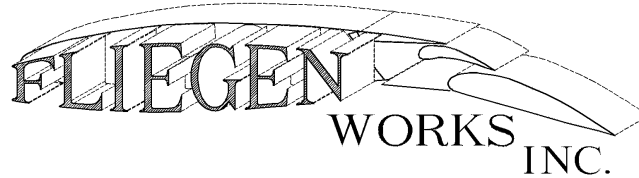


**IMMERSIVE CAMERA MOUNT SYSTEM**



**FLIEGEN WORKS INC.**

**PORTLAND, OR**

**503 221-4001**

**INSTRUCTIONS FOR CONTINUED AIRWORTHINESS AND COMPONENT  
MAINTENANCE MANUAL**

This ICA must be followed when the Immersive Camera Mount System is installed in accordance with Supplemental Type Certificate, (STC) No. SR01822SE, dated April 02, 2010.

The information contained in this document supplements or supercedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this manual, consult the basic aircraft ICA or Maintenance Manual.

<b>MAKE:</b>	<b>MODEL:</b>
<b>BELL HELICOPTER TEXTRON</b>	<b>206 SERIES &amp; 407</b>
<b>ROBINSON</b>	<b>R44 AND R44-II</b>

STATEMENT OF INITIAL CERTIFICATION

This manual complies with Federal Aviation Association (FAA) Airworthiness Requirements part 27.

FAA Acceptance: FTW AEG Date: Dec 13, 2007

The above certification does not apply to revisions or amendments made after the date of initial certification by other Approved Organizations. Revisions or amendments made by other Approved Organizations must be separately certified and recorded on separate record sheets.

STATEMENT OF REVISION B CERTIFICATION

This manual complies with Federal Aviation Association (FAA) Airworthiness Requirements part 27.

FAA Acceptance: FAA by STC amendment Dated: 4/2/10

The above certification does not apply to revisions or amendments made after the date of this certification.

STATEMENT OF REVISION C CERTIFICATION

This manual complies with Federal Aviation Association (FAA) Airworthiness Requirements part 27.

FAA Acceptance: FTW AEG Dated: 2/15/2011

The above certification does not apply to revisions or amendments made after the date of this certification.

**Fliegen Works Inc.**  
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**503 221-4001**

RECORD OF REVISION

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IR	12/05/07	N/A									
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CURRENT REVISION CHANGES:

Rev C – Added option for Ladybug 3 Camera installation.

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503 221-4001

Component Maintenance  
Manual & ICA

IMMERSIVE CAMERA  
MOUNT SYSTEM

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Current revision status and revisions to this document may be obtained from

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A subscription for revisions is available; contact Fliegen Works Inc.

Notice of revision availability is sent to the registered owner of each kit. If you are the owner of this system, and your information has changed, please send the new ownership information to the above address, including a valid email address.

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## INTRODUCTION

### 1. General

This Component Maintenance Manual (CMM) and Instructions for Continued Airworthiness, (ICA) contains the maintenance instructions to install, maintain, inspect and repair the Immersive Camera Mount System on a variety of helicopters. This manual establishes limitations and presents requirements for testing, disassembly, cleaning, checking, inspection, repair, and assembly of the camera mount. When in conflict with other referenced documents, this CMM supercedes all other documents.

#### A. How to Use this Manual

##### (1) Arrangement.

This document closely follows ATA 100 Specification format for a component maintenance manual. Listed below are the sections and their contents:

- Description and Operation: General overview of the Immersive Camera Mount System and its operation.
- Limitations: Limitations, scheduled and special inspections of this equipment to maintain it in an airworthy state.
- Testing and Fault Isolation: Information provided for testing of this component to determine likely faults, isolate those faults, and provide corrective action.
- Maintenance Practices: Step-by-step instructions for disassembly, assembly, and cleaning of the Immersive Camera Mount and its related equipment.
- Installation/Removal: Step-by-step instructions for installing and removing the Immersive Camera Mount on varying helicopter and skid configurations, along with instructions for installing related equipment.
- Inspection/Check: Detailed instructions after cleaning and corrective action, where applicable.
- Repairs: Information pertinent to repairing the Immersive Camera Mount System.
- Fits and Clearances: Tolerance, wear limits, and torque values for components.
- Special Tools, Fixtures, and Equipment: Items necessary for maintenance of the Immersive Camera Mount System.
- Illustrated Parts List (contains a Detailed Parts List): Lists all necessary parts for maintenance support of the MCS and structural attachments.

Instructions are supported by illustrations as required.

#### B. In-Process Inspection

In-process inspection requirements are provided within the document where most relevant and applicable. Detailed inspection requirements are provided for each major operation of overhaul, such as disassembly, cleaning, repair, replacement, and modification, as applicable.

#### C. Tolerances, Wear limits, Corrosion Limits, Torque Values, and Adjustments.

All maintenance shall comply with the wear limits, fits, and tolerances as listed in this CMM.

D. Worn or Defective Parts.

Parts, components, subassemblies, or assemblies found worn or defective beyond the repairable limits established by this document will be condemned and disposed of.

E. Repair, Rehabilitation, and Reconditioning.

The repair, rehabilitation, and reconditioning of equipment and their components specified herein shall be accomplished in accordance with specific instructions set forth in this CMM. Tolerances and limits set forth herein are the minimum and maximum acceptable standards. However, these repair procedures are not mandatory if the repair facility is able to develop satisfactory procedures for repair. Any repair procedures developed by the repair facility shall be documented and require separate FAA approval.

F. Repair and Renovation.

This document requires repair and renovation of parts to within the dimensional and tolerance specifications noted herein.

G. Warnings, Cautions, and Notes

Personnel performing operations, procedures, and practices included or implied in this maintenance manual shall observe the following warnings. Disregarding these warnings and precautionary information may cause serious injury, death, or destruction of material.

Warnings: Warnings call attention to the use of materials, processes, methods, procedures, or limits that must be followed precisely to avoid injury to persons.

Cautions: Cautions call attention to methods and procedures that must be followed to avoid damage to equipment.

Notes: Notes call attention to methods that make the job easier.

H. Quality Assurance /Quality Control (QA/QC)

(1) Responsibility.

Personnel authorized by the FAA under Title 14, CFR part 43, must perform all repairs. The facility performing the overhaul (hereafter referred to as the repair facility) is responsible for the performance of all inspections specified herein. The repair facility may utilize its own facilities or any other commercial laboratory acceptable to the FAA.

(2) Quality Assurance Terms and Definitions.

For quality assurance terms and definitions, refer to MIL-STD-109.

References

<b>Specification</b>	<b>Nomenclature</b>
MIL-A-8625	Anodic Coatings for Aluminum
AC43.13-1B	Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair
MIL-STD-2219	Fusion Welding for Aerospace Applications
MIL-STD-1907	Inspection Liquid Penetrant and Magnetic Particle

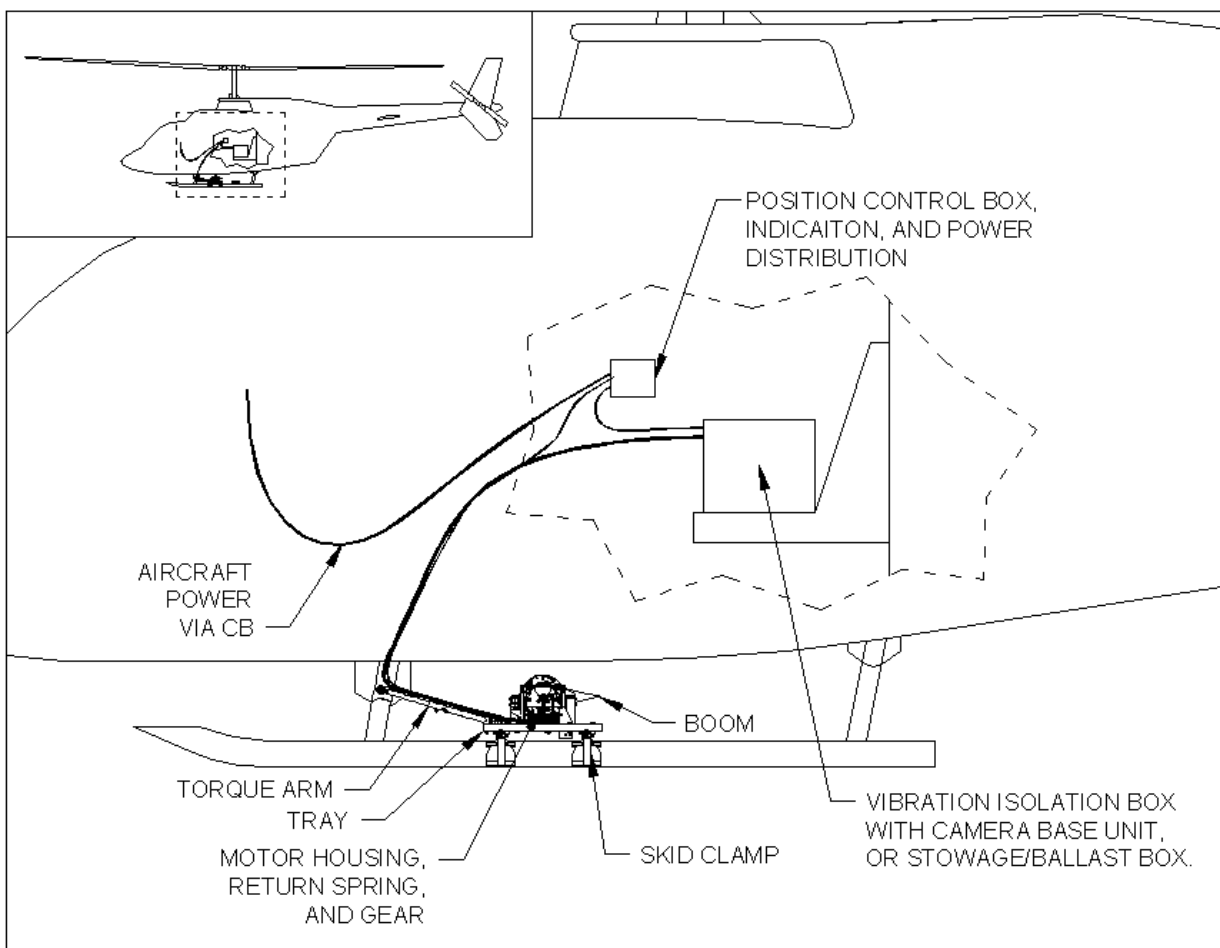
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## DESCRIPTION AND OPERATION

### 1. Description

#### A. General

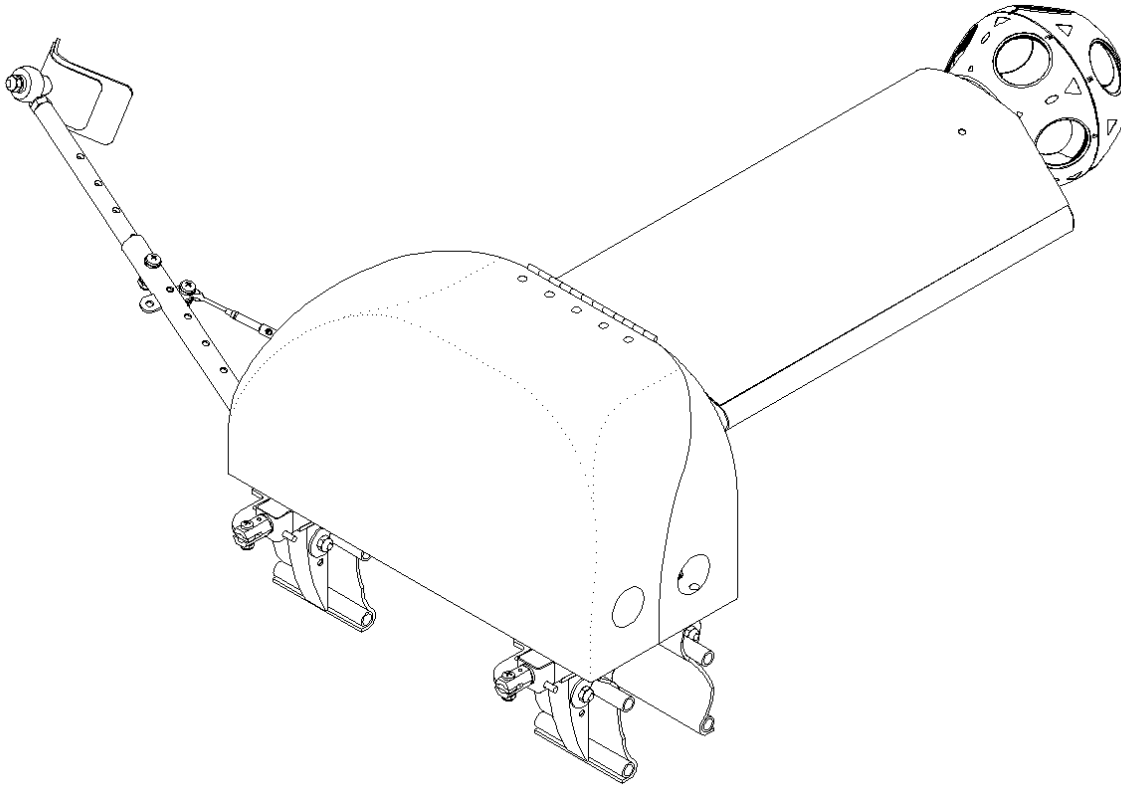
The Immersive Camera Mount System includes a Retractable Camera Mount, a Position Control Box, and option for either a Vibration Isolation Box if used with the IMC camera and base unit, or a Stowage Box if used with other cameras such as the Ladybug 3. The Retractable Camera Mount attaches to the skid of various helicopters. The Vibration Isolation Box (VIB) and Position Control Box are two control units located within the cabin of the helicopter. The system is designed to lower an Immersive Media or Point Grey Ladybug 3 Camera Head below the skids during flight for video recording while safely retaining cabin equipment.



Immersive Camera Mount System Installed on a Bell Helicopter 206B  
Figure 1.1 (fairing not depicted)

The system is powered from the helicopter's non-essential bus, which connects to the Position Control Box via a supplied power harness. The installer is responsible for providing separately FAA approved 28 VDC 7.5 Amp to 20 Amp circuit breaker and connection to the power harness. This box serves as the primary control and indication unit for the up and down positions of the camera. It also distributes power

to the Retractable Camera Mount and Camera Base Unit. The Camera Base Unit is supplied by Immersive Media, P/N BU-2360-II. The Immersive Camera Head is also supplied by Immersive Media, P/N CA-2360-II. The Ladybug 3 Camera Head is supplied by Point Grey, and is controlled by a laptop computer.



Immersive Camera Mount Assembly, (cables not shown, IMC Camera shown)  
Figure 1.2

## B. Drive System Detail

The drive system that extends and retracts the boom with camera head is a worm gear segment driven by a worm on a shaft attached to a motor. The worm shaft is held in place by a pair of pillow blocks that may be shimmed for proper worm/worm gear meshing.

## 2. Operation

Normal operating data follows, assuming a system that has been completely installed and passed the pre-flight check. The pre-flight check is defined in the Inspection/Check section of this document and the Rotorcraft Flight Manual Supplement. Refer to the Installation/Removal section of this document if the system is not installed.

### A. Lowering the Camera

These instructions refer to handling of the Position Control Box before and during flight by the camera operator. Electrical power should already be supplied to the system from the rotorcraft's accessory power breaker.

1. Verify that the UP indication light is on (green) for takeoff, with the position switch locked in the center OFF position.

- 2 When the pilot indicates it is safe to deploy camera, pull to unlock position switch and move to DOWN position.
- 3 Verify that the motor indication light is on (yellow). This light should remain on for approximately 30 seconds while the camera system deploys. If the motor indication light does not turn off after 30 seconds, the camera may have failed to deploy.
- 4 When the DOWN indication light turns on (blue), turn the switch back to the center OFF position. The camera is now down and ready to film.

Note: For IMC Camera refer to Immersive Media's Camera Base Unit Instructions for operating the camera. For Ladybug 3 Camera refer to the camera's operating manual for operation (not provided herein).

## B. Raising the Camera

These instructions refer to handling of the Position Control Box during flight.

- 1 When ready to raise camera, pull to unlock position switch and move to UP position.
- 2 Verify the motor indication light is on (yellow). This should remain on for approximately 30 seconds while the camera system retracts.
- 3 When the UP indication light turns on (green), turn the motor to the center OFF position. The camera is now up and ready for landing.

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### AIRWORTHINESS LIMITATIONS

Note: The Airworthiness Limitations section is FAA approved and specifies inspections and other maintenance required under §§43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

#### 3. General.

This chapter contains airworthiness limitations based on §§27.571 for the Immersive Camera Mount System only. Refer to the Inspection/Check section of this document for recommended inspection.

##### A. Time Limited Items:

None.

##### B. Required Inspections Interval:

No required maintenance or inspection tasks.

Note See page 501 for manufacturer suggested inspection intervals.

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## TESTING AND FAULT ISOLATION

### 1. General.

This chapter contains procedures for testing the Immersive Camera Mount. The equipment employed for testing shall consist of that listed in Figure 1.1:

#### A. Required Tools and Equipment

Inspection and test equipment required to determine conformance of the Immersive Camera Mount to the requirements contained in this CMM are listed in Figure 1.1. The table lists the equipment by nomenclature and part number. Possession of all equipment listed is not to be construed as mandatory when the repair facility may have similar equipment onsite or can locally purchase or manufacture adequate equipment to accomplish all job functions in a competent and efficient manner.

Item No.	Part No.	Nomenclature
1		+28V power source
2		3-4" C-clamps
3	IMC407-160-10	3/8" wrench or socket

Table of Special Inspection and Test Equipment  
Figure 1.1

### 2. Preparation for Testing.

- (1) Examine the camera mount and attached equipment visually to determine exterior finish, markings, configuration and routing of wires, and attaching parts.
- (2) Attach the camera system to a dummy-skid or other object that allows it to actuate up and down without interfering with the ground. If needed, remove the Skid Clamps and attach the Skid Tray to the edge of a table with C-clamps.
- (3) Attach the power cable (IPL 7.2-9) to a +28V power source as if installed on a helicopter. Refer to installation instructions starting on page 401.

