NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Western Pacific Region

March 24, 2016

ELT EXAMINATION

Present to the examination:

Zoë Keliher (writer of notes)
NTSB – Air Safety Investigator

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ACR – Technical Support Manager

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FAA – Air Safety Investigator

Dennis McCall
Air Methods – Director of Operations

A. ACCIDENT

Location: Biggs, CA
Date: December 15, 2015
Aircraft: Airbus AS350B3

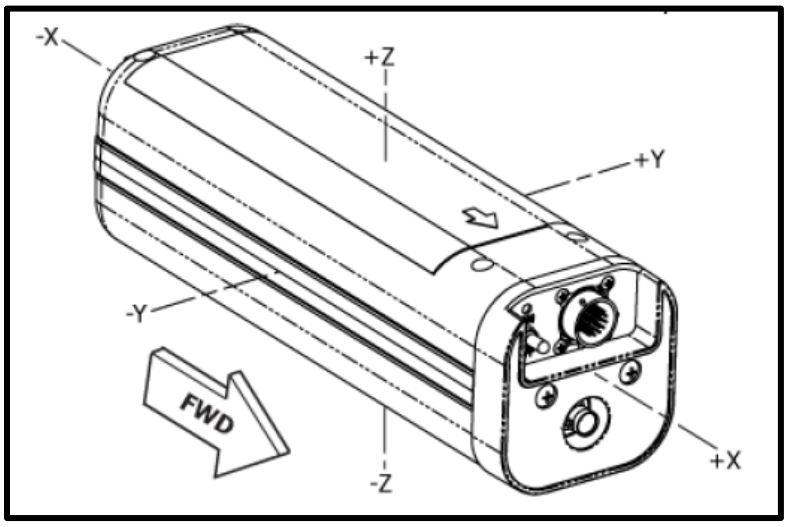
B. DETAILS OF THE INVESTIGATION:

1. Description/Operation:

The helicopter was equipped with an Artex Aircraft Supplies, INC., (now ACR Electronics Inc.), C406-N HM Emergency Locator Transmitter (ELT), part number 453-5061 (serial number 04326). According to the manufacturer's original documents for that serial number, the ELT was manufactured in October 2007.

Picture #01: ELT in Accident Helicopter

The Artex C406-N HM ELT is a single output ELT that incorporates latitude/longitude information from the helicopter's GNS 530W navigation system and transmits on all three emergency frequencies (121.5/243.0 and 406 MHz). The ELT was developed for helicopter installations and features an additional 5-axis G-Switch module, which allows the ELT to be activated in any of the six orthogonal axes. Activation can occur by the following three circumstances: automatically by the g-switches (either the 2.3-g primary g-switch or the 12.5-g 5-way g-switch); manual activation on unit; manual activation on cockpit panel.



Picture #02: Six Orthogonal Axes

2. Maintenance:

The helicopter records indicate that the ELT was installed in May 2008 by Texas Aviation Services under TAS 350-7299. The ELT battery, part number 452-0133 (serial number 359028-018), was recorded as being installed in May 2015. The last maintenance that occurred was recorded as consisting of a check per CFR 91.207 (d) on October 29, 2015.

C406-N-HM ELT **Artex 570-5060, Revision C** **N/A** **Artex 570-5060, Revision C**

The C406-N-HM ELT consists of the 453-5061 transmitter located in the overhead portion of the left hand baggage compartment, a 453-5078 programming adapter attached to the ELT connector and the 110-338 ELT antenna located on top of the cabin. A cockpit panel switch is located on the right side of the instrument panel. A warning horn is located in the left hand baggage compartment. The C406-N-HM receives GPS navigation information from the GNS-530W. The C406-N-HM ELT is installed in accordance with AC 43.13-1B Chapter 11, Sections 5-19, AC 43.13-2B Chapters 2 and 3. Reference Texas Aviation Drawing # TAS 350-7299 sheet 12.

Airframe Inspection

NHA Part/Serial Position Code Level Code	Task # Task Description	AME #	Part # ~ Part Desc ~ Serial	Task Type	Interval	Since New	Since Overhaul / Inspection	Last Performed	Trigg. Param	Remaining Units	Due Value	Forecasted / Due at Date
	00A0000-01 Registration Certificate Renewal FAA 36 Month Recurring Requirement per 14 CFR 47.40			INSP	36 Month End			04/25/2013	CAL	136 Days	04/30/2016	04/30/2016
	00A2562-01 ELT – Check per 14 CFR 91.207 (d)			INSP	12 Month End			10/29/2015	CAL	320 Days	10/31/2016	10/31/2016
AF-2562-ELT 1.15	00C2562-02 ELT BATTERY REPLACEMENT		453-5061 ~ TRANSMITTER, ELT C406-NHM ~ 04326	OTH	60 Months	47Months		05/29/2013	CAL	917 Days	06/20/2018	06/20/2018
AF-2562-ELT 1.15	00C2562-03 406 MHz ELT REGISTRATION		453-5061 ~ TRANSMITTER, ELT C406-NHM ~ 04326	OTH	24 Month End	47Months		06/25/2015	CAL	562 Days	06/30/2017	06/30/2017

