MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft
   - Nationality and Registration Mark: N539MY
   - Serial No.: 18282238
   - Make: Cessna
   - Model: 182T

2. Owner
   - Name (As shown on registration certificate): NG Research
   - Address (As shown on registration certificate): PO Box 655, Bristow, VA 20136-0655

3. For FAA Use Only

4. Type
   - Repair
   - Alteration
   - Unit

5. Unit Identification
   - Make
   - Model
   - Serial No.
   - AIRFRAME

6. Conformity Statement
   - A. Agency's Name and Address
     - Name: Philip Glasgow
     - Address: 2533 Dallas Creek Court
     - City: Fort Collins
     - Zip: 80528

   - B. Kind of Agency
     - U. S. Certified Mechanic
     - Foreign Certified Mechanic
     - C. Certificate No.
     - Certified Repair Station
     - Certified Maintenance Organization

   - D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

7. Approval for Return to Service
   - Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is
     - Approved
     - Rejected

   - By
     - FAA Flight Standards Inspector
     - FAA Designee

   - Certificate or Designation No.
     - A&P 3292572 IA

   - Signature/Date of Authorized Individual
     - Philip Glasgow 10/16/13

FAA Form 337 (10-06)
NOTICE
Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

<table>
<thead>
<tr>
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<th>10/16/13</th>
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Nationality and Registration Mark        Date

Installed Gomolzig Flugzeug-und Maschinenbau GmbH Muffler IAW STC SA01096W1.

Updated weight & balance records.

---------------------------------------------------------------END-----------------------------------------------------------------------

☑ Additional Sheets Are Attached

FAA Form 337 (10-06)
Installation Instruction

for

Cessna 182S and T

Modification 2024354

Equipped with Gomolzig Silencer Kit C182-606580

Edition: 01.07.2011

The content of this Version dated 01.04.2010 is issued under the privilege of DO EASA.21J.274.

Installation Permission

Based on the conditions stated in the EASA STC the installation of this modification is hereby permitted by the approval holder GOMOLZIG Flugzeug- und Maschinenbau GmbH for the following aircraft only:

Model: Cessna 182T
Registration: 
Serial No.: 
Date: 2011-08-22

Signature/Stamp: 

Bearbeiter: B. Ahler
Datum: 01.07.2011
Musterprüfung: A. Kocks
Datum: 15.07.2011

Il_2024354_N302MP_18282273.doc
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### Data Package

- Form One
- Attachment 1
- Installation Instruction II_2024354_rev0_20110701
- Installation Drawing C182(T)-606580.00
- Supplement to Pilot's Operating Handbook and FAA Approved Aircraft Flight Manual
- SPOH_2024354_rev0_20110701
- STC EMZ SA1062/ STC SA01096WI
- Minor Change Approval Change Note CN_2024354_rev0_20110701

### Copyright

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Introduction:

The aircraft can be modified i.a.w. this installation instruction. The installation can be performed by an approved maintenance organisation. The installer has to verify, that no other modification is incorporated, which together with the intended modification will effect the airworthiness of the aircraft.

The Gomolzig Low Noise Silencer System C 182-606550 was initially approved by the German LBA STC EMZ SA1062, which later on was grandfathered through EASA and validated by FAA under STC SA01096WI.

With modification 2024354 the silencer was removed from the left side and installed to the right side. This modification was approved by a Minor Change Approval of the EASA approved Design Organisation Gomolzig Flugzeug- und Maschinenbau GmbH based on their privileges. Consequently this installation instruction is part of the above mentioned approval.

According to the "Agreement between United States of America and the European Community on cooperation in the regulation of civil aviation safety" a Minor Change Approval of an appropriate approved EASA Design Organisation is considered approved by the FAA.

Installation Instruction:

This system consists of LH and RH exhaust tubing leading the exhaust gas to a main muffler. This muffler has a shroud assy. The exhaust gas is lead via an elbow and a swivel ball joint to an additional silencer that is installed in the RH cowling area. Perform the installation i.a.w. the following instruction and corresponding Installation Drawing C182(T)-606580.00

1) Remove the upper and lower cowling parts, remove the complete original exhaust system from the cylinder outlet ports in accordance with the Maintenance Manual.

2) Mount the LH (Item 4, 5, 6) and RH (Item 7, 8, 9) exhaust tubing, but don't tighten the screws in order to align the system. Use the required Lycoming Blow-Proof-Gaskets and self locking stop nuts for the exhaust-tubing / engine connection. Mount the muffler (Item 1) together with the pre-mounted heating shroud (Item 31). Tighten the self locking nuts corresponding to the Maintenance Manual, tighten the clamps in a way, that moving of the muffler is still possible.

3) Mount the triad bracket (Item 16) corresponding to the installation drawing on the right hand side of the engine with the standard parts (items 34-38) to the oil sump.

4) Mount the silencer (Item 2) and connect the swivel-ball joint to the mufflers outlet with standard parts (Item 12, 18, 20, 21). Tighten the swivel-ball joint screw and
springs in a way, that rotating the silencer by hand is possible. Secure the castle nuts (Item 20) with cotter pins (Item 21).
5) Connect the silencer (Item 2) to the triad bracket with the standard parts (Items 17, 28, 29, 32, 33, 34 and 35). Screw and secure the clamp (Item 14) with the safety wire (Item 15).
6) Secure the tail pipe with the original attaching parts.
7) Mount the cooling air hose (Item 23) to the silencers (Item 2) cooling shroud inlet and fix it with the clamp (Item 24).
8) Mount the Y-Tube (Item 22) to the original cabin heat inlet hose (Item 26). Secure with clamps (Item 24).
9) Mount the other end of the cooling air hose (Item 23) to the Y-Tube (Item 22) and secure with clamp (Item 24).
10) Mount the cabin heat inlet tube (Item 26) to the LH flange of the shroud and fix it with the original clamp (Item 30).
11) Mount the cabin heat outlet tube (Item 27) to the RH flange of the shroud (Item 31) and fix it with the original clamp (Item 25).
12) Check all parts concerning proper and tight fitting. Tighten all pre-tightened connections and secure all parts with the designated standard parts.
13) Mount the complete cowling corresponding to the Maintenance Manual. Check the cowl-flaps function.
14) Conduct an engine ground run by an authorised person.
15) Correct the Weight and Balance Sheet with the data given on the following page.
17) Add Instruction of Continued Airworthiness to the Maintenance Documentation.
18) Release aircraft to service.
Weight and Balance

Change due to the installation of Gomolzig Silencer Kit C182-606580

Reference line is the front of the firewall:

Removing the original exhaust system:

The weight of the removed exhaust system (including side tubing): 9,6 kg or 15 lbs
45,0 cm or 17,7 inch

Centre of gravity of the removed parts:
in front of the firewall
Resulting in a moment of:
9,6 kg x 45 cm = 432 kg cm
27,7 lbs x 17,7 inch = 490,3 lbs inch

Installation of silencer kit C182T-606580:

The weight of the new muffler with side tubing is:
7 kg or 15,4 lbs
75 cm or 29,53 inch

The centre of gravity is in front of the firewall
It has a moment of:
7 kg x 75 cm = 525 kg cm
15,4 lbs x 29,53 inch = 454,8 lbs inch

The weight of the additional silencer is:
6,5 kg or 14,3 lbs
41,5 cm or 16,33 inch

The centre of gravity is in front of the firewall
It has a moment of:
6,5 kg x 41,5 cm = 269,8 kg cm
14,3 lbs x 16,33 inch = 230,2 lbs inch

The kits complete weight is:
13,5 kg or 29,7 lbs
794,8 kg cm or 685 lbs inch

Corrective data due to the installation of the Gomolzig Silencer Kit C182-606580

added weight
+ 3,9 kg or 10,4 lbs

added moment
- 362,8 kg cm or - 194,7 lbs inch
Instruction for Continued Airworthiness

During the maintenance checks of this aircraft the following checks have to be conducted at the silencer kit C182T-606580:

1.1 Muffler:
   (a) Inner pipes
   (b) Muffler
   (c) Swivel ball joint
   (d) Cracking inside the side covers

1.2 Silencer:
   (a) Inner tubing
   (b) Steel wool
   (c) Attachment / Mounting

2. Work instruction referring 1.1:
   (a): remove each side tubing part and light the mufflers inner tubes with a light
   - check for deformation or cracks and for well passage of exhaust gas.
   (b): remove the shroud and check the mufflers wall for deformation and cracks. Conduct an exhaust system leak-test (e.g. with the help of a blowing hoover)
   - Leaks have to be welded with filler rod 1.4551 or equivalent.
   (c): The swivel-ball connection attachments have to be rotatable by hand
   - if necessary adjust the springs. Lubricate contact surfaces with appropriate high temperature grease.
   (d): Visual check: Cracks are not allowed.

3. Work instruction referring 1.2:
   (a): Light inner tubing with the help of a light and check for deformation or cracking.
   (b): Remove the back side by unfastening the four screws. Check the area between casing and tubing, which needs to be completely filled out by steel wool.
   (c): The attachment parts have to be without any cracks, the triad bracket has to be without damage. The silencer has to be flexible inside the shock mount attachment, any movement restrictions due to the shock mount rubber parts are prohibited.

4. For ordering spare parts or in case of detecting any failure or defects contact:

Gomolzig Flugzeug- und Maschinenbau GmbH,
Eisenwerkstr. 9, D-58332 Schwelm,
Germany
Phone: +49 (0)2336 490 330
Fax: +49 (0)2336 490 339

E-MAIL: INFO@GOMOLZIG.DE
Pilot’s Operating Handbook and FAA Approved Airplane Flight Manual

Supplement for Cessna 182S and T

Modification 2024354

Equipped with Gomolzig Silencer Kit C182-606580

Edition: 01.07.2011

This Flight Manual Supplement is EASA approved under approval number EMZ SA 1062 and FAA STC SA01096WI. The content of this Version dated 01.07.2011 is issued under the privilege of DO EASA.21J.274.

Installation Permission

Based on the conditions stated in the EASA STC the installation of this modification is hereby permitted by the approval holder GOMOLZIG Flugzeug- und Maschinenbau GmbH for the following aircraft only:

Model: Cessna 182T
Registration:
Serial No.: 
Date: 2011-08-22
Signature/Stamp: 

This Document is issued to AVC Serial-No.: 1826273 only. © by GOMOLZIG Flugzeug- und Maschinenbau GmbH.

Bearbeiter: B. Ahlert
Datum: 01.07.2011
Musterprüf.: A. Kocks
Datum: 15.07.2011
Log of Revisions / Amendments

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SECTION 1: GENERAL

Introduction:

This Supplement to the Pilot's Operating Handbook and FAA Approved Aircraft Flight Manual refers to the operation of the aircraft with the Gomolzig Low Noise Silencer Kit C182-606580.

The Gomolzig Low Noise Silencer System C182-606550 was initially approved by the German LBA STC EMZ SA 1062, which later on was grandfathered through EASA and validated by FAA under STC SA01096WI.

With modification 2024354 the silencer was removed from the left side and installed to the right side. This modification was approved by a Minor Change Approval of the EASA approved Design Organisation Gomolzig Flugzeug- und Maschinenbau GmbH based on their privileges. Consequently this supplement is part of the above mentioned approval.

According to the "Agreement between United States of America and the European Community on cooperation in the regulation of civil aviation safety" a Minor Change Approval of an appropriate approved EASA Design Organisation are considered approved by the FAA.

This supplement to the Flight Manual (POH supplement) only contains information that contributes to safe operation. The supplement must be followed, if the aircraft is equipped with the equipment listed in chapter 6. It extends the original flight manual (POH) by adding or replacing specific information and procedures only in the areas expressly mentioned below.

For limitations, procedures and performance information not contained in this supplement please refer to the original Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
SECTION 2: LIMITATIONS

This section remains unchanged

SECTION 3: EMERGENCY PROCEDURES

This section remains unchanged

SECTION 4: NORMAL PROCEDURES

This section remains unchanged

SECTION 5: PERFORMANCE

This section remains unchanged

SECTION 6: MASS AND BALANCE / EQUIPMENT LIST

According to the data given in the Installation Instruction II_2024354_rev0_20110701 the Weight and Balance Sheet of each specific aircraft can be corrected.

SECTION 7: AIRPLANE AND SYSTEMS DESCRIPTION

This Supplement to the Pilot's Operating Handbook and FAA Approved Aircraft Flight Manual refers to the operation of the aircraft with the Gomolzig Low Noise Silencer Kit C182-606580.

This system consists of LH and RH exhaust tubing leading the exhaust gas to a main muffler. This muffler has a shroud assy. The exhaust gas is lead via an elbow and a swivel ball joint to an additional silencer that is installed in the RH cowling area.

For procedures and information not contained in this part of this supplement, please refer to the original Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
Supplemental Type Certificate

IMPORT

Number: SA01096WI

This certificate issued to:
Gomolzig Flugzeug- und Maschinenbau GmbH
Loher Strasse 1/ Gebäude 38
D-58332 Schwein, Germany

This certificate is to certify that the change in the type design for the following product with the limitations and conditions therefore as specified herein meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations. Luftfahrt-Bundesamt (LBA) originally certificated this modification under German LBA EMZ (STC) No. SA 0672. The FAA validated this modification under U.S. Supplement Type Certificate No. SA01095WI. Effective September 28, 2003, the European Aviation Safety Agency (EASA) began oversight of this modification on behalf of Luftfahrt-Bundesamt.

Original Product-Type Certificate Number: 3A13
Make: Cessna
Model: 182S, 182T

Description of Type Design Change: Installation of Gomolzig C182R-606550 engine exhaust system silencer.


Limitations and Conditions: Compatibility of this design change with previously approved modifications must be determined by the installer. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

This STC is not to be transferred since its issuance was in accordance with 14 CFR 21.29 and is based upon a validation of the German LBA EMZ No. SA 0672.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: December 17, 2001

Date of issuance: July 3, 2002

Date received: 

By direction of the Administrator

Original signed by Eual Conditt

Eual M. Conditt, Jr.
Associate ACO Manager, Airframe & Services
Wichita Aircraft Certification Office

Any alteration of this certificate is punishable by a fine of not exceeding $10,000, or imprisonment not exceeding 5 years, or both.

FAA Form 1120-1 (2-84) PAGE 1 OF 5 PAGES

This certificate may be transferred in accordance with FAR 21.157.
CHANGE NOTE

project definition [Engineering]:

CHANGE NOTE - No.: CN_2024354_rev0_20110701.DOC
check list to change note: CLCN_2024354_rev0_20110701.doc
Project Title: CESSNA 182 EXHAUST SYSTEM RH OUTLET
affected (S)TC: EMZ SA 1062
affected type/make: Cessna
affected model(s): 182S/T with STC SA 1062
affected S/Ns: all
available documents: Flughandbuch, Maintenance Manual, Parts Katalog

Project Tille: CESSNA 182 EXHAUST SYSTEM RH OUTLET

Variant of exhaust system C182-606550

The exhaust system is already approved with STC LBA EMZ SA 1062 and FAA STC SA01096WI. Without changing of any feature the muffler outlet of the new variant was moved to the righthand side on customer's request. PN of the modified system is changed to C182-606580. PN of the lefthand side outlet system remains C182-606550.

Project Leader
name: Bernd Ahlert
signature: [Signature]
date: 01.07.2011

Classification and start of Certification Project [Office of Airworthiness]:

project in capability list: yes
applied Certification Basis: FAR 23 Amdl 23-1 through 23-45
Certification Programme: CP_2024354_rev0_20110701
Master Document List: MDCL_2024354_rev0_20110701

Change [ ] Major [X] Minor [ ] ATC [ ] significant
Repair [ ] Major [ ] Minor [X] STC [ ] not significant
Unrepaired Damage [ ] Major [ ] Minor [ ] ASTC

Office of Airworthiness
name: Achim Kocks
signature: [Signature]
date: 01.07.2011

Approval [Office of Airworthiness] / EASA

Minor Change/Repair approved under authority of the design organisation EASA. 23J. 274 with regard to the valid procedures of the corresponding design organisation exposition.

Implementation of this modification is valid after the date shown below.

This modification complies with the applicable Certification Specifications as listed in the Certification Programme mentioned above.

Approval: Office of Airworthiness / EASA
name: Achim Kocks
signature: [Signature]
date: 01.07.2011

CR finished: date:
DoC signed: date:

Countersigned Project Leader
name: Bernd Ahlert
signature: [Signature]
date: 01.07.2011

Finalisation [Office of Airworthiness]:

Implementation of this Major Change/Repair is only valid after issuance of an corresponding EASA approval!

Musterunterlage
MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft
   - Nationality and Registration Mark: N539MY
   - Serial No.: 18282238
   - Make: Cessna
   - Model: 182T

2. Owner
   - Name (As shown on registration certificate): NG Research
   - Address (As shown on registration certificate): P.O. Box 655, Bristow, VA 20136-0655

3. For FAA Use Only
   - The technical data identified herein has been found to comply with the applicable airworthiness requirements and is hereby approved for use only on the above described aircraft, subject to conformity inspection by a person authorized in CFR title 14, Part 43, section 43.7.
   - Approving Inspector: Philip Glasgow, Date: 12/1/2012, Denver FSDO NM-03

4. Type
   -  Repair
   - Alteration
   - Unit
   - Make
   - Model
   - Serial No.
   - ☐ AIRFRAME
   - ☐ POWERPLANT
   - ☐ PROPELLER
   - ☐ APPLIANCE

5. Unit Identification
   - (As described in Item 1 above)

6. Conformity Statement
   - A. Agency's Name and Address
     - Name: Philip Glasgow
     - Address: 2533 Dallas Creek Court
     - City: Fort Collins
     - State: CO
     - Zip: 80528
     - County: USA
   - B. Kind of Agency
     - ☑ U.S. Certificated Mechanic
     - ☐ Foreign Certificated Mechanic
     - ☐ C. Certificate No.
     - ☐ Certified Repair Station
     - ☐ Certified Maintenance Organization
     - ☐ A&P 3292572 IA
   - D. I certify that the repair and/or alteration made to the unit(s) identified in Item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

   Signature/Date of Authorized Individual: Philip Glasgow, Signature/Date: 12/1/2012

7. Approval for Return to Service
   - Pursuant to the authority given persons specified below, the unit identified in Item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is ☑ Approved ☐ Rejected
   - By FAA Flt. STANDARDS INSPECTOR: ☐
   - FAA Designee: ☐
   - Maintenance Organization: ☐
   - Inspection Authorization: ☑
   - Other (Specify): ☐

   Signature/Date of Authorized Individual: Philip Glasgow, Signature/Date: 12/1/2012

FAA Form 337 (10-06)
8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Installed Equipment.

Installed Paravion Technology C182-100 Infrared Camera provisions IAW STC SA00294DE.

Ref Paravion Engineering Report ER-C182ELP-2 Rev N/C.

-Installed a Paravion Technology Augmented Reality System (ARS) IAW Paravion C182 Electrical-Rev A & ARS 214. The ARS is powered from the Avionics Buss and is protected using a 15 AMP Klixon C/B switch P/N 7270-1-15 labeled "ARS". The ARS is interfaced to FLIR Camera system IAW the above mentioned Paravion C182 Electrical-Rev A Dwgs. The ARS ECU is mounted in the baggage compartment at station 130".

-The ARS is secured to the rear baggage compartment shelf using two quick disconnect controller mount rails. Ref attached Paravion Technology Inc drawing ARS 4130 sheet 3 for fabrication of controller rails. Attached the controller mount rails to two existing structures in the aircraft using 4X Screws P/N MS27019-1-10, 7 X washers P/N NAS1149F0332P & 3 X nuts P/N MS21042-L3.

-Installed the new cover plate for the ARS. Ref Paravion Technology Dwg # ARS 4130 sheet 2. Attached fabricated cover with 8 X Screws P/N MS35206-231. Instructions for continued airworthiness for the augmented Reality System are contained in Paravion Document PR-ARS-120M. Ref 8110-3 dated 3/30/11 and Paravion report ARS-4004-901 for structural mounting.

-Mounted the Inertial Navigation Unit (IMU) on top of the fabricated cover plate and secured with 4 X IR-620 spacers, 4 X MS35207-266 screws & 4 X MS21042L3 nuts. The IMU is powered from the above ARS ECU and is protected using a 2 amp internal fuse to the ARS ECU. Mounted the GPS antenna P/N 42G01215A-XT-1 to the topside of the aircraft at station 79.0 using manufacturer provided screws, 4X MS21044C3 nuts & 4 X NAS1149C0332R washers.