### 3. Testing.

- (1) Use the Position Control Box (IPL 7.2-4) to drive the camera system up and down. Pay close attention to the following issues:
  - The worm should run smoothly through the entire 90-degrees of rotation. Make sure the worm is centered laterally on the gear and does not bind, hop, or jump at any point during operation.
  - The green LED should be on when the boom is up.
  - The yellow LED should be on when the motor is running
  - The blue LED should be on when the boom is down.
- (2) With the camera system up and the boom installed, press down on the end of the boom to look for play between the worm and gear.
  - If there is visible movement between the worm and gear, (greater than 1/32" between the skid tray and motor housing), shim the drive shaft to bring it closer to the gear (refer to the Maintenance Practices, page 308).

- If there is excessive play in the main shaft bearings, then the shaft, bearings, or housing may be out of tolerance (refer to Fits and Clearances, page 701).

(3) Vibration Isolation Box (VIB)

- If something rattles during flight, one of the mounts may be broken or have loose hardware. Visually inspect the vibration mounts through the holes in the outer layer of the VIB.

4. Fault Isolation.

(1) Motor does not run:

With switch in Up or Down, check power at TB 1 between pin 4 and 6. If power but the motor is not running, replace motor. If no power, check continuity of main harness, (pin A to pin A – straight through harness, see schematic page 603), repair or replace harness. If position control box does not produce power with switch in up or down, replace position control box.

(2) Indicator lights do not light:

If the system functions, check that the limit switches for the up stop and down stop are engaging at the same time. If they are both mechanically working together, then the switches can be swapped on the terminal block. IF the problem follows the switch, replace the switch. Otherwise replace light or entire position control box.

(3) Camera system is not powered:

Check Circuit breaker. Verify the P05 has 24 Volts, if not, replace position control box.

### MAINTENANCE PRACTICES

Note: See Testing and Fault Isolation, page 201, to establish the condition of the component or determine the most probable cause of its malfunction. Do this to determine the extent of disassembly required to avoid unnecessarily deconstructing and rebuilding the camera mount assembly.

#### 1. General

##### A. Required Tools and Equipment

<b>Item No.</b>	<b>Part Number</b>	<b>Nomenclature</b>
1		#1 Phillips screwdriver
2		#2 Phillips screwdriver
3		1/4" wrench or socket
4		5/16" wrench or socket
5		11/32" wrench or socket
6		3/8" wrench or socket
7		1/2" wrench or socket
8		#40 drill
9		#30 drill
10		3/32" hex key
11		7/64" hex key
12		3-4" C-clamps

##### B. Safety

###### (1) Using Toxic/Flammable Materials.

Due to the toxicity and flammability of the solvent solutions used in cleaning procedures, adequate ventilation must be provided. Avoid prolonged contact with solutions and chemicals. Do not use dry cleaning solvent or flammable cleaners near an open flame or in an area where very high temperatures prevail.

#### 2. Disassembly

##### A. General

This section contains the detailed instructions for disassembly. Cleaning, in-process inspection, processing, repair, assembly, and testing are included in separate sections.

##### B. Purpose

Pre-shop analysis instructions are provided to determine, prior to beginning overhaul activities, the extent of overhaul required to return Immersive Camera Mount to a serviceable condition as specified herein. These instructions are to be used for examination of the incoming Immersive Camera Mount. This examination provides information to the overhaul facility for use in preparing estimates required to determine the extent of disassembly, repair, modification, and replacement required to overhaul the Immersive Camera Mount to a completely serviceable unit. The

examination also provides information relating to work and parts requirements. Quality standards contained in this CMM must be adhered to. Detailed cleaning and corrosion treatment methods are incorporated in this CMM where applicable.

(1) Unpacking

Use reasonable caution when removing the Immersive Camera Mount from the shipping container. Place parts on a suitable workbench. Check all tags and forms attached to the camera mount and equipment to determine the reason for removal from service.

(2) Cleaning

The external surfaces of the Immersive Camera Mount will be thoroughly cleaned before disassembly. Refer to cleaning instructions in this document, page 307, for detailed instructions.

C. Disassembly Criteria

Practices and procedures outlined in this paragraph are to be followed throughout disassembly of the medical cylinder shroud.

- (1) Disassembly shall be based on the results of the pre-shop analysis and a thorough visual and mechanical inspection.
- (2) Disassembly shall be a complete removal of all parts to the extent required to meet all quality assurance requirements of this CMM and the work contract.
- (3) Record and tag all defective parts with the reason for rejection.
- (4) Mated and matched parts shall be tagged, handled, and stored together to preclude damage or loss. These parts are not individually interchangeable. If one part requires replacement, replace all parts of the mated or matched set.

D. Disassembly Instructions

Subsequent steps list the procedure for disassembling the camera mount. Refer to the IPL for a detailed parts breakdown.

Note: Do not disassemble the camera mount more than is necessary to determine if parts or assemblies are serviceable for continued use.

(a) Fairing

- 1 The fairing is attached by screws and washers to nutplates on the Skid Tray.

(b) Skid Clamps

- 1 The Skid Clamps (IPL 3.2) are attached to the Skid Tray (IPL 2.2-5) using four fasteners (IPL 2.2-8) and four washers (IPL 2.2-13) each. The fasteners are tightened according to torque values given on page 705. Typically, the only disassembly required is removal of the adjustable tube (IPL 3.2-4). If further disassembly is required, remove the modified end nut (IPL 3.2-13) and C-cap (IPL 3.2-9) to allow access to the internal components of the clamp. See IPL Figure 3.2 for a detailed breakdown

of the clamp components. Rubber is removed by drilling out the rivets on the contact tube.

(c) Torque Arm

- 1 Removing the Torque Arm from the Skid Tray requires the removal of two bolts (IPL 2.2-7, 2.2-9). Further disassembly of the Torque Arm requires no special instructions for disassembly, and can be done according to IPL Figure 2.2. Tighten according to torque values given on page 705.

(d) Motor Housing

**WARNING:** The torsion springs have enough energy to break fingers if released. The Motor Housing is extremely difficult to reassemble once the spring energy has been released during disassembly. Attempting to disassemble the Motor Housing is strongly discouraged and can damage the camera system. Disassembling the motor includes removing the Motor Housing from the Skid Tray (IPL 5.2) or detaching the Side Plates (IPL 5.3-4, IPL 5.3-5) from the Top Plate and Motor Housing assembly (IPL 5.4).

- 1 If a specific problem necessitates disassembly of the Motor Housing (i.e. replacement of the gear, bearings, or springs), then use the following steps. Two people are required for this disassembly.
  1. Remove the Skid Clamps (IPL 2.2-3) from the tray and clamp the tray to a table with C-clamps.
  2. Start with the system in the up position and the Camera Boom detached.
  3. Remove the Up Stop (IPL 5.2-22).
  4. Place thin aluminum or plastic sheet beneath the springs. Secure sheet so it runs to the edge of the recession where the springs exit the Skid Tray. This should protect the Skid Tray from damage while the springs are removed.
  5. Unbolt the lower Pillow Blocks (IPL 5.3-6) and Shear Pin Bracket (IPL 5.3-8) from the Skid Tray while FIRMLY pressing the top of the Motor Housing into the tray.

**Caution:** You must physically hold the Motor Housing in place so that the springs do not snap out of position.
  6. Have a helper slide each Pillow Block off the main shaft of the Motor Housing.
  7. With the Motor Housing detached, but manually held in place, slowly move it away from the inboard edge of the tray. This should draw the lower ends of the spring out of the small holes in the Skid Tray.

**Warning:** The springs will release and quickly rotate within the housing, so be careful with your fingers.
  8. When the ends of the spring are clear of their holes, the Motor Housing can be lifted away from the tray.
  9. Further disassembly can continue as necessary (Refer to IPL Figure 5.3).
  10. If the gear shaft or springs must be removed (IPL 5.3-7), make sure to loosen the shaft clamps (IPL 5.3-35), which are hidden beneath the springs.

Note: Access these clamps most easily by prying the spring coils apart with a large flathead screwdriver. Each clamp uses a #6 screw, which accepts a 7/64 hex head.

11. Refer to the assembly instructions in Section E after completing repair or replacement.

2 Replacement of parts that support the drive shaft (IPL Figure 5.5) does not require the Motor Housing disassembly described above. The specific parts in this type of maintenance are the motor Pillow Blocks (IPL 5.5-9), shims (IPL 5.5-8), Oilites (IPL 5.5-14,28), clamps (IPL 5.5-34), and shaft/worm (IPL 5.5-27).

1. Loosen the shaft collar (IPL 5.5-33) from the motor shaft.

2. Remove the screws from the Top Plate (IPL 5.5-52).

Caution: This will transfer the spring tension onto the Up Stop.

3. You should now be able to turn the shaft by hand by gripping the shaft clamp, IPL 5.5-34. Turning the shaft essentially walks the drive assembly off of the Top Plate. Add shims or replace parts as necessary and reassemble.

3 Motor removal: The motor can be replaced without disassembling any other component of the Motor Housing.

1. Use a #1 Phillips screwdriver to loosen the four screws on the inside of the Motor Housing. The screws are accessed from the outboard side of the Motor Housing, behind the drive shaft Pillow Blocks.

(e) Skid Tray

1 Camera Stops: The Up Stop (IPL 5.3-22) can be removed from the Skid Tray as needed and with no special instructions. Do not remove this stop when also removing parts of the motor drive shaft; it is needed to restrain the Motor Housing.

Caution: The Down Stop (IPL 5.3-21) is linked to the lower Pillow Block that reacts to spring tension. Remove and replace one (1) screw at a time to hold the Pillow Block to the tray.

2 Skid Clamps: The assembled skid clamp is removed from the Skid Tray with four AN3-13A bolts (IPL 2.2-8) and AN960-10L washers.

3 Assembled Motor Housing: If the Motor Housing must be removed from the Skid Tray, refer to the disassembly of the Motor Housing, pages 302-303. Note that the Motor Housing is extremely difficult to reattach to the Skid Tray once the spring tension has been released during disassembly.

(f) Boom/Camera Assembly

1 The IMC camera head can be taken off the boom by removing the cable harness that secures it. Loosen the turnbuckle before removing the screw on the leading edge of the boom. The screws on the side of the boom should only be removed if replacing the entire cable harness.



- 2 The Ladybug 3 camera head can be taken off the boom by removing the 4 screws that attach the adapter plate to the boom. The adapter plate is taken off the camera by removing five screws.
- 3 The boom is attached to the Motor Housing with four screws and washers (IPL 2.2-10,12). These screws are accessed from the outboard side of the Motor Housing.

(g) Vibration Isolation Box (VIB)

- 1 The Headstrike Pad is attached with hook and loop fasteners.
- 2 The Inner Box of the VIB (IPL 6.2-2) is attached with eight (8) 8-32 screws to the vibration mounts. A snubbing washer (IPL 6.2-6) is used on each side of the vibration mount. To remove the Inner Box from the Outer Box of the VIB, removed the front side panels of the Outer Box that are attached with a row of 4-40 screws. Use a #1 Phillips screwdriver.
- 3 If the plastic glides are loose or damaged, they may be removed from the inner bock by drilling out the six (6) csk AD4 rivets.

E. Assembly Instructions

Subsequent paragraphs contain general practices and procedures for assembling subassemblies of the Immersive Camera Mount System prior to installation on the rotorcraft. Refer to the disassembly section for required tools and equipment.

(1) General Practices

These instructions contain the essential detail procedures for reassembly of detail parts and subassemblies, assemblies, and components, as applicable. Where applicable and following each reassembly procedure, instructions are given for testing or calibrating the individual items independently. These tests determine whether the reassembled subassembly, assembly, or component is functioning properly.

(2) Reassembly of the Retractable Camera Mount (See IPL Figures 2.2 through 5.4).

(a) Fairing

- 1 The fairing is installed with fasteners and washers to the skid tray.

(b) Skid Clamps

- 1 The Skid Clamps (IPL 3.2) are attached to the Skid Tray (IPL 2.2-5) using four fasteners (IPL 2.2-8) and four washers (IPL 2.2-13) each. The fasteners are tightened according to torque values given on page 705. The adjustable tube (IPL 3.2-4) should be installed per the installation instructions for the skid of the helicopter.
- 2 The clamp is assembled from its piece parts as shown in IPL Figure 3.2. Use LPS-2 lubricant or multipurpose grease on the threaded rod before assembly.
- 3 Rubber is attached to the contact tubes with CR3213-4-3 rivets and AN960-6 washers

(c) Torque Arm

- 1 The Torque Arm is attached to the Skid Tray with two bolts, (IPL 2.2-7, IPL 2.2-9). Assembly of the Torque Arm requires no special instructions and is illustrated in IPL Figure 2.2. Tighten according to torque values given on page 705.

(d) Motor Housing

Note: The Motor Housing is difficult to assemble because of the strong spring forces involved.

- 1 Follow these guidelines for assembling the Motor Housing.
  1. Assemble the motor, Shear Bracket, Motor Plate, and Top Plate as shown in IPL Figure 5.4. If riveting the pieces together for the first time, temporarily attach the Side Plates (IPL 5.3-4 and -5) to insure that the assembly is square before match drilling. Attach the motor loosely with the four included screws.
  2. Assemble the drive shaft as shown in IPL Figure 5.5. Use 0.02" shims (IPL 5.5-8), or the thickness previously used. Tighten the drive shaft Pillow Blocks (IPL 5.5-9) and shaft clamp (IPL 5.5-33) before final tightening of the motor screws.
  3. Refer to IPL Figure 5.3 for assembly of the main gear shaft. Do not rivet the Shear Pin bracket (IPL 5.3-8) or attach the Pillow Block assembly (IPL 5.3-6) in this step. Leave the shaft collars (IPL 5.3-35) loose.
  4. Attach the Top Plate and Motor Housing assembly from step 1 to the drive shaft assembly from step 2.
  5. Tighten the shaft collars (IPL 5.3-35) against the Side Plate. A flathead screwdriver is useful for prying the springs apart and accessing the hex screws. When tightening the shaft collars, ensure that the worm is laterally centered on the gear, and that the Side Plates (IPL 5.3-4 and 5.3-5) are not pushed outwards along the shaft.
  6. Manually rotate the springs approximately 270 degrees so that they appear as drawn in IPL Figure 5.3. This should tighten the coils of the spring, not expand them. Small-diameter steel tubing is helpful for creating leverage on the spring ends.
  7. Insert the spring ends into the holes on the Skid Tray. This is typically done simultaneously with step 6. While maintaining pressure on the top of the Motor Housing, attach the Pillow Blocks (IPL 5.3-6) to the end of the shaft and to the Skid Tray. With both Pillow Blocks attached, the Motor Housing can be released.

Note: The Down Stop is easier to install after one screw is in the Pillow Block without the stop. Add the stop with the remaining screw and remove and replace the first screw with the Down Stop.

8. The main gear should rotate and contact the top of the Skid Tray under the spring force (Assuming the Up Stop IPL 5.2-22 is not yet installed). Attach the Shear Pin bracket (IPL 5.3-8) and rivet into place with IPL 5.3-56.

(e) Skid Tray

- 1 Camera Stops: The Up Stop (IPL 5.3-22) can be added to the Skid Tray as needed and with no special instructions. The Down Stop (IPL 5.3-21) should be added with caution because it is linked to the lower Pillow Block that reacts to spring tension.
- 2 Skid Clamps: The assembled skid clamp is attached to the Skid Tray with four AN3-13A bolts (IPL 2.2-8) and AN960-10L washers.
- 3 Assembled Motor Housing: The instructions listed for the Motor Housing (part (c) of this section) explain how to attach the Motor Housing to the Skid Tray.

(f) Boom/Camera Assembly

- 1 There are no special instructions for assembly of the boom and camera. Refer to the installation instructions on page 404. The boom is attached to the Motor Housing with four screws and washers (IPL 2.2-10,12). These screws are accessed from the outboard side of the Motor Housing (the open end).

(g) Vibration Isolation Box (VIB)

- 1 The Headstrike Pad is attached with hook and loop fasteners.
- 2 The Inner Box of the VIB (IPL 6.2-2) is attached with eight (8) 8-32 screws to the vibration mounts. A snubbing washer (IPL 6.2-6) is used on each side of the vibration mount. Reattach the front side panels to the Outer Box with 4-40 screws and nuts.
- 3 The plastic glides can be reattached to the Inner Box with MS20426AD4 rivets. Determine rivet length at installation.

Final Assembly And Testing

(1) Required Parts and Tools for Final Assembly

Item No.	Part Number	Nomenclature
1	TT-T-735 Grade B	Alcohol
2	TT-T-548	Toluene
3	MIL-P-8585	Zinc chromate primer
4	IMC407-506	Shim

(2) Painting, Refinishing, and Marking

Painting, refinishing, and marking the equipment is accomplished in the following paragraphs.

Repair parts may be anodized, depending on customer requirements, and the Camera Boom may be painted as desired.

Note: If affected area is marred by corrosion, treat surface as outlined in item 1(E)(3), page 502. CHECK before finishing the area.

(a) Anodize parts per MIL-A-8625, Type III, class 2. Do not anodize assembled parts.

(b) Painting:

Note: The gears, motor shaft, motor and bearing races may not be painted.

Any part to be painted shall be clean and dry and either anodized as above, or treated with an etch and conversion coat such as Alodyne 1201C. If pre-treating is not necessary, wipe clean with toluene or xylene (item 2) to remove oil and grease. Wipe dry with clean cloth, then wipe with cloth moistened with alcohol (item 13). Prime parts with item 3. A topcoat is optional.

(c) Marking: Verify the Fliegen Works identification label is legible or replace with identical label. Verify placards are installed.

(d) Placards: Verify placards locating the weight and C.G. of the Retractable camera mount and Vibration Isolation Box are installed.

(3) Worm/Worm Gear Final Fit

When the motor housing has been removed from the skid tray, or the gear play is excessive per the testing section, the worm shaft pillow blocks are to be shimmed. Extend the mount to the down position. Loosen the 4 pillow block screws (IPC fig 5.5 items 52. Loosen the shaft clamp (IPC fig 5.5 item 33). Remove or install IMC407-506 shims so that the worm is as tight as possible but still allows for the shaft to be turned by hand through its range (90°) on the bench. Verify the play between the motor housing and skid tray, when extended is less than 1/32" Tighten pillow block screws and shaft clamp.

- (4) Final Inspection.
  - (a) Visually inspect for correct assembly.

G. Storage

Store in a clean, dry location.

H. Packaging

- (1) The boom, Torque Arm, and Skid Clamps should be removed from the Motor Housing prior to packaging unless they are in the custom transport case IMC407-161. Refer to IPL Figure 2.2 and Installation/Removal Figure 1.1 for general disassembly prior to packaging.
- (2) The items should be packaged and wrapped separately to prevent damage during transport.

