ONBOARD SYSTEMS INTERNATIONAL

LIFT WITH CONFIDENCE

TROUBLESHOOTING GUIDE

125-004-00 Revision 1

*As of: August 14, 2009*

- For all TALON™ Cargo Hooks


# TALON Cargo Hook Troubleshooting Guide

- TALON LC Hydraulic Hook
- TALON LC Cargo Hook
- TALON LC Keeperless Hook
- TALON LC Big Mouth Cargo Hook
- TALON MC Cargo Hook
- Remote & Carousel Hooks

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# RECORD OF REVISIONS

| Revision | Date | Page(s) | Reason for Revision |
|---|---|---|---|
| 0 | 06/26/2008 | | Original issue. |
| 1 | 08/14/2009 | 7 | Added information about TALON Keeperless Cargo Hook from SB 159-027-00. |
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The current revision levels for all manuals are posted on the Onboard Systems International website at www.onboardsystems.com. Print copies of the most current revisions for all manuals are available from the factory.

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# Troubleshooting Guide 125-004-00

Revision 0
*As of June 26, 2008*

## *TALON LC Cargo Hook*

- TALON LC Hydraulic Hook

  TALON LC Cargo Hook

  TALON LC Keeperless Hook

  TALON Big Mouth Cargo Hook

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# Section 1—General Information

### INTRODUCTION

With thousands of installations on aircraft around the world, the TALON™ line of cargo hooks from Onboard Systems has proven to be extremely reliable. However, care must be taken during installation and ongoing operations to ensure continued safe operation. If proper care and attention is not paid to the installation and operation instructions, a cargo hook malfunction or an inadvertent load release can result.

This guide outlines field troubleshooting procedures for TALON cargo hook systems. It is intended to provide a general overview of common problems that may occur during external load work as well as suggestions on how to resolve them. This document has not been reviewed or approved by the FAA or other aviation regulatory agencies and is not a substititute for the specific guidelines and proceedures provided in the Owner's Manual, Rotorcraft Flight Manual Supplement, Service Manual or Instructions for Continued Airworthiness. This manual should be used as a guide by experienced aircraft mechanics using standard shop practices and basic troubleshooting skills along with the specific user documentation provided with your cargo hook kit.

Troubleshooting is best done with the cargo hook system installed on the helicopter. Standard shop tools and a quality multi-meter may be required. Before starting, you should have the most current version of each of the applicable technical documents for your system available and be familiar with their contents.

## TECHNICAL DOCUMENTATION

Each Onboard Systems cargo hook kit is supplied with technical documentation that outlines the proper installation, operating and maintenance procedures for the equipment, in addition to important caution and warning information.The technical documentation usually consists of the following:

- Owner's Manual
- Rotorcraft Flight Manual Supplement
- Instructions for Continued Airworthiness
- Service Manual

Current versions of Onboard Systems technical documents can be downloaded from the Onboard Systems website at www.onboardsystems.com through the Customer Support or Product Information areas. Alternatively, you can call Onboard Systems directly at +1-360-546-3072 to obtain copies of the required documentation.

**NOTE**

**It is critical that you take the time to read and understand all documentation before attempting to install, operate or maintain the cargo hook equipment.**

## AUTOMATIC UPDATE NOTIFICATION SERVICE

Onboard Systems offers an automated notification service for documentation updates. This service allows customers to self-register their Onboard Systems products at our website (www.onboardsystems.com) and if any of the documentation for their specific product(s) is updated (or if a Service Bulletin is issued), they will automatically receive a fax or e-mail.

This service allows you to register your Onboard Systems products either by helicopter model or by part number. To access the system, just visit the Customer Support area of the Onboard Systems website and choose "Document Update Service" from the menu.

Simply set up a User ID and password, then select your products. You can choose to receive notifications by either e-mail, fax, or both fax and e-mail. Finally, decide whether you want to receive immediate notification if any of the documentation for a registered product is posted, or just on a weekly or monthly basis.

You can change your preferences at any time by logging back into the system. And if you forget your password, you can ask the system to e-mail or fax your password to you.

## WARNINGS, CAUTIONS AND NOTES

The following definitions apply to Warnings, Cautions & Notes used in this manual:

1. The “Warning” symbol means that if this information is not observed, serious injury, death or immediate loss of flight safety could occur.


