

Dead Penguins - I never knew this!

Did you ever wonder why there are no dead penguins on the ice in Antarctica ?

Where do they go? Wonder no more !

It is a known fact that the penguin is a very ritualistic bird which lives an extremely ordered and complex life. The penguin is very committed to its family and will mate for life, as well as maintain a form of compassionate contact with its offspring throughout its life.

If a penguin is found dead on the ice surface, other members of the family and social circle have been known to dig holes in the ice, using their vestigial wings and beaks, until the hole is deep enough for the dead bird to be rolled into, and buried.

The male penguins then gather in a circle around the fresh grave and sing:

"Fr eeze a jolly good fellow."

"Fr eeze a jolly good fellow."



406MHz ELT's and 406MHz Antenna's

Lloyd Klee
www.aviationsafety.co.nz

406MHz only

- I am being specific re 406MHz as many ELT data reports in the past few years have mixed up both

TSO91 (121.5/243MHz)

and

TSO126 (406/121.5MHz)

- (That includes the ATSB Transport Safety Report May 2013)

Reasons as to failures

- **Most Helicopter ELT failure to alert RCC are due to**
- Broken antenna *(as it is on the outside of the aircraft)*
- Separation of BNC connectors on Coax Cable
- Failure of the coax cable by earthing
- Failure of the ELT to stay in the mounting bracket *(see above)*
- Incorrectly mounted to allow G switch to activate
- *(many Artex ME406 mounted in AF configuration)*
- ELT not correctly encoded *(factory maintenance code)*

NZ Helicopter accidents

- 12 months ending March 2015- 7 fatalities
- Accidents recorded as per NZ CAA = 19
- Accidents that CAA records showed that ELT activated was 1 / 19- Actual was 6/19
- Of 19, nine were slow or dynamic rollover or auto rotate- ELT would not have operated.
- Ten where ELT would have been expected to activate

Antenna Location

One of the major issues is the location of the Antenna

- Many are installed on the side of the helicopter – **Which side?**
- ***The side that the helicopter naturally lies on due the torsional rotation of the blades***



Antenna Location

The rest are on the top and just as vulnerable



Results of ELT location

Then there is the issue with the location of the ELT !

The main mast to the rotor can crush the ELT especially if it is a R22 or R44



Antenna Cables through bulkheads

The new cable “stripper”



So what is to be done ?



Testing an antenna within a Tail Boom – R44

Test location Taupo

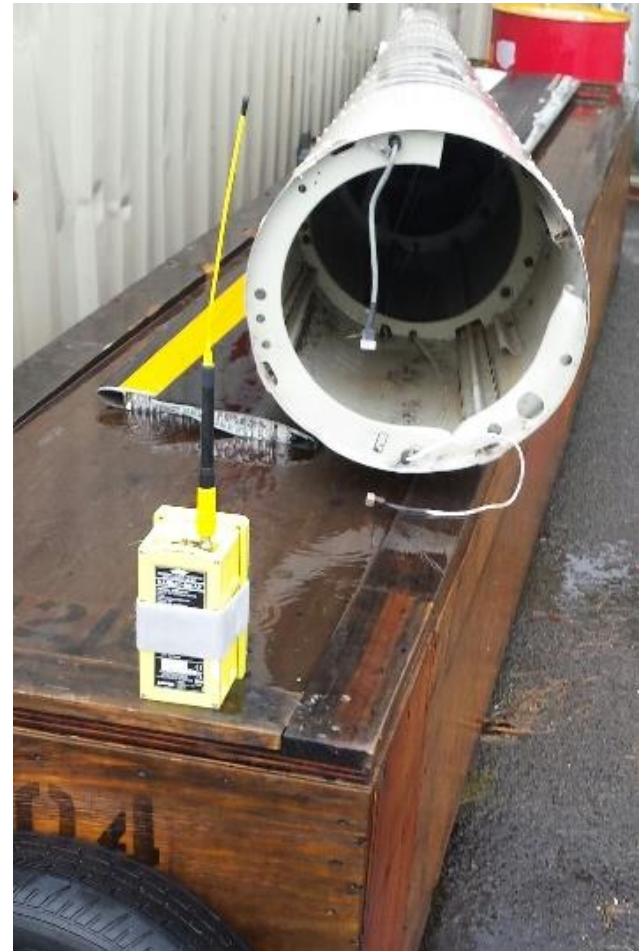


Lloyd Klee www.aviationsafety.co.nz

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Test of an antenna within a tail boom

