Contents

• SAR Who/What/When
• What does a crash look like?
• ELTs and SARSAT/COSPAS.
• What you can do to help us find you.
• What you can do to survive.
Who does SAR?

• Primary SAR is provided by the Canadian Armed Forces and Coast Guard
• Mission Control Centre (MCC) at CFB Trenton
• Joint Rescue Coordination (JRCC) centres at Halifax, Trenton and Victoria.
• Additional SAR resources provided by the Civil Air Search And Rescue Association (CASARA), and Coast Guard Auxiliary (CGA)
CASARA

- Civil Air Search and Rescue Association
- Nationwide volunteer organization
- Search taskings from Trenton JRCC in support of 424 SAR Squadron
SAR Responsibility Areas
What does SAR do?

- MCC determines crash location from SARSAT/COSPAS data
- JRCC determines search area and resources, and controls searches.
- CAF, CASARA and CCGA search for missing aircraft or vessels.
- CAF SAR Techs provide emergency medical care and evacuation.
When does SAR start?

- ELT signal detected by SARSAT/COSPAS or other aircraft.
- Flight Plan or Flight Itinerary expires and JRCC is notified.
- ATC loses contact with aircraft which is under their control.
What Will A Crashed Airplane Look Like?
What Will It Look Like? (2)
Visual Search 1

- 500 AGL: Where’s the crash?
Visual Search 2

• How about now? (200 AGL)
What is an ELT?

• Low power radio transmitter (~50-75mw 121.5) (5W 406)
• 121.5Mhz, 243Mhz (military) or 406Mhz
• Triggered by impact/shock
• 48 Hour battery life
• External and Built-in antennas
• Typically installed in the tail of an aircraft
Typical ELT Location

Approximate Dimensions

- Overall Height: 8’11”
- Overall Length: 26’11”
- Wing Span: 36’1”
- Wing Area: 174 sq ft
- Cabin Height (max): 48”
- Length (firewall to aft baggage area): 142”
- Width: 39.5”

ELT
ELT Types

• TSO C-91 (this is the most common)
  – Original spec. for 121.5 ELT
  – Reliability problems, poor frequency control
  – Poor survivability

• TSO C-91a
  – Next generation 121.5 ELT
  – Remote control (panel switch)
  – More reliable G switch
  – Improved frequency control
ELT Types Cont.

• 406 ELTs, EPIRBs (marine) and PLBs
  – SARSAT/COSPAS designed for 406 Beacon frequency
  – 5W burst digital signal at 406MHz (~50ms)
  – Low power continuous homing signal on 121.5MHz
  – Very accurate frequency control
  – More reliable G switch
  – Improved survivability
  – Identity broadcast (each unit registered)
  – Possible GPS position broadcast
  – Personal Locator Beacons available
  – High cost
## Comparing ELT Types

<table>
<thead>
<tr>
<th>TYPE</th>
<th>121.5</th>
<th>406</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location Accuracy</strong></td>
<td>12nm</td>
<td>2nm</td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
<td>Local</td>
<td>Global</td>
</tr>
<tr>
<td><strong>Signal Power</strong></td>
<td>.1W</td>
<td>5W</td>
</tr>
<tr>
<td><strong>Alert time</strong></td>
<td>1.5-2.0 Hours (LEOS)</td>
<td>Instantaneous (GEOS)</td>
</tr>
<tr>
<td><strong>Doppler Location</strong></td>
<td>2 Passes (LEOS)</td>
<td>1 Pass (LEOS)</td>
</tr>
</tbody>
</table>
SARSAT/COSPAS

- Satellites on Polar orbits (LEOS)
- Satellite orbits take 100 minutes
- Monitoring 121.5*, 243*, and 406 MHz
- Primarily designed for 406 MHz
- Relay ELT signals to local user terminals (ground stations)
- Doppler shift used to find possible location of the beacon

* 121.5 and 243 monitoring will cease by Feb. 2009
SARSAT/COSPAS System
SAR Steps

