MECHANICAL SPECIALTIES, LLC
1000 85TH AVE SE
OLYMPIA, WA 98501

MECHANICAL SPECIALTIES REPORT 407-430-105

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

For

MECHANICAL SPECIALTIES MODEL 350-430-100-100 ADVANCED DUEL EXTERNAL CARGO HOOK /ADEC™ CARGO HOOK SYSTEM

For

BELL TEXTRON CANADA LIMITED 407 HELICOPTERS

FAA STC NO.: SR11869SE

FAA ACTION
West Certification Branch

☐ Approve	☐ Concur	☒ CFRs
☐ Reject	☒ Accept	☐ EASA CS
☐ Acknowledge		☐ CARs

TSO/Project #s: N/A

Comments:

ICA, Rev. 3, Accepted

Response Number: 773-25-00296

File Code: ***

for WCB Manager Vince Massey Digitally signed by Vince Massey Date: 2025.04.23 16:30:19 -07'00'

*** File Code: 8110.1.a.(2).ST14189SE-R.SR11869SE

Original Author:	J. Goodwin	Revision Author:	J. Goodwin
Date:	7/31/2024	Date:	2/5/2025

CHANGE LOG

Rev.	Author	Date	Description of Changes
I/R	J. Goodwin	7/31/2024	Original Release
1	J. Goodwin	12/16/2024	Changes address non-concurs from FAA memorandum 618567350. 1. Added additional inspection criteria to long line assembly 2. ICA inspections 3. Added daily inspection criteria of the installation. 3. Added service hour log sheet for operator use of long line assembly, in accordance with long line manufacturer's 2,000 hour/4 year service life. 4. Greater clarity/detail added to each inspection item during overhaul of metallic structures of installation. (beam assembly, fittings, load cell, etc.)
2	J. Goodwin	2/5/2025	Changes address non-concur from FAA Memorandum 2023377915. 1. Changed "required" to "recommended" overhaul at 5 year / 1,000 hour interval. 2. Changed "required" overhaul location at Mechanical Specialties, or MS approved repair station, to "highly recommend" for operators to send the cargo hook in for 5 year / 1,000 hour overhaul. In accordance with PS-AIR-21.50-01. 3. Figures 4.1-4.11 added as illustrations for overhaul instructions of the Model 350 ADEC™ hook. (5 year / 1,000 overhaul) 4. Table 4.1 added as Bill of Material for Model 350 ADEC™ for reference to overhaul instructions and Figures 4.1-4.11 4. 5 year / 1,000 overhaul instructions added to section 4.0 of this document.
3	J. Goodwin	4/17/2025	1. Fixed typos in section 2 and 6. 2. Updated BoM to reflect new spring within 350-430-101-101 cargo hook. Item 48 (1986K11 was J-50)

This Instructions for Continued Airworthiness Manual will be distributed with every kit sold, either on paper or electronically.

Updates to this manual are available online at www.mechspecialties.com/support or by calling (360) 273-7604. Revisions will be disseminated to current customers via email address on file.

TABLE OF CONTENTS

LIST OF REFERENCES

1. Mechanical Specialties, LLC drawing 350-430-100-100, 407 ADEC System Installation, Revision 0, dated 5/30/2024, or later.

2. Mechanical Specialties, LLC drawing 350-430-114-100, Wiring Diagram, HEC System, Revision 0, dated 6/25/2024, or later.

3. Mechanical Specialties, LLC drawing 350-430-116 Placards, HEC system, Revision 0, dated 6/10/2024, or later.

4. BHT-407-II-1, Bell 407 Installation Instruction for Emergency Float Kit.

5. BHT-407-II-5, Bell 407 Installation Instruction for Cargo Hook.

6. BHT-ALL-SPM, Bell Standard Practices Manual

7. FAA Advisory Circular, AC 43.13-1B, *Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair,* Change 1, dated 9/8/98.

8. FAA Advisory Circular, AC 43.13-2B, *Acceptable Methods, Techniques, and Practices – Aircraft Alterations,* Change 0, dated 3/3/08.

LIST OF ABBREVIATIONS

AC	Advisory Circular (FAA Publication)
ADEC™	Advanced Dual External Cargo
BQRS	Backup Quick Release System
CG	Center of Gravity
DAD	Dual Actuation Device
FAA	Federal Aviation Administration
HEC	Human External Cargo
NHEC	Non-Human External Cargo
PCDS	Personnel Carrying Device System
PQRS	Primary Quick Release System
QRS	Quick Release System
RFMS	Rotorcraft Flight Manual Supplement
STC	Supplemental Type Certificate
TC	Type Certificate
TSO	Technical Standard Order

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1.0 INTRODUCTION

1.1 PURPOSE

This document contains the Instructions for Continued Airworthiness (ICA) for the Mechanical Specialties, LLC BELL 407 ADEC™, Human External Cargo (HEC) System.

1.2 SYSTEM DESCRIPTION

Mechanical Specialties, LLC has designed the ADEC™ System for the BELL 407 series helicopters, for use in HEC and non-HEC operations.

The system consists of one cargo hook assembly that contains two independent dual actuation load carrying systems, attachment beam, mounts, and mounting hardware. The cargo hook system is attached to the helicopter using existing structural attach points. Therefore, no structural modifications to the rotorcraft are being made. This HEC dual hook system replaces the Type Certificated, factory installed cargo hook.

The Mechanical Specialties, LLC BELL 407 ADEC™ Human External Cargo (HEC) System is unique in that no part of this system is required to be removed during the transition between NHEC and HEC operations. Both NHEC and HEC loads are carried by the ADEC™ Hook's dual load beams. (see figure 1.2)

Per AC27-1B, change 8, section 27.865B, para c.4 & para d.7.vi.A, any HEC system as a whole is required to have a dual actuation device to release the HEC from the aircraft. The dual actuation device consists of both the primary and secondary releases. The primary load carry system will release if either the primary electrical release or primary manual release is actuated. The secondary load carrying system will release if the secondary electrical release or secondary manual release is actuated. The HEC load will not depart the aircraft until BOTH the primary and secondary load carrying systems are separately released.

An intercommunications system between pilot and HEC is not provided with this system. A note located in the Rotorcraft Flight Manual Supplement (RFMS) (Doc No. 407-430-110) states:

> *This system is not authorized for use without a means of direct communication between Pilot-in-Charge (PIC) and HEC approved by the local aviation authority.*

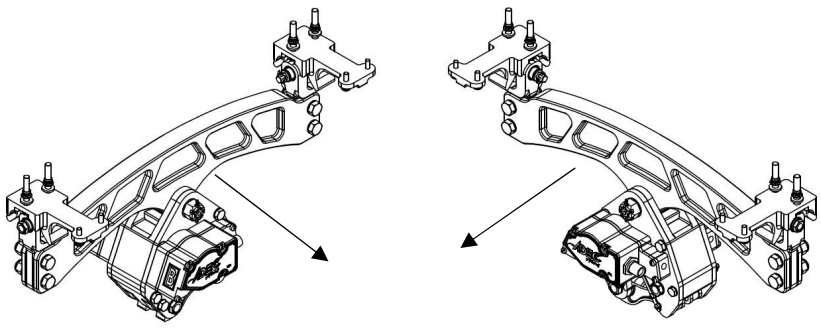


Figure 1.1: 407 ADEC™/HEC system (arrows indicate front of aircraft)

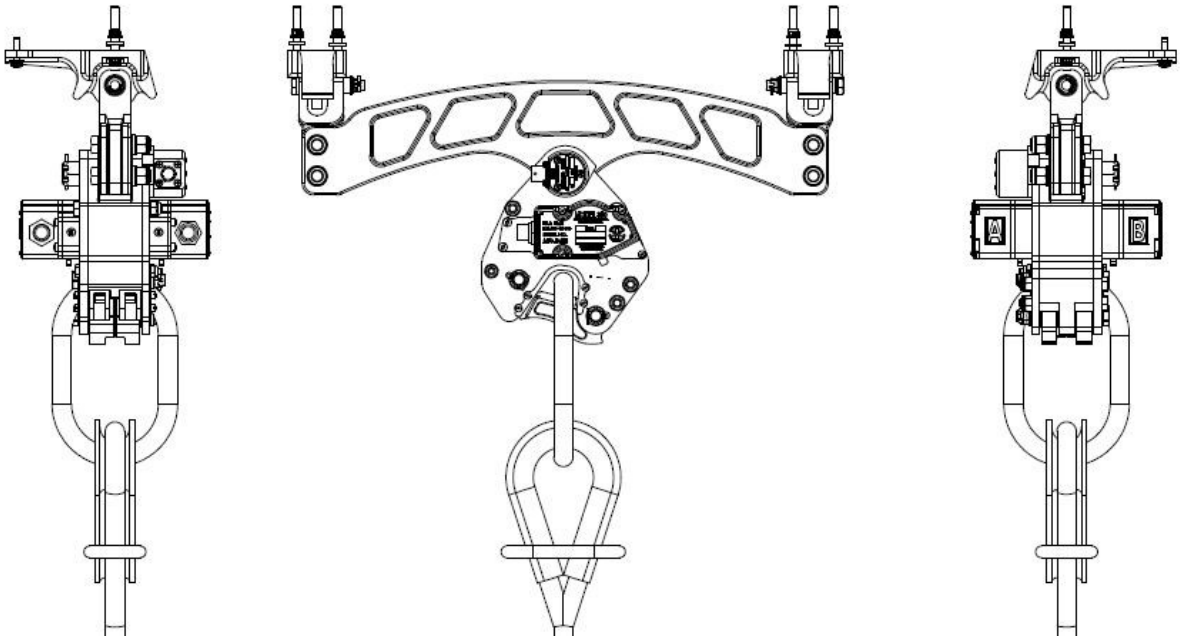


Figure 1.2: ADEC™ System Overview (looking right, looking forward, & looking left)

NHEC and HEC operations utilize BOTH load beams.

THE HEC LOAD RATING OF THIS INSTALLATION IS 946 LBS.

THE NHEC LOAD RATING OF THIS INSTALLATION IS 2,650 LB.

Both sides of the dual load carrying assembly (ADEC™ cargo hook) are fitted with micro switches for open hook indication inside the helicopter.

The release system for each load carrying system will consist of a primary electrical release with a secondary lever-type manual release. See Figure 1.2 below. The releases are centrally located on the pilot's cyclic control but arranged so that only one can be operated at a time. The releases are independent of each other and must be operated individually to release the load from the helicopter. See Figure 1.3 below for the hook release controls block diagram.

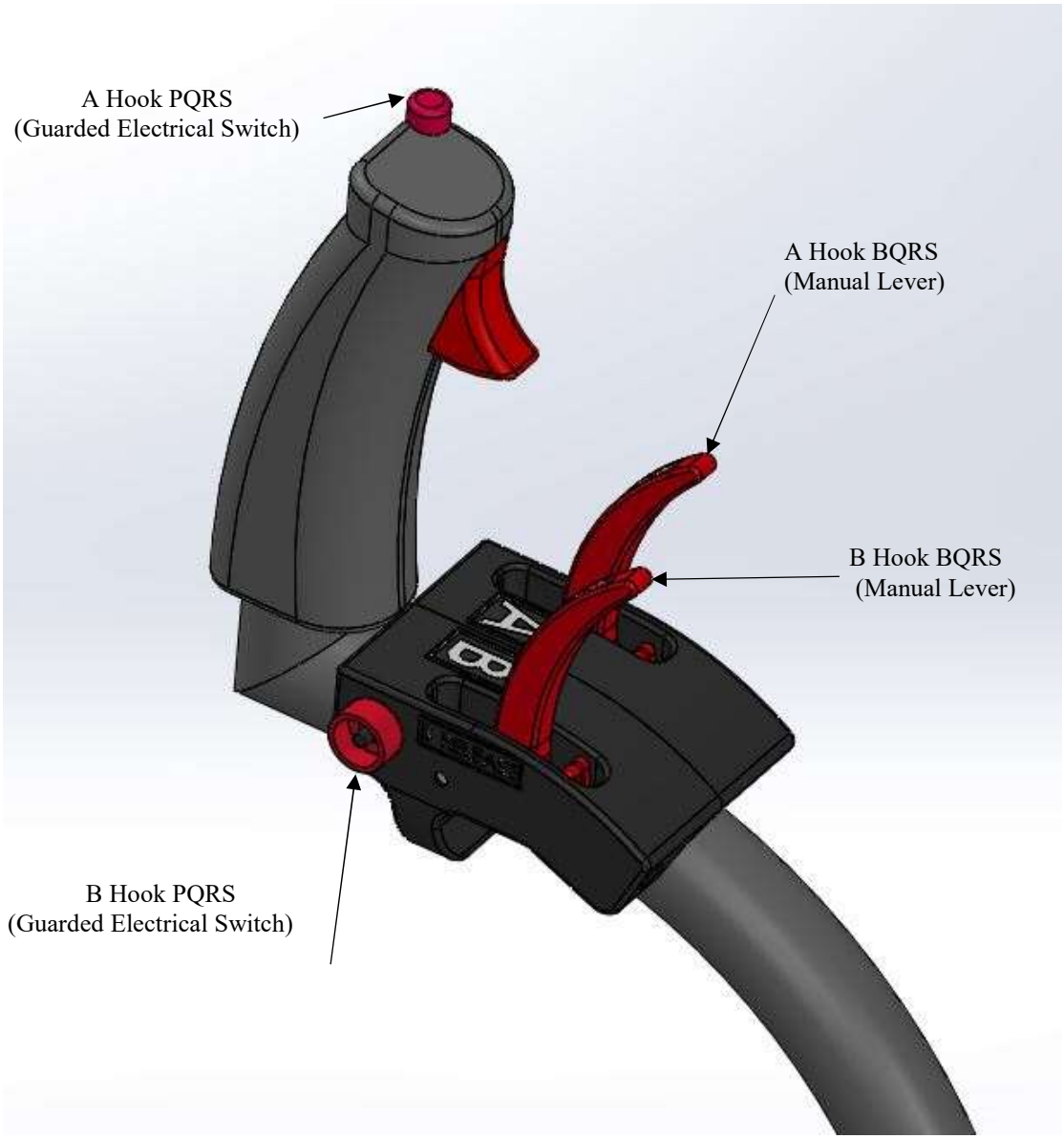


Figure 1.2: HEC Release Actuation Methods

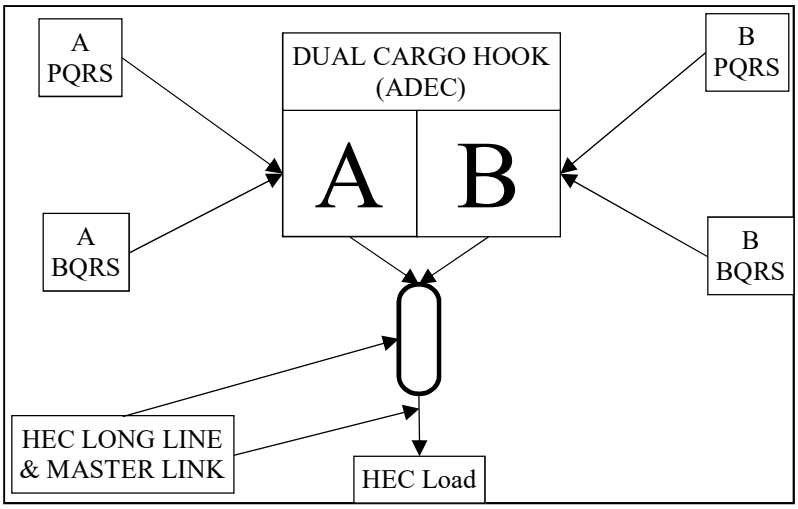


Figure 1.3: HEC Release Actuation Methods

2.0 INCLUDED WITH INSTALLATION – KIT. (COMPONENTS AND DOCUMENTATION)

Components

350-430-100-100	407 ADEC™ System Installation
350-430-101-101	407 ADEC™ Cargo Hook Assembly
350-430-102-200	BRACKET
350-430-103-100	ADEC WIRE HARNESS SHORT, B
350-430-104-100	ADEC WIRE HARNESS SHORT, A
350-430-105-100	ADEC CABLE ASSEMBLY SHORT, A
350-430-106-100	ADEC CABLE ASSEMBLY SHORT, B
350-430-107-100	LOAD CELL ASSEMBLY
350-430-108-100	ADEC WIRE HARNESS LONG
350-430-109-100	ADEC CABLE ASSEMBLY, LONG
350-430-110-100	ADEC MANUAL RELEASE LEVER ASSEMBLY
350-430-111-100	SWITCH HARNESS, LH
350-430-112-100	SWITCH HARNESS, RH
350-430-113-100	WIRE HARNESS
350-430-114-100	WIRING DIAGRAM, HEC SYSTEM
350-430-115-###[1]	Lift-It® LCP HEC LONG LINE ASSEMBLY
350-430-116	PLACCARDS, ADEC/HEC SYSTEM
Misc.	Hardware, Electrical, and Other Components.