2. The “Caution” symbol means that there is a risk of injury or degradation in performance of equipment if this information is not observed.


3. The “Note” symbol draws the reader’s attention to information which may not be directly related to safety, but which is important or unusual.

# Section 2 — Theory of Operation

The primary elements of a cargo hook are the load beam, the internal mechanism, and a DC solenoid. The load beam supports the load and is latched through the internal mechanism. The DC solenoid and an external manual release cable provide the means for unlatching the load beam.

## KEEPERED HOOKS

For keepered hooks, the load beam is normally returned to its closed position after release of the load by a spring in the internal mechanism. In the closed position, a latch engages the load beam and latches it in this position. The load is attached to the load beam by passing the cargo sling ring into the throat of the load beam past a spring-loaded keeper, which secures the load.

To release the load, the latch is disengaged from the load beam. With the latch disengaged, the weight of the load causes the load beam to swing to its open position, and the cargo sling slides off the load beam. A spring in the internal mechanism then drives the load beam back to its closed and latched position.

## KEEPERLESS HOOKS

For keeperless hooks, the load beam is normally held in the open position by a spring-loaded detent. The load is attached to the load beam by passing the load ring into the throat of the load beam and pushing the ring against the upper portion of the load beam throat, which will cause the hook to close. In the closed position, a latch engages the load beam and secures it in this position.

To release the load, the latch is disengaged from the load beam. With the latch disengaged, the weight of the load causes the load beam to swing to its open position, allowing the load hook to slide off the load beam. The load beam then remains in the open position awaiting the next load.

## LOAD RELEASE METHODS

A load release can be initiated by the following methods:

1. ***Electrical Release*** — For all primary and belly hooks, as well as remote and/or carousel hooks, release is normally achieved by pilot actuation of the push-button switch in the cockpit. When the push-button switch is pressed, it energizes the DC solenoid in the cargo hook, and the solenoid opens the latch in the internal mechanism.

2. ***Mechanical Release*** — In an emergency, all primary or belly hooks can also release their loads by operating a mechanical release. A manual release cable is attached to a mechanical release lever, handle or pedal and connected to the internal mechanism of the cargo hook. When the handle is depressed, it will unlatch the load beam. This option is not available for

remote and/or carousel hooks. Hydraulic hooks have their own alternative release method described under method 3 below.

3. ***Hydraulic Release Function*** — For hydraulic cargo hooks, release can be achieved in an emergency by manually operating a hydraulic lever or handle in the cockpit. The lever operates a hydraulic release system which actuates the internal mechanism of the cargo hook to unlatch the load beam.