3. Cleaning

A. Required Tools and Equipment.

Item No.	Specification No.	Nomenclature
1		Soap & water
2		Lint-free cloth
3	TT-T-735 Grade B	Alcohol

B. Normal Cleaning.

- (1) If installed, remove the Immersive camera head from the boom (Installation/Removal page 404).
- (2) Thoroughly clean the structure with soap and water using a soft cloth. Rinse off any soap residue with clean water.

Caution: Do not use harsh chemical cleaners or abrasive cleaning agents because they may damage the finish or promote corrosion.

- (3) Dry with a clean, lint-free cloth immediately.
- (4) Reinstall equipment.

Note: If cleaning removes lubrication, it must be replaced, see page 305, Assembly.

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## INSTALLATION AND REMOVAL

### 1. General

#### A. Consumables:

- (1) MS3367-1, cable ties, rated for 50lbs, 12X

Warning: Verify the cable ties are MIL spec and rated, substituting unrated cable ties is not allowed.

- (2) MS21256-1 clip, 2X
- (3) Waterproof binding tape per PPP-T-60 Type IV class I, such as Polyken 231.

#### B. Hardware

All required hardware is included with the Retractable Camera Mount. Figure 1.1 shows an overview of the camera mount installation and associated hardware. Note that the components can be attached in different positions to facilitate mounting on the left or right skid of the helicopter. The Retractable Camera Mount can also attach to the front or back strut of a skid.

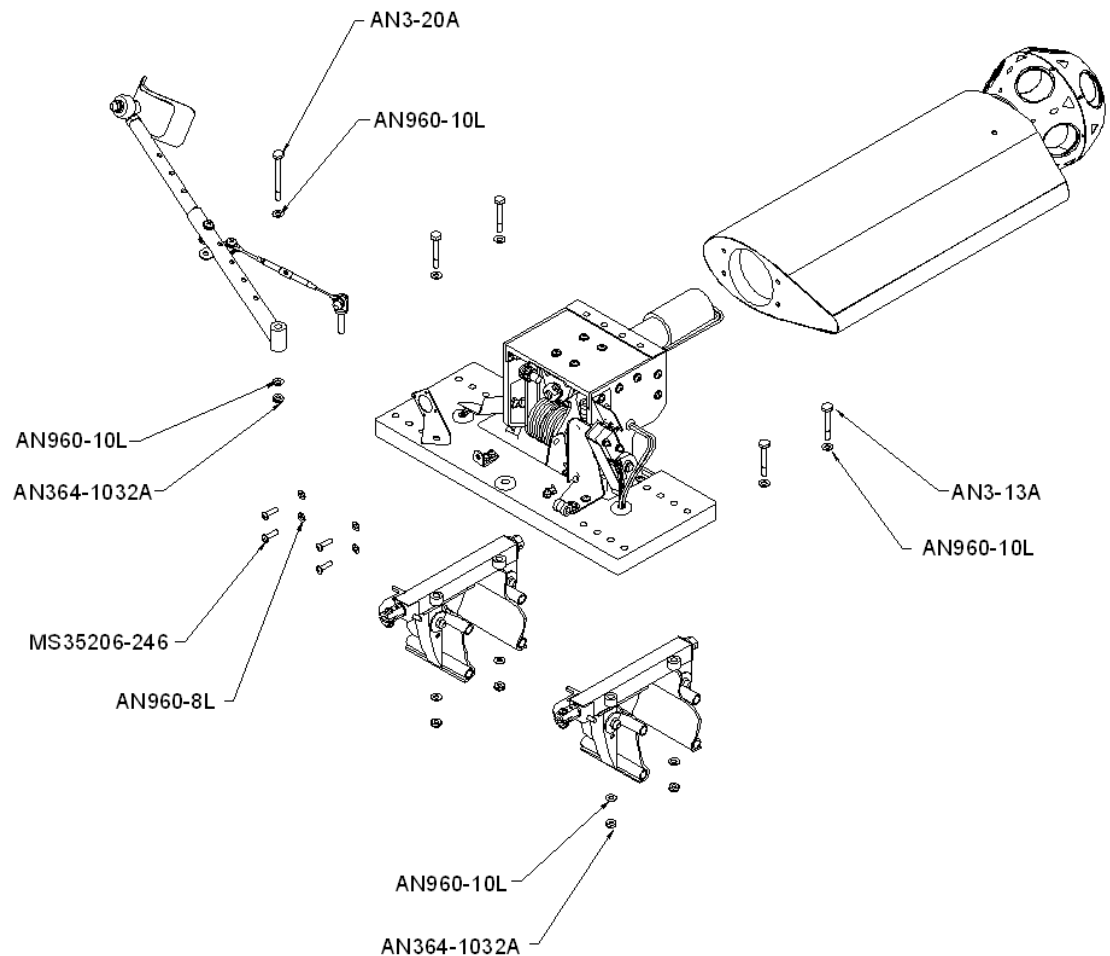


Figure 1.1: Retractable Camera Mount Assembly

### C. Required Electrical Power

The installer is responsible for providing separately FAA approved 28 VDC 7.5 Amp to 20 Amp circuit breaker and connection to the power harness. Often an auxiliary power breaker and connector is installed and may be used for this installation if sized per the above requirements.

Note: For installations longer than 1 week, it is recommended that a suitable cannon plug be installed near the VIB for power and control. The camera mount cable can also be terminated at near the step and incorporated into the cannon plug. Contact Fliegen Works for a specific helicopter detail design.

### D. Skid Clamps

- (1) Each Skid Clamp can mount to four sets of holes on the Skid Tray. Adjust the location of the clamps such that they avoid any areas on the skid that are not uniform. Leave one pair of mounting holes on the forward end for the Torque Arm.
- (2) The two upper cylindrical grips on each clamp can be adjusted for skids of various diameters. If needed, remove the hardware on the side of the clamp's arm to move the upper grips to a different hole location. When properly fitted, each cylindrical grip should be located approximately halfway between the middle and top of the skid.

Caution: If the tubes are too far apart, the lower tube will be under the bottom of the skid and the top tube will not contact the skid. The mount may become loose after take-off.

- (3) Verify that each of the 4 tubes contacts the skid symmetrically and with equal pressure.

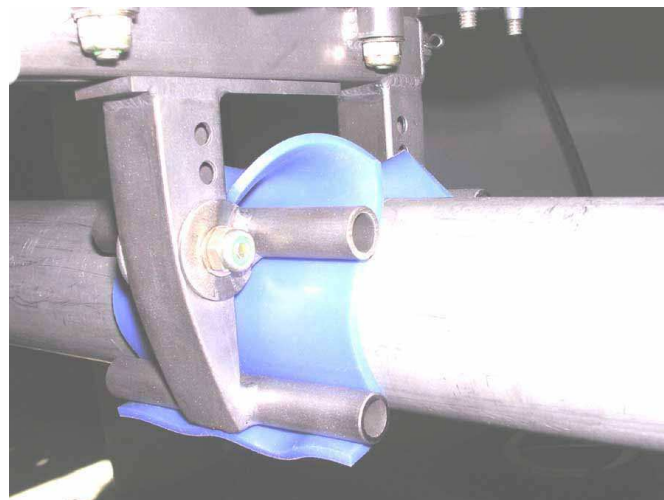


Figure 1.2: Clamps installed on small diameter skid



- (4) With the camera mount loosely mounted on the skid, adjust the Torque Arm to the proper length for the chosen clamp positions (see D. Torque Arm, page 404).
- (5) Note that the clamps tighten with a counter-clockwise turn. Each clamp handle is stepped to indicate the correct clamping strength. When the step of the handle can sit flush with the clamp body, the clamp is adequately secured. Do not tighten beyond this point. Figures 1.3a and 1.3b show the clamp handle before and after proper tightening.



Figure 1.3a: Not Closed (bad)

Figure 1.3 b: Closed (good)

- (6) Fold the clamp handle in and secure with 50lb zip ties threaded through the hole in the end of the clamp. For installations of less than 1 week, zip ties are acceptable. The clamps must be secured with safety wire for installations longer than 1 week.



Figure 1.4: Clamp closed with zip tie

E. Torque Arm

- (1) Attach the Torque Arm to the end of the Skid Tray nearest to the helicopters strut with the included hardware. Initially leave the turnbuckle loose. The Torque Arm uses AN3-11A and AN3-20A bolts to attach to the tray.
- (2) Adjust the length of the Torque Arm to squarely contact the strut. The length can be adjusted in one-inch increments by removing the through-bolt in the Torque Arm. Some additional adjustment can be made with the rod end (tighten jam nut on rod end, if adjusting). Use the shortest length of the Torque Arm permitted by the clamping position.
- (3) For installations of less than 1 week, secure the end of the Torque Arm with two (2) MS3367-1, 50lb zip ties placed around the strut. One (1) zip tie is placed around the other zip ties to secure them from moving vertically off of the support. Note that the rubber chafing pad is part of the torque arm and physically attached to it.

For installations for more than 1 week, Install two BREEZE 200-52H (ALT MS35842-15 ) hose clamps.

- (4) The turnbuckle is secured with one (1) MS21256-1 clip. The turnbuckle may be safely wired per AC43.13-1B using MS20995 wire if no clip is available.



Figure 1.5: Proper Torque Arm attachment

#### F. Camera

- (1) The camera wiring must be installed through the boom prior to attaching the boom to the rest of the system.
- (2) With the camera cabling attached and threaded through the boom, secure the camera with the cradle as shown in Figure 1.6. The turnbuckle should be tightened enough to secure the camera base to the end of the boom. The o-ring at the base of the camera should be slightly compressed.

CAUTION: Do not mar the boom when tightening the turnbuckle.



Figure 1.6: Camera head installation

- (3) The turnbuckle is secured with one (1) MS21256-1 clip. This clip must be replaced each time the camera is removed. The turnbuckle may be safely wired per AC43.13-1B if no clip is available.

#### G. Camera Boom

- (1) Thread the camera cabling through the access hole on the Motor Plate before trying to install the boom (Figure 1.7, B)
- (2) Attach the boom with the four MS35206-246 screws and AN960-L washers (Figure 1.7, A). Make sure the airfoil faces forward, with the round end toward the front of the helicopter.

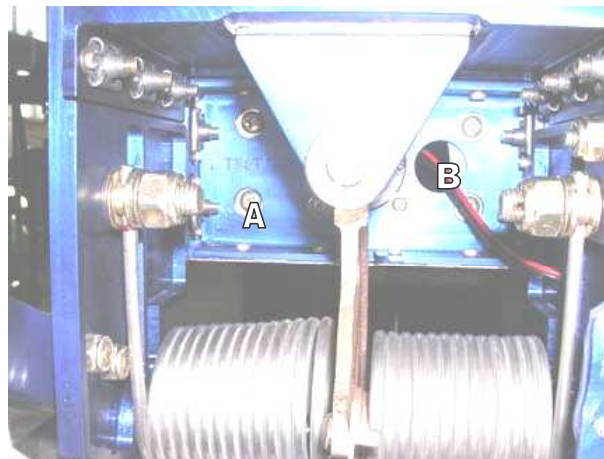


Figure 1.7: Camera Boom attachment and wiring

H. Camera System Cabling – Temporary Installation (1 week or less)

For permanent installations obtain separate FAA approval for particular installation.

- (1) Run the primary cable along the Torque Arm and up the helicopter's strut using zip ties every 6 inches along the strut and binding tape as required. Allow a drip loop at the strut/ fuselage for gear flexing. Route the cables through the window or vent. Allow slack inside so door can open. Do not obstruct either door from operating. Run the cable to the Position Control box.



Figure 1.8, Exterior Wiring Attachment

- (2) Route the cabling from the Control Box down the front side of the seat and tape to the floor to the back of the front seat. Secure the excess interior cabling to the back of the seat with zip ties and binding tape.



Figure 1.9, Interior Wiring Attachment

- (3) Route the Power Harness from the Control Box down the front side of the seat and tape to the separately installed provisions from the Auxiliary Power supply. Secure this harness with zip ties and binding tape. See Appendices.



I. Position Control Box and Electrical Power Supply

- (1) The electrical supply is comes from the rotorcraft's 28V accessory power breaker (7.5 to 20 amps.) MS3101 A 14S-1S plug and wiring is included with the camera system. This plug must be wired so that PWR-001-18 (Pin A) is attached to +28V and GND-001-18 (Pin C) is grounded.
- (2) Attach the base unit harness (A), the main power harness (B), and the camera system harness (C) to the Position Control Box as shown in Figure 1.8.

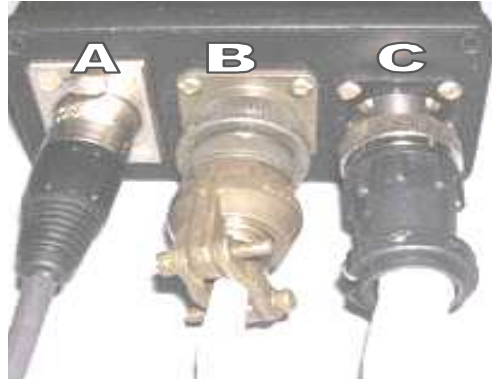


Figure 1.8: Position Control Box attachment

J. Camera Base Unit

- (1) The Immersive camera base unit should be in the Vibration Isolation Box (VIB), FW part number IMC407-701. This box must be secured to an unoccupied seat using a seat belt, and must face out from seat. For Ladybug Camera a laptop is the base unit, and it is stowed in the Stowage Box during takeoff and landing.
- (2) Run the lap belt through the cable restraint on one side of the box, over the top, and through the opposing cable restraint before buckling. Tighten the seat belt.

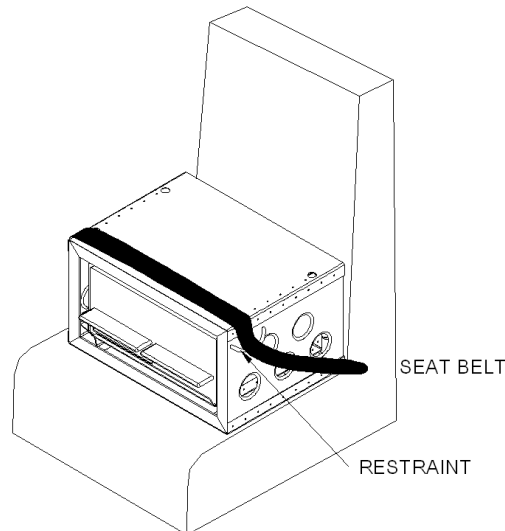


Figure 1.9: VIB Seatbelt Restraint

#### K. Position Control Box

- (1) The Position Control Box must be restrained during take-off and landing using the quick-connect lanyard (IPL 7.2-13), as shown in Figure 1.10.
- (2) Use a #2 Phillips screw driver to secure the lanyard to the Position Control Box, and clip the slide-bolt end of the lanyard to the VIB's cable restraints. Clip the lanyard to the opposite side of passengers in adjacent seats.



Figure 1.10: Position Control Box Restraint

- (3) The hand-held camera controller should also be clipped through the lanyard's slide bolt opposite of adjacent passengers, as seen in Figure 1.10.

#### L. Weight and Balance

- (1) Enter the installation on the installed aircraft equipment list and add the weight change to the empty weight of the aircraft. Add the following weights as installed:
  - The Retractable Camera Mount weighs 16 lbs. with IMC Camera, 18.8 lbs. with Ladybug 3. See C.G. placards.
  - The Vibration Isolation Box weighs 20.3 lbs with the Camera Base Unit installed. Stowage Box weighs 5.2 lbs. with provisions for 120 lbs. of combined cargo and box weight at PAX c.g. See C.G. placards.
  - The cabling of the Immersive Camera System adds 3.7 lbs to one side of the helicopter. The C.G. location of the cables is at the door where the cables enter the helicopter.
  - The Position Control Box and main power cabling weighs 3.3 lbs, and is located inside the cabin.
- (2) The longitudinal C.G. location of the Retractable Camera Mount depends on the installed location and adjusted length of the torque arm. It is recommended that the C.G. location be physically measured from the datum of the helicopter. Refer to Appendices for aircraft specific weight and balance information.
- (3) If the placards are damaged or missing, refer to the Inspection/Check section of this document, page 501.

### INSPECTION/CHECK

Note: This section defines specific wear and damage to be checked for each component. When damage is found, replacing a component may be the most practical/cost effective solution and will keep the unit looking new.

#### 1. Scheduled inspections

##### A. Daily & Post Installation Inspection

Note: These instructions do not supercede the pre-flight inspection outlined in the Rotorcraft Flight Manual Supplement for the Retractable Camera Mount. See STC for applicable document.

Retractable Camera Mount:

- 1 Check lateral Shear Pin for signs of fretting. (IPL 5.3-56)
- 2 Verify the Skid Clamps are installed correctly and handles secured with zip ties or safety wire (installation instructions and photo on page 402).
- 3 Verify the Torque Arm is braced effectively against the strut, and secured with MS3367-1, cable ties or hose clamps (installation instructions and photo page 404).
- 4 Inspect Torque Arm cable ties and replace if at all damaged.

Position Control Box:

- 5 Verify all connections are secure and the up indicator light is on when the switch is in the UP position. The camera should already be in the up position. This indicates that the box is receiving power.

Camera Base Unit:

- 6 Verify Vibration Isolation Box or Stowage Box is secured properly with a seat belt through the two loops (Installation and Removal, page 406).
- 7 Verify the red retention latches are up.
- 8 Check with camera operator that his or her equipment is functioning properly.

##### B. A-Phase Inspection – every 200 hours:

###### (1) Skid Clamps

- 1 Check for cracks and corrosion.
- 2 Check rubber for wear and damage. Damage greater than 0.25” diameter require replacement of the rubber.
- 3 On the helicopter, inspect the clamping location on the skid for chaffing or scratching. This area is highly stressed and susceptible to cracks initiated by clamping damage.

###### (2) Torque Arm

- 1 Check for signs of wear in the general structure and rubber and for cracking near the weld. If damage is found, the clamp should be returned to Fliegen Works Inc. for repair or replacement.

- 2 Check for cracks and corrosion.
- 3 Check rubber for wear and general condition. Damage greater than 0.25" diameter requires replacement of the rubber.
- 4 On the helicopter, inspect the torque arm clamping location on the strut/crosstube for chaffing or scratching. This area is highly stressed and susceptible to cracks initiated by clamping damage.

(3) Motor Housing

- 1 Check for general wear to the structure and for play between the worm and gear. If significant play exists (more than 1/32" at the worm/gear interface), the Pillow Blocks must be shimmed. Remove the Pillow Block hardware, loosen the four motor attachment screws, and shim the Pillow Blocks as needed. Secure the Pillow Block screws before tightening the motor attachment screws.