Documentation

350-430-100-100, 407 ADEC™ System Installation Drawing
407-430-105, Instructions for Continued Airworthiness (this document)
407-430-110, HEC Rotorcraft Flight Manual Supplement
Drawings and Manuals Listed in List of References, page iv.
Copy of Supplemental Type Certificate

Note[1]: ### = length in feet

3.0 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 Regulation unless an alternative program has been FAA approved.

Life Limited Components

Part Number	Description	Replacement Interval
350-430-115-###[1]	Lift-It® HEC Long Line	4 years / 2,000 hrs.[2]

1. ### = length in feet
2. Four (4) years after date of initial use or 2,000 hours of service whichever is sooner.
3. New, unused long lines have a maximum shelf life of two years from the date of manufacture.
4. Service hours can be tracked on page A2 of this document. Print additional sheets as required.

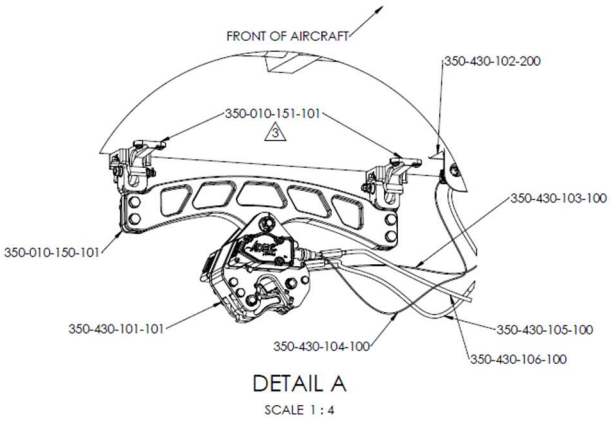
Approved By:_____ Date:_____
Manager, Seattle Area Certification Office

4.0 INSPECTION / OVERHAUL SCHEDULE

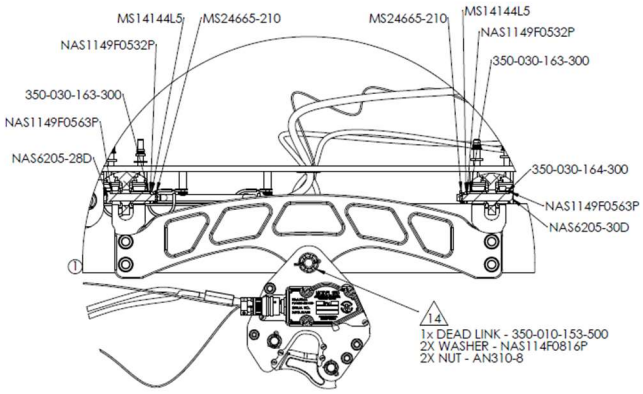
Daily Inspection(s)

- Visually check all mount hardware to ensure security of the cargo hook.
- Visually check the electrical harnesses for damage and security.
- Visually check the manual release cables and the connection to the cargo hooks for damage and security.
- Visually check the cargo hook for damage and hardware for security.
- Rotate cargo hook & beam assembly the full range of motion to insure there is no cable binding that can cause the cargo hook to open.

Beam & Mount Assembly (See Detail A & F in 350-430-100-100 installation drawing for part stack up.)



DETAIL A
SCALE 1 : 4



DETAIL F
SCALE 1 : 3
FACING FORWARD

Annual / 100 Hour

- Physically check that beam rotates smoothly on 350-010-151-101 mount assemblies
  - If binding or rotation is not smooth, inspect the following:
    - Slip bushings
- Physically check that hook rotates smoothly on 350-010-150-101 beam assembly

500 Hour (NOTE: removal of beam, slip bushings, and NAS bolts may be required to perform this inspection)

- Ensure beam rotates smoothly on 350-010-151-101 mount assemblies)
  - It is recommended to clean holes with cleaning solvent and wipe dry. Ensure debris clear from all rotating components.
  - Check that hook rotates smoothly on load cell / beam.
    - It is recommended to clean holes with cleaning solvent and wipe dry. Ensure debris clear from all rotating components.
  - Check Mount Assemblies, 350-010-151-101, for cracking / damage
    - Rotate 350-010-150-101 forward and backward to inspect mount around spherical bearing.

- If cracking is found anywhere on the mount assembly, remove the damaged component and replace.

- Check Mounts and bearings for cracking / wear / deformation.
  - IF cracking exists, replace damaged component
  - Inspect bearing installation within mount for wear / loose fitting
  - Inspect bearings for smooth operation
- Inspect bearing installation within mount for wear / loose fitting
  - With beam rotated fully forward or backward, inspect bearing race for looseness within mount.
  - If looseness is found, remove beam assembly 350-010-150-101 to have full access to bearing. If bearing has become loose inside of mount, replace entire mount assembly.
- Check all Slip Bushings for deformation that impedes rotation of the beam assembly.
  - If 350-010-150-101 is not rotating smoothly, remove beam assembly, slip bushings, and hardware. Inspect for damage that is causing poor rotation. Replace as necessary.
- Check Beam and bushings for wear / deformation if rotation of hook or beam is not smooth.
  - It is recommended to clean holes with cleaning solvent and wipe dry. Ensure debris clear from all rotating components.
- Inspect 350-430-107-100 load cell assembly for cracking, damage, wear.
  - Clean OD of load cell pin with cleaning solvent and wipe dry.
  - Ensure debris clear from beam bushing, hook bushings, and load cell pin to prevent damage to load cell assembly.
  - If galling or damage prevents smooth rotation, replace.
- If installed as alternate, inspect 350-010-153-500 (dead link)
  - Clean OD of load cell pin with cleaning solvent and wipe dry.
  - Ensure debris clear from beam bushing, hook bushings, and load cell pin to prevent damage to load cell assembly.
  - If galling or damage prevents smooth rotation, replace.
- Check fastener hardware for wear, or deformation, replace as necessary. (NAS bolts & washers,
- After re-assembly, ensure beam assembly and hook can pivot their full range of motion.

5 year / 1000 Hour (remove beam, slip bushings, and NAS bolts to perform this inspection)

- Ensure beam rotates smoothly on 350-010-151-101 mount assemblies)
- It is recommended to clean holes with cleaning solvent and wipe dry. Ensure debris clear from all rotating components.
- Check that hook rotates smoothly on load cell / beam.
  - It is recommended to clean holes with cleaning solvent and wipe dry. Ensure debris clear from all rotating components.
- Check Mount Assemblies, 350-010-151-101, for cracking / damage
  - Rotate 350-010-150-101 forward and backward to inspect mount around spherical bearing.
  - If cracking is found anywhere on the mount assembly, remove the damaged component and replace.
- Check Mounts and bearings for cracking / wear / deformation.
  - IF cracking exists, replace damaged component

    - Inspect bearing installation within mount for wear / loose fitting
    - Inspect bearings for smooth operation
- Inspect bearing installation within mount for wear / loose fitting
    - With beam rotated fully forward or backward, inspect bearing race for looseness within mount.
    - If looseness is found, remove beam assembly 350-010-150-101 to have full access to bearing. If bearing has become loose inside of mount, replace entire mount assembly.
- Check all Slip Bushings for deformation that impedes rotation of the beam assembly.
    - If 350-010-150-101 is not rotating smoothly, remove beam assembly, slip bushings, and hardware. Inspect for damage that is causing poor rotation. Replace as necessary.
- Check Beam and bushings for wear / deformation if rotation of hook or beam is not smooth.
    - It is recommended to clean holes with cleaning solvent and wipe dry. Ensure debris clear from all rotating components.
- Check fastener hardware for wear, or deformation, replace as necessary. (NAS bolts & washers)
- After re-assembly, ensure beam assembly and hook can pivot their full range of motion.

<u>Cargo Hook Inspection / Overhaul</u> (Both A & B)

Annual / 100 Hour (check the following items)

- Check Load Beams, Side Plates, Abrasion Plates, and Bushings for wear.
    - Inspect for damaged parts, or components that affect smooth action of the release mechanism. Ensure dust and debris are removed from hook.
- Check A & B Latch Lugs for wear / deformation
    - If gouge damage is found on any of the latch lugs, replace latch assembly.
- Check both Latch Rollers for wear / deformation and that they rotate freely.
    - Latch rollers should rotate freely. Ensure they are cleaned of any debris.
- Check hardware for excessive wear, replace as necessary.

2.5 year / 500 Hour (check the following items)

- Check A & B Load Beams, Side Plates, Abrasion Plates, and Bushings wear.
- Load Beams: rotation of each load beam & poorly engaging latches
    - Clean load beam holes and ensure smooth rotation.
- Side Plates: wear greater than .03” around trunnion lugs. Cracking.
    - If either of these are found, remove the side plate from service and replace.
- Abrasion Plates: missing hardware and cracking.
    - If either of these are found, remove from service and replace.
    - Check side plates for corrosion under Abrasion plates. (abrasion plates may need to be removed to perform this inspection) If corrosion is found on side plate greater than .020, replace.
- Bushings: wear affecting smooth rotation of the release mechanism.
    - May require cleaning and inspection for damage if smooth rotation is not occurring.
- Check A & B Latch Lugs for wear / deformation.
- Check both Latch Rollers for wear / deformation and that they rotate freely.

- Check hardware for wear, replace as necessary.

5 year / 1000 Hour (Cargo Hook Disassembly and Inspection Instructions)

Item numbers in Figures 4.1-4.6 are shown with their corresponding part numbers in Table 4.1.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	202-118-1	PIN, CARGO HOOK	4
2	202-120-1	PIN, CARGO HOOK	6
3	202-141-100	MODIFIED SOLENOID ASSY	1
4	202-143-1	PIN, CARGO HOOK	2
5	202-198-1	PIN, CARGO HOOK	2
6	202-199-1	PIN, CARGO HOOK	2
7	301-040-098-001	BEARING SPACER	4
8	350-010-002-101	SPACER ASSEMBLY	1
9	350-010-022-101	LATCH ASSEMBLY	2
10	350-010-201-101	SIDE PLATE ASSY., LH	1
11	350-010-202-101	SIDE PLATE ASSY., RH	1
12	350-020-031-100	LOAD BEAM ASSEMBLY, LH	1
13	350-020-032-100	LOAD BEAM ASSEMBLY, RH	1
14	350-040-003-501	SHAFT AND ARM LH	1
15	350-040-004-501	SHAFT AND ARM RH	1
16	350-040-008-101	LEVER, ASSY	2
17	350-040-011-501	LINK	2
18	350-040-142-100	MODIFIED SOLENOID ASSY., CCW	1
19	350-050-001-201	SPRING HOUSING LH	1
20	350-050-002-201	COVER PLATE	2
21	350-050-003-202	SOLENOID COVER, LH	1
22	350-050-004-201	SPRING HOUSING RH	1
23	350-050-006-201	SOLENOID COVER RH	1
24	350-050-007-201	DATA TAG LH	1
25	350-050-008-201	DATA TAG, RH	1
26	350-050-026-500	BUMPER, LATCH	2
27	350-050-147-500	RELEASE ARM, LH	1
28	350-050-148-501	RELEASE ARM, RH	1
29	350-050-149-500	DRIVER	2
30	350-050-152-301	SPRING BUSHING	2
31	350-050-154-301	SPRING BUSHING	2
32	350-050-171-200	SWITCH CLAMP, LH	1
33	350-050-172-200	SWITCH CLAMP, RH	1
34	350-050-840-600	BUMPER, LOAD BEAM	2
35	350-080-016-400	PIN, LEVER	2
36	350-430-111-100	SWITCH HARNESS, LH	1
37	350-430-112-100	SWITCH HARNESS, RH	1
38	350-430-113-100	WIRE HARNESS	1
39	350-430-116-002	PLACARD	1
40	350-430-116-003	PLACARD	1
41	5960	SPRING	2
42	92373A106	SPRING PIN	2
43	93085A151	SCREW	4
44	96877A330	SCREW	2
45	98296A829	ROLL PIN	2
46	AN3-25A	BOLT	1
47	AN4-25A	BOLT	3
48	1986K11	SPRING	2
49	M-29	SPRING	2
50	MS14144L6	NUT	2
51	MS21044N06	NUT	4
52	MS21044N3	NUT	1
53	MS21044N4	NUT	3
54	MS21318-1	RIVET	8
55	MS24665-300	COTTER PIN	2
56	MS24694-S97	SCREW	2
57	MS35265-33	SCREW	4
58	MS35265-36	SCREW	8
59	NAS1149D0632K	WASHER	4
60	NAS1149F0316P	WASHER	2
61	NAS1149F0416P	WASHER	6
62	NAS1149F0616P	WASHER	2
63	NAS1149F0632P	WASHER	8
64	NAS1149FN632P	WASHER	4
65	NAS6206-38D	BOLT	2
66	PC07A8-2P	CONNECTOR	1
67	TJM120711	WIRING BLOCK	1

Table 4.1: Model 350 Bill of Materials

NOTE: It is highly recommended for operators to return their Model 350 cargo hook to Mechanical Specialties', or to a Mechanical Specialties' authorized repair station, for this overhaul. See page 34 for contact information on overhauls and general maintenance inquiries.

