Emergency GPS Location Devices

SOARING SOCIETY OF AMERICA

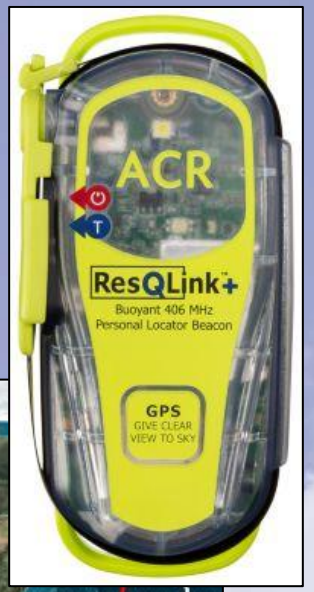
Presented at the

Soaring Society of America

National Convention

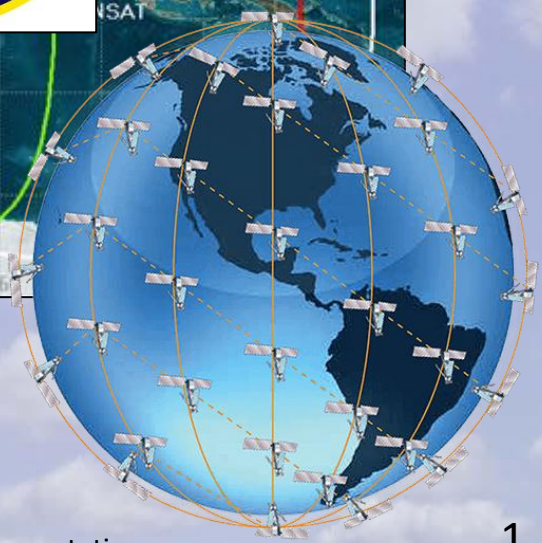
October 26, 2024

Updated: January 16, 2025



INTERNATIONAL SATELLITE SYSTEM COSPAS SARSAT SEARCH AND RESCUE

GEOS worldwide



PLEASE NOTE

This document may have been updated with new information, changes, and corrections.

Be sure to visit my presentation web site and download the latest version of this document. It could make an important difference to your work!

http://aviation.derosaweb.net/presentations

Thank you, John (OHM)

Table of Contents

- Part 1 – Overview of Emergency Location Devices
- Part 2 – Emergency Locator Transmitters (ELTs)
- Part 3 – Personal Locator Beacons (PLBs)
- Part 4 – Personal Satellite Communicators
  - Spot Device Information
  - Garmin Devices Information
  - Others Satellite Communicators
- Part 5 – Satellite Emergency Response Centers
  - Governmental - COSPAS-SARSAT (PLBs)
  - Commercial – GEOS (Spot, Garmin)
- Other Topics
  - Garmin InReach Watch
  - ADS-B?
  - Comparisons & Conclusions
  - Tracking Examples
  - Survival Kits (Landout and Bailout)
  - Safety Information Resources

NOTIFICANTION

The Information in this Document Was Current as of

January 2025

Emergency Location Devices

Preamble - Why Do We Need Them?

Synopsis: For glider pilots it isn't a matter of if, it is a matter of when, that conditions will require that we land at a place other than our home gliderport.

For gliders this event is called a "land out" and is usually a safe affair. For airplanes this situation, maybe caused by an "engine out", could be a true emergency. But with either gliders or airplanes we may both be attempting to land at an unimproved field which can be a significant distance, and time, from assistance.

Most likely your glider land-out is a safe event and assistance may well arrive quickly. But there is always the chance that it might not. We might be injured and require quick emergency care. We might land in an area without cell phone coverage to allow calling for help. So, how can we get quick help?

This presentation will be an overview of the types of small, relatively inexpensive, portable satellite-based emergency location devices to carry with us during flight (or camping, hiking, skiing, etc) that will provide you needed help in an emergency. We will cover the features, costs, and pros/cons of each type of device.