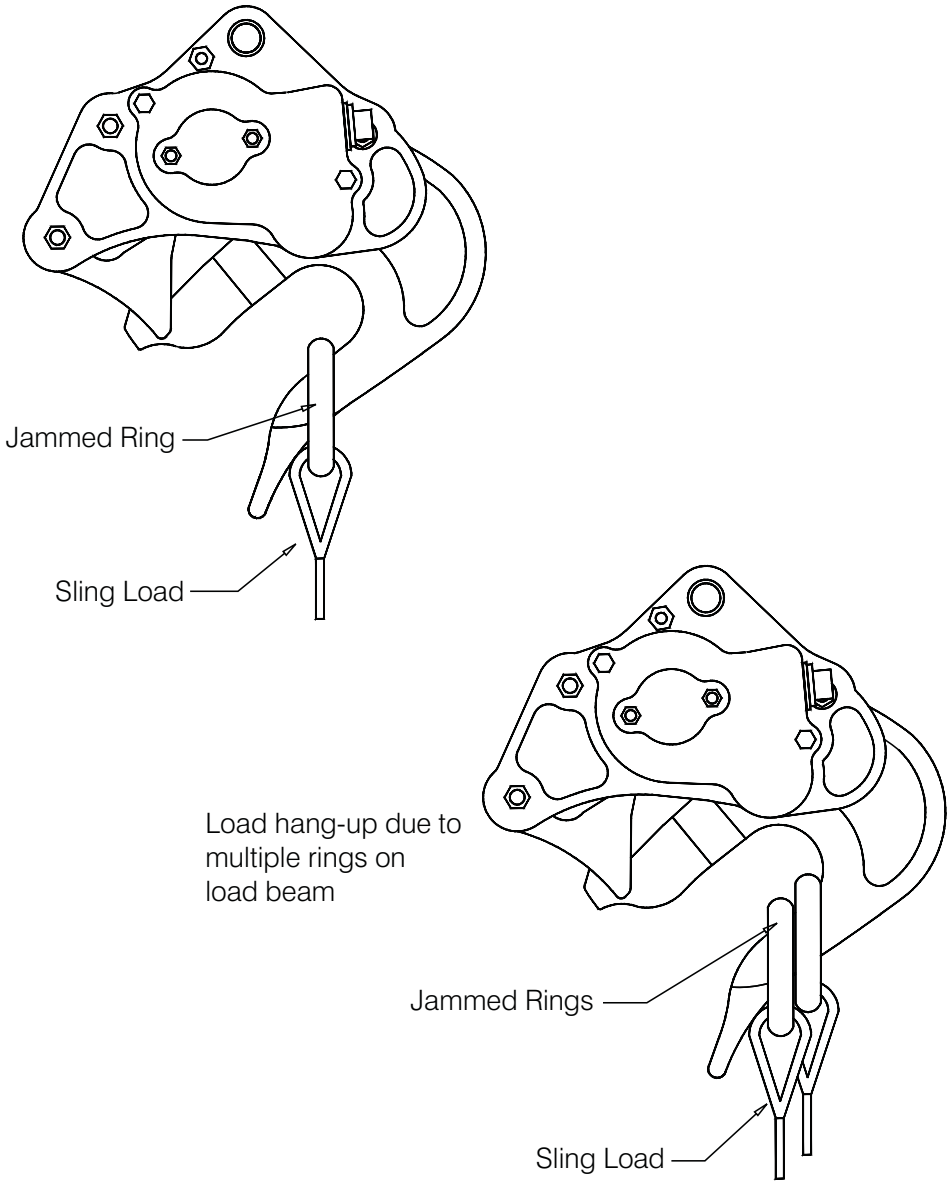
4. ***Manual Actuation*** — On most hooks, including primary and belly hooks, remote and/or carousel hooks, and hydraulic hooks, loads can also be released by the actuation of a lever or knob on the side of the cargo hook by ground personnel.

# Section 3 — Load Hang-ups

## USE OF A LOAD RINGS THAT ARE TOO SMALL, OR MULTIPLE LOAD RINGS

Load rings that are too small or using multiple load rings on a single hook may result in the ring(s) hanging on the load beam when the load is released. Only correctly sized load rings must be used (see Figure 3 for an example). Please refer to the applicable manuals for your particular cargo hook system for specific rigging restrictions.

**Figure 1: Example of how small load rings or multiple load rings can hang up on the keeper.**




5.

# Section 4 — Inadvertent Load Releases

The following list outlines some of the most common installation, operation or maintenance errors that can cause inadvertent releases; however, it is not an exhaustive list. Please refer to the appropriate manual for your particular cargo hook model for additional information about specific causes of inadvertent releases for your cargo hook system.

**A helicopter cargo hook system must be properly installed, maintained and operated in accordance with the applicable technical documentation supplied with the hook. Deviation from these instructions can result in an accidental or inadvertent release of the cargo hook load, resulting in serious injury or death.**


- *Incorrect rigging adjustment for the mechanical release cable*
  Incorrect rigging adjustment of the mechanical release cable can lead to an inadvertent load release. This can be caused during external load operations where the motion of the cargo hook and suspension system can move the cable sufficiently to activate the hook release mechanism. It is critical that the manual release cable rigging be set each time the hook is installed on the aircraft. As each cargo hook installation has unique requirements for the rigging setup, the appropriate manual should be referenced for proper instructions.

  It is critical that the load beam of the Onboard Systems TALON Keeperless style cargo hook is closed and fully locked before installation of the mechanical release cable and setting the cable free play. If the free play is set while the load beam is in the open position, when the load beam is closed it may reduce the amount of free play to an unsafe level that will not allow adequate margin of safety during external load operations. The reduced level of free play on the cable may result in inadvertently activating the release mechanism on the hook during operations, which could cause an inadvertent load release.