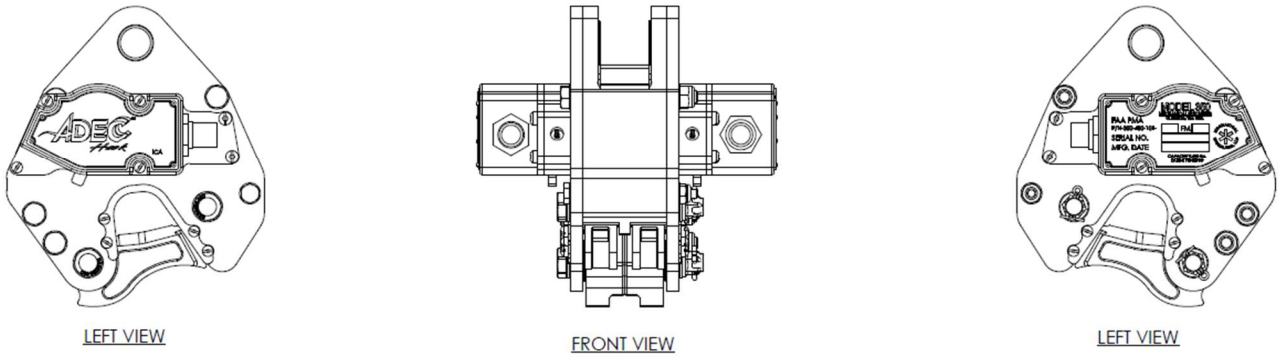


Figure 4.1: Model 350 ADEC™ Hook Views. (Assembled)

Disassembly Instructions

- Loosen screws (items 43, 57, and 58) to remove release mechanism components from cargo hook. See figures 4.2 and 4.3 for exploded views of each side of the cargo hook. Upon removal of components shown in figures 4.2 and 4.3:
    - Inspect all threaded hardware for wear on plating (plating has been worn away completely), or damaged / stripped threads, and replace as necessary. Damage on threaded components or hardware can include rough or gritty turns during assembly / disassembly.
    - Inspect components (solenoid covers, spring housings, cover plates, etc.) for wear, gouges, or has cracks. If cracks are present replace as necessary. If wear exists greater than .030", replace as necessary.
- Utilize pin removal tools to disconnect the electrical wire leads from the terminal block shown in the wire schematic on Figure 4.11.
- Continue to remove the release mechanism components until the hook is disassembled per Figure 4.4.
- Begin disassembly of internal mechanisms by removing all nuts, washers, and cotter pins from the left side of the hook as per Figure 4.5 (items 50, 52, 53, 55, 56, 59, and 63)
    - Note that the countersunk screws (item 56) are to be removed last, prior to removing the side plate assemblies.
- Remove the Left Hand Side Plate Assembly (item 10) from the hook assembly
    - NOTE: It is recommended to leave all of the bolts in the hook for ease of disassembly, and keeping the latch and load beam assemblies in place.
- Remove all internal components in the left side of the hook as shown in figure 4.5.
- Remove the bolts, washers, and countersunk screw from the right side of the hook assembly.
- Remove the Right Hand Side Plate Assembly (item 11) from the hook assembly
- Remove all internal components in the right side of the hook as shown in figure 4.6.

- Inspections can be performed on all sub-assemblies and hardware.

Inspections

- Check Side Plate Assemblies (Items 10 & 11)
  - Inspect for wear or damage greater than .03" around trunnion lugs. Replace side plate
  - Inspect for loose bushings – if found this indicates damage / permanent deformation to the side plate hole, replace side plate.
  - Abrasion Plates: missing hardware and cracking. Replace Abrasion Plate
  - Bushings: wear or damage affecting smooth rotation of the release mechanism. Gently press out bushings and replace as necessary.
- Check Load Beam Assemblies for:
  - Wear / damage in excess of .050" on the load carrying surfaces. If found, replace.
  - Damage to bushings that cause rough rotation around NAS bolt, replace bushings if damage is found.
- Load Beams: rotation of each load beam & poorly engaging latches
  - Clean load beam holes and ensure smooth rotation.
  - If damage is found that prevents smooth rotation, replace as necessary.
- Check A & B Latch Lugs for wear / deformation.
- Check both Latch Rollers for wear / deformation and that they rotate freely.
- Clean and then check bearings in each lever for wear / deformation and they rotate smoothly.
  - If gritty or rough rotation is evident, replace bearing as necessary.
- Check hardware and pins for wear, replace as necessary.
  - Check pins for deformation or bending. Clean pins of any debris or corrosion. If damage, gouging, or bends are found, replace.
- Ensure all debris is removed from components and clean

Assembly Instructions

- Ensure all components are clean prior to assembly
- Install all internal components in the right side of the hook as shown in Figures 4.6 & 4.7. Apply 130-AA Lubriplate on all rotation surfaces (bushing holes).
- Ensure RH Switch Harness Leads (Item 37) are wired through pass through hole of Spacer Assembly. See Figure 4.11.
  - NOTE: Ensure that the heat shrink of the switch harness is formed such that the wires do not contact the Lever Assembly.
- Install the Right Hand Side Plate Assembly (item 11) onto the hook assembly per Figures 4.6 & 4.8.
  - NOTE: It is recommended to install all of the bolts and countersunk screw in the hook for ease of assembly, and keeping the latch and load beam assemblies in place. (Figure 4.6)
- Install the bolts, washers, and countersunk screw from the right side of the hook assembly. (Figure 4.6)
- Install all internal components in the left side of the hook as shown in figure 4.5. & 4.10.
  - Both Switch Harness leads (Items 36 & 37) are to be assembled and pass through hole in LH side plate assembly. See Figure 4.5, 4.10, & 4.11.
- Install the Left Hand Side Plate Assembly (item 10) onto the hook assembly.
  - Both Switch Harness leads (Items 36 & 37) are to be assembled and pass through hole in LH side plate assembly. See Figure 4.5, 4.10, & 4.11.
- Finish assembly of internal mechanisms by installing all nuts, washers, and cotter pins from the left side of the hook as per Figure 4.5 (items 50, 52, 53, 55, 56, 59, and 63)

- Install Cotter Pins onto NAS bolts.

- Install LH and RH release mechanism components as per Figures 4.2 and 4.3.

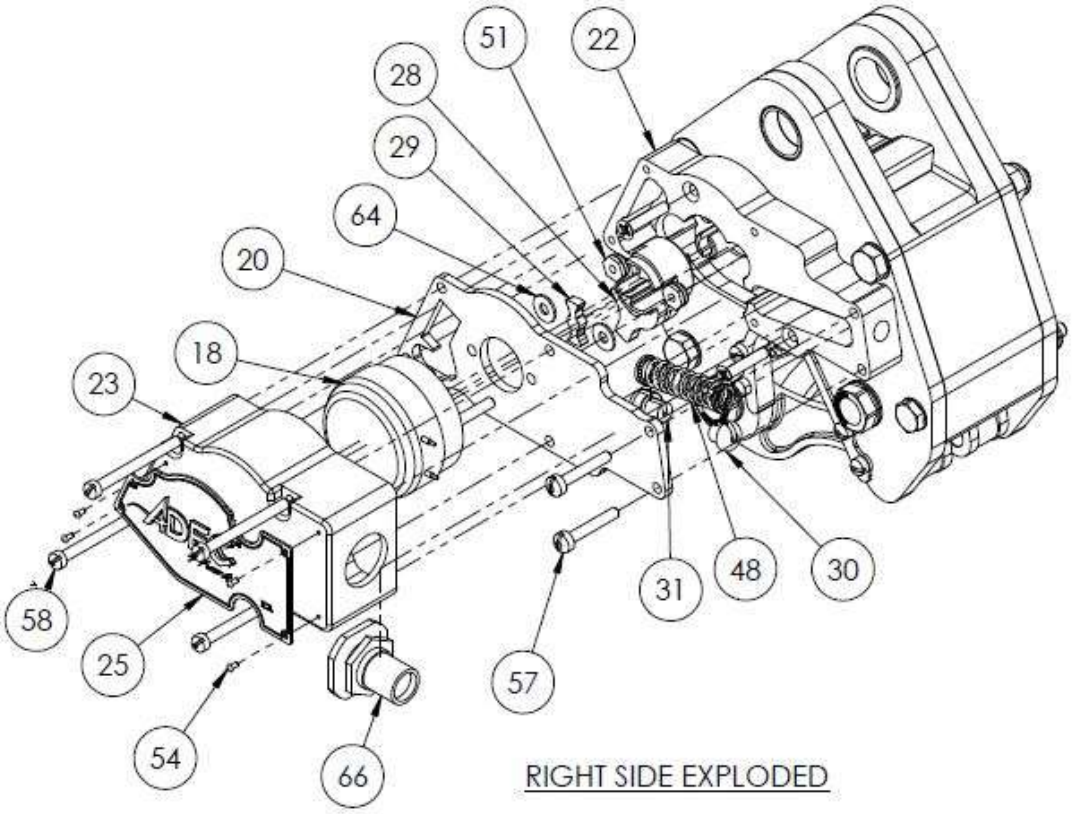


Figure 4.2: Model 350 ADEC™ Right Side Exploded View (Externals)

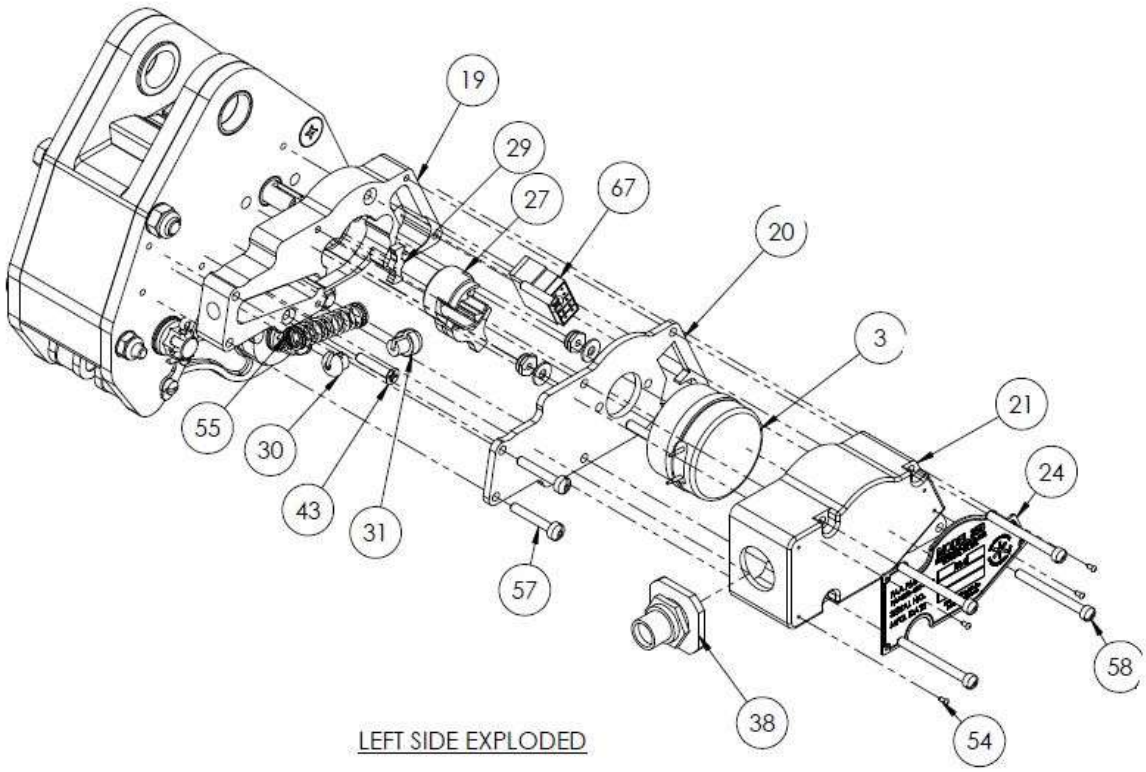


Figure 4.3: Model 350 ADEC™ Left Side Exploded View (Externals)

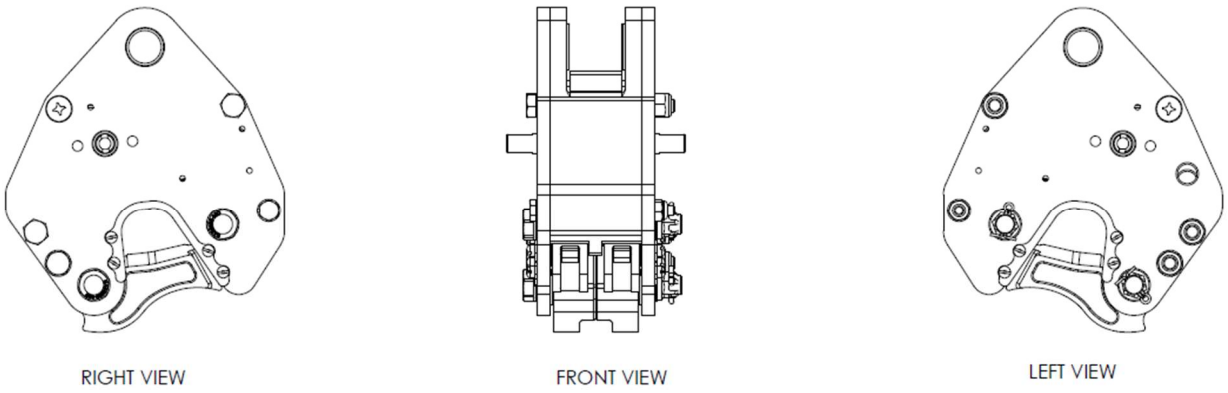


Figure 4.4: Model 350 ADEC™ Hook with Release Mechanisms (Externals) Removed.

