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BOM (Broadcasting Outer Module) Installation Instructions

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BOM (Broadcasting Outer Module) Installation Instructions					
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AMENDMENT RECORD

This procedure is reviewed to ensure its continuing relevance to the systems and process that it describes. A record of contextual additions or mission is given below:

Revision No.	Date	Responsable Person	Description of Change
1	12/6/2017		Initial release
2	04/14/2018	Ananda Leon	Modified installation alignment

Warranty

Levil Aviation warrants this product to the original purchaser to be free from defects in material and workmanship for a period of one year from the date of the original purchase. The following are not covered: software, damage resulting from accident, neglect, misuse, fire, or flood, improper voltage supply or failure to follow operational guidelines supplied with this product. Extended warranty is available for purchase on our website.

Please register your product online at: http://aviation.levil.com

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1. Introduction

Every pilot should have a safety net when they go flying because no matter how much we hope for the best, it is always good to be prepared for the worst. The BOM provides an affordable solution that gives pilots the peace of mind they need to be able to safely overcome any instrument malfunction or related emergency.

The BOM (Broadcasting Outer Module) is the first and only aerodynamic pod that mounts under the wing of the aircraft. All components are incorporated into the BOM, making it a fully independent, completely wireless, all in one avionics device. The BOM is a platform for innovation, setting the stage for the future of aviation.

The BOM is a fully independent, completely wireless, self-powered, all in one avionics device. Avionics include WAAS GPS, ADSB-in, AOA, Air Data (Altitude, Airspeed), AHRS (Attitude, Directional Gyro, Turn Coordination, rate of turn, VSI) and outside air temperature. Once it is installed, the BOM connect via Wi-Fi to a tablet inside the cockpit and data can be displayed on multiple Apps thanks to its open protocol.

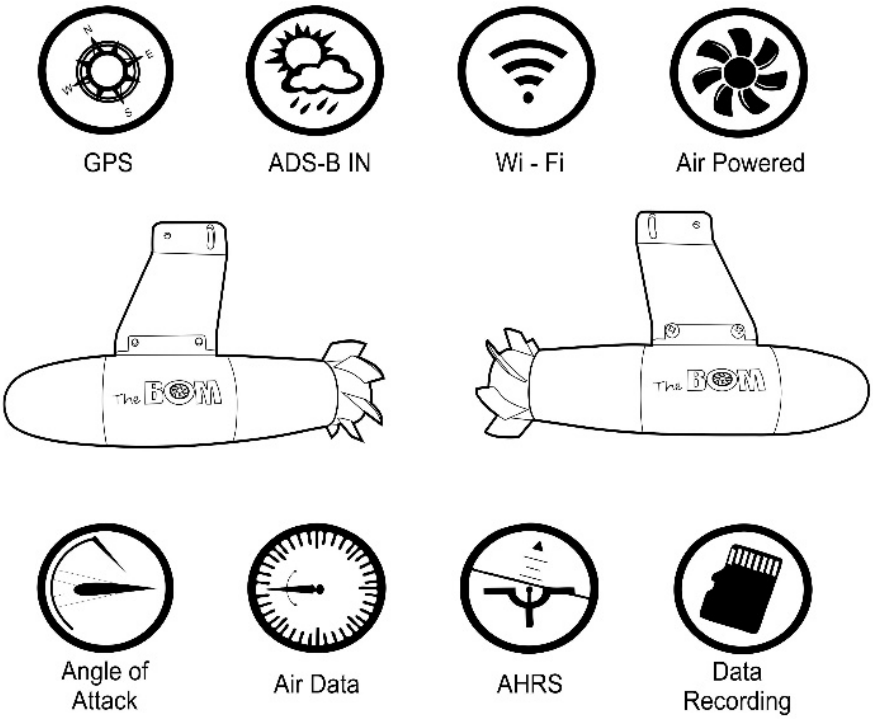


Figure 1. BOM features

What makes the BOM special?

