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**E-47B Electronic  
Load Weigh System**

*for the  
Bell 204, 205, 210, 212, and 412 series,  
Agusta AB412 series, and  
Garlick UH-1H helicopters*

**Owner's Manual**

*Owner's Manual Number 120-021-00  
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## RECORD OF REVISIONS

<i>Revision</i>	<i>Date</i>	<i>Page(s)</i>	<i>Reason for Revision</i>
9	08/07/06	Title page, 1-1, 1-4, 2-7, Section 4, Section 5	Added additional models to title page. Updated maintenance information. Added kit part number 200-044-01. Added kgs to Weight and Balance table and added reference to RFMS 121-034-00 on page 2-7. Removed RFMS from section 5 and created new RFMS document number 121-034-00.
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11	1/25/08	1-4	Changed 200-044-00 to use internal harness 270-044-01.
12	2/25/08	2-4, 2-5, 4-4, Table 4-1	Changed shield wire connection instructions. Added inspection criteria for P/N 290-055-00.
13	03/31/09	2-5	Added note to trim electrical conduit if necessary to accommodate short tube P/N 290-055-00. Updated note format. Added note to adjust manual release cable.
14	3/2/10	TOC, Section 2 & Section 4	Updated manual to reflect new load weigh harness configuration. Changed overhaul frequency criteria.
15	03/20/13	1-4	Replaced indicator in kit 200-044-01.
16	03/01/18	4-1, 4-2, 4-3	Updated 5 year/1000 hour inspection actions. Removed requirement to perform magnetic particle inspection of load cell, removed daily check, updated definition of “hours of external load operations” remove “Verify calibration of the load cell by lifting a load of known weight”.

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# Section 1

## General Information

### Introduction

The Onboard Systems Load Weigh System is a compliment to the helicopter lifting system. Its purpose is to display the weight of the load carried on the cargo hook. The Load Weigh System consists of three components, the cockpit mounted Indicator, the Internal Harness and the Load Cell. The system is designed specifically for each helicopter and is intended to be a permanent installation.

### Safety Labels

The following definitions apply to safety labels used in this manual.



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Draws the reader's attention to important or unusual information not directly related to safety.



Used to address practices not related to personal injury.

## System Part Number

<b>Part Number</b>	<b>Description</b>
200-044-00	E-47B Load Weigh System
200-044-01	E-47B Load Weigh System

## Indicator Features

The features of the C-39 Indicator include:

- Front panel programmable
- Data Recorder communications link
- Internal back lighting system
  - Indicator P/N 210-095-00, 28 Volt lights
  - Indicator P/N 210-095-02, 5 Volt Lights
- Night Vision Compatible (NVG) When an external NVG source is used in place of the internal back light.
- Hook-Open Warning Display
- Analog Meter Output Signal

## Indicator Specifications

**Table 1-1 Indicator Specifications**

<b>SPECIFICATIONS</b>	<b>INDICATOR</b>
Size	Fits standard 2¼" clock hole
Weight	.43 lbs (.20 kgs)
Operating Voltage	21 to 31 VDC
Current Consumption	< 25 mA
Accuracy Over Operating Temperature Range	0.1% ± 1 digit
Operating Temperature Range	+70°C to -45°C
Storage Temperature Range	+80°C to -50°C
Scaleable Analog Output	0 to 5VDC ± 0.5%

## Indicator Pin Out

The connector located on the back of the Indicator has the following pin out.

**Table 1-2 Indicator Pin Out**

<b>Pin Letter</b>	<b>Function</b>
A	+ 28 VDC In
B	- Load Cell Signal
C	+ Load Cell Signal
D	+ Load Cell Excitation
E	Load Cell Common
F	Analog Out Common
G	+ Analog Out
H	Hook Open
J	Data Recorder Clock
K	Data Recorder Data
L	Shield
M	Back Light Common
N	Back Light Source
P	Aircraft Ground
R	Not Used

## Load Cell Specifications

Table 1-3 Load Cell Specifications

SPECIFICATIONS	LOAD CELL
Weight (includes clevis)	2.0 lbs (.91 kgs)
Accuracy Over Operating Temperature Range	0.5% ± 1 digit
Operating Temperature Range	+70°C to -45°C
Storage Temperature Range	+80°C to -50°C

## Bill Of Materials

The following items are included with each system, if shortages are found contact the distributor from whom the system was purchased.

Part No.	Description	Qty	
		200-044-00	200-044-01
120-021-00	Owner's Manual	1	1
121-034-00	RFMS	1	1
210-095-00*	C-39 Indicator, 28 Volt Lights	1	opt.
210-095-02*	C-39 Indicator, 5 Volt Lights	opt.	1
210-045-00	E-47B L/C & Clevis Assy	1	-
210-045-01	E-47B L/C & Clevis Assy	-	1
290-055-00	Tube	1	1
270-044-01	Harness Assembly	1	1
400-048-00	Power Switch	1	1
215-010-00	Placard	2	2
215-012-00	Placard	1	1
512-001-00	Ty-Wrap	10	10
510-028-00	Screw	4	4
510-029-00	Nut	4	4

\* 210-095-00 and 210-095-02 Indicators are compatible with both 200-044-00 and 200-044-01 kits. Verify Indicator voltage matches aircraft lighting system voltage (5V or 28V).

## Inspection

Inspect each component for evidence of mishandling and damage. If damage is evident, do not use it. File a claim with the carrier and notify the distributor from whom the system was purchased.

# *Section 2*

## **Installation Instructions**

### **Introduction**

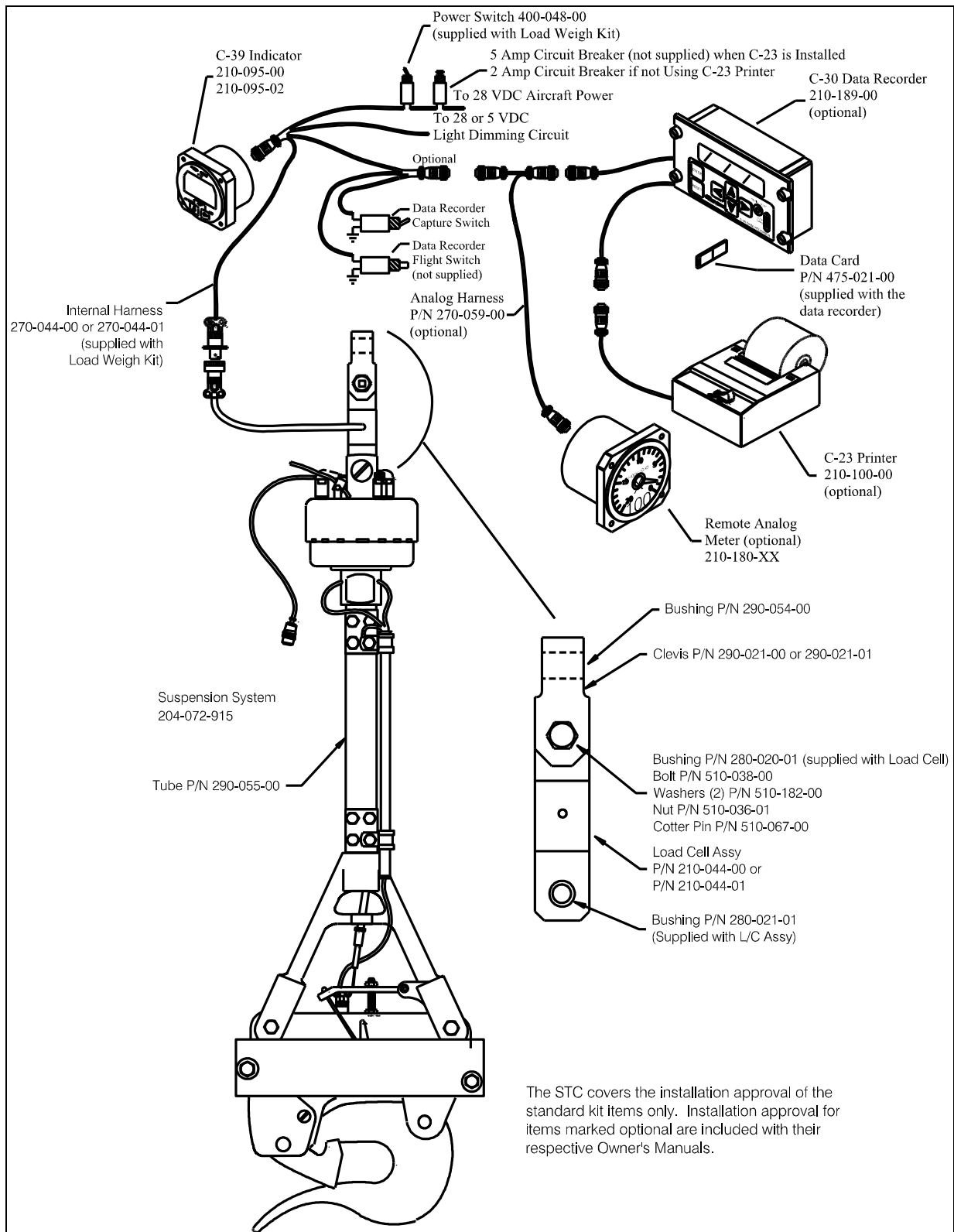
This section describes how to install the components of the Electronic Load Weigh System.