  After the free play is set, move the hook and associated suspension system throughout its full range of motion while observing free play. Also check that the manual release cable housing is not kinked or pulled tight in any hook or swing frame position.

  *Restraining of the mechanical release cable*
  Incorrect routing and restraining of the cargo hook mechanical release cable can cause an uncommanded cargo hook release. This can happen when the cable acts as the stop that prevents the cargo hook and suspension system from swinging freely in all directions. If the cargo hook load

causes the hook to strain against the manual release cable, the swaged end of the cable may separate, allowing the inner cable to activate the cargo hook mechanical release mechanism, resulting in an uncommanded release. To prevent this, ensure that no combination of cyclic stick or cargo hook position is restrained by the manual or electrical release cables. Also, check that the manual release cable housing is not kinked or pulled tight by any hook or swing frame position.

- *Incorrect mechanical release cable*
  Each cargo hook installation requires a specific length and configuration of manual release cable. Some Onboard System cargo hook kits include a mechanical cable as part of the kit; other kits utilize the existing OEM cable. It is critical that the operator verify that the correct cable is being used for their particular installation. Installation of an incorrect mechanical release cable may cause an inadvertent release or may prevent the release of the hook. Reference the applicable owner's manual for details.

- *Incorrect release fitting installed*
  Many Onboard Systems hook kits include a release fitting that will adapt the release cable to interface with the cargo hook. It is critical to ensure that the correct fitting is used as this will affect the adjustment of the cable rigging. Installation of an incorrect mechanical release cable may cause an inadvertent release or may prevent the release of the hook. Reference the applicable owner's manual for details on the correct release fitting.

- *Failure to follow required maintenance schedules*
  It is critical to maintain Onboard Systems cargo hooks and any associated external load equipment per the applicable service documentation schedule. Lack of proper maintenance can cause poor or improper performance from the hook and may lead to an inadvertent release or inability to release. Service manuals are available from our website and contain complete hook overhaul schedules and procedures, or you can speak to one of our Technical Support representatives for more information.

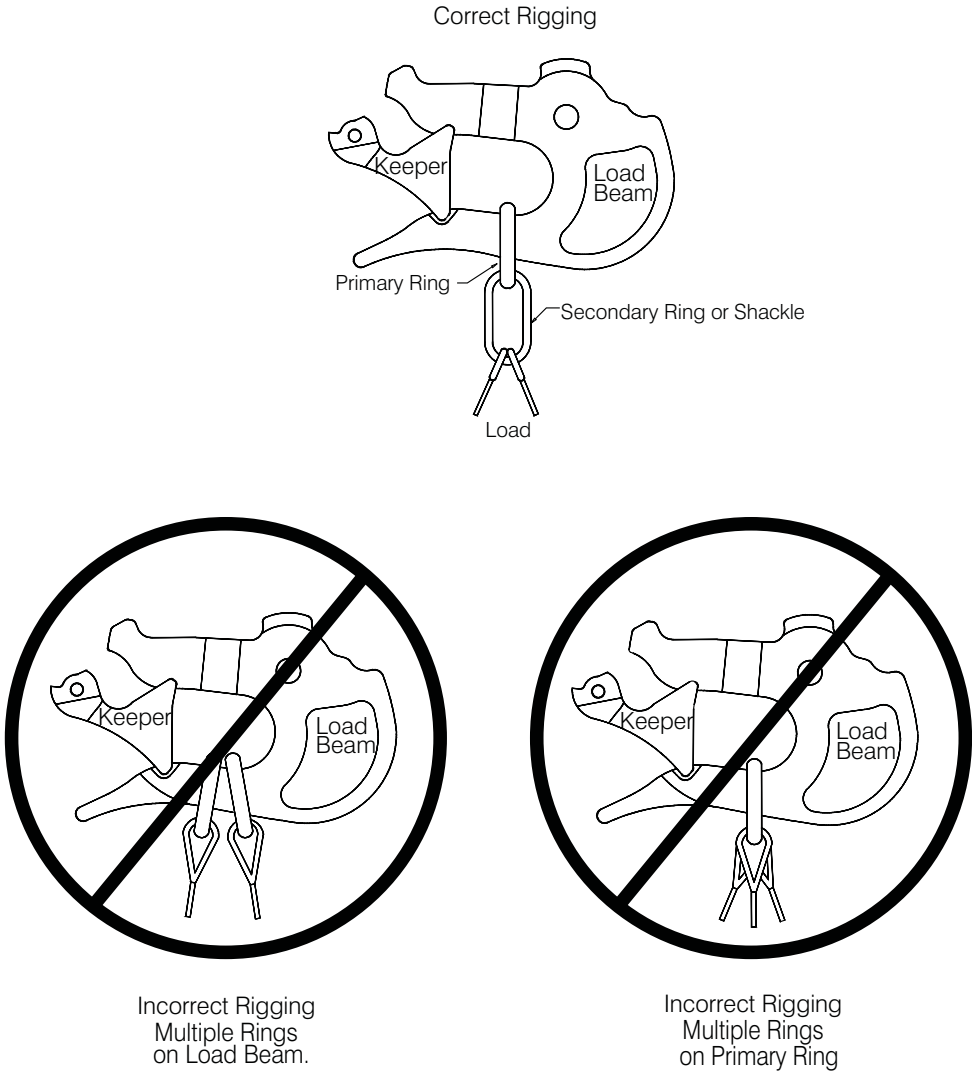
- *Accidental contact with cargo hook release controls by pilot*
  Many aircraft do not utilize guarded switches and controls in the cockpit for the cargo hook release controls. In addition, some installations utilize release switches that only require slight pressure to activate. These factors may lead to a situation where the pilot may accidentally contact the cargo hook release controls during external load operations. It is recommended that before each flight, pilots orientate themselves with the operations of the cargo hook release controls. In addition, they must exercise extreme care during flight to ensure that accidental contact with the controls does not occur.