Bottom line: We must be prepared

Emergency Location Devices

Glider Land-outs Examples

Emergency Location Devices

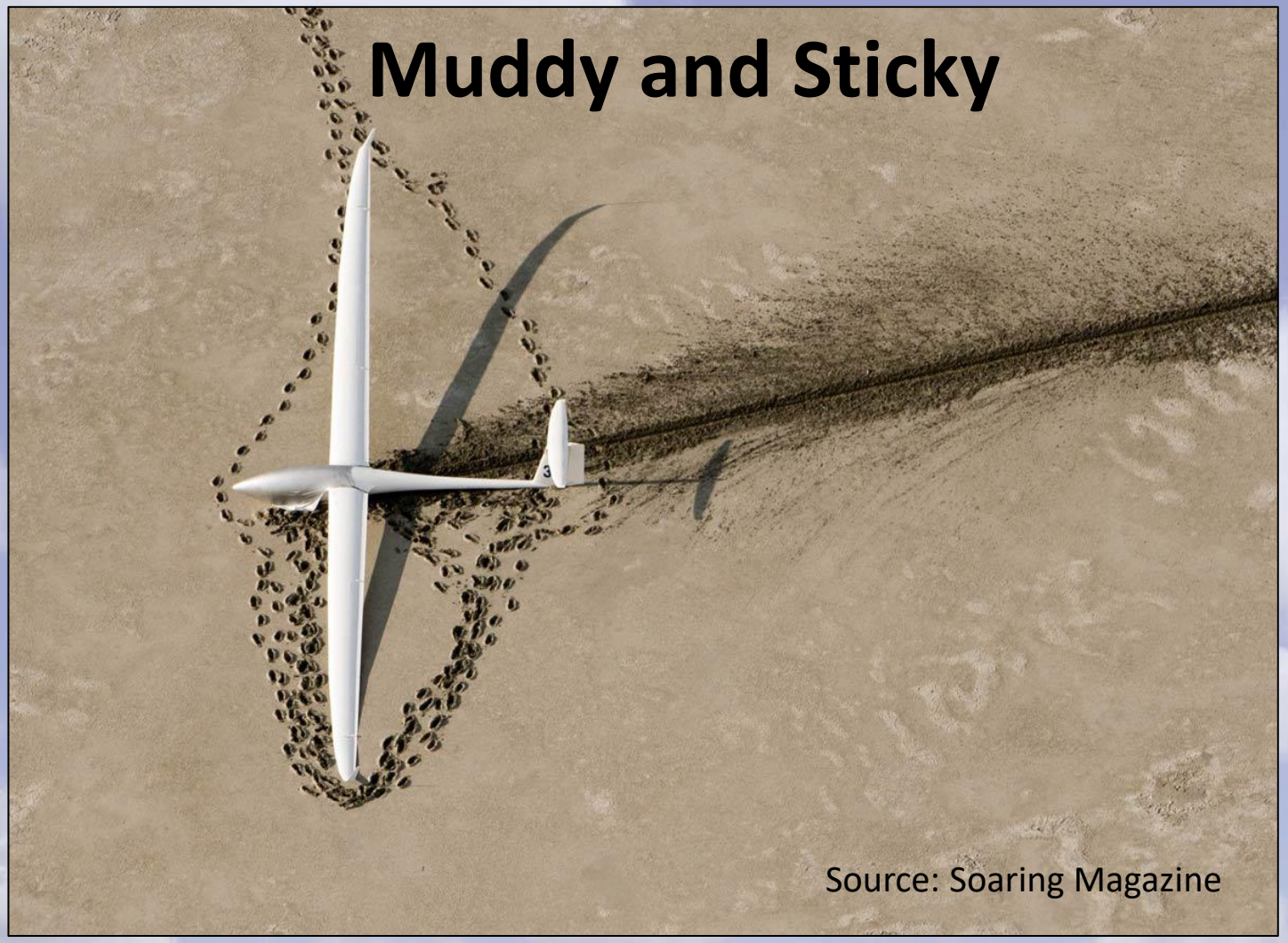
Glider Land-outs Examples

Emergency Location Devices

Glider Land-outs Examples