-Mounted the INS RS232 control box to the fabricated cover plate using a plate with is attached to the above mentioned cover plate using 4 X MS35206-226 screws. Ref Paravion Technology Dwg 4130 Sheet 4 item -12 for full fabrication details. Attached the INS RS232 control box to the above mentioned plate using 4 X MS35206-226 screws.

-Mounted Janteg Downlink Control ECU to the floor aft of the FLIR at station 105.00 mounted to existing structure using 4 X MS27039-1-10 screws. Attached 4 X MS21059 L4 nut plates to the existing structure using 2 X MS20426AD3-4 rivets each. Installed the Janteg Down link IAW manufacturers Dwgs 1011139 and user manual BHDXT-S-TWINTX-HP-AB. System is protected using a Klixon C/B switch P/N 7270-1-3 and is labeled "Down Link". Mounted two antennas on the bottom of the aircraft. The IMU is mounted at station 145.0" on the bottom of the aircraft to the R/H side of the aircraft center line. Fabricated a doubler from 6061 T6 aluminium 4" X 5". Attached the antenna to the aircraft using 4 X P/N MS51987-48 screws, 4 X P/N AN960C8 washers & 4 X P/N MS21042-L08 nuts. Mounted the second antenna to the bottom of the aircraft at station 125.0" to the L/H side of the center line. Fabricated a doubler from 6061 T6 aluminium 4" X 5". Attached the antenna to the aircraft using 4 X P/N MS51987-48 screws, 4 X AN960C8 P/N washers & 4 X P/N MS21042-L08 screws. Mounted the control head to the center console using 4 X P/N MS35206-215 screws, 4 X MS21042L04 nuts & 4 X AN960JD3 Washers. Ref Structural analysis dwg ER-ARS-214-2, ER-IR2300-2 & Paravion dwg ARS 232.

-Installed 2 X Video Accessory Corporation Video Distribution Amplifiers P/N 11-524-104 Ref Paravion Technology Inc Dwg # C182 ARS-1000 item -14 for fabrication details of the supporting bracket. Attached the Video Distribution Amplifiers support brackets to the shelf using 2 X MS27039-0807 screws, 2 X MS21042-L08 nuts & 4 X NAS1149FN832P washers. Attached the distribution Amplifiers to the brackets using 4 X MS24693S27 screws. Power is supplied from the avionics buss and the amplifiers are protected using a 1 Amp Klixon C/B P/N 7277-2-1 C/B Labeled"Video Dstrb".

FAA Form 337 (10/06)
8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

<table>
<thead>
<tr>
<th>Nationality and Registration Mark</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>N539MY</td>
<td>11/5/3</td>
</tr>
</tbody>
</table>

Installed 2 X Video Accessory Corporation Video switches P/N 17-511-112. Power is supplied from the avionics buss and is protected using a 1 Amp Klixon C/B P/N 727721-1. Controlling the 2 X Video switches by installing 2 X Rotary switches one labeled “Downlink Video & ARS or FLIR”. The second switch is labeled “MFD Video & PRI or SEC”. They are collectively labeled “Video switching”. These switches are located in the upper center overhead panel. Fabricated a switch panel is secured to the overhead interior panel using 4 X 632 clip nuts & 4 X MS35206-228 screws. Located the FLIR control switch, Laser Interlock control switch & the FLIR Anti Ice switch to the above mentioned overhead panel. Ref Paravion dwg C182ARS-1000 for fabrication details.

The monitor is mounted to the instrument panel on the R/H side using 3X MS24693-363 screws. Attached 3X MS21049-L3 nut plates to the instrument panel using 6 X MS21426-3-4 counter sunk rivets. The primary display is provided power from the avionics buss and is protected using a 3 Amp C/B P/N 7277-2.3. And is labeled “Monitor Power”.

Fabricated a center console and installed in the aircraft. Ref Paravion Technology drawing C1821RC-1000 for details and ref attached conformity reports for material used. Ref Paravion Technology Drawing ARS182-1000 sheet 3 & 4 for fabrication details of the attaching brackets for the above mentioned console. Attached the brackets to the floor using MS20426AD3-3.5 Rivets X 24.

Installed 2 X Aux Foot switches on the floor at station location 20.00”. Fabricated foot switch holder form the same material as mentioned above for the center console and installed a 2 X switches P/N M8805/55-001 X 2. Attached the Foot switch housing Using 2 x MS35206-228 screws and 2 X AN960JD5L washers. to the floor using 3 X Nut plates P/N MS21075L06 & 1 X MS21069L06 nut plate. Attached the nut plates to the floor using 8 X MS20426AD3-3.5 Rivets.

Mounted an existing Motorola radio on the above mentioned center console on the aft end using a doubler fabricated from 6061 T6 aluminum 2" X 4" .063”. Used 1 X AN3-3A bolt and 1 X NAS1149F0332P washers to attach to the console.

Wire gauge selection was done in accordance with AC43-13-1B Chapter 11, Aircraft Electrical System, section 5 (wiring rating) paragraphs 11-66, 11-67 section 6 (Aircraft Electrical Wire section) paragraphs 11-76, 11-77.

An electrical load does not exceed limitations of AC43-13-1b Chapter 11, paragraphs 424 (Electrical load limits), 425 (generator) and 428 (determination of electrical load).

The Instructions for Continued Airworthiness (ICA) contained in the Flight Standards Handbook Bulletin for Airworthiness (HBW-8900.1) are not applicable as these components are not field repairable and are “Remove and Replace” items only.

Aircraft weight & balance and equipment list amended as required.

----------------------------------------------------------------- Nothing follows ---------------------------------------------------
OVERHEAD BREAKER PANEL

ARS

15

(8 AWG) ELECT BUS

0/4 AWG BUS

0/8 AWG BUS

FLIR

15

(12 AWG) ELECT BUS

11 ft. (TW)

ELECTRICAL BUS 1

ELECTRONIC BUS

VIDEO DIST.

1

(22 AWG)

VIDEO SWITCHES

FLIR

1

(22 AWG)

DE-ICE

20

(12 AWG) OH ESS BUS

11 ft. (TW)

ELECTRICAL BUS

AVIONICS BUS 1

DOWNLINK XMTR

5

(18 AWG)

AVN BUS 1

11 ft. (TW)

WIRE LEGEND

TW = TOTAL WIRE LENGTH

SS = TOTAL SNAKE SKIN LENGTH

TS = TOTAL SHELLED LENGTH

DIMENSIONS IN INCHES

TOLERANCES EXCEPT WHERE NOTED:

± 0.1

± 0.05

± 0.010

ANGLES = 5° 1'

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PANEL MONITOR
P/N: AB-08

EXISTING COAX STOWED BEHIND PANEL MONITOR. AFT VIDEO PANEL AUX 2 CONNECTED TO FLIR VID AMP OUTPUT 1)

CV2 COMPOSITE IN
CV1 COMPOSITE IN
PWR
GND

MONITOR REMOTE CONTROL

9 PIN MOLEX

MONITOR MENU SWITCH

SOLDER TERMINAL VIEW

DIMMER WIPER
DIMMER GND
DIMMER SVDC
POWER COMMON
POWER N/O

SOLDER TERMINAL VIEW

MONITOR POWER SWITCH

MONITOR VGA

AR5 VGA OUT

WIRE LEGEND

TW = TOTAL WIRE LENGTH
SS = TOTAL SNAKE SKIN LENGTH
TS = TOTAL SHEILD LENGTH
WIRE LEGEND
TW = TOTAL WIRE LENGTH
SS = TOTAL SNAKE SKIN LENGTH
TS = TOTAL SHEILD LENGTH

JANTEQ DOWNLINK
P4 POWER

POWER
A
B
C
D

POWER GROUND

GROUND

A
B
C
D

P2 DATA
RX+
E
RX-
F
RTN
G

8ft.(TW)

JTQ PWR (18 AWG)

DWNLINK XMTR

14ft.(TW)

S

BUS

JTQ GND (18 AWG)

AIRFRAME GROUND

DWNLINK XMTR

3ft.(SS)

AR PORT 3

ARS PORT 3

8ft.(TW)

3ft.(SS)

11ft.(TW)

12ft.(TW)

38in.(TW)

P1 CONTROL
+12 VDC

A
B
C
D
E
F

(24 AWG)

(24 AWG)

JTQ CTRL

JTQ CTRL

CONTROL HEAD

CONSOLE DISCONNECT

SOLDER CUP VIEW

WIRE CONNECTOR

CVBS VIDEO IN

DELK VIDEO

VIS VIDEO AMP

AND SWITCHING

OMNI ANTENNA

ANTENNA

TX OUT RF1

ANTENNA

TX OUT RF2

3.5ft.(TW)(SS)

10ft.(TW)

6.5ft.(TW)(SS)

Lemo Connector

PARAVION® Inc.

Technology

Internal CLASS 3B

External CLASS 2A

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DATE

4/13/2012

PARAVION TECHNOLOGY INC.

DO NOT SCALE DRAWING

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NOTE: ALL WIRES 22 AWG
SWITCHES TO BE IN OFF POSITION.

29in(TW) 18.5in(SS)

ARS COMPOSITE VIDEO OUT  ARS COMPOSITE VIDEO IN  ARS HD-SDI INPUT

31in.(TW) 19in.(SS)

FLIR U2J3 HD-SDI OUTPUT

U2J3 12ft.(SS) 12ft.(TW)

2A PANEL MONITOR

FROM AFT VIDEO PANEL

ARS HD-SDI INPUT

7-1/4in.(TW)

7in.(TW)

V7525B COAX (EXISTING COAX)

MFD VIDEO #1

1.3in.(SS) VID SWT PWR (22 AWG)

0.3ft. (TW) VID SWT GND (22 AWG)

O/H BREAKER PANEL

PARAVION® Inc.

VIDEO DISTRIBUTION

FULL TECHNOLOGY

FBI C182 HAWK OWL

MASTER ELECTRICAL

PROCTOR

2009 PARAVION TECHNOLOGY INC.

INTERNAL CLASS 2B

EXTERNAL CLASS CA

3RD ANGLE

PARAVION IS A TRADEMARK OF PARAVION TECHNOLOGY INC.
1. TWiNAX SOCKET COME WiTH CRiMP iNSTRUCTIONS.
2. ALL OTHER SocketS ARE: M39029/56-348 (USE CRiMPER M22520/2-01 (BLUE CRiMPER) DIE K40).
GIMBAL SIDE OF LASER/GPS/DE-ICE CABLE

NOTES:
1. COAX SOCKET COMES WITH CRIMP INSTRUCTIONS.
2. ALL OTHER SOCKETS ARE: M39029/56-352 (USE CRIMPER M22520/1-01 DIE M22520/1-01).
10" of wire slack from O/H opening to breaker panel

O/H video switch breaker

CUT LINE (FOR WIRE PULL-THRU)

1-3/8" HOLE

6-1/2"

4-1/8

LH COVER PANEL

(for aft circuit breakers)

2X POST LIGHTS (CLEARANCE HOLES FOR POST LIGHTS BEHIND PANEL ARE Ø.625)

#8 NUTPLATE

1.4

2.8

O/H video switch breaker

3/4

(video/DA switches)

OVERHEAD VIEW BATTERY ACCESS PANEL

(AFT)

DOWNLINK COAX

1" DIA.

9-1/2"

AFT OF LH COVER PANEL

AFT SHELF CLOSE-OUT PANEL (BEHIND ARS)

CUT TO MATCH ARS MOUNT RAILS

EXISTING AFT BREAKER PANEL SUPPORT

AFT SHELF CLOSE-OUT PANEL (BEHIND ARS)
INSTRUMENT PANEL, RIGHT SIDE

TRIM MOUNT RAIL AT MONITOR CUT-OUT (TOP OF DZUS ANGLE, WULFSBERG SUPPORT)

MONITOR INSTALLATION

WULFSBERG INSTALLATION

0.17 (TYP.)

(EXISTING SCREW LOCATION TYP.)

EXISTING ACCESS PANEL

INSTRUMENT PEDESTAL

MATCH-DRILL TO EXISTING ACCESS PANEL SCREWS (4X) FOR INSTALLATION OF 2X C182ARS-1000-19.

1.25

3.81

(3-13/16, FIT TO CONSOLE)

CONSOLE INSTALLATION
1. Label wires as indicated.

**WIRE LABEL LEGEND**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WIRE LABEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>AEX027B22</td>
</tr>
<tr>
<td>8</td>
<td>AEX025PWR16</td>
</tr>
<tr>
<td>9</td>
<td>AEX025GN16</td>
</tr>
<tr>
<td>10</td>
<td>AEX026B22</td>
</tr>
</tbody>
</table>

**NOTE:**

1. LABEL WIRES AS INDICATED.
- ALLOW 5 IN. (MIN) CLEARANCE FOR AIR FLOW (THIS SIDE)
- INSTALL: ADDED WEIGHTS, -1/2 INSTN: ARS4003/4004 REB
- INSTALL TN REB LS
- INSTALL FOR CLEARANCE
- ALLOW 3.0 IN. (MIN) CLEARANCE FOR CONNECTORS (THIS SIDE)

NOTES:
1. MINIMUM MOUNT SURFACE MATERIAL 0.032" THK SPECIFICATION 6061-T6, QQ-A-250/11. MOUNTING SURFACE RATING MUST BE GREATER THAN 61 LBS. PER SQ. FT.
2. USE A MINIMUM OF (4) #8 MS35206 OR EQUIVALENT STRENGTH FASTENERS OF APPROPRIATE LENGTH PER RAIL (ARS-4130-X) IN THE LARGEST RECTANGULAR PATTERN POSSIBLE.

- 1 CONTROLLER INSTALLATION
  (HORIZONTAL INSTALL SHOWN
  ALT: VERTICAL INSTALL SEE SHT 2)
  INSTALLED WEIGHT: ARS-4003-X CONTROLLER 14 LB.
  ARS-4004-X CONTROLLER 16 LB.

- UP (VERTICAL INSTALL)
- FASTENERS APPROVED IN THESE AREAS
- MOUNT A MINIMUM OF THIS DIMENSION BETWEEN FASTENERS

- DIMENSIONS IN INCHES TOLERANCES EXCEPT WHERE NOTED:
  X = ± 0.1
  XX = ± 0.05
  XXX = ± 0.010
  ANGLES = ± 1°

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- DRAWN CHLD
-

- DRAWN
- CHK'D
- APVD
- BY
- BY
- BY

- 1 OF 2
-2 CONTROLLER INSTALLATION

(VERTICAL INSTALL SHOWN)

INSTALLED WEIGHT:
ARS-4003-X CONTROLLER 14 LB.
ARS-4004-X CONTROLLER 16 LB.

ALLOW .5 IN. (MIN) CLEARANCE FOR AIR FLOW (THIS SIDE)

ALLOW 3.0 IN. (MIN) CLEARANCE FOR CONNECTORS (THIS SIDE)

FASTENERS APPROVED IN THESE AREAS

MAINTAIN A MINIMUM OF THIS DIMENSION BETWEEN FASTENERS

NO FASTENERS IN UNSHADED AREAS

FASTENERS APPROVED IN THESE AREAS

INSTALL THIS END UP ONLY

4X 4X
8X 6X

PARAVION®
Technology Inc.

THREADS:
INTERNAL CLASS 2B
EXTERNAL CLASS 2A

3RD ANGLE
PROJECTION

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DIMENSIONS IN INCHES

TOLERANCES EXCEPT WHERE NOTED

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EXCEPT WHERE NOTED

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EXCEPT WHERE NOTED

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NOTES:
- APPLY LOCTITE 640 (P/N:64031) THREAD LOCKING COMPOUND.

-2 ASSEMBLY
(PICTURE FOR REFERENCE ONLY
SEE SHT 2 FOR DETAILS)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>MS3367-4-0</td>
<td>4&quot; WIRE TIE</td>
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<tr>
<td>1</td>
<td>ARS-3610-3</td>
<td>CABLE ASSEMBLY</td>
</tr>
<tr>
<td>1</td>
<td>ARS-3610-2</td>
<td>CABLE ASSEMBLY</td>
</tr>
<tr>
<td>1</td>
<td>ARS-3610-1</td>
<td>CABLE ASSEMBLY</td>
</tr>
<tr>
<td>3</td>
<td>NAS11490DN632J</td>
<td>WASHER</td>
</tr>
<tr>
<td>3</td>
<td>25004</td>
<td>3/8 NYLON CLAMP</td>
</tr>
<tr>
<td>8</td>
<td>MS35206-231</td>
<td>SCREW</td>
</tr>
<tr>
<td>6</td>
<td>MS35206-226</td>
<td>SCREW</td>
</tr>
<tr>
<td>4</td>
<td>MS21042L3</td>
<td>NUT</td>
</tr>
<tr>
<td>4</td>
<td>NAS114900332J</td>
<td>WASHER</td>
</tr>
<tr>
<td>4</td>
<td>MS35207-265</td>
<td>SCREW</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>SCREW ZINC PLATED OR S.S. (COMMERCIAL</td>
</tr>
<tr>
<td>4</td>
<td>MS27039-08-05</td>
<td>SCREW</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>SPACER</td>
</tr>
<tr>
<td>1</td>
<td>ARS-4130-12</td>
<td>PLATE</td>
</tr>
<tr>
<td>1</td>
<td>ARS-4130-10</td>
<td>PLATE</td>
</tr>
<tr>
<td>1</td>
<td>MCHPTCBOS3N21</td>
<td>DOWNLINK BOX (COSUAL GSE PROD) (CUSTOMER SUPPLIED)</td>
</tr>
<tr>
<td>1</td>
<td>HG1700-H5B</td>
<td>IMU- LASER RING GYRO UNIT</td>
</tr>
<tr>
<td>1</td>
<td>PROPAN-V3-RT21</td>
<td>GPS INTERFACE</td>
</tr>
</tbody>
</table>

-2 ASSY

-2 ASSY

10 - 20 MS3367-4-0 4" WIRE TIE
1 - 19 ARS-3610-3 CABLE ASSEMBLY
1 - 18 ARS-3610-2 CABLE ASSEMBLY
1 - 17 ARS-3610-1 CABLE ASSEMBLY
3 - 16 NAS1149DN632J WASHER
3 - 15 25004 3/8 NYLON CLAMP
8 - 8 14 MS35206-231 SCREW
6 - 6 13 MS35206-226 SCREW
4 - 4 12 MS21042L3 NUT
4 - 4 11 NAS114900332J WASHER
4 - 4 10 MS35207-265 SCREW
2 - 2 9 W4 X 8mm CS. PH SCREW ZINC PLATED OR S.S. (COMMERCIAL)
4 - 4 8 MS27039-08-05 SCREW
- - 7 NOT USED
4 - 4 6 IR-620-2 SPACER
1 - 1 5 ARS-4130-12 PLATE
1 - 1 4 ARS-4130-10 PLATE
1 - 1 3 MCHPTCBOS3N21 DOWNLINK BOX (COSUAL GSE PROD) (CUSTOMER SUPPLIED)
1 - 1 2 HG1700-H5B IMU- LASER RING GYRO UNIT
1 - 1 1 PROPAN-V3-RT21 GPS INTERFACE
-1 ASSEMBLY
(-2 ASS' CABLE ASSEMBLIES)

USE EXISTING NUT SUPPLIED WITH PROPAK

 removed existing ARS-5000-7 placard (REUSE IF POSSIBLE)

AR5 SYSTEM CONTROLLER (REF.)

Paravion® Inc.

