N145BB Marquart Charger
Operating Handbook

N145BB

May 2022

TABLE OF CONTENTS

SECTION **PAGE**

Description of Systems and Structures

DESCRIPTIONS AND INTRODUCTION

The BU-180 is a high-performance, amateur built Biplane aircraft. Its bi-winged design results in superb performance and quick handling with an aggressive rate of climb with the 180 HP Lycoming engine. Pitch control is provided by elevators mounted on the horizontal stabilizer. Roll capability is provided by ailerons on the lower outboard wing panels. Yaw control is provided by a rudder mounted on the vertical stabilizer, and is actuated by conventional rudder pedals. The pitch and roll capability is provided by control sticks in a conventional configuration.

The tail wheel steering is provided by differential braking and steering cables attached to the rudder controls providing positive steering at all times while on the ground.

The structure of the BU-180 is a 4130 welded chrome moly steel fuselage frame with Dacron and dope fabric finish. The wing panels are wood spar and ribs using conventional Dacron and dope Ceconite covering.

The engine that powers the BU-180 is a Lycoming O-360-A1A. The engine conforms to the O-360-A1A Type Certificate in its current configuration.

LANDING GEAR

The main landing gear is steel tubular construction taken from a late model Cessna.

BAGGAGE COMPARTMENT

A baggage compartment is provided aft of the rear seat with an access panel on the port side of the aircraft. The baggage limit is 80 pounds. Depending on the pilot, passenger, and fuel to be carried, up to 25# of baggage may be required to balance the CG with a 200# pilot.

FLIGHT CONTROLS

Pitch and roll control is actuated either control stick located between the pilot or passengers legs. The rudder pedals are conventional with toe brakes actuating master cylinders mounted for the rear seat, but with linkage to the front seat so the brakes function from either seat. The ailerons are actuated by push/pull rods. The rudder actuated by cables. The elevator is configured with a push/pull rod system

Trim is provided by a spring tension adjustment set on the left side of the rear cockpit.

ENGINE CONTROLS

The throttle quadrant is located on the left side of both cockpits. The mixture control is located in the throttle quadrant. The carburetor heat control is mounted to the instrument panel in the rear cockpit. The fuel selector (On/Off) is mounted low on the left side of the rear cockpit.

BRAKES

The braking system consists of hydraulic Cleveland 6:00x6 disk brakes on each main tire, actuated by individual toe master cylinders with linkage to be actuated from either cockpit.

FUEL SYSTEM

The aircraft has a 20 gallon header tank. There is no auxiliary tank, although a small auxiliary tank may be added to the upper center section in the future. The fuel gauge is a Cub type cork float and stick in the top of the header tank.

The 20 gallon header fuel tank is located just aft of the firewall above the front cockcpit occupant's legs. The unusable fuel quantity is less than 1/2 gallon. The engine is fed via an engine driven fuel pump and can be boosted with an electric auxiliary pump. The fuel shutoff valve is located on the left side of the firewall in front of the fuel tank with a torque tube back to the rear cockpit located low on the left side of the cockpit.

The fuel filler cap is located on the top of the boot cowl.

OPERATING PROCEDURES

BEFORE STARTING

Before starting, be sure that the engine is properly filled with oil and there is sufficient fuel plus reserve for the intended flight. Ensure fuel shutoff valve is turned on and no fuel is leaking from the engine compartment. Close all access panels and ensure the plane is configured for flight before climbing into the cockpit.

STARTING

At winter time temps, the engine may require several shots of prime. Mixture control Rich. Select master switch On. Turn magnetos to Left only. Push starter button on the right side console. Once the engine starts, Switch the magnetos to both, turn on the alternator and desired electrical devices.

TAKEOFF

Takeoff roll should be started with the control stick slightly aft to keep the tailwheel on the ground to improve tailwheel steering. The plane should be allowed to accelerate to 40 mph IAS at which time rudder authority is sufficient to overcome most crosswind conditions. The tail is normally allowed to lift to improve forward visibility down the runway as the plane continues to accelerate to 60 mph IAS. At 65 mph IAS, the tail may be slightly lowered allowing the plane to fly lift off the runway. It is recommended to use a shallow climb while the plane accelerates to 90 mph IAS or higher to facilitate cylinder head cooling.

