

## OPREATING AND MAINTENANCE MANUAL

T6-200-01/02-A/B



### INFRARED THERMAL IMAGING CAMERA SYSTEM

**EXPORT WARNING:** THIS SYSTEM, TECHNICAL DATA ARE SUBJECT TO EXPORT CONTROL OF EITHER THE INTERNATIONAL TRAFFIC IN FIREARMS REGULATIONS (ITAR) OR THE EXPORT ADMINISTRATION REGULATIONS (EAR) AND CANNOT BE EXPORTED WITHOUT THE AUTHORIZATION OF EITHER THE DEPARTMENT OF STATE OR THE DEPARTMENT OF COMMERCE PRIOR TO EXPORT.

**LOG OF REVISIONS**

| REV LEVEL | PAGE | DESCRIPTION      | APP BY | DATE     |
|-----------|------|------------------|--------|----------|
| IR        | ALL  | ORIGINAL RELEASE | R.R.   | 05/01/17 |
|           |      |                  |        |          |
|           |      |                  |        |          |
|           |      |                  |        |          |

**TABLE OF CONTENTS**

| SECTION | DESCRIPTION                                      | PAGE |
|---------|--|------|
| 1.0     | GENERAL INFORMATION.....                         | 4    |
| 2.0     | LAB TESTING.....                                 | 5    |
| 2.1     | CERTIFICATIONS.....                              | 5    |
| 3.0     | SPECIFICATIONS.....                              | 6    |
| 3.1     | Fig. 1 - WIRING SCHEMATIC.....                   | 7    |
| 4.0     | CAMERA REMOVAL AND INSTALLATION.....             | 8    |
| 4.1     | REMOVAL.....                                     | 8    |
| 4.2     | INSTALLATION.....                                | 8    |
| 5.0     | TRANSITION PLATE REMOVAL AND INSTALLATION.....   | 9    |
| 5.1     | REMOVAL.....                                     | 9    |
| 5.2     | INSTALLATION.....                                | 9    |
| 5.3     | Fig. 2 - PARTS ILLUSTRATION / PARTS LISTING..... | 10   |
| 6.0     | TROUBLESHOOTING CAMERA .....                     | 11   |
| 7.0     | TROUBLESHOOTING WIRING HARNESS.....              | 12   |
| 8.0     | FUNCTIONAL CHECKS.....                           | 13   |
| 9.0     | MAINTENANCE AND REPAIR.....                      | 13   |
| 10.0    | AIRWORTHINESS LIMITATIONS.....                   | 13   |
| 11.0    | WEIGHT AND BALANCE DATA.....                     | 14   |
| 12.0    | PLACARDS AND MARKINGS.....                       | 14   |
| 13.0    | TOOLS AND MATERIALS.....                         | 14   |
| 14.0    | PREFLIGHT CHECKS.....                            | 15   |
| 15.0    | SOFTWARE UPDATES.....                            | 15   |
| 16.0    | LIGHTNING STRIKE.....                            | 15   |
| 17.0    | HARD LANDING.....                                | 15   |
| 18.0    | TOWING AND TAXIING.....                          | 15   |
| 19.0    | RETURN TO MANUFACTURER FOR SERVICE.....          | 15   |

## SECTION 1.0

### GENERAL INFORMATION

The T6-200 (EVS) is an externally mounted camera used for monitoring the aircraft surroundings. the camera has a vertical sweep range of 28 degrees (forward looking), and provides video output to a flight display.

The camera trim is pilot controlled by a trim control switch mounted in the cockpit accessible to the pilot and is constrained to vertical (up/down) adjustment only. The T6-200 (EVS) System enhances a pilot's ability to fly an aircraft by providing increased visibility for improved situational awareness. The T6-200 (EVS) allows a pilot to identify the runway environment, ground features and hazards under day or night low visibility conditions but it is not a required system. The T6-200 (EVS) operation is based on advanced infrared (IR) sensor functionality, adjusts to current conditions in real time to maintain optimal detection capability, and shall not be used for landing approach credits per §91.175(l).

#### NOTE:

The T6-200 (EVS) system is approved for single pilot use and to be used for situational awareness only. Navigation predicated upon use shall not be approved.