- Automatically Powered on/off with the vibration of the engine
- Self-powered and self-charging
- Fully independent inertial measurement system & source of altitude, position, and flight telemetry
- Wireless platform offering iOS/Android compatibility
- Multiple App compatibility. For a full list of compatible apps visit our website http://aviation.levil.com/compatible-apps.html

2. Installation

Installation of the BOM was made easy by eliminating wires all together, and making the BOM a completely wireless interface system. Installation requires:

- Remote location: Under the wing or any place away from propeller backwash
- Positioned close to the leading edge of the wing (for GPS reception)
- Attitude adjustments for level flight
- Angle of Attack calibration

The following are some considerations before installing the BOM:

The BOM is an instrument package and should be treated as such. Do not drop it, bang it, use as lever to bend the installation bracket, immerse in liquid, etc.

2.1 Choosing the place of installation:

- To avoid erroneous air speed and angle of attack readings, the BOM should be installed outside the propeller wash and some distance away from the boundary layer (Boundary layer is the pressure change as the air moves around a surface)
- For optimal GPS reception, the front of the BOM should be facing the sky
- For optimal Wi-Fi signal, the tablet should have a direct view of the BOM, however, it will still work if there is partial blockage
- For optimal ADS-b reception, the BOM should have a direct view to the ground towers

After all these considerations, a recommended location to mount the BOM is slightly forward of the wing leading edge on the lower part of the wing. Some high wing aircraft have wing struts that could be used to attach the BOM and will give good clearance for GPS reception.

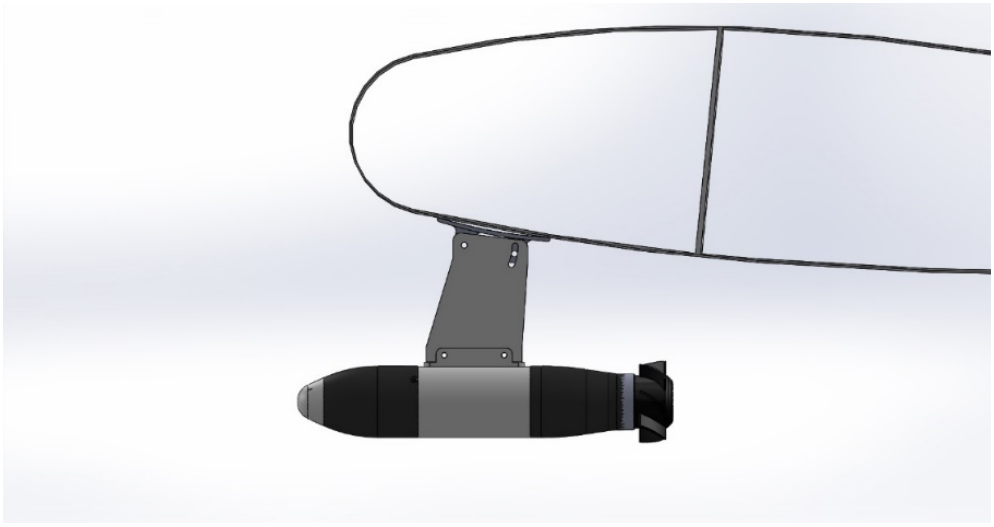


Fig 2. Ideal position for the BOM where the nose has a clear view to the sky

Because the BOM requires to be installed some distance from the wing or other installation surfaces, a 100-mm long installation bracket is supplied. This bracket has an adjustable channel to set the tilt angle as necessary.