Note: If play is not removed by shims, the motor shaft may be bent. Radial play greater than 0.005" requires replacement. See Fits and Clearances, page 701.

(4) Fairing

- 1 Check for cracks and delaminating in the fiberglass fairing. Any damage greater than 1" in length or within 1" of the attachment of the fairing requires repair or replacement.
- 2 Placard: The weight and C.G. of the Retractable Camera Mount should be clearly marked on the upper surface of the fairing. If the placard is missing or damaged, mark the C.G. as located 1.75 inches from the beginning of the boom, and centered fore/aft along the fairing.

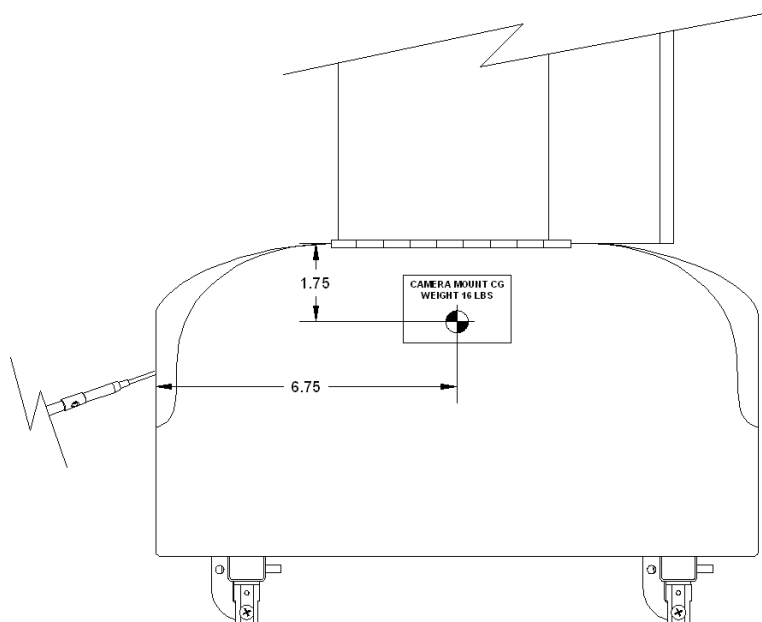


Figure 1.1: Top View, C.G. Location



(5) Camera Boom

- 1 Inspect the Camera Boom for general wear, particularly for damage to the sheet metal structure.

(6) Sheet Metal Damage

Four types of damage are considered; dents, scratches, corrosion, and errant holes. The repair limits are as follows:

(a) Dents

- 1 Dents that are less than 0.5" long and are less than .063 deep may be present with no repair in any of the sheet metal parts.
- 2 Dents up to 1" in length and up to .25 deep in any of the sheet metal parts may be repaired per the repair section. Dents larger than those prescribed above must have the damaged part replaced.

(b) Scratches

- 1 Scratches up to .007 deep and less than 1.0 inch in length may be feathered and refinished.
- 2 Scratches up to .010 deep and less than 2 inch in length may be repaired per the repair section. Scratches larger than those prescribed above require replacement of the component.

(c) Corrosion

- 1 Corrosion, when found, should be thoroughly removed by sanding and/or scrubbing prior to determining the depth of the damage. Damage up to .007 deep and less than 1.0 inch in length may be feathered 4:1 and refinished.
- 2 Corrosion up to 0.010 inches deep, and less than 2.0 inches in length, may be repaired. If corrosion is larger than that prescribed above, replace the component.

(d) Errant Holes and Damage

- 1 Errant holes smaller than 0.20" diameter and over 2.0" apart are acceptable on the boom structure.
- 2 Holes and damage greater than that prescribed above require repair per the repair section, or may require the component replaced.

(7) Vibration Isolation Box or Stowage Box

Inspect the VIB or Stowage Box for general wear, particularly for damage to the sheet metal structure. Four types of damage are considered; dents, scratches, corrosion, and errant holes. The repair limits are as follows:

(a) Dents

- 1 Dents less than 1.0" long and less than .063 deep may be present with no repair in any of the sheet metal parts.
- 2 Dents up to 3" in length and up to .25 deep in any of the sheet metal parts may be repaired per the repair section. Dents larger than those prescribed above must have the damaged part replaced.

- (b) Scratches
  - 1 Scratches up to .01" deep and less than 1.5 inch in length may be feathered and refinished.
  - 2 Scratches up to .010 deep and less than 3.0" in length may be repaired per the repair section. Scratches larger than those prescribed above require replacement of the component.
- (c) Corrosion
  - 1 Corrosion, when found, should be thoroughly removed prior to determining the depth of the damage by sanding and/or scrubbing. Damage up to .01" deep and less than 1.5" in length may be feathered 4:1 and refinished.
  - 2 Corrosion up to 0.015 inches deep, and less than 3.0 inches in length may be repaired. If corrosion is larger than that prescribed above, replace the component.
- (d) Vibration Mount Damage
  - 1 Visually inspect the rubber of the vibration isolation mounts. Cracks or tears in the rubber require replacement.
- (e) Glide Plate Damage
  - 1 The glide plates are riveted to the Inner Box of the VIB. If a glide plate is loose or deformed such that it could damage the Camera Base Unit, then it should be replaced.
- (f) Weight and C.G. Placard
  - 1 The weight of the VIB should be clearly listed as 20.3 lbs, with the C.G. shown centrally located on the upper foam pad of the box.
- (8) Position Control Box:
  - 1 Check Box for general condition.
  - 2 Check condition of placards.
  - 3 Check Indication Lights. Use the Position Control Box to drive the camera up and down when the system is not installed on a helicopter. Verify that all three lights function properly. Refer to Testing and Fault Isolation, page 201, for further detail.

Green: camera up  
Yellow: when motor is running  
Blue: camera down

- (b) Check condition of connectors and cables.

2. Special Inspections

A. Hard Landing

(1) After a hard landing or severe turbulence – prior to the equipment's next flight:

- 1 Check Immersive Camera Mount for general condition.
- 2 Check Shear Pin and Shear Bracket for deformation.
- 3 Inspect the Up/Down Stops (IPL 5.2-21, 5.3-22) for deformation.
- 4 Inspect the Up/Down Triggers (IPL 5.3-16, 5.3-17) and limit switch brackets (IPL 5.3-15).
- 5 Check clamps, Torque Arm, and boom for cracks, dents, and deformation.
- 6 If further damage is suspected, proceed to Testing and Fault Isolation, page 201.

B. Camera-down Landing

(1) After landing with unit down:

- 1 Visually inspect the extent of damage. Refer to Testing and Fault Isolation page 201 and Repairs page 601.
- 2 Order new Retractable Camera Mount or parts as necessary.

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## REPAIRS

### 1. Repair

#### A. Required Tools and Equipment

Item No.	Nomenclature	Specification No.
1	2024-T3 aluminum	QQ-A-250/5
2	MS20426AD3-XX, rivet	
3	CR3213-4-XX, rivet, cherry	

#### B. Sheet Metal Repair (Camera Boom and VIB)

(1) Repair of sheet metal damage.

Use the FAA guidelines stated in AC 43.13-1B sheet metal repair section 4-58.

(a) Repair patch

Fabricate a repair patch of the same gauge 2024-T3 aluminum (item 1), with 2 rows of MS20426AD3 rivets (or CR3213-4-XX if needed), at a 3/4" staggered pitch, and extending 7/8" past the damage. Finish.

#### C. Fiberglass Repairs

(1) Repair of fiberglass damage:

Use FAA guidelines stated in AC 43.13-1B composite repair section 3-2.

(a) The composite parts are made from West systems 105 epoxy with 206 hardener. The use of vacuum bagging is recommended.

#### D. Electrical Components

(1) Position Control Box

(a) The LED indicators, connectors, switches, circuit breakers, and diodes may be replaced if necessary. Refer to IPL Figure 7.1 for specific part numbers and Figure 1.1 on page 603 for the electrical wiring schematic.

(2) Retractable Camera Mount

(a) The limit switches, wiring, and connectors may be replaced if damaged. Label all replaced wires as they were on the original, and as indicated on the electrical wiring schematic, Figure 1.1, page 602.

#### E. Motor Housing

(1) Refer to Maintenance Practices, page 303, for instructions on shimming and disassembly of the Motor Housing.

F. VIB Headstrike Pad

- (1) The cover of the headstrike pad may be replaced with fabric or leather that passes FAR 29.853 vertical burn test.
- (2) Foam is Ensolite AHC, and may not be replaced with any other material.

G. Other Repair

Other than the Camera Boom, damage to the system or components that necessitates permanent repair will require return to Fliegen Works Inc.

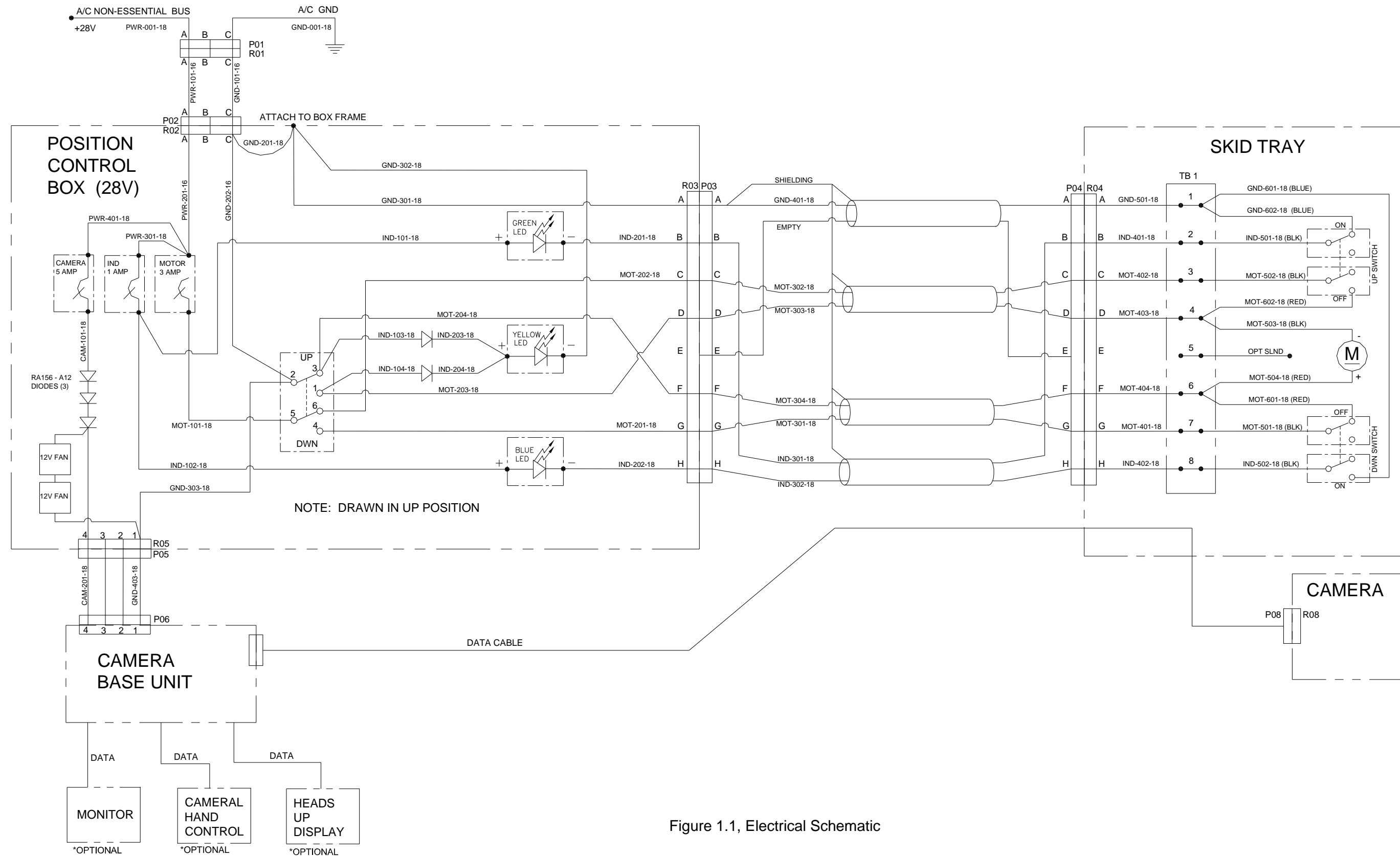


Figure 1.1, Electrical Schematic

Fliegen Works Inc.  
Portland, OR  
503 221-4001

Component Maintenance  
Manual & ICA

IMMERSIVE CAMERA  
MOUNT SYSTEM

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FITS AND CLEARANCES

1. General

This section contains all fits and clearances and torque values used in assembly, including permissible “in-service/service wear”, and manufacturers design wear tolerances.

2. Fastener Fits

The following table presents the size limitations for various fasteners/parts holes.

<b>Fastener/Part Identification.</b>	<b>Nomenclature</b>	<b>Hole Size</b>	<b>Preferred Drill Size</b>
MS20470AD3 MS20426AD3	Rivet	.096 - .101	40
MS20470AD4 MS20426AD4 CR3213-4	Rivet	.128 - .131	30
MS20470AD5 MS20470D5	Rivet	.159 - .160	21
4-40	Screw	.112 - .128	30
6-32	Screw	.138 - .149	24
8-32	Screw	.164 - .177	18
10-32	Screw	.188 - .201	11
AN3	Bolt		
AN6	Bolt	.375 - .397	V

3. Bearing Fits

The following table presents the size limitations for various bearing interfaces on the Retractable Camera Mount. Note that the Nyliner bearings have no tolerance listed because they are adaptable to the bearing hole size. If components are found to be significantly outside their listed tolerance, then replacement is required.

<b>IPL Number</b>	<b>Nomenclature</b>	<b>Dimension Tolerance</b>
IPL 5.3-7	Shaft, Gear, Motor Housing	OD = 0.3745 – 0.3755
IPL 5.3-6	Pillow Block, Gear Shaft, Motor Housing	ID = 0.434 – 0.436
IPL 5.3-30	Bearing, Nyliner	N/A
IPL 5.3-13	Bearing, Modified, Motor Housing (Nyliner)	N/A
IPL 5.3-10	Shaft, Motor, Motor Housing	OD = 0.3125 - 0.3135
IPL 5.3-9	Pillow Block, Motor Shaft, Motor Housing	ID = 0.4395 - 0.4420,
IPL 5.3-28	Bearing, Oilite	ID = 0.3135 - 0.3145 OD = 0.3995 - 0.4005
IPL 5.3-14	Bearing, Modified, Motor Housing (Oilite)	ID = 0.3135 - 0.3145 OD = 0.3995 - 0.4005

4. Clearances:

The fairing is to have a minimum clearance to the motor housing of .050 throughout the booms travel. If the clearance is below that value, investigate cause for the fairing movement. If the clearance can not be restored by adjusting the attaching fasteners, then the fairing may be ground to provide clearance.

5. Torque

A. Values

Values for applying torque to fasteners are given in inch-pounds in this specification. English units are given in inch-pounds, in-lb, as well as foot-pounds, ft-lb. 12 in-lb = 1 ft-lb. Conversions are as follows:

<u>Multiply</u>	<u>by</u>	<u>to obtain</u>
Foot-pounds, ft-lb	12	inch-pounds, in-lb.
Inch-pounds, in-lb	0.0833	Foot-pounds, ft-lb

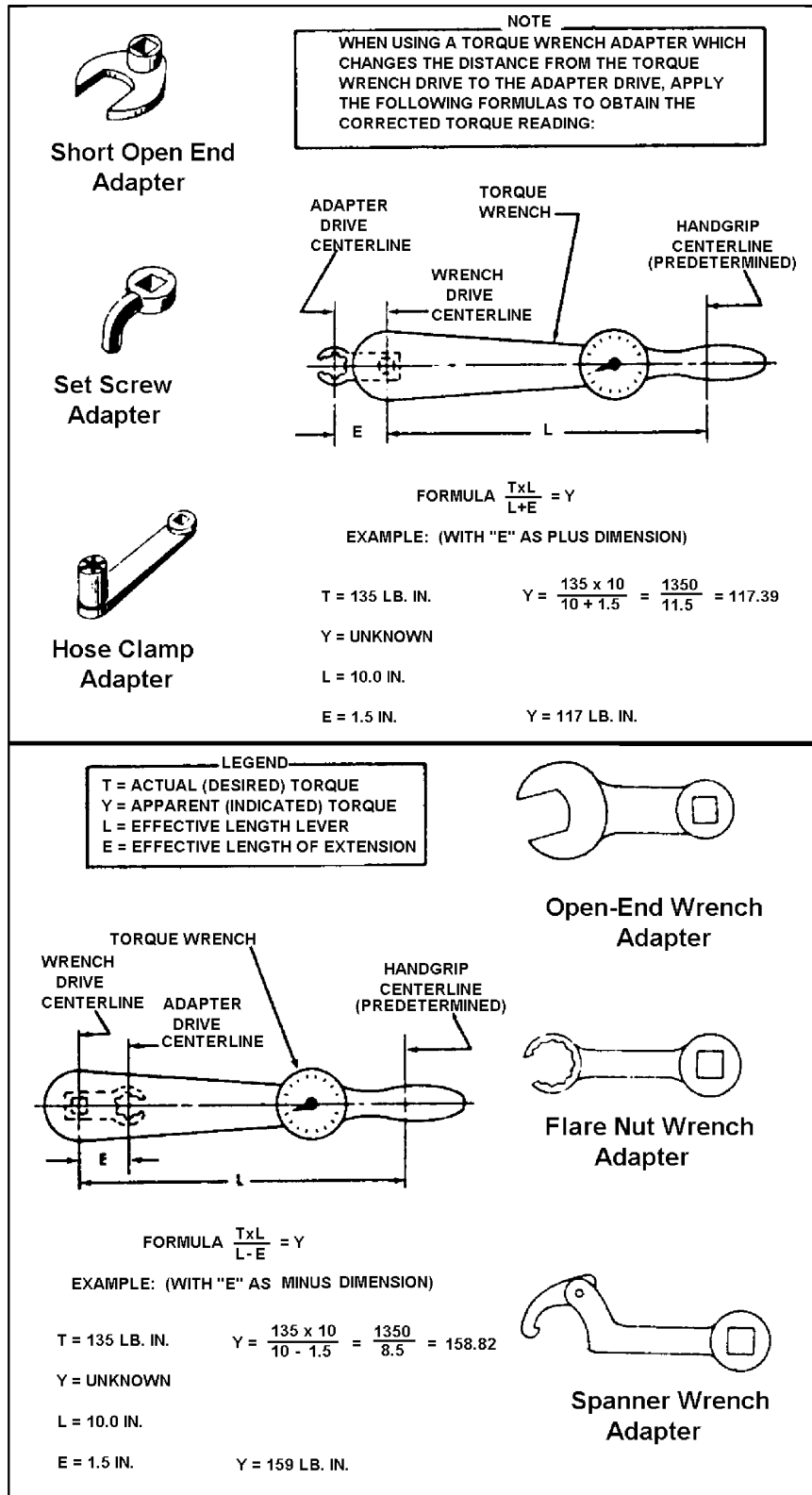
B. Tooling Requirements

1) Calibrated torque wrench

A calibrated torque wrench with the proper operating limits for the hardware should be chosen. The torque wrench is to have a valid and current calibration sticker affixed to it. Calibration is required traceable to NIST. Torque wrenches without a calibration sticker may not be used.