CLIMB

Best rate-of-climb speed is roughly 72 mph IAS. The best angle-of climb is 78 mph at S.L. Recommended normal climb speed is >90 mph for proper cooling.

CRUISE

Recommended maximum normal cruise RPM is 2700 rpm on the O-360-A1A Lycoming. Check all temps and pressures in the green.

GENERAL FLYING QUALITIES

The Marquart Charger is designed to be used for “Gentleman level Aerobatics” with a g-load rating of +6 and -4 Gs at a gross weight of 1650#. Full fuel and a 200# pilot places the plane at 1500# and in a proper CG range, so single pilot Aerobatics are quite possible. With a passenger, g-loading should be limited.

The Marquart MA-4 Charger is a well mannered plane in the air and has excellent ground handling and landing characteristics with the Cessna Spring gear legs.

LANDING

Slow the aircraft to 100 mph IAS before turning base. An approach speed of 80 mph should be used under normal conditions. The target airspeed should be obtained on final. Slips may also be used in conjunction to lose altitude. A speed of 65 mph over the numbers is recommended. The aircraft should be flared and held off until it settles onto the runway. Brakes may then be applied normally.

The MA-4 will wheel land or 3 point land equally well depending on circumstances and pilot skill.

A short field landing should be made with an approach speed of 65 mph.

Crosswind landings in the MA-4 are easy. A conventional "wing low" approach should be used, permitting the upwind main wheel to touch first. The other main gear will lower and touch gently. It will land in a 3 point or wheel landing equally well.

SLIPS

Slips are very effective. Rapid descents with high sink rates can be obtained through a properly executed slip. Biplanes, by design already generate a lot of drag. Slipping a biplane is an excellent way to set up a very high sink rate. The Cessna spring steel gear on this aircraft makes for very gentle landings.

OPERATING LIMITATIONS

The Marquart MA-4 Charger is intended for day VFR operation with standard equipment installed. The aircraft has proper external lighting for night flight, but lacks instrument lighting and landing lights, so is not intended to be used for night flight. Operation should be in accordance with all markings, placards, and check lists in this Operating Manual.

UTILITY CATEGORY OPERATION

The Marquart MA-4 Charger is intended to be operated in the Aerobatic category. The following Aerobatic category maneuvers are approved:

1. Any maneuver incident to normal flying.
2. Minimum speed maneuvering with full aft stick.
3. Lazy eights, chandelles, steep turns, aileron rolls, Immelman turns, Hammerhead turns, Loops, and Spins.

MAXIMUMS

Gross Weight	1650 lbs.
Maneuvering Speed	145 mph
Flight Load Factors	+6G, -4g

ACROBATIC LIMITATIONS

Maneuver	Maximum Entry Speed (IAS)
Chandeles	145 mph
Lazy Eights	145 mph
Steep Turns	145 mph

AIRSPEED LIMITATIONS

Smooth Air (Red Line)	180 mph
Maneuvering Speed	145 mph
Caution Range (Yellow Arc)	145-180 mph
Normal Range (Green Arc)	60-145 mph
Stall Speed	60 mph

ENGINE INSTRUMENT MARKINGS

Oil Temperature Gauge -		
Normal Operating Range		
(Green Arc)	100-215°F	30 – 100°C
Yellow	215-240°F	100 – 115°C
Red	240F	
Oil Pressure Gauge -		
Normal Operating Range	55 - 95 PSI at 2700 rpm	
Maximum Allowable	95 PSI	
Yellow	25 - 55 PSI	
Red	25 PSI	
Cylinder Head Temperature (If Installed) -		
Normal Operating Range	300-450°F	150 – 230°C
Yellow	450-525°F	230 – 270°C
Red	525°F	270°C
Tachometer -		
Normal Operating Range	500-2700 RPM	
Maximum Allowable	2700 RPM	
Voltmeter -		
Normal Operating Range	12.5-14.5 Volts	