INS, GPS, & DOWNLINK ASSEMBLY

ARS-232

DIMENSIONS IN INCHES

- TOLERANCES EXCEPT WHERE NOTED:
- X = ±.1
- XX = ±.05
- XXX = ±.010
- ANGLES=±1°

THREADS:
- INTERNAL CLASS 2B
- EXTERNAL CLASS 2A

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2 OF 2
NOTES:

1. BREAK ALL SHARP EDGES.
2. ALL UNSPECIFIED RADII TO BE .13 MIN. O.N.O.

### -10 BRACKET
**Material:** 0.04" THK 6061-T6 ALUMINUM QQ-A-250/11
**Finish:** BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303 OR EPOXY POLYAMIDE PRIMER PER MIL-P-23377
**Description:** FLAT PATTERN

### -12 BRACKET
**Material:** 0.063" THK 6061-T6 ALUMINUM QQ-A-250/11
**Finish:** BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303 OR EPOXY POLYAMIDE PRIMER PER MIL-P-23377
**Description:** FLAT PATTERN

### -11 CHANNEL
**Material:** 1" X 1" X .083" THK 6063-T52 ALUMINUM EXTRUSION
**Finish:** BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303 OR EPOXY POLYAMIDE PRIMER PER MIL-P-23377
**Description:** FLAT PATTERN

### -13 BRACKET
**Material:** 0.063" THK 6061-T6 ALUMINUM QQ-A-250/11
**Finish:** BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303 OR EPOXY POLYAMIDE PRIMER PER MIL-P-23377
**Description:** FLAT PATTERN

---

**Legend:**
- **1.00**
- **1.25**
- **1.87**
- **.65**
- **75°**
- **R.13**
- **.0063**
- **.13**
- **.05**
- **.010**
- **FLAT PATTERN**
- **MAT'L:** MATERIAL
- **FINISH:** FINISHING REQUIREMENTS
- **NOTE:** IMPORTANT INFORMATION

---

**Table: Update History**

<table>
<thead>
<tr>
<th>SHEET</th>
<th>REV</th>
<th>DATE</th>
<th>DESCRIPTION</th>
<th>BY</th>
<th>CHK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7/27/2011</td>
<td>UPDATE TO CURRENT CONFIG; MATERIALS, FIN.</td>
<td>TN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7,12</td>
<td>8/16/2011</td>
<td>ADDED PART -10 &amp; SH 12; REDUCED .159 HOLE FROM -24</td>
<td>TN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,2</td>
<td>9/9/2011</td>
<td>ADDED BLACK POWDER COAT FINISH TO -10,-11,-12,-13,-14</td>
<td>TN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Drawing Information:**
- **Title:** Paravion® Inc.
- **Mount Parts:** FBI HAWK OWL PROJECT
- **Drawing Number:** C182ARS-1000
- **Dimensions in Inches**
- **Tolerances:**
  - **X:** ± .010
  - **XX:** ± .05
  - **XXX:** ± .010
- **Angles:** ± 1°
- **Threads:**
  - **Internal Class 2B**
  - **External Class 2A**
- **Projection:** 3rd Angle

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-1BR R/H BRACKET

MATERIAL: .060" THK 6061-T6 ALUMINUM QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(MOUNTS CONSOLE TO FLOOR)

DIMENSIONS IN INCHES

PROJECT TOLERANCES EXCEPT

WHERE NOTED:

X = ± .005
X.X = ± .010
ANGLES = ± 1°

SPORTO

DO NOT SCALE DRAWING

Paravion® Inc.

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Inc.

Mount Parts
FBI Hawk Owl

PROJECT

C182ARS-1000

Paravion® Technology Inc.

Technology

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J OF 13
-9 Bracket

MAT'L: .063" THK 6061-T6 ALUMINUM QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 2 PER AIRCRAFT)
(MOUNTS CONSOLE TO FLOOR)

2X Ø.101
CSNK Ø.189
X 100' (OPP. SIDE)
DETAIL A
(Scale 2/1)
-20 BRACKET
SUGGESTED MATL: .06" THK 6061-T6 ALUMINUM QQ-A-200/6
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 1)

-21 BAR
SUGGESTED MATL: .50" THK 6061-T6 ALUMINUM QQ-A-200/6
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 1)

-22 BAR
SUGGESTED MATL: .06" THK 6061-T6 ALUMINUM QQ-A-200/6
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 1)

-23 DOUBLE
SUGGESTED MATL: .06" THK 6061-T6 ALUMINUM QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 1)
ENGRAVED PANEL

-24 C.B. PANEL

SUGGESTED MAT'L: .06" THK 6061-T6 ALUMINUM QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 1)
-25 BASE PLATE

MATL: 8-1/8" X 4-1/4" X 1/2" THK PVC SHEET PLASTIC
COLOR: GREY
-26 TRIM

MAT'L: 8-1/8" X 4-1/4" X 1/8" THK POLYCARBON PLASTIC
COLOR: BLACK
SHEFFIELD PLASTICS MACROLON GP)

DIMENSIONS IN INCHES

TOLERANCES EXCEPT WHERE NOTED:

\[
\begin{align*}
X & = \pm 0.1 \\
XX & = \pm 0.05 \\
XXX & = \pm 0.010 \\
\end{align*}
\]

ANGLES = \pm 2.0°

INTERNAL: CLASS 2B
EXTERNAL: CLASS 2A

DO NOT SCALE DRAWING

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-27 SWITCH HOUSING

MAT'L: .070" THK LEXAN COLOR: CLEAR
FINISH: FLAT BLACK ENAMEL (PAINT INTERIOR SURFACE ONLY)

R.09 TYP.

2.90

2.84 1.150

2.50

1.250

1.812

2X .140

3X .575

(1.150)

.750

.56

.38

.07 TYP.

ISO VIEW
(FOR REFERENCE ONLY)
-28 L/H BRACKET

MAT'L: 060" THK 6061-T6 ALUMINUM QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 1 PER AIRCRAFT)
(MOUNTS VIDEO GAIN MODULE)

-29 R/H BRACKET

MAT'L: 060" THK 6061-T6 ALUMINUM QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303
(BUILD 1 PER AIRCRAFT)
(MOUNTS VIDEO GAIN MODULE)
-30 PLACARD

SUGGESTED MAT'L: .04" THK 6061-T6 ALUMINUM QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303

(BUILD 1)
-31 PLACARD

(APPLICABLE TO: C206 STATIONAIRE ONLY)

SUGGESTED MAT'L: .04" THK 6061-T6 ALUMINUM QQ-A-250/11

FINISH: BLACK POLYURETHANE POWDER COAT CARDINAL C241-BK303

(BUILD 1)

Paragon® Inc.

Paragon® Technology

Mount Parts

FBI HAWK OWL PROJECT

C18245-1000

Dimensions in Inches

Tolerances Except Where Noted:

\[ X = \pm .01 \]

\[ XX = \pm .005 \]

\[ XXX = \pm .010 \]

Angles = \pm 1°

Thread: Internal Class 2B

3rd Angle Projection

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<table>
<thead>
<tr>
<th>Item</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CPX075-1</td>
<td>HEADER CONNECTOR</td>
</tr>
<tr>
<td>2</td>
<td>CPX076-1</td>
<td>FEMALE CONTACT</td>
</tr>
<tr>
<td>3</td>
<td>CPX076-1</td>
<td>COVER PLATE</td>
</tr>
<tr>
<td>4</td>
<td>CPX076-1</td>
<td>COVER PLATE</td>
</tr>
<tr>
<td>5</td>
<td>CPX076-1</td>
<td>COVER PLATE</td>
</tr>
<tr>
<td>6</td>
<td>CPX076-1</td>
<td>COVER PLATE</td>
</tr>
</tbody>
</table>

**Title:** C182 CONSOLE  
**Drawing Number:** C182RC-1000  
**Dimensions in Inches:**  
**Do Not Scale Drawing:**  
**Paravion® Technology Inc.**  
**Confidential Information:**

---

**Sheet Information:**
- Sheet: 1 of 5
- Drawing Number: C182RC-1000
- Title: C182 CONSOLE
- Dimensions:  
- Do Not Scale Drawing
- Paravion® Technology Inc.

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**Notes:**  
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- Paravion® is a trademark of Paravion Technology Inc.
KEYBOARD BUILD-UP

NOTE MOUNTING ORIENTATION OF GMS

DETAIL B
(SIDE VIEW)

MATCH DRILL CONSOLE TO (NO. 144)

(INSTALL NUTPLATES AS SHOWN)

4X 37

2X 14 4X

1.00 2.00

2X 14 4X

15 2X

GMS

8X 38

MATCH DRILL 
CONSOLE TO (NO. 144)

DETAIL A
(SIDE VIEW)

2X MATCH-DRILL #0.125
ENLARGE TO #1.125
FOR CONNECTORS INSTALLATION

2X, MATCH-DRILL #0.125
ENLARGE TO #1.125
FOR CONNECTORS INSTALLATION

 SECTION A-A

NOTES:

- CEメント into position shown using: OATEY ABS CEMENT #30902, BLACK.
- FOR CTM2B MOUNTS REMOVE FOAM TAPE AND APPLY CYANOACRYLATE TO ATTACH MOUNTS.
- USE TEMPLATES FOR HOLES AND CUTOUTS.

1 CONSOLE ASSEMBLY
(FBI HAWK OWL PROJECT)
VENDOR PART NUMBER: C182IRC-1000-50V

NOTES:

1. MAT' L USED: .100/.080 BLACK KYDEX PLASTIC.
   (GRADES 100, T, 200, 6200, 6565 ACCEPTABLE)
2. VENDOR: PLASTIC CREATIONS LTD.
   4640 IRONTON ST.
   DENVER, CO. 80239

CONSOLE

Paravion® Inc.
Technology

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FLAT PATTERN

-51 COVER PLATE
MATERIAL: 6061-T6
STOCK: 0.025" SHEET QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT
CARDINAL C241-BK303

-52 USB COVER
MAT'L: 6061-T6
STOCK: 0.025" SHEET QQ-A-250/11
FINISH: BLACK POLYURETHANE POWDER COAT
CARDINAL C241-BK303

BREAK ALL SHARP EDGES

Paravion® Technology

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Calculations show that Margins-of-Safety are large reference strength of screws and components of mounting fixture. Minimum Mount Shelf 0.010 thickness, based only on ultimate strength (no rigidity needs addressed).

Actual installation mounted to shelf (2024-T3, 0.032 sheet), ARS-4130-1 brackets supported on aluminum angles (3/4"-x-3/4"-x-0.095") installed using (4 ea.) MS27039-0808, (8 ea.) NAS1149FN832P, (4 ea.) MS21042L08 exceeding requirements of this analysis.

Minimum Margin-of-Safety (35%) is based on bending in Roll-Pin Retention Slot at Ultimate 18g Sideward inertial acceleration.

INPUT: Unit Weights

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARS-4004-1</td>
<td>16.25 lb</td>
<td>5.10 in</td>
</tr>
<tr>
<td>IMU Assy, ARS-232-2</td>
<td>22 lb</td>
<td>6.00 in</td>
</tr>
<tr>
<td>Hardware</td>
<td>0.88 lb</td>
<td></td>
</tr>
</tbody>
</table>

Fasteners

<table>
<thead>
<tr>
<th>Fastener</th>
<th>Type</th>
<th>Count</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS24693 (#8-32)</td>
<td>n = 2 per corner</td>
<td>( \phi_8 = 0.16 )</td>
<td></td>
</tr>
<tr>
<td>MS24693 (#10-32)</td>
<td>n = 1 per corner</td>
<td>( \phi_{10} = 0.19 )</td>
<td></td>
</tr>
</tbody>
</table>

These screws attach ARS4130-13 plates to ARS4004-1 assy

Tensile Strength, \( TS_8 \) := 840 lb. MINIMUM
Minimum C'Sink Diameter: \( \phi_8 \) := 0.285

MS24693 (#10-32) | n = 1 per corner | \( \phi_{10} = 0.333 \) |

These screws attach ARS4130-14 feet to ARS4130-13 plates

Tensile Strength, \( TS_{10} \) := 1200 lb. MINIMUM
Minimum C'Sink Diameter: \( \phi_{10} \) := 0.333

Materials

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref. ARS-4130-13 Mount Plate, 6061-T6</td>
<td>Thickness := 0.125 in</td>
<td></td>
</tr>
</tbody>
</table>

\( F_{su} := 20000 \) psi

(Fsu Conservative, app'l to all ARS-4130 components)

Ref. CFR14, FAR23, 23.561(b)(3)(ii), Amendment 23-48;
Worst-Case Ultimate inertial loading, \( g_{load} := 18 \) g's

\[
W_{t_0} := \sum_{i=1}^{3} W_{t_i}
\]

\[
CG := \frac{W_{t_1} \left( \frac{H_{t_1}}{2} \right) + W_{t_2} \left( \frac{H_{t_2}}{2} \right)}{W_{t_0}} = 5.6
\]

Moment := \( g_{load} \cdot W_{t_0} \cdot CG = 3953 \) in-lb
Set \( k := 1 \ldots 4 \)  
\[ x_1 := 0.225 \quad x_2 := 1.025 \quad x_3 := 10.470 \quad x_4 := 11.270 \]

**Fastener Tension:**

\[
\text{Tension}_{8} := \frac{\text{Moment} \cdot x_4 + Wt \cdot g \cdot \text{Load}}{\sum_{k} (x_k)^2} = 275 \text{ lb./screw (#8-32 rated 840 lb.)}
\]

**Margin-of-Safety,**

\[
\text{MS} := \frac{\text{Tension}_{8}}{1.15(\text{Tension}_{8})} - 1 = 165\% \quad \text{Including ref. to 23.625(a)(2)} \]

**Fastener Tension:**

\[
\text{Tension}_{10} := \frac{\text{Moment} \cdot x_2 + Wt \cdot g \cdot \text{Load}}{2 \cdot \sum_{j} (x_j)^2} = 269 \text{ lb./screw (#10-32 rated 1200 lb.)}
\]

**COMBINED LOADING**

**Margin-of-Safety,**

\[
\text{MS} := \frac{\text{Tension}_{10}}{1.15(\text{Tension}_{10})} - 1 = 287\% \quad \text{Including ref. to 23.625(a)(2)} \]

**Foot Shear Area:**

\[
\text{SA} := \frac{0.533 + 0.710}{2} - 0.089 + 0.710 - 0.030 = 0.07\text{sq. in. (Shear Area of "foot")}
\]

**Shear Stress in foot:**

\[
\text{FSS := } \frac{\text{Tension}_{10}}{\text{SA}} = 3515 \text{ psi, } \ Fsu = 20000 \text{ psi}
\]

**Margin-of-Safety,**

\[
\text{MSS := } \frac{\text{Fsu}}{1.15(\text{FSS})} - 1 = 395\% \quad \text{Including ref. to 23.625(a)(2)} \]

**Fastener Shear:**

\[
\text{Shear}_{8} := \frac{Wt \cdot g \cdot \text{Load}}{4 \cdot n} = 88 \quad \text{Shear}_{10} := \frac{Wt \cdot g \cdot \text{Load}}{4 \cdot n} = 176
\]

Because screw shear load is much much less than 1/2 of screw tensile strength and tension load is much much less than screw tensile strength, calculation of allowable shear using calculated tension load (Ref. Bruhn Chapt. D1) is unnecessary.

- 
- 
- 
-
"TEAR-OUT", -13 PLATE

ShearStress8 := \( \frac{Tension8}{\pi \Phi 8 \text{ (Thickness)}} \) = 2461 psi, Margin = \( \frac{Fsu}{1.15 \cdot \text{ShearStress8}} - 1 = 607\% \)

ShearStress10 := \( \frac{Tension10}{\pi \Phi 10 \text{ (Thickness)}} \) = 2059 psi, Margin = \( \frac{Fsu}{1.15 \cdot \text{ShearStress10}} - 1 = 745\% \)

ROLL-PIN INSTALLATION:
(Considered in Worst-Case, as though at greatest distance from hinge point)

Ref. MS16562-32 Roll Pin, rated 2100 lb. Double Shear; \( DS := \frac{\text{Moment}}{(2) \cdot (11.29)} = 175 \text{ lb.} \)

Where 11.29 = Moment Arm of Roll Pin, Opposite foot contribution neglected.

"Beam" Dimensions: Width := 0.125 Height := 0.112 Minimum

Shear Stress in "Beam": \( \text{SSB} := \frac{DS}{2 \cdot \text{(Width)} \cdot \text{(Height)}} = 6253 \text{ psi} \)

ShearMargin := \( \frac{Fsu}{1.15 \cdot \text{(SSB)}} - 1 = 178\% \)

Ref. Installation Drawing ARS-214, Roll-Pin load is imposed at 0.075 inch from end of slot. Bending Stress is calculated as though \( DS/2 \) is imposed at 0.1 inch from "square" slot end.

Second Moment-of-Area, \( I := \frac{\text{Width} \cdot \text{Height}^3}{12} = 14.63 \times 10^{-6} \text{ in.}^4 \)

Slot Length, \( Ln := 0.613 \text{ Load Appl'n, } a := 0.10 \)

\( b := Ln - a \)

\( \text{Load} := \frac{DS}{2} \quad \text{ch} := \frac{\text{Height}}{2} \)

Ref. Mach. Hdbk Strength of Materials: Max. Bending Stress = \( BS := \frac{\text{Load} \cdot a \cdot b^2 \cdot \text{ch}}{1 \cdot (Ln)^2} = 23461 \)

Where \( Fty := 35000 \text{ psi} \)

BendingMargin := \( \frac{Fty}{1.15 \cdot BS} - 1 = 30\% \)

IMU, TOP PLATE INSTALLATION:

\( W_{1z} = 22 \text{ lb.} \quad g\text{Load} = 18 \)

Installed using 8 ea. MS24693 (#8-32) screws: \( \frac{W_{1z}}{8} \cdot g\text{Load} = 50 \text{ lb.} \)

Tension/Shear per Screw
REFERENCE AIRCRAFT INSTALLATION:

Fastener Tension: $x_1 = 0.340 \quad x_2 = 9.908$  \textbf{Worst-Case Fastener Locations}

$$\text{Tension}_{\text{Shelf}} \ := \ \frac{\text{Moment}_{x_2} + \frac{W_0 \ g \ Load}{8}}{4 \ \sum (\frac{x_j^2}{j})} = 188 \ \text{lb./screw (#8-32 rated 840 lb. min.)} \ \ (\text{Ref. 840 lb. Tension Strength})$$

COMBINED LOADING

Assumed 4 ea. #8 screws fastening Mount Fixtures to Shelf

Actual Installation included 2 ea. #10, 2 ea. #8

\textbf{Note} that MS21042L08 nuts are rated 1670 lb. axial load.

Minimum Mount Shelf Thickness, based on equivalent Shear Area, material, is calculated as follows:

$$\text{Shelf} := \frac{Tension_{\text{Shelf}}}{(\pi \cdot 0.375) \cdot F_{\text{su}}} = 0.008 \ \text{inch} \ \text{Based on NAS1149, #8 Washer, 0.375" OD)}$$

$$\text{Shear}_{\text{Shelf}} := \frac{W_0 \ g \ Load}{8 \cdot (\phi 8) \cdot \text{Shelf}} = 69082 \ \text{psi}$$

$$F_{\text{bru}} := 67000 \ \text{psi, \ ref. MMPDS, 6061-T6, 0.010 sheet, \ e/D = 1.5}$$

The above "Minimum Shelf Panel Thickness DOES NOT consider shelf rigidity need. Calculation of minimum shelf panel ref. shear pull-through agrees approximately with calculation ref. bearing strength."

Regulatory requirements are satisfied when ARS 4004 and IMU combined assembly is mounted to a shelf greater than 0.010 inch thick, manufactured from 6061-T6 or stronger material, using 8 ea. MS24694, #8-32 or equivalent strength screws.
The following calculations verify very large structural Margin of Safety reference requirements of CFR14, Part 23, 23.561(b)(3), 23.625, reference FLIR TALON Control Electronics Unit installation on IR-2300-1 Equipment Shelf installed to C182IR-1012-1 Support Assembly.

SUMMARY: The calculations show greatest calculated bolt tension, reference 18g Forward inertial loading, to be 85 lb. imposed on #8-32 screw rated to 840 lb. and 15 lb. imposed on #6-32 screw rated 725 lb.

REF. IR-2300-1; With Talon CEU installed

LOAD LOCATION VECTORS DEFINITION

\[ X_0 := \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \]  
[Bolt Pattern Center, IR-2100-1 Mount Plate (IR-2000-1 "Buttons")]

\[ X_1 := \begin{pmatrix} 0.00 \\ 3.10 \end{pmatrix} \]  
[Center-of-Gravity, Talon CEU P/N23364-200]  
REF. MFR'S DATA

\[ X_2 := \begin{pmatrix} 0.00 \\ 0.00 \end{pmatrix} \]  
[Bolt Pattern Center, Talon CEU "Clamp Mount"]  
REF. DWG. IR-2300-1

\[ X_3 := \begin{pmatrix} 0.00 \\ 0.00 \end{pmatrix} \]  
[Bolt Pattern Center, Talon CEU "Pin Mount"]  
REF. DWG. IR-2300-1

CEU Weight := 13 lb.; [Weight of P/N23364-200 CEU]  
REF. MFR'S DATA

(1) CEU Inertial Loads

up := 1  
forward := 2  
side := 3  
[REF.]