• JRCC is notified of missing aircraft
• Search resources are tasked.
• 1st stage search typically a track crawl
  – Looking for active target (ELT, smoke, signals, etc.)
• Search progresses to low level coverage of search area (CSAD).
• Target found, SAR Techs jump in....
What’s the CSAD

- CSAD 1 is a 20 NM box around the planned track of the aircraft
- CSAD 1 starts 10 NM prior to the last known point (LKP), and ends 10 NM past the destination.
- CSAD 2 widens the search area by a further 10 NM from the LKP to 15NM past the DEST.
How long will it take?

- Assuming your ELT is working.
- Average time to Satellite pass: 45 mins.
- Minimum of two passes before ELT targeted and search triggered (90 mins).
- Time to launch 1-2hrs
- Time to reach search area?

Plan on spending the night!
How to Be Found Alive

• Survive the return to earth
  – Practice emergency procedures
• Be prepared to survive
• Be found quickly
What can you do?
(Before and during the flight)

• File a flight plan, and follow it
• Use flight following whenever possible
• Regularly tell FSS where you are on 126.7
• Tell FSS if you are deviating from course
• Make sure your ELT is in good condition and preferably is a TSO C-91a or 406.
• Ensure that your PAX are briefed on the ELT, survival kit, radios, and evacuation procedures
What can you do?  
(After the premature end of the flight)

• Aviate, Navigate, Communicate  
  – Tell someone what’s happening (mayday…)

• Get out of the plane

• Turn on the ELT as soon as possible and leave it on (prior to landing if possible).

• Prepare to spend the night

• Prepare to signal over flying aircraft

• Check that the ELT is on, maybe move it
Do Not ...

• Leave the crash site unless in immediate danger.
• Turn off the ELT, I repeat **DO NOT** turn off the ELT
Be Prepared

• Dress for the conditions (remember you may be out there all night).
• Carry a personal survival kit, **on your person**.
• Carry an aircraft survival kit and have it close at hand.
• File a Flight plan and stick to it (yes I’ve said this before, it’s important).
Personal Survival Kit

- Waterproof (wooden) matches
- Signal mirror (and flares)
- Sterile bandages
- Package of kleenex
- Sunscreen and mosquito repellent
- Small knife
- Signal tape or signal panel
- Space blanket
- Food (meal replacement bars)
- Parachute cord (multi-strand cord)
- Fishing line and hooks
CASARA
Aircraft Survival Kit

Bright Orange Cotton Bag with Contents List on Tag
Overall Dimensions:
Length: 24 inches
Diameter: 9 inches
Weight: 6 lbs

10-06-22
CASARA Ottawa
Kit Opened

- Signal Panel
- Garbage Bags (x4)
- 2 Large Coffee Cans with wire handles, taped open ends together
First Aid:
• Shell Dressings (x2)
• Emergency Blankets (x4)
• Triangular Bandages (x4)
• Roll of Gauze Bandage (2” x 18’)

Heat/Signaling:
• Candles (x2)
• Matches in Waterproof Container
• Whistle
• Koolik (solid pocket stove)
• Butane Lighter

Shelter:
• Folding Saw
• Knife (compass, fishing line, hooks)
• Plastic Tarp (8’6” x 10’)
• Parachute Cord (20’)

Comfort:
• Teabags/OXO/Sugar Packets (x16)
• Granola Bars (x8)
• Hard Candy
• Bug Repellent
• Snare Wire
• Survival Handbook
Additional Survival Aids

- Personal Locator Beacon (406Mhz) carried on your person.
- Flashlight(s)
- Leatherman tool or the like
- Handheld aviation radio
- Handheld GPS (doesn’t need to be an aviation one)
Credits

• Presentation developed by T. Cooper
• Crash photos from www.CAP-ES.net (Scott E Lanis US Civil Air Patrol)
• Survival kit photos by J. McArthur
Fly Safe

(and file a flight plan)