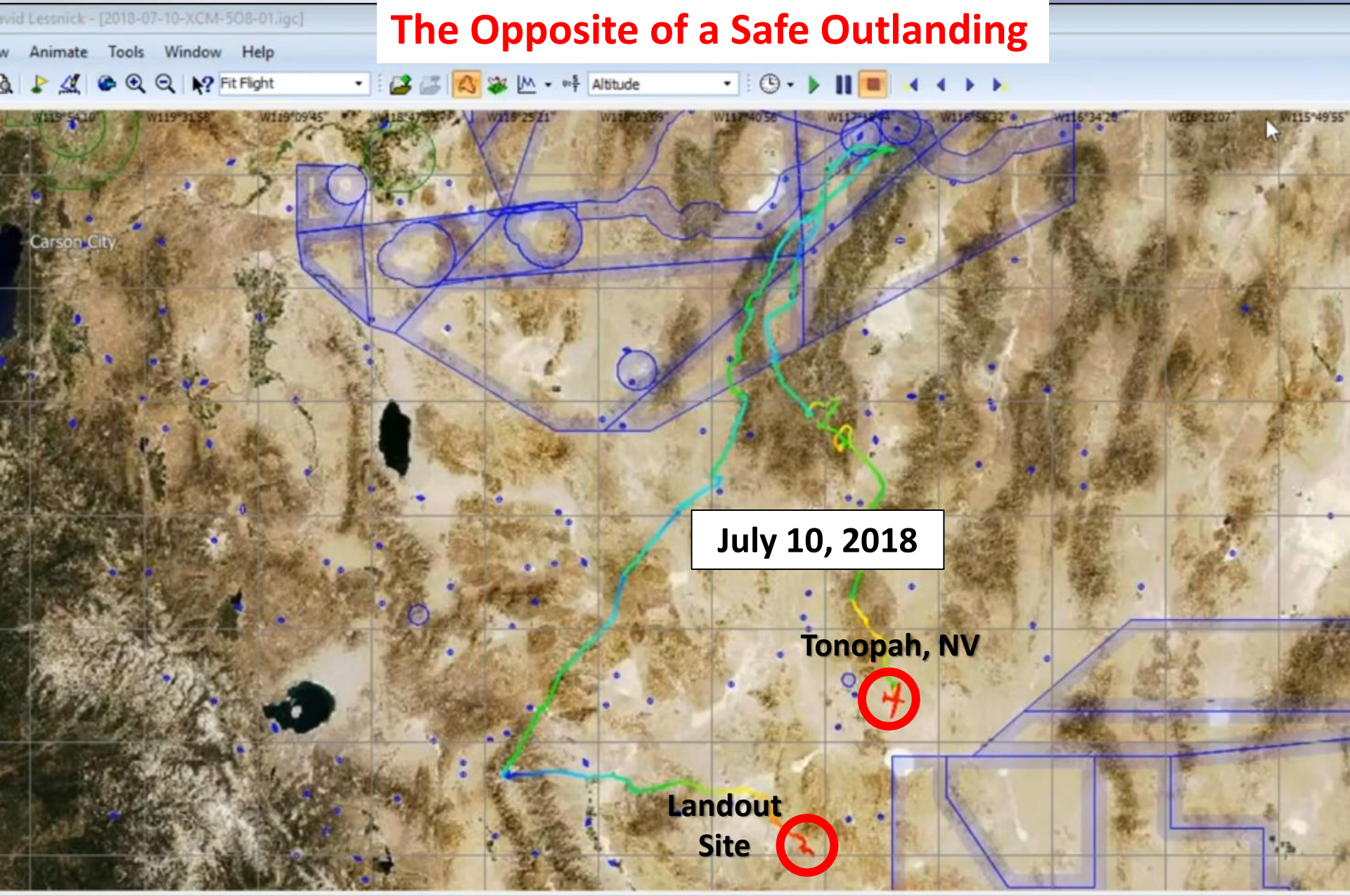
Emergency Location Devices

Glider Land-outs Examples



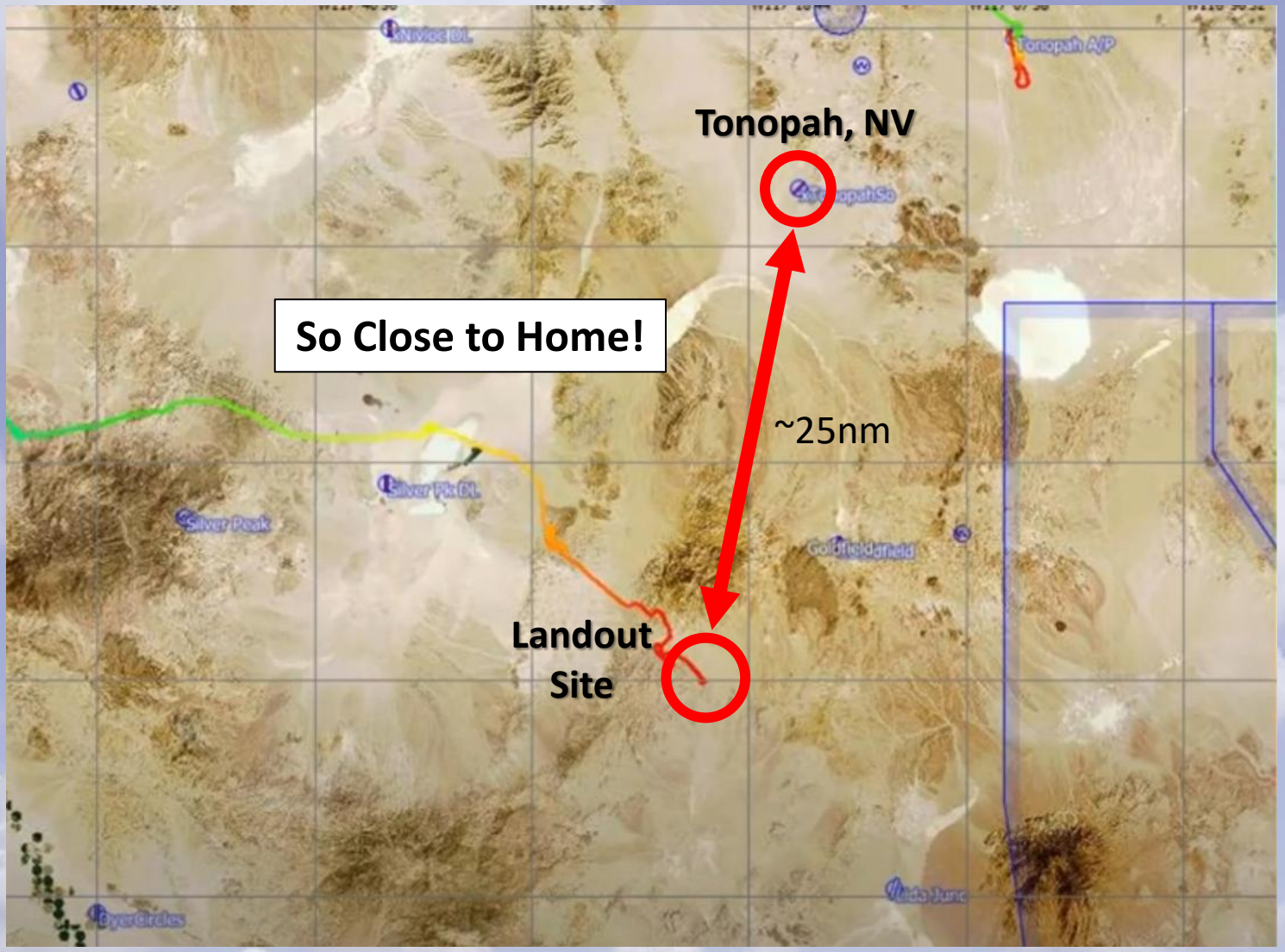
Emergency Location Devices

The Opposite of a Safe Outlanding



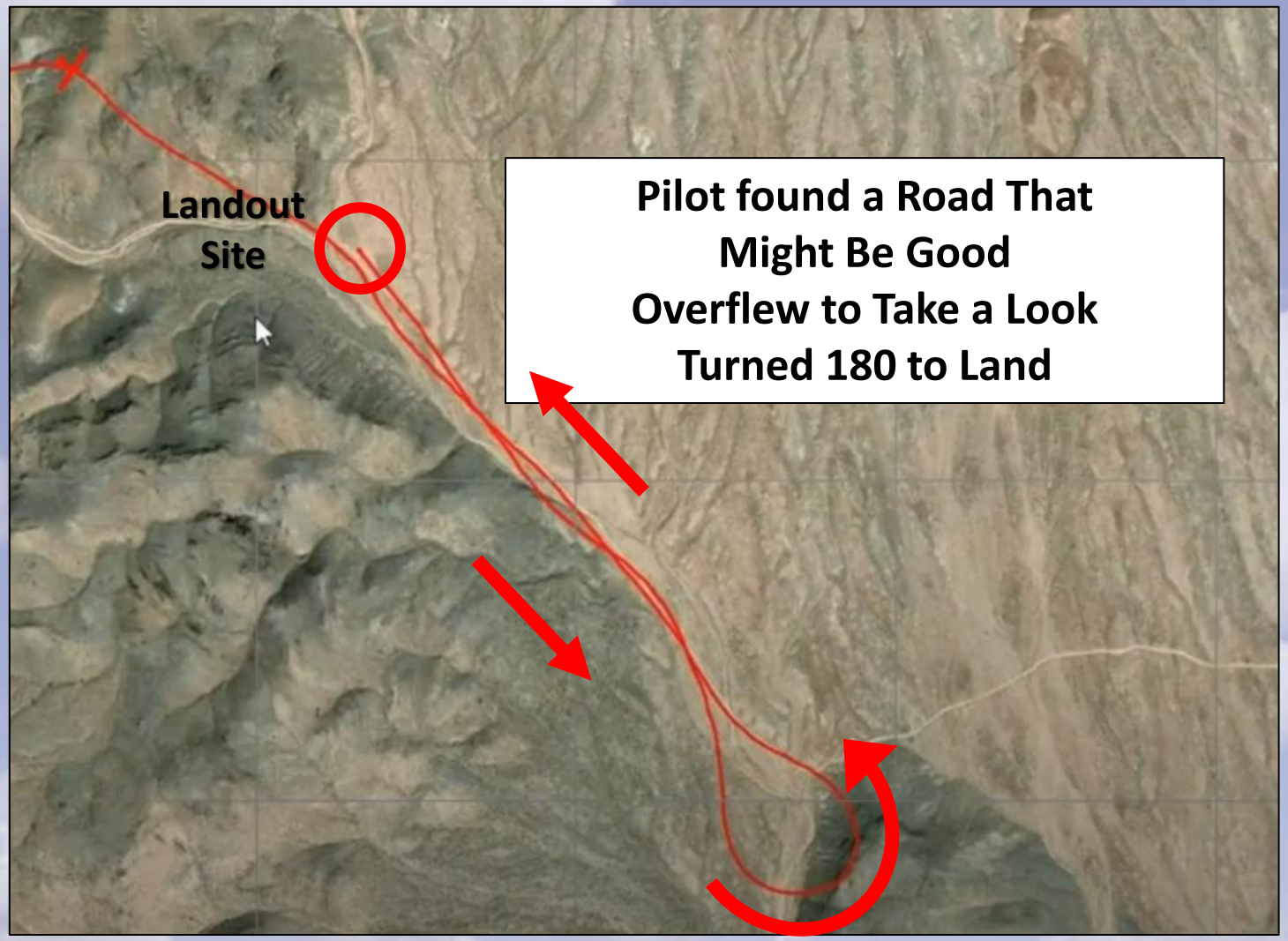