- *Belly Hook Switch Position (HAC Recommended Practice)*
  Subsequent to a fatal Bell 204 accident in Canada, it was recommended in a judgement that the electric cargo release switch position be standardized

as the bottom switch on the cyclic. While the Helicopter Association of Canada (HAC) does not have the authority to impose such a utilateral requirement, the HAC encourages its members to use Systemic Safety Management Principles to address the risk of unintentional release of under slung cargo or inappropriate emergency response due to inconsistent switch configurations. HAC suggests that helicopter operators mitigate the risks of accidental discharge and inappropriate emergency response by standardizing cyclic switch configurations across their own fleet (as much as possible) with the bottom/lowest switch on the cyclic being reserved to release the belly hook.

- *Use of improper load ring sizes, shapes, material or rigging configuration* Extreme care must be exercised in rigging a load on the cargo hook. Steel load rings are recommended to provide consistent release performance and resistance to fouling. Using incorrect ring sizes, ring combinations or types of rigging can cause the rigging to fall from the cargo hook accidentally. Please refer to the applicable owner's manual or flight manual supplement for the specific ring size specifications. The examples shown in Figure 1 below are not intended to represent all possibilities. It is the responsibility of the operator to ensure the cargo hook will function properly with the selected rigging.

**Figure 2: Example of correct and incorrect cargo hook rigging.**



- ***Uncommanded release due to use of a load ring that is too large***
  Load rings that are too large will cause an uncommanded release. The ring will flip over the end of the load beam, push up against the keeper and then fall free. Only correctly sized load rings must be used. Please refer to example in Figure 2 below. Please refer to the applicable manuals for your particular cargo hook system for specific rigging and ring size restrictions.