The following instructions are provided for the benefit of experienced aircraft maintenance facilities capable of carrying out the procedures. They must not be attempted by those lacking the necessary expertise.

### **System Installation Overview**

Refer to the following page for an overview of the system installation.

**Figure 2-1 System Installation Overview**



## Internal Harness Installation

The Internal Harness is made up of four cables terminated to one connector. The connector is plugged into the back of the Indicator. One of the cables is marked "LOAD CELL" and is fitted with a bulkhead fitting. This cable is connected to the load cell. Another cable is marked "POWER" and is connected to the aircraft electrical power. Another cable is marked "LIGHT", refer to the *Indicator Internal Back Light* section for installation instructions. The last cable is marked "DATA" and can be connected to the optional Data Recorder or Analog Slave Meter.



*This data cable may or may not be terminated with a connector depending on manufacture date.*

Route the cable under the floor boards, with the existing aircraft wire bundles to the "forward cant. bulkhead". Attach the bulkhead fitting to the forward cant. bulkhead using the Ty-wraps provided. Secure the cables to the existing wiring bundles with the Ty-wraps.

**Secure the cables clear of flight control rods.**

## Indicator Installation

The Indicator should be mounted in a position that is convenient, accessible and visible to the pilot. It can be mounted in a standard 2¼" instrument hole. Connect the Indicator to its Internal Harness, refer to *Internal Harness Installation*.

## Indicator Internal Back Light

The 210-095-00 Indicator is equipped with an Internal Back Lighting System that can be connected to the aircraft 28 VDC light dimming circuit. Use a 22 gauge, twisted pair, shielded cable to connect the aircraft dimming circuit to the Internal Harness. Cut off the cable shield wire at the light dimmer end.

The 210-095-02 Indicator is equipped with an Internal Back Lighting System that can be connected to the aircraft 5 VDC light dimming circuit. Use a 22 gauge, twisted pair, shielded cable to connect the aircraft dimming circuit to the Internal Harness. Cut off the cable shield wire at the light dimmer end.

## **Indicator Hook-Open Warning**

The 210-095-00 & 210-095-02 Indicators are equipped with a Hook-Open Warning feature that can be connected to a cargo hook equipped with a hook open switch. Depending on the capabilities of the cargo hook switch, the Indicator will flash "HOOK OPEN" when the cargo hook load beam is open. The cargo hook switch must be normally open when the cargo hook load beam is in the closed position. When the load beam is open, one side of the switch must be grounded and the other side of the switch is to be connected to the Indicator. Use a 22 gauge, shielded wire to connect the cargo hook switch to the Indicator. Disassemble the Indicator mating connector and carefully solder the wire, from the cargo hook switch, to pin H. Cut off the cable shield wire at the light dimmer end.

## **Remote Analog Meter**

The 210-095-00 and 210-095-02 Indicator is equipped with an Analog drive circuit that can be connected to a user supplied remote analog meter. Use a 22 gauge, twisted pair, shielded cable to connect the remote analog meter to the Indicator. Disassemble the Indicator mating connector and carefully solder the positive wire, from the analog meter, to pin G and the common wire to pin F. Cut off the cable shield wire at the light dimmer end.

The 210-095-00 and 210-095-02 Indicator can be connected to Onboard Systems' Analog Slave Meter, P/N 210-180-00, through the "DATA" cable. This meter gives solid weight indications without needle bounce. The Analog Slave Meter may be mounted in any convenient location in a standard 3" instrument hole. Attach connector, P/N 410-130-00, to data line per pin out in Figure 2-2 to connect the Analog Slave Meter to the Internal Harness "DATA" cable. If a data connector is present on the data line use cable, P/N 270-059-00, to connect to Analog Slave Meter.



## Load Cell Installation

Remove the cargo hook suspension system assembly P/N 204-072-915-11 from the aircraft. Remove link P/N 205-070-944-3 from the suspension system assembly, this link will not be used in the installation. The Load Cell & Clevis Assembly P/N 210-045-01 will be used in place of the link.

### NOTICE

*If your aircraft is equipped with Bell P/N 204-030-841 hard point (204B and 204B-1) contact Onboard Systems to obtain P/N 290-021-01 Load Cell Clevis. This Load Cell Clevis replaces the 290-021-00 Load Cell Clevis in the assembly P/N 210-045-01 (210-045-00 if kit P/N 200-044-00 is installed) and allows additional clearance for installation.*

Remove the tube (shaft) P/N 204-072-920-1 from the suspension assembly. Replace the tube with the shorter one provided, P/N 290-055-00.

### NOTICE

*It may be necessary to cut the conduit for the electrical harness to a shorter length to accommodate tube P/N 290-055-00.*

Re-install the suspension assembly with the load cell cable pointing to the left and aft using the hardware removed. Use a general purpose grease (MIL-G-23827) on the bolts and the bushings.

Adjust the manual release cable to account for the shorter distance between the top of the bell housing and cargo hook. **Swing the hook assembly to the full extremes to verify that it does not self trip.**

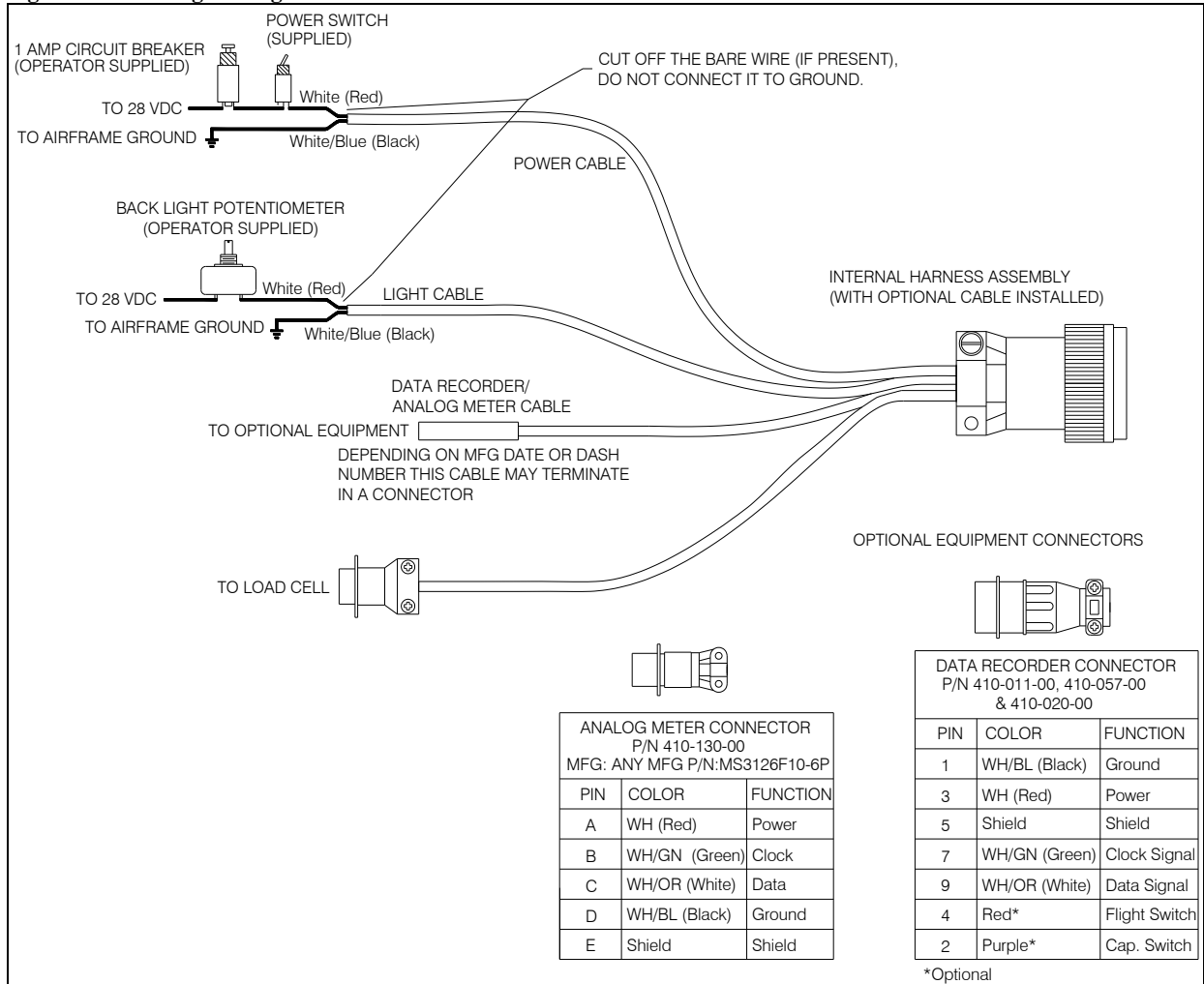
Secure the load cell cable to the existing wiring bundle with the Ty-wraps provided.