2) Torque values when using adapters

If adapters are used that affect the length of the torque wrench, the final torque indication must be adjusted accordingly. Determine the torque wrench setting as shown in the following figure, and be sure to account for friction drag after determining the desired setting.



### C. Hardware Cleanliness

All hardware is to be free from dirt, grit, and grease. Stainless steel hardware is particularly susceptible to galling when threaded parts have any dirt or grit on them. All stainless hardware should be stored in a way that prevents contamination from dust, for example, by keeping it in sealed bags or in closable bins. When stainless steel hardware is used, it should be kept bagged until it is installed. If stainless steel hardware is removed from an assembly for shipping, it should be wiped clean and re-bagged until re-assembly. Any dirty hardware should be thoroughly cleaned and lubricated with any dry film lubricant, such as LPS 1, Teflon, silicone, Mold Release, Krytox, cetyl alcohol, etc.

### D. Torque Procedure

Be sure the hardware is clean and dry unless specified on the drawing. Run the nut down to near contact with the washer or bearing surface and check the friction drag torque required to turn the nut. Whenever possible, apply the torque to the nut and not the bolt. This will reduce rotation of the bolt in the hole and reduce wear. Add the friction drag torque to the desired torque. This is referred to as "final torque," which should register on the dial or setting for a snap-over type torque wrench. Apply a smooth even pull when applying torque pressure. If chattering or a jerking motion occurs during final torque, back off and re-torque. If this happens again, disassemble and check the threads for galling or burrs, discard if any are found. If a hardware assembly is torqued beyond the maximum torque, the items shall be disassembled, inspected for damage, re-assembled, and properly torqued.

See the sections on reused hardware and the use of adapters if applicable.

### E. AN Bolts

#### (1) Torque

All AN bolts shall be properly torqued to the values in Figure 4.2 unless otherwise called out on the drawing. If torquing an assembly deforms a part, Fliegen Works Inc. should be notified or the part repaired. Deformation may occur during the assembly of plastic parts, electrical components, straps, etc.

TABLE 7-1. Recommended torque values (inch-pounds).

CAUTION THE FOLLOWING TORQUE VALUES ARE DERIVED FROM OIL FREE CADMIUM PLATED THREADS.				
TORQUE LIMITS RECOMMENDED FOR INSTALLATION (BOLTS LOADED PRIMARILY IN SHEAR)			MAXIMUM ALLOWABLE TORQUE LIMITS	TIGHTENING
Thread Size	Tension type nuts MS20365 and AN310 (40,000 psi in bolts)	Shear type nuts MS20364 and AN320 (24,000 psi in bolts)	Nuts MS20365 and AN310 (90,000 psi in bolts)	Nuts MS20364 and AN320 (54,000 psi in bolts)
FINE THREAD SERIES				
8-36	12-15	7-9	20	12
10-32	20-25	12-15	40	25
1/4-28	50-70	30-40	100	60
5/16-24	100-140	60-85	225	140
3/8-24	160-190	95-110	390	240
7/16-20	450-500	270-300	840	500
1/2-20	480-690	290-410	1100	660
9/16-18	800-1000	480-600	1600	960
5/8-18	1100-1300	600-780	2400	1400
3/4-16	2300-2500	1300-1500	5000	3000
7/8-14	2500-3000	1500-1800	7000	4200
1-14	3700-5500	2200-3300*	10,000	6000
1-1/8-12	5000-7000	3000-4200*	15,000	9000
1-1/4-12	9000-11,000	5400-6600*	25,000	15,000
COARSE THREAD SERIES				
8-32	12-15	7-9	20	12
10-24	20-25	12-15	35	21
1/4-20	40-50	25-30	75	45
5/16-18	80-90	48-55	160	100
3/8-16	160-185	95-100	275	170
7/16-14	235-255	140-155	475	280
1/2-13	400-480	240-290	880	520
9/16-12	500-700	300-420	1100	650
5/8-11	700-900	420-540	1500	900
3/4-10	1150-1600	700-950	2500	1500
7/8-9	2200-3000	1300-1800	4600	2700
<p>The above torque values may be used for all cadmium-plated steel nuts of the fine or coarse thread series which have approximately equal number of threads and equal face bearing areas. * Estimated corresponding values.</p>				

Figure 4.2 Recommended Torque Values,  
(from AC43.13-1B table 7-1)

(2) Torque order

When groups of bolts are torqued, the outermost bolts shall be torqued first, and the inner bolts last. When applying torque to circular patterns, the bolts should be torqued across the circle, in a star pattern.

(3) Bolt Length

All bolt installations that involve a self-locking nut or plain nut shall have a minimum of 1 full thread of the bolt protruding through the nut. The shank of the bolt must not contact the nut when the nut is torqued. If the above conditions cannot be met, a bolt of the next dash number longer or shorter should be installed (see section 3.1, page 707, on washer stack-up).

F. Special Bolts, Seat Track Fittings

(1) Torque

Torque per Figure 4.2.

G. Screws

Screws that are non-threaded shank, are size 10 or larger, and are installed with a loose nut, shall be torqued to the values listed in Figure 4.2. Other screws should be tightened by hand approximately 1/4 turn past run-up of the assembly. Brass and aluminum screws are easily stripped, so care should be exercised not to over-torque.

(1) Screw Length

All screw installations that involve a self-locking nut or plain nut shall have a minimum of 1 full thread of the screw protruding through the nut. The shank of the screw must not contact the nut when the nut is torqued. If the above conditions cannot be met, a screw of the next dash number longer or shorter may be installed.

H. Nuts

(1) Self-locking Nuts

Self-locking nuts, when re-used, must have at least the minimum prevailing torque from Figure 4.3. Nuts smaller than those listed in the table shall not be used if they can be run up by hand.

Fine Thread Series	
Thread Size	Minimum Prevailing Torque (in-lb)
7/16-20	8
1/2-20	10
9/16-18	13
5/8-18	18
3/4-16	27
7/8-14	40
1-14	55
1-1/8-12	73
1-1/4-12	94
Coarse Thread Series	
Thread Size	Minimum Prevailing Torque
7/16-14	8
1/2-13	10
9/16-12	14
5/8-11	20
3/4-10	27
7/8-9	40
1-8	51
1-1/8-8	68
1-1/4-8	88

Figure 4.3  
 Minimum Prevailing Torque Values for Re-used Self-locking Nuts,  
 (from AC43.13-1B table 7.2)

I. Washers

The addition of washers to an assembly to eliminate threads in bearing is allowed. An assembly may have up to 2 washers under a nut and 1 washer under a bolt head.

The substitution of a thin washer for a thick washer to provide adequate thread engagement is allowed. The removal of a washer under the head of a bolt is allowed, provided the bolt does not rotate and can be tightened from the nut end. It is preferable that the fastener has the proper nominal grip length. If the stack up is such that variations in tolerances or coating thickness changes, changing the washer thickness or adding washers is preferred.

J. Re-use of Hardware

If any hardware is reassembled, special attention should be paid to the quality of the threads. If the hardware requires excess torque to assemble, or chatters during assembly, discard the hardware; the threads are likely damaged and are galling.

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SPECIAL TOOLS, FIXTURES, AND EQUIPMENT

1. General

A. Facilities.

The repair facility shall be equipped to perform all phases of overhaul and modifications as directed in this CMM. These facilities shall include, but are not limited to, machine shop, cleaning, and testing. Facilities shall have such environmental control as to provide the greatest possible care to prevent damage and deterioration to equipment during storage, movement, unpacking, overhaul and repair operation, and testing, as well as after acceptance.

B. Support Items.

(1) Special Tools and Equipment.

Special tools and equipment required to overhaul as directed by this CMM are listed in Figure 1.1. The table lists the tools and equipment by nomenclature, part number, and technical description. Possession of all tools and equipment listed is not to be construed as mandatory when the repair facility may have similar tools and equipment at the facility, or can locally purchase or manufacture adequate tools and equipment to accomplish all job functions in a competent and efficient manner.

Item No.	Part Number	Nomenclature	Technical Description
-	-	Torque Wrench	12-200 in-lb.
-	G27	Hand Riveter	CherryMAX tools
-	G750A	Power Hydraulic Riveter	CherryMAX tools
-		Screwdriver	#1 Phillips
-		Screwdriver	#2 Phillips
-		Wrench or socket	1/4"
-		Wrench or socket	5/16"
-		Wrench or socket	11/32"
-		Wrench or socket	3/8"
-		Wrench or socket	1/2"
-		Drill	#40
-		Drill	#30
-		Hex key	3/32"
-		Hex key	7/64"

Table of Special Tools and Equipment  
 Figure 1.1

(2) Fabricated Tools and Equipment.

There are no fabricated tools for this CMM.

(3) Finite Life Items, Time Between Overhaul (TBO) Items, and Mandatory Replacement Parts.

Not applicable.

(4) Repair Parts.

Repair and replacement parts as required for overhaul, modification, and repair of MCS assembly can be found in the IPL, page 1000.

C. Modifications.

(1) Monitor. A small 1 lb monitor may be attached to the VIB with 2 fasteners that are at least 8-32. The monitor mounting must be below the head strike pad and easily fold out of the way with a non-rigid articulated arm.

(2) Adel Clamps. The addition of MS21919WDGxx clamps may be installed to facilitate the routing of hoses and cables. The clamps are to be mounted with MS21059L3 nutplates and the proper grip length AN3 bolt or MS27039-1-xx screw.

2. Standards

A. Quality of Material.

Parts and materials used for replacement, repair, and modification of the Immersive Camera Mount assembly will comply with the applicable drawings and specifications, unless otherwise specified in the CMM.

B. Man-hour Standards.

Pre flight: 3 minutes

A-phase: 45 minutes

B-phase: 2 hours

C. Electromagnetic Compatibility Standards.

Not applicable.

## ILLUSTRATED PARTS LIST

### 1. Introduction

#### A. Statement of purpose of IPL.

The purpose of this Illustrated Parts List is to provide the repair facility with detailed parts data for repair or replacement of components.

#### B. Explanation of how to use IPL.

A numerical parts list and detailed exploded views of the component are provided. Figure 2.2 shows the top-level assembly, and is where you should start. Figures 2.2 and greater show breakdowns of individual sub-components.

Find the part or subassembly of interest, locate the applicable figure, find the appropriate number from the figure, and then find the corresponding part number in the table immediately following the figure.

#### C. List of abbreviations and list of terminology that has varying interpretations...

Not applicable

#### D. List of names and addresses of all vendors supplying items or articles...

Fliegen Works Inc.  
921 SE 47th Ave.  
Portland, OR 97215  
503 221-4001

#### E. Explanation of the model/series/type of the unit covered by the parts list.

IMC407-100 and subassemblies are covered by this IPL and are in the following order:

1. IMC407-150, Skid Tray Assembly
2. IMC407-700, Vibration Isolation Box Assembly, IMC407-702, Stowage Box Assembly.
3. IMC407-8XX, Position Control Box and Electrical Components.

The Camera Head and Camera Base Unit parts data may be available from Immersive Media.

The installation in the aeronautical product may contain additional items that are not covered here. Consult the equipment manufacturer's data for parts data.

2. Top-Level Assembly Overview

Part Number	Nomenclature	Fig.	Item	QTY REQ.
IMC407581	Fairing, Motor Housing	2.2	1	1
IMC407-200-01	Assembly, Camera Boom	2.2	2	1
IMC407-200-02	Assembly, Camera Boom	2.2	2	ALT
IMC407-300	Assembly, Clamp	2.3	3	2
IMC407-400	Assembly, Torque Arm	2.3	4	1
IMC407-500	Assembly, Motor Housing	2.3	5	1
			6	
AN3-11A	Bolt	2.3	7	1
AN3-13A	Bolt	2.3	8	4
AN3-20A	Bolt	2.3	9	1
MS35206-246	Screw	2.3	10	4
IMC407-519	Bracket, Skid Tray Harness	2.3	11	1
AN960-8L	Washer	2.3	12	4
AN960-10L	Washer	2.3	13	12
			14	
AN364-1032A	Nut	2.3	15	12
			16	
MIL-T-55164-1-37TB-6	Terminal Block	N.S.	N.S.	1

Numerical Index: IMC407-150, Top-Level Assembly  
 Figure 2.1

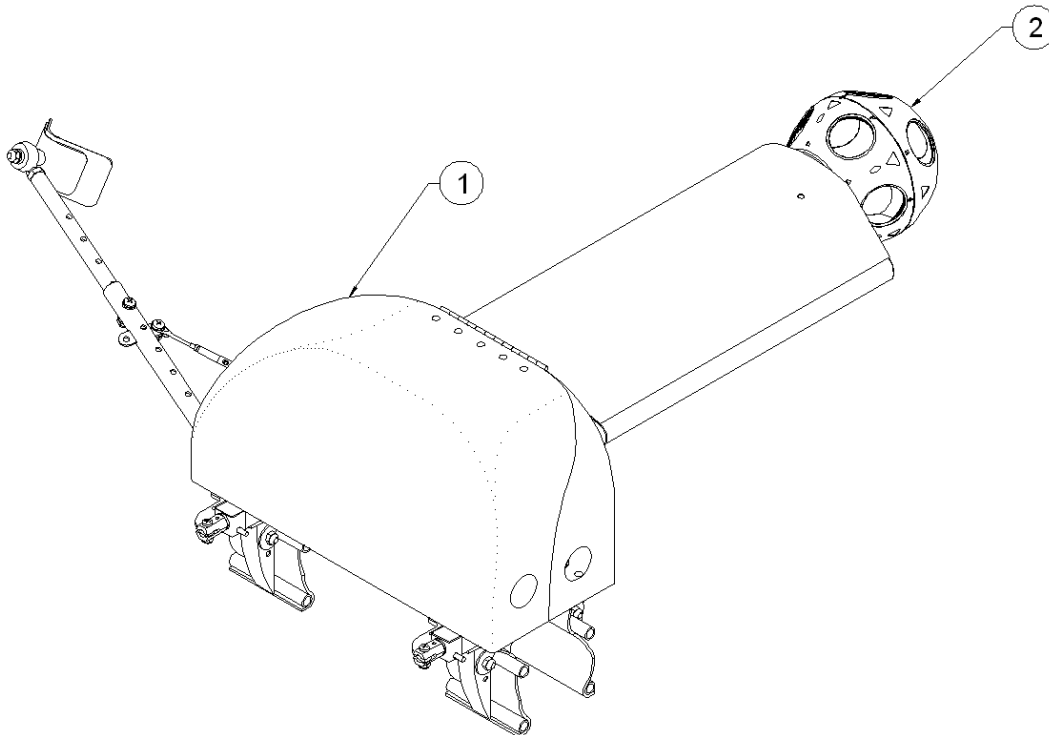


Figure 2.2: Top-Level Assembly, With Fairing

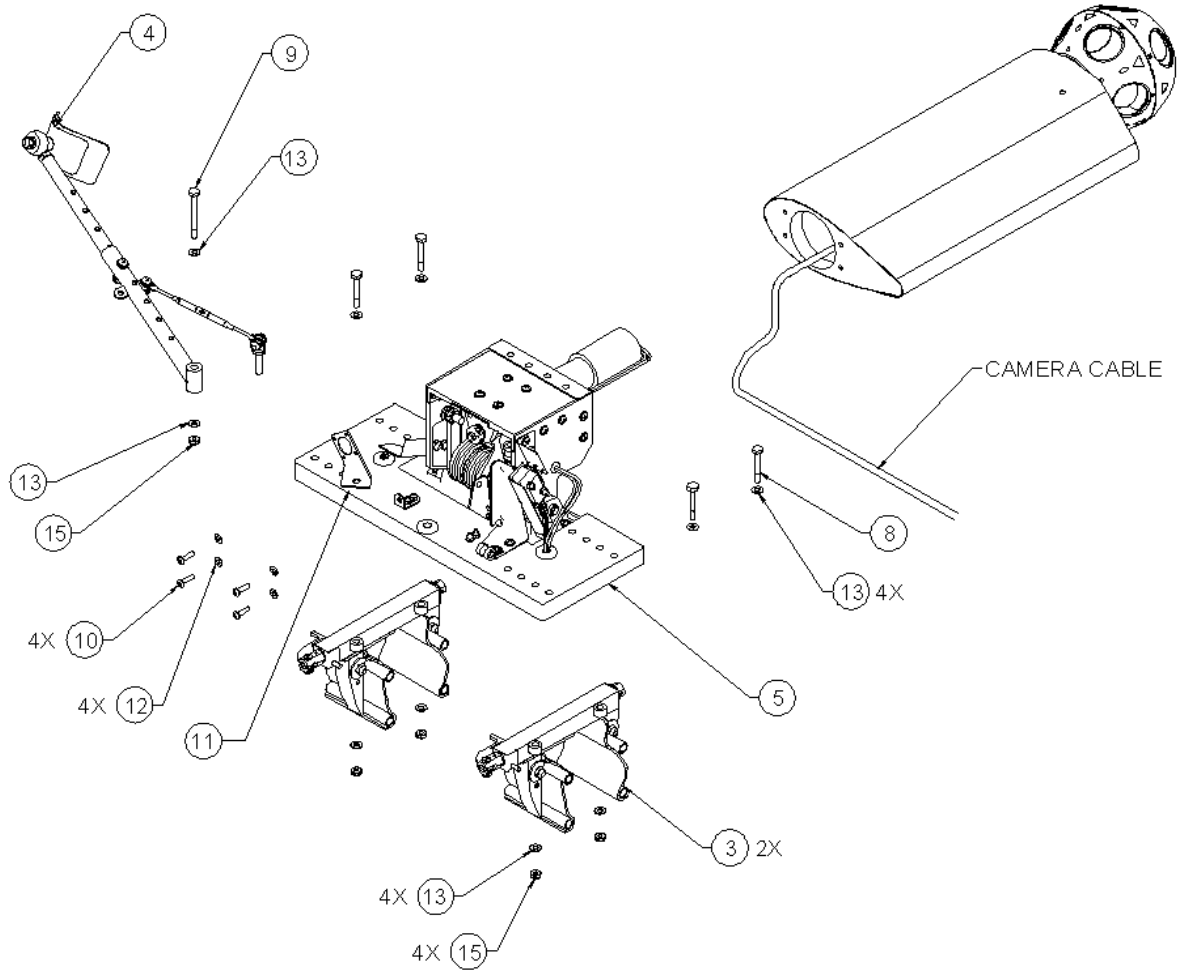


Figure 2.2: Top-Level Assembly, Without Fairing

3. Clamp Assembly, IMC 407-300

Part Number	Nomenclature	Fig.	Item	QTY REQ.
IMC407-301	Weldment, Clamp	3.2	2	1
IMC407-320	Weldment, Carriage, Clamp	3.2	3	1
IMC407-310	Weldment, Adustable Tube, Clamp	3.2	4	2
IMC407-330	Bumper, Clamp	3.2	5	2
IMC407-331	Rod, Clamp	3.2	6	1
IMC407-333-01	Nut, Modified, Clamp	3.2	7	1
IMC407-334	Handle, Clamp	3.2	8	1
IMC407-335	Cap, C, Clamp	3.2	9	1
AN960-10	Washer	3.2	10	2
AN365-832	Nut	3.2	11	2
AN365-1032	Nut	3.2	12	2