Ref. 14CFR, Part 23, Section 23.561(e), (b3):

Ultimate Load Factors:  
\[ n_{up} := 3.0 \]  
\[ n_{forward} := 18.0 \]  
\[ n_{side} := 4.5 \]

LOAD MAGNITUDE VECTORS DEFINITION

\[ PV_1 := \begin{pmatrix} 0.00 \\ 0.00 \\ -39.00 \end{pmatrix} \]  
[Weight of P/N23364-200 CEU]

\[ PV_2 := \begin{pmatrix} 0.00 \\ -234.00 \\ -13.00 \end{pmatrix} \]  
REF. UPWARD INERTIAL LOAD IN RELATION TO AIRPLANE

\[ PV_3 := \begin{pmatrix} 0.00 \\ -234.00 \\ -13.00 \end{pmatrix} \]  
REF. FORWARD INERTIAL LOAD IN RELATION TO AIRPLANE
\[ \begin{align*}
\text{PV}_3 &= \begin{pmatrix} n_{\text{side}} \cdot \text{Weight} \\ 0 \\ -\text{Weight} \end{pmatrix} = \begin{pmatrix} 58.50 \\ 0.00 \\ -13.00 \end{pmatrix} \\
\end{align*} \]

**REF. SIDEWARD INERTIAL LOAD IN RELATION TO AIRPLANE**

\[
\begin{align*}
\text{Set} & \quad i := 1 \ldots 4 \\
x_1 & := 2.015 \\
y_1 & := 2.150 \\
x_3 & := -2.015 \\
y_3 & := 2.150 \\
x_2 & := 2.015 \\
y_2 & := -2.150 \\
x_4 & := -2.015 \\
y_4 & := -2.150 \\
\end{align*}
\]

[Bolt Pattern, IR-2100-1 Mount Plate (IR-2000-1 "Buttons")]

\[
\begin{align*}
\left( \begin{array}{c}
\text{MX}_{1,1} \\
\text{MY}_{1,1} \\
\text{MZ}_{1,1}
\end{array} \right) & := \begin{pmatrix} 0.00 \\ -10.92 \\
0.00 \end{pmatrix} \text{ lb.-in.; [Moment on Mt. Plate Bolt Pattern due to up g-load]} \\
\begin{pmatrix} n_{\text{up}} = 3.00 \end{pmatrix}
\end{align*}
\]

\[
\begin{align*}
\left( \begin{array}{c}
\text{MX}_{1,2} \\
\text{MY}_{1,2} \\
\text{MZ}_{1,2}
\end{array} \right) & := \begin{pmatrix} 725.40 \\ -3.64 \\
65.52 \end{pmatrix} \text{ lb.-in.; [Moment on Bolt Pattern due to fwd g-load]} \\
\begin{pmatrix} n_{\text{forward}} = 18.00 \end{pmatrix}
\end{align*}
\]

\[
\begin{align*}
\left( \begin{array}{c}
\text{MX}_{1,3} \\
\text{MY}_{1,3} \\
\text{MZ}_{1,3}
\end{array} \right) & := \begin{pmatrix} 0.00 \\ 177.71 \\
0.00 \end{pmatrix} \text{ lb.-in.; [Moment on Bolt Pattern due to side g-load]} \\
\begin{pmatrix} n_{\text{side}} = 4.50 \end{pmatrix}
\end{align*}
\]

**Based on upward inertial load, ref. Bruhn Chapter D1**

\[
\begin{align*}
\text{TX}_{1,i} & := \frac{x_i \cdot \text{MY}_{1,1}}{\sum_i (x_i)^2} \\
\text{TY}_{1,i} & := \frac{y_i \cdot \text{MX}_{1,1}}{\sum_i (y_i)^2} \\
\text{BT}_{1,i} & := (\text{TX}_{1,i} + \text{TY}_{1,i}) + \frac{n_{\text{up}} \cdot \text{Weight}}{4}
\end{align*}
\]

**[Ultimate Bolt Tension, IR-2000-1 Button Installation, Upward Inertial Load]**

\[
\begin{align*}
\text{TX}_{1,i} & = \begin{pmatrix} -1.35 \\ -1.35 \\ 1.35 \\ 1.35 \end{pmatrix} \\
\text{TY}_{1,i} & = \begin{pmatrix} 0.00 \\ 0.00 \\ 0.00 \\ 0.00 \end{pmatrix} \\
\text{BT}_{1,i} & = \begin{pmatrix} 8 \\ 8 \\ 11 \\ 11 \end{pmatrix} \\
\begin{pmatrix} n_{\text{up}} = 3.00 \\ \text{Weight} = 13.00 \end{pmatrix}
\end{align*}
\]

\[
\sum_i \text{BT}_{1,i} - n_{\text{up}} \cdot \text{Weight} = 0.00 \quad \text{Must equal zero}
\]
BTmax := max(BT) = 11 lb. [MS24693 (#8-32) rated to 840 lb. Tension ref. MS24693]
[MS21042L08 rated to 1670 lb. Tension ref. MS21042]

MS_1 := \frac{840}{1.15 \cdot BTmax} - 1 = 6478\% \quad \text{Ref. FAR23.625 Fitting Factor}

[Extremely High]

Where:
\( \Phi_A := 0.285 \) Minimum Head Dia., MS24693 (#8-32) Ref. Specification MS24693
\( \Theta_0 := 0.080 \) Material Thickness, Ref. Drawing IR-2300-1
\( n_{up} = 3.00 \)
\( F_{su} := 27000 \text{ psi; 6061-T6 Sheet, Ref. MMPDS, 3.2.6.0(b1)} \)
\( \sigma_{shear} := \frac{BTmax}{Ashar} = 155.03 \quad MS_2 := \frac{F_{su} \cdot \sigma_{shear}}{1.15 \cdot BTmax} = 1 = 15044\% \quad \text{[Ref. Tear-Thru]} \)

Based on Forward inertial load, ref. Bruhn Chapter D1

\[
TX_{2,i} := \frac{x_i \cdot MX_{1,2}}{\sum (x_i)^2} \\
TY_{2,i} := \frac{y_i \cdot MX_{1,2}}{\sum (y_i)^2} \\
BLT_{2,i} := (TX_{2,i} + TY_{2,i})
\]

[Ultimate Bolt Tension, IR-2000-1 Button Installation, Forward Inertial Load]

\[
\begin{array}{cccccc}
x_i & y_i & TX_{2,i} & TY_{2,i} & BLT_{2,i} & n_2\
2.02 & 2.15 & -0.45 & 84.35 & 84 & 0.00\
2.02 & -2.15 & -0.45 & -84.35 & -85 & \quad \text{Must equal zero}\
-2.02 & 2.15 & 0.45 & 84.35 & 85 & \text{Must equal zero}\
-2.02 & -2.15 & 0.45 & -84.35 & -85 &
\end{array}
\]

BLTmax := max(BLT) = 85 lb. [MS24693 (#8-32) rated to 840 lb. Tension ref. MS24693]
[MS21042L08 rated to 1670 lb. Tension ref. MS21042]

MS_3 := \frac{840}{1.15 \cdot BLTmax} - 1 = 761\% \quad \text{Ref. FAR23.625 Fitting Factor}

[High]

Where:
\( \Phi_B := 0.16 \) Dia., MS24693 (#8-32) Ref. Specification MS24693
\( \Theta_0 := 0.080 \) Material Thickness, Ref. Drawing IR-2300-1

\[
\text{Bearing Load} = BL := n_{\text{forward}} \cdot \frac{\text{Weight}}{4} = 58.50 \text{ lb./screw}
\]

\[
\text{Bearing Area} = BA := \Phi_B \cdot (\Theta_0) = 0.013 \quad \text{sq. in. per screw}
\]
\[ \sigma_{\text{bearing}} := \frac{\text{BL}}{\text{BA}} = 4570 \text{ psi} \]

\[ n_{\text{forward}} = 18.00 \]

[Ultimate Bearing Stress, Forward Inertial Load]

\[ F_{\text{bru}} := 88000 \text{ psi, Ref. MMPDS, 3.6.2.0(b1)} \]

\[ M_{S4} := \frac{F_{\text{bru}}}{1.15 \cdot \sigma_{\text{bearing}}} - 1 = 1574\% \quad \text{Ref. FAR23.625 Fitting Factor} \]

[Extremely High]

\[
\begin{pmatrix}
\text{MX}_{1,3} \\
\text{MY}_{1,3} \\
\text{MZ}_{1,3}
\end{pmatrix}
:= \begin{pmatrix}
x_{1} \times P_{V3} = \\
0.00 \\
177.71 \\
0.00
\end{pmatrix} \quad \text{lb.-in.} \quad \text{[Moment on Bolt Pattern due to Side g-load]} \]

\[ n_{\text{side}} = 4.50 \]

\[ T_{X,3,i} := \frac{x_{i} \cdot \text{MY}_{1,3}}{\sum_{i} (x_{i})^{2}} \]

\[ T_{Y,3,i} := \frac{y_{i} \cdot \text{MX}_{1,3}}{\sum_{i} (y_{i})^{2}} \]

\[ \text{BOLT}_{3,i} := (T_{X,3,i} + T_{Y,3,i}) \]

\[ x_{i} = \\
2.02 \\
2.02 \\
-2.02 \\
-2.02
\]

\[ y_{i} = \\
2.15 \\
-2.15 \\
2.15 \\
-2.15
\]

\[ T_{X,3,i} = \\
22.05 \\
22.05 \\
-22.05 \\
-22.05
\]

\[ T_{Y,3,i} = \\
0.00 \\
0.00 \\
0.00 \\
0.00
\]

\[ \text{BOLT}_{3,i} = \\
22 \\
22 \\
-22 \\
-22
\]

\[ \sum_{i} \text{BOLT}_{3,i} = 0.00 \quad \text{Must equal zero} \]

\[ \text{BoltTmax} := \max(\text{BOLT}) = 22 \text{ lb.} \quad \text{[MS24693 (#8-32) rated to 840 lb. Tension ref. MS24693]} \]

\[ \text{[MS21042L08 rated to 1670 lb. Tension ref. MS21042]} \]

\[ M_{S5} := \frac{840}{1.15 \cdot \text{BoltTmax}} - 1 = 3213\% \quad \text{Ref. FAR23.625 Fitting Factor} \]

[Extremely High]

\[ \Phi_A = 0.285 \quad \text{Minimum Head Dia.} \quad T_{\theta_{0}} = 0.080 \quad \text{Material Thickness} \quad \text{Ashear} = 0.072 \]

\[ F_{\text{su}} := 27000 \text{ psi; 6061-T6 Sheet, Ref. MMPDS, 3.2.6.0(b1)} \]

\[ M_{S6} := \frac{F_{\text{su}} \cdot \text{Ashear}}{1.15 \cdot 1.5 \cdot \text{BoltTmax}} - 1 = 4985\% \quad \text{Ref. FAR23.625 Fitting Factor} \]

[Extremely High]

The above completes analysis of attachment to the shelf to C182IR-1012-1 Support Assy.
Ref. (8 ea.) MS24693S51 (#8-32) screws, rated 840/2 = 420 lb. shear) to attach the Mount Pin Blocks to the IR-2300-1 plate, (4 ea.) MS24693S based on 18.0 Forward inertial loading (13 lb. at 3.10 inches above the shelf).

**Ref. Figure 1**, \[ M_x := (3.10) \left( n_2 \right) \text{Weight} = 725 \text{ in.-lb.}, \text{ where: } n_2 = 18.00 \]

\[
\begin{align*}
Y_1 &= 1.79 \\
Y_2 &= 2.24 \\
Y_3 &= 7.58 \\
Y_4 &= 8.28
\end{align*}
\]

\[
VT_i := \frac{Y_i \cdot M_x}{\sum (Y_i)^2}
\]

<table>
<thead>
<tr>
<th>( i )</th>
<th>( Y_i )</th>
<th>( VT_i )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.79</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>2.24</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>7.58</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>8.28</td>
<td>45</td>
</tr>
</tbody>
</table>

= Up Load on each ECU Tie-Down Point Due to Forward Inertia Load, 18g Ultimate

By Inspection Max Load = \[ ML := VT_4 = 45 \text{ lb.} \]

**Ref. Fig. 1**, \[ T_{\text{max}} := \frac{1}{2} \left[ 0.81 \cdot \left( 1.19 \cdot VT_4 \right) \right] 1.15 = 33 \text{ lb.} \text{ Ref. FAR23.625 Fitting Factor} \]

**Ref. MS24693S51 (#8-32); rated 840 lb.**

By Inspection Secondary Load = \[ M_2 := VT_3 = 41 \text{ lb.} \]

**Ref. Fig. 1**, \[ T_{2\text{max}} := \frac{0.68 \cdot \left( 0.24 \cdot VT_3 \right)}{\left( 0.25^2 + 0.68^2 \right)} 1.15 = 15 \text{ lb.} \text{ Ref. FAR23.625 Fitting Factor} \]

**Ref. MS24693S27 (#6-32); rated 725 lb.**

These calculations show that Margins-of-Safety reference FLIR TALON ECU installation on IR-2300-1 equipment shelf assembly, FAR requirements 23.561, 23.625 are extremely large.
<table>
<thead>
<tr>
<th>AIRCRAFT OR AIRCRAFT COMPONENT IDENTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAKE</strong></td>
</tr>
<tr>
<td>Cessna Aircraft</td>
</tr>
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**LIST OF DATA**

<table>
<thead>
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<th>TITLE</th>
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<tr>
<td>Report:</td>
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<tr>
<td>ARS-4004-901</td>
<td>Structural Substantiation</td>
</tr>
<tr>
<td>Date: March 29, 2011</td>
<td>Equipment Installation</td>
</tr>
</tbody>
</table>

**Notes:**

1. Structural aspects only of the above data are approved herein. This approval is only for engineering design data.
2. This approval is valid only for Cessna Aircraft Model: 182T S/N: 18282177 and is issued in support of the alteration of the aircraft.
3. Except as noted, all applicable requirements are to amendment levels established in TCDS 3A13, Revision 69.

**PURPOSE OF DATA**

In support of avionics equipment installation:

**APPLICABLE REQUIREMENTS (List specific sections)**

FAR 23.301, 23.303, 23.305, 23.307, 23.341, 23.561, 23.601, 23.603, 23.605, 23.613

**CERTIFICATION** - Under authority vested by direction of the Administrator and in accordance with conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and on attached sheets numbered have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations.

I recommend approval of these data

**SIGNATURES OF DESIGNATED ENGINEERING REPRESENTATIVE**

Venkat Ramachandran

**DESIGNATION NUMBER**

DERT-635514-NM

**CLASSIFICATION**

Structures
NOTES:
VOLTAGE RANGE: 11 - 30 VOLTS
POWER CONSUMPTION: 72 VA
TROLL INTERFACE: CONNECTOR P2 PINS H, J & K
FOR REFERENCE USE ONLY

HAND HELD CONTROLLER

DATA INTERFACE

POWER INTERCONNECT

AUDIO INTERFACE

3/16/2011
JANTEQ
9272 JERONIMO RD.
IRVINE, CA, 92618
PH: (949) 215-2603
FAX: (949) 215-2604

AVIATION Tx WIRING INTERFACE

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MAY NOT BE REPRODUCED OR DISTRIBUTED WITHOUT THE WRITTEN CONSENT OF JANTEQ INC.
FINISH: ANODIZE PER MIL-A-8625 TYPE II, CLASS 2, COLOR OPTIONAL (OR EQUIV.)
ALT: BLACK POLYURETHANE POWDER COAT CARDINAL #006-BK05 (OR EQUIV.)
ALT: EPOXY PRIMER PER MIL-P-23377 TYPE I, CLASS 1 (OR EQUIV.)

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<th>DATE</th>
<th>DESCRIPTION</th>
<th>BY</th>
<th>APR</th>
<th>CHK</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>12/04/2008</td>
<td>ADDED #0.625, 4X #0.172 Holes</td>
<td>BNS</td>
<td>REB</td>
<td>LS</td>
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<td>1</td>
<td></td>
<td>12/14/2009</td>
<td>ADDED -2 NON-CERTIFIED</td>
<td>BNS</td>
<td>REB</td>
<td>LS</td>
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<tr>
<td>1</td>
<td></td>
<td>03/05/2010</td>
<td>ADDED WTS., REF DIMS 1.65 &amp; 0.08 NON-CERTIFIED</td>
<td>BNS</td>
<td>REB</td>
<td>LS</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>06/03/2011</td>
<td>ADD FLANGE BENDS, SLOTTED HOLE -2 NON-CERT.</td>
<td>BNS</td>
<td>REB</td>
<td>LS</td>
</tr>
</tbody>
</table>

-2 DOUBLER
MAT'L: 6061-T6 QQ-A-250/11 AMS 4027
STOCK: 0.040 SHEET
EST. WEIGHT = 0.05 LBS

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Paravion® Technology

DRAWING NO. ARS-4100

-DO NOT SCALE DRAWING-
NOTES:
1. BREAK ALL SHARP EDGES.
2. ALL INTERNAL AND EXTERNAL RADII TO BE .02-.03 UNLESS OTHERWISE SPECIFIED.

-10 PLATE

REC. MAT: .25 THK 6061-T6 ALUMINUM PLATE, QQ-A-200/11
FINISH: POWDER COAT COLOR: RED (CARDINAL TO09-RD03)

SECTION A-A
-11 BRACKET

REO. MLAT: 2.00" x .50" THK 6061-T6 ALUMINUM BAR, QQ-A-200/8
FINISH: ANODIZE PER MIL-A-8625 TYPE II, CLASS 2, COLOR: BLACK

DIMENSIONS IN INCHES

TOLERANCES EXCEPT WHERE NOTED:

XXX = ±0.005
XXX = ±0.010
ANGLES = ±1°

DO NOT SCALE DRAWING

©2006 Paravon Tech Inc. PARAVON IS A TRADEMARK OF PARAVON TECHNOLOGY INC.
-12 PLATE
REC. MAT'L: 3.0" x .38" THK 6061-T6 ALUMINUM BAR, QQ-A-200/8 ASTM B221
FINISH: POWDER COAT COLOR: BLACK (CARDINAL TO05-BK05)

-13 MOUNT PLATE
FINISH: ANODIZE PER MIL-A-8625 TYPE II, CLASS 2, COLOR: BLACK

-14 FOOT
REC. MAT'L: .75" 6061-T6 ALUMINUM RND, QQ-A-200/8 ASTM 221
FINISH: ANODIZE PER MIL-A-8625 TYPE II, CLASS 2, COLOR: BLACK

-15 SLIDER
REC. MAT'L: .75" x .38" THK 6061-T6 ALUMINUM BAR QQ-A-200/8 ASTM 221
FINISH: ANODIZE PER MIL-A-8625 TYPE II, CLASS 2, COLOR: BLACK
-16 BRACKET

REC. MAT'L: 2.00" X .50" THK 6061-T6 ALUMINUM BAR, QQ-A-200/8
FINISH: ANODIZE PER MIL-A-8625 TYPE II, CLASS 2, COLOR: BLACK

SECTION A-A

Drill and tap thru per MS33537 for 10-32 UNF-2B locking helical insert.
United States of America
Department of Transportation Federal Aviation Administration

Supplemental Type Certificate

Number SA00294DE

This certificate, issued to Paravion Technology, Inc.
2001 Airway Avenue
Fort Collins, CO 80524

certifies that the change in the type design for the following product with the limitations and conditions
therefor as specified herein meets the airworthiness requirements of Part 3 of the Civil Air Regulations.

Original Product—Type Certificate Number: 3A13
Make: Cessna
Model: R182, 182R, 182T, T182T, 182Q, & 182S

Description of the Type Design Change:
Installation of an external Infrared Imaging System in accordance with Paravion Technology Master Drawing

Limitations and Conditions:
1. Compatibility of this design change with previously approved modifications must be determined by installer.
2. A copy of this certificate and Flight Manual Supplement must be maintained as part of the permanent records
   for the modified aircraft.
3. FAA approved Aircraft Flight Manual Supplement, PR-C182IR-100M, Revision 0, dated June 6, 1997, or later
   FAA approved revision is required.
4. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give
   the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until sur-
rendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the
Federal Aviation Administration.