Emergency Location Devices

The Opposite of a Safe Outlanding



Emergency Location Devices

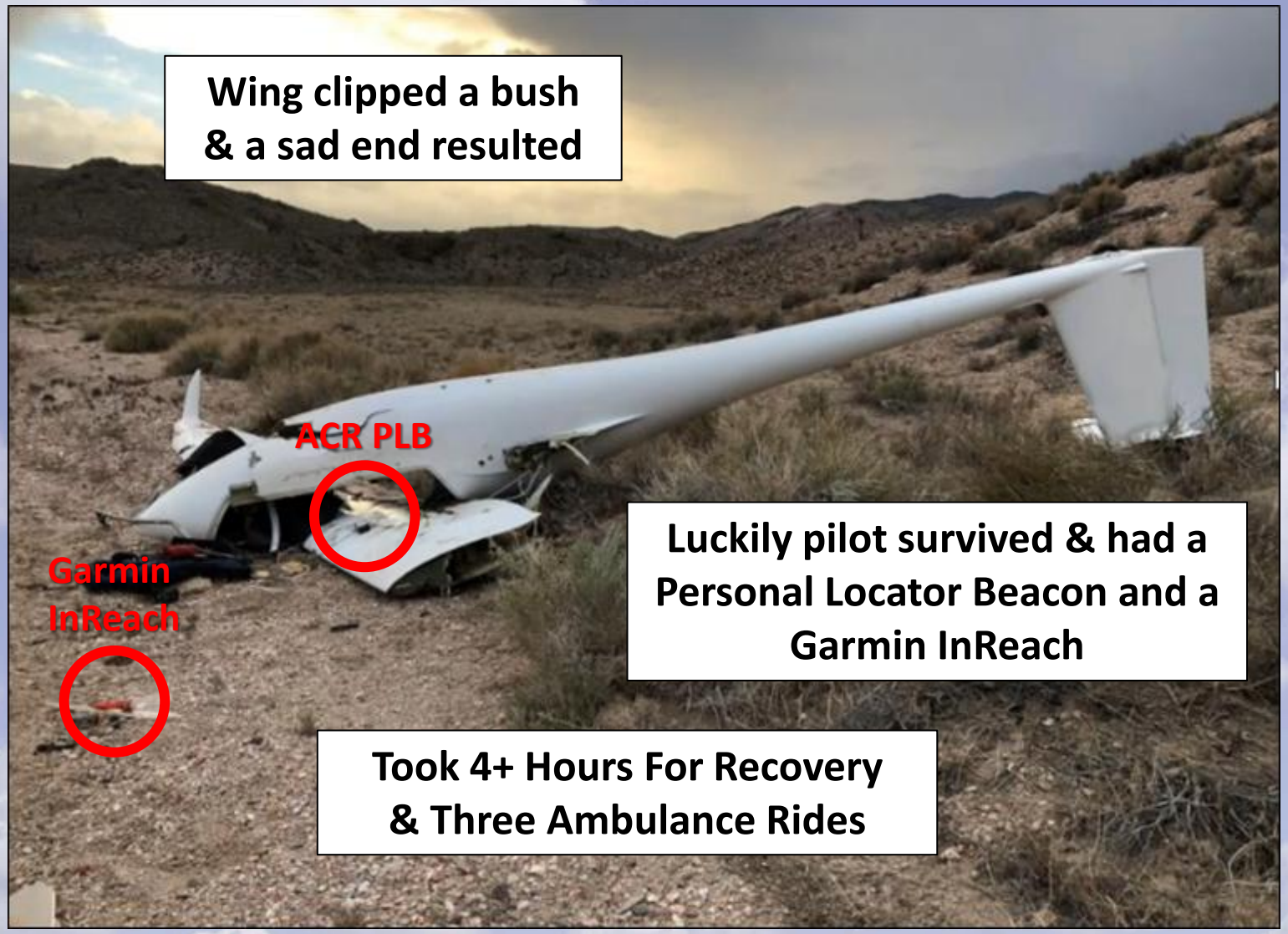
The Opposite of a Safe Outlanding



Emergency Location Devices

The Opposite of a Safe Outlanding

Emergency Location Devices



Emergency Location Devices

Glider Landouts – Example

David Lessnick Information

Accident: July 10, 2018
Took off from: Tonopah, NV
Glider: Shempp Hirth Discus CS
Contest ID: 51P
Tail Number: N104TH

"ONE BAD DECISION that almost KILLED ME & How I Survived It"

Video Discussion: https://tinyurl.com/Lessnick2018-07-10

First responders took 4-1/2 hours to get to the crash location
Then 3 separate ambulance rides to Las Vegas