# Electrical Connections

Install the supplied power switch, P/N 400-048-00. The “POWER” cable on the Internal Harness is supplied extra long, cut off the excess cable and use as needed to connect the switch and circuit breaker. Connect the “POWER” white (or red wire if earlier harness configuration P/N 270-044-00 is installed) wire to one side of the power switch, connect another piece of suitable wire to the other side of the switch and then to an available 1 or 2 amp circuit breaker as illustrated in Figure 2-2. Connect the circuit breaker to the 24 VDC bus. Connect the white/blue wire (or black wire if 270-044-00 is installed) to the ground bus. The bare wire (present on P/N 270-044-00 harness only) should be cut off as it is not needed at this end of the cable. Use a minimum of 22 gauge wire to make all connections. Secure the connections and protect from corrosion.

The following figure shows the wiring arrangement. Wire colors for harness P/N 270-044-00 are shown in parentheses.

**Figure 2-2 Wiring Arrangement**



## Electrical Connections, continued

Connect the Internal Harness to the Indicator connector. Install the placard 215-010-00 "ELECTRONIC WEIGHING SYSTEM" next to the power switch and circuit breaker. Install the placard 215-012-00 "TURN THE WEIGHING SYSTEM OFF WHEN NAVIGATION EQUIPMENT IN USE" "NO AIRCRAFT OPERATION SHOULD BE PREDICATED ON THE READING OF THE ONBOARD WEIGHING SYSTEM" next to the Indicator.



*If the C-23 Printer is being utilized with the C-30 Data Recorder, a 5 amp circuit breaker should be used.*

## Installation Check-Out

After the system has been properly installed, activate the circuit breaker to turn the system on. Refer to *Operation Instructions*.

Perform an EMI ground test per AC 43.13-lb section 11-107. For equipment that can only be checked in flight an EMI flight test may be required.



*The load cell is of a class of equipment not known to have a high potential for interference. This class of equipment does not require special EMI installation testing (i.e. FADEC) as required in paragraphs 7 and 8 of FAA policy memorandum ASW-2001-01.*

**Ensure that the cargo hook is free to move to its full extremes.**

**Ensure that all electrical cables are secured clear of flight control rods and hydraulic lines.**

## Weight and Balance

ITEM	WEIGHT
Indicator	.43 lbs (.20 kgs)
Load Cell & Clevis	2 lbs (.91 kgs)
<b>Total</b>	<b>2.44 lbs (1.11 kgs)</b>

## Paper Work

Insert the Rotorcraft Flight Manual Supplement 121-034-00 into the aircraft flight manual. In the US fill in FAA form 337 for the initial installation. This procedure may vary in different countries. Make the appropriate aircraft log book entry.

# Section 3

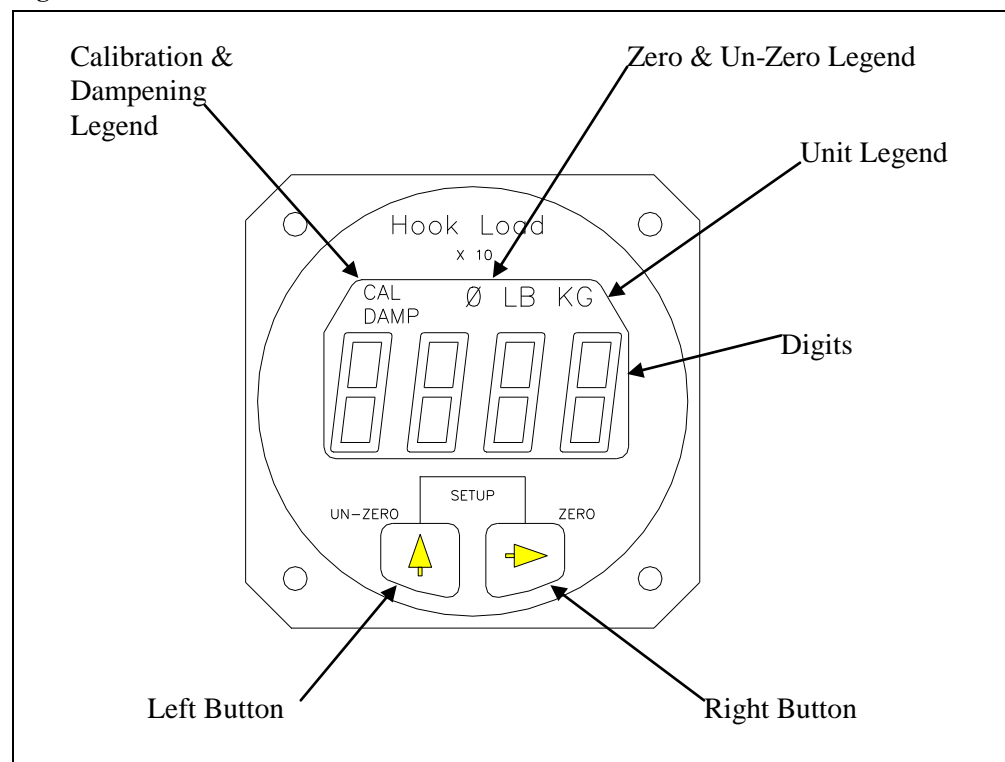
## Operation Instructions

### Indicator Front Panel

The C-39 Indicator front panel includes the following features.

- The four 7 segment LCD digits show the weight on the Cargo Hook and display various setup information.
- The Legends clarify the digital display, i.e. - when the LB Legend is turned on, the display will be pounds, etc.
- The right button is used to Zero the display in the Run Mode and select the digit to be changed in the Setup Mode.
- The left button is used to Un-Zero the display in the Run Mode and scroll the selected digit in the Setup Mode.

Figure 3-1 Front Panel

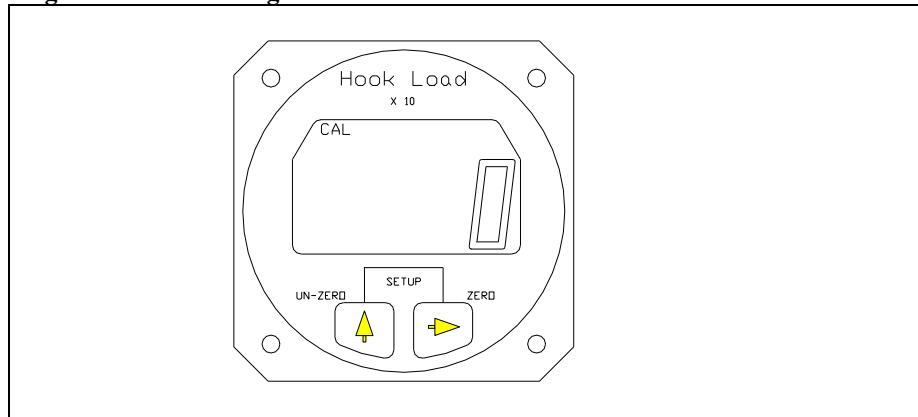


## The Run Mode

The C-39 Indicator has two operating modes, Run and Setup. The Run Mode is used to display the cargo hook weight and the Setup Mode is used to setup or configure the Indicator to the helicopter and to the Load Cell. When powered up, the Indicator always comes on in the Run Mode.

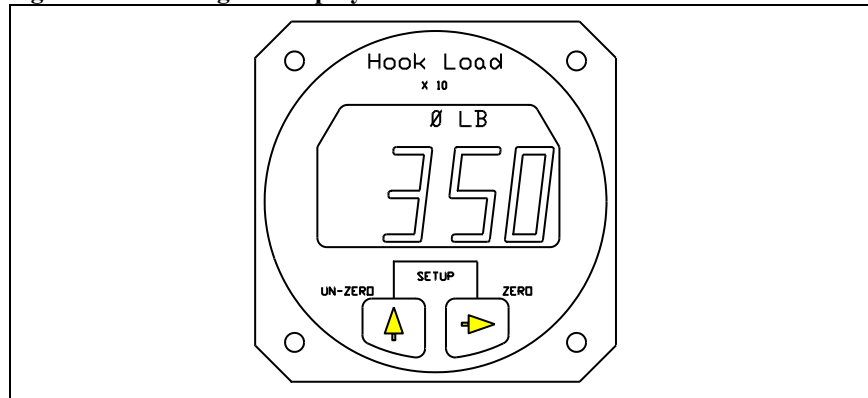
After the Indicator has been correctly installed, power it up by activating the aircraft electrical system. The Indicator will go through a self-diagnostic routine. During this routine the display will display all of the digits and legends. If a problem is found during the routine an Error Code will be displayed. For an explanation of Error Codes see the section *Error Codes*. After the diagnostic routine the display should look like this:

**Figure 3-2 After Diagnostic Routine**



The illustration is of the Indicator in the Run Mode with no load on the hook. Note the LB legend displayed.