Part Number	Nomenclature	Fig.	Item	QTY REQ.
IMC407-333-02	Nut, Drilled 5/16-18	3.2	13	1
			14	
			15	
AN960-8	Washer	3.2	16	2
AN960-516	Bolt	3.2	17	2
IMC407-919	Spring Washer	3.2	18	1
			19	
			20	
MS27039-0818	Screw	3.2	21	1
MS27039-0811	Screw	3.2	22	1
MS27039-1-18	Screw	3.2	23	2
			24	
			25	
	Cotter Pin	3.2	26	2
			27	
IMC407-205	Clamp, Cable, Camera Head	3.2	n.s	
CR3213-4-XX	Rivet, Cherry	3.2	29	8

Numerical Index: Clamps  
 Figure 3.1

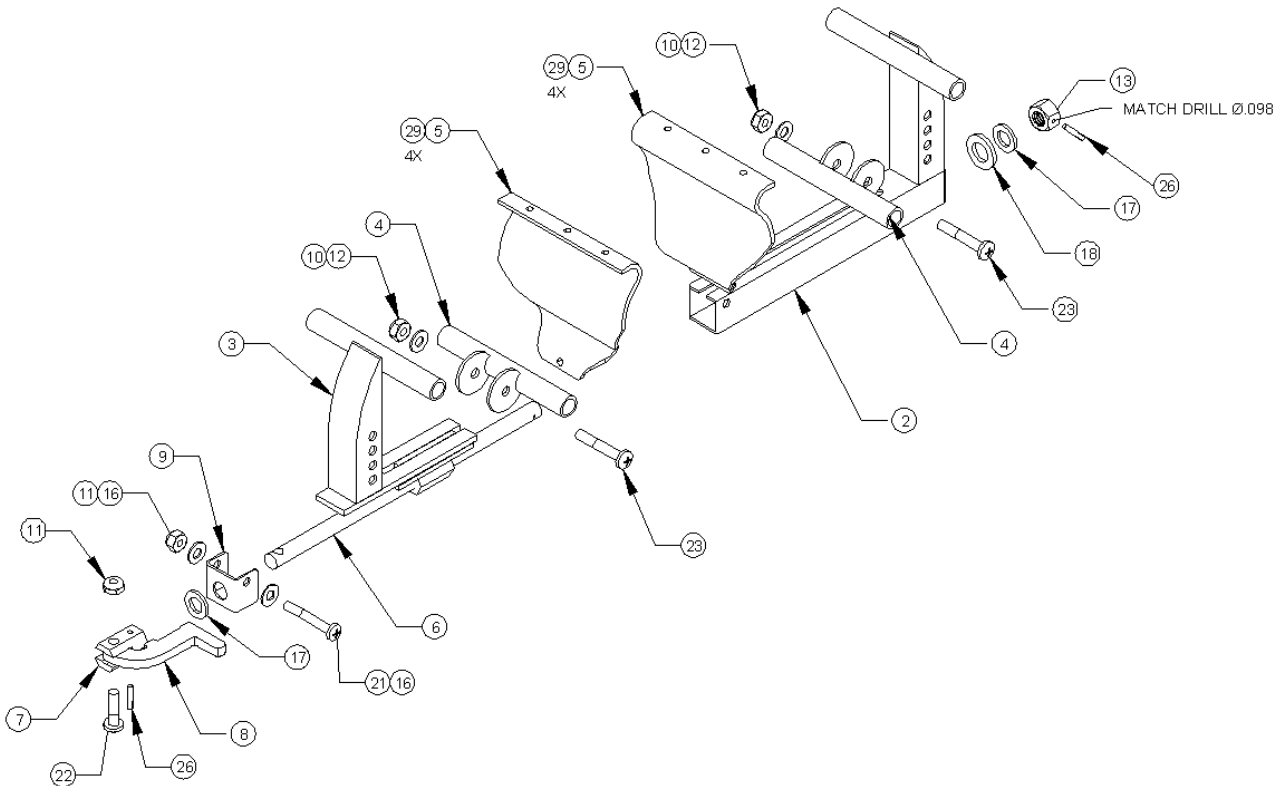


Figure 3.2: Clamp Assembly

4. Torque Arm Assembly, IMC407-400

Part Number	Nomenclature	Fig.	Item	QTY REQ.
IMC407-401	Weldment, Torque Arm	4.2	2	1
IMC407-405	Insert, Torque Arm	4.2	3	1
IMC407-410	Weldment, Capture, Torque Arm	4.2	4	1
			5	
			6	
AN365-1032	Nut	4.2	7	4
AN316-5R	Nut	4.2	8	1
AN960-6	Washer	4.2	9	2
AN960-10	Washer	4.2	10	7
			11	
MS24693-279	Screw, CSK	4.2	12	1
MS27039-1-10	Screw	4.2	13	2
MS27039-1-16	Screw	4.2	14	1
			13	
MS21252-2RS	Clevis End	4.2	16	1
MS21251-B2S	Turnbuckle	4.2	17	1
MS212552LS	Eye End	4.2	28	1
MS21256-1	Clip, Turnbuckle	4.2	19	2
MD35-14	Rod End	4.2	20	1
CR3213-4	Rivet	4.2	21	2
IMC407-905	Rubber, 3"x5"	4.2	22	1
AN42B-11	Eyelet	4.2	23	1

Numerical Index: Clamps  
 Figure 4.1

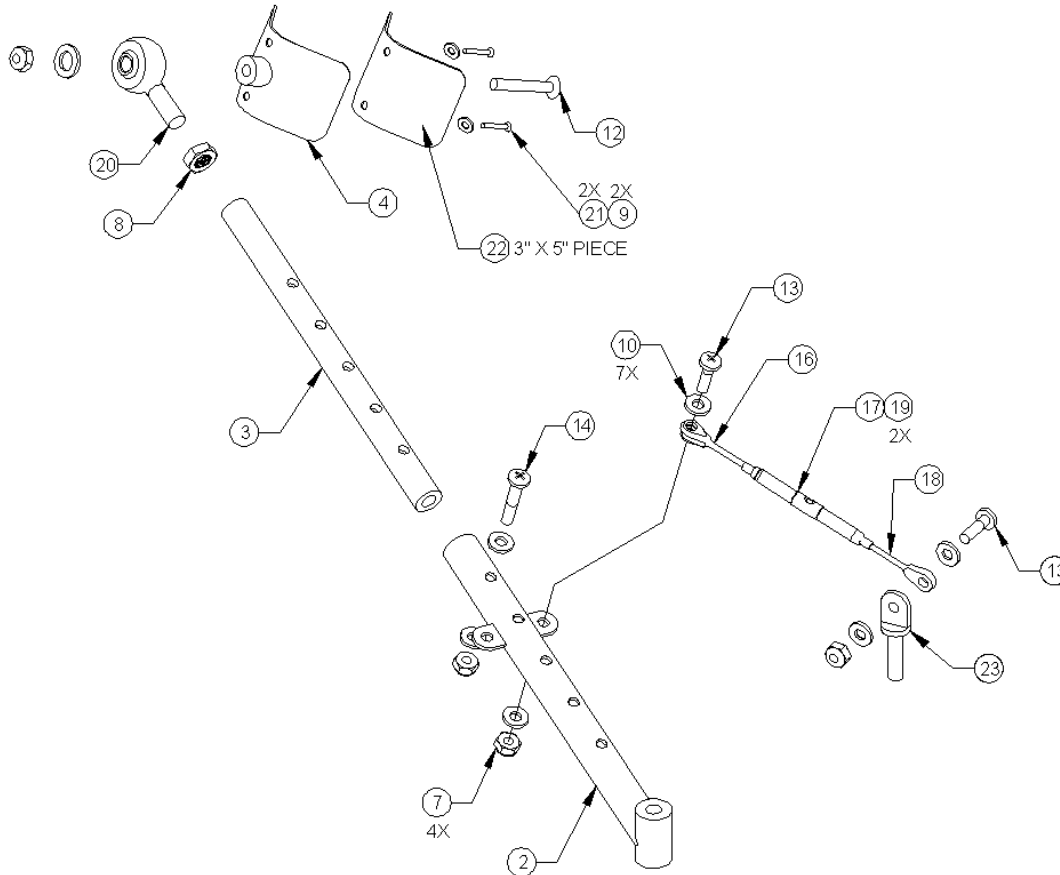


Figure 4.2: Torque Arm Assembly

5. Motor Housing Assembly, IMC407-500

Part Number	Nomenclature	Fig.	Item	QTY REQ.
IMC407-501	Plate, Motor Housing	5.4	2	1
IMC407-502	Plate, Top, Motor Housing	5.4	3	1
IMC407-503-01	Plate, Side, Motor Housing	5.3	4	1
IMC407-503-02	Plate, Side, Motor Housing	5.3	5	1
IMC407-504	Pillow Block, Gear Shaft, Motor Housing	5.3	6	2
IMC407-505	Shaft, Gear, Motor Housing	5.3	7	1
IMC407-506	Shim, Motor Housing	5.5	8	2
IMC407-507	Pillow Block, Motor Shaft, Motor Housing	5.5	9	2
IMC407-508	Shaft, Motor, Motor Housing	5.5	10	1
IMC407-509	Bolt, Modified	5.3	11	2
IMC407-510	Gear, Modified, Motor Housing	5.3	12	1
IMC407-511	Bearing, Modified, Motor Housing	5.3	13	2
IMC407-512	Bearing, Modified, Motor Housing	5.5	14	1
IMC407-513	Bracket, Switch, Motor Housing	5.3	15	2



Part Number	Nomenclature	Fig.	Item	QTY REQ.
IMC407-514	Bracket, Trigger, Up, Motor Housing	5.3	16	1
IMC407-515	Bracket, Trigger, Down, Motor Housing	5.3	17	1
IMC407-516	Bracket, Gear Release, Motor Housing	5.3	18	1
IMC407-517	Bracket, Shear, Motor Housing	5.4	19	
IMC407-520	Tray, Motor Housing	5.2	20	1
IMC407-530	Assembly, Hard Stop, Down, Motor Housing	5.2	21	1
	0.1" thick rubber, 3.0" x 0.75"	5.2	N.S	1
IMC407-535	Assembly, Hard Stop, Up, Motor Housing	5.2	22	1
	0.1" thick rubber, 1.7" x 1.46"	5.2	N.S	1
IMC407-900	Motor	5.4	23	1
IMC407-901	Switch, Limit	5.3	24	4
IMC407-902-01	Spring	5.3	25	1
IMC407-902-02	Spring	5.3	26	1
IMC407-906	Worm	5.5	27	1
IMC407-910	Bearing, Oilite	5.5	28	2
IMC407-911	Bearing, Oilite	5.3	29	2
IMC407-913	Bearing, Nyliner	5.3	30	2
IMC407-915-01	Pin, Groove	5.5	31	1
IMC407-915-02	Pin, Groove	5.3	32	1
IMC407-916	Shaft Collar	5.5	33	1
IMC407-917	Shaft Clamp	5.5	34	1
IMC407-918	Shaft Collar	5.3	35	2
IMC407-920	Nut, Castle	5.3	36	2
AN743-13	Bracket	5.2	37	1
MS21919-WDG-4	Clamp	5.2	38	2
MS24665-134	Cotter Pin	5.3	39	2
AN960-516	Washer	5.3	40	4
AN960-8L	Washer	5.2	41	30
AN960-4L	Washer	5.3	42	8
			43	
			44	
AN364-832A	Nut	5.3	45	5
MS20365-440A	Nut	5.3	46	8
MS21059-L08	Nutplate	5.4	47	22
			48	
MS35206-245	Screw	5.2	49	6
MS35206-216	Screw	5.4	50	4
MS35206-243	Screw	5.3	51	2
MS35206-246	Screw	5.4	52	17
MS24693-11	Screw	5.3	53	4

Part Number	Nomenclature	Fig.	Item	QTY REQ.
			54	
MS20470-D5-XX	Rivet	5.3	N.S.	1 <sup>(B)</sup>
MS20470-AD5-XX	Rivet	5.3	56	1 <sup>(A)</sup>
MS20426-AD4-XX	Rivet	5.4	57	12
MS20470-AD3-XX	Rivet	5.2	58	44

Numerical Index: Motor Housing  
Figure 5.1

Notes:

(A) Used on Bell 206 series, 407.

