

Skybolt N 77VW

OWNERS MANUAL

1. General Description
2. Specifications
3. Aircraft Systems
 - 3.1 Fuel System
 - 3.2 Aircraft Hydraulic system
 - 3.3 Inverted Fuel and Oil System
 - 3.4 Electrical System
4. Instrumentation and Avionics
 - 4.1 Engine Management
 - 4.2 Flight Management
 - 4.3 Avionics
5. Operating Instructions
 - 5.1 Preflight
 - 5.2 Engine Start
 - 5.3 Engine Run Up & Controls Check
 - 5.4 Take Off
 - 5.5 Stalls
 - 5.6 Cruising
 - 5.7 Aerobatic maneuvers
 - 5.8 Approach and Landing
 - 5.9 Engine Shutdown
6. Emergency Procedures
 - 6.1 Engine Fire during start
 - 6.2 Power Loss during Takeoff

Skybolt 77VW Owners Manual

1. General Description:

The "Skybolt" was designed by LaMar Steen of Denver Colorado as a fully aerobatic two place Bi Plane with ease of construction. The prototype was completed in one year by minority students at Manual Arts High School in Denver Colorado where Mr. Steen was the instructor. Recommended power plants range from 125Hp for sport flying to the 260Hp Lycoming for serious aerobatic competition. No destructive test were performed on the prototype however conservative calculations by a professional stress engineer indicate a Plus 9 and Minus 8 G load factor at a gross weight of 1650 lbs. The airframe exceeds the aerobatic minimums of plus 6 and minus 3 G's at a gross weight of 2000lbs. The prototype has been flown to over 200 MPH with plus 8 and minus 5 G applied in a gradual fashion.

2. Specifications:

| | |
|-----------------|---------------------|
| Wing Span Upper | 24 FT |
| Wing Span Lower | 23 FT |
| Length | 19 FT |
| Height | 7 FT |
| Empty Weight | 1108 Lbs 1123 w/oil |
| Gross Weight | 1800 Lbs |
| Useful Load | 618 Lbs |

Rigging Data:

| | |
|--------------------------|---------------------------------|
| Wing Incidence | Upper +1.5 ° Lower +1.5 ° |
| Horiz Stab Incidence | +1.0° to 2.5° Ground Adjustable |
| Dihedral, Lower +1.5° | Upper 0.0° |
| Vertical Stab Incidence | 0.0° to centerline |
| Engine | 0.0° |
| Thrust Line | 6" below top Longeron |

3. Systems

3.1 Fuel System:

The fuel system consists of a 28 gal main tank which is located aft of the firewall and forward of the front cockpit. The fuel gauges consists of one sight tube mounted on the rear of the tank(Markings consist of remaining gallons) and a electronic sender mounted in the tank and it's indicating

gauge is mounted in the instrument panel in the rear cockpit with markings calibrated for ¼- ½- ¾ of tank capacity. Fuel flows from the bottom of the main tank via a flop tube for aerobatic flight to a gascolator , then to an electric fuel pump and engine driven fuel pump then to the fuel injection system. The electric pump should be turned on during take off, landings and emergency operations.

3.2 Hydraulic Brake System:

Toe brakes are installed in both the front and rear cockpit. They may be used to assist in ground handling and keeping the airplane straight on the landing rollout. Since the Skybolt has a significant amount of static weight on the tail wheel, a considerable amount of breaking force may be applied without fear of nosing over. Each brake is self contained and is fed through a reservoir on right/left rear toe brake/rudder pedal. The front brakes are activated by use of a slave rod connected from the rear pedals to the front pedals. Bleeding is accomplished from the wheel cylinder with excess air being expelled from each reservoir. The cap must be removed from the reservoir when bleeding. A very small air vent in the cap will allow contraction and expansion of brake fluid. Flight test have shown no seepage during inverted flight.

3.3 Inverted Fuel and Oil System:

Aerobatic and inverted flying is accomplished in the fuel system through fuel injection. Oil flow is provided during aerobatic maneuvers by a Christian Inverted Oil System which allows unlimited aerobatic maneuvers while maintaining full oil flow. A small (usually 1 PT or Less) amount of oil is lost overboard after each period of aerobatics and/or inverted flight via the oil breather tube which exits the aircraft just below the tail wheel spring. A dribble valve is provided in the induction system to prevent fuel accumulation in the intake which minimizes the possibility of an induction fire after shutdown as the injector lines percolate fuel.

3.4 The Electrical System:

Consists of a 25 ampere sealed lead acid battery, adjustable regulator, 12 volt 60 ampere alternator and a master solenoid and master switch. The system uses a common hot bus and a common ground buss. These busses are located on the electrical panel on right side of rear cockpit along with master switch, slave switches and circuit breakers. Master and starter solenoids are located on the forward (engine) left side of the firewall.