**Figure 3-3 LB Legend Displayed**

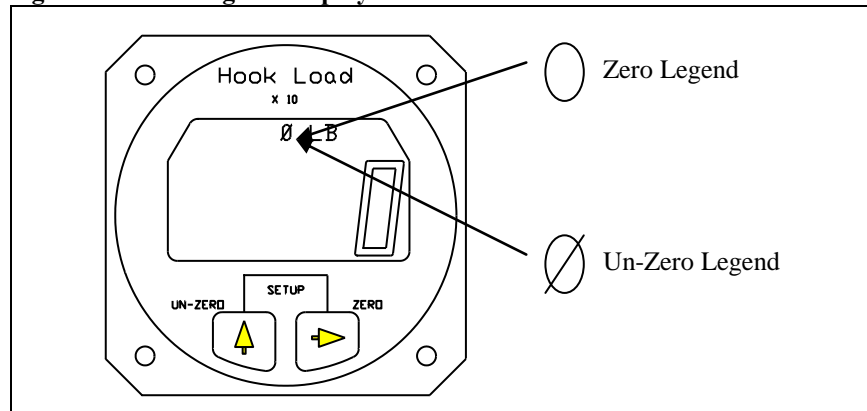


The illustration is a typical hook load reading. The display is 3,500 pounds, note the last digit is not displayed.

## To Zero or Tare the Display

The zero feature is used to zero or tare the weight on the Cargo Hook that is not wanted, such as the weight of a cargo net or long line. The Right button is used to zero the Indicator reading. When the Right button is pressed the display is zeroed. The zero legend is turned on and the zeroed number is stored in memory. If the Right button is pressed again, before the Un-zero button is pressed, the display blinks in response to the button closure. Zero is only available in the Run Mode.

**Figure 3-4 Zeroing the Display**



## To Un-Zero the Display

The Left button is used to add the zeroed value back into the current Indicator reading or Un-zero the display. When the Left button is pressed, the number previously zeroed is added to the current display and the Un-zero legend is turned on. If the Left button is again pressed before the zero button is pressed, the display blinks in response to the button closure. Un-Zero is only available in the Run Mode.

## The Run Mode continued

### Error Codes

Error Codes are the result of difficulties discovered during the Indicator diagnostic tests. Diagnostic tests occur at power up and during the execution of certain routines. Listed below is a matrix of the Error Code displays, their meaning and possible corrective action. Pressing either button will usually bypass the error code, however, the displayed information may be suspect.

**Table 3-1 Indicator Error Codes**

<b>DISPLAY</b>	<b>CAUSE</b>	<b>POSSIBLE CORRECTIVE ACTION</b>
Err 1	A/D or D/A circuit failure	Potential short in the optional analog meter cable. Clear short and power cycle the Indicator by turning the power to the Indicator off for a few moments. If Error Code continues, return the Indicator to the factory.
Err 2	NV Ram failure	Power cycle the Indicator; if Error Code continues, return the Indicator to the factory.
Err 3	NV Ram write failure	Re-enter data, if Error Code continues, return the Indicator to the factory.
Err 4	NV Ram busy failure	Power cycle the Indicator, if Error Code continues return the Indicator to the factory.



## The Setup Mode

The C-39 Indicator can be used with a wide range of helicopters and load cells. The Setup Mode on the Indicator matches the Indicator to the Load Cell and to the helicopter. This is accomplished by entering data into the Indicator. Entered data includes the load cell Calibration Code, the units that the Indicator should read-out (pounds or kilograms), and several other items.

The Indicator has a group of Setup routines, arranged in menu form, that are used to configure the Indicator. Shown on the next page is a matrix of the Setup routines and a brief discussion of their function and how they are programmed. A complete discussion of each setup item is presented later in this section.

To enter the Setup Mode press both the Right and Left buttons at the same time while the Indicator is powered up and in the Run Mode. To exit the Setup Mode and return to the Run Mode, press both the buttons at the same time. If you are in a Setup routine and have started to change an entry, but you change your mind before completing the procedure, power cycle the Indicator to exit the Setup Mode and then go to the Run Mode without changing the item. The Indicator is power cycled by turning the Indicator power off for a few moments.

## The Setup Mode, continued

**Table 3-2 Indicator Setup Routines**

MENU	FUNCTION	DISPLAY
Press the Left button to scroll through the menu	Press the Right button to view or change the menu item.	To return to the Run Mode press both the Right and Left buttons at the same time.
DAMP	<u>Dampening Level</u> , sets the pilots preference for display dampening.	Blinking display is previously entered Dampening Level. Select the desired dampening level by pressing the Left button.
CODE	<u>Calibration Code</u> , matches the Indicator to the Load Cell.	Display is previously entered CAL Code. The Code is changed by selecting the digit to be changed with the Right button. The selected digit will blink. Change the blinking digit by pressing the Left button.
0 in	<u>Installation ZERO</u> , matches the Indicator to the installed Load Cell and to the helicopter. After this procedure the display will be zero when no load is on the Cargo Hook.	Display is a combination of load on the Load Cell, and normal load cell zero offset. Remove all weight from the installed Load Cell except the Cargo Hook, and press any button to complete the procedure and return to the Run Mode.
LOAD	<u>Load</u> , is used to calibrate the system by lifting a known load.	No previous display is shown. Enter the known load using the Right button to select the digit to be changed and Left button to enter the number. Known load is entered "X 10" i.e.; 5000 kilograms is entered as 500. After the known load is entered, press both buttons at the same time and lift the known load. When the load is stabilized press either button. A new Calibration Code will be calculated and the known load will be displayed. This completes the procedure.
Scale	<u>Scale</u> , matches the analog output of the Indicator to an optional remote analog meter.	Display is previously entered number. To change the number use the Right button to select a digit, use the Left button to scroll the digit to the desired number. Entry is times 10.
LB KG	<u>Units</u> , selects the Indicator units (pounds or kilograms).	Display is previously selected unit. To change the unit, use the Left button.
XX - V	<u>Version</u> , is the revision level of the Indicator hardware and software.	Version is for information only, it cannot be changed.

## The Setup Mode, continued

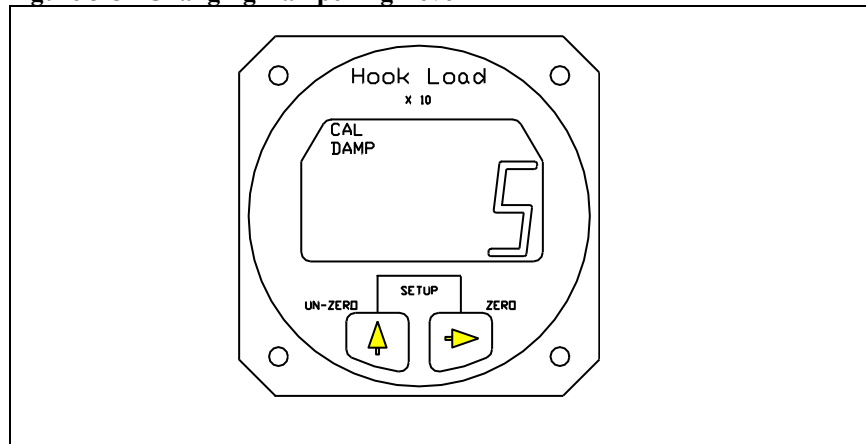
### Indicator Dampening

The Damp or dampening routine allows the pilot to adjust the Indicator dampening level to his preference. The dampening routine is a program that stabilizes the Indicator reading. It offers a trade-off between Indicator responsiveness and stability. Ten dampening levels are available, from 0 through 9. At level 0 the display responds to the slightest change in weight. However, if the load bounced even slightly, the display digits would respond instantly, making the display look unstable. With a dampening level of 9, the display would be stable under the most turbulent conditions, however, it would take several seconds for the display to respond to a change in weight. The ideal dampening level will depend on the flying conditions. A mid range setting of 5 or 6 is usually adequate.

### To Look at or Change the Dampening Level

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu, using the Left button, until the word DAMP is displayed. To look at or change the Dampening Level press the Right button. The display should look like this:

**Figure 3-5 Changing Dampening Level**



The CAL and the DAMP legend is turned on and the previously set dampening level is displayed. To return to Run without changing the current dampening level press both the Right and Left buttons at the same time. To change the dampening number, use the Left button to scroll the blinking digit to the desired number. After the selection has been made press both the Right and Left buttons at the same time to return to Run.

### Indicator Calibration

The Calibration Code, or CAL code, is a mandatory input. The Indicator will not accurately display the load without the correct Calibration Code. The Calibration Code scales the signal from the Load Cell.