Weight and Balance Sample Loading

Loaded Weight & Balance Data for N125BB Marquart Charger						
Owner / Builder	**Jeff Scott**					
DATUM REFERENCE POINT IS FRONT BOTTOM OF FIREWALL						
Weight at	WEIGHT (lb)	MOMENT ARM (in)		MOMENT WT. (in/lb)		
LEFT WHEEL	586	14		8204.00		
RIGHT WHEEL	582	14		8148.00		
TAIL WHEEL	76	192.50		14630.00		
EMPTY WEIGHT	1244			30982.00		
		24.91	CG (inches aft of datum)			
AIRCRAFT LOADING						
Fuel=6#/gal Oil=1.875#/qt						
	WEIGHT (lb)	VOLUMES	MOMENT ARM (in)		LOAD MOMENT. (in*lb)	
Empty CG	1244		24.91		30982.00	
OIL (7.0qt@1.875#)	0.00	0	-12.44	Oil Included	0.00	
FUEL (header 20 gal)	120.00	20	10		1200.00	
CENTER SECTION FUEL (8 gal)	0.00	0	21		0.00	
PILOT	200		67		13400.00	
PASSENGER	0		35		0.00	
LUGGAGE	25		90		2250.00	
GROSS WEIGHT	1589.00				47832.00	
C. G. Inches from DATUM	30.10					
C. G. Range	30 - 34					

Gross weight
1650 pounds
Fuel capacity
20 gallons
Engine
Lycoming O-360-A1A
Horsepower
180 horsepower @ 2700 rpm
Top speed
180 mph IAS

Range
Maximum cruise: @ 140 MPH 210 miles with 30 minutes reserve
Economy cruise: @ 120 MPH 240 miles with 30 minutes reserve

Service Ceiling
14,000 feet (1650 pounds)

EMERGENCY PROCEDURES

BRAKE FAILURE

If a brake failure is suspected, proceed to the nearest airport with adequate runway length to accommodate a landing without brakes. It is recommended, with a single brake failure that neither brake be utilized during landing and roll-out. Plan the touchdown near the approach end of the runway. The aircraft nose should be aligned with the runway centerline. Use minimum safe airspeeds for existing conditions. Maintain directional control straight down the runway with rudder and tailwheel steering. Allow the airplane to roll to a stop without the use of brakes. The engine may have to be stopped to reduce the ground roll. Push or tow the aircraft to a facility for repair.

EMERGENCY LOCATOR TRANSMITTER

An ELT is installed aft of the baggage area and is accessible via the baggage door.

ICING CONDITIONS

Carburetor ice may be encountered at any time, even with ambient temperatures of 80 F. The first indication of carburetor ice should be a slight drop in engine RPM. Slight engine roughness may or may not accompany this engine RPM drop. If carburetor icing is suspected, the following procedures are suggested:

1. Apply full carburetor heat. Engine roughness may then occur due to an over-rich mixture or water from the melting ice.

2. Continuous engine operation with carburetor heat ON is not recommended due to the decrease in engine efficiency.

CAUTION: *Flying in known icing conditions is not only prohibited by FAA regulations, but it is also very foolish. However, should wing icing occur, the following procedures are suggested:*

1. Monitor engine RPM for any indication of carburetor ice.
2. Increase airspeed if possible to reduce the angle of attack.
3. Changing altitude or course may alter the rate of accumulation of ice.
4. Remember that ice accumulation increases wing loading, decreases performance, decreases range and increases stall speeds. When landing, plan a slightly higher than normal air speed during landing approach. Guard against the increased stall speed created by the above mentioned conditions.