Date of application: January 10, 1997  Date issued: June 10, 1997
Date amended: 2/18/98; 4/8/04; February 17, 2009

By direction of the Administrator

Melissa Sandow
Program Manager
Northwest Mountain Region
Denver Aircraft Certification Office

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or
both.

This certificate may be transferred in accordance with FAR 21.47.

FAA Form 8110-2 (10-88)
PARAVION TECHNOLOGY, INC.
2001 AIRWAY AVENUE
FT. COLLINS, COLORADO 80524

ER-C182ELP-2
Rev. N/C

Structural Substantiation Engineering Report for FLIR TALON Installation on Cessna Model 182 Aircraft

Prepared by: Robert E. Bristol
Date: Oct. 12, 2011

Reviewed by: Larry Stark
Date: 10-12-2011

Proprietary Information--Use or disclosure of this data subject to restrictive legend on title page.
**Revision History**

<table>
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<th>Revision</th>
<th>Date</th>
<th>Detail of Changes</th>
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Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<td>Advisory Circular</td>
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<tr>
<td>A/C</td>
<td>Aircraft</td>
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<td>Aircraft Certification Office</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>CP</td>
<td>Certification Plan</td>
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<td>DER</td>
<td>Designated Engineering Representative</td>
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<td>FAA</td>
<td>Federal Aviation Administration</td>
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<tr>
<td>KEAS</td>
<td>Knots Equivalent Airspeed</td>
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<td>KIAS</td>
<td>Knots Indicated Airspeed</td>
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<td>STC</td>
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<td>TC</td>
<td>Type Certificate</td>
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<tr>
<td>TCDS</td>
<td>Type Certification Data Sheet</td>
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</table>

Based on model R182

- \( V_A \) Design Maneuvering Speed = 112 knots (Ref. TCDS 3A13)
- \( V_c \) Design Cruising Speed = 160 knots (Ref. Cessna Literature)
- \( V_{NE} \) Never Exceed Speed = 182 knots (Ref. TCDS 3A13)
- \( V_D \) Dive Speed; 230 knots Ref. CFR14, 23.335
## References

<table>
<thead>
<tr>
<th>Document No.</th>
<th>Document Title</th>
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<tbody>
<tr>
<td>TCDS 3A13 Revision 69, April 20, 2009</td>
<td>Type Certification Data Sheet for Cessna Model 182</td>
</tr>
<tr>
<td>AC 23-19A</td>
<td>Airframe Guide for Certification of Part 23 Airplanes</td>
</tr>
<tr>
<td>Ref. 2</td>
<td>Fluid Dynamic Drag, Hoerner, S.F.</td>
</tr>
<tr>
<td>Ref. 3</td>
<td>NACA-TN 2960 &quot;Drag of Circular Cylinders for Wide Range of Reynolds Numbers and Mach Numbers&quot;</td>
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<td></td>
<td>&quot;Stress Concentration Factors&quot;, R.E. Peterson, John Wiley &amp; Sons, 1974</td>
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<tr>
<td></td>
<td>&quot;Introduction to Flight&quot;, J. D. Anderson, McGraw-Hill Book Company</td>
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</tbody>
</table>
1.0 Introduction

1.1 Purpose and Scope


Representative External Loads Provision Installation, with reference load installed, is shown in Figure 1.

![Figure 1 - External Loads Provision Installation](image)

The External Loads Provision is mounted to the floor of the Cargo compartment of Cessna 182 aircraft, and extends through a hole cut through the Cargo compartment door. This mount accepts a second mount bracket, which is designed to accept a mount plate to which the external load is attached. This report documents loading (load weight, shape, and mount plate configuration) applicable to use with FLIR TALON system installed.
### 1.2 Compliance Summary

The design and analysis of the modification shows that the installation meets all applicable structural requirements identified below. The minimum margin-of-safety for each installation is shown in Table 1. Analysis begins at the FLIR TALON imager unit installation and proceeds installation of the Support Assembly (C182IR-1012) to the Cargo Compartment floor.

Margin-of-safety greater than 500% is reported as HIGH.

#### Minimum Margin of Safety Summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Mode of Failure</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attached Calculations</td>
<td>SX5-606-1 Support Plate (1/4-inch 6061-T6)</td>
<td>Shear-Thru</td>
<td>High</td>
</tr>
<tr>
<td>Attached Calculations</td>
<td>SX5-606-1 Support Plate, Load Attaching Bolt</td>
<td>Tension</td>
<td>411%</td>
</tr>
<tr>
<td>Attached Calculations</td>
<td>IR-4301-10 Adapter Plate (Outer Bolt Circle)</td>
<td>Attaching Bolt Tension</td>
<td>High</td>
</tr>
<tr>
<td>Attached Calculations</td>
<td>IR-4301-10 Adapter Plate (Outer Bolt Circle)</td>
<td>Attaching Bolt Tear-Thru</td>
<td>High</td>
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<tr>
<td>Attached Calculations</td>
<td>IR-1040 Support Assy (Mount Bracket)</td>
<td>Shear</td>
<td>132%</td>
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<tr>
<td>Attached Calculations</td>
<td>Channel Rivets Installation</td>
<td>Shear</td>
<td>High</td>
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<tr>
<td>Attached Calculations</td>
<td>Bracket Installation, AN525-10 Screws</td>
<td>Shear</td>
<td>491%</td>
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<tr>
<td>Attached Calculations</td>
<td>Torsional Stress</td>
<td>Tension</td>
<td>High</td>
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<tr>
<td>Attached Calculations</td>
<td>Bending</td>
<td>Static Friction</td>
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<td>Rotation Lock</td>
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<td>Attached Calculations</td>
<td>IR-1060-1 Bolt (1/4-28, 303 Stainless)</td>
<td>Tension, assuming 50-70 in-lb Wrench Torque</td>
<td>6%</td>
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<tr>
<td>Attached Calculations</td>
<td>IR-1032 Support Assy Instn</td>
<td>Shear</td>
<td>High</td>
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<tr>
<td>Attached Calculations</td>
<td>Tube Torsional Stress</td>
<td>Shear</td>
<td>77%</td>
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<td>Attached Calculations</td>
<td>Attaching Screws, IR-1032, NAS1303</td>
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<tr>
<td>Attached Calculations</td>
<td>Cargo Floor Screws MS35207-264, Tension</td>
<td>Tension</td>
<td>259%</td>
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Regulatory compliance for this change is based on the following:
14 CFR; Part 23 including Amendments 23-1 through 23-61.

Table 1 – Compliance Summary

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<th>Title</th>
<th>Amdt.</th>
<th>Compliance Statement</th>
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<tbody>
<tr>
<td>23.301 (a)(b)(c)</td>
<td>Loads.</td>
<td>23-48</td>
<td>The installation is analyzed for limit loads as calculated in this document. Appropriate Factor of Safety and Fitting Factor are included as part of this analysis.</td>
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<tr>
<td>23.303</td>
<td>Factor of safety.</td>
<td>23-0</td>
<td>All limit loads are multiplied times a 1.5 factor of safety.</td>
</tr>
<tr>
<td>23.305</td>
<td>Strength and deformation.</td>
<td>23-45</td>
<td>Analysis shows that the modified structure is able to support limit loads without detrimental or permanent deformation.</td>
</tr>
<tr>
<td>23.307 (a)</td>
<td>Proof of structure.</td>
<td>23-0</td>
<td>Analysis using reliable methods shows that strength and deformation requirements for 23.305 are met for all load cases in 23.301.</td>
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<tr>
<td>23.321</td>
<td>General.</td>
<td>23-45</td>
<td>Flight load factors for critical altitudes and weights for the flight envelope defined in the POH are used in the analysis. Compressibility effects are not significant.</td>
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<tr>
<td>23.333</td>
<td>Flight envelope.</td>
<td>23-34</td>
<td>Installation of Talon System does not alter the flight characteristics of the OEM aircraft. A flight envelope for use in applied loads on ELP is generated in a conservative manner.</td>
</tr>
<tr>
<td>23.335(a)(b)(c)(d)</td>
<td>Design airspeeds.</td>
<td>23-48</td>
<td>The installation of Talon System does not alter the design airspeeds of the aircraft. A flight envelope for use in applied loads is generated in a conservative manner.</td>
</tr>
<tr>
<td>23.337(a)(b)</td>
<td>Limit maneuvering load factors.</td>
<td>23-48</td>
<td>Limit maneuver load factors as prescribed in the regulation for normal category aircraft are used in the analysis with FLIR Talon System installed.</td>
</tr>
</tbody>
</table>

©Copyrighted Paravion Technology, Inc. (2010). Paravion Technology, Inc. Copyrighted and CONFIDENTIAL Proprietary Information–Use or disclosure of this data subject to restrictive legend on title page.
Limit gust load factors as calculated per 23.341(c) are used in the analysis with FLIR Talon System installed.

**VERTICAL SURFACES**

- **23.441(a)** Maneuvering loads. 23-48 Maneuvering loads based on vertical surface area with FLIR Talon System installed are used in the analysis.
- **23.443(a)(c)** Gust loads. 23-48 Gust loads based on vertical surface area with FLIR Talon System installed are used in the analysis.

**GROUND LOADS**

- **23.471** General. 23-0 Installation does not alter the ground loads of the OEM aircraft. A conservative estimate of loads for use in applied loads is used in the analysis.
- **23.473(a)(d) (e)(g)** Ground load conditions and assumptions. 23-48 Installation does not alter the ground loads of the OEM aircraft. A conservative estimate of loads for use in applied loads is used in the analysis.
- **23.479** Level landing conditions. 23-45 Installation does not alter the ground loads of the OEM aircraft. A conservative estimate of loads for use in applied loads is used in the analysis.
- **23.481(a)(b)** Tail down landing conditions. 23-0 Installation does not alter the ground loads of the OEM aircraft. A conservative estimate of loads for use in applied loads is used in the analysis.
- **23.483** One-wheel landing conditions. 23-0 Installation does not alter the ground loads of the OEM aircraft. A conservative estimate of loads for use in applied loads is used in the analysis.
- **23.485** Side load conditions. 23-45 Installation does not alter the ground loads of the OEM aircraft. A conservative estimate of loads for use in applied loads is used in the analysis.
- **23.493** Braked roll conditions. 23-0 Installation does not alter the ground loads of the OEM aircraft. A conservative estimate of loads for use in applied loads is used in the analysis.
### Subpart D – Design and Construction

<table>
<thead>
<tr>
<th>Section</th>
<th>Subsection</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.601</td>
<td>GENERAL</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>23.613</td>
<td>Material strength properties and design values.</td>
<td>23-45</td>
<td>Statistically based material strength properties from MMPDS are used in the analysis. 'A' basis values are used for single member structural elements and 'B' basis values are used for redundant structure.</td>
</tr>
<tr>
<td>23.619</td>
<td>Special factors.</td>
<td>23-45</td>
<td>Standard analysis and aerospace grade materials are used for the design so no special factors of safety are required to address uncertainty, deterioration or appreciable variability.</td>
</tr>
<tr>
<td>23.625 (a)</td>
<td>Fitting factors.</td>
<td>23-7</td>
<td>A fitting factor of 1.15 was applied to each fitting substantiated by analysis. No additional fitting factor is required for continuous joints with multiple fasteners and section properties typical of the member being spliced.</td>
</tr>
</tbody>
</table>

Analysis is based on ultimate maneuvering load factor, gust load factor requirements, and ground loading requirements. It is shown that external load installation within loading limits will not have detrimental or permanent deformation during flight operations within certificated aircraft limitations.

### RESULTS SUMMARY:

**Margins-of-Safety:**

\[ \text{Cd} = 0.85 \]

- **MS_1**: 1054% (HIGH) Mount Plate Shear Thru
- **MS_{11}**: 5857% Tear-Thru, IR4301 Skirt
- **MS_2**: 411% Mount Plate Screws, Tension
- **MS_{21}**: 1317% AN3, IR-4301 Skirt
- **MS_3**: 132% Rivet Shear, Channels Instrn
- **MS_4**: 557% (HIGH) Screw Shear, Bracket Instrn[AN525]
- **MS_5**: 491% Torsional Stress, Inner Spt Tube
- **MS_6**: 507% (HIGH) Bending Stress, Inner Spt Tube
- **MS_7**: 587% (HIGH) Torsional Stress, Outer Support Tube

**FLIGHT ENVELOPE**

<table>
<thead>
<tr>
<th>Flight Condition</th>
<th>V_p (knots)</th>
<th>n_p</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Maneuvering&quot;</td>
<td>112</td>
<td>3.93</td>
</tr>
<tr>
<td>&quot;Cruise&quot;</td>
<td>160</td>
<td>5.62</td>
</tr>
<tr>
<td>&quot;Dive&quot;</td>
<td>230</td>
<td>4.32</td>
</tr>
<tr>
<td>&quot;Maneuvering&quot;</td>
<td>112</td>
<td>-1.57</td>
</tr>
<tr>
<td>&quot;Cruise&quot;</td>
<td>160</td>
<td>-3.62</td>
</tr>
<tr>
<td>&quot;Dive&quot;</td>
<td>230</td>
<td>-2.32</td>
</tr>
<tr>
<td>&quot;Landing&quot;</td>
<td>49</td>
<td>2.05</td>
</tr>
</tbody>
</table>

©Copyrighted Paravion Technology, Inc. (2010). Paravion Technology, Inc. Copyrighted and CONFIDENTIAL Proprietary Information—Use or disclosure of this data subject to restrictive legend on title page.
Based on Friction Lock at Tapered Collar, IR-1060-1 Bolt at 50-70 in.-lb. Wrench Torque (40000 psi Tension)

Based on Shear (MS27039-1-11) Anti-Rotation Lock Screw Only

Cargo Compartment Mount Bracket Screws, Shear, Based on MS27039, #10-32

Cargo Compartment Mount Bracket Screws, Tension

Tension Stress, IR-1060-1 Bolt at 50-70 in.-lb. wrench torque.

NOTE: Worst-Case Tension Loading imposed on the (10) CR3214-4 Rivets fastening the inboard end of the C182IR-1022 Support to the Cargo Floor is 27 lb. (3 lb. per rivet). These rivets are rated to 250 lb. tension each rivet.

Worst-Case Tension Loading imposed on the (4) #10 screws at the outboard end is 165 lb. (42 lb. per screw). These screws are rated to 1200 lb. tension.
2.0 External Loads

2.1 Model Information

This document is applicable to:

Cessna model 182; 182Q, 182R, 182S, 182T, T182T, R182*

Type Certificate (TC) Holder:

Cessna Aircraft Company

P. O. Box 7704

Wichita, Kansas 67277

Type Certification Data Sheet (TCDS):

3A13 Revision 69, April 20, 2009

Basic Aircraft Information from TCDS– Model 182:

- Lycoming 0-540., 235 Horsepower at 2400 rpm (R182)
- Maneuver speed. $V_A = 112$ KIAS (R182)
- Never Exceed Speed, $V_{NE} = 182$ KIAS (R182)
- Maximum Takeoff Weight = 3,100 Lbs.
- Maximum Landing Weight = 2,950 Lbs.

Basic Aircraft Information for Cessna website:

- Maximum Useful load = 1,030 Lbs.
- Wing Span = 36 Ft.
- Standard Empty Weight = 2,095 Lbs.
- Wing Area = 174 sq. ft.
- Wing Loading = 3100 Lb./174 sq. ft. = 17.816 Lbs/sq ft
- Stall Speed = 49 KCAS

- R182 is shown as worst-case
2.2 Load Axis System

The loads axis system is a "right-handed" system defined in the aircraft (A/C) coordinate system as follows:

- **X**: (+) LH Outboard normal to the A/C centerline of the fuselage
- **Y**: (+) Aft along A/C centerline of the fuselage
- **Z**: (+) Up normal to A/C centerline along the fuselage

Acceleration loads are provided as accelerations in "G" and are aircraft accelerations. For example:

\[ \text{Nz} = 5.0 \text{ means aircraft is accelerated 5 g's vertically upward} \]

In evaluating an item of mass, inertial load on the part is calculated as:

\[ F_z = -5.0g \times (\text{Wt of part}) \]

whereby a positive acceleration imparts a negative direction inertial force.

![Figure 2, Load Axis System](image-url)
2.3 Design Airspeeds

The flight envelope is per 23.333 and TCDS information:

Design Maneuvering Speed, \( V_A = 112 \text{ KIAS} \)

Minimum design cruising speed calculated per 14 CFR 23.335(a):
Where: \( W = 3100 \) \( S = 174 \) \( V_h = 182 \text{ KIAS} (V_{NE}, R182) \)

Ref. 23.335(a)(1) \( V_c := \sqrt{\frac{W}{S}} = 139 \text{ KEAS} \)

\[ \text{MINIMUM:} \quad V_c = 159 \text{ KEAS, Ref. Cessna Literature} \]

Ref. 23.335(a)(2) \( \frac{W}{S} = 17.82 < 20 \) (multiplier 33 is required.)

Ref. 23.335(a)(3) \( V_c \) need not be greater than \( 0.9 * V_h = 0.9 * 182 = 164 \text{ KEAS, Sea Level} \)

Therefore \( V_c \) is set to \( 164 \text{ KIAS} \) = \( 277 \text{ ft./sec. for this analysis} \)

Dive speed is calculated from 23.335(b):

Ref. 23.335(b)(2)(i) \( V_0 = 1.4 * V_c = 230 \text{ KEAS} \)

Ref. 23.335(b)(3) \( \frac{W}{S} = 17.82 < 20 \) (multiplier 1.4 is required)

Therefore \( V_0 \) is set to \( 230 \text{ KEAS} \) = \( 388 \text{ ft./sec. for this analysis} \)

2.4 Limit Maneuvering Load Factors

The maximum limit load factors at maneuvering speed \( V_c \) per 14 CFR 23.337 for normal category aircraft are used:

Ref. 23.337(a)(1)

\[ n := 2.1 + \frac{24000}{GW + 10000} = 3.93 \text{ Positive, need not be greater than 3.8} \]
Ref. 23.337(b)(1)

\[ n = 0.4 \times 3.93 = 1.57 \text{ Negative, for this analysis} \]

Pitch, yaw and rolling accelerations due to abrupt maneuvers are relatively small for this installation due to proximity or the installation to the aircraft center of gravity. Therefore the principle loads due to maneuver are as defined by 23.337.

### 2.5 Limit Gust Load Factors

Maximum limit gust load factors are calculated per the method in 14 CFR 23.341. A conservative airplane normal force coefficient is assumed:

\[ a := 2 \cdot \pi = 6.28 \text{ /radian (Note: } a - \frac{\pi}{180} = 0.11 \text{ /degree)} \]

\[ g_a := 32.2 \text{ feet per second per second} \]

\[ \rho := 0.00238 \text{ lb-sec}^2/\text{ft}^4 \text{ (slug/ft}^3) \]

Where: MFW = 2095 + 180 = 2275 lb. (Std Empty Weight + 1 Crew)

\[ \mu_g := 2 \cdot \frac{MFW}{S} \cdot \frac{\rho \cdot C_h \cdot a \cdot g}{5.3 + \mu_g} = 11.24 \]

\[ K_g := \frac{0.88 \mu_g}{5.3 + \mu_g} = 0.60 \]

Using

\[ V_c := 164 \text{ knots} \]

\[ N_{\text{positiveCruise}} := 1 + \frac{K_g \cdot U_{\text{dec}} \cdot V_c \cdot a}{498 \cdot \left( \frac{MFW}{S} \right)} = 5.73 \]

\[ N_{\text{negativeCruise}} := 1 - \frac{K_g \cdot U_{\text{dec}} \cdot V_c \cdot a}{498 \cdot \left( \frac{MFW}{S} \right)} = -3.73 \]

Using

\[ V_d := 230 \text{ knots} \]

\[ N_{\text{positiveDive}} := 1 + \frac{K_g \cdot U_{\text{ded}} \cdot V_d \cdot a}{498 \cdot \left( \frac{MFW}{S} \right)} = 4.32 \]

\[ N_{\text{negativeDive}} := 1 - \frac{K_g \cdot U_{\text{ded}} \cdot V_d \cdot a}{498 \cdot \left( \frac{MFW}{S} \right)} = -2.32 \]

### 2.6 Limit Ground Load Factors

The descent velocity in feet per second per 23.473(d) is;

\[ V_g = 4.4 \left( \frac{W}{S} \right)^{1/4} = 9.0 \text{ ft./sec. where } W = 3100 \text{ lb., } S = 174 \text{ sq. ft.} \]

Need not exceed 10 ft./sec., may not be less than 7 ft./sec.
The landing gear static gear deflection is measured at 2.50 inches at MTOW. This indicates that the landing gear spring rate is:

\[ K = \frac{2950}{2.5} = 1,180 \text{ lb. per inch} \]

The landing gear is modeled as a simple spring mass system as shown in Figure 2 - Landing Gear System.