## The Setup Mode, continued

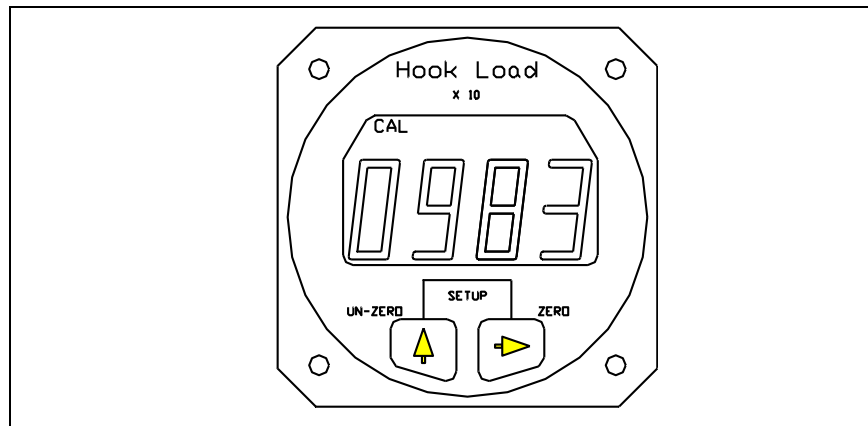
### Indicator Calibration, continued

If the C-39 Indicator was supplied as part of a Load Weigh System, the Calibration Code will have been entered into the Indicator by the factory, however, it should be confirmed. If the Indicator is to be mated to a different Load Cell, it must be calibrated before use. Calibration can be done by entering a known Calibration Code or by lifting a known load and having the Indicator calibrate itself. Both options are discussed below.

### To Look at or Change the Calibration Code

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word CODE is displayed, then press the Right button. The display should look like this:

Figure 3-6 Changing the CAL Code



The CAL legend is turned on and the previously entered or computed Calibration Code is displayed. To return to Run without changing the CAL Code, press both the Right and Left buttons at the same time. To change the Calibration Code, use the Right button to select the digit to be changed, then use the Left button to scroll the blinking digit to the desired number. When the Calibration Code has been entered, press both the Right and Left button at the same time to return to Run.

## NOTICE

*Depending on the type of Load Cell, the Calibration code could be a 3 or 4 digit number. If the Calibration Code is a 3 digit number a leading zero (0) must be used. For example if a Load Cell had a CAL Code of 395 it would be entered as 0395.*

## The Setup Mode, continued

### To Look at or Change the Calibration Code, continued

If the load cell Calibration Code is not known or as a cross check, the Indicator can generate the Calibration Code. This is done by entering the weight of a known load into the Indicator LOAD routine and then lifting the load. See the section Calibration by Lifting a Known Load.

### Installation Zero

Installation zero is a routine that matches the Indicator to the ***INSTALLED*** Load Cell. It adjusts the Indicator reading to compensate for the weight of the Cargo Hook on the Load Cell and whatever zero offset is built into the Load Cell. The Installation Zero procedure is not mandatory. If done the Indicator will read zero when the Un-Zero button is pressed and there is no weight on the Cargo Hook. If the Installation Zero is not done, the Indicator will show the weight of the Cargo Hook plus the value of the Load Cell zero offset.

### To Run the Installation Zero Routine

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the symbol "0 in" is displayed, then press the Right button. The CAL legend will be turned on and the current weight on the Cargo Hook will be displayed and blinking. Remove any weight that is not to be zeroed out and press either button to complete the procedure and return to the Run Mode.

### Calibration by Lifting a Known Weight

Calibration by lifting a known weight is a Setup routine that calculates the Calibration Code for the Load Cell attached to the Indicator. It is useful if the load cell Calibration Code is not known or as a cross check to the accuracy of a known Calibration Code. The procedure is done by entering the known weight into the Indicator and then lifting the weight. This procedure can be done in the shop or on the helicopter. The accuracy of the procedure is directly related to the weight of the known load. If for example the procedure was done with a 1,000 pound load that was assumed to weigh only 900 pounds, all subsequent lifts would be displayed 10% light.



*Be sure to include the weight of everything between the Cargo Hook and the load, i.e. the cable, net, dirt, etc.*

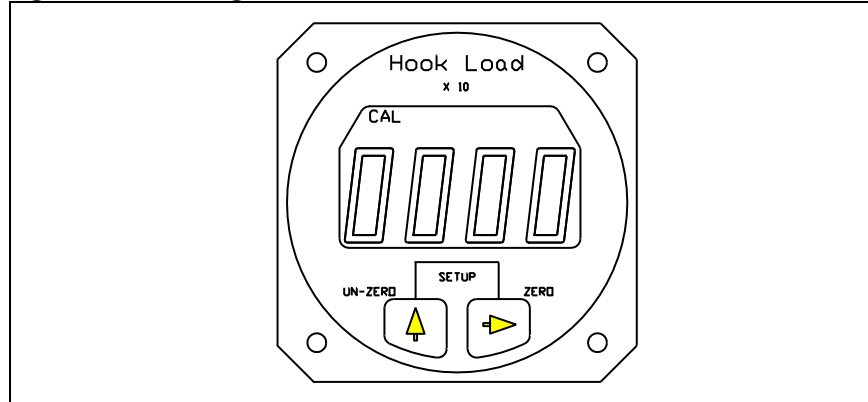
The closer the known load approaches the lifting capacity of the helicopter, the more accurate the calculated Calibration Code will be.

## The Setup Mode, continued

### To Run the Calibration by Lifting a Known Weight Routine

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word LOAD is displayed, then press the Right button. The display should look like this:

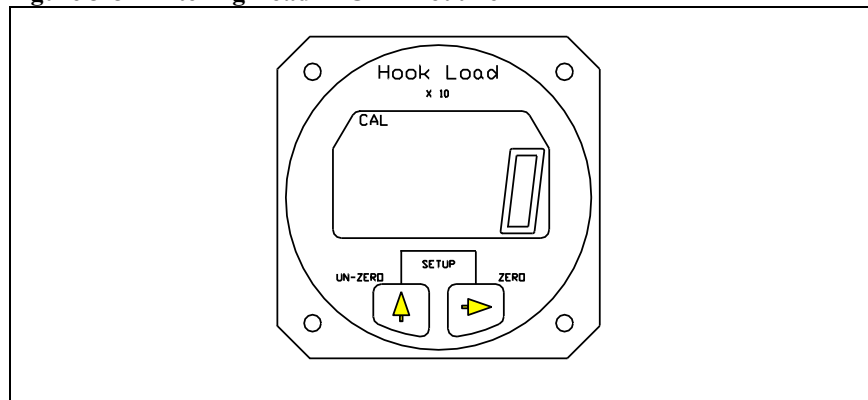
**Figure 3-7 Running CAL Routine**



The CAL legend is turned on and the first digit is blinking. The previous load is not displayed. At this point if you wish to return to the Run Mode without changing the Calibration Code, power cycle the Indicator. At this point it is not possible to return to the Run Mode without changing the Calibration Code by using the buttons on the Indicator front panel.

To proceed with the procedure, use the Right button to select the digit to be changed, then use the Left button to scroll the blinking digit to the desired number. Note that the known weight is entered "X 10"; a 1000 pound load is entered as 100. When the known load has been entered, press both the Right and Left button at the same time. The display will look like this:

**Figure 3-8 Entering Load in CAL Routine**



## The Setup Mode, continued

### Calibration by Lifting a Known Weight, continued

The CAL legend and the digits will be blinking. Again, at this point if you wish to return to the Run Mode without changing the Calibration Code, power cycle the Indicator. It is not possible to return to the Run Mode by using the buttons on the Indicator front panel without changing the Calibration Code. If you wish to proceed, lift the known load and when it is stabilized, press either button to complete the procedure. The Indicator will display the load. This ends the procedure. The Indicator is now calibrated to the Load Cell. It is a good practice to go to the Code routine and record the new Calibration code for later reference.

### Setting the Scale for a remote analog meter

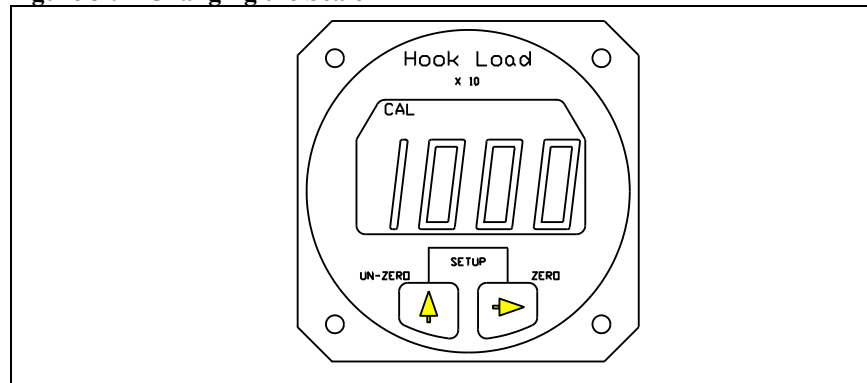
The Scale routine is used when a user supplied analog meter is connected to the Indicator. It is used to match or calibrate the analog meter to the Indicator. The Indicator outputs a 0 to 5 VDC analog signal which is proportional to the Load Cell load. The Scale number tells the Indicator at what point in pounds or kilograms it should reach the 5 VDC output. If for example a 5 volt analog meter is used and its full scale reading is 10,000 pounds, the number entered into the Indicator Scale routine would be 1000 (the number is entered X 10). This number tells the Indicator that it should output the proportional 0 to 5 VDC signal between zero pounds and 10,000 pounds.