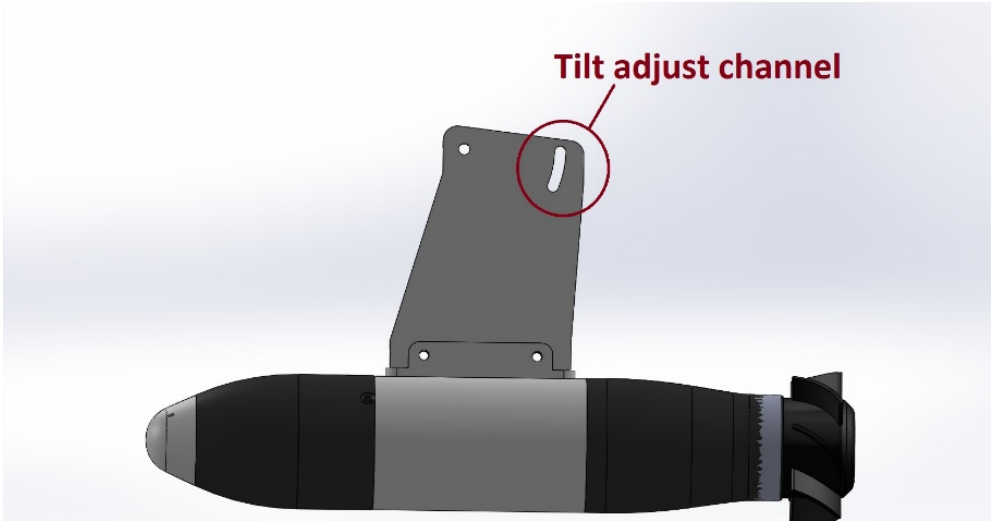


Fig 3. Bracket to support the BOM from the installation fixture

3. Structural Strength Requirement

3.1 Pull Test

The structure must be able to sustain 6G pull test in the vertical axis when installed in test fixture representative of an aircraft panel. The BOM weight is 0.8 lb. therefore the installation must support more than 4.8 lb. (0.8 lb. x 6Gs = 4.8 lb.).

Before installation, perform the following pull test to make sure that the base is strong enough to sustain the BOM:

- Cut a piece of a rigid material (i.e. wood) slightly bigger than the inspection plate whole.
- Clamp the piece of material to the inspection plate; use two clamps, one in the front and one in the back of the inspection plate.
- Perform a pull test with a force of more than 4.8 lbs.

The inspection plate base must sustain this applied force without deformation.

This test must be repeated once installed on the aircraft.

3.2 Torsional Test

The BOM requires a minimum of 1.5 lbs. of force in the longitudinal direction at maximum speed (210 kt.) and at least 10 lbs. of force in longitudinal and lateral direction for accidental collisions. Since accidental collision forces are greater than the flying forces, the torsional test will be performed using the 10-lb. force.

Using the same set up as mentioned in 3.1:

- Attach a 3rd clamp to the center of the rigid material already attached.
- Push the clamp in the longitudinal and lateral direction, at a distance of 4” from the base, with a force of 10 lbs.

The inspection plate base must sustain this applied force without deformation.

This test must be repeated once installed on the aircraft.

4. Attaching the BOM to the wing or airframe

Because of the versatility of the BOM there are many ways to attach it to the wing or airframe. The following options have been tested up to 210 kt. As more options are tested, installation procedures may be updated.

Option 1:

The first method is using an inspection plate near the leading edge. Not all inspection plates can be used, there are some things to take into consideration.

The BOM has been calculated to have about 0.7 lb. of drag at 210 kt. Therefore, the inspection plate should be able to sustain a moment of 0.7 lb. with a 4" arm if you fly at 210 kt.