![Figure 3 - Landing Gear System](image)

The diagram above represents the airplane and landing gear at the point of initial contact with the ground where the downward velocity is 9 ft/s and the spring force is zero. Maximum acceleration occurs at the bottom of the stroke when downward velocity is zero and the spring compression and therefore resulting force and acceleration are maximum. Maximum spring compression is conservatively found by assuming the work done by the airplane is converted to spring energy. Such that:

\[ U = \Delta KE + FX = \Delta SE \]

Work done by the aircraft = Spring Energy increase.

\[ \Delta KE = \frac{1}{2} \frac{GW}{g} (v^2) \] Where \( v = \) vertical velocity at contact, reduced to 0 at maximum compression, \( GW = \) aircraft gross weight at touchdown, \( g = \) acceleration of gravity.

\[ FX = \frac{GW}{3} Y_1 \] Where wing lift equal to 2/3 of airplane weight (GW) is assumed per 23.477(e).

\[ \Delta SE = \frac{1}{2} KY_1^2 \] Where \( K = \) Spring Constant (=GW/Yo), \( Yo = \) Static Gear Deflection at aircraft weight GW, and \( Y_1 = \) maximum gear deflection during landing (vertical velocity = 0)

Using the above equations, the following quadratic equation can be written:

\[ Y_1^2 - 2 \left( \frac{Yo}{3} \right) Y_1 - \left( \frac{Yo}{g} v^2 \right) = 0 \]
Therefore:
\[ Y_1 = \left( \frac{Y_0}{3} \right) + \sqrt{\left( \frac{Y_0}{3} \right)^2 + \left( \frac{Y_0}{g} \right)^2} \]

Solving for the Vertical Force on the aircraft at maximum gear deflection \( Y_1 \),

\[ F_1 = \frac{GW}{g} Y_1 + \frac{2}{3} GW \]

And:
\[ \frac{d^2}{dx^2} Y = \frac{F_1}{GW} = \left[ \frac{Y_1}{Y_0} + \frac{2}{3} \right] g \]

= Maximum vertical acceleration in units of g.

Where: \( Y_0 = 2.50 \) inches (= 0.21 ft Static Deflection) and \( v = 9 \) ft/sec., maximum vertical aircraft acceleration (inertia load factor) is calculated to be 2.1 g.

### 2.7 Limit Longitudinal Airloads

**Limit drag load is calculated by the following equation:**

\[ F_Y = \frac{1}{2} \rho V^2 S C_d = \frac{1}{2} (0.00238)(v^2)(S)(C_d) \]

Where: \( v = \) airspeed in ft/sec, \( S = \) Load frontal area in sq. ft \((0.83)\),

\( C_d = 0.85 \)

### 2.8 Limit Lateral Maneuver and Gust Airloads

External loads can also have an exposed vertical surface which results in a side or lateral load.

These calculations are based on flat area as above (side area projection of Talon installation is equivalent to frontal projection. Drag coefficient used for sideward flow is 0.85. Forces can be resolved into a normal force or lateral load on the external load by using the cross-flow principle in Ref 2.

\[ F_N = qSC_n \]

Where the \( q \), the dynamic pressure is;

\[ q = \frac{1}{2} \rho V^2 \]

The normal force coefficient for a body inclined to the flow at an angle of attack is given by.
\[ C_n = C_{D_{\text{basic}}} (\sin^2 \alpha) \]

\[ F_x = qS C_d (\sin^2 \beta) \]

Lateral maneuver load at speeds up to \( V_A \) is calculated per 23.441 using:
- Static freestream sideslip angle equal to 15 degrees per 23.441(a)(3).
- Overswing angle 1.5 times static per 23.441(a)(2).
- Assuming sidewash factor equal to 2.0 to account for local flow around the fuselage side due to sideslip maneuver.

\[ \beta_{\text{max}} = 15 \times 1.5 \times 2.0 = 45 \, \text{deg}. \]

Lateral gust load at speeds up to \( V_C \) is calculated per 23.443 using:
- \( U_{de} = 50 \, \text{ft./sec. at } V_C \) per 23.333(c).
- \( V_C = 164 \, \text{knots} = 277 \, \text{ft/sec.} \)
- Equivalent sideslip angle:

\[ \beta = \tan^{-1} \left( \frac{U_{de}}{V_C} \right) = \tan^{-1} \left( \frac{50}{277} \right) = 10.2 \, \text{deg.} \]

Assuming a sidewash factor equal to 2.0 to account for local flow around the fuselage side due to side gust:

\[ \beta_{\text{max}} = \beta(2.0) = 10.2(2.0) = 20.4 \, \text{deg}. \]

Lateral gust loads at speeds up to \( V_D \) are conservatively included by using the gust velocity per 23.333(c) of 25 fps.
- \( V_D = 371 \, \text{fps} \)
- \( V_d = 230 \, \text{knots} = 388 \, \text{ft./sec.} \)
- Equivalent sideslip angle:

\[ \beta = \tan^{-1} \left( \frac{U_{de}}{V_d} \right) = \tan^{-1} \left( \frac{50}{388} \right) = 3.7 \, \text{deg}. \]

\[ \beta_{\text{max}} = \beta(2.0) = 3.7(2.0) = 7.4 \, \text{deg}. \]

Therefore the limit lateral load for maneuver and gust conditions is as shown below, in Table 3:
Table 2 - Limit Loading for Maneuver and Gust Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>V (fps)</th>
<th>$\beta_{\text{max}}$ (deg)</th>
<th>q (psf)</th>
<th>S (ft$^2$)</th>
<th>C_D</th>
<th>F_X (Lbs)</th>
<th>F_Y(Lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maneuver ($V_A$)</td>
<td>189</td>
<td>45</td>
<td>42.5</td>
<td>0.83</td>
<td>0.85</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Gust ($V_C$)</td>
<td>270</td>
<td>20.4</td>
<td>86.8</td>
<td>0.83</td>
<td>0.85</td>
<td>8</td>
<td>61</td>
</tr>
<tr>
<td>Gust ($V_D$)</td>
<td>388</td>
<td>7.4</td>
<td>179</td>
<td>0.83</td>
<td>0.85</td>
<td>2</td>
<td>126</td>
</tr>
<tr>
<td>Landing ($V_S$)</td>
<td>83</td>
<td>45</td>
<td>8.14</td>
<td>0.83</td>
<td>0.85</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

2.9 Limit Inertia Loading

The Turret Weight used in this analysis is 35 lbs. The Support Assembly weight used is 5 lb. The Electronic Control Unit weight is 13 lb.

Resulting applied vertical load is computed based on the maximum $N_2$ load factors found in sections 2.4, 2.5 and 2.6., by the following equation:

$$F_Z = -N_2 \cdot (35)$$

2.10 Net Applied External Loads

The air loads and inertia loads for a component of maximum area and weight combined for each corner of the V-n diagram are shown in Table 3.

Table 3 – Net Limit Loads at Centroid of External Load

<table>
<thead>
<tr>
<th>Case - Condition</th>
<th>F_X (Lbs)</th>
<th>F_Y (Lbs)</th>
<th>F_Z (Lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - $V_A$-positive</td>
<td>15</td>
<td>30</td>
<td>-138</td>
</tr>
<tr>
<td>2 - $V_C$-positive</td>
<td>8</td>
<td>61</td>
<td>-197</td>
</tr>
<tr>
<td>3 - $V_D$-positive</td>
<td>2</td>
<td>126</td>
<td>-151</td>
</tr>
<tr>
<td>4 - $V_A$-negative</td>
<td>15</td>
<td>30</td>
<td>+55</td>
</tr>
<tr>
<td>5 - $V_C$-negative</td>
<td>8</td>
<td>61</td>
<td>+127</td>
</tr>
<tr>
<td>6 - $V_D$-negative</td>
<td>2</td>
<td>126</td>
<td>+81</td>
</tr>
<tr>
<td>7 - $V_S$-Landing</td>
<td>3</td>
<td>6</td>
<td>-72</td>
</tr>
</tbody>
</table>
These loads are applied at the center of area for the external load (~7.9 inches below the Support Mount Plate for the Talon installation).

Applied direct loads and Moments at evaluation locations are defined in the Calculations (MathCad Format) attached to this report. Annotations are contained in the calculations listing to define the purpose of calculations. These calculations are therefore not repeated in the body of this report.

Table 4 – Net Limit Loads at Mount Plate Surface Center

<table>
<thead>
<tr>
<th>Case - Condition</th>
<th>$N_z$</th>
<th>Direct Loads</th>
<th>Torsional Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$P_x$ (lbs)</td>
<td>$P_y$ (lbs)</td>
</tr>
<tr>
<td>1 - $V_{A,positive}$</td>
<td>+3.93</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>2 - $V_{C,positive}$</td>
<td>+5.62</td>
<td>8</td>
<td>61</td>
</tr>
<tr>
<td>3 - $V_{D,positive}$</td>
<td>+4.32</td>
<td>2</td>
<td>126</td>
</tr>
<tr>
<td>4 - $V_{A,negative}$</td>
<td>-1.57</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>5 - $V_{C,negative}$</td>
<td>-3.62</td>
<td>8</td>
<td>61</td>
</tr>
<tr>
<td>6 - $V_{D,negative}$</td>
<td>-2.32</td>
<td>2</td>
<td>126</td>
</tr>
<tr>
<td>7 - $V_{S,Landing}$</td>
<td>+2.05</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

These loads are representative of the FLIR Talon installation, 35 lb. Turret, 0.83 square feet projected area and 0.85 Drag Coefficient.

3.0 Allowables

3.1 Materials

All materials used in the design are specified by industry material specification with statistically based material strength properties included in the MMPDS (Ref. 1). For the analysis ‘A’ basis values are used for single member structural elements and ‘B’ basis values maybe used for redundant structure. Aerospace grade materials with proven methods of corrosion protection are used for the design so no special factors of safety are required to address uncertainty, deterioration or appreciable variability. The environmental temperatures in the area of the design are well within the allowable range for the aluminum structure used. Therefore, no correction is required to account of the effects of temperature.

Applicable material allowables from MMPDS for the materials used in the design are summarized in Table 5.
Table 5 – Material Allowables

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Specification</th>
<th>F_tu (ksi)</th>
<th>F_cy (ksi)</th>
<th>F_su (ksi)</th>
<th>F_bru e/D=2 (ksi)</th>
<th>E (msi)</th>
<th>MMPDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6061-T6</td>
<td>Sheet 0.010-0.249</td>
<td>AMS- QQ-A-250/11</td>
<td>42</td>
<td>35</td>
<td>27</td>
<td>88</td>
<td>9.9</td>
<td>3.6.2.0(b1)</td>
</tr>
<tr>
<td>6061-T62 &amp; T6511</td>
<td>Plate; 0.25-2.0 in.</td>
<td>AMS- QQ-A-250/11</td>
<td>42</td>
<td>36</td>
<td>27</td>
<td>88</td>
<td>9.9</td>
<td>3.6.2.0(b2)</td>
</tr>
<tr>
<td>6061-T6, &amp; T62</td>
<td>Tube and Pipe 0.025 - 0.50 Wall Thick</td>
<td>AMS- WW-T-700/6</td>
<td>42</td>
<td>34</td>
<td>27</td>
<td>88</td>
<td>9.9</td>
<td>3.6.2.0(c1)</td>
</tr>
</tbody>
</table>

Mechanical properties for the minimum strength direction are used unless otherwise noted. Bearing allowables are based on 2.0 e/D.

3.2 Fasteners

All fasteners used in the design are specified by military or industry specification with statistically based material strength properties included in the MMPDS or the fastener specification. The fasteners are aerospace grade which are well proven in this type of application. No special factors of safety are required to address uncertainty, deterioration or appreciable variability. The environmental temperatures in the area of the design are well within the allowable range for fasteners used and no correction is required to account of the effects of temperature.

Fastener allowables from MMPDS or the fastener specification are summarized in Table 6.
Table 6 – Fastener Allowables

<table>
<thead>
<tr>
<th>Fastener</th>
<th>Type</th>
<th>Nominal Diameter (in)</th>
<th>Tension (lbs)</th>
<th>Single Shear (lbs)</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS27039-1-11</td>
<td>Screw</td>
<td>0.190</td>
<td>2500</td>
<td>2125</td>
<td>Specification MS27039</td>
</tr>
<tr>
<td>MS35207-264</td>
<td>Screw</td>
<td>0.190</td>
<td>1200</td>
<td>600 (1/2 Tension)</td>
<td>Specification MS35207</td>
</tr>
<tr>
<td>AN4-10A</td>
<td>Bolt, Steel</td>
<td>0.250</td>
<td>4080</td>
<td>3680</td>
<td>Specification AN3 – AN20</td>
</tr>
<tr>
<td>AN3-10A</td>
<td>Bolt, Steel</td>
<td>0.190</td>
<td>2210</td>
<td>2125</td>
<td>Specification AN3 – AN20</td>
</tr>
<tr>
<td>AN525-10</td>
<td>Screw, Washer Head</td>
<td>0.190</td>
<td>4780</td>
<td>2125</td>
<td>MMPDS, AN525 EngrsEdge.com Tensile Thrd Area</td>
</tr>
<tr>
<td>MS20426AD4</td>
<td>Rivet</td>
<td>0.125</td>
<td>N/A</td>
<td>319</td>
<td>26000 psi Mil-R-5674F</td>
</tr>
<tr>
<td>MS20470AD4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.0 STRESS ANALYSIS

4.1 SX5-606-3 Support Plate

Plate Material: 6061-T6 aluminum alloy

\[ F_{su} = 27 \text{ ksi (A)} \]
\[ 28 \text{ ksi (B)} \]

\[ F_{tu} = 42 \text{ ksi (A)} \]
\[ 43 \text{ ksi (B)} \]

Ref. MMPDS, 3.6.2.0(b1)
4.2 IR-1040 Mount Bracket

Figure 5 – Load Support Fixture (IR-1040-(X))

Note: SX5-606-1 (For FLIR Talon installation) is approximately centered in the channels shown above.
Figure 6 – Representative Load Support Installation:
IR-431-1 Assembly (Gimbal attached to IR-4301-10 and SX5-606-1),
IR-1040-(X), C182IR-1012-1
FIGURE 7, Guide Collar Detail

FIGURE 8, IR-4301-10 Plate

Plate Material: 6061-T6 aluminum alloy

\[ F_{su} = 27 \text{ ksi (A)} \]
\[ 28 \text{ ksi (B)} \]
\[ F_{tu} = 42 \text{ ksi (A)} \]
\[ 43 \text{ ksi (B)} \]

Ref. MMPDS, 3.6.2.0(b1)
This report substantiates the installation of three pieces of equipment on the baggage compartment (FS 124 to FS134) shelf of a Cessna 182 aircraft. Figure 1 shows the equipment installation of the rails and the installation of the equipment on the rails.

Each rail is installed with two screws to the forward end of the shelf and two screws to the aft angle of the baggage shelf. The IMU is attached to the rails using four feet as shown in Figure 2. The feet are locked in place using locking blocks and roll pins.
Figure 3 - Equipment Installation - DETAIL

The baggage area is placarded for 80 lbs per Cessna Pilot Operating Handbook (POH). Therefore, the vertical load is not a concern for the shelf.

The most critical condition will be the emergency forward 18.0 g's per FAR 23.561.

Max. Weight of equipment = 37.0 lbs.

Max. C.G. of equipment above shelf = 8.0 inches

Horizontal Reaction $R_H = 18.0 \times 37.0 = 666$ lbs.

This load is reacted primarily by two MS16998-31 screws in compression. The secondary load path is two MS16562-38 pins. We can conservatively assume that only the weaker of the two load path transfers load.

Single shear rating of each roll pin = 1050 lbs.

$$M.S. = (2 \times 1050/666) - 1 = \text{HIGH}$$
Vertical Reaction $R_v = \frac{(18.0 \times 37.0 \times 8.0\text{")}}{(10.25\text{")}) = 520 \text{ lbs.}$

This load is reacted by the foot in two rails.

Shear area of foot = 0.07 in²

Shear stress in foot $\sigma_s = \frac{520}{2/0.07} = 3715 \text{ psi.}$

The foot is made using 6061-T6 aluminum, $F_{su} = 27000 \text{ psi.}$

\[ \text{M.S.} = \frac{27000}{3715} - 1 = + \text{HIGH} \]

Load is transferred to baggage shelf using screws that attach the rails to shelf.

Tensile load on screws = \(\frac{(18.0 \times 37.0 \times 8.0\text{")}}{(4\times10.0\text{")}) = 133 \text{ lbs.}\)

Tensile Strength of MS35206 #8-32 screws ($F_{tu} = 60 \text{ ksi}$) = 730 lbs.

\[ \text{M.S.} = \frac{730}{133} - 1 = + \text{HIGH} \]

Based on positive strength margins of the installation, the equipment installation is adequate to meet the strength requirements of the aircraft.
INSTRUCTIONS FOR CONTINUED AIRWORTHINESS
AUGMENTED REALITY SYSTEM INSTALLATION

This document is applicable to systems certificated under the following
Supplemental Type Certificates:
SR00682DE

The above certification documents include approval for Augmented Reality
System (ARS) installation to the following aircraft:

Bell 206A/B
Bell 206L, L-1, L-3, L-4
Bell 407
REVISION CONTROL PROCEDURE

Revisions to this document are mailed to owner of record. Before inserting a change, ensure this manual is correct. Check the existing List of Effective Pages in this manual to ensure that all prior revisions are inserted. Do not insert this revision if prior revisions are not inserted.
# LIST OF EFFECTIVE PAGES

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<th>DATE</th>
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<td>04/08/08</td>
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<td>12</td>
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<td>04/08/08</td>
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<td>A-1</td>
<td>1</td>
<td>04/08/08</td>
</tr>
<tr>
<td>A-2</td>
<td>1</td>
<td>04/08/08</td>
</tr>
<tr>
<td>B-1</td>
<td>1</td>
<td>04/08/08</td>
</tr>
</tbody>
</table>
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A STANDARD TORQUE VALUE CHART                                       A
B PERIODIC INSPECTION CHECKLIST                                     B

ADDITIONAL REFERENCE

AC43.13-2B Acceptable Methods, Techniques and Practices – Aircraft Alterations
AIRWORTHINESS LIMITATIONS

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.

No airworthiness limitation associated with this type design change.

This system has no life-limited components.

<table>
<thead>
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<th>REVISION</th>
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<th>APPROVED</th>
</tr>
</thead>
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</tr>
<tr>
<td>1</td>
<td>04/08/08</td>
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</tr>
</tbody>
</table>
1.0 SYSTEM DESCRIPTION

The Paravion Technology, Inc./Churchill Navigation Augmented Reality System (ARS) is an accessory to certain infrared and visible light imaging system installations installed under separate certification, to add display of parcel and address overlay information to the monitor screen. The Augmented Reality System is operated by the assigned observer in accordance with imaging system certification instructions.

This accessory to the previously certificated imaging system is designed as an aid to surveillance operations, requires no pilot action, and is non-essential to safety-of-flight.

The ARS uses GPS input, to determine imaging system location and viewpoint. Touch screen commands are used to enable its various options (See Users Handbook). It is designed to consume less than 4.5 amp (28VDC), and to be powered through the imaging system circuit breaker.

1.1 The ARS installation includes the following major components:

A. Controller Assembly, 6 lbs. (2.7 kg)
B. Serial Bypass Switch, 1.2 lbs. (0.5 kg)
C. Inertial Measurement Unit, 5 lbs. (2.2 kg)
D. GPS Antenna, 0.3 lbs. (0.1 kg)
E. Cables Installation, est. 3 lbs. (~1.4 kg estimate)
F. Monitor Mount Installation (Ref.), 1.7 lbs. (0.8 kg)
G. Monitor Assembly (Ref. DBM-100-5T), 5.3 lbs (2.4 kg)

| TABLE I |

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WEIGHT (lbs)</th>
<th>LONGITUDINAL</th>
<th>LATERAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F.S. (in)</td>
<td>MOMENT (in-lbs)</td>
</tr>
<tr>
<td>ARS-4000 Controller Assembly</td>
<td>6.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARS-3500 Serial Bypass Switch</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARS-3600 IMU ASSEMBLY</td>
<td>5.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS Antenna</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cables Installation</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor Installation</td>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: This table is to be completed upon system installation.