The Scale number does not affect Onboard Slave Meters, P/N 210-106-00 or 210-180-00. This number only affects user supplied instruments connected to the analog out signal.

### To Look at or Change the Scale

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word SCALE is displayed, then press the Right button. The display should look like this:

**Figure 3-9 Changing the Scale**



## The Setup Mode, continued

### To Look at or Change the Scale, continued

The CAL legend is turned on and the previously set Scale number is displayed. To return to Run without changing the Scale, press both the Right and Left button at the same time. To change the Scale number, use the Right button to select a digit to be changed, then use the Left button to scroll the blinking digit to the desired number. When the complete Scale number has been entered, press both the Right and Left button at the same time to return to Run.

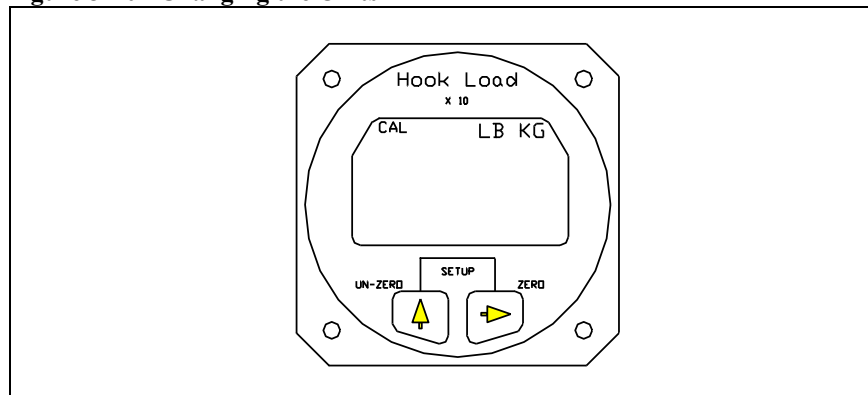
### Select KG or LB Units

The units routine sets the display to read in pounds (LB) or kilograms (KG).

### To look at or change the Units

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word LB or KG is displayed, then press the Right button. The display should look like this:

**Figure 3-10 Changing the Units**



The CAL legend is turned on and the previously set unit is displayed. To return to Run without changing the units, press both the Right and Left button at the same time. To change the units press the Left button. When the selection has been made, press both the Right and Left button at the same time to return to Run.

**NOTICE**

*The selected units are displayed when in the Run Mode.*

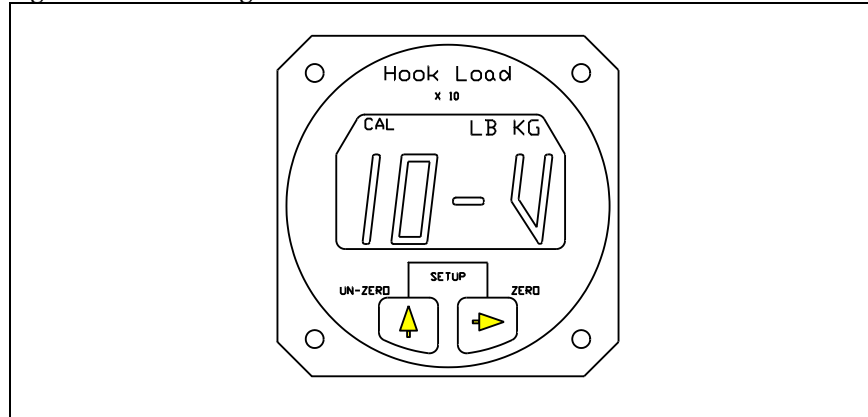


## The Setup Mode, continued

### Indicator Version

The Version routine displays the Indicator's hardware and software revision levels. Version is set at the factory and cannot be changed.

**Figure 3-11 Looking at Indicator Version**



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## *Section 4*

# **Maintenance**

The following procedures are provided for the benefit of experienced aircraft maintenance facilities capable of carrying out the procedures. They must not be attempted by those lacking the necessary expertise. It is recommended that only minor repairs be attempted by anyone other than the factory.

### **Lubrication**

Lubrication of Load Weigh System is recommended every 500 hours of operation. To obtain maximum life under severe duty conditions such as logging or seismic work, it is recommended to lubricate the Load Cell and Clevis pivot points every 200 hours. Recommended lubricants are AeroShell 17, MIL-G-21164 or Mobilgrease 28, MIL-G-81322.

## Inspection

The scheduled inspection/overhaul intervals noted below are maximums and are not to be exceeded. If the load weigh system is subjected to unusual circumstances, extreme environmental conditions, etc., it is the responsibility of the operator to perform the inspections more frequently to ensure proper operation.

---

**Annually or 100 hours of external load operations, whichever comes first, inspect the load weigh system per the following instructions (see Figure 4-1 for part identification and Table 4-1 for inspection criteria).**

---

### **NOTICE**

*Hours of external load operations should be interpreted to be (1) anything is attached to the primary cargo hook (whether or not a useful load is being transported) and (2) the aircraft is flying. If these conditions are **NOT** met, time does **NOT** need to be tracked.*

1. Move the load cell and the suspension system throughout their full ranges of motion and observe the load weigh electrical harness to ensure that it has enough slack. The harness must not be the stops that prevent the load cell or cargo hook suspension from moving freely in all directions.
2. Visually inspect the electrical harness strain relief at the load cell for damage.
3. Visually inspect the external load cell electrical harness for damage and chafing.
4. Visually inspect the external load weigh harness connector for damage and security.
5. Visually inspect the load cell covers for corrosion, damage (ref Table 4-1 for criteria) and security.
6. Visually inspect the load cell link and load cell clevis for corrosion, damage and cracks (ref Table 4-1 for criteria).

## **Inspection** continued

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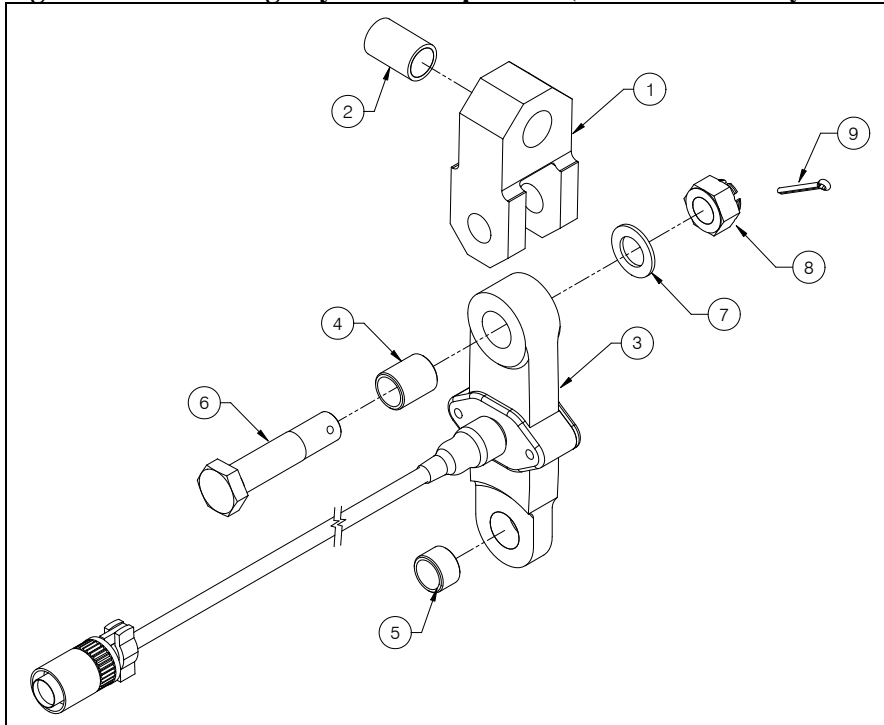
**Every 5 years or 1000 hours of external load operations, whichever comes first, perform the following.**

---

1. Return the Load Cell Assembly (P/N 210-044-00 or 210-044-01) to the factory for inspection and calibration. The factory will inspect the condition of the load cell and perform acceptance test procedures including calibration and zero balance, repairing as necessary.
2. Inspect internal electrical harness from the load weigh indicator to the load cell for general condition, security of attachment, and chafing along the length of wire runs.
3. Inspect for security of load weigh indicator attachment.
4. Inspect load cell attachment hardware, refer to Table 4-1.