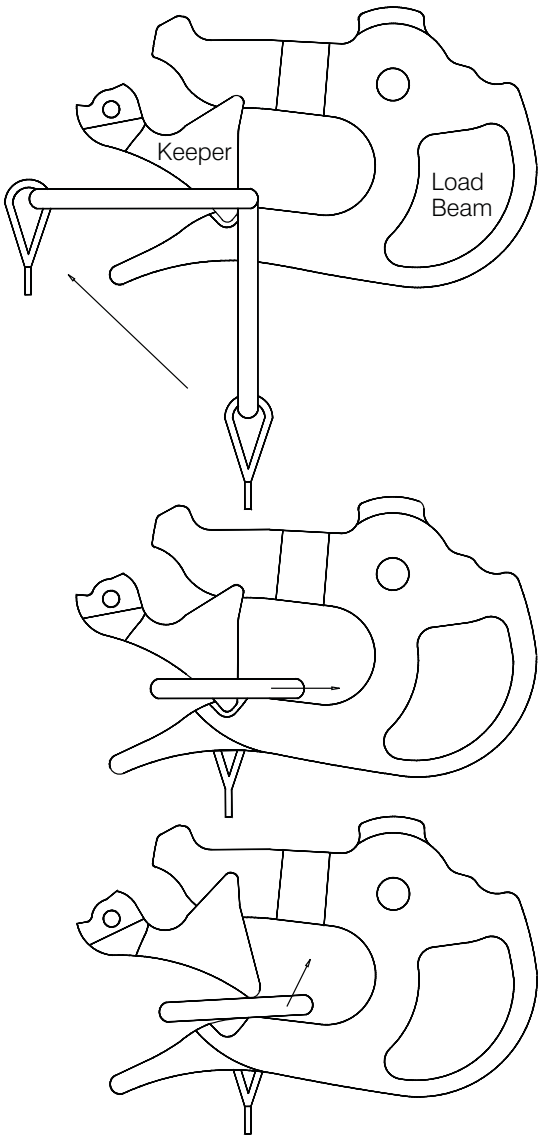
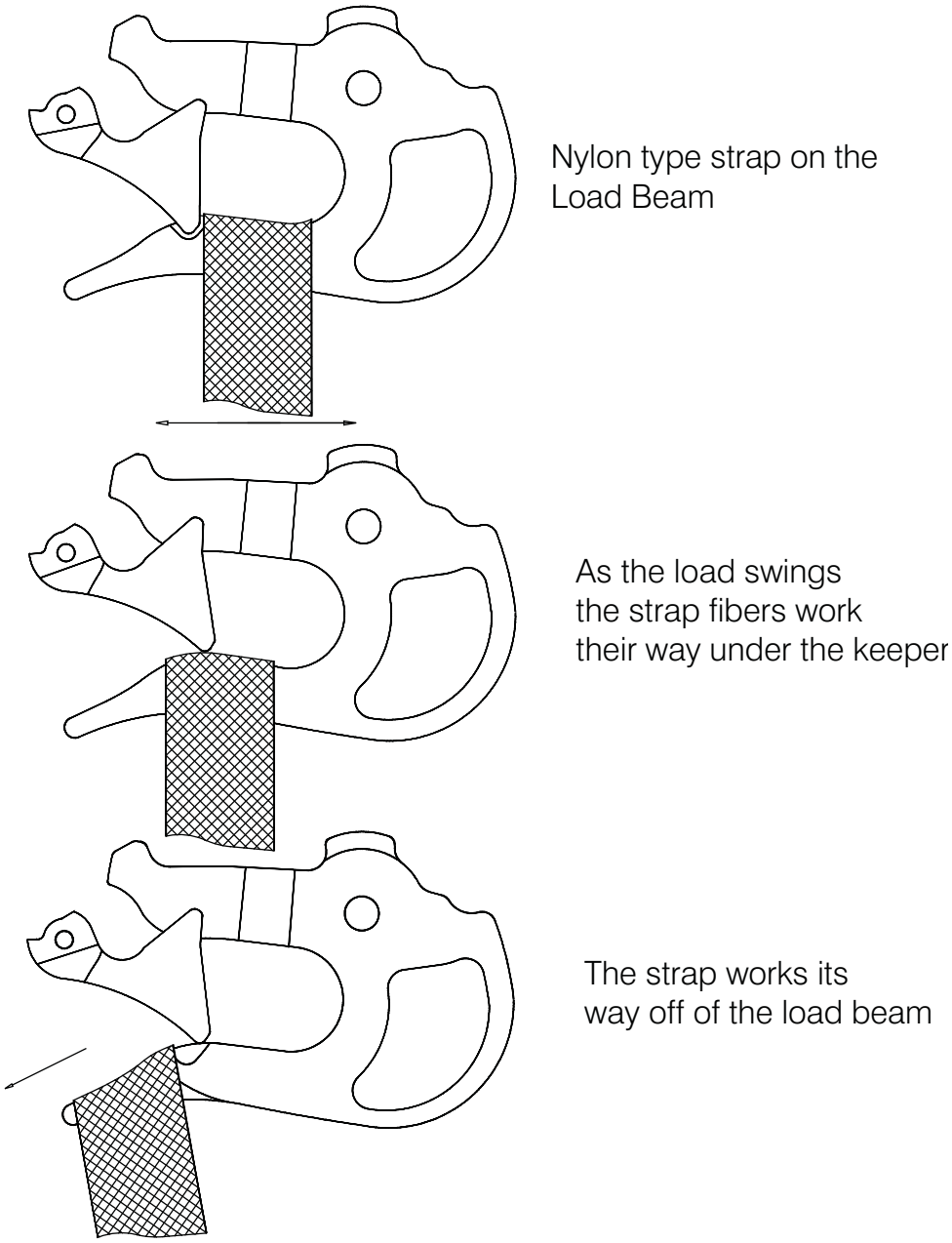