Component Weight & Balance data completed

Date: 
Aircraft: 
By:
2.0 INSPECTION AND MAINTENANCE

It is the objective of this inspection and maintenance procedure to ensure that component installations are secure and that the electrical system is airworthy. Table II, TROUBLE SHOOTING GUIDE, refers to the most likely problems that may be encountered, and outlines the appropriate corrective actions. Appendix B, Inspection Checklist should be referenced during periodic Airworthiness inspections. All loose and/or replaced fasteners should be referenced during periodic Airworthiness inspections. All loose and/or replaced fasteners should be tightened per the torque requirements outlined in Appendix A.

3.0 COMPONENT REMOVAL AND REPLACEMENT

The major components of the ARS (Controller Unit and Inertial Measurement Unit) are mounted in the baggage area of the aircraft, in accordance with certificated installation data. The monitor is mounted for operation by observer in accordance with certificated installation data. The GPS antenna is mounted to the aircraft exterior in accordance with approved data.

Electrical power for the Augmented Reality System is obtained from the power supply installed to provide power to the imaging system to which the system has been added. Data transmission wiring is routed to the monitor and imaging system according to aircraft requirements in accordance with certificated ARS installation data.

Assure that imaging system power supply is switched to OFF and that electrical wires are disconnected and capped before removing any component of the system.

Component removal/re-installation order does not affect system performance after completion of the work.

NOTE: When mounting components are removed and replaced, follow torque recommendations given in Appendix A for fastener installation. Remove installed wire caps and re-install wiring. Refer to AC43.13-2B guidelines for installation of GPS antenna and other alterations as needed.

4.0 COMPONENT SERVICE PROCEDURE

If troubleshooting results in the finding of faults in the system components the Augmented Reality System must be disabled before the faulty unit is removed. Aircraft Weight and Balance should be adjusted accordingly, reference Table I of this document. The faulty component must be returned to Paravion Technology, Inc. for repair or replacement.
### 5.0 SYSTEM TESTING/TROUBLESHOOTING PROCEDURES

#### TABLE II
TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>ADDITIONAL SYMPTOMS</th>
<th>POSSIBLE CAUSE</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>No video.</td>
<td>Cooling fans do not run</td>
<td>No power to ARS</td>
<td>Ensure that the aircraft is providing power to the ARS.</td>
</tr>
<tr>
<td></td>
<td>Cooling fans may or may not run</td>
<td>ARS internal breakers</td>
<td>Ensure that the 3 circuit breakers mounted to the ARS unit are not tripped. If tripped, reset. If circuit breaker fails to reset, remove ARS unit from aircraft and send to Paravion for service.</td>
</tr>
<tr>
<td></td>
<td>Cooling fans run, no beeping sound as unit powers on, no lights on IMU</td>
<td>12V power supply breaker blown</td>
<td>Reset breaker. If problem persists, remove ARS Controller unit and IMU from aircraft and send to Paravion for service.</td>
</tr>
<tr>
<td></td>
<td>Cooling fans running</td>
<td>Monitor off</td>
<td>Ensure monitor is ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proper video input not selected</td>
<td>Press “Source” on the monitor until video is shown (usually with the on-screen designation “PC” or “VGA”).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Video wiring</td>
<td>Monitor off</td>
</tr>
<tr>
<td>Video shows ARS controls, but no camera video.</td>
<td>Camera off or camera in standby</td>
<td>Turn camera ON and wait for initialization to complete. Ensure camera is operational.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Video wiring</td>
<td>Monitor off</td>
<td></td>
</tr>
<tr>
<td>Video indicates “NO CAMERA”</td>
<td>Camera off or camera in standby</td>
<td>Turn camera ON and wait for initialization to complete. Ensure camera is operational.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial connection from camera is bad</td>
<td>Turn camera ON and wait for initialization to complete. Ensure camera is operational.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ARS Controller Unit internal component or wiring faulty, possible software fault.</td>
<td>Monitor off</td>
<td>Inspect wiring between camera serial port output and ARS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remove unit from aircraft and return to Paravion for service.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Field repair of the ARS Controller Unit should not be attempted.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>ADDITIONAL SYMPTOMS</td>
<td>POSSIBLE CAUSE</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------</td>
<td>---------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Camera does not turn on or hand controller is unresponsive.</td>
<td>Hand controller backlight is off.</td>
<td>No power to camera</td>
<td>Ensure camera has aircraft power.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hand controller wiring bad</td>
<td>Inspect wiring between hand controller and camera. If plugging the hand controller directly in to the camera solves the problem, then inspect aircraft-side wiring and replace as necessary. System will be usable in this state, but geo-pointing functions (if available) will not work.</td>
</tr>
<tr>
<td>Hand controller backlight is on. Serial Bypass Switch (ARS-3100-1) has no LEDs lit.</td>
<td>Serial Bypass Switch does not have power.</td>
<td>Inspect wiring between Serial Bypass Switch and camera. Ensure power is available on the bypass switch (pin 1=ground, pin 2=+5v DC +/- 10%). As a temporary solution, the hand controller may be plugged directly in to the camera, or a plug shorting pins 3 and 9 may be used in place of the serial bypass switch, but geo-pointing functions (if available) will not work.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Serial Bypass Switch has failed</td>
<td>Disconnect the serial bypass switch and manually short pins 3 and 9 on the cable harness. Do not touch pin 2 (+5v power). If the camera can be turned on, then replace the serial bypass switch. As a temporary solution, the hand controller may be plugged directly in to the camera, or a plug shorting pins 3 and 9 may be used in place of the serial bypass switch, but geo-pointing functions (if available) will not work.</td>
</tr>
<tr>
<td>Hand controller backlight is on. Serial bypass switch has one LED lit.</td>
<td>Wiring bad</td>
<td>Inspect wiring between hand controller, serial bypass switch, and camera. If plugging the hand controller directly in to the camera solves the problem, then inspect aircraft-side wiring and replace as necessary. The system will be usable in this state, but geo-pointing functions (if available) will not work.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Serial bypass switch has failed</td>
<td>Disconnect the serial bypass switch and manually short pins 3 and 9 on the cable harness. Do not touch pin 2 (+5v power). If the camera can be turned on, then replace the serial bypass switch. As a temporary solution, the hand controller may be plugged directly in to the camera, or a plug shorting pins 3 and 9 may be used in place of the serial bypass switch, but geo-pointing functions (if available) will not work.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>ADDITIONAL SYMPTOMS</td>
<td>POSSIBLE CAUSE</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Video indicates “INVALID IMU”</td>
<td>IMU not initialized</td>
<td>The aircraft must move at least 10 knots before the IMU initializes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No GPS signal</td>
<td>Ensure that the GPS antenna has an unobstructed view of the sky. The IMU will not work inside a hanger.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GPS antenna is connected improperly</td>
<td>Ensure that the antenna is connected to IMU connector marked “Primary” and not the one marked “Secondary”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GPS antenna and/or cable is faulty</td>
<td>With the aircraft outside and the ARS powered ON for at least 5 minutes, verify that the GPS light on the IMU is red or orange. No light indicates that the antenna, antenna cable, or IMU is bad and should be replaced.</td>
<td></td>
</tr>
<tr>
<td>Video indicates “NO IMU”</td>
<td>No signal from IMU</td>
<td>Ensure that the data cable (marked “Ethernet” on the IMU) is securely connected.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IMU has no power.</td>
<td>If the IMU “Power” LED is not on, then verify wiring. Power cable should have 9-15 volts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IMU Failure</td>
<td>If the power cable has 9-15 volts and the IMU “Power” LED remains off, then replace the IMU. Contact Paravion Technology, Inc. for system recalibration instructions.</td>
<td></td>
</tr>
<tr>
<td>Touch screen not</td>
<td>Wiring bad</td>
<td>Inspect wiring between touch screen and ARS.</td>
<td></td>
</tr>
<tr>
<td>responsive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Touch screen inaccurate</td>
<td>Fingers operate incorrect button, or finger must be in the wrong place to operate button</td>
<td>Touch screen needs recalibration</td>
<td>Contact Paravion Technology, Inc. for touch screen calibration instructions.</td>
</tr>
<tr>
<td>Road/Video alignment poor</td>
<td>Camera mount and/or IMU have been moved with respect to airframe since last calibration.</td>
<td>Contact Paravion Technology, Inc. for system calibration instructions.</td>
<td></td>
</tr>
</tbody>
</table>
### IMU (ARS-3600-1): LED Definitions:

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SdNav</td>
<td>Off</td>
<td>IMU Booting</td>
</tr>
<tr>
<td></td>
<td>Red Flash</td>
<td>Running, but not yet operational. GPS has not yet output a valid time.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Running, but not yet operational. GPS has a valid time, but has not initialized. Waiting for the vehicle to travel &gt; 5 m/s.</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
<td>Operational, but data is not yet real-time. This condition should not last more than 10 seconds.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Operational</td>
</tr>
<tr>
<td>GPS</td>
<td>Off</td>
<td>GPS does not have a valid position.</td>
</tr>
<tr>
<td></td>
<td>Red Flash</td>
<td>Operational check (startup only)</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>GPS has a standard position solution (SPS). This is the default state.</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
<td>GPS has a differential solution (SBAS). This is normally not used.</td>
</tr>
<tr>
<td>Power</td>
<td>Off</td>
<td>No power to the system.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>System is powered; 5v internal voltage is active.</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
<td>System is powered; Outputting data to serial port. This is normally not used.</td>
</tr>
</tbody>
</table>
FIGURES

FIGURE 0: Suggested Installation, Bell 407 shown
⚠ TOUCH SCREEN MONITOR REQ'D. 7 & 8 (REF. EA)

2. Wires labeled/(colored) as shown

TO EXISTING IMAGING SYSTEM

IMAGING SYSTEM CIRCUIT BREAKER

28 VDC

28 VDC

TO EXISTING IMAGING SYSTEM

IMAGING SYSTEM CIRCUIT BREAKER

28 VDC

TO EXISTING IMAGING SYSTEM

IMAGING SYSTEM CIRCUIT BREAKER

28 VDC
### COMPONENTS, FIGURE 1

<table>
<thead>
<tr>
<th>ITEM NO</th>
<th>PN</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>TYP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0*</td>
<td>ACC02E16-9S-003</td>
<td>CONNECTOR (Blkd Receptacle) REF.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ARS-3600-1</td>
<td>INERTIAL MEASUREMENT UNIT</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>3</td>
<td>ES54100-2</td>
<td>ANTENNA, GPS</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>4</td>
<td>ARS-3500-1</td>
<td>SERIAL BYPASS SWITCH</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>5</td>
<td>MS27474E20F41S</td>
<td>CONNECTOR (Blkd Receptacle)</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>M85049/41-12A</td>
<td>BACKSHELL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ARS-3100-1</td>
<td>CABLE, PASS-THRU</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>7</td>
<td>ARS-3011-1</td>
<td>VIDEO CABLE ASSY</td>
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<td>EA.</td>
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<tr>
<td>8</td>
<td>ARS-3011-2</td>
<td>TOUCHSCREEN CABLE ASSY</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>9</td>
<td>ARS-3010-1</td>
<td>POWER CABLE ASSY, IMU</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>10</td>
<td>ARS-3010-2</td>
<td>SIGNAL CABLE ASSY, IMU</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>11</td>
<td>ES56221-1</td>
<td>MONITOR POWER CABLE</td>
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<td>EA.</td>
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<tr>
<td>12</td>
<td>ES58110-1</td>
<td>FUSE HOLDER</td>
<td>1</td>
<td>EA.</td>
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<tr>
<td></td>
<td>AGC-3</td>
<td>FUSE, 3 AMP</td>
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<td>EA.</td>
</tr>
<tr>
<td>13</td>
<td>MS27467T15B18P</td>
<td>CONNECTOR</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td></td>
<td>M85049/49-2-14W</td>
<td>BACKSHELL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>AIM-97095</td>
<td>CONNECTOR (Or equiv. DE-9 Female)</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>15</td>
<td>MS27467T9B35P</td>
<td>CONNECTOR</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td></td>
<td>MS27506-B-9-2</td>
<td>BACKSHELL (Alt: MS27506-F-9-2)</td>
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<td>EA.</td>
</tr>
<tr>
<td>16</td>
<td>V75268</td>
<td>75 OHM COAXIAL CABLE (Or equiv.)</td>
<td>15</td>
<td>FT.</td>
</tr>
</tbody>
</table>

**ATTACHING HARDWARE,**

- ARS-3600-2 HAT SECTION ASSEMBLY 2 EA.
- MS20470AD4-X RIVET (Length may vary) 16 EA.
- MS35206-08XX SCREW 4 EA.
- NAS1149CN616R WASHER 4 EA.
- MS27039-08XX SCREW (Length may vary) 4 EA.
- MS21042L08 SELF LOCKING NUT 4 EA.
- MS35206-XXX (#4-40)SCREW (Length may vary) 4 EA.

**WIRING SPECIFICATION:**

- Circuit Breaker rating must be 20A or lower
- System electrical power and ground, Connector 1 Pins A and C, are M22759/16-14 or equivalent.
- All other (data transmission) wires are M22759/16-22 or equivalent

**NOTE:** The Inertial Measurement Unit, Serial Bypass Switch, & GPS Antenna are supplied as Line Replaceable Units, assembled and calibrated at the factory. Field maintenance of these units should not be attempted.
FIGURE 2: Augmented Reality System Controller Installation
COMPONENTS, FIGURE 2

<table>
<thead>
<tr>
<th>ITEM NO</th>
<th>PN</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>TYP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ARS-4000-1</td>
<td>CONTROLLER ASSEMBLY</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>2</td>
<td>MS27484E20F41PN</td>
<td>CONNECTOR</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td>3</td>
<td>ACC02E16-9S-003</td>
<td>CONNECTOR</td>
<td>1</td>
<td>EA.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ATTACHING HARDWARE,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>MS27039-08XX</td>
<td>SCREW (Length may vary)</td>
<td>4</td>
<td>EA.</td>
</tr>
<tr>
<td>-</td>
<td>MS35333-106</td>
<td>LOCK WASHER</td>
<td>4</td>
<td>EA.</td>
</tr>
</tbody>
</table>

**Note:** The Controller Assembly is supplied as a Line Replaceable Unit, assembled and calibrated at the factory. Field maintenance of the unit must not be attempted.
APPENDIX A

STANDARD TORQUE VALUE CHART
Appendix A

**RECOMMENDED TORQUE VALUES (inch-pounds)**  
(Reference AC 43.13-1B, Change 1, Dated 9/8/98)

**CAUTION**

THE FOLLOWING TORQUE VALUES ARE DERIVED FROM OIL FREE CADMIUM PLATED THREADS.

<table>
<thead>
<tr>
<th>Thread Size</th>
<th>Tension type nuts:</th>
<th>Shear type nuts:</th>
<th>Nuts:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MS20356, MS21042,</td>
<td>MS20364, MS21245,</td>
<td>MS20365,</td>
</tr>
<tr>
<td></td>
<td>MS17825, AN310</td>
<td>MS17826, AN320</td>
<td>MS21245,</td>
</tr>
<tr>
<td></td>
<td>(40,000 psi in bolts)</td>
<td>(24,000 psi in bolts)</td>
<td>MS17826,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AN310</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(90,000 psi in bolts)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(54,000 psi in bolts)</td>
</tr>
<tr>
<td>Fine Thread Series</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-36</td>
<td>12-15</td>
<td>7-9</td>
<td>20</td>
</tr>
<tr>
<td>10-32</td>
<td>20-25</td>
<td>12-15</td>
<td>40</td>
</tr>
<tr>
<td>1/4-28</td>
<td>50-70</td>
<td>30-40</td>
<td>100</td>
</tr>
<tr>
<td>5/16-24</td>
<td>100-140</td>
<td>60-85</td>
<td>225</td>
</tr>
<tr>
<td>3/8-24</td>
<td>160-190</td>
<td>95-110</td>
<td>390</td>
</tr>
<tr>
<td>7/16-20</td>
<td>450-500</td>
<td>270-300</td>
<td>840</td>
</tr>
<tr>
<td>1/2-20</td>
<td>480-690</td>
<td>290-410</td>
<td>1100</td>
</tr>
<tr>
<td>9/16-18</td>
<td>800-1000</td>
<td>480-600</td>
<td>1600</td>
</tr>
<tr>
<td>5/8-18</td>
<td>1100-1300</td>
<td>600-780</td>
<td>2400</td>
</tr>
<tr>
<td>3/4-16</td>
<td>2300-2500</td>
<td>1300-1500</td>
<td>5000</td>
</tr>
<tr>
<td>7/8-14</td>
<td>2500-3000</td>
<td>1500-1800</td>
<td>7000</td>
</tr>
<tr>
<td>1-14</td>
<td>3700-5500</td>
<td>2200-3300*</td>
<td>10,000</td>
</tr>
<tr>
<td>1-1/8-12</td>
<td>5000-7000</td>
<td>3000-4200*</td>
<td>15,000</td>
</tr>
<tr>
<td>1-1/4-12</td>
<td>9000-11000</td>
<td>5400-6600*</td>
<td>25000</td>
</tr>
<tr>
<td>Coarse Thread Series</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-32</td>
<td>12-15</td>
<td>7-9</td>
<td>20</td>
</tr>
<tr>
<td>10-24</td>
<td>20-25</td>
<td>12-15</td>
<td>35</td>
</tr>
<tr>
<td>1/4-20</td>
<td>40-50</td>
<td>25-30</td>
<td>75</td>
</tr>
<tr>
<td>5/16-18</td>
<td>80-90</td>
<td>48-55</td>
<td>160</td>
</tr>
<tr>
<td>3/8-16</td>
<td>160-185</td>
<td>95-100</td>
<td>275</td>
</tr>
<tr>
<td>7/16-14</td>
<td>235-255</td>
<td>140-155</td>
<td>475</td>
</tr>
<tr>
<td>1/2-13</td>
<td>400-480</td>
<td>240-290</td>
<td>880</td>
</tr>
<tr>
<td>9/16-12</td>
<td>500-700</td>
<td>300-240</td>
<td>1100</td>
</tr>
<tr>
<td>5/8-11</td>
<td>700-900</td>
<td>420-540</td>
<td>1500</td>
</tr>
<tr>
<td>3/4-10</td>
<td>1150-1600</td>
<td>700-950</td>
<td>2500</td>
</tr>
<tr>
<td>7/8-9</td>
<td>2200-3000</td>
<td>1300-1800</td>
<td>4600</td>
</tr>
</tbody>
</table>

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.

This table includes standard nut and bolt combinations, currently used in aviation maintenance. For further identification of hardware, see AC 43.13-1B, Chapter 7.
APPENDIX B

ANNUAL/300 HR. INSPECTION CHECKLIST

<table>
<thead>
<tr>
<th>INSPECTION (Infrared Camera System)</th>
<th>COMMENTS</th>
<th>INITIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check for mount fasteners security (GPS antenna and other exterior installations, interior installations). Inspect equipment and adjacent aircraft structure for condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Torque all fasteners in accordance with Appendix A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Inspect electrical cabling for security and insulation damage. Evaluate cable routing to avoid heat and movement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Inspect Controller Assembly and surrounding area for airflow obstruction. Clean heat radiation surfaces as needed. Verify cooling fans operation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

#### INSTRUCTIONS:
Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed $1,000 for each such violation (Section 901 Federal Aviation Act 1958).