Each TrueView EVS T6 Infrared Thermal Imaging System component has the following function:

- 1- The (FLIR) camera assembly acquires the image and forwards the signal to a video source. The video source is determined by the end user and not included as part of this system.
- 2- An separate circuit breaker is utilized to supply DC power to the thermal imaging system.
- 3- A toggle switch is utilized to enable piloting commands to the cameras linear servo tilt control for in flight adjustments throughout a vertical sweep range of 28 degrees (forward looking).
- 4- A video out SMA Connector provides the electrical connection from the imaging system to the video output/display source.

#### NOTE:

Infrared is effective at day/night in smoke, haze, smog, and a broad spectrum of rain, snow, and radiation type fog; however penetration is limited during certain atmospheric conditions including: heavy rain, heavy snow, coastal (advection) fog, and most cloud formations.

The T6-200 (EVS) Infrared Thermal Imaging System is composed of the following:

- 1- Camera Assembly
- 2- Wiring Harness Assembly
- 3- Toggle Switch
- 4- Circuit Breaker
- 5- Video output/display source (on-board or auxiliary display, determined by end user)

**SECTION 2.0**

**LAB TESTING**

| RTCA DO 160 G Level Testing, T6-200 Thermal Imager |                                     |
|--|-------------------------------------|
| Magnetic Effects Cat Z                             | Decompression                       |
| Power Input Cat A                                  | Over pressure                       |
| Voltage Spike B                                    | Temperature Variation               |
| Audio Freq. Susceptibility Cat Z                   | Humidity                            |
| Induced Signal Susceptibility Cat Z                | Operational Shock                   |
| RF Susceptibility Cat Z                            | Crash Safety Impulse                |
| RF Emissions Cat B                                 | Crash Safety Sustained Acceleration |
| Electrostatic Discharge Cat A                      | Vibration                           |
| EMC Test Report                                    | Waterproofness                      |
| Total EMC  | Sand and Dust                       |
| Temperature  | Salt Spray                          |
| Altitude   |                                     |
| DLS Formal Test Report No. 38093                   |                                     |

**2.1 CERTIFICATIONS**

| Initial STC Certification on Bell 407      |                      |
|--|----------------------|
| EMI/RFI Test Plan                          | Report No. TP03034   |
| Ground Test Plan                           | Report No. TP03034.1 |
| Installation Drawing List                  | IDL 03034            |
| Manufacturing Drawing List                 | MDL 03034            |
| FAA-PMA Approved                           |                      |
| Field Approvals will require FMS and ICAS. |                      |

### SECTION 3.0 - CAMERA SPECIFICATIONS

#### Performance

|                 |                               |
|-----------------|-------------------------------|
| Thermal Imager: | Uncooled VOx Microbolometer   |
| Display Format: | 640 x 480 (NTSC)              |
| Frame Rate:     | 30 Hz, fast frame (NTSC)      |
| Time to Image:  | <3.5 sec (cold start)         |
| Camera Lens:    | 19mm, Hard Coated             |
| Field of View:  | 32° Horiz x 26° Vert          |
| Sweep Range:    | 0 - 28° Vert: forward looking |