Picture #03: Maintenance Excerpts

According to FAR 91.207 (d):
(d) Each emergency locator transmitter required by paragraph (a) of this section must be inspected within 12 calendar months after the last inspection for--
(1) Proper installation;
(2) Battery corrosion;
(3) Operation of the controls and crash sensor; and
(4) The presence of a sufficient signal radiated from its antenna.

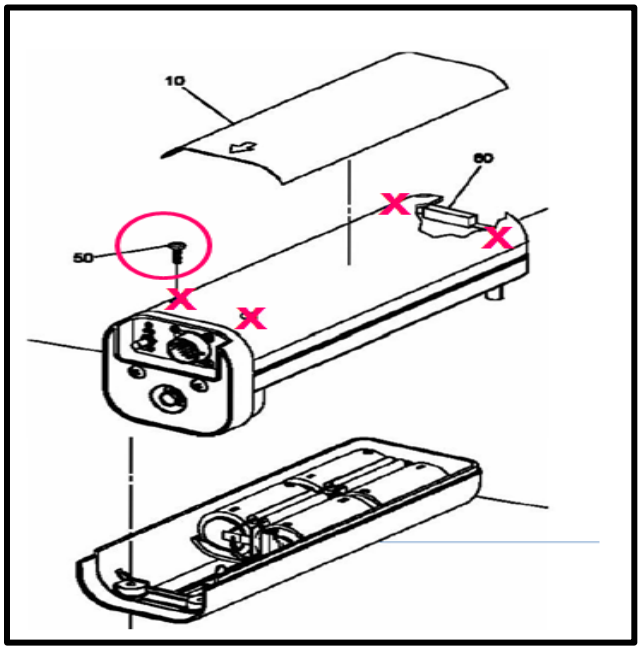
The AC43.13 states that inspection of the ELT must be accomplished by properly certified person or repair station within 12 calendar months after the last inspection. The following guidance is given:

“Activate the ELT using an applied force. Consult the ELT manufacturer’ s instructions before activation. The direction for mounting and force activation is indicated on the ELT. A TSO-C91 ELT can be activated by using a quick rap with the palm. A TSO-C91a ELT can be activated by using a rapid forward (throwing) motion coupled by a rapid reversing action. Verify that the ELT can be activated using a watt meter.” There is a note indicating that this is merely a check to see if the g-switch is functioning not a measured check.

3. Examination:

An examination of the ELT was conducted on March 30, 2016 at the facilities of ACR Electronics, Inc. located at 5757 Ravenswood Road, Fort Lauderdale, Florida 33312. Investigators collectively from the National Transportation Safety Board, Federal Aviation Administration, Air Methods, and ACR were all present to the examination that occurred over a one-day period; there were numerous personnel employed by ACR that assisted with the disassembly/examination. ACR will complete an entire report with photos of the examination. These notes will merely serve as an addendum of pertinent findings for a basis to conduct further examinations.

The ELT was removed from a sealed transport box and the NTSB security tape was in place; pictures of the box were taken by investigators. An external examination of the unit revealed that the protective top cover was not included with the shipment. Aside from a crack stretching the entire length of the back of the unit, there is no external damage noted. The torque seal on the 4 screws of the clamshell was green, consistent with that side having been removed since manufacturer. There was no writing on the casing to indicate that side was not to be removed.



Picture #03: Screws with Green Torque Seal

A downloadable history of the ELT indicated that it had been activated 20 times since the battery was installed for a cumulative 16 minutes of operation. It is unknown how many of these activations and cumulative minutes were amassed post accident.

The g-switches were test as per the component maintenance manual (CMM) which is the procedure followed in new and overhauled units.