LOW OIL PRESSURE/ENGINE OVERHEAT

A low oil pressure reading may be caused by malfunction of the indicating system, oil pump failure, or loss of oil. Monitor the oil temperature gauge for a marked increase in temperature. If no temperature change is detected, the failure may be in the oil pressure indicating system. Proceed to the nearest airport, land, check the oil level, and determine the difficulty. In flight, if the oil pressure indication is low and is confirmed by high oil temperatures, reduce power and proceed to the nearest airport or suitable landing area and land. If possible, notify the nearest ATC radio facility of your difficulty.

CAUTION: *Lack of oil pressure will cause the engine to seize, requiring replacement or repair. Do not expect engine to continue operating while in-flight. When operating in high outside air temperature, the oil temperature may approach the red line. This is not detrimental and is not cause for concern unless the oil temperature exceeds the red line on the oil temperature gauge. A reduced power setting will lower the oil temperature; should it exceed the red line in flight, land at an airport and correct the problem.*

IN FLIGHT ENGINE FIRES

In-flight engine fires in today's modern aircraft are extremely rare and it should be noted that the presence of smoke does not always mean that a flaming fire exists. As an example, it may be engine oil on the exhaust system. If, in the pilot's judgment, an engine fire exists the following procedures are suggested:

1. Fuel selector - OFF
2. Ignition switch - OFF
3. Establish a maximum safe rate of descent. Increasing speed may blow the fire out.
4. Side slip maneuvers may be used, as necessary, to direct flames away from the cockpit area.
5. Select a suitable field for a forced landing.
6. Notify ATC of your location and problem, if possible.
7. Master switch - OFF
8. Complete the forced landing; do not try to restart the engine.

IN FLIGHT ELECTRICAL FIRES

Indication of in-flight electrical fires may be wisps of smoke or the smell of hot or burning insulation. Should an electrical fire develop, the following procedures are suggested:

1. Master switch - OFF
2. All Electrical switches - OFF
3. Proceed to nearest suitable airport for landing.

CAUTION: *If electrical power is necessary for safety of flight, attempt to isolate the electrical problem and turn that unit off.*

ENGINE FAILURE

Engine failures are very rare in modern aircraft. Should an engine failure occur, the basic procedures listed below may be a useful guide:

1. Establish a glide speed of 78 mph.
2. Check wind direction for landing.
3. Pick a suitable landing area and plan an approach.
4. Carburetor Heat - ON
   Magneto Switches - OFF, then ON
5. If the engine does not start promptly, attention should be shifted to the forced landing procedure.
6. Notify ATC of your location and problem, if possible.
7. Fuel Valve - OFF
   Magneto Switches - OFF
   Master Switch - OFF
8. Complete the landing and secure the aircraft. Notify ATC by telephone of your location, the aircraft situation, and location.

ELECTRICAL SYSTEM MALFUNCTION

The voltage reading will vary depending on the current drain from operating equipment. Check the alternator and regulator for malfunction and control equipment usage.

Care of the Aircraft

EXTERIOR CARE

Keep the dope and fabric clean, and repair or recover as necessary. The aircraft is currently covered using the Ceconite process, but the overall condition of the dopes is only in fair condition.

WINDSCREEN CARE

It is recommended that you keep the Plexiglas of the windscreens clean and unscratched. The following procedures are recommended:

1. If large deposits of mud and/or dirt have accumulated on the Plexiglas, flush with clean water. Rubbing with your hand is recommended to dislodge excess dirt and mud without scratching the Plexiglas.
2. Wash with soap and water. Use a sponge or heavy wadding of a soft cloth. **DO NOT** rub, as the abrasive action in the dirt and mud residue will cause fine scratches in the surface.
3. Grease and oil spots may be removed with a soft cloth soaked in kerosene.
4. After cleaning, wax the Plexiglas surface with a thin coat of hard polish-wax. Buff with a soft cloth.
5. If a severe scratch or marring occurs, jeweler's rouge is recommended. Follow directions, rub out the scratch, apply wax and buff.