#### Physical Properties

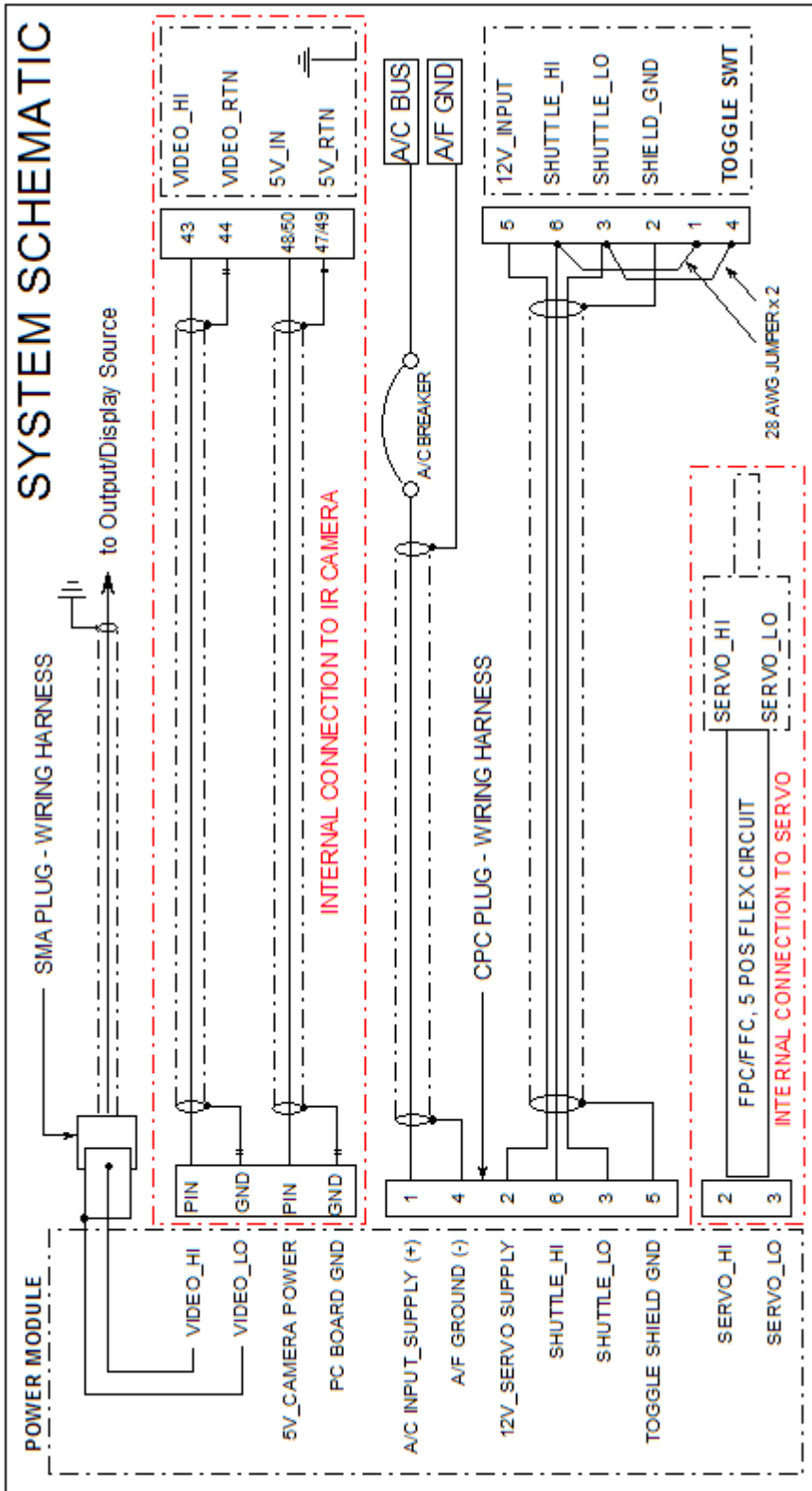
|                   |                                  |
|-------------------|----------------------------------|
| Turret Housing:   | S-2 Glass Composite              |
| Transition Plate: | Glass Impregnated Laminate       |
| Opt Temp Range:   | -40°C to +80°C                   |
| Temp Shock:       | 5 degrees / min                  |
| Operational Alt:  | Opt test to 16,000' @ 160 mph    |
| Vibration:        | 4.3g (three axis, 8 hrs ea)      |
| Shock             | 200g shock pulse, (11 msec)      |
| Environmental:    | Sealed to IP-67 (nitrogen purge) |

#### Specifications

|                              |  |
|------------------------------|--|
| Input Power:                 | 340ma @ 12VDC (0.34amp), 170ma @ 24VDC (0.17amp) |
| EMI/RFI Protection           | YES (fully shielded housings)                    |
| Lightening Strike Protection | YES (rapid discharge path)                       |
| Dimensions:                  | 5.27" L – 2.72" W – 3.20" H                      |
| Weight:                      | 1 lb (as viewed above)                           |
| STC Certification:           | Bell 407 & GX, Sikorsky S76                      |

#### Features

|                         |  |
|-------------------------|--|
| Mounting Configuration: | Direct to flat honeycomb structures<br>or factory designed extension plate (skin and rib structures) |
| Wiring Harness:         | Fully assembled to camera, user defines video termination  |
| Sweep Control:          | In-flight pilot trim control, electric servo operated  |
| Mounting Hardware:      | Everything included and/or available   |
| Maintenance:            | On-Condition Maintenance, Full Support   |



SECTION 3.1

FIGURE 1

SYSTEM SCHEMATIC

## SECTION 4.0 - CAMERA REMOVAL AND INSTALLATION

### 4.1 - REMOVAL Refer to Figure 2

1- Remove electrical power and/or open the associated circuit breakers.