Emergency Location Devices

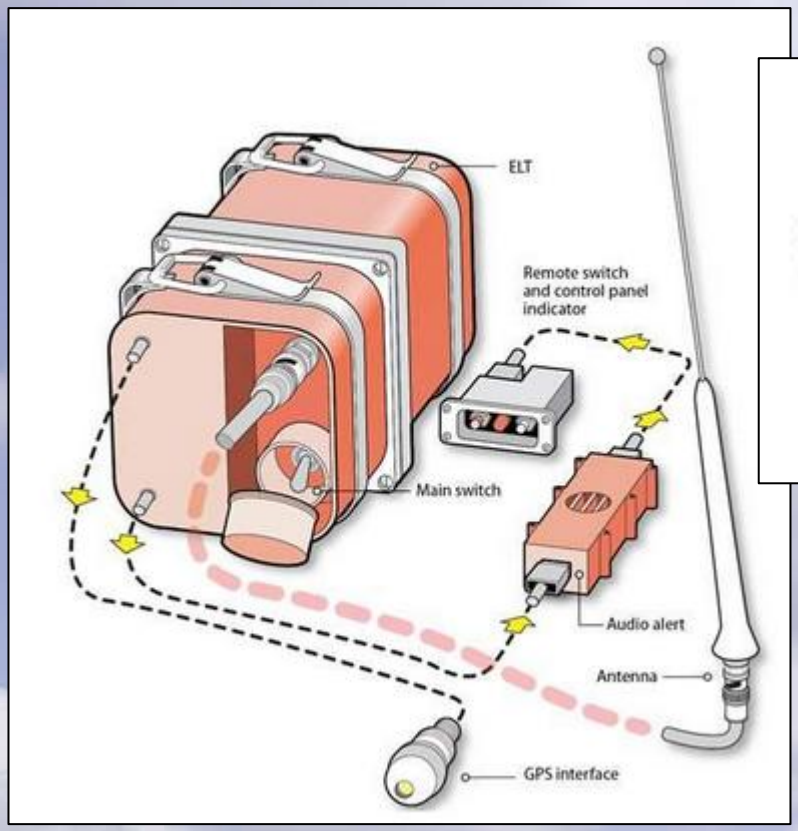
Device Types To Be Covered

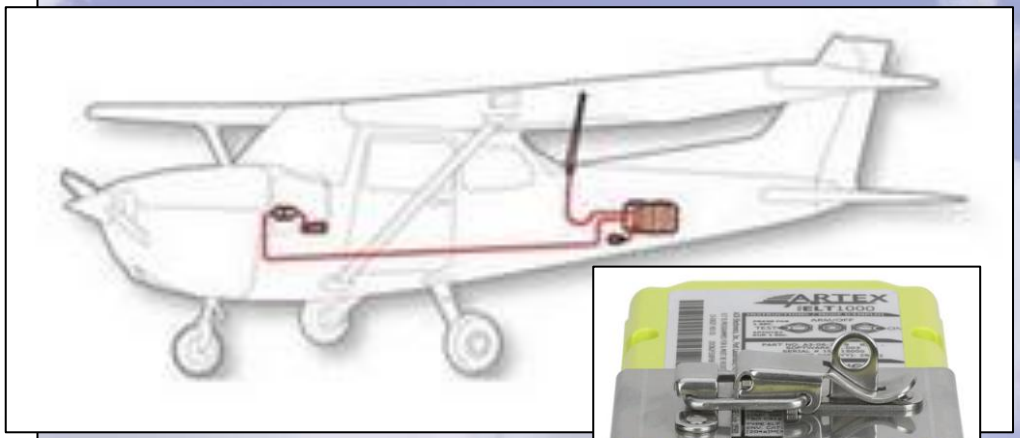
Emergency Locator Transmitters (ELT) >

< Personal Locator Beacons (PLB)

"Personal Satellite Communicators" >

Emergency Locator Transmitter (ELT)





Source: https://www.aopa.org/advocacy/aircraft/aircraft-operations/emergency-locator-transmitters

Emergency Location Devices

Emergency Locator Transmitters (ELT)

- ELTs when triggered – typically by a “crash” – they will broadcast a homing signal on 121.5 Mhz
- Modern ELTs when triggered will also broadcast an alert to orbiting satellites on 406 Mhz with GPS position, on 406 Mhz
- ELTs are required in all US-registered airplanes [91.207] with some exceptions
- As of 1973 ELT 121.5 Mhz (the “guard” channel) are **required** to be monitored by all U.S. civil registered civil aircraft (except as provided in [91.207(e) and (f)])

Emergency Location Devices

Emergency Locator Transmitters (ELT)

- **Original ELT Models (1973)**
  - In actual crashes an activation accuracy rate of less than 25% and a 97% false-alarm rate
  - Transmits homing beacon on 121.5 MHz at **0.2W (200mW)**
  - FAA Technical Standard Order TSO-C91
  - **High levels of false alarm signals**
  - **Sales of these ELTs are prohibited by the FCC beginning in 2019**