NOTE: *Never use benzene, gasoline, alcohol, acetone, carbon tetrachloride, lacquer thinner or glass cleaner to clean plastic. These materials will damage the plastic and may cause crazing.*

ENGINE OIL

Check engine oil level on each flight prior to operating the engine. Do not mix brands, nor grades of motor oil. Recommended oil numbers for expected ambient temperatures are:

Temperature	Grade
Winter	SAE 40 Aviation Oil
Summer	SAE 50 Aviation Oil
Year Round	20W-50 Phillips X/C, 15W50 Aeroshell or equivalent Aviation Grade Oil

NOTE: *Engine oil and 48110 series spin on filter should be changed at a maximum of 50 hours.*

BATTERY

The battery is a 12 volt Odyssey PC-680 AGM type battery mounted in the footwell of the front cockpit. It should be checked during annual maintenance inspections.

TIRE SERVICE

This aircraft has 6:00x6 aircraft tires. Tires should be inspected for wear and cuts and abrasions before each flight. Tires should be replaced when the remaining tread depth reaches 1/16". The proper inflation pressure for the main tires is 32 PSI.

BRAKE SERVICE

The brake pads should be inspected annually, and replaced when the pad thickness is less than 0.030".

ELECTRICAL SYSTEM

Inspect the electrical wiring annually for chafing or loosening.

RECURRENT MAINTENANCE INSPECTION

At annual inspection, inspect N145BB in accordance with Federal Aviation Regulations. Every 50 hours the oil and filter should be changed.

FUEL REQUIREMENTS

Alcohol free MOGAS of 92 AKI or higher or 100LL Avgas or equivalent should be used.

N145BB CHECKLISTS

PREFLIGHT

The aircraft should be given a thorough visual inspection prior to each flight.

Preflight	
Master Off	Off
Mags Off	Off
Radio Off	Off
Check Fuel	Full
Check Oil	6 Qt
Walk Around	
Close Access Panels	

Start	
Brakes	Set
Master	On
Fuel	On
Mixture	Rich
Boost Pump	On
Mags	Left
Prime	As Needed
Pump Throttle	As Needed
Set Throttle	
Stick	Back
Clear Prop	"CLEAR"
Engage Starter	
Oil Pressure	Check
Alt Field	On
Strobes	On
Lights	On
Avionics	On
USB Ports	On
Ammeter	Charging
Avionics	On
GPS	On

Pre Taxi	
Mixture	Lean
Altimeter	Set
Transponder	On/Set
Radio	On/Set
Lights	On
Strobes	On

Run-up	
Brakes	Set
Controls	Free & Correct
Boost Pump	Off
Throttle	1700 RPM
Mixture	Set
Carb Heat	Check
Mags	Check
Fuel Pressure	Check
Boost Pump	On
Trim	Set

TAKEOFF - NORMAL

1. Throttle: Full open.
2. Controls: Lift off at 60 mph. accelerate to 90 mph, establish normal climb, retract flaps.
3. Climb speed >90 mph IAS as necessary for engine cooling.

CLIMB

1. Normal – >90 mph.
2. Best Rate - 778 mph at S.L. full throttle.
3. Best Angle - 72 mph at S.L. full throttle.

CRUISE

Power setting: 2300 to 2700 RPM.

1. Mixture - Lean to peak RPM.

BEFORE LANDING

1. Mixture – As necessary
2. Carburetor heat – As necessary
3. Airspeed: 80 mph.

LANDING

1. 65 mph over the numbers.
2. Touchdown three point or wheel landing
3. Maintain directional control with the rudder steering.
4. Brake, as required, for stopping.

LANDING - OBSTACLE CLEARANCE

1. Airspeed: 70 mph on final.
2. Slip as needed to loose altitude.
3. Maintain directional control with the rudder steering.
4. Brake, as required, for stopping.

AFTER LANDING

1. Carb Heat Off.

SHUTDOWN

1. Stop engine using IDLE CUTOFF.
2. Turn off switches on electrical systems.
3. Mags off.
4. Master switch off.
5. Turn Fuel Valve selector Off.
6. Chock wheels and tie down aircraft.