**CAUTION:** SUPPORT THE CAMERA ASSEMBLY (1) WHEN REMOVING THE ATTACHING HARDWARE. DO NOT COMPLETELY REMOVE THE CAMERA UNTIL THE WIRING HARNESS HAS BEEN DISCONNECTED. FAILURE DOING SO MAY CAUSE DAMAGE TO COMPONENT AND/OR WIRING HARNESS.

2- Gain internal access to wiring harness (11) and loosen as necessary allowing free movement of wiring harness.

3- Remove screws (2) and washers (3), 8 PLCS.

4- Disconnect the camera wiring harness (11) by lowering the camera assy (1).

5- Remove the camera assy (1) from the aircraft.

6- Clean all mounting areas of any dirt or debris.

**NOTE:** If helicopter operation is necessary without camera assy (1) install blank turret shell.

### 4.2 - INSTALLATION – Refer to Figure 2

1- Remove electrical power and/or open the associated circuit breakers.

**NOTE:** Make sure mounting areas are clean.

2- Remove the blank turret shell, if previously installed.

3- Connect wiring harness (11) to camera assy (1).

**NOTE:** Install 8 screws (2) wet with low strength locking compound #8701 (or equivalent).

4- Position the camera assy (1), install washers (3) and screws (2). Torque screws (2) to 4 in/lbs.

5- Secure wiring harness (11) slack in position as necessary.

6- Perform an electrical bonding measurement from the camera assy (1) LH or RH # 2 screws to the airframe. reading shall not exceed 2.5 Milliohms, repair as necessary.

7- Apply electrical power and/or close the associated circuit breakers.

8- Perform a functional check of the camera assembly.



**SECTION 5.0 - TRANSITION PLATE REMOVAL AND INSTALLATION**

**5.1 - REMOVAL** - Refer to Figure 2

- 1- Remove electrical power and/or open the associated circuit breakers.
- 2- Remove camera assembly (1), refer to camera removal steps in section 4.1.
- 3- Remove screw (7) and lock washer (8) from bonding strap.
- 4- Remove screws (4), lock washers (5) and washers (6), 4 PLCS.
- 5- Remove transition plate assembly (10).
- 6- Clean mounting areas of sealant and/or dirt.

**5.2 - INSTALLATION** – Refer to Figure 2

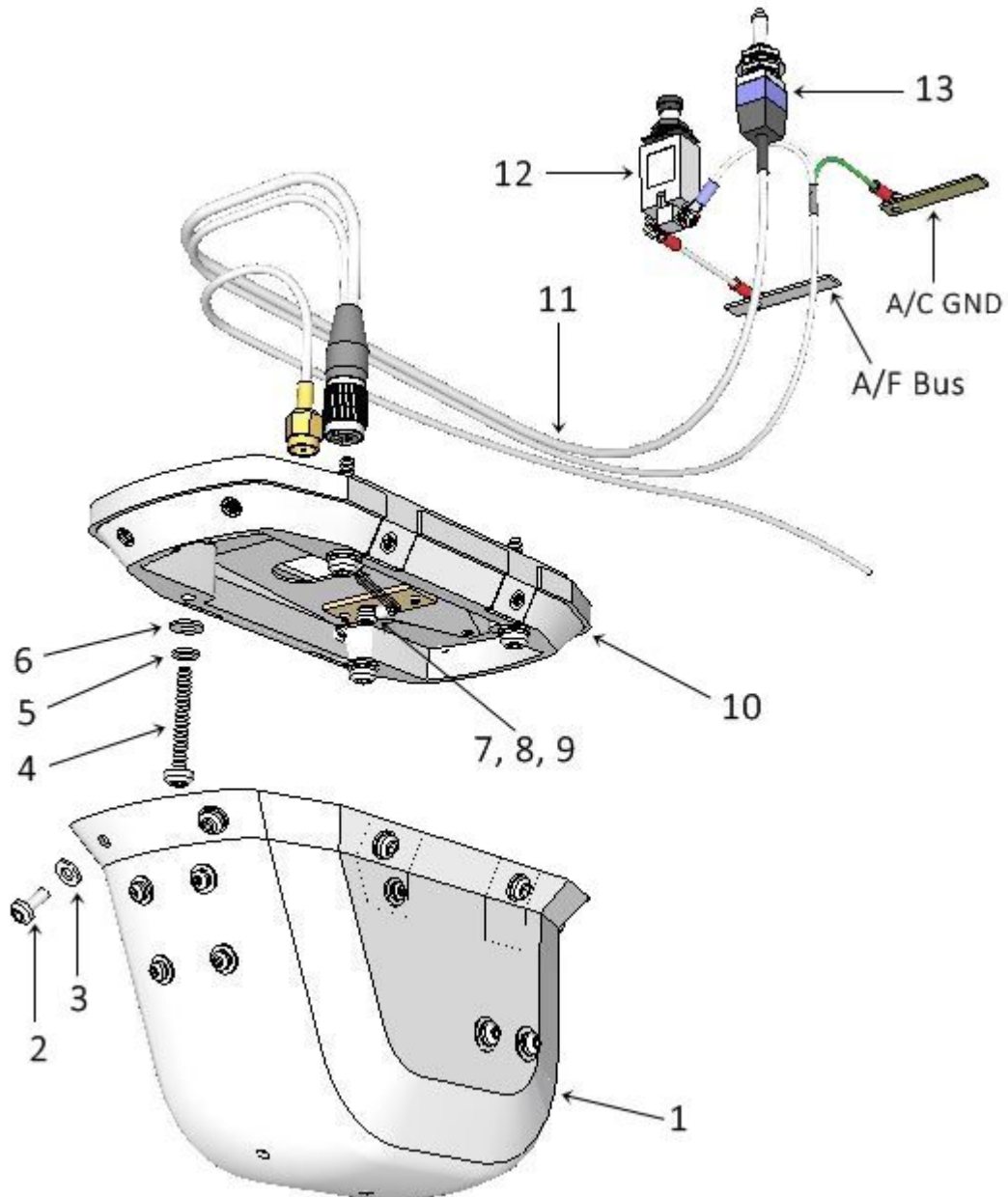
**NOTE:** Make sure mounting areas are clean.