4. Instrumentation and Avionics

The aircraft is intended for day VFR operations. A comprehensive set of VFR instrumentation has been provided with basic flight instruments in the front cockpit and complete instrumentation in the rear (solo) cockpit.

4.1 Engine Management

- Manifold pressure gauge
- Tachometer
- Oil pressure w/ oil temperature gauge
- Fuel Pressure gauge
- Electric Fuel quantity gauge
- Cylinder Head Temperature gauge
- Exhaust Temperature Gauge

4.2 Flight Management

- Air speed indicator
- Altimeter
- G-meter
- Ampere meter
- Compass
- Electric Turn Coordinator
- Dynon EFIS with:
 - a. Artificial Horizon
 - b. Heading Indicator
 - c. Altimeter
 - d. Air Speed Indicator
 - e. Turn Rate indicator
 - f. Slip/Skid Ball
 - g. Clock/Timer
 - h. G-meter
 - i. Voltmeter with alert
 - j. Digital Check List.

4.3 Avionics

- Kx 125 Nav Com
- P.S. Engineering Intercom (two place)
- RT-76 Transponder with King AK-350 encoder

5. Operating Instructions:

5.1 PREFLIGHT: The aircraft should be given a through visual inspection prior to each flight.

Particular attention should be given to the following:

- (a) Master and magneto switches “OFF”
- (b) Check luggage area for loose or heavy objects.
- (c) Check inside rear fuselage for loose objects & foreign objects.
- (d) Check for external fabric damage
- (e) Check all controls for correct & freedom of movement
- (f) Check security of Trim/servo Tabs
- (g) Check fuel supply for quantity and tight cap
- (h) Check all fuel vents for obstructions
- (i) Check tires for damage and proper inflation
- (j) Check Oil Level & top off as necessary
- (k) Sump fuel tank and gascolator check for water and other foreign matter
- (l) Check cowling for security and missing screws
- (m) Check Air intake for obstructions
- (n) Check propeller for nicks & defects
- (o) Check spinner for security and cracks
- (p) Check tail wheel for condition, deformed springs and security
- (q) Check trim for neutral position

5.2 Engine Starting and warm up: as follows:

Cold starts are easily accomplished by opening the throttle approximately $\frac{1}{4}$ inches and placing the mixture control to full rich. Turn master switch on and activate the fuel boost pump until pressure is noted on the fuel pressure gauge. (Boost pump off) Return mixture control to idle cut off (full rear). Engage combination Magneto/starter switch. Engine should start immediately, as the engine catches, smoothly move the fuel mixture control to full rich, throttle to idle.

Hot Starts are similar with one important difference. Throttle should be advanced to approximately $\frac{1}{2}$ power, fuel boost pump turned on for 2 seconds to force cool fuel through the injector system with the mixture control full rich. Return fuel mixture to idle cut off (full rear) Throttle to $\frac{1}{4}$ power and engage magneto/starter switch. Engine should start after a few revolutions once the flooded engine is cleared. Immediately move mixture control to full rich (full forward) and throttle to idle. Hot starts require deliberate flooding to avoid false starts caused by vapor lock from a hot engine boiling the fuel in the injector lines. Be aware that any back fire could cause a fire and should be handled as noted in section “emergency procedures”.

5.3 Engine Run up & controls check.

Position aircraft so as to avoid propwash damage. Smoothly apply power to indicate 1800 RPM Check for 25 to 75 rpm drop on both right and left magnetos, return magneto switch to “both”

With engine operating at 1800 RPM smoothly cycle the propeller for proper operation using the prop control lever (blue). Several hundred RPM drop should be noted as the control is moved. Return control to full forward position.

Check gauges for normal indications of oil pressure, oil temperature, cylinder head temperature, exhaust gas temperature, electrical system and fuel quantity.

Check controls for correct and free operation

5.4 Take off

Set elevator trim control for take off.

When cleared, taxi into position and move slightly forward to lock tail wheel and establish direction. Boost pump ON. Smoothly advance throttle while maintaining heading with rudder. Slight forward stick will raise tail slightly (6” or less) to normal take off attitude. Aircraft will fly off the runway by itself and climb attitude should be established. Climb speed between 90 and 115 MPH depending upon desired angle of climb.

The boost pump should remain ON during full power portion of climb. The aircraft climbs out comfortably at 90 MPH indicated. Since the climb angle is so great at this speed, for safety reasons it is recommended that speed be increased above 100 MPH as the nose will be lower and visibility increased. Gentle turns back and forth during climb are recommended to better alert for traffic. Mixture may be leaned slightly during climb out being careful to monitor cylinder head temperature.