(B) Reserved

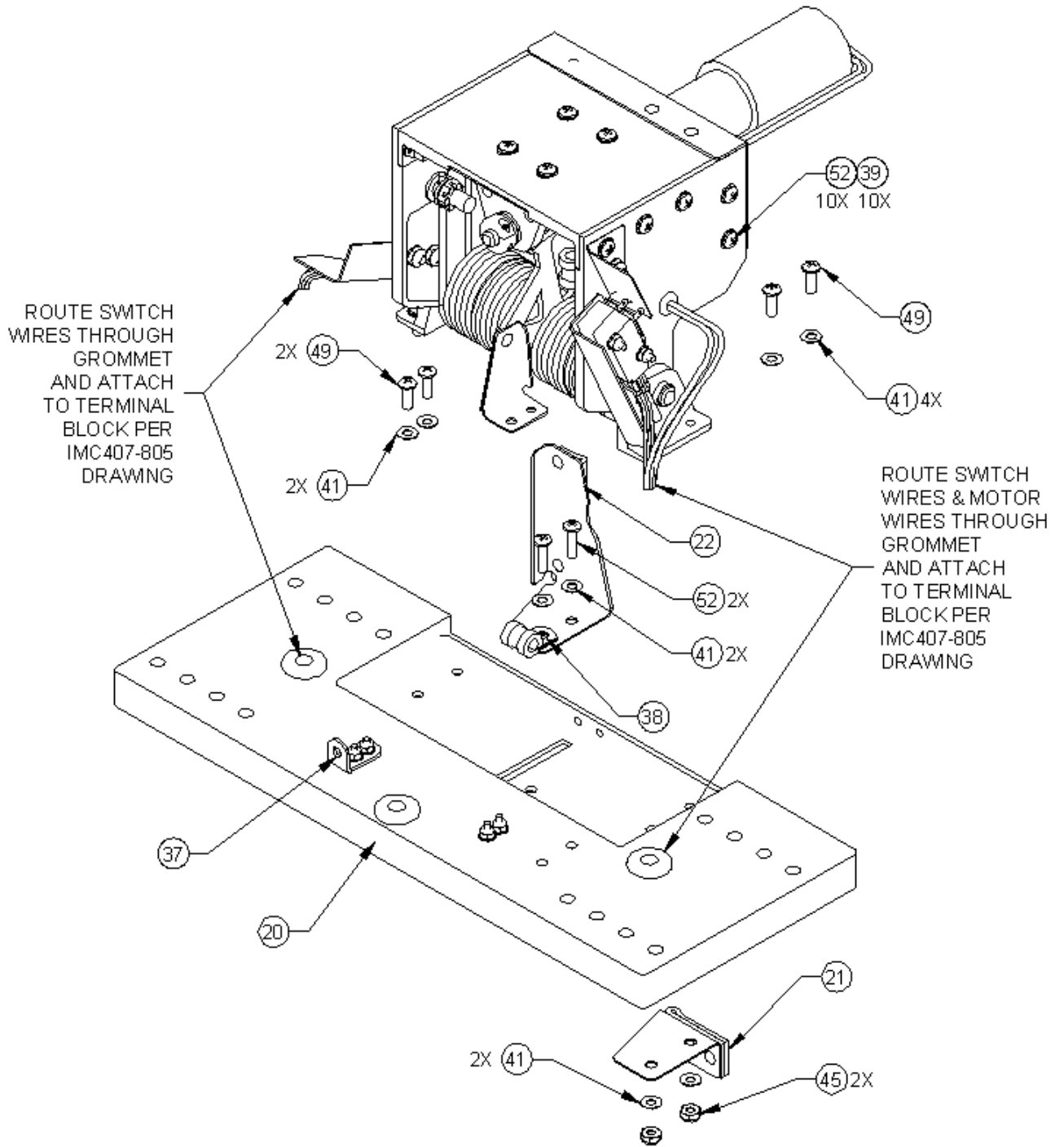


Figure 5.2: Motor Housing Assembly, Tray and Stops

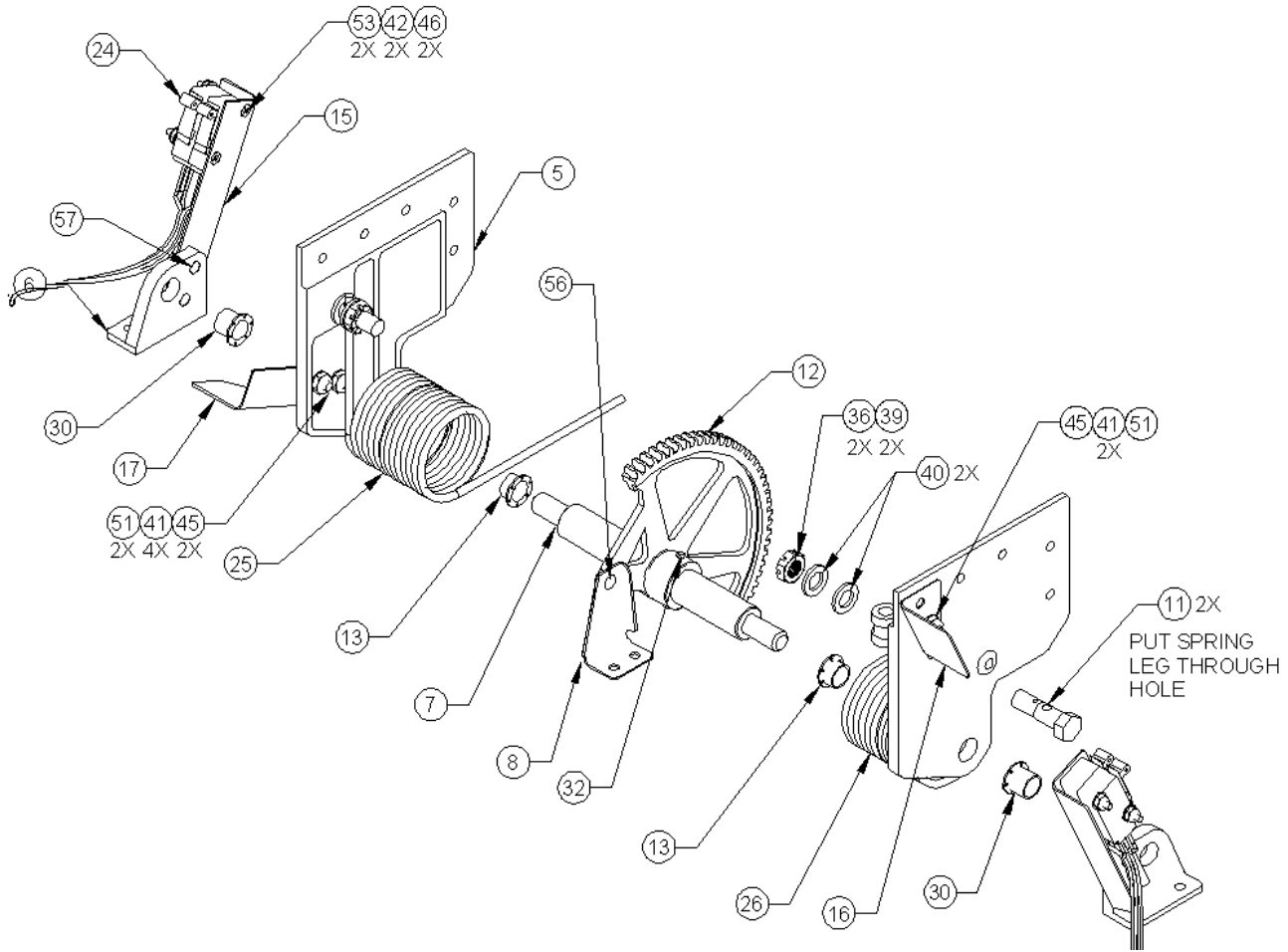


Figure 5.3: Motor Housing Assembly, Shaft Assembly

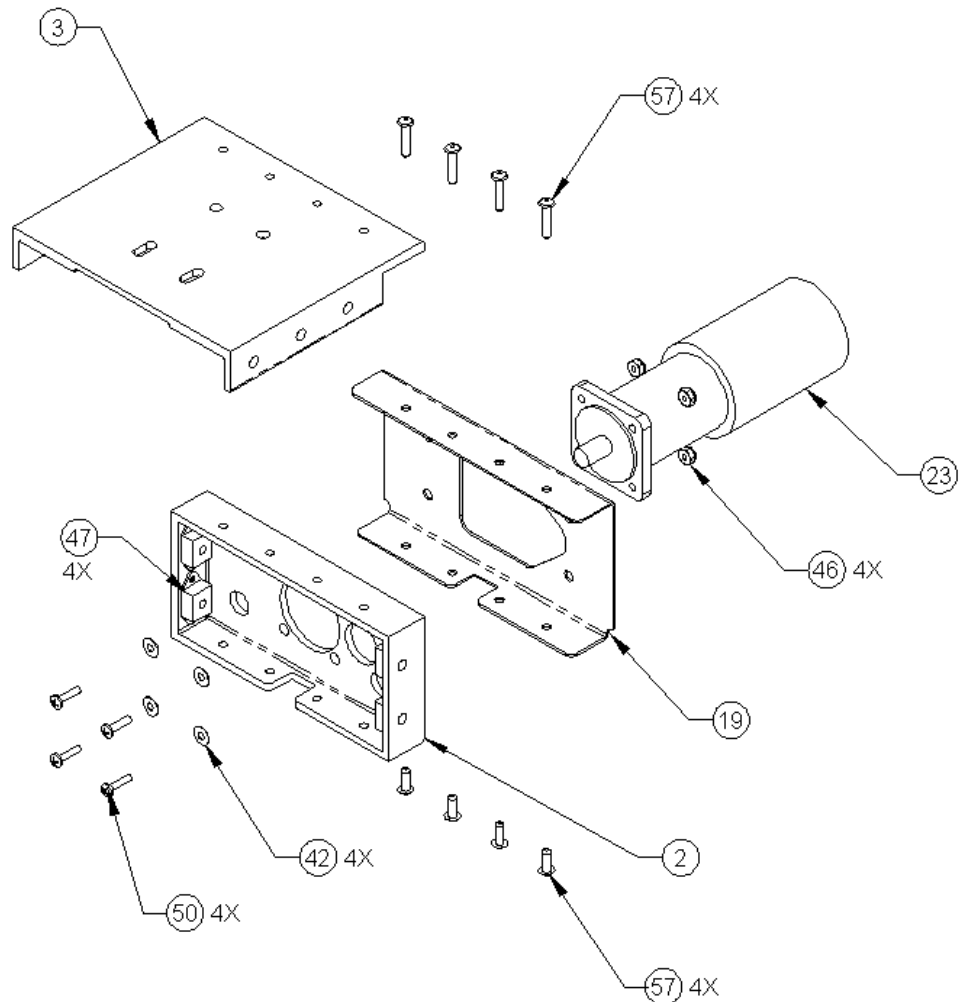


Figure 5.4: Motor Housing Assembly, Motor and Shear Bracket

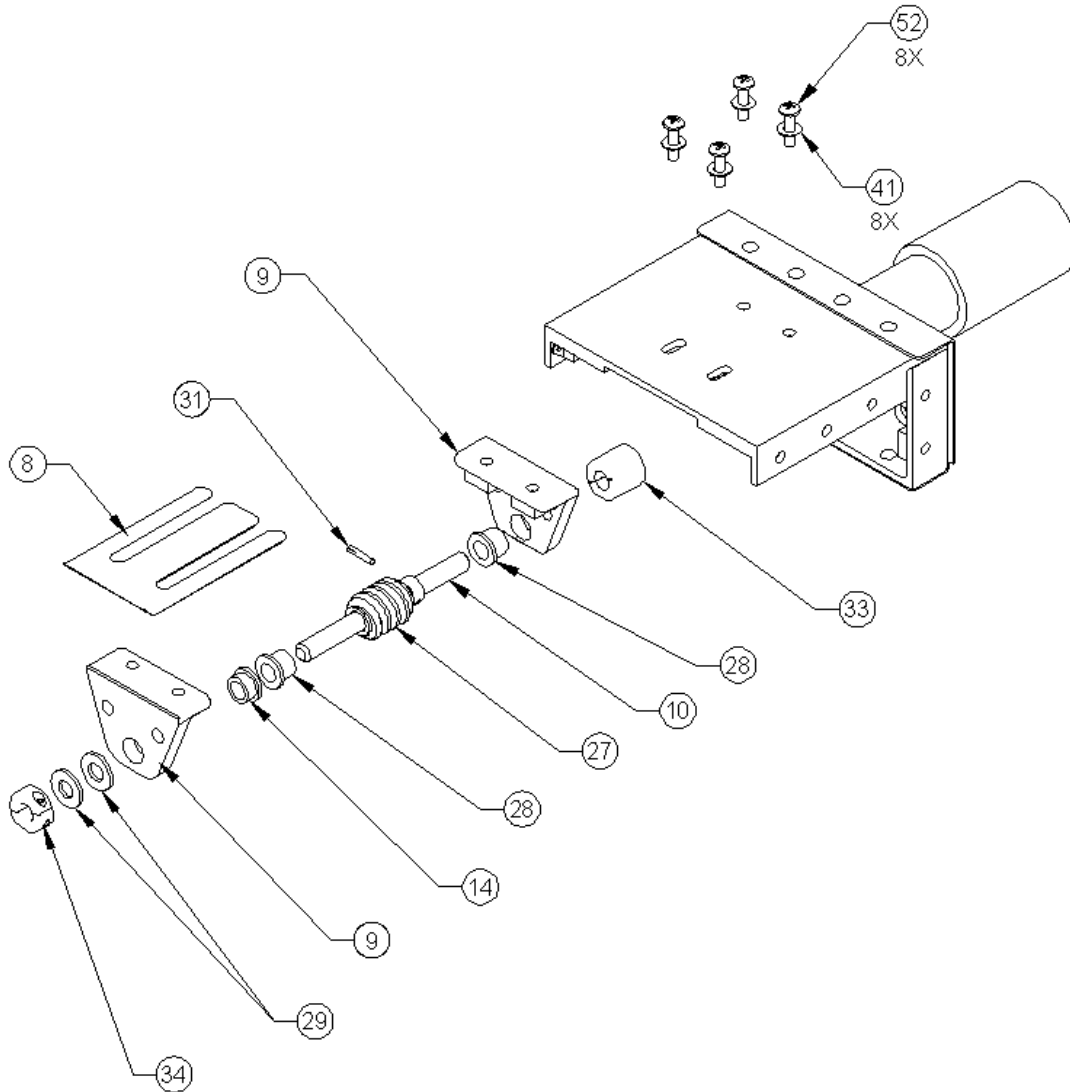


Figure 5.5: Motor Housing Assembly, Gear Drive

Vibration Isolation Box / Stowage Box Assembly

Part Number	Nomenclature	Fig.	Item	QTY REQ. -701 VIB	QTY REQ. -702 Stowage
IMC407-710-01	Assembly, Outer, VIB	6.2	1	1	0
IMC407-710-02	Assembly, Outer, Stowage	6.3	1	0	1
IMC407-720	Assembly, Inner VIB	6.2	2	1	0
IMC407-708	Door, Stowage Box	6.3	3	0	1
IMC407-925-01	Lord Mount	6.2	4	8	0
MS27039-0820	Screw, 8-32	6.2	5	8	0
J02049-1	Washer, Snubbing	6.2	6	16	0
MS27039-0820	Nut	6.2	7	12	0
A35537-11	¼ Turn Retainer	6.2	8	2	0
A35601-3	¼ Turn Retainer	6.2	8	ALT	0

Part Number	Nomenclature	Fig.	Item	QTY REQ. -701 VIB	QTY REQ. -702 Stowage
IMC407-707	Pad, Headstrike, VIB	6.2	9	1	1
IMC407-706	Cable, Restraint	6.2	10	2	2
MS27039-1-09	Screw, 10-32	6.2	11	4	4
AN960-8	Washer	6.2	12	8	8
423-06	¼ Turn Retainer	6.3	13	0	3
MS21059-L3	Nutplate, Floating	6.3	14	0	4
MS35206-215	Screw, 4-40	6.2	15	14	0
MS21044N-04	Lock Nut, 4-40	6.2	16	14	0
AN960-4	Washer	6.2	17	14	0
MS2027P5	Hinge	6.3	18	0	AR

Numerical Index: Vibration Isolation Box Assembly, IMC407-700  
 Figure 6.1

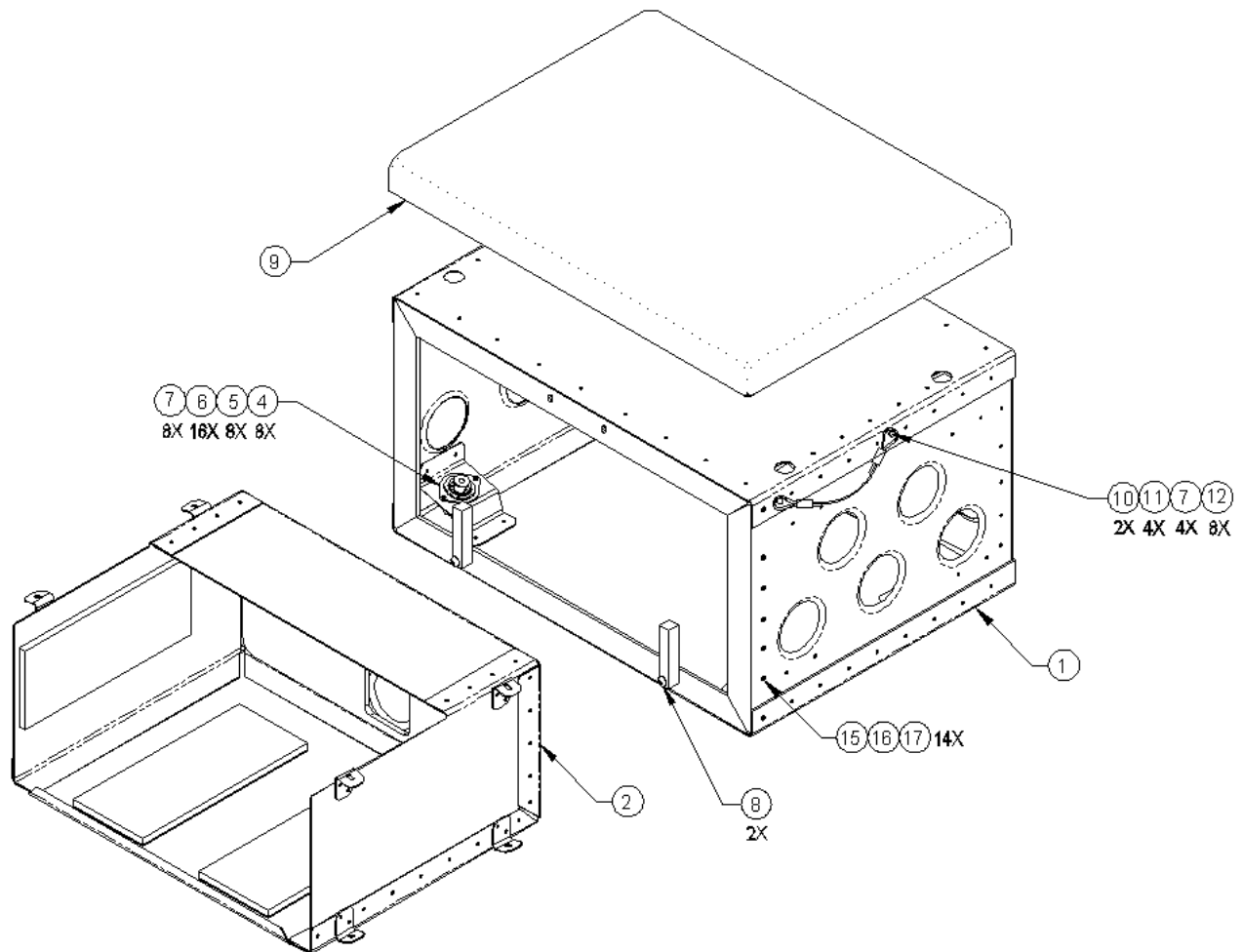


Figure 6.2: Vibration Isolation Box Assembly, IMC407-700

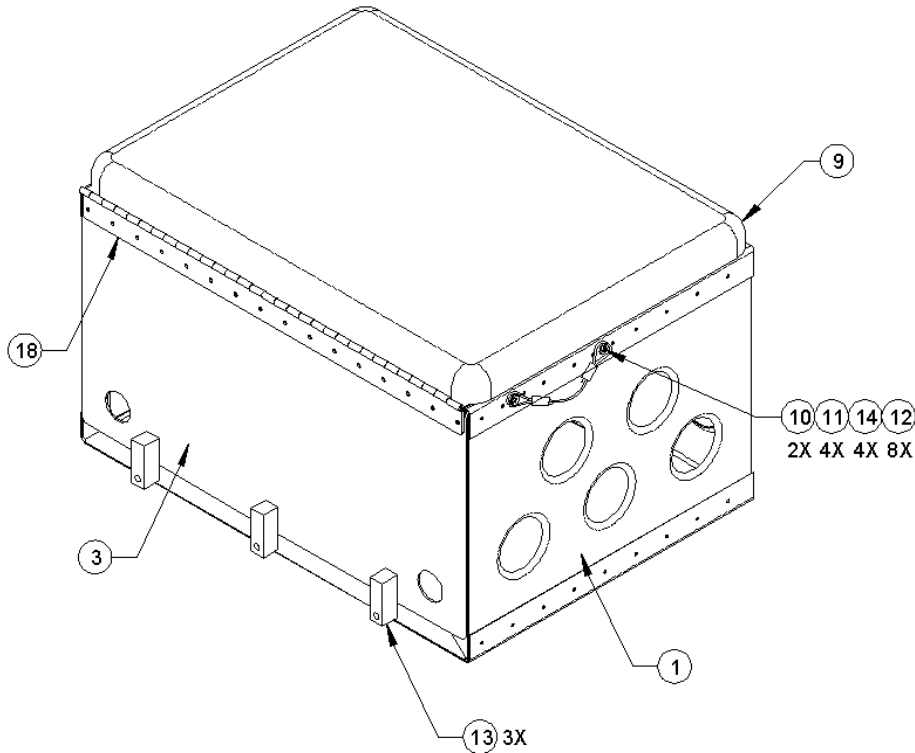


Figure 6.3 Stowage Box Assembly, IMC407-702

7. Electrical Components

Part Number	Nomenclature	Fig.	Item	QTY REQ.
MS24659-21A	Switch, Toggle	7.2	1	1
Klixon 7277-2-3	Circuit Breaker, Push-Pull, 3 Amp	7.2	2	1
Klixon 7277-2-1	Circuit Breaker, Push-Pull, 1 Amp	7.2	n.s.	1
Klixon 7277-2-1	Circuit Breaker, Push-Pull, 5 Amp	7.2	n.s.	1
IMC407-922-01	LED, Indicator, Green	7.2	3	1
IMC407-922-02	LED, Indicator, Yellow	7.2	n.s.	1
IMC407-922-03	LED, Indicator, Blue	7.2	n.s.	1
IMC407-921	Box, Position Control	7.2	4	1
NC4FP-1	XLR Connector, Panel Mount, 4 Pin, Neutric	7.2	5	1
MS 3102A 14S-1 P	Receptical, Panel Mount, 3 Pin, ITT Cannon	7.2	6	1
192990-1670	Receptical, Panel Mount, 8 Pin, #12 Shell, ITT Cannon	7.2	7	1
M7928/1-30	Terminal, Ring Tongue, 16-18 awg	n.s.	n.s.	40
M22759/16-18	Wire, Tefzel, 18 awg	n.s.	n.s.	AR.
NC4MX	Male XLR Cable Connector,	7.2	8	1