- 1- Remove electrical power and/or open the associated circuit breakers.
- 2- Position transition plate assy (10), install 4 screws (4), lock washers (5) and washers (6).
- 3- Attach bonding strap to bonding plate with screw (7) and lock washer (8).
- 4- Apply a sealant bead around the transition plate assy (10) base, install camera assy (1), refer to camera installation in section 4.2.

Parts Listing – see fig. 2

| ITEM | PART No.       | DESCRIPTION               | QTY |
|------|----------------|---------------------------|-----|
| 1    | T6-50205       | CAMERA ASSEMBLY           | 1   |
| 2    | T6-210-13      | SCREW                     | 8   |
| 3    | T6-210-14      | WASHER (NYLON)            | 8   |
| 4    | T6-210-09      | SCREW                     | 4   |
| 5    | T6-210-16      | LOCK WASHER               | 4   |
| 6    | T6-210-17      | WASHER (REDUCED O.D.)     | 4   |
| 7    | T6-260-22      | SCREW                     | 1   |
| 8    | T6-260-23      | LOCK WASHER               | 1   |
| 9    | T6-260-16      | BONDING STRAP             | 1   |
| 10   | T6-50212       | TRANSITION PLATE ASSEMBLY | 1   |
| 11   | T6-260-00      | WIRING HARNESS ASSEMBLY   | 1   |
| 12   | KLIXON 3/4 AMP | CIRCUIT BREAKER           | 1   |
| 13   | T6-260-02      | TOGGLE SWITCH             | 1   |