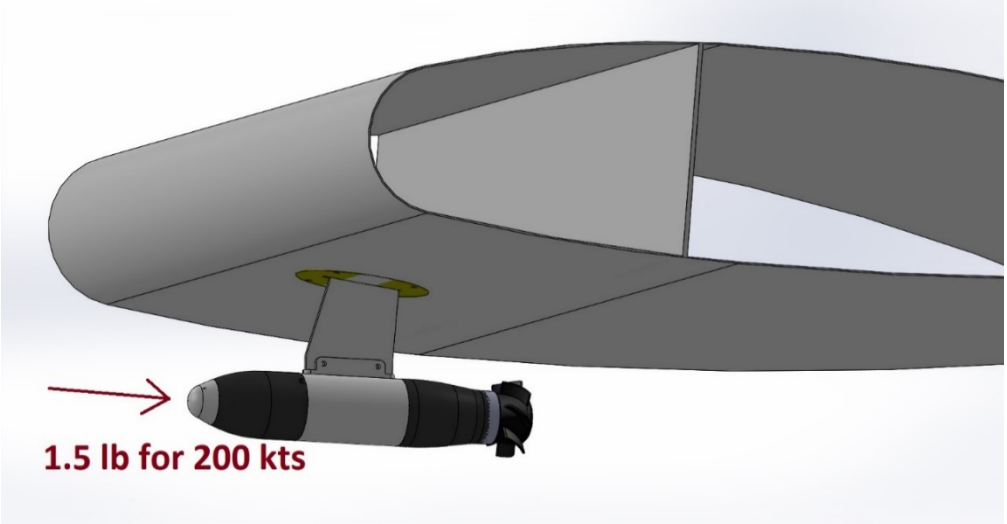
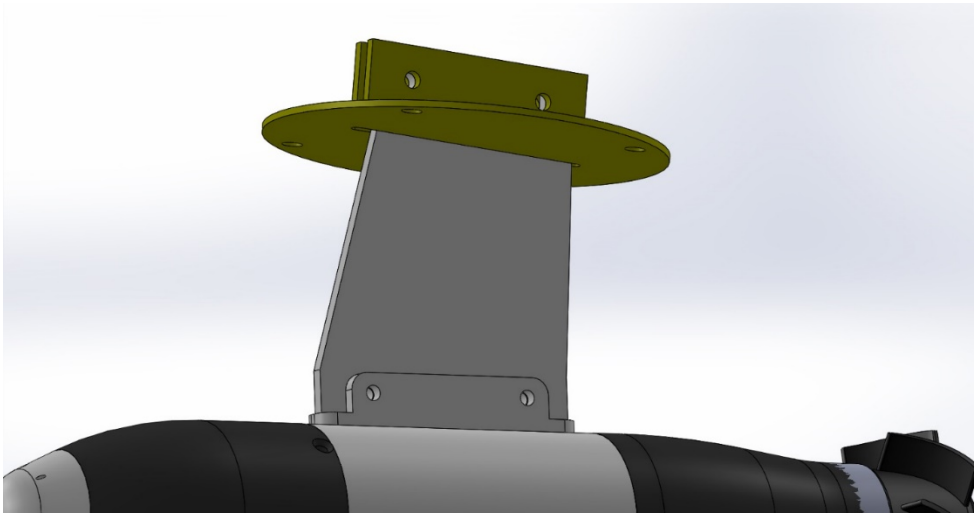


Fig 4. Testing for inspection plate rigidity

The inspection plates are usually made of a thin aluminum sheet. A 1/16" thick plate is recommended, and may be purchased separately, to make the installation stronger. Use the



airplane's inspection plate as a template to cut the 1/16" aluminum plate.

Fig 5. Mounting plate with brackets to replace inspection plate

Make sure the screws that hold the inspection plate are at least 8-32 or 10-32 (4mm – 5mm). Do not use self-tapping screws as they tend to loosen with vibration.

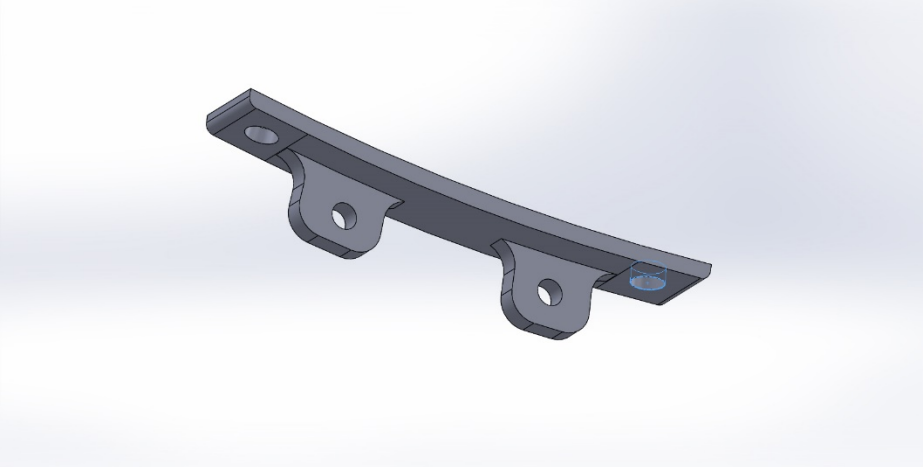
Option 2:

A second method to install the BOM is by using an external bracket to hold it to the wing using the screws that hold the fuel tank, or the tip fairing. NOTE: Piper's fuel tanks tend to leak and placing a device here may increase the risk of fuel leaking.

RV's may benefit from this method since inspection plates are too far back in the wing.

Fig 6. BOM installation on an RV9 using an external bracket. Notice the pitot on the right is at the same distance from the wing

The bracket installation is more rigid than the inspection plate installation. Brackets for different airplanes can be purchased separately from Levil Aviation or you can make your own using a 1” x 1” x 1/8” 6061 aluminum extrusion. While the extrusion is still long, use a



vise to give the shape of the wing, then cut it to length and remove the excess material.

Fig 7. Bracket to install the BOM using screws already on the wing

NOTE: If you are not using an existing installation location, additional FAA approval may be required. Please contact your local flight standard district office to discuss required documentation.

4.1 Tilt Setting

For optimal Angle of Attack measurement, use the "Tilt-adjust channel" of the bracket included with the BOM to align the longitudinal axis of the BOM with the chord line of the wing. The chord line is an imaginary straight line that connects the leading and trailing edges of the airfoil.

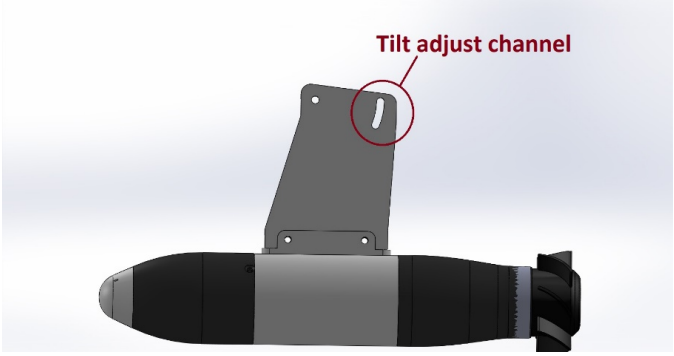


Fig 3. Bracket to support the BOM from the installation fixture

4.2 Attitude adjustments

Once the BOM is permanently installed and the tilt set, the attitude indicated (pitch and roll) may be different from level flight. There is a Caging feature on the AHRS Utility App to Reset the roll and pitch errors. Caging can be done during flight by the pilot, or on the ground if the aircraft maintains a straight and level configuration when grounded. To Cage the BOM:

1. Turn ON the BOM by removing the protective covers and simulating Engine ON conditions (battery must be charged)
2. Connect iPad's WiFi network to the SSID BOM-xxxx
3. Open AHRS Utility and confirm connection to the BOM, all systems must be up and running
4. On the AHRS Utility, go to Device Config -> Enable Configuration (if you haven't done so) -> Acknowledge the pop up warning (if you haven't done so) -> Select the BOM tab -> Click on "Check Two way communication".
5. If the message "Device Connected" appears, proceed to Step 5. Otherwise, WiFi communication did not initialize correctly. You must go to your iPad's WiFi settings and disable the WiFi momentarily, then Enable again. Repeat Steps 1 to 4.

6. Under "Attitude Adjustments" Click Cage
7. Acknowledge that a "Cage successful message" was received
8. The BOM will reset itself automatically and the new attitude configuration will appear. Verify roll and pitch values now simulate level flight

NOTE: If Caging during flight, use an alternative Attitude indicator and/or confirm with the earth's horizon outside that the aircraft is straight and level. Do not use the BOM for reference. Maintain the aircraft un-accelerated and straight and level during the caging process. Maneuvering the aircraft during Caging process will induce an error. To go back to original parameters, click Uncage.