#### 1. Aircraft
- **Nationality and Registration Mark:** USA N539MY
- **Serial No.:** 18282238
- **Make:** CESSNA
- **Model:** 182T
- **Series:** SKYLANE

#### 2. Owner
- **Name (As shown on registration certificate):** CESSNA AIRCRAFT COMPANY
- **Address (As shown on registration certificate):**
  - **City:** WICHITA
  - **State:** KANSAS
  - **Zip:** 67215-1400
  - **Country:** USA

#### 3. For FAA Use Only

#### 4. Type
- **Repair Alteration**
- **Unit**
  - [ ] AIRFRAME
  - [ ] POWERPLANT
  - [ ] PROPELLER
  - [ ] APPLIANCE

#### 5. Unit Identification

#### 6. Conformity Statement

**A. Agency's Name and Address**
- **Name:** YINGLING AVIATION
- **Address:** 2010 AIRPORT ROAD
  - **City:** WICHITA
  - **State:** KS
  - **Zip:** 67277
  - **Country:** USA

**B. Kind of Agency**
- [ ] U.S. Certified Mechanic
- [ ] Foreign Certified Mechanic
- [ ] Manufacturer
- [ ] Certificate No.
- [ ] Certificated Repair Station
- [ ] YN8R621Y
- [ ] RADIO CLASS 1,2,3
- [ ] Certified Maintenance Organization

**D. I certify that the repair and/or alteration made to the unit(s) identified in Item 5 above and described on the reverse of this form or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.**

**Extended range fuel per 14 CFR Part 43 App. B**
- [ ]

**Signature/Date of Authorized Individual**
- **Signature:** [Signature]
- **Date:** 8/19/19

**7. Approval for Return to Service**

Pursuant to the authority given persons specified below, the unit identified in Item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is [ ] APPROVED [ ] REJECTED

**BY**
- **FAA Fit Standards Inspector**
- **FAA Designee**
  - **X** Repair Station
  - **Inspection Authorization**
  - **Other (Specify):**

**Certificate or Designation No.**
- **YN8R621Y
  - **Signature/Date of Authorized Individual:**
    - **Signature:** [Signature]
    - **Date:** 8/19/10

**FAA Form 337 (10-06)**
NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

<table>
<thead>
<tr>
<th>USA</th>
<th>N539MY</th>
</tr>
</thead>
</table>

Nationality and Registration Mark | Date

CESSNA 182T – 18282238 – N539MY

Provisions: Installed antenna doublers under the fuselage for future install of a Directional Finder Antenna.

2 ea provisions at FSS 31.5
2 ea provisions at FSS 44.0

Cut 1 ea opening provision for DF antenna coax. Located on pilot side under the fuselage at FSS 48.0. Fabricated and installed cover plate.

Reference:
AC 43.13-1B
AC 43.13-2B Chap. 3

The above installation meets the requirements for static loading in accordance with A.C.43.13-2B Chapter 1 par. 106 through 114. No changes were noted to the compass system. Further details are on file at C.R.S. # YN8R621Y under W.O. # AVI 10082.

>>>>>>>>>>>>>>>>>END<<<<<<<<<<<<<<<<<<
# MAJOR REPAIR AND ALTERATION

(Airframe, Powerplant, Propeller, or Appliance)

INSTRUCTIONS: Print or type all entries. See FAR 43.3, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed $1,000 for each such violation (Section 901 Federal Aviation Act 1958).

<table>
<thead>
<tr>
<th>1. Aircraft</th>
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<tr>
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</tr>
<tr>
<td>Serial No.</td>
<td>18282238</td>
</tr>
<tr>
<td>Make</td>
<td>CESSNA</td>
</tr>
<tr>
<td>Model</td>
<td>182T</td>
</tr>
<tr>
<td>Series</td>
<td>SKYLANE</td>
</tr>
<tr>
<td>Name (As shown on registration certificate)</td>
<td>CESSNA AIRCRAFT COMPANY</td>
</tr>
<tr>
<td>Address (As shown on registration certificate)</td>
<td>ATTN: DEPT 093 3 CESSNA BLVD</td>
</tr>
<tr>
<td>City</td>
<td>WICHITA</td>
</tr>
<tr>
<td>State</td>
<td>KANSAS</td>
</tr>
<tr>
<td>Zip</td>
<td>67215-1400</td>
</tr>
<tr>
<td>Country</td>
<td>USA</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Owner</th>
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</thead>
<tbody>
<tr>
<td>Name</td>
<td>CESSNA AIRCRAFT COMPANY</td>
</tr>
<tr>
<td>Address</td>
<td>ATTN: DEPT 093 3 CESSNA BLVD</td>
</tr>
<tr>
<td>City</td>
<td>WICHITA</td>
</tr>
<tr>
<td>State</td>
<td>KANSAS</td>
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<td>67215-1400</td>
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<tr>
<td>Country</td>
<td>USA</td>
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<table>
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<tr>
<th>3. For FAA Use Only</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4. Type</th>
<th>5. Unit Identification</th>
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</thead>
<tbody>
<tr>
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<td>Alteration</td>
</tr>
<tr>
<td>AIRFRAME</td>
<td>(As described in Item 1 above)</td>
</tr>
<tr>
<td>POWERPLANT</td>
<td></td>
</tr>
<tr>
<td>PROPELLER</td>
<td></td>
</tr>
<tr>
<td>APPLIANCE</td>
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</table>

<table>
<thead>
<tr>
<th>6. Conformity Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Agency’s Name and Address</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>City</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>Zip</td>
</tr>
<tr>
<td>Country</td>
</tr>
<tr>
<td>B. Kind of Agency</td>
</tr>
<tr>
<td>Foreign Certified Mechanic</td>
</tr>
<tr>
<td>C. Certificate No.</td>
</tr>
<tr>
<td>Certificated Repair Station</td>
</tr>
<tr>
<td>Certificated Maintenance Organization</td>
</tr>
<tr>
<td>D. I certify that the repair and/or alteration made to the unit(s) identified in Item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Approval for Return to Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pursuant to the authority given persons specified below, the unit identified in Item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is</td>
</tr>
<tr>
<td>Other (Specify)</td>
</tr>
<tr>
<td>Manufacturer</td>
</tr>
<tr>
<td>Maintenance Organization</td>
</tr>
<tr>
<td>Person Approved by Canadian Department of Transport</td>
</tr>
<tr>
<td>FAA Designee</td>
</tr>
<tr>
<td>Repair Station</td>
</tr>
<tr>
<td>Inspection Authorization</td>
</tr>
</tbody>
</table>

Signature/Date of Authorized Individual: [Signature/Date of Authorized Individual]

FAA Form 337 (10-06)
NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

USA N539MY
Nationality and Registration Mark
8/19/10
Date

Cessna 182T–18282238–N539MY

INSTALLED SYSTEMS:
- Installed Yingling Aviation Installation of Cabin Skylights IAW STC SA01569WI.

CONTINUED AIRWORTHINESS INSTRUCTIONS:
- Reference Yingling Aviation Document No. 5640-F182-06 Rev. A, for Instructions for Continued Airworthiness Installation of Skylights in the Cessna 182T.

WEIGHT & BALANCE and EQUIPMENT LIST: Revised Aircraft Weight & Balance and Equipment List. See Aircraft Weight & Balance records for details.

The above installation meets the requirements for static loading in accordance with A.C.43.13-2B Chapter I par. 106 through 114. No changes were noted to the compass system. Further details are on file at C.R.S. # YN8R621Y under W.O. # AV110082.

>>>>>>>>>>>>>>>>END<<<<<<<<<<<<<<<<<<
MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

INSTRUCTIONS: Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed $1,000 for each such violation (Section 901 Federal Aviation Act 1958).

Nationality and Registration Mark
USA N539MY

Serial No.
18282238

Make
CESSNA

Model.
182T

Series
SKYLANE

Name (As shown on registration certificate)
CESSNA AIRCRAFT COMPANY

Address (As shown on registration certificate)
ATTN: DEPT 093 3 CESSNA BLVD
City WICHITA State KANSAS
Zip 67215-1400 Country USA

Repair
AIRFRAME

Alteration

Unit

Make
(As described in item 1 above)

Model

Serial Number

Conformity Statement

A. Agency's Name and Address
YINGLING AVIATION
2010 AIRPORT ROAD
WICHITA KS
67277 USA

B. Kind of Agency
U.S. Certificated Mechanic

C. Certificate No.
YN8R621Y

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Signature/Date of Authorized Individual

Extended range fuel
per 14 CFR Part 43
App. B

FYI
Signature/Date of Authorized Individual

FAA Form 337 (10-06)
8. Description of Work Accomplished
(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

USA N539MY

Nationality and Registration Mark

Date

Cessna 182T-18282238-N539MY

Installation Description: The following equipment was installed IAW Mfr's Installation Manual P/N 150-049106 Rev F and the AC 43.13-2B. Using the existing mission radio interface system. System is powered from Mission Buss (Electrical Buss 3) thru a 5 Amp pull type circuit breaker.

Installed Equipment:
Wulfsberg P-2000 VHF Digital/Analog Tactical FM Radio:
- Wulfsberg FM Transceiver P-2000VHF P/N 400-049200-11-011-2135-2135, 3.0 lbs @ arm 14.0
- Comant VHF FM (bent whip) Antenna P/N CI292-3, .5 lbs @ arm 60.7
- Comant VHF FM (bent whip) Antenna P/N CI292-2, .5 lbs @ arm 143.0

OPERATIONAL GROUND CHECKS: Post installation ground functional and interference tests were performed IAW Wulfsberg Installation Drawing 150-049106 Rev F or later.

EMI testing performed IAW YINGLING AVIATION EMI Test Doc. 23507-F206-10 Rev IR or Later on 8/19/10 and found to be satisfactory.

CONTINUED AIRWORTHINESS INSTRUCTIONS:
- Inspections-During annual, 100 hour, or alternate type inspections as required, inspect the Wulfsberg P-2000 FM Radio, including all components in the system, for damage and general condition to ensure their continued satisfactory operation. Replace parts that are damaged and defective with identical parts.
- Removal and replacement-Reference the Wulfsberg Installation Manual P/N 150-049106 Rev F Section 5 for return to service after repairs.

WEIGHT & BALANCE and EQUIPMENT LIST: Revised Aircraft Weight & Balance and Equipment List. See Aircraft Weight and Balance records for details.


The above installation meets the requirements for static loading in accordance with A.C.43.13-2B Chapter 1 par. 106 through 114. Electrical load Calculation was performed IAW AC43.13-1B Chap 11 Para 36 and found to be less than 80% of electrical system capacity. No changes were noted to the compass system. Further details are on file at C.R.S. # YN8R621Y under W.O. # AVI 10082.
### MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

INSTRUCTIONS: Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed $1,000 for each such violation (Section 921 Federal Aviation Act 1956).

1. Aircraft
   - Nationality and Registration Mark: USA N539MY
   - Serial No.: 18282238
   - Make: CESSNA
   - Model: 182T
   - Series: SKYLANE

2. Owner
   - Name (As shown on registration certificate): CESSNA AIRCRAFT COMPANY
   - Address (As shown on registration certificate): 3 CESSNA BLVD
   - City: WICHITA
   - State: KANSAS
   - Zip: 67215-1400
   - Country: USA

3. For FAA Use Only

4. Type
   - Repair
   - Alteration
   - Unit
   - Make
   - Model
   - Serial Number
   - AIRFRAME
   - POWERPLANT
   - PROPELLER
   - APPLIANCE

5. Unit Identification
   - Type
   - Manufacturer

6. Conformity Statement
   - A. Agency's Name and Address
     - Name: YINGLING AVIATION
     - Address: 2010 AIRPORT ROAD
     - City: WICHITA
     - Zip: 67277
     - Country: USA
   - B. Kind of Agency
     - U.S. Certificated Mechanic
     - Foreign Certificated Mechanic
     - Certificated Repair Station
     - Certificated Maintenance Organization
   - C. Certificate No.
     - YNR621Y
   - D. Certified Repair Station
     - RADIO CLASS 1,2,3
   - D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

7. Approval for Return to Service
   - Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is
   - APPROVED
   - REJECTED

FAA Form 337 (10-06)
8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

USA
N539MY
Nationality and Registration Mark
8/9/10
Date

Cessna 182T–18282238– N539MY

INSTALLED SYSTEMS: Installed Precise Flight Pulselite Control unit IAW STC SA4005NM.

OPERATIONAL GROUND CHECKS: Required ground tests were performed and the equipment was found to operate normally IAW Precise Flight Installation Manual PPRI-2000 Doc # 015PMAN0001 Rev. O dated May 16, 2007.

CONTINUED AIRWORTHINESS INSTRUCTIONS: Reference Document No. 000PMAN0002 Rev. D (7/07) for Instructions for Continued Airworthiness.

AFMS: FAA Approved Flight Manual Supplement Doc. No. 000PMAN0001Rev. A (7/24/03) was inserted into the Aircraft Flight Manual.

WEIGHT & BALANCE and EQUIPMENT LIST: Revised Aircraft Weight & Balance and Equipment List. See Aircraft Weight & Balance records for details.

The above installation meets the requirements for static loading in accordance with A.C.43.13-2B Chapter 1 par. 106 through 114. No changes were noted to the compass system. Further details are on file at C.R.S. # YN8R621Y under W.O. # AVI.10082.
MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

INSTRUCTIONS: Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed $1,000 for each such violation (Section 901 Federal Aviation Act 1958).

1. Aircraft
   - Nationality and Registration Mark: USA N539MY
   - Serial No.: 18282238
   - Make: CESSNA
   - Model: 182T
   - Series: SKYLANE

2. Owner
   - Name (As shown on registration certificate): CESSNA AIRCRAFT COMPANY
   - Address (As shown on registration certificate): ATTN: DEPT 093 3 CESSNA BLVD WICHITA KS
   - City: WICHITA
   - State: KS
   - Zip: 67215-1400
   - Country: USA

3. For FAA Use Only

4. Type
   - Repair
   - Alteration
   - Unit: AIRFRAME

5. Unit Identification
   - Make
   - Model: SKYLANE
   - Serial Number: (As described in item 1 above)

6. Conformity Statement
   - Agency's Name and Address: YINGLING AVIATION
     - Address: 2010 AIRPORT ROAD WICHITA KS
     - Zip: 67277
     - Country: USA
   - Kind of Agency: U.S. Certificated Mechanic
     - Certificate No.: YN8R621Y
     - Radio Class: 1,2,3

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

7. Approval for Return to Service
   - Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is APPROVED.

FAA Form 337 (10-06)
8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

USA N539MY
Nationality and Registration Mark 8/19/10
Date

CESSNA 182T –18282238—N539MY

INSTALLED SYSTEMS: The following avionics equipment was installed IAW Yingling Aviation STC Number SA01552WI. Amendment date November 12, 2009.


OPERATIONAL GROUND CHECKS: Required ground tests were performed and all equipment was found to operate properly.


WEIGHT & BALANCE and EQUIPMENT LIST: Revised Aircraft Weight & Balance and Equipment List. See Aircraft Weight & Balance records for details.


The above installation meets the requirements for static loading in accordance with A.C.43.13-2B Chapter 1 par. 106 through 114. No changes were noted to the compass system. Further details are on file at C.R.S. # YN8R621Y under W.O. # AVI 10082.
### FAA Form 8130-6, Application for U.S. Airworthiness Certificate

**Date:** 12/31/2010

**U.S. Department of Transportation**
**Federal Aviation Administration**

#### Application for U.S. Airworthiness Certificate

**Registration Mark**: N539MY

**Aircraft Builder's Name**: Cessna Aircraft Company

**Aircraft Model Designation**: 182T

**Year of Manufacture**: 2010

**FAA Coding**:

**Aircraft Model Designation**: IO-540-AB1A5

**Propeller Builder's Name**: McCauley Propeller Systems

**Propeller Model Designation**: B3D36C431/80VSA-1

**Number of Engines**: One

**Engine Builder's Registration**: 9282238 Lycoming Engines

**Engine Serial Number**: N539MY Cessna Aircraft Company 182T

**Date of Inspection**: Jul22,2010

**NAME**: David W. LaPierre

**ADDRESS**: 14119 Russ Meyer Blvd., PO Box 1996, Independence, KS 67301

**Aircraft Specification or Type Certificate Data Sheet**

**Type Certificate Data Sheet**: 3A13 - Revision 69

**Airworthiness Directives**: 08-10

**Supplemental Type Certificate**: N/A

**Airworthiness Certificate Requested**

**Aircraft Certification Basis**: U.S. Airworthiness Certificate requested.

**Aircraft Certification Basis**: 49 of the United States Code 44101, et seq., and applicable Federal Aviation Regulations, and that the aircraft has been inspected and is airworthy and eligible for the airworthiness certificate requested.

**In Airworthiness Certificate**

**Issue Date**: Jul 22, 2010

**Signature**: David W. LaPierre, Director Quality, Independence

**Aircraft Operation and Maintenance Records**

**Check if Records in Compliance with 14 CFR Section 61.417**: Yes

**Total Airframe Hours**: 2.2

**Experimental Only**: Enter hours flown since last certificate issued or renewed

**Certification Requested**

**Type**: SAME

**Aircraft Inspection by FAA**

**Aircraft Inspected**: 14 CFR §21.90

**Aircraft Manufacturer**: Cessna Aircraft Company

**Certificate Holders**: Robert R. Evans

**Date**: Jul 22, 2010

**Designee's Signature**: Robert R. Evans

**FAA Inspector's Signature**: [Signature]

**Special Flight Permit**

**Special Flight Permit**: N/A

**Type**: N/A

**Class**: N/A

**Operation**: N/A

**Location**: N/A

**Remarks**: N/A

**Limitations**: N/A

**Approval Authority**: N/A

**Certificate Requested**: N/A

**Date**: Jul 22, 2010

**Designee's Signature and Address**: [Signature]

**FAA Inspector's Signature**: [Signature]
A. MANUFACTURER

B. PRODUCTION BASIS (Check applicable item)
- PRODUCTION CERTIFICATE (Give production certificate number)
- TYPE CERTIFICATE ONLY
- APPROVED PRODUCTION INSPECTION SYSTEM

C. GIVE QUANTITY OF CERTIFICATES REQUIRED FOR OPERATING NEEDS

D. THE AIRCRAFT DOES NOT MEET THE APPLICABLE AIRWORTHINESS REQUIREMENTS AS FOLLOWS:

E. THE FOLLOWING RESTRICTIONS ARE CONSIDERED NECESSARY FOR SAFE OPERATION: (Use attachment if necessary)

F. CERTIFICATION - I hereby certify that I am the registered owner (or his agent) of the aircraft described above; that the aircraft is registered with the Federal Aviation Administration in accordance with Title 49 of the United States Code 44101 et seq, and applicable Federal Aviation Regulations; and that the aircraft has been inspected and is safe for the flight described.

DATE

NAME AND TITLE (Print or type)

SIGNATURE

X A. Operating Limitations and Markings in Compliance with 14 CFR section 91.9, as Applicable

B. Current Operating Limitations Attached

C. Data, Drawings, Photographs, etc. (Attach when required)

D. Current Weight and Balance Information Available in Aircraft

E. Major Repair and Alteration, FAA Form 337 (Attach when required)

F. This inspection Recorded in Aircraft Records

G. Statement of Conformity, FAA Form 8130-9 (Attach when required)

H. Foreign Airworthiness Certification for Import Aircraft (Attach when required)

I. Previous Airworthiness Certificate issued in Accordance with 14 CFR Section _______ BAR _______ (Original attached)

J. Current Airworthiness Certificate Issued in Accordance with 14 CFR Section 21.193(a)

K. Light-Sport Aircraft Statement of Compliance, FAA Form 8130-15 (Attach when required)
**UNITED STATES OF AMERICA**

**DEPARTMENT OF TRANSPORTATION-FEDERAL AVIATION ADMINISTRATION**

**STANDARD AIRWORTHINESS CERTIFICATE**

<table>
<thead>
<tr>
<th>1 NATIONALITY AND REGISTRATION MARKS</th>
<th>2 MANUFACTURER AND MODEL</th>
<th>3 AIRCRAFT SERIAL NUMBER</th>
<th>4 CATEGORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>N539MY</td>
<td>Cessna Aircraft Company 182T</td>
<td>18282238</td>
<td>Normal</td>
</tr>
</tbody>
</table>

**5 AUTHORITY AND BASIS FOR ISSUANCE**

This airworthiness certificate is issued pursuant to the Federal Aviation Act of 1958 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefor, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation, except as noted herein.

Exceptions:

None

**DUPLICATE**

**6 TERMS AND CONDITIONS**

Unless sooner surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator, this airworthiness certificate is effective as long as the maintenance, preventative maintenance, and alterations are performed in accordance with Parts 21, 43, and 91 of the Federal Aviation Regulations, as appropriate, and the aircraft is registered in the United States.

**DATE OF ISSUANCE**

Jul 22, 2010

**FAA REPRESENTATIVE**

Robert R. Evans

**DESIGNATION NUMBER**

ODA-100129-CE

Any alteration, reproduction, or misuse of this certificate may be punishable by a fine not exceeding $1,000 or imprisonment not exceeding 3 years or both.

**THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.**

**FAA Form 8100-2 (3-08)**