	Neutric			
NC4FX	Female XLR Cable Connector, Neutric	7.2	n.s.	1
MS3106 A 14S-1 S	Plug, Straight, 3 Socket, Threaded	7.2	9	1
MS3106 A 14S-1 P	Plug, Straight, 3 Pin, Threaded	n.s.	n.s.	1
MS3101 A 14S-1 S	Plug, Cord Connector, 3 Socket, Threaded	n.s.	n.s.	1
MS3057-6C	Clamp, 14 Shell, Sealed	7.2	10	3
192922-1260	Plug, #12 Shell, Trident Ringlock, ITT Cannon	7.2	11	1
192926-0510	Reverse Plug, #12 Shell, Trident Ringlock, ITT Cannon	n.s.	n.s.	1
192990-1540	Backshell, #12 Shell, Trident Ringlock, ITT Cannon	7.2	12	2
192900-0450	Contact, Socket, Ringlock, 16-18 awg, ITT Cannon	7.2	n.s.	8
192900-0446	Contact, Pin, Ringlock, 16-18 awg, ITT Cannon	7.2	n.s.	8
MIL-T-55164/1 37 TB	Terminal Block	n.s.	n.s.	1
IMC407-808	Lanyard, Quick Connect	7.2	13	1

Numerical Index: Position Control Box, and Electrical Components  
Figure 7.1

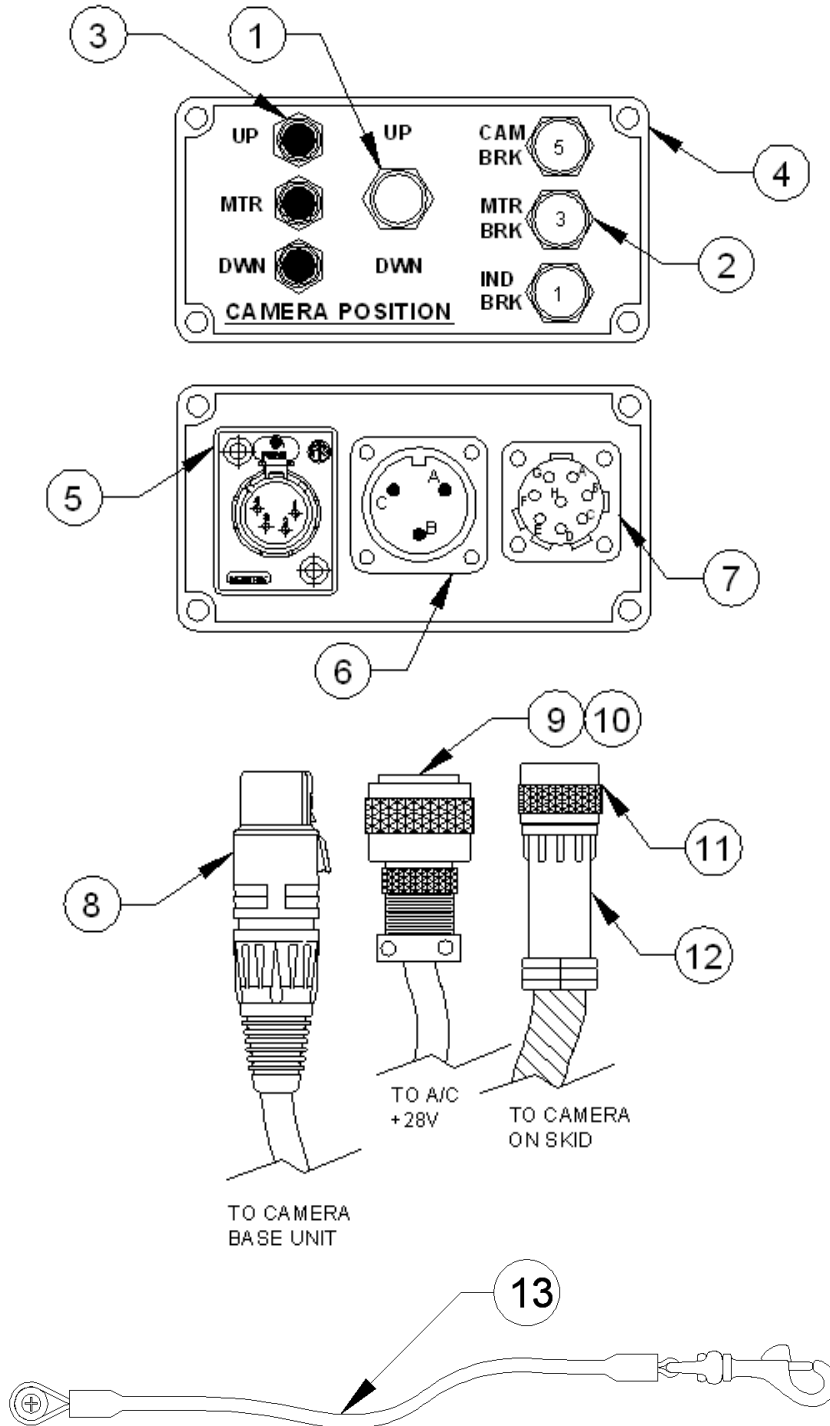


Figure 7.2: Electrical Components

APPENDIX A – ROTORCRAFT SPECIFIC DATA

Make and Model Applicability:

Bell Helicopter Textron; 206 Series, 407 Series

A. Weight and Balance

- (1) Figure A.1 and Table A.1 demonstrate an alternate method of measuring the longitudinal C.G. location using the strut's attachment to the helicopter as a reference.

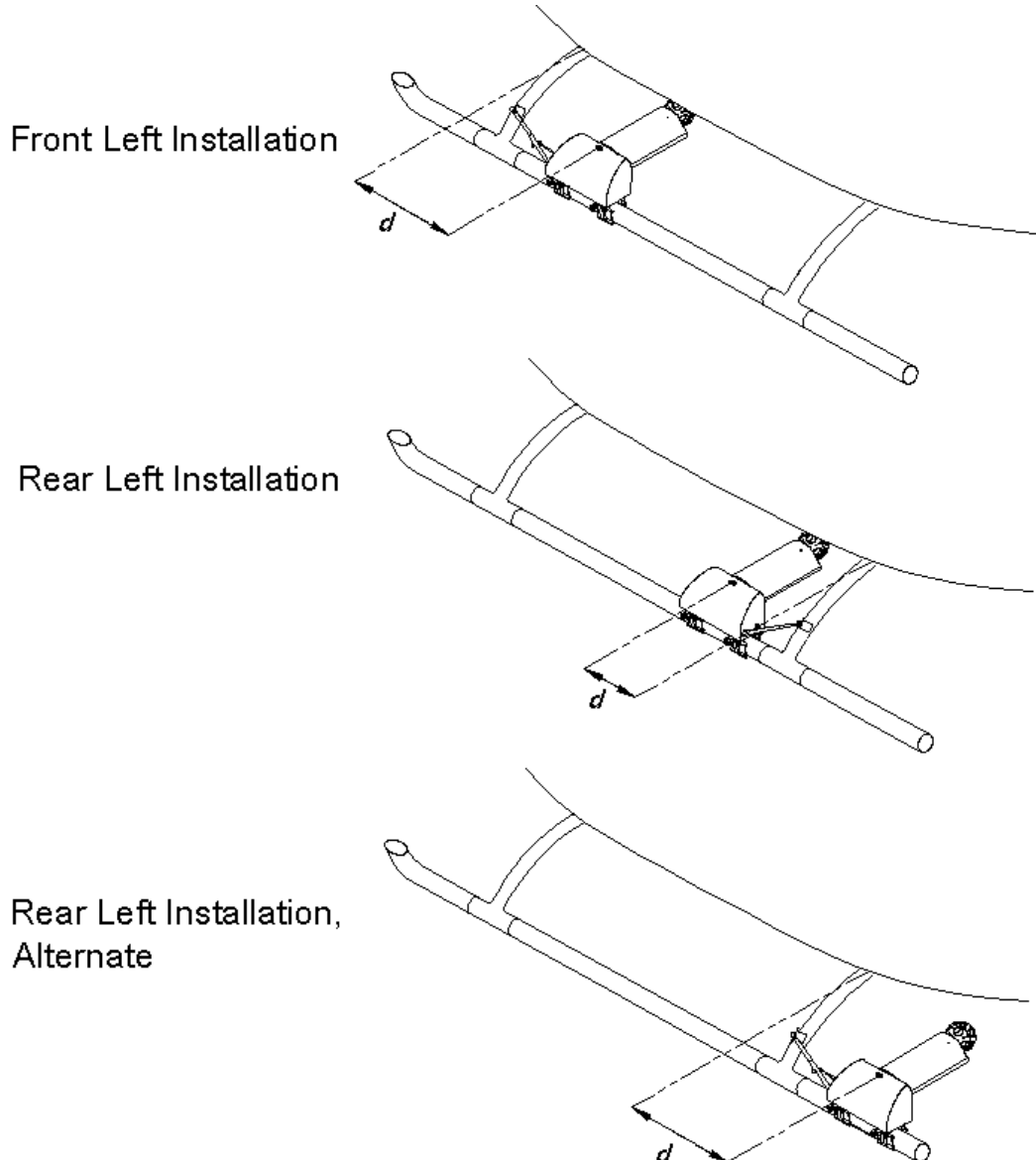


Figure A.1: Installation Location Weight and Balance

Table A.1: Longitudinal Camera Mount C.G.

Helicopter Model	Longitudinal strut location from datum	Longitudinal Camera Mount C.G. (in.)
Bell 206 A/B Series All skid types	Front: +72.0 in.	72.0 + <i>d</i>
	Rear: +126.5 in.	126.5 +/- <i>d</i>
Bell 206 L Series All skid types	Front: +73.0 in.	73.0 + <i>d</i>
	Rear: +155.2 in.	155.2 +/- <i>d</i>
Bell 407 All skid types	Front: +73.0 in.	73.0 + <i>d</i>
	Rear: +155.2 in.	155.2 +/- <i>d</i>

- (2) The lateral C.G. location of the Retractable Camera Mount is different for each helicopter, camera and skid location. Table A.2 lists the lateral C.G. locations for each helicopter model and skid type, though measurement of the C.G. location after installation is still recommended.

Table A.2: Retractable Camera Mount C.G. Location

Model	Skid	Lateral C.G. Location (in.)
206 A/B	Std (low)	+/- 35.3
206 A/B	High	+/- 37.7
206 A/B	Float	+/- 38.9
206 L	Std (low)	+/- 43.7
206 L	High	+/- 44.3
206 L	Float	+/- 46.1
407	Std (low)	+/- 46.1
407	High	+/- 49.7
407	Float	+/- 50.3

- (3) Calculate the weight and balance based on the installed location of the C.G. placards on the Retractable Camera Mount and Vibration Isolation Box measured from the helicopter's datum.

Table A.3: Weight and Balance Worksheet, IMC Camera

Component	Weight (lbs)	LONGITUDINAL		LATERAL	
		C.G. (in)	Moment (in-lbs)	C.G. (in)	Moment (in-lbs)
Retractable Camera Mount	16 lbs				
Vibration Isolation Box	20.3 lbs				
Camera Cables	4.7 lbs				

Table A.4: Weight and Balance Worksheet, Ladybug 3 Camera

Component	Weight (lbs)	LONGITUDINAL		LATERAL	
		C.G. (in)	Moment (in-lbs)	C.G. (in)	Moment (in-lbs)
Retractable Camera Mount	18.8 lbs				
Stowage Box	5.2 lbs. plus cargo				
Camera Cables	4.7 lbs				

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APPENDIX B – ROTORCRAFT SPECIFIC DATA

Make and Model Applicability:

Robinson Helicopter Company; R44, R44-II

A. Weight and Balance

- (1) Figure B.1 and Table B.1 demonstrate an alternate method of measuring the longitudinal C.G. location using the strut's attachment to the helicopter as a reference.

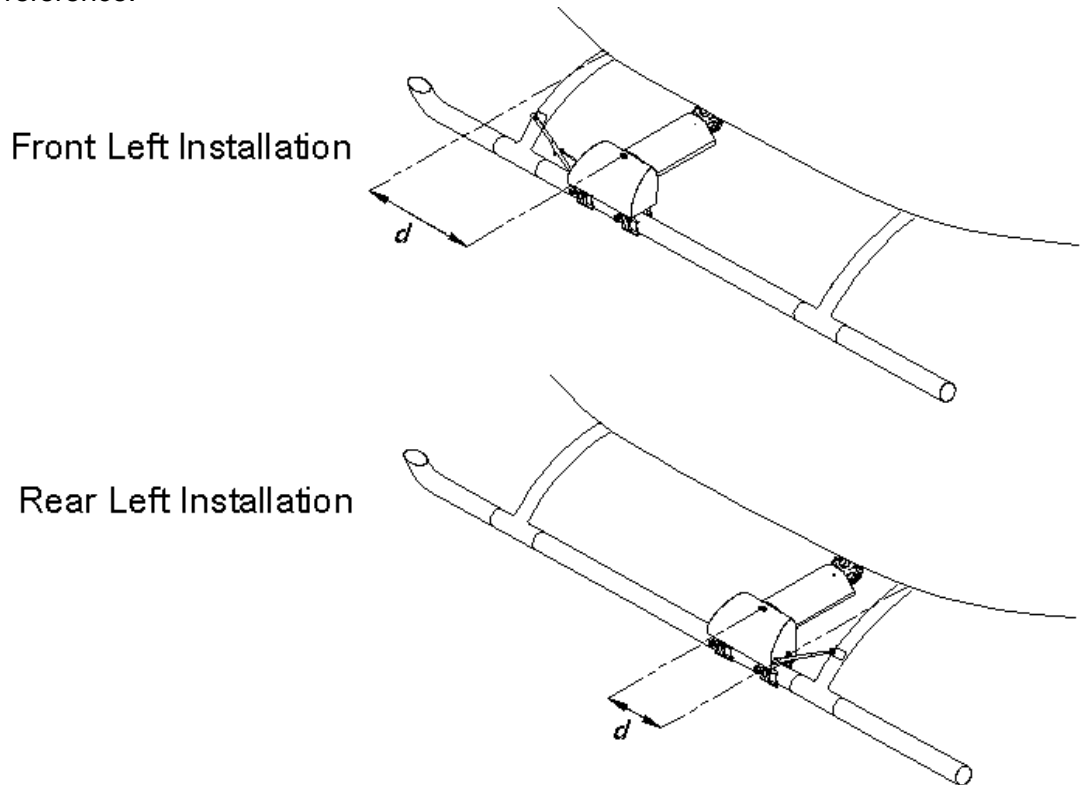


Figure B.1: Installation Location Weight and Balance

Table B.1: Longitudinal Camera Mount C.G.

Helicopter Model	Longitudinal strut location from datum	Longitudinal Camera Mount C.G. (in.)
R44, R44-II	Front: +69.0	69.0 +d
R44, R44-II	Rear: +122.0	122.0 -d

- (2) The lateral C.G. location of the Retractable Camera Mount (16 lbs) is different for each helicopter and skid location. Table B.2 lists the lateral C.G. locations for each helicopter model and skid type, though measurement of the C.G. location after installation is still recommended.

Table B.2: Retractable Camera Mount C.G. Location

Model	Skid	Lateral C.G. Location (in.)
R44, R44-II	Std	+/- 37.0

- (3) Calculate the weight and balance based on the installed location of the C.G. placards on the Retractable Camera Mount and Vibration Isolation Box measured from the helicopter's datum.

Table B.3: Weight and Balance Worksheet

Component	Weight (lbs)	LONGITUDINAL		LATERAL	
		C.G. (in)	Moment (in-lbs)	C.G. (in)	Moment (in-lbs)
Retractable Camera Mount	16 lbs				
Vibration Isolation Box	20.3 lbs				
Camera Cables	4.7 lbs				

Table B.4: Weight and Balance Worksheet, Ladybug 3 Camera

Component	Weight (lbs)	LONGITUDINAL		LATERAL	
		C.G. (in)	Moment (in-lbs)	C.G. (in)	Moment (in-lbs)
Retractable Camera Mount	18.8 lbs				
Ballast Box	5.2 lbs. plus cargo				
Camera Cables	4.7 lbs				

### B. Camera System Power Cabling – Temporary Installation

The camera mount system includes a power harness that is terminated in an MS3106 A 14S-1 P cannon plug. A MS3101 A 14S-1 S is also provided with pig tail for attaching to ground and 28VDC 6.5 Amp aircraft power via an 7.5 to 20 amp breaker. The harness is routed from the circuit breaker panel – access is from under the front LH seat and around the side panel to the rear seat. See figure B2. The



cable is then routed along the sides of the cabin and secured with Binding Tape and MS3367-1, cable ties to existing holes. Route the cable up to the VIB –secure to seat and console. Near the doors, the cable may be tucked under the lip of the door sill. See figure B3. Ensure any excess cable is well secured and does not affect egress.



Figure B.2: Power Cable Routing: CB panel, under seat, cable dressing.

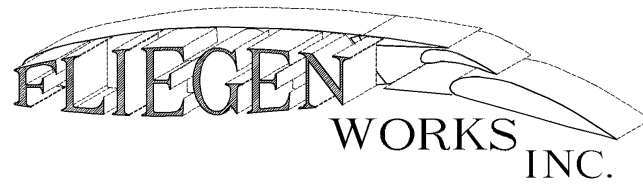


Figure B.1: Power Wire Routing

Fliegen Works Inc.  
Portland, OR  
503 221-4001

Component Maintenance  
Manual & ICA

IMMERSIVE CAMERA  
MOUNT SYSTEM



**FLIEGEN WORKS INC.**  
**PORTLAND, OR**  
**503 221-4001**