- Check BT100 2015- 043
- Power measured BT100 = 35.2dBm
- Power receipted on GEO satellite
- -134.55 dBm average



Test- (successful)

406AP- Vertical Antenna bent in “h” shape to fit boom then boom enclosed

External Radiated power measured BT100 2015-045 = **43%**

Power measured on LEO satellite

-138.23dBm average

Satellite location correct

Latitude 37.74823

longitude 176.07684

This test was also successfully repeated with a whip antenna enclosed in the tail boom



Testing on three separate occasions has proven

- *That a 406MHz antenna within an aircraft fuselage will transmit successfully to the Cospas-sarsat system*
- *The tests show that it matters little if the fuselage material is composite or aluminium*
i.e. You do not need a window
- **NOTE** *that the signal will not transmit through a carbon fibre fuselage*

The Issues

- We need to change some of the wording of the RTCA document D-204A
- This is to do with antenna location
- The word ***shall*** needs to be replaced with **should**
- Current Wording DO-204A
- 3.1.10.1 Antenna Polarization The antenna *shall* / **should** be mounted to provide either right-hand circular or vertical polarization when the aircraft is in the normal flight attitude.
- Remember most 406MHz ELT antennas are now omni directional

The Issues

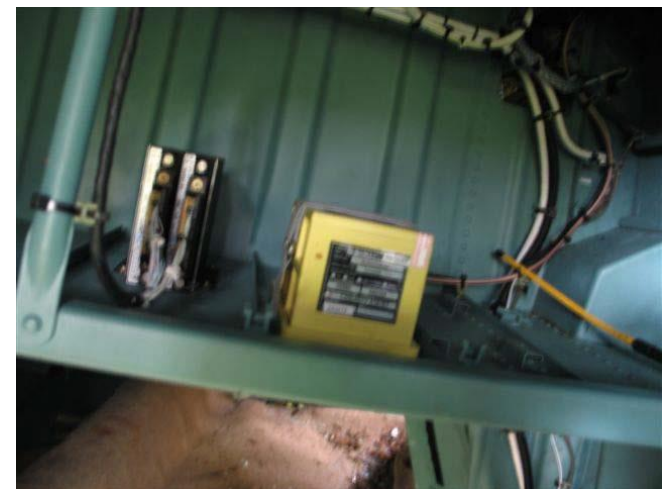
- **3.1.10.4 Internal Antenna Location**

- *The antenna **shall** / **should** be installed as close to the ELT unit as practicable, insulated from metal window casings and restrained from movement within the cabin area. The antenna **shall** / **should** be located such that its vertical extension is exposed to a RF transparent window.*
- *The proximity to the vertical sides of the window and to the window pane and casing and the minimum acceptable window dimensions **shall** / **should** be in accordance with the equipment manufacturer's instructions*
- *This part of the regulation written around 121.5/243MHz ELTs*

Results if wording change

- *Engineers will be able to install 406MHz ELT systems in the most crash worthy position and still comply with regulations*
- ELT systems currently fail due to regulations

crash worthy
position



What can you do to assist

- The data collected from accidents often leaves a lot to be desired.
- We continue to struggle to receive accurate ELT information from most accidents
- Helicopter accidents in particular have a high failure of ELT systems generally due to broken antennas
- Loss of control -slow roll overs will not activate an ELT even with multi axis G -Switches

Under review

- As a result of AF447 and MH370, a new Generation 406MHz is now underway
- IN-FLIGHT EVENT DETECTION & TRIGGERING
- *The in-flight event detection and triggering criteria logic shall be designed to process data pertaining to aircraft status and provide output(s) information to transmission system(s)*

Second generation Cospas-Sarsat 406MHz beacon systems

- next generation ELTs specifications,
- Mandatory GNSS specifications (GPS)
- PLUS In-flight activation because of flight anomaly
- Power source options?
- Crash safety (crash worthy) specifications?
- Return link services specifications options?
- Second generation homing ?Maybe just 406MHz
- Improved Antenna and Cabling Specifications
- Currently RTCA are developing aviation-based 406 MHz MEOSAR distress alerting and location proposals / papers for consideration by Cospas-Sarsat
- Defining the frequency of transmission of data and applicable parameters

However in the meantime

- Ensure that all accidents have a higher level of audit around the ELT installation
- and
- reasons for both not working or working
- Support a change in location of antennas to crash worthy positions via the regulator
- Ensure all ELT installations are ***engineered***

Questions ??