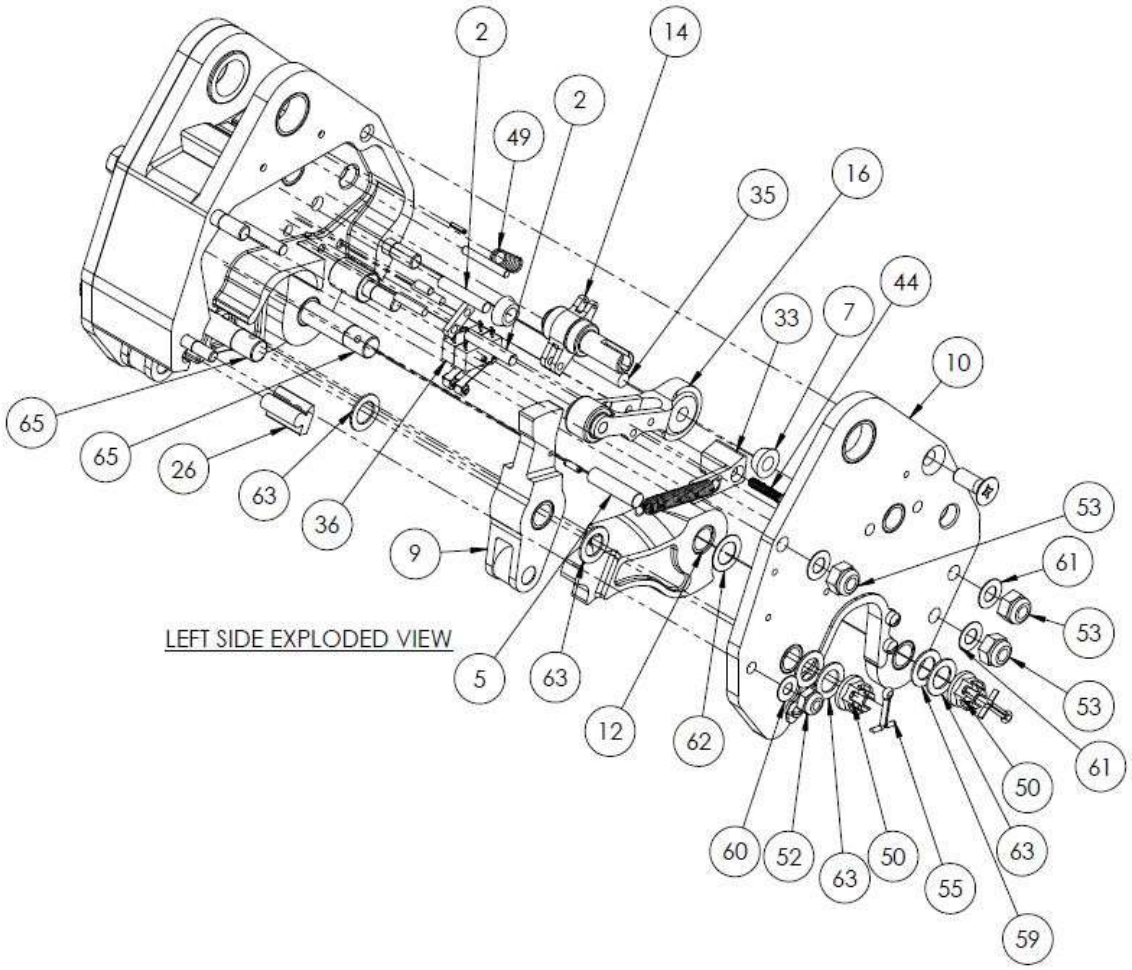


Figure 4.5: Model 350 ADEC™ Left Side Exploded View (Internals)

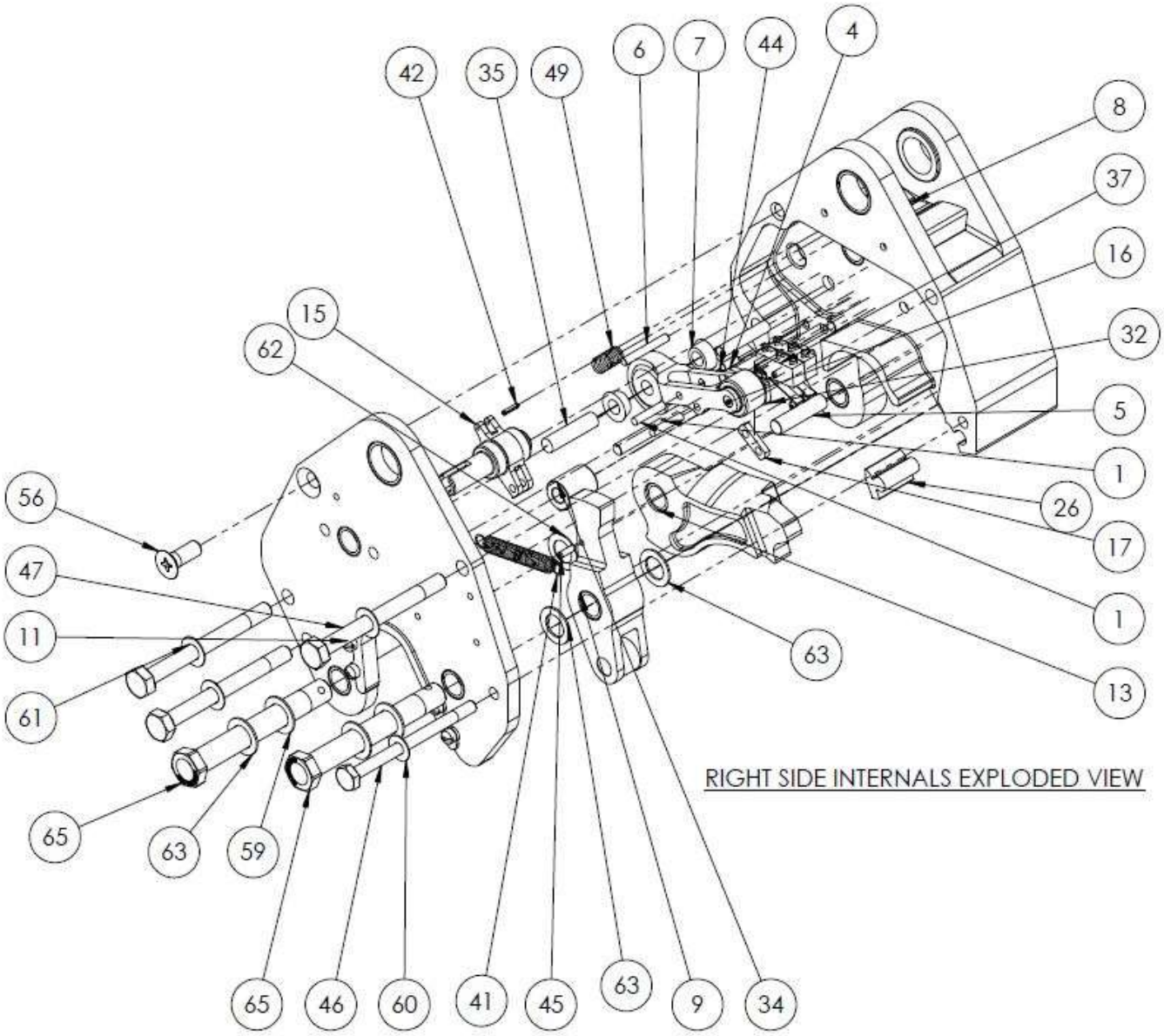


Figure 4.6: Model 350 ADEC™ Right Side Exploded View (Internals)

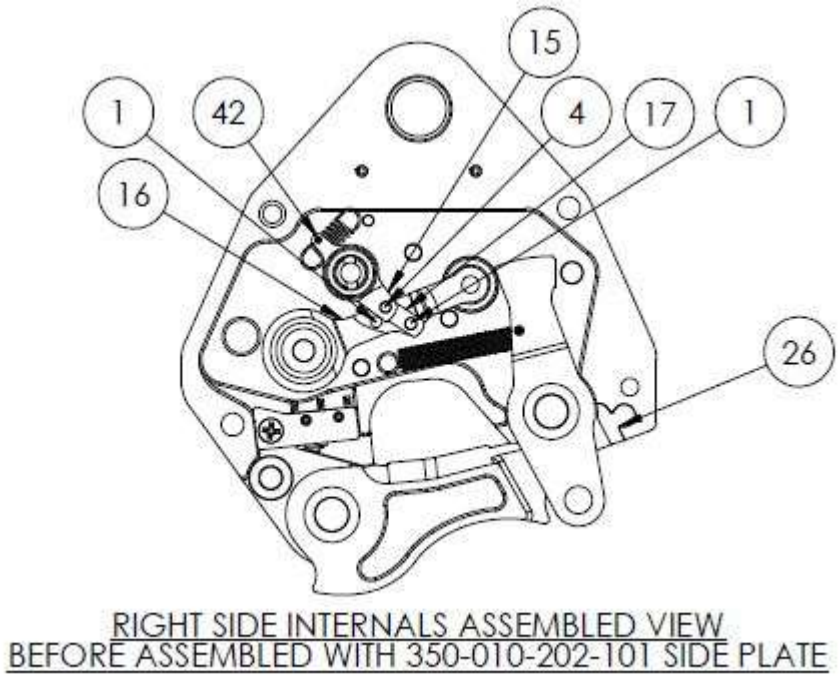


Figure 4.7: Model 350 Right Side Assembled View (Internals)

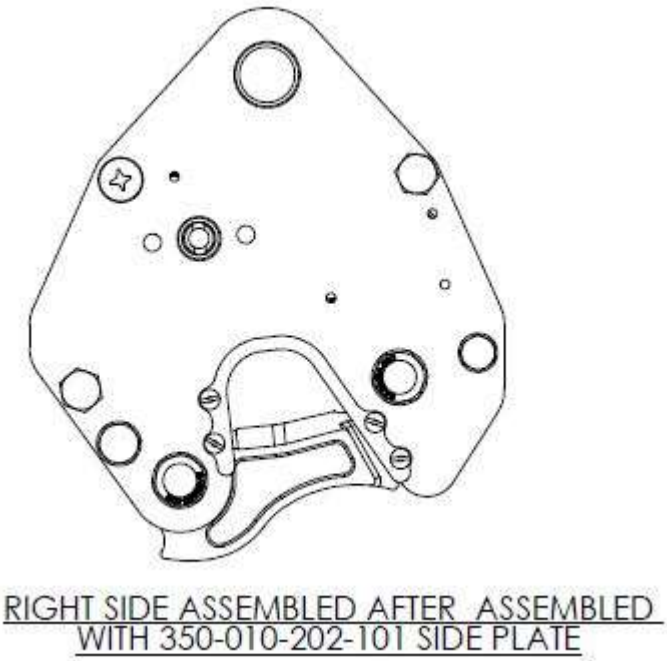


Figure 4.8: Model 350 ADEC™ Right Side Assembled (Internals)

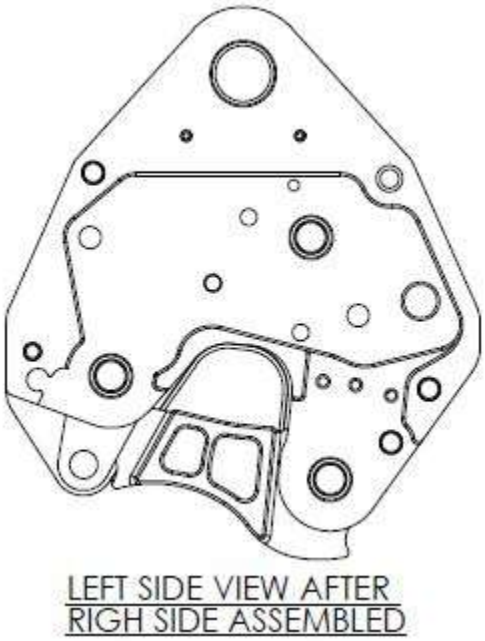


Figure 4.9: Model 350 ADEC™ Left Side Unassembled (Internals)

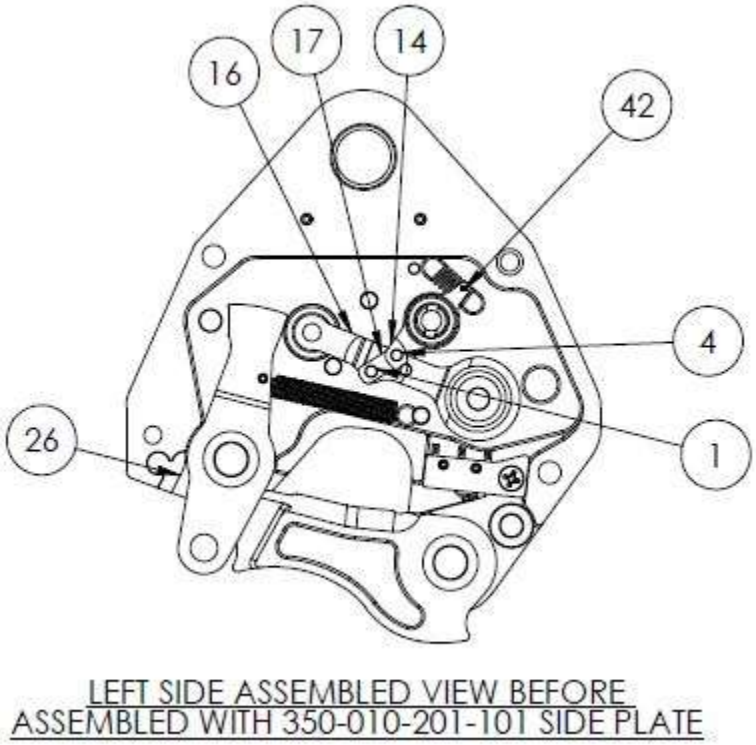


Figure 4.10: Model 350 ADEC™ Left Side Assembled View (Internals)

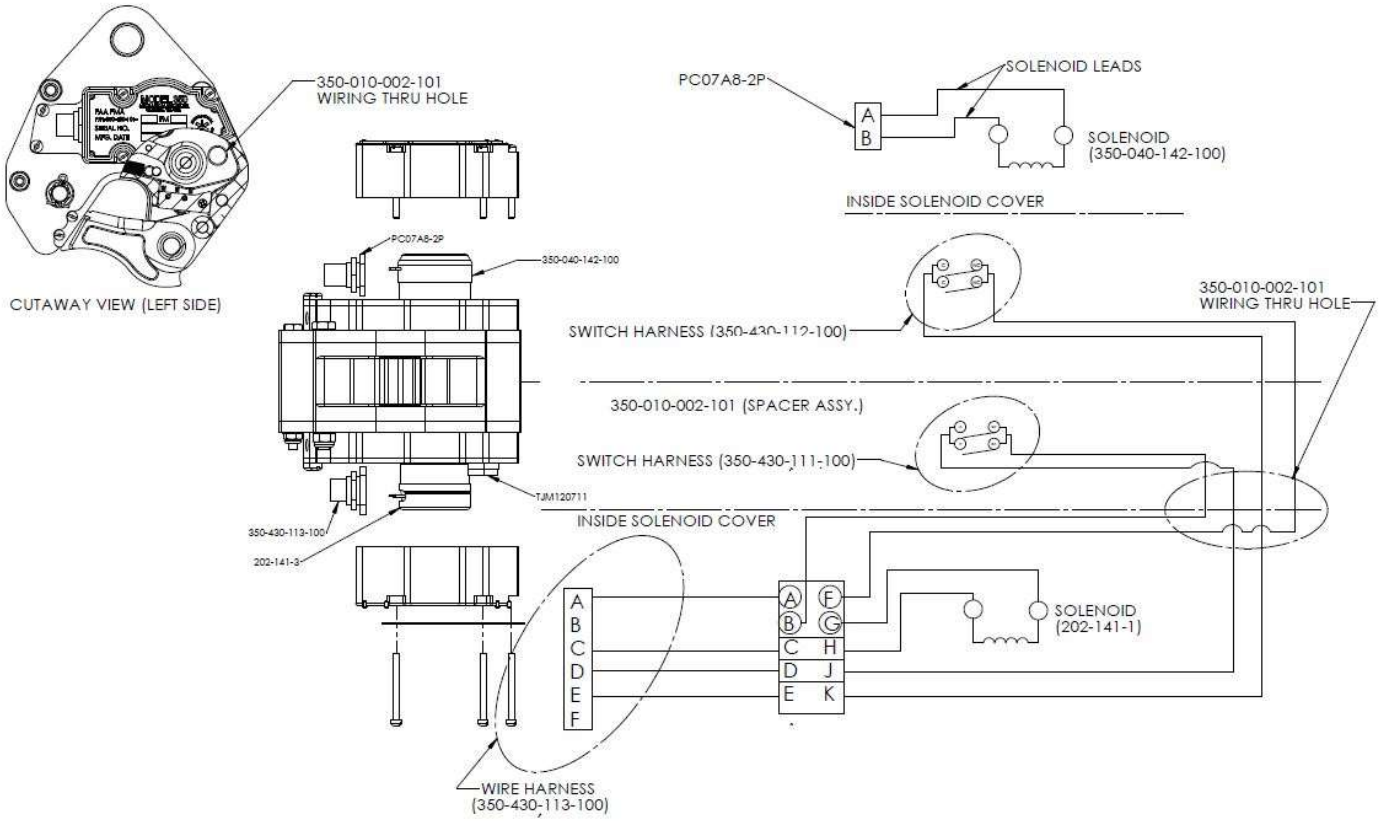


Figure 4.11: Model 350 ADEC™ Electrical Wire Schematic and Locations

Testing Instructions after assembly

- Perform Functional test of manual release levers and electrical releases (0 lbs)
- Perform the following Load Tests.