**Figure 3: Example of how incorrect load rings can slip past the keeper.**

- *Uncommanded release due to nylon type straps*
  Nylon type straps (or similar material) must not be used directly on the cargo hook load beam as they have a tendency to creep under the keeper and fall free. If straps must be used they should be first attached to a correctly sized primary ring. Only the primary ring should be in contact with the cargo hook load beam. Please refer to Figure 4 for an example:

**Figure 4: Example of how nylon straps used directly on the load beam can slip past the keeper.**



- ***Uncommanded release due to cable or rope type straps***
  Cable or rope type straps must not be used directly on the cargo hook load beam. Their braided eyes will work around the end of the load beam and fall free. If cable or rope is used they should be first attached to a correctly sized primary ring. Only the primary ring should be in contact with the cargo hook load beam. Please refer to Figure 5 for an example:

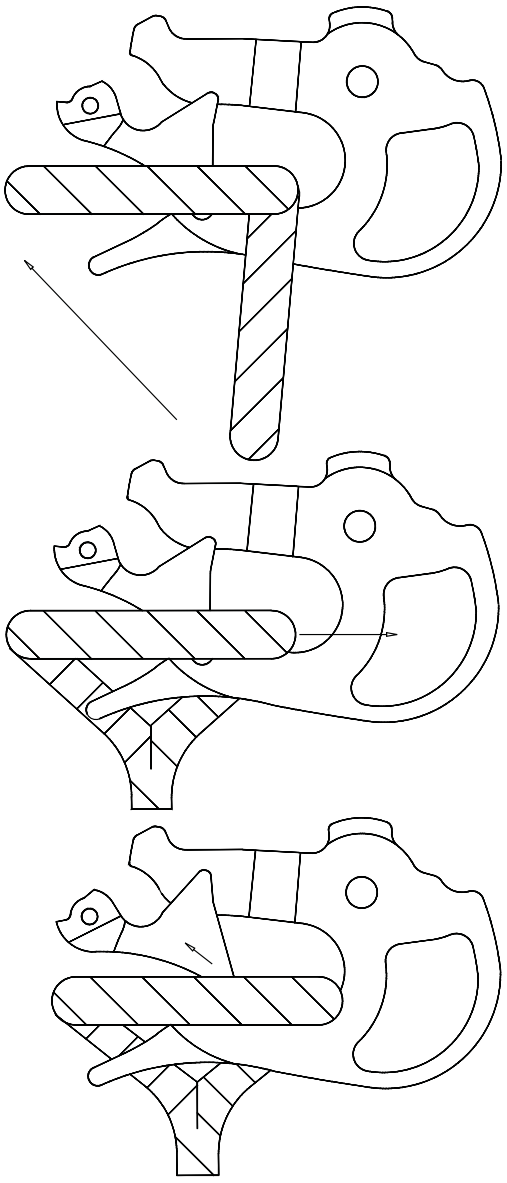



**Figure 5: Example of how cable or rope straps used directly on the load beam can slip past the keeper.**

- *Cargo hook is not completely latched*
  If the load beam is not fully locked and latched an inadvertent load release can occur. This can happen if the mechanical release cable is worn, binds or sticks and prevents the cargo hook mechanism from locking. Therefore, after loading the rigging onto the cargo hook, it is important to verify that the cargo hook load beam is properly latched. Do this by pulling on the rigging and load beam to ensure the load beam does not open. If so equipped, verify that the hook is locked by observing the hook locked indication on the cargo hook. In addition, regularly check the condition of the mechanical release cables for signs of damage, binding or wear, and replace as needed by referring to the owner's manual and other technical documentation provided with the cargo hook.
- *External aircraft equipment contacting hook release lever or load beam keeper*
  If aircraft components or accessories are able to swing into contact against the cargo hook release lever or knob, they may be able to open the cargo hook, releasing the load. In addition, if aircraft components are able swing up against the keeper, it could lift up the keeper and allow the rigging to slide off the hook. Therefore, after the initial installation of the cargo hook system onto the aircraft and again after components or accessories are added or modified on the aircraft, the system should be checked. Move the cargo hook and suspension system in all directions and ensure that no aircraft components or accessories are able to contact the cargo hook release lever, knob or keeper.
- *Power surge to cargo hook*
  Shorts or faults in the electrical wiring, switches, relays, fuse blocks, etc. may cause aircraft power to be routed to the cargo hook without the pilot contact on the electrical release switch, which could cause an inadvertent release of the external load. The aircraft cargo hook electrical system should be regularly inspected for shorts, damage or wear and be repaired or replaced as needed following the schedule provided in the owner's manual and other technical documentation for the cargo hook and aircraft documentation.