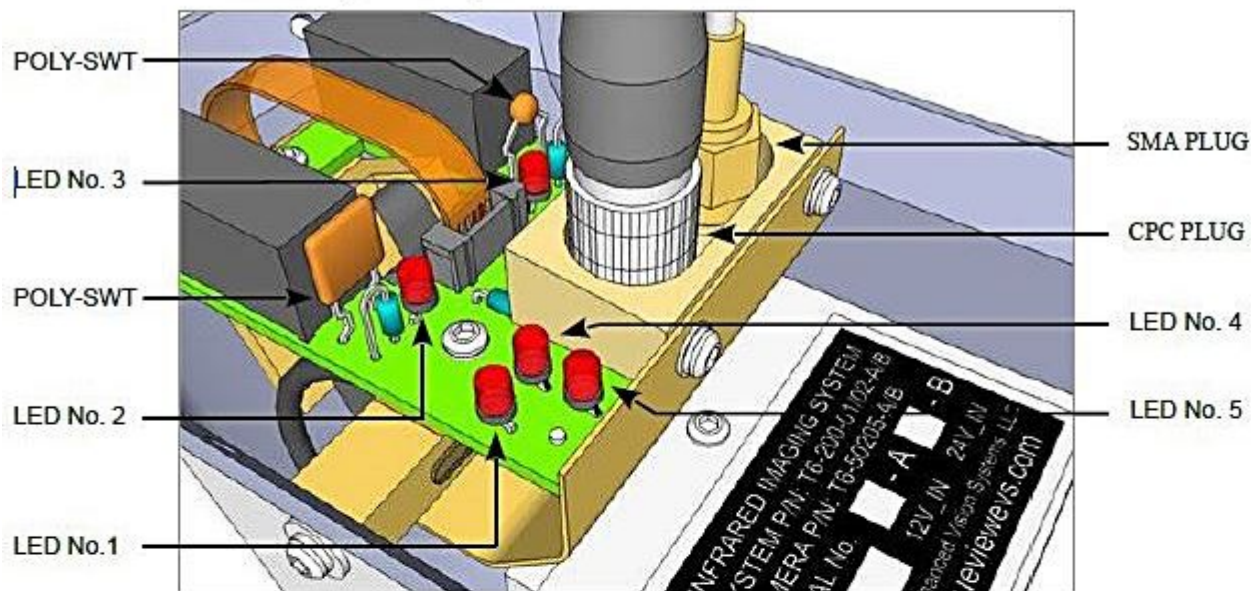
**5.3 - PARTS ILLUSTRATION**



**FIGURE 2**

**SECTION 6.0 – TROUBLESHOOTING CAMERA ASSEMBLY**

Troubleshooting the T6 Imager is accomplished by observing the 5 power level indicators illustrated



With the CPC and SMA Plugs engaged, and power available, observe the following:

| NORMAL OPERATING CONDITIONS |                      | TOGGLE SWITCH ACTION                 |        |  | CONDITION |  |
|-----------------------------|----------------------|--------------------------------------|--------|--|-----------|--|
| LED Indicator               | INDICATES            | AFT_POSITION                         | CENTER | FWD_POSITION                                 | NORMAL    |  |
| No. 1                       | PWR_IN FULL SYSTEM   | LED No's. 1, 2 & 3 ALWAYS ON         |        |  |           |  |
| No. 2                       | PWR_TO CAMERA        |                                      |        |  |           |  |
| No. 3                       | PWR_TO SERVO SWITCH  |                                      |        |  |           |  |
| No. 4                       | PWR_SERVO ACTIVE_AFT | ON                                   | OFF    | OFF  |           |  |
| No. 5                       | PWR_SERVO ACTIVE_FWD | OFF                                  | OFF    | ON   |           |  |
| TROUBLESHOOTING A FAILURE   |                      | REFER TO TROUBLESHOOTING NOTES BELOW |        |  |           |  |
| LED Indicator               | OBSERVATION [NOTES]  | CAUSE                                |        | REMEDY                                       |           |  |
| No. 1                       | OUT — NOTE 1         | NO INPUT POWER FROM A/C BUS          |        | CONFIRM PWR TO CPC: [SEE PAGE 24]            |           |  |
| No. 2                       | OUT — NOTE 2         | FAILED POLY-SWT / FAILED CONVERTER   |        | RETURN FOR SERVICING                         |           |  |
| No. 3                       | OUT — NOTE 3         | FAILED POLY-SWT / FAILED CONVERTER   |        | RETURN FOR SERVICING                         |           |  |
| No. 4                       | NO BEEP_LT [4] [5]   | FAULTY TOGGLE SWT OR CIRCUIT         |        | SEE PAGE 24 for [ TROUBLE SHOOTING HARNESS ] |           |  |
| No. 5                       | NO_BEEP LT [4] [5]   |                                      |        |  |           |  |