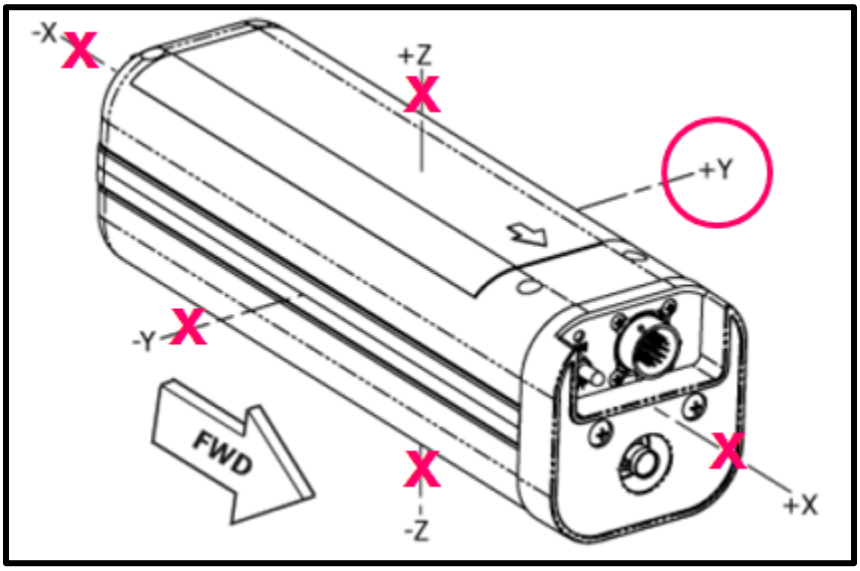
The unit was installed (velcroed) on a test centrifuge. The g-switch did not activate at 3.8g's (tested at 380 MHZ with no activation).

UUT SHOULD NOT ACTIVATE	UUT RANGE TO ACTIVATE	UUT FAILURE RANGE
0 Hz -------- 287 Hz	288 Hz -------- 337 Hz	338 Hz --------- 400 Hz

The unit was then tested as per item number 15 (below) by manual force on an office chair (drop test). These instructions are not given to the public. The unit only activated on one axis, the left (+y).

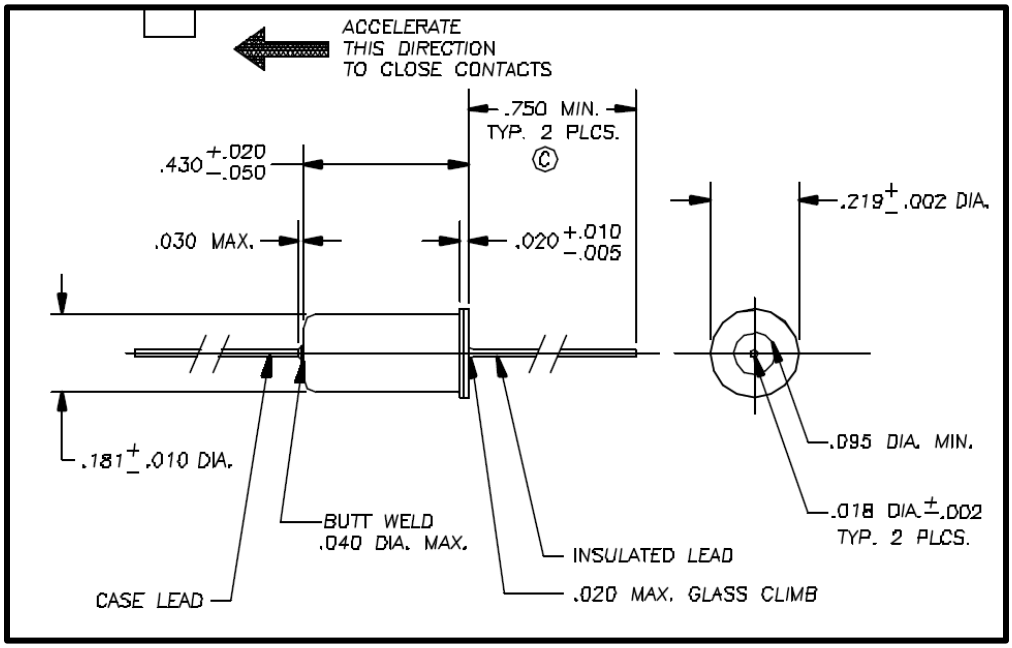
15. 5 Way G-switch Module Test (HM Models only)

a. Keep G-switch loop (151-5060) and 50 ohm load installed from previous step. Activation of the five module switches can be accomplished by thrusting the UUT into a piece of foam padding or cushion of office/shop chair in the five different directions specified on the label. Verify in each case that the UUT activates via G-switch closure as indicated by the LED flashing. Reset the UUT after each activation by toggling the ON/OFF switch ON and then OFF.



Picture #04: G-Switch Only Activated on One Axis

The g-switches are manufacturer by Select Controls from Long Island. It was opened in no discrepancies were noted. After the complete testing (as will be documented in the ACR complete report), the unit was violently hit against hard services numerous times. Eventually, operation of the G switches were obtained in all axis with the exception to the forward (+x) axis.



Picture #05: G-Switch