LOAD TESTING OF RIGHT LOAD BEAM ONLY
LOAD TESTING – HOLD ALL LOADS FOR 5 SECONDS PRIOR TO RELEASE

LOAD (LBS.)	RELEASE METHOD	OPERATOR	DATE
10	22 VDC		
10	MANUAL LEVER		
1000	22 VDC		
1000	MANUAL LEVER		
2000	22 VDC		
2000	MANUAL LEVER		
3200	22 VDC		
3200	MANUAL LEVER		
6400	DO NOT RELEASE		

LOAD TESTING OF LEFT LOAD BEAM ONLY
LOAD TESTING – HOLD ALL LOADS FOR 5 SECONDS PRIOR TO RELEASE

LOAD (LBS.)	RELEASE METHOD	OPERATOR	DATE
10	22 VDC		
10	MANUAL LEVER		
1000	22 VDC		
1000	MANUAL LEVER		
2000	22 VDC		
2000	MANUAL LEVER		
3200	22 VDC		
3200	MANUAL LEVER		
6400	DO NOT RELEASE		

BOTH LOAD BEAMS CLOSED, RELEASE RIGHT LOAD BEAM ONLY
LOAD TESTING – HOLD ALL LOADS FOR 5 SECONDS PRIOR TO RELEASE

LOAD (LBS.)	RELEASE METHOD	OPERATOR	DATE
1000	22 VDC		
2000	22 VDC		
3200	22 VDC		

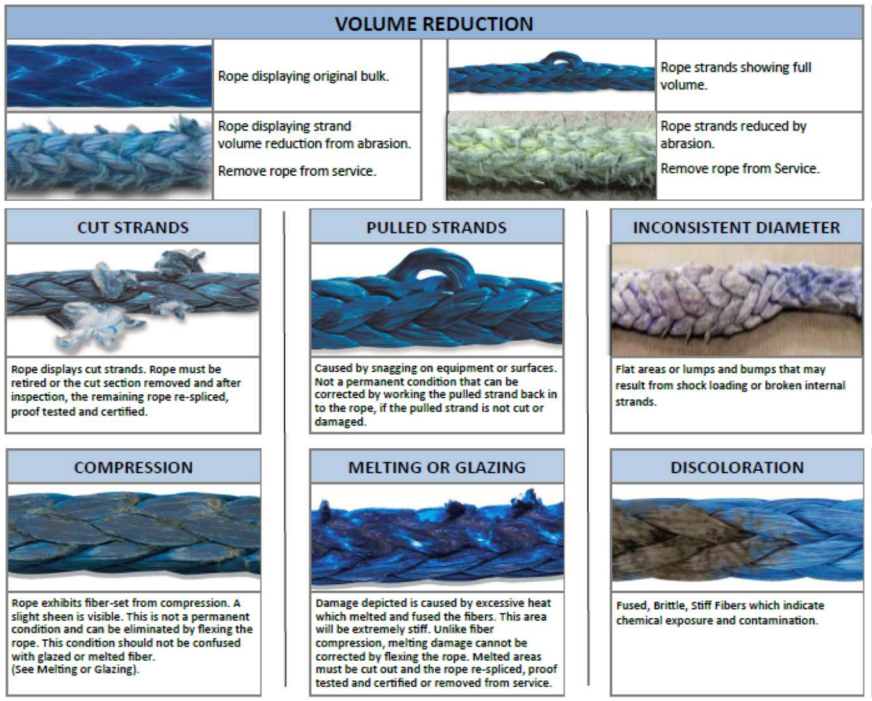
BOTH LOAD BEAMS CLOSED, RELEASE LEFT LOAD BEAM ONLY
LOAD TESTING – HOLD ALL LOADS FOR 5 SECONDS PRIOR TO RELEASE

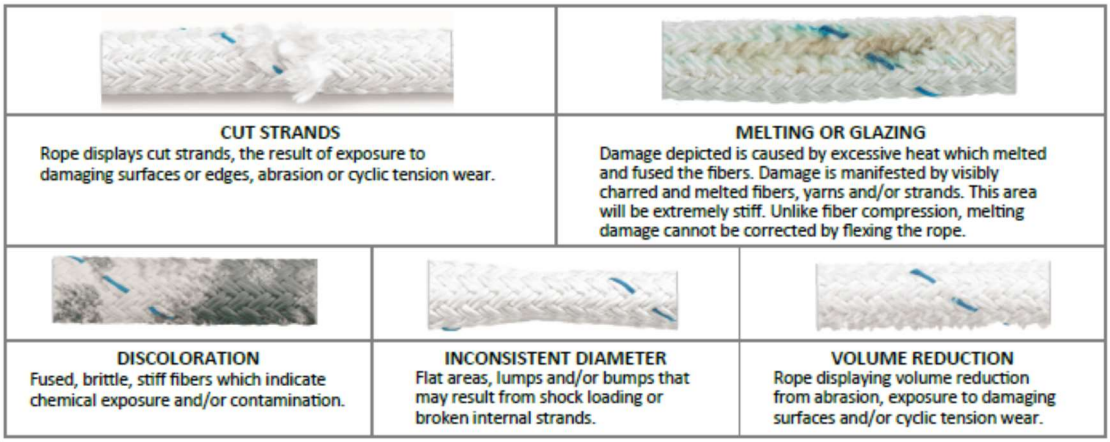
LOAD (LBS.)	RELEASE METHOD	OPERATOR	DATE
1000	22 VDC		
2000	22 VDC		
3200	22 VDC		

HEC Long Line Inspection

Daily Inspection(s):
Note: removal of the long line outer cover may be required to perform these inspections.

- Per ASME B30.30-2019, visually inspect the rope assembly to discover gross damage that may be an immediate hazard, such as distortions, abrasion, cut strands or deterioration of end connections.
- Per ASME B30.30-2019, visually inspect the rope assembly for heat/electrical damage, chemical or UV degradation, local changes to diameter, lay length or twisting of rope.
- Per CI 2001-04, visually inspect for high or low strands or randomly uneven cross-sections.
- Per CI 2001-04, visually inspect for excessive twist or corkscrewing.
- Per CI 2001-04, visually inspect for broken filaments, fuzzy areas or kinks.
- Per Lift-It Long Line User Manual, HECSHLL, Revision 6, if any of the visual damage shown below or listed above is present in the rope, the rope assembly will be removed from service for evaluation by Lift-It or other qualified personnel with recognized degree or certificate or with extensive training, knowledge and experience of synthetic rope assemblies.
- Per Lift-It Long Line User Manual, HECSHLL, Revision 6, visually inspect for damaged thimbles or master links which show signs of corrosion, cracks, distortion, sharp edges, incorrect shape or localized wear.
- Per Lift-It Long Line User Manual, HECSHLL, Revision 6, inspect for loose thimbles which are not captivated by the eye splice with ears, retaining ring or lashing.
- Per Lift-It Long Line User Manual, HECSHLL, Revision 6, visually inspect for tears, holes, cuts, punctures to covers along with broken seams or zippers.
- After inspection, and there is no damage, ensure long line outer cover is installed prior to use.





Annual / 100 Hour

- Per CI 2001-04, Lay out rope in a straight line on a smooth surface under hand or mechanical tension to straighten the rope. Visually examine the entire rope length for detectable damage and deterioration including eye splices or end-to-end splices using the daily inspection figures as guidance.
- Per CI 2001-04, sight the rope down the length to look for high or low strands and randomly uneven sections.
- Per CI 2001-04, tactile inspection of the entire rope length checking by feel for unevenness, rough spots or stiff sections.
- Per CI 2001-04, measure the rope circumference at several locations including all locations that may exhibit signs of damage noting any differences of more than 10 percent difference from nominal diameter.
- Per CI 2001-04, with enough tension to straighten the rope and overcome any ground friction, measure the total length of the rope. The length should not vary by more than $\pm$5 percent of the original new length.
- Per Lift-It Manual, HECSHLL, Revision 6, inspect for internal abrasion especially at any sights where the external fibers may exhibit unusual features or potential damage.
- Per ASME B30.30-2019, while inspecting for internal abrasion, check the interior of the rope structure for dirt or grit that may be causing damage to the rope yarns.


Fig. 1 Inspect for Internal Abrasion.

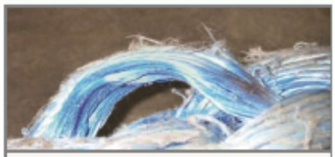


Fig. 2 Inspect for Internal Abrasion.


Fig. 3 Compare Surface Yarns with Internal Yarns.

- Visually inspect entire assembly for any apparent damage from a heat source.
- Visually inspect for localized wear, cracking, distortion, sharp edges or corrosion of thimbles and master links. Attention should be at any welded locations of the thimbles.
- Visually inspect the master links for any deformation

5.0 PLACARDS AND MARKINGS

Inside aircraft, in full view of the pilot:

R E L E A S E

A Hook Manual Release Lever on Pilot's Cyclic.
(0.25" x 2.5")
Installed on Release Assembly Handle shown in Figure 5.3 (highlighted red)

R E L E A S E

B Hook Manual Release Lever on Pilot's Cyclic.
(0.25" x 2.5")
Installed on Release Assembly Handle shown in Figure 5.3 (red)

A RELEASE

Pilot's Cyclic LH Side near Guarded Thumb Button.
(0.5" x 1.2")
See highlighted area of Fig. 5.1 at right for installation location.

B RELEASE

RH Side of Release Handle Assembly near Electrical Release.
(0.5" x 1.2")
Right hand side of Release Assembly shown in Figure 5.3 (blue)

HOOK "A"
OPEN WHEN LIT

Installed adjacent to Red Warning Light on Instrument Panel.
(0.5" x 1.2")

HOOK "B"
OPEN WHEN LIT

Installed adjacent to Red Warning Light on Instrument Panel.
(0.5" x 1.2")

'A' HOOK REL.

Installed with 5 amp circuit breaker.
(0.19" x .90")

'B' HOOK REL.

Figure 5.1: Cyclic Detail

HEC VNE 65 KIAS

Installed on 407 Exterior Loads Flip Chart Placard (Non-interfering)
(0.5" x 1.75")

Installed with 5 amp circuit breaker.

HOOK LIGHTS

(.19” x .90”)
Installed with 1 amp circuit breaker.
(0.19” x 0.90”)

LOAD CELL

Installed with 2 amp circuit breaker
(0.19” x 0.90”)

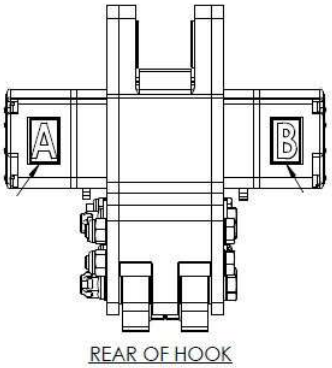


Figure 5.2: 350-430-101-101 hook (rear view)

A

Rear Face of Left Side of Hook as shown. (Fig. 5.2)
Top Face of Left Side of Manual Release. (Fig. 5.3) (green)
(0.625” x 1.0”)

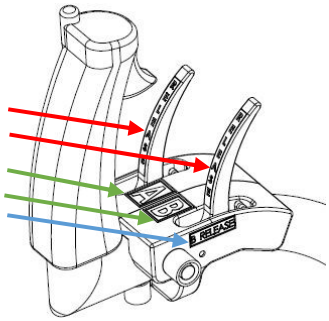
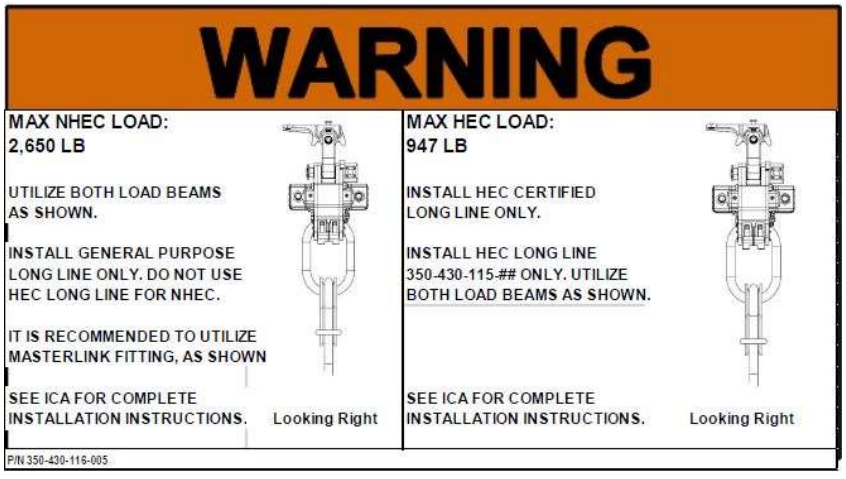


Figure 5.3: 350-430-110-100 Assembly

B

Rear Face of Right side of Hook as shown. (Fig. 5.2)
Top Face of Right Side of Manual Release. (Fig. 5.3) (green)
(0.625” x 1.0”)



Installed on LEFT side of aircraft, below rear passenger door. (3.250”x 6.0”)

6.0 EXISTING INSTALLATION & REMOVAL

Prior to installation, the aircraft must have the BELL 407 factory cargo hook fittings already furnished on the aircraft. This system mounts to these fittings. Note, these fittings are within the airframe and are not part of Mechanical Specialties' ADEC Kit. See Figure 6.1. Also, Figures 6.2 & 6.3 are for the operators'/installers' reference to what cargo hook system may already exist on the aircraft.