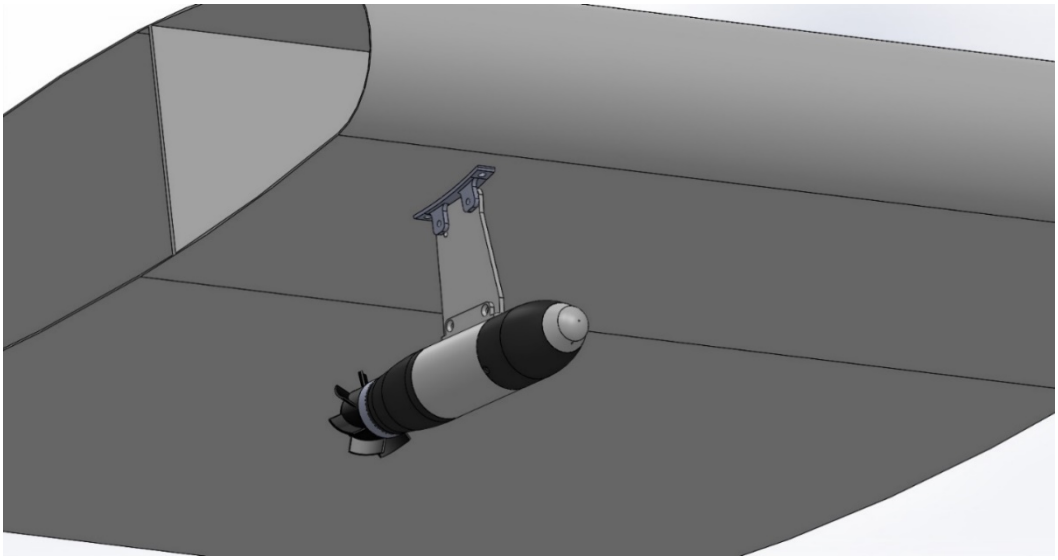


Fig 8. BOM installation using an external bracket

5. Operating Limitations

a) The BOM system is not a required system and may not be used as a substitution for the certificated aircraft system.
b) No operational credit may be taken for installation of the BOM system.
c) The AoA included within the BOM is non-required and is to be used only as supplemental information to the pilot. The AoA system may not be used as a substitution for the certified aircraft stall warning system.
d) No operational credit may be taken for such items as reduced approach speed and shorter landing distances.
e) The BOM may be flown at a Maximum speed of 210 kt.

f) Although the BOM transmits AHRS Data is not to be used as a substitution for the certified AHRS instrumentation of the airplane. The AHRS supplied by the BOM is to be used only as supplemental information to the pilot.
g) Levil Aviation does not provide or endorse any carry-on device that displays the information sent by the BOM.
h) Ferrous Materials near the BOM may affect the compass reading.
i) When transporting or temporarily storing in an airplane or vehicle, temperature range should be no less than 20 ° F (-12 ° C) and not more than 150 ° F (65 ° C)
j) Storing our device at temperatures higher than 170 ° F for extended periods of time (more than 2 hrs.) may cause damage to battery and possible fire.
k) DO NOT disassemble, remodel, drop or modify the BOM as this will invalidate the warranty of the unit as well as the FAA NORSEE certification.
l) Do not use the BOM as an anti-collision system. Not all traffic is displayed using ADS-B in. Most aircraft are not currently ADS-B Out equipped and therefore not detectable by the BOM.
m) Levil Aviation does not provide a display for this unit. Any display the pilot chooses to integrate Should comply with FAA certification requirements or qualify as a carry-on device. Under no circumstances should any display be placed in any way that it will obstruct the pilot's views of the aircraft flight instruments or the external view, which may be detrimental to the ability of the pilot to fight the aircraft.