## Inspection continued

**Figure 4-1 Load Weigh System Components (Load Cell Assembly P/N 210-044-01 shown)**



**Table 4-1 Inspection Criteria**

Item	Part	Inspect for:	Repair
1	Load Cell Clevis P/N 290-021-00 P/N 290-021-01	Dents, nicks, cracks, gouges, corrosion or scratches.	Repair dents, gouges, nicks, scratches and corrosion if less than .030" deep, blend out at a ratio of 20:1, length to depth, replace if otherwise damaged. Touch up part with zinc chromate primer.
2	Bushing P/N 290-054-00	Wear on inside diameter.	Replace bushing if inside diameter exceeds 0.520 in.
3	Load Cell Assembly P/N 210-044-00 P/N 210-044-01	Dents, nicks, cracks, gouges, corrosion or scratches in the load cell link.	Repair dents, gouges, nicks, scratches and corrosion if less than .030" deep, blend out at a ratio of 20:1, length to depth, replace Load Cell Assembly if otherwise damaged. Touch up part with zinc chromate primer. Load Cell Link is 15-5 stainless steel, no finish touch-up required.
		Dents, nicks, cracks, gouges, corrosion or scratches in the covers.	Repair dents, gouges, nicks, scratches and corrosion if less than .030" deep, blend out at a ratio of 20:1, length to depth. Touch up with Alodine and zinc chromate primer.

*continued*

## Inspection continued

**Table 4-1 Inspection Criteria** continued

4	Bushing P/N 280-020-01	Wear on inside diameter.	Replace bushing if inside diameter exceeds 0.520 in.
5	Bushing P/N 280-021-01	Wear on inside diameter.	Replace bushing if inside diameter exceeds 0.520 in.
6	Bolt P/N 510-038-00	Wear on outside diameter, security of attachment.	Recommend replacement of threaded fasteners.
7	Washer P/N 510-182-00	Security of attachment	Replacement recommended.
8	Nut P/N 510-036-01	Security of attachment.	Recommend replacement of threaded fasteners.
9	Cotter Pin P/N 510-067-00	Security of attachment.	Replace.
10	Tube P/N 290-055-00 (not shown in Figure 4-1)	Wear in bolt holes.	Replace if bolt hole diameter exceeds .271 in.
		Dents, nicks, cracks, gouges, corrosion or scratches.	Repair gouges, nicks, scratches and corrosion if less than .010" deep, blend out at a ratio of 20:1, length to depth, replace if otherwise damaged. Dents in the tube up to .050 deep are acceptable. Touch up part with zinc chromate primer.

## Trouble Shooting

**Table 4-2 Trouble Shooting**

DIFFICULTY	PROBABLE CAUSE	CORRECTIVE ACTION
Circuit breaker opens when the circuit to Load Weigh System is energized.	Short in the system, faulty circuit breaker or switch.	Repair or replace defective wiring, circuit breaker and switch.
Load Weigh Indicator does not light up.	Faulty wiring, circuit breaker or switch.	Check the power switch, circuit breaker and wiring. If this doesn't help, return the unit to the factory.
Where Am I?		Turn the Indicator power off for a few moments. When it comes to life it will be in the Run mode.
Displayed load is incorrect.	Incorrect Calibration Code.	Ensure the correct Calibration Code has been entered.
Displayed load is not stable.	Dampening level is too small.	Adjust the Dampening level to a larger number.
Displayed load takes too long to change the reading when the load is changed.	Dampening level is too large.	Adjust the Dampening level to a smaller number.
Do not recognize the displayed numbers on the Indicator.	NV Ram failure, A/D or D/A circuit failure.	Refer to <i>Error Codes</i> in section 3.
Load Weigh Indicator does not change with changing hook loads.	Defective load cell or damaged internal harness.	Check for damaged internal harness, replace load cell.

## Instructions for Returning Equipment to the Factory

If an Onboard Systems product must be returned to the factory for any reason (including returns, service, repairs, overhaul, etc.) obtain an RMA number before shipping your return.



*An RMA number is required for all equipment returns.*

- To obtain an RMA, please use one of the listed methods.
  - Contact Technical Support by phone or e-mail ([Techhelp@OnboardSystems.com](mailto:Techhelp@OnboardSystems.com)).
  - Generate an RMA number at our website: <http://www.onboardsystems.com/rma.php>
- After you have obtained the RMA number, please be sure to:
  - Package the component carefully to ensure safe transit.
  - Write the RMA number on the outside of the box or on the mailing label.
  - Include the RMA number and reason for the return on your purchase or work order.
  - Include your name, address, phone and fax number and email (as applicable).
  - Return the components freight, cartage, insurance and customs prepaid to:

Onboard Systems  
13915 NW 3rd Court  
Vancouver, Washington 98685  
USA  
Phone: 360-546-3072



# Section 5 Certification FAA STC

United States of America  
Department of Transportation Federal Aviation Administration

## Supplemental Type Certificate

*Number* SH4751NM

*This certificate, issued to:* **Onboard Systems International  
13915 NW 3rd Court  
Vancouver, WA 98685**

*certifies that the change in the type design for the following product with the limitations and conditions therefore as specified hereon meets the airworthiness requirements of Part \* of the \* Regulations.*

*Original Product—Type Certificate Number:* \* See Attached Approved Model List No. SH4751NM  
*Make:* \* for List of Approved Rotorcraft Models and  
*Model:* \* Applicable Airworthiness Regulations

*Description of the Type Design Change:* Fabrication of Onboard Systems Model 200-044-00 and 200-044-01 Load Weigh Kit System in accordance with FAA-approved Onboard Systems Master Drawing List (MDL) No. 155-001-00, Revision 23, dated April 07, 2010, or later FAA-approved revision; and Installation of this system in accordance with FAA-approved Onboard Systems Owner's Manual No. 120-021-00, Revision 14, dated March 05, 2010, or later FAA-approved revision. This modification must be inspected and maintained in accordance with Section 4 of the FAA-approved Onboard Systems Owner's Manual No. 120-021-00, Revision 14, dated March 05, 2010, or later FAA-approved revision.


*Limitations and Conditions:* Approval of this change in type design applies to only those model rotorcraft listed on Approved Model List (AML) No. SH4751NM, dated January 03, 1990, or later FAA-approved revision, which are equipped with Bell external cargo hook suspension assembly, P/N 204-072-915-11, P/N 204-072-915-25 or P/N 204-072-915-103. This approval should not be extended to other rotorcraft of these models on which other previously approved modifications are incorporated unless it is determined by the installer that the relationship between this change and any of those other previously approved modifications, including changes in type design, will introduce no adverse effect upon the airworthiness of that helicopter. Rotorcraft modified in accordance with this STC must be operated in accordance with an FAA-approved copy of Onboard Systems Rotorcraft Flight Manual Supplement (RFMS) 121-034-00 dated September 19, 2007, or later FAA-approved revision.

A copy of this Certificate, AML No. SH4751NM, and FAA-approved RFMS must be maintained as part of the permanent records for the modified rotorcraft.


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 surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.*

*Date of application:* February 28, 1989      *Date reissued:*  
*Date of issuance:* July 28, 1989      *Date amended:* January 03, 1990; July 27, 1990; September 20, 2007; May 07, 2010



*By direction of the Administrator*



(Signature)  
Acting Manager, Seattle Aircraft Certification Office  
(Title)

---

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)

# Approved Model List

## FAA APPROVED MODEL LIST (AML) SH4751NM FOR ONBOARD SYSTEMS

ISSUE DATE: January 3, 1990

ITEM	AIRPLANE MAKE	AIRPLANE MODEL	TYPE CERTIFICATE NUMBER	CERTIFICATION BASIS FOR ALTERATION	FAA SEALED DRAWING LIST		RFM SUPPLEMENT NO. AND DATE	AML AMENDED DATE
					NUMBER	REV		
1	Bell	204B, 205A, 205A-1	H1SW	CAR 7, dtd 8/1/58 and Amendments 7-1 through 704, category B.	155-001-00	Rev. 1 7/10/90	121-034-00 9/19/07	NC
2	Bell	212, 412, 412EP	H4SW	FAR Part 29, dated 2/1/65 and Amdt. 29-1 and 29-2. See TCDS H4SW for additional information.	155-001-00	Rev. 18 8/30/06	121-034-00 9/19/07	NC
3	Garlick	UH-1H	H13WE	FAR 21.25 (a)(2)	155-001-00	Rev. 18 8/30/06	121-034-00 9/19/07	9/20/07
4	Agusta	AB412 and AB412EP S/N 25801 and subs.	H79EU	FAR Part 29, dated 8/12/65. See TCDS H1SW for additional information.	155-001-00	Rev. 18 8/30/06	121-034-00 9/19/07	9/20/07
5	Bell	210	H1SW	FAR Part 29, dated 8/12/65. See TCDS H1SW for additional information.	155-001-00	Rev. 18 8/30/06	121-034-00 9/19/07	9/20/07



