each run
    c. Test aileron
    d. Test pitch
    e. Test with different flap settings
    f. thoroughly postflight the aircraft
        i. Examine fuel filters

Emergency Planning

1. Chair/dry Fly POH, Section 3
2. Practice Emergency Egress
3. Have available or in-use:
    a. Battery Power Cord Cutter
    b. Fire Extinguisher
    c. Number to Fire Station
    d. Portable Radio
    e. 2 ground people
    f. Parachute

[AC 23-8B - Flight Test Guide]

1. Part 1 –Flight Test Guide for Certification of Part 23 Airplanes
2. Part 2 – Power Available (Appendix 1)
3. Part 3 – Manuals, Markings & Placards Checklist (Blank) (Appendix 4)
4. Part 4 – Manuals, Markings & Placards Checklist (table) (Appendix 4)
5. Part 5 – Guide for preparing POH Supplements. (Appendix 5)

6. Part 6 – Charts (Appendix 7)
    a. Stall Speed as a function of bank angle ∂ -- $Vstall = Vstall\ at\ 0/\sqrt{\cos \partial}$
7. Part 7 – Conversion charts (Appendix 8)
8. Part 8 – airspeed calibration – GPS Method page 12 (Appendix 9)
9. Part 9 – Trapped Static Data Reduction table?? (Appendix 9)
10. Part 10 – CAS measurements (Appendix 9)
11. Part 11 – Calibrating GS with a DME (N/A) (Appendix 9)
12. Part 12 – CAS vs IAS plotting (Appendix 9)
13. Part 13 – Climb performance after STC (Appendix 10)

Airspeed Calibration

3. GPS METHOD. The Global Positioning System (GPS) method consists of using a GPS unit to determine ground speed, which is then used to calculate true airspeed. Any commercial GPS unit can be used that produces consistent results. Once true airspeed is calculated, the data reduction is nearly identical to the speed course method described previously. One difference is that the scale altitude correction factor (ΔV_c the difference between CAS and EAS as shown in figure A7-5) may be significant at higher altitudes and speeds that may be flown with this method. Specifically, you will solve the following equation for (ΔV_{pec}):

$$V_i + \Delta V_{ic} + \Delta V_{pec} + \Delta V_c = V_{true} * \sigma$$

And then, assuming that all of the pitot-static error is in the static port, you may calculate the altitude position, error, ΔH_{pec}, as described in the Trailing Bomb/Cone Method.

a. Test Conditions.

(1) *Air Quality*. The air should be as smooth as possible with a minimum of turbulence. The wind velocity and direction must be constant for this method to give correct results.

(2) *Weight and C.G*. Same as the speed course method.

(3) *Altitude*. The altitude is not critical, but it should be chosen where the air is smooth and the winds are constant.

(4) *Speed Range.* Any speed at which the aircraft can be stabilized in level flight (see Figure A9-2).

(5) *Runs* . Three runs per airspeed are required to calculate one true airspeed. The three runs must be done at the same indicated speed and altitude on different headings. The headings should be 60 to 120 degrees apart. ______

(6) Configuration. Same as the speed course method.

b. Test Procedures.

(1) Stabilize the airplane in steady level flight at the desired test speed configuration. Record the indicated airspeed, pressure altitude (29.92 set), outside air temperature and configuration of the aircraft.

(a) Record both ground track and ground speed from the GPS unit once the values are stable (this can take up to 10 seconds after stabilizing).

(b) Turn 60 to 120 degrees either direction and record the new ground track and speed once restabilized at the same airspeed and altitude on the new heading. Minor variations in altitude (up to 100 feet) are much preferred to any variation in airspeed from the initial value. A one knot change in indicated airspeed will cause at least a one knot change in true airspeed, but 100 feet of altitude only causes on the order of 1/2 of 1 percent change in the density ratio, σ.

(c) Turn another 60 to 120 degrees in the same direction and record a third set of ground track and speeds.

(2) Once you have three sets of ground track and speed for a given indicated airspeed and configuration, repeat steps (1)(a) through (1)(c) above at sufficient increments, to provide an adequate calibration curve for each of the configurations.

c. Data Reduction.

The best way to calculate true airspeed from the three sets of ground tracks and speeds is with a personal computer spreadsheet. The following solution was developed assuming that the three legs flown had the same true airspeed (indicated airspeed, OAT, and pressure altitude were identical) and that the wind did not change during the three legs. The table shows the spreadsheet equations for one popular spreadsheet program that will solve the problem. Note that wind speed and direction are intermediate outputs. If a series of points are done at nearly the same time, altitude and geographic location, then the consistency of the calculated wind speed and direction will be an indicator of the validity and accuracy of the calculated true airspeeds.

	A	B	C
1	Ground Speed 1	184	184
2	Track 1	265	265
3	Ground Speed 2	178	178
4	Track 2	178	178
5	Ground Speed 3	185	185
6	Track 3	82	82
7	X1	=B1*SIN(PI()*(360-B2)/180)	183.3
8	Y1	=B1*COS(PI()*(360-B2)/180)	-16.0
9	X2	=B3*SIN(PI()*(360-B4)/180)	-6.2
10	Y2	=B3*COS(PI()*360-B4)/180)	-177.9
11	X3	=B5*SIN(PI()*(360-B6)/180)	-183.2
12	Y3	=B5*COS(PI()*(360-B6)/180)	25.7
13	M1	=-1*(B9-B7)/(B10-B8)	-1.17
14	B1	=(B8+B10)/2-B13*(B7+B9)/2	6.71
15	M2	=-1*(B11-B7)/(B12-B8)	8.77
16	B2	=(B8+B12)/2-B15*(B7+B11)/2	4.42
17	Wx	=(B14-B16)/(B15-B13)	0.2
18	Wy	=B13*B17+B14	6.4
19	Wind Speed	=SQRT(B17^2+B18^2)	6.4
20	Wind Direction	=MOD(540-(180/PI()*ATAN2(B18, B17)),360)	177.9
21	True Airspeed	=SQRT((B7-B17)^2+(B8-B18)^2)	184.4