- **Updated ELT Models (1985)**
  - Improved performance for activation and false-alarm rate
  - Transmits homing beacon on 121.5 MHz at **0.2W (200mW)**
  - FAA Technical Standard Order TSO-C91a
  - **121.5 Mhz COSPAS-SARSAT satellite system monitoring was discontinued in 2009 at least partly due to the high number of false alarm signals.**

- **Advanced ELT Models (1992)**
  - Transmits homing beacon on 121.5 MHz at **0.2W (200mW)** **and** in current models on 406.0 MHz at **5W** **with encoded GPS position**
  - FAA Technical Standard Order TSO-C126a
  - Monitoring of 406.0 Mhz via **COSPAS-SARSAT** governmental satellite system

More on the SARSAT system in a Later Slide

Source: https://www.aopa.org/advocacy/aircraft/aircraft-operations/emergency-locator-transmitters

Emergency Location Devices

Emergency Locator Transmitters (ELT)

- All **ELTs** must be inspected every **12 calendar months**.

- **Testing;**
  - **Analog 121.5Mhz ELTs** must only be tested within the **first five minutes after the hour**, and you may transmit no more than three audible sweeps.
  - **Digital 406Mhz ELTs** must **only be tested in accordance with the manufacturer's instructions**.
  - Airborne tests are **never** authorized for any ELT.

- **Transmissions;**
  - All models transmit a homing beacon on 121.5 MHz.
  - Current models also transmit on 406 Mhz with encoded GPS location information.

- **Batteries** - Must be replaced after one hour of cumulative use or when 50 percent of their usable life has expired. Expiration date for replacing (or recharging) the battery must be legibly marked on the outside of the transmitter and entered into the aircraft maintenance record.

Personal Locator Beacons (PLB)

Emergency Location Devices

Personal Locator Beacons (PLB)

ACR ResQLink View
$485

McMurdo FastFind 220
$330

RescueMe PLB 1
$370

Prices are MSRP as of October 26, 2024

Emergency Location Devices

Personal Locator Beacons (PLB)

- **Description -** A PLB is a portable battery powered radio transmitter used in emergencies to locate airplanes, vessels, and persons in distress and in need of immediate rescue.
- Also referred to as “EPIRB” (Emergency Position-Indicating Radio Beacon)
- Utilizes the governmental **COSPAS-SARSAT** satellite system to alert rescue services
- Global Positioning System (GPS) based accurate to 100 meters or less 🡐 More about SARSAT in a Later Slide
- Transmits on 406 MHz at 5W
  - Transmit only. Receive capable only on latest ACR model
- 121.5Mhz Homing beacon
- Subscription Service: None required
- Must re-register every 2 years with NOAA (National Oceanic and Atmospheric Administration) – A Free Service

ACR ResQLink View

Emergency Location Devices

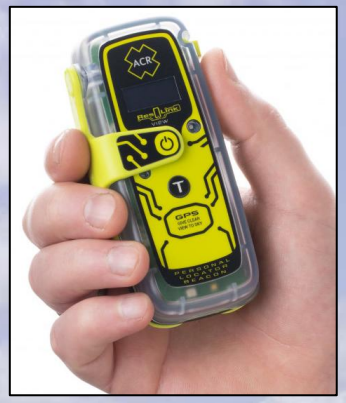
Acratex ACR Personal Locator Beacons

- ACR ResQLink View (as shown at right)
  - https://www.acrartex.com/t/categories/aviation
  - Cost: Approximately $290-$350
  - Subscription Fees: **None**
  - Homing beacon on 121.5
  - Size: 4.52” x 2.03” x 1.49”
  - Weight: 0.33 lbs
  - Water Resistance: Buoyant and Waterproof to 5m for 1 hour
  - Strobes – Both Visible and Infrared
  - Emergency Response Center: SARSAT
  - NASA GEO and LEO (Geostationary & Low Earth Orbit)
  - Confirmation digital display
  - Battery: Internal 5 Year Lithium battery life with 28 hour operational life
  - External power input: **None**
  - Text Messaging: Maybe?
  - Real Time Tracking: **None**

← More on SARSAT in a Later Slide

← See on later slides about “406Link”