FAA APPROVED:

Acting Manager, Seattle Aircraft  
Certification Office

REISSUED:

AMENDED: September 20, 2007

# Brazilian Approval



MINISTÉRIO DA DEFESA  
COMANDO DA AERONÁUTICA  
DEPARTAMENTO DE PESQUISAS E DESENVOLVIMENTO  
CENTRO TÉCNICO AEROESPACIAL  
INSTITUTO DE FOMENTO E COORDENAÇÃO INDUSTRIAL

## CERTIFICADO DE HOMOLOGAÇÃO SUPLEMENTAR DE TIPO (Supplemental Type Certificate)

**NÚMERO** 2005S04-05  
(Number)

Este certificado, emitido com base na Lei nº 7565 "Código Brasileiro de Aeronáutica", de 19 de dezembro de 1986,  
(This certificate, issued in the basis of the Law No. 7565 "Código Brasileiro de Aeronáutica", dated 19 December 1986,

é conferido ao (à): Onboard Systems  
(is granted to:) 13915 NW 3<sup>rd</sup> Court  
Vancouver, WA 98685  
USA

por ter a modificação ao projeto de tipo do produto abaixo citado, observadas as limitações e condições  
(for having the change to the type design of the product mentioned below, with the limitations and conditions therefor as)  
especificadas, satisfeito aos requisitos de aeronavegabilidade aplicáveis.  
(specified hereon, met the applicable airworthiness requirements.)

Produto Original - Número do Certificado de Tipo: \* see attached CTA Approved Model List, I.R., dated  
(Original Product - Type Certificate No.) 15 Apr. 2005, or later CTA approved revisions.

Fabricante: \*  
(Manufacturer:)

Modelo(s): \*  
(Model(s):)

### DESCRIÇÃO DA MODIFICAÇÃO AO PROJETO DE TIPO: (Description of Type Design Change:)

Installation of Onboard Systems Model E-47 and E-47B Cargo Hook Load Cell Systems, in accordance with FAA Approved Onboard Systems Master Drawing List No. 155-001-00, Rev. 13, dated 11 May 2004, and Onboard Systems Owner Manual No. 120-003-00, Rev. 0, dated 05 Jan. 1989 (E47), or Onboard Systems Owner Manual 120-021-00, Rev. 7, dated 13 Nov. 2003 (E47B), or later approved revisions.

This CHST validates in Brazil the STC # SH4751NM, issued by FAA (USA).

### LIMITAÇÕES E CONDIÇÕES: (Limitations and Conditions:)

See continuation sheet for applicable data.

### DATAS: (Dates of:)

Do Requerimento: 01 Dec. 2004  
(Application:)

Da emissão: 15 Apr. 2005  
(Issue:)

Da reemissão:  
(Reissue:)

  
GERALDO CURCIO NETO Ten Cel Av  
Chefe da Divisão de Certificação de Aviação Civil  
(Chief, Divisão de Certificação de Aviação Civil)

  
LUIZ ALBERTO C. MUNARETTO Cel Av  
Diretor do Instituto de Fomento e Coordenação Industrial  
(Director, Instituto de Fomento e Coordenação Industrial)

F-400-01B (08.04)

Fl. 01 de 02  
(Sheet) (of)

H.02-2392-0

**Brazilian Approval** continued



**MINISTÉRIO DA DEFESA**  
COMANDO DA AERONÁUTICA  
DEPARTAMENTO DE PESQUISAS E DESENVOLVIMENTO  
CENTRO TÉCNICO AEROSPAÇIAL  
INSTITUTO DE FOMENTO E COORDENAÇÃO INDUSTRIAL

Folha de Continuação ao  
(Continuation Sheet to)

**CERTIFICADO DE HOMOLOGAÇÃO SUPLEMENTAR DE TIPO**  
(Supplemental Type Certificate)

**NÚMERO 2005S04-05**  
(Number)

**LIMITAÇÕES E CONDIÇÕES:**  
(Limitations and Conditions)

- I. The approval of this type design change should not be extended to other rotorcraft of these models on which other previously approved modifications are incorporated unless it is determined by the installer that the relationship between this change and any of those other previously approved modifications, including changes in Type Design, will introduce no adverse effect upon the airworthiness of that rotorcraft.
- II. 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.
- III. Approval of this change in type design applies to only those Bell model rotorcraft listed on AML No. 2005S04-05, dated 15 Apr. 2005, or later approved revision, which are equipped with Bell external cargo hook suspension assembly, P/N 204-072-915-11, and suspension link, P/N 205-070-944-3.
- IV. Inspect load cells in accordance with Section 5 of the appropriate Onboard Systems Owners Manual.
- V. Operation must be performed in accordance with FAA approved Rotorcraft Flight Manual Supplement, revised 27 Jul. 1990, or later approved revision.
- VI. A copy of this Certificate and the Supplement referred on item V above shall be maintained as part of the permanent records of the modified rotorcraft.

-----END-----

F-400-01B (08.04)

Fl. 02 de 02  
(Sheet) (of)

H.02-2392-0

**Brazilian Approval** continued

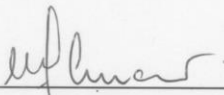


**MINISTÉRIO DA DEFESA  
COMANDO DA AERONÁUTICA  
DEPARTAMENTO DE PESQUISAS E DESENVOLVIMENTO  
CENTRO TÉCNICO AEROSPACIAL  
INSTITUTO DE FOMENTO E COORDENAÇÃO INDUSTRIAL**

**CTA APPROVED MODEL LIST  
FOR CHST 2005S04-05**

AIRCRAFT MAKE	AIRCRAFT MODEL(s)	TYPE CERTIFICATE NUMBER	CERTIFICATION BASIS
BELL HELICOPTER	204B	H1SW (FAA)	CAR 7
BELL HELICOPTER	205A	H1SW (FAA)	CAR 7
BELL HELICOPTER	205A-1	H1SW (FAA)	CAR 7
BELL HELICOPTER	212	H4SW (FAA)	FAR 29
BELL HELICOPTER	412	8103 (CTA)	RBHA/FAR 29

CTA Approved:

  
\_\_\_\_\_  
**Geraldo Curcio Neto Ten Cel Av**  
**Chief, Divisão de Certificação de Aviação Civil**

CTA Approved Date: 15 Apr. 2005.

Revision: I.R.

Fl. 01 de 01  
(Sheet) (of)

H.02-2292-0

# Transport Canada Approval

DEPARTMENT OF TRANSPORT

## Supplemental Type Approval

Number: SH93-25

This approval is issued to:

Onboard Systems  
11212 N.W. Saint Helens Road  
Portland, Oregon  
97231 U.S.A.

Issue No.: 1

Approval Date: May 5, 1993

Issue Date: May 5, 1993

Responsible Region

Pacific

Aircraft/Engine Type or Model:

Bell 204B, 205A, 205A-1, 212, 412

Canadian Type Approval or Equivalent:

DOT H-86 and FAA H1SW

Description of Type Design Change:

Fabrication & Installation Of Onboard Systems Model E-47 and E-47B Cargo Hook Load Cell Systems Per FAA STC SH4751NM.

Installation/Operating Data,  
Required Equipment  
and Limitations:

Fabrication is in accordance with FAA Approved Onboard Systems Master Drawing List No. 155-001-00, Revision 1, dated July 10, 1990\*.

Installation is in accordance with either FAA Approved Onboard Systems Owners Manual No. 120-003-00, dated January 5, 1989\* (E-47), or 120-021-00, dated July 10, 1990\* (E-47B).

Inspect load cells in accordance with Section 5 of the appropriate Onboard Systems Owners Manual.

Required Equipment and Limitations: See Continuation Sheet

(\* or later FAA Approved Revision)



**Conditions:** This approval is only applicable to the type / model of aeronautical product specified therein. Prior to incorporating this modification, it shall be established that the interrelationship between this change and any other modification(s) incorporated will not adversely affect the airworthiness of the modified product.

L.B. Samoil  
Regional Airworthiness Engineer  
For Minister of Transport

Canada

26-0357 (10-88)

DEPARTMENT OF TRANSPORT

# Supplemental Type Approval

(Continuation Sheet)

Number: SH93-25

Issue No.: 1

Approval Date: May 5, 1993

Issue Date: May 5, 1993

**NOTE: THIS ADDENDUM SHALL REMAIN PART OF THE SUPPLEMENTAL TYPE APPROVAL REFERRED THEREIN.**

Required Equipment:

1. Aircraft must be equipped with Bell external cargo hook suspension assembly P/N 204-072-915-11, and suspension link P/N 205-070-944-3.
2. FAA Approved copy of Onboard Systems Rotorcraft Flight Manual Supplement revised July 27, 1990, or later FAA Approved revision.

Limitation:

Approval of this change in type design applies to only those Bell model rotorcraft listed on FAA Approved Model List No. SH4751NM dated January 3, 1990, or later FAA approved revision.