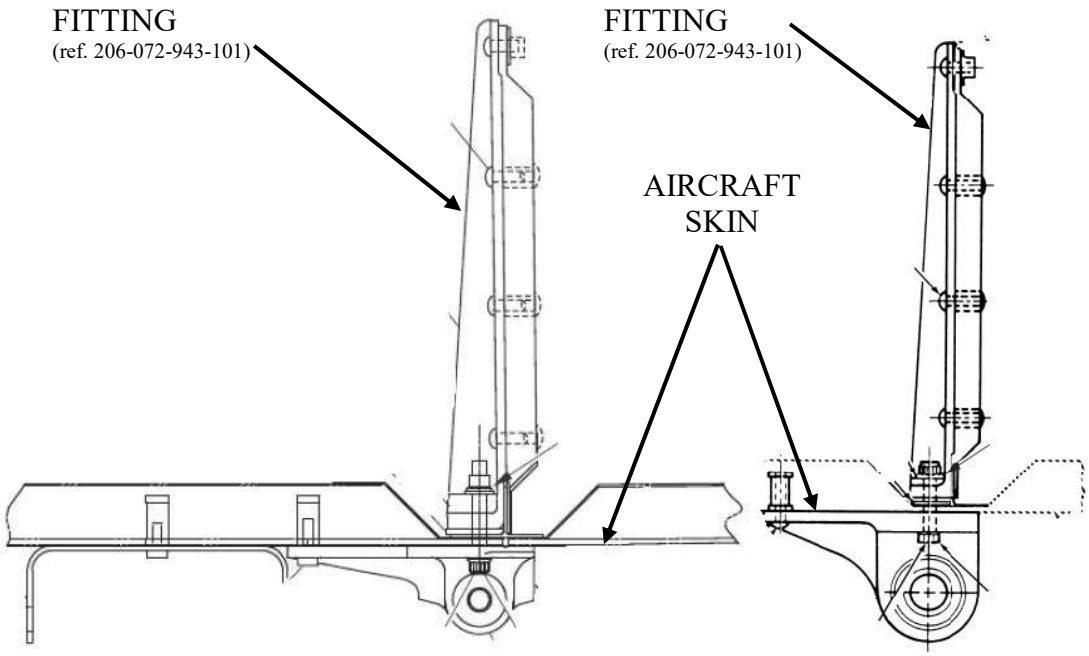


Figure 6.1: Bell 407 Cargo Hook Fittings (Reference Only, NOT included with Installation)

FIGURE 6.2: Right and Left pictures of Bell 407 Manual cable (206-072-902-005) and Electrical cable (Bell Ref. BHT-II-5, pg 10) shown as reference. Left image shows location of entry hole on 407 aircraft belly. FS and BL locations can be found BHT-II-5, pg. 7, figure 1-1, View E.

Figure 6.3: Examples of Bell 407 Cargo Hooks with Trolley (left) and Beam (right) Suspension Systems. NOTE: these are two examples of cargo hook kits available from Bell. For a complete list, see BHT-407-II-5 pg. i & ii.

Refer also to the following:
Mechanical Specialties drawing 350-430-100-100, *407 ADEC™ System Installation*, Rev. 0 or later.
Mechanical Specialties drawing 350-430-114-100, *Wiring Diagram,HEC System*, Rev. 0 or later.

6.1 PRE-INSTALLATION STEPS

To install the HEC system, remove the existing cargo hook system from the aircraft. Section 6.2 onward details the installation steps of the Model 350-430-100-100 ADEC™ system.

1. Begin by disconnecting all electrical and manual release cables from the existing hook(s).
2. Remove the cargo hook from the beam or trolley assembly. (Figure 6.3)
3. Remove the beam or trolley. (Figure 6.3)
4. Remove the four (4) bolts & four (4) screws attaching the existing pillow blocks, and adhesive residue exposing the aircraft skin. (Figure 6.3)
5. Remove the bracket holding the manual and electrical release cables. (Figure 6.2)
6. Remove the manual release cable and sealant. Remove control cable by disconnecting it from the previous cargo hook and pulling the cable out of the aircraft. Sealant will need to be removed. (Figure 6.2)
7. Retain the electrical release harness, as it will be utilized with the 350-430-100-100 installation.
8. Remove manual release cable, manual release handle assembly, and sealant from the aircraft. Leave the existing electrical release installed. Disconnect the handle assembly from the cyclic

tube by removing the clamp. Loosen control cable jam nut, and spin handle on cable to remove handle.

6.2 BRACKET AND MOUNTS INSTALLATION

Install bracket and Aircraft Mounts per 350-430-100-100 drawing. Figures below are for installer's reference. Note that 350-430-100-100 installation references both BHT-407-II-5 and BHT-407-II-1.

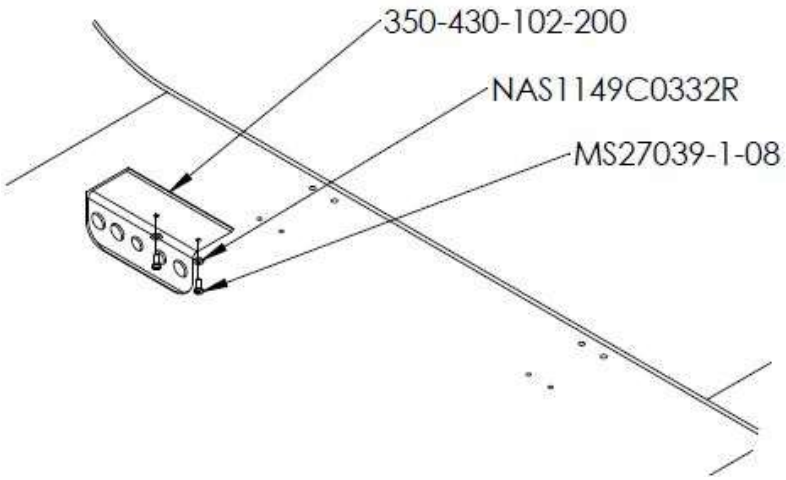


FIGURE 6.4: Bracket Installation per BHT-407-II-5

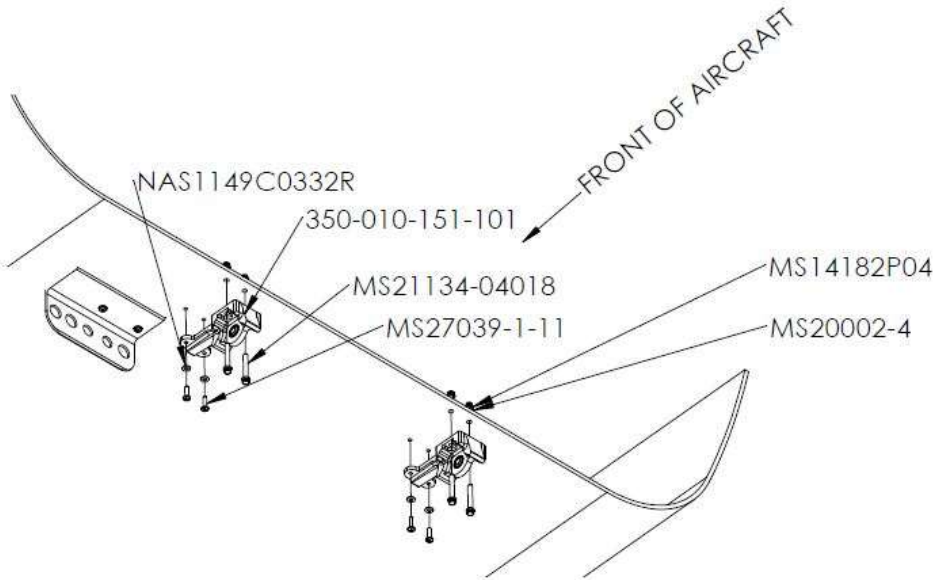


FIGURE 6.5: Aircraft Mounts (350-010-151-101, qty. 2) to be installed in the same manner described per BHT-407-II-5, pg. 4, section 1-3 "Cargo hook provisions (206-706-341-123/-125/-127/131) – installation"

6.3 BEAM AND HOOK INSTALLATION.

After Aircraft Mounts and Bracket (350-010-151-101, 350-430-102-200) have been installed to the 407, install the beam (350-010-150-101) with the bolt heads facing forward. Note that one side of the beam has two slip bushings and the other has one. The NAS6205-28 bolt is to be installed on the side with one slip bushing. Install the hook using the load cell. Ensure that the electrical connectors of the hook and load cell face the left side of the aircraft. See below and 350-430-100-100 ADEC System Installation. Also, ensure that there is no torque applied to the load cell with the AN310-8 nut. Per the manufacturer's instructions, tighten the AN310-8 until it is tight on the beam, then back off the nut and cotter.

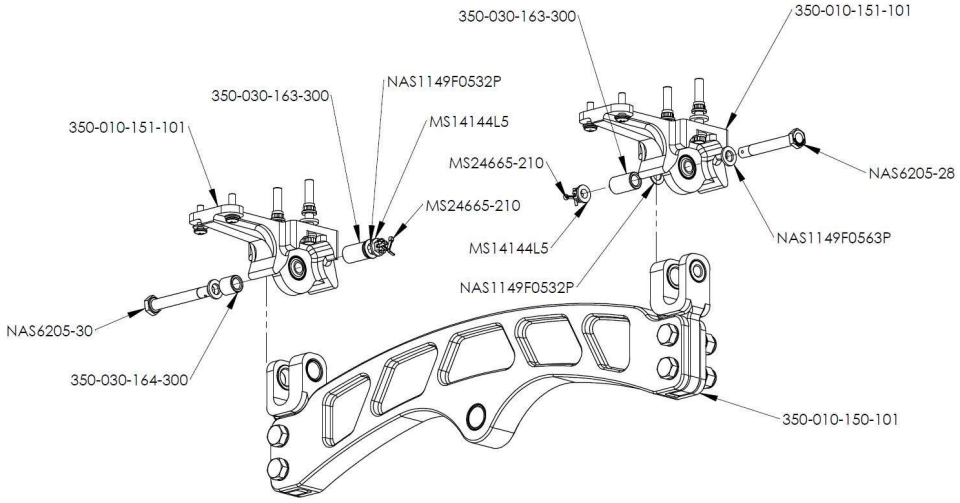


FIGURE 6.6: Beam Installation

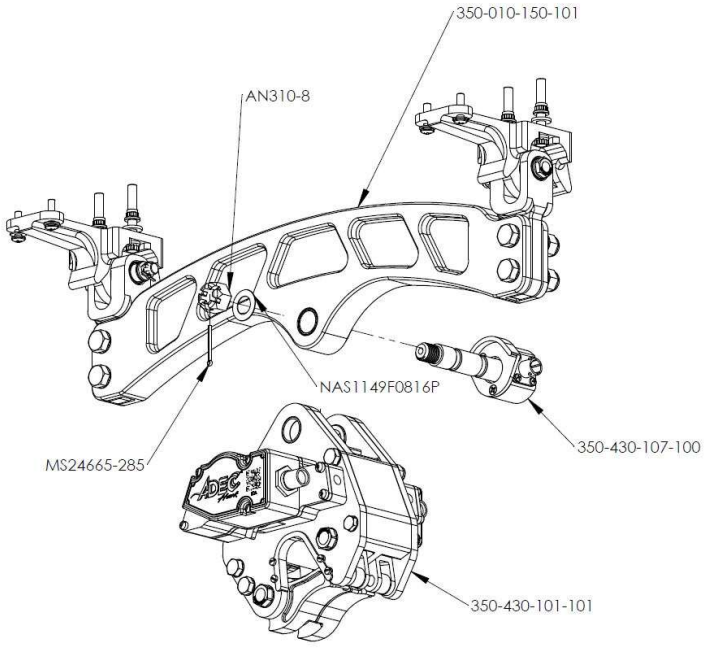


FIGURE 6.7: Hook Installation

6.4 PQRS and BQRS Installation (Cables and Wire harnesses) & Load Cell

The ADEC™ HEC System controls consist of two electrical releases and two manual backup releases. The control cable release mount, shown below, is clamped onto the pilot's cyclic control tube. Utilize drawing 350-430-100-100 to reference locations of the cables & mounting hardware. Also reference BHT407-II-1, section 1-23, Instructions 12-15 for opening up hole to .700" MAX for the cables & wire harnesses to feed into the aircraft. Note: Installer is to utilize Mechanical Specialties' supplied grommet edging (P/N G3365643) instead of the referenced grommet (BHT-II-1 pg. 50, item 61 - MS35489-149) to line the edge of the newly cut hole to prevent damage to the manual release cables and wire harnesses. AFTER wire harnesses (350-430-108-100, 224920, and existing electrical hook release harness) and manual cables (350-430-108-100, qty 2) are installed in the .700" hole, follow the installation instructions (BHT407-II-5, page 11, flag note 7 – Figure 1-1) to completely seal the cavity with sealant C-251 (MIL-PRF-81733)

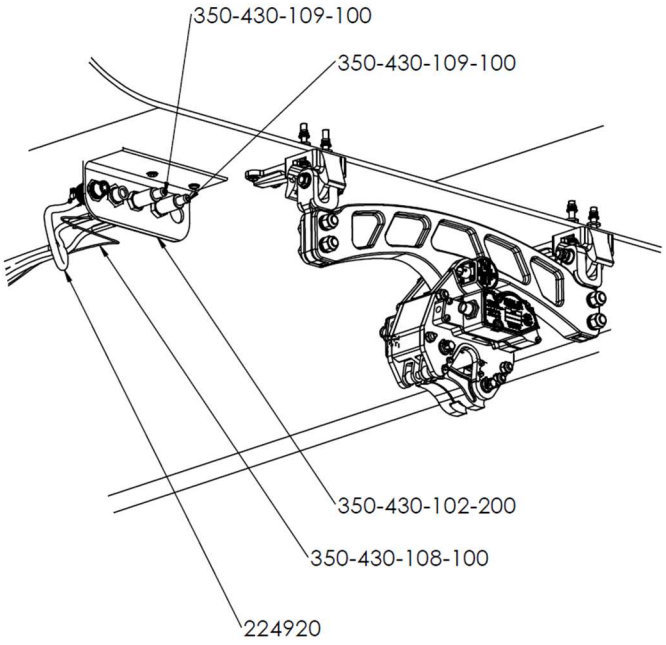


Figure 6.8: Cable Installation (Bracket to Belly)

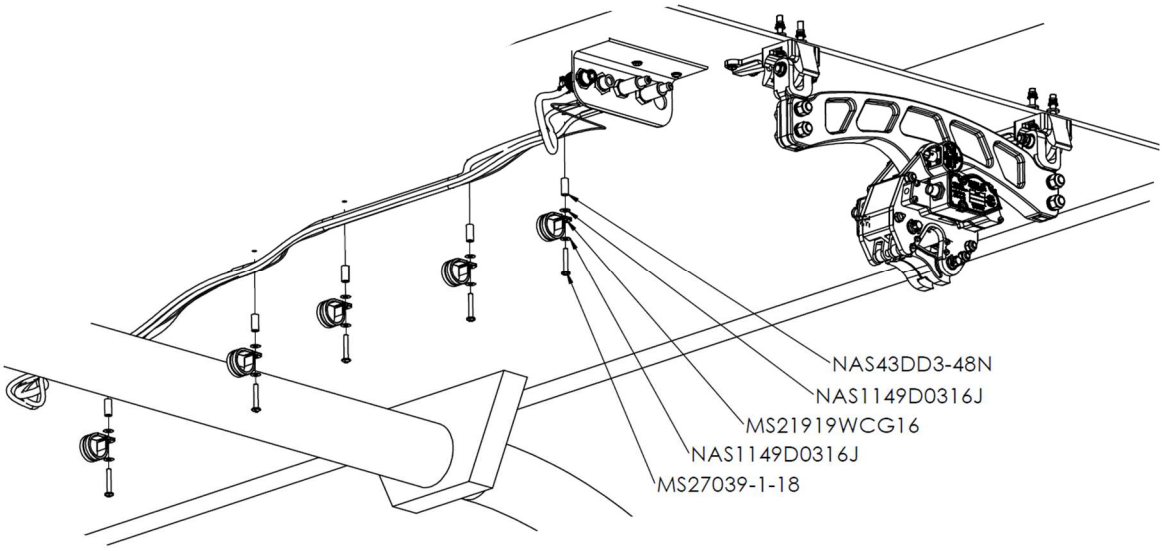


Figure 6.9: Hose Clamp Installation (5x)