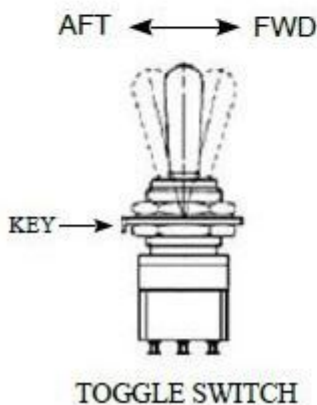
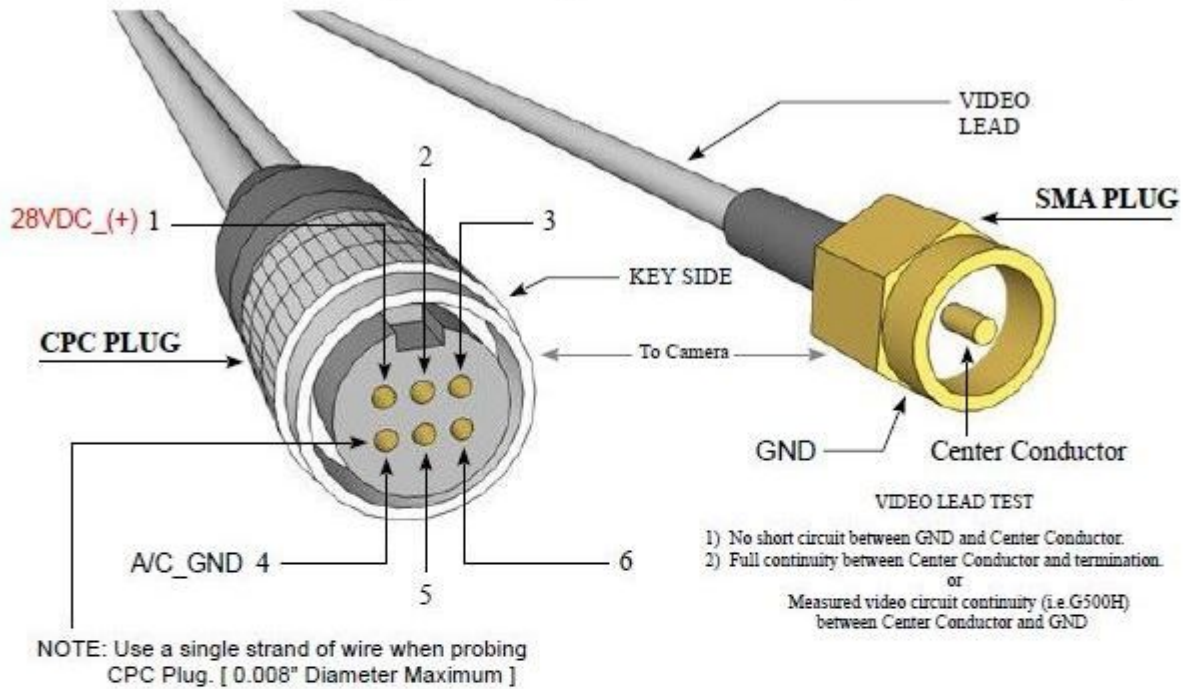
NOTE: See Remedy column for the following conditions below.

- 1- If LED No. 1 is not illuminated, supply power is not present to T6 camera system and will not function.
- 2- If LED No. 1 is ILLUMINATED and LED No. 2 is not illuminated, supply power to camera has fail and will not deliver an image.
- 3- If LED No. 1 is ILLUMINATED and LED No. 3 is not illuminated, supply power to "Tilt Control" switch has failed and will not function.
- 4- If LED No. 3 is ILLUMINATED and LED No's. 4 & 5 fail to illuminated when beeped, this indicates faulty "Tilt Control" switch/circuits.
- 5- If LED Nos. 4 & 5 illuminated when beeped, but no servo movement is observed, this indicates a faulty "Servo Unit".

**SECTION 7.0 – TROUBLESHOOTING WIRING HARNESS**

**Note:** Confirm supply power to pins (1) & (4) then remove power and perform “toggle circuit test” as defined in continuity test block below and “video lead test” as illustrated below.

**Troubleshooting Wiring Harness by Continuity**



| T6 - Wiring Harness Continuity Test through CPC Plug |                |   |              |                        |        |     |
|--|----------------|---|--------------|------------------------|--------|-----|
| Power Circuit Test                                   |                | Toggle Circuit Test                           |              | With Toggle Positioned |        |     |
| Pin  | Assignment     | Observe Continuity                            |              | AFT                    | CENTER | FWD |
| 1 [1]  | <b>28VDC_+</b> | Between                                       | 2 & 6 [only] | -                      | -      | X   |
| 2 [2]*   | Trim_(+) Input | Between                                       | 3 & 5 [only] | -                      | -      | -   |
| 3 [2]  | Trim_Lo        | Between                                       | 2 & 3 [only] | X                      | -      | -   |
| 4 [1]  | <b>A/C_GND</b> | Between                                       | 5 & 6 [only] | -                      | -      | -   |
| 5 [2]  | Trim_(-) Input | No Continuity Observed Across Any [2,3,5 & 6] |              | -                      | X      | -   |
| 6 [2]  | Trim_Hi        |   |              |                        |        |     |

[1] – Observe 28VDC supply power between Pins 1 and 4.  
 [2] – Use “Toggle Circuit Test” column for testing pins 2,3,5 & 6.  
 \*Pin 2 receives 12VDC from Camera.