# Section 5 — Troubleshooting Tables

| TABLE 1: CARGO HOOK TROUBLESHOOTING | | |
|---|---|---|
| **SYMPTOM** | **PROBABLE CAUSE** | **CORRECTIVE ACTION** |
| Cargo hook does not operate electrically, manual release operates normally<br>*or*<br>Circuit breaker opens or fuse blows when Cargo Hook is energized | Cargo hook electrical polarity is reversed, short or open in the system, faulty wiring, circuit breaker or solenoid | 1. Disconnect electrical cable from electrical connector on Cargo Hook.<br>2. Activate cargo hook electrical release switch. If the circuit breaker or the fuse opens, fault lies within the aircraft electrical. Check for short or opens in aircraft electrical system.<br>3. The hook is equipped with a suppression diode that typically will short if the cargo hook electrical connection is reversed. Verify that the aircraft electrical harness pin out matches the requirements of the cargo hook. If the aircraft pin out is incorrect and the hook was energized, the hook diode will have to be replaced<br>4. Use a multimeter to check the ohms reading between pins A and B of hook electrical connector. Verify the range is within the acceptable range as specified in the service manual.<br>5. If open or short indication is obtained or a reading outside the acceptable range, remove solenoid assembly from cargo hook and remove suppression diode from the assembly.<br>6. Check solenoid resistance; replace solenoid if outside acceptable ohm range. If within range, replace suppression diode. |
| Cargo hook does not operate manually, electrical operates normally | Defective manual release cable or defective manual release system | 1. Check manual release cable for binding or sticking of inner cable<br>2. Verify manual release cable is properly connected to the cargo hook and rigging is properly set |
| Cargo hook does not operate electrically or manually | Defective internal mechanism | Disassemble, and inspect internal mechanism for binding, jamming, and worn or broken parts by referring to the specific owner's manual and other technical documentation for the cargo hook. |
| Load beam fails to relatch after load release | Defective latch mechanism | 1. Check manual release cable for binding or sticking of inner cable<br>2. On keepered hooks, if load beam does not auto relatch, check return spring, pin, and arm assembly. |

| TABLE 1: CARGO HOOK TROUBLESHOOTING | | |
|---|---|---|
| **SYMPTOM** | **PROBABLE CAUSE** | **CORRECTIVE ACTION** |
| Excessive cargo hook manual release pull-off | | 1. Check pivot points for excessive friction and lubricate<br>2. Check contact surfaces between latch and load beam<br>3. Check operation of unit using manual release lever |
| Inadvertent load release | | See “Section 4 — Inadvertent Load Releases” on page 7. |

# Section 6 — Returning an Item to the Factory

When an item is to be returned to the factory for service:

- Package the item carefully to ensure safe transit

  Include an explanation of the problem and symptoms

  Include your company name, contact name, address, phone and fax number

  Return the item freight, cartage, insurance and customs prepaid to:

**Onboard Systems**
**Service Department**
**13915 NW Third Court**
**Vancouver, WA 98685**
**USA**

**Telephone: 360-546-3072**
**Fax: 360-546-3073**
**E-mail: info@onboardsystems.com**