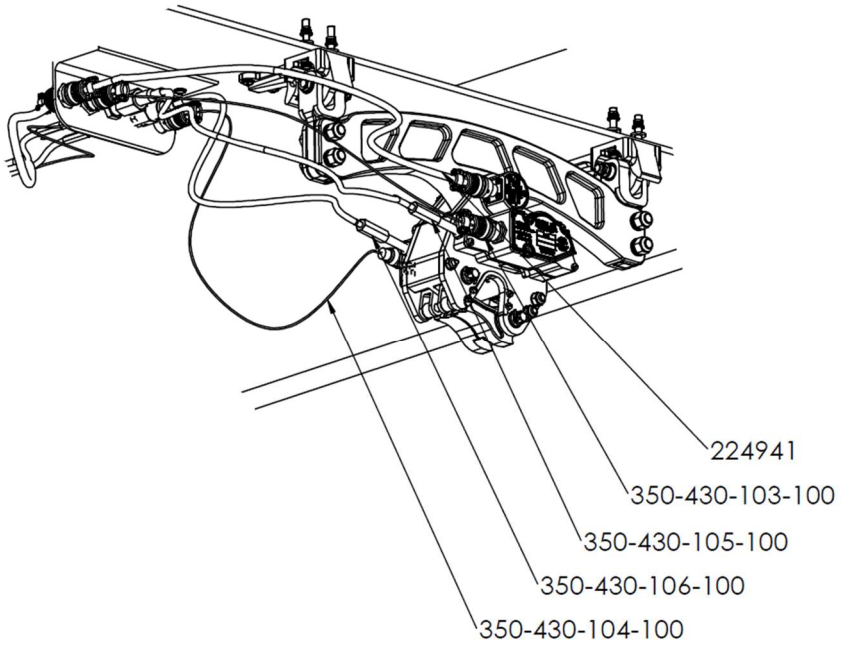


Figure 6.10: Cable Installation (Bracket to Hook)

Install 350-430-103-100 & 350-430-104-100 wire harnesses per 350-430-100-100 drawing as shown in **Figure 6.10**.
Install 350-430-105-100 & 350-430-106-100 cables per 350-430-100-100 drawing as shown in **Figure 6.10**
Install 224941 HLI Signal cable per 350-430-100-100 drawing as shown in Figure 6.10

To install 350-430-109-100 cables into manual lever assembly (350-430-110-100), both sides of the system will need to be open to allow the ball enough movement to rest inside lever. Once each lever can affect release, clamp the control cable release mount to the pilot's cyclic control as shown below. Position the mount for comfortable use by pilot. Tighten assembly around cyclic.

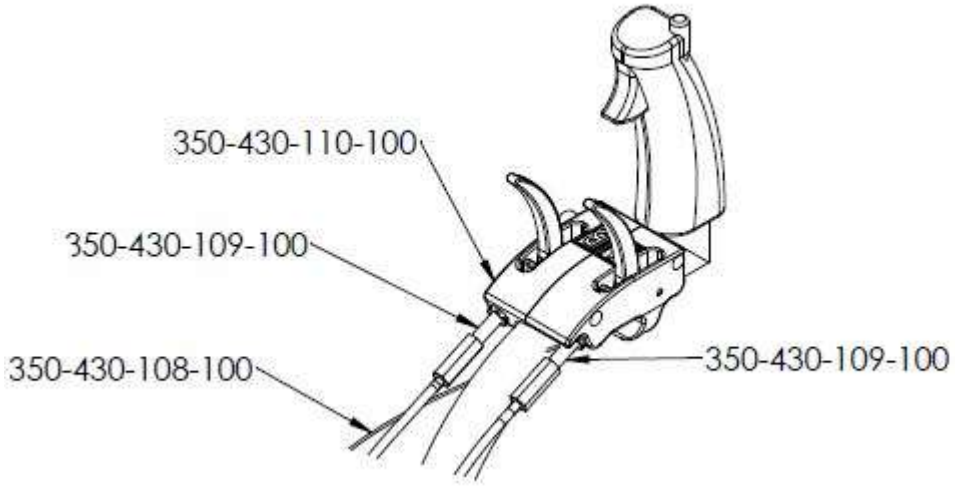


Figure 6.11: HEC Hook Release Handle Assembly Installation

Clamp the control and electrical cables to the cyclic tube, 2 – 3 inches above the cyclic boot as shown below.

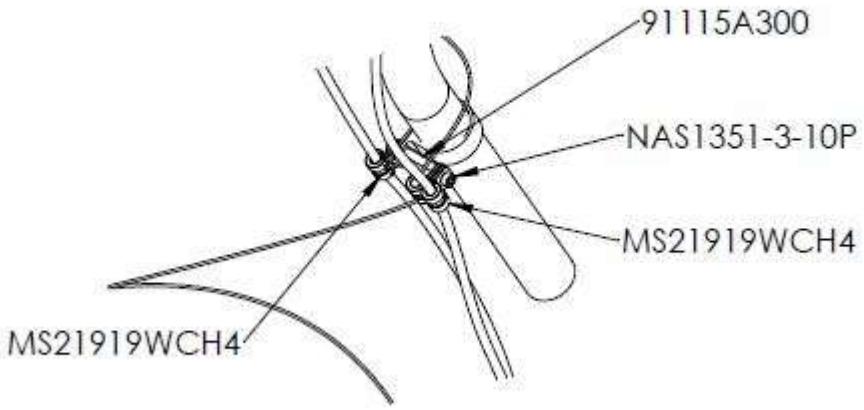


Figure 6.12: Cable Clamp Assembly Installation

6.5 ELECTRICAL INSTALLATION

See the electrical schematic on the following page. Refer to Mechanical Specialties, LLC Electrical Schematic drawing 350-430-114-100 for more detail. Follow guidance from AC43.13-1B, Chapter 11.

ADEC™ Hook 350-430-101-101: System "A"

The 15 Amp "HOOK" circuit breaker is replaced by a 5A circuit breaker, p/n 7277-2-5 (Figure 6.18, CB4). Label this breaker with the provided "'A' HOOK REL." placard.

ADEC™ Hook 350-430-101-101: System "B"

A 5A circuit breaker, p/n 7277-2-5 (Figure 6.18, CB3) is added for System "B" Label this breaker with the provided "'B' HOOK REL." placard. Note: the switch installed in 350-430-110-100 is a SPDT (single pole, dual terminal) actuation switch. It is to be connected via terminals 1 (power) & 2 (common) for momentary switch function. See 350-430-114-100 on the following page for details on wiring the installation.

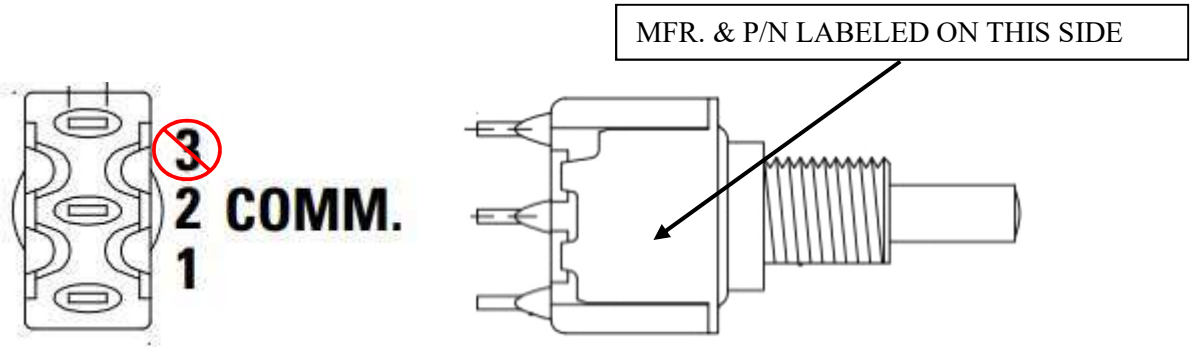


Figure 6.13: Electrical Terminals on Momentary Switch

Hook Open Lights

Install P/N MS25041-4 lights (Figure 6.18, L1 & L2) on the instrument panel **in clear view of the Pilot in charge (PIC)** . These lights illuminate when either "A" or "B" load beams are open. Power is supplied to the lights by a 1A circuit breaker, P/N 7277-2-1 (Figure 6.18, CB2) which is added to the aircraft. Label this breaker with the provided "HOOK LIGHTS" placard.

Load Cell Indicator

Install MSI P/N 503052-0002 **in clear view of the Pilot In Charge (PIC)**. This Load Indicator is to be connected to a provided 2A circuit breaker, P/N 7277-2-2 (Figure 6.18, CB1) via the provided HLI PWR I/O cable, P/N 204521. To connect the power cable to the breaker, follow steps in the *MSI HLI Hardware User Guide, Rev A.* Connect the Bulkhead Load Pin Cable, P/N 224920, to the indicator.

NOTE: the 90 degree connector should be inside the aircraft, connected to the indicator. The bulkhead fitting on the other end of the cable is on the exterior of the aircraft.

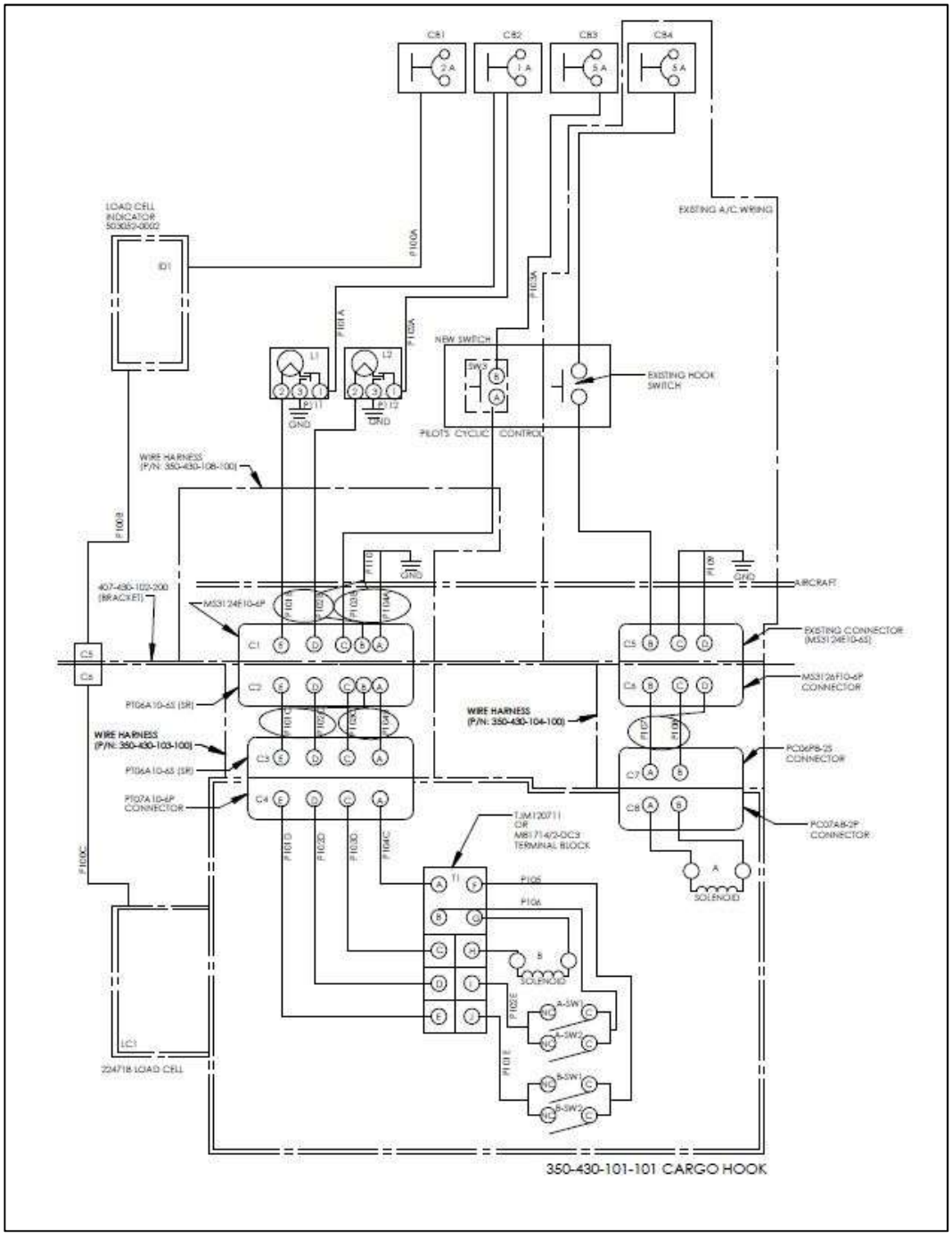


Figure 6.18: HEC System Electrical Schematic (350-430-114-100)

6.6 FULL REMOVAL INSTRUCTIONS

Reverse installation steps to remove HEC system from helicopter.

7.0 FUNCTIONAL CHECKS

After initial installation and any subsequent time the HEC system is reinstalled, function checks must be performed.

Electrical Release Testing:

1. Test System A electrical release. Check that open indication light illuminates. Close and re-latch load beam.
2. Test secondary hook electrical release. Check that open indication light illuminates. Close and re-latch load beam.

If the electrical release mechanisms do not open smoothly or on the first attempt, verify the following:

1. The circuit breakers are pushed in.
2. The electrical cables are connected per the wire diagram, Mechanical Specialties, LLC drawing number 350-430-114-100. (schematic shown on previous page)
3. If failure to release during tests persists, refer to troubleshooting table on the following page.

Manual Release Testing:

1. Test System A manual release. Check that open indication light illuminates. Close and re-latch load beam.
2. Test System B manual release. Check that open indication light illuminates. Close and re-latch load beam.

If the manual release mechanisms do not open smoothly or on the first attempt, verify the following:

1. The control cables are installed per Mechanical Specialties, LLC drawing 350-430-100-100.
2. “A” release(s) goes to “A” hook, “B” release(s) goes to “B” hook.
3. The control cables are free to move and not pinched or damaged.
4. If failure to release during tests persists, refer to troubleshooting table on the following page.

7.1 TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Cargo hook will release with manual release cable but won't release electrically.	Open circuit - faulty wiring, circuit breaker, cargo hook solenoid.	Disconnect electrical connector from cargo hook. Place leads of multimeter on pins A & B of cargo hook connector. Check for reading of 2-3 ohms. If open circuit indication is attained, replace solenoid.
Cargo hook will release electrically but not manually.	Check manual release rigging and for damage to cable	Readjust rigging, replace damaged cable, repair internal mechanism of cargo hook.
Cargo hook will not release electrically or manually.	Cargo hook internal mechanism.	Remove cargo hook from service. Repair internal mechanism.
Load beam will not latch.	Cargo hook internal mechanism	Remove cargo hook from service. Repair internal mechanism.
Visible cracks	Visible cracks	Remove cargo hook from service. Replace damaged parts.
Visible corrosion or gouges deeper than .03" deep.	Visible gouges or corrosion.	Remove cargo hook from service. Replace damaged parts.

8.0 REPLACEMENT PARTS AND SERVICE

Contact Sales at Mechanical Specialties, LLC for replacement parts or overhaul inquiries.

Mechanical Specialties, LLC
1000 85th Ave SE
Olympia, WA 98501
(360) 273-7604
sales@mechspecialties.com

APPENDIX A

INSPECTION SHEETS FOR 350-430-115-###[1]

LOG*: SERVICE HOURS TRACKING OF P/N: 350-430-115-####[1]

Sheet Number**:_____

SERIAL NUMBER	DATE	START TIME	END TIME	HOURS	NOTES:

*Note: this document and any data collected is for the operator's records. It is to be utilized for maintaining a service log of the long line assembly, 350-430-115-###[1], per Lift-It service life requirements for HEC operations. 2,000 hours/4 years from date of manufacture.

**Print additional sheets, as required.

APPENDIX B

Full Text of TSO-C167

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Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, D.C.

TSO-C167

Effective Date: 6/9/04

Technical Standard Order

Subject: Personnel Carrying Device Systems (PCDS), also known as Human Harnesses

1. PURPOSE. This Technical Standard Order (TSO) is for manufacturers of personnel carrying device systems (PCDS), who are applying for a TSO authorization or letter of design approval. In it, we (the Federal Aviation Administration, or FAA) tell you what minimum performance standards (MPS) your PCDS must first meet to obtain approval and identification with the applicable TSO marking. Hereon, we refer to a PCDS as a "human harness."

2. APPLICABILITY. This TSO affects new applications submitted after this TSO's effective date.

3. REQUIREMENTS. New models of a human harness, identified and manufactured on or after this TSO's effective date, must meet the MPS based on the following documents:

- National Fire Protection Association (NFPA) 1983, "Standard on Fire Service Life Safety Rope and System Components," 2001 edition, for a life safety harness Class III, and
- Society of Automotive Engineers (SAE) Aerospace Standard (AS) 8043, RevisionA, "Restraint Systems for Civil Aircraft," issued March 2000, as amended by appendix 1 of this TSO.

a. Functionality. This TSO's standards apply to equipment intended to transport personnel externally from a helicopter (human external cargo (HEC) operations). This equipment is intended for long-term, work related activities where the user is required to remain in the device for extended periods of time. Note that 14 CFR ⇓ 133.45 specifies limitations for external-load operations as rotorcraft-load combination Class D, the certification requirements for HEC operations are found in 14 CFR § 27.865 or 14 CFR § 29.865, as applicable.

b. Functional Qualification. Demonstrate the required performance under the test conditions in the MPS (see APPENDIX 1 of this TSO).

c. Deviations. We have provisions for using alternative or equivalent means of compliance to the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation per 14 CFR § 21.609.

4. MARKING.

a. Mark at least one major component permanently and legibly with all the information listed in 14 CFR § 21.607(d), except for:

(1) Section 21.607(d)(2). Use the name, type, and part number instead of the optional model number.

b. The label also must include the information required in NFPA 1983 Section 3.1.4.2(2) or 3.1.4.2(3), as applicable.

c. In addition, mark the following permanently and legibly with at least the manufacturer's name, subassembly part number, and the TSO number:

(1) Each component that is easily removable (without hand tools),

(2) Each interchangeable element, and

(3) Each sub-assembly of the article that you determined may be interchangeable.

5. APPLICATION DATA REQUIREMENTS. Under 14 CFR § 21.605(a)(2), you, as a manufacturer/applicant must give the FAA's Aircraft Certification Office (ACO) manager responsible for your facilities, one copy each of the following technical data to support our design and production approval:

a. Operating instructions and equipment limitations, sufficient to describe the equipment's operational capability.

b. Installation procedures and limitations, sufficient to ensure that the human harness, when installed according to the installation procedures, still meets this TSO's requirements. The limitations must identify any unique aspects of the installation. Finally, the limitations also must include a note with the following statement:

> The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft.

c. Schematic drawings of the installation procedures.

d. List of the components, by part number, that make up the human harness complying with the standards in this TSO. You should include vendor part number cross-references, when applicable.

e. Instructions for Continued Airworthiness covering the periodic maintenance, calibration, and repair, for the continued airworthiness of an installed human harness. Instructions should

include recommended inspection intervals and service life. Refer to APPENDIX 1, paragraph **5d**.

f. Material and process specifications list.

g. The quality control system description required by 14 CFR §§ 21.605(a)(3) and 21.143(a), including functional test specifications. These test each production article to ensure compliance with this TSO.

h. Manufacturer's TSO qualification test report.

i. Label drawing giving the information required by paragraph **4** of this TSO.

j. A list of all drawings and processes, including revision level, to define the article's design. For a minor change, you only need to make revisions to the list available on request.

6. MANUFACTURER DATA. Besides the data to be furnished directly to the FAA, each manufacturer must have the following technical data available for review by the responsible manager:

a. The functional qualification specifications for qualifying each production article to ensure compliance with this TSO.

b. Equipment calibration procedures.

c. Corrective maintenance procedures within 12 months after TSO authorization.

d. Schematic drawings.

e. Material and process specifications.

7. FURNISHED DATA. With each article manufactured under this TSO, provide one copy of the technical data and information in paragraph **5a** through **5j** and paragraph **6** of this TSO. Add any other data or information necessary for the proper installation, certification, and use, or for continued airworthiness, or both, of the human harness.

8. AVAILABILITY OF REFERENCED DOCUMENTS.

a. You can buy copies of NFPA 1983 from the National Fire Protection Association, 1Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101, telephone (617) 770-3000, fax (508) 895-8301. You can get copies through the NFPA Internet website @ www.nfpa.org.

b. You can buy copies of 14 CFR part 21 Subpart O, 14 CFR part 27, 14 CFR part 29, and 14 CFR part 133 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402-9325. Telephone (202) 512-1800, fax (202) 512-2250. You also can get copies from the Government Printing Office (GPO), electronic CFR Internet website @ www.access.gpo.gov/ecfr/.

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c. You can get Advisory Circular (AC) 20-110, "Index of Aviation Technical Standard Orders," and AC 20-36, "Index of Articles Certified under the Technical Standard Order System," from the U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785,telephone (301) 322-4477, fax (301) 386-5394. You also can get copies from the FAA's Regulatory and Guidance Library (RGL) @ www.airweb.faa.gov/rgl. On the RGL website, select "Advisory Circulars."

d. You can buy copies of SAE AS 8043, Revision A, from the Society of Automotive Engineers, Inc., Department 331, 400 Commonwealth Drive, Warrendale, PA 15096-0001. Telephone (724) 776-4970, fax (724) 776-0790. You can also get copies through the SAE Internet website @ www.sae.org.

Susan J. M. Cabler

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Acting Manager, Aircraft Engineering Division
Aircraft Certification Service

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR A PERSONNEL CARRYING DEVICE SYSTEM (PCDS), ALSO KNOWN AS A HUMAN HARNESS

1. Purpose. This appendix prescribes the minimum performance standards (MPS) for a personnel carrying device system (PCDS). Hereon, we (the Federal Aviation Administration) refer to a PCDS as a "human harness."

2. Requirements. We base the MPS on the following standards:

- National Fire Protection Association (NFPA) 1983, "Standard on Fire Service Life Safety Rope and System Components," 2001 edition, and
- Society of Automotive Engineers (SAE) Aerospace Standard (AS) 8043, Revision A, "Restraint Systems for Civil Aircraft," issued March 2000.

3. NFPA 1983. The following sections of NFPA 1983 – on life safety harness system components, Class III – apply to this TSO:

For:	See NFPA 1983:
Definitions	**a.** Sections 1.3.1 to 1.3.30, except 1.3.8 and 1.3.26. **b.** Section 1.3.31. Replace section with the following: Life Safety Harness: A system component; materials arranged and secured on the body to support a person during human external cargo (HEC) operations. HEC is a person (or persons), who is ferried, raised, lowered, or otherwise transported external to the rotorcraft fuselage. In 14 CFR §§ 27.865 and 29.865, we define certification requirements for external loads, including HEC. We define operating limitations for HEC operations in 14 CFR § 133.45(e).
Product Labeling and User Instruction Requirements	Sections 3.1.4.2(2), 3.1.4.2(3), and 3.2.3.2.
Design and Construction Requirements	Sections 4.3.1.3, 4.3.2, 4.3.3, 4.3.4, 4.3.5, and 4.3.6.
Performance Requirements	Sections 5.3.4, 5.3.5, 5.3.6, and 5.3.9.
Testing Requirements	Sections 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, and 6.3.6.

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR A HUMAN HARNESS Continued

4. SAE AS 8043, Revision A.

a. The following sections of SAE AS 8043, Revision A, apply to this TSO:

For:	See SAE AS 8043, Revision A:
Definitions	Paragraphs 3.4, 3.4.1, 3.4.2, 3.4.3, 3.5, and 3.8.
General Requirements	Paragraphs 4.1, 4.3, 4.6, and 4.9.
Webbing Requirements	Paragraph 5.3.
Webbing Test Procedure	Paragraphs 8, 8.2, 8.3, and 8.4.
Requirements for Adjusting Hardware Release	Paragraph 6.4.2.
Requirements for Assembly Performance	Paragraph 7.1.4.
Test Procedure for Nonmetallic Hardware	Paragraph 9.2.2.

b. We modified the following SAE AS 8043, Revision A, paragraphs, which also apply to this TSO:

SAE AS 8043, Revision A:	Replace with:
Paragraph 3.1 (Definitions)	PCDS (also called "Human Harness"): A device or system that has the structural capability and features needed for safely transporting occupants externally during human external cargo (HEC) operations. These systems include, but are not limited to, life safety harnesses.
Paragraph 4.5 (General Requirements)	Adjustment: A harness shall be capable of snug adjustment, by the occupant, by a means easily within the reach of that person and easily operable, or shall be provided with a locking retractor. The harness shall maintain the adjusted position during flight. Non-locking retractors shall not be used. If a harness is designed to fit a range of sizes, it shall be clearly marked to specify the waist size and height or the chest size and height of the occupant for which it is designed.

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR A HUMAN HARNESS Continued

SAE AS 8043, Revision A:	Replace with:
Paragraph 5.2 (Webbing Requirements)	Breaking Strength: The webbing in a human harness must have a breaking strength not less than 22kN (5,000 lbs), when tested by the procedure in Paragraph 8.2. Breaking strength after the abrasion tests of Paragraph 10.5 must be not less than 16.7 kN (3,750 lbs), when tested by the procedure in Paragraph 8.2.
Paragraph 5.4 (Webbing Requirements)	Resistance to Light: The webbing in a human harness, after testing by the procedure in Paragraph 8.4, must have a breaking strength not less than 13.3 kN (3,000 lbs).
Paragraph 6.1 (Metallic Hardware)	Corrosion Resistance: Metallic hardware parts of a human harness must not corrode, after subjected to the conditions in Paragraph 9.1. Metallic adjusting devices must not fail, gall, or wear to an extent that impairs normal adjustment. A buckle must not separate when a force of not more than 0.22 kN (5 lbs) causes it partially to engage.
Paragraph 9 (Test Procedure for Metallic Hardware)	Test Procedure for Hardware: Use three samples of hardware for each test, unless otherwise specified.
Paragraph 9.1 (Test Procedure for Metallic Hardware)	Corrosion Resistance: Test hardware using conditions in ASTM B117-73[2], Standard Method of Salt Spray (Fog) Testing. The test must consist of 24-hour exposure to salt spray, followed by 1 hour of drying. In a salt spray test chamber, place samples in a position most likely to develop corrosion on the larger areas. At the end of the test, wash the hardware with water to remove the salt. After drying, examine the hardware for corrosion.
Paragraph 6.2.1 (Nonmetallic Hardware)	Temperature Resistance: Nonmetallic hardware parts of a human harness, when subjected to the conditions in Paragraph 9.2.1, must not warp or otherwise deteriorate to cause the assembly to operate improperly.
Paragraph 6.2.2 (Nonmetallic Hardware)	Solvent Resistance: Nonmetallic hardware parts of a human harness, when subjected to the conditions in Paragraph 9.2.2, must not deteriorate to cause the assembly to operate improperly.

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR A HUMAN HARNESS Continued

SAE AS 8043, Revision A:	Replace with:
Paragraph 9.2.1 (Test Procedure for Nonmetallic Hardware)	Temperature Resistance: Subject nonmetallic hardware to the conditions in Procedure D of ASTM D756-78[2], Standard Methods of Test for Resistance of Plastics to Accelerated Service Conditions. Disregard the measurements in Paragraph 7 of that procedure.
Paragraph 6.4.1 (Adjusting Hardware Release)	Release Force: Any adjusting release hardware of a human harness must release when a force of not more than 0.13 kN (30 lbs) is applied to a pull or lift release mechanism. Release mechanisms requiring a twisting or torsional motion must release with a force equal to 0.13 kN (30 lbs) applied at the appropriate moment arm relative to the axis of rotation, when tested as prescribed in Paragraph 9.4.
Paragraph 10.5 (Test Procedure for Assembly Performance)	PCDS (or Human Harness), Abrasion Conditioning Procedure: Test the webbing breaking strength on an area of webbing conditioned using the procedure in Paragraph 8.2. Use the adjustment hardware and webbing combination that best represents the human harness' hardware and webbing. The combination must not show wear before conditioning. Use test equipment that provides the conditions of Figure 4 of SAE AS 8043, Revision A, with a length of stroke of 152-203 mm (6-8 inches) and a cycle rate of 16-18 cycles per minute. One cycle consists of one lengthening stroke and one shortening. **NOTE:** Condition the webbing for 4 hours at 21 ± 1 degree C (70 ± 3 degrees F) and 65 ± 2 percent relative humidity. Test samples within 1 hour after conditioning.

5. Additional Requirements. The following requirements also apply to this TSO:

a. The maximum operating weight for harnesses approved under this TSO is 450 pounds. The maximum operating weight is the total weight of the individual and all equipment supported by the harness.

b. Construct the harness with stitching that will not unravel when broken.

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR A HUMAN HARNESS Continued

c. Load-bearing Hardware.

(1) Construct all load-bearing hardware (D-rings, buckles, links, and so on) using forged, machined, stamped, extruded, or cast metal. Castings must meet Class I, Grade A requirements of SAE-AMS-STD-2175 (formerly MIL-STD-2175A), Classification and Inspection of Castings. All hardware parts must lack burrs and sharp edges, and must be designed and installed to minimize injury to the occupant.

(2) The load-bearing hardware must meet the fatigue requirements of 14 CFR § 27.571 or 14 CFR § 29.571 as applicable, and the corrosion resistance requirements of NFPA 1983 Paragraph 6.5.6.

d. The manufacturer must prepare Instructions for Continued Airworthiness (ICA) per 14 CFR § 27.1529 or 14 CFR § 29.1529, as applicable. The ICA must include at least the information required by NFPA 1983 Paragraph 3.2.3.2.