## SECTION 8.0 - FUNCTIONAL CHECKS

The operation of the T6-200 (EVS) system is as follows:

- 1- Apply electrical power to the aircraft.
- 2- Power-up the cockpit display.
- 3- Turn camera system on by closing "INFRARED" system circuit breaker located in the circuit breaker panel.
- 4- Confirm infrared image appears on-screen.
- 5- Use the "camera trim" switch to confirm proper functionality for varied viewing angles.
- 6- Shut down the camera system by opening the "INFRARED" circuit breaker located in the circuit breaker panel.
- 7- Power-down the cockpit display and power to the aircraft.

## SECTION 9.0 - MAINTENANCE AND REPAIR

### MAINTENANCE

Maintenance on system components is limited to On-Condition (OC). OC is a maintenance process having repetitive inspections or tests to determine the condition of an assembly with regard to continued serviceability. Corrective action is taken when required by condition of the unit.

### REPAIR

Major repairs to the system components are made only during overhaul when the equipment is removed from the aircraft. Return Components To The Manufacturer For Service for information about returning units for repair or overhaul.

### CLEANING

**CAUTION:** DO NOT USE ANY ABRASIVE CLEANERS OR COMPOUNDS TO CLEAN THIS UNIT.

Clean the camera lens with soft lint-less cloth dampened with mild cleaning solution.

## SECTION 10.0 - AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is FAA approved and specifies inspections and other maintenance required under 14 CFR §43.16 and 14 CFR §91.403 unless an alternative program has been approved by the FAA.

NO airworthiness limitations are associated with this system.

**SECTION 11.0 - WEIGHT AND BALANCE DATA**

| Weight and Balance Information  |              |                 |                  |
|---|--------------|-----------------|------------------|
| ITEM  | PART NUMBER  | WEIGHT (LBS)    | STATION/LOCATION |
| Camera Assembly   | T6-50205     | 0.75            | Station #        |
| Transition Plate Assy   | T6-50212     | 0.25            | Station #        |
| Wiring Harness  | T6-260-00    | 0.25            | *                |
| Toggle Switch   | T6-260-02    | **              | < Location of >  |
| Circuit Breaker   | T6-260-04    | **              | < Location of >  |
| Display ***   | Displays P/N | Displays Weight | Station #        |
| * = Various Station<br>** = Less than 1 lb, part of wiring harness assembly<br>*** = Determined by the end user |              |                 |                  |

**SECTION 12.0 - PLACARDS AND MARKINGS**

**NOTE:**

Make sure placards are present and legible at all times. Replace all missing, torn or illegible placards immediately.

- 1- Placards are required and located in the cockpit for the circuit breaker and trim control switch.

**SECTION 13.0 TOOLS AND MATERIALS**

| TOOLS* AND MATERIALS   |                               |                          |
|--|-------------------------------|--------------------------|
| ITEM   | MATERIAL                      | USE                      |
| Sealant  | RTV102 or 108 (or equivalent) | Flange Sealing           |
| Thread Lock Compound   | MG# 8701 (or equivalent)      | Low Strength Thread Lock |
| * No special tooling is required for maintaining this system |                               |                          |

### **SECTION 14.0 PREFLIGHT CHECK**

There are no specific pre-flight requirements associated with this installation.

### **SECTION 15.0 SOFTWARE UPDATES**

There are no routine software updates for this system.

### **SECTION 16.0 LIGHTNING STRIKE**

No specific known issues are associated with lightning strikes and the installation of this equipment.

### **SECTION 17.0 HARD LANDING**

No specific known issues are associated with hard landings and the installation of this equipment.

### **SECTION 18.0 TOWING AND TAXIING**

No known issues are associated with towing and taxiing and the installation of this equipment.

### **SECTION 19.0**

#### **RETURN COMPONENTS TO THE MANUFACTURER FOR SERVICE**

- 1- There are no user serviceable parts associated with the installation of this equipment.
- 2- If it has been determined that the wiring harness is in proper condition after troubleshooting in accordance with section 7.0, the installed display is operating properly, and the camera assembly is not responding in accordance with section 6, the camera assembly must be returned for inspection and repair.

### **TECHNICAL SUPPORT**

For further system information and support

[www.trueviewevs.com](http://www.trueviewevs.com)