5.5 Stalls

The aircraft has gentle stall characteristics in both power on and power off conditions. Departure stalls are also gentle with no tendency to drop a wing. The gentle stall characteristics of the Skybolt are due to the unique wing design. The thicker top wing completely stalls so the aircraft can mush ahead under full control as the lower wing has not completely stalled. Power off stall speed is approximately 70 MPH indicated, however landings are accomplished above this figure to allow touchdown in a full 3 point attitude.

5.6 Cruising

Optimum cruise configuration is a function of aircraft loading and other factors such as power settings, altitude, air temperature and density. High cruise settings of 2350 to 2400 RPM and 23 to 23.5 inches manifold pressure should result in speeds of about 135MPH at approximately 11

gallons per hour fuel burn. Low cruise is recommended at 2500 RPM and 22 inches manifold pressure, resulting in speed of approximately 125MPH and 9 gallons per hour fuel burn.

5.7 Aerobatic Maneuvers

This aircraft has demonstrated all advanced category aerobatic maneuvers with no undesirable flight characteristics. Loads greater than 6 G positive and 3 g negative are not recommended or necessary to perform any maneuver. Smoothness of flight to avoid abusing the airframe is strongly recommended. Full aerobatic power settings raises fuel consumption to greater than 15 gallons per hour, so fuel quantity should be carefully planned. Aerobatics are what the Skybolt is all about and the following chart will provide guidance for maneuver entry speeds.

| | POSITIVE | “G” | | NEGATIVE | “G” | |
|-----------------|-----------------|---------------|--------------|-----------------|-------------|------------|
| Maneuver | Max V | Best V | MIN V | Max | Best | Min |
| Slow Roll | 160 | 140 | 120 | - | - | - |
| Barrel Roll | 160 | 140 | 130 | 160 | 140 | 130 |
| Snap Roll | 130 | 120 | 100 | 130 | 120 | 100 |
| Immelman | 200 | 160 | 155 | - | 160 | 160 |
| Hammerhead | 200 | 150 | 120 | - | 150 | 130 |
| Knife Edge | 160 | 140 | 110 | - | - | - |
| Loop | 200 | 160 | 130 | - | 160 | 140 |
| Vertical Roll | 200 | 180 | 180 | - | - | - |
| Spin | Stall | - | - | - | - | - |

VNE 200 with flutter testing to 220 MPH
 Maneuvering 130 Mph

5.8 Approach and Landing

Approaches should be made at a pattern altitude of 800 to 1000 ft. AGL. The pattern should be planned so the field may be reached from any point should sudden power loss occur. Maintaining a downwind leg such that the runway is about 45°s under the wing. Power should be reduced to approx. 2200 RPM with prop control full forward on downwind. Check fuel/boost pump on. Reduce power to 1500 RPM as the end of the runway is passed and start a gradual circular base when the runway is 45°s behind the wing. Base and final should be at 90 to 100 mph with 80 to 85 across the fence. The ideal pattern will be circular with the runway in sight until just before touchdown, similar to a carrier approach. Slips as required should be used to maintain runway visibility. Use peripheral vision and establish proper touchdown attitude (three point centered and straight with the runway). The aircraft should touch down slightly tail wheel first. Hold neutral stick until aircraft slows then gradually pull stick full back (up elevator).

Extreme slips are permissible if required or desired. Touchdown is accomplished above true stall so it is important not to jerk the control stick back at the moment of touchdown.

Crosswind landings are easily accomplished using normal wing low technique with a strong crosswind component easily mastered. The rudder has great authority and is used to maintain heading during landing and rollout. Brakes are used as necessary. A technique used on strange or narrow runways is to make a normal touchdown as described above and then use forward stick to raise the tail to level attitude. This requires longer rollout but provides excellent visibility.

5.9 Engine Shutdown:

After landing, allow cylinder head temperature to cool and stabilize, shutdown should be accomplished by smoothly leaning mixture to idle/cutoff. Verify that master and magneto switches are off. It is recommended to always fill the main fuel tank to minimize the possibility of moisture condensation in the fuel tank.

6. Emergency Procedures:

6.1 Engine Fire during Start: Should an induction system fire start from over priming, continue cranking the engine with the mixture control in the idle/cutoff position until engine starts which will pull flames into induction system and extinguish the fire.

6.2 Power loss during takeoff: If sudden complete power loss occurs after leaving the ground, immediately lower nose and establish glide straight ahead. If altitude permits, check fuel and verify that electric pump is on and proper inlet pressure exists. Should a power off landing be required, turn off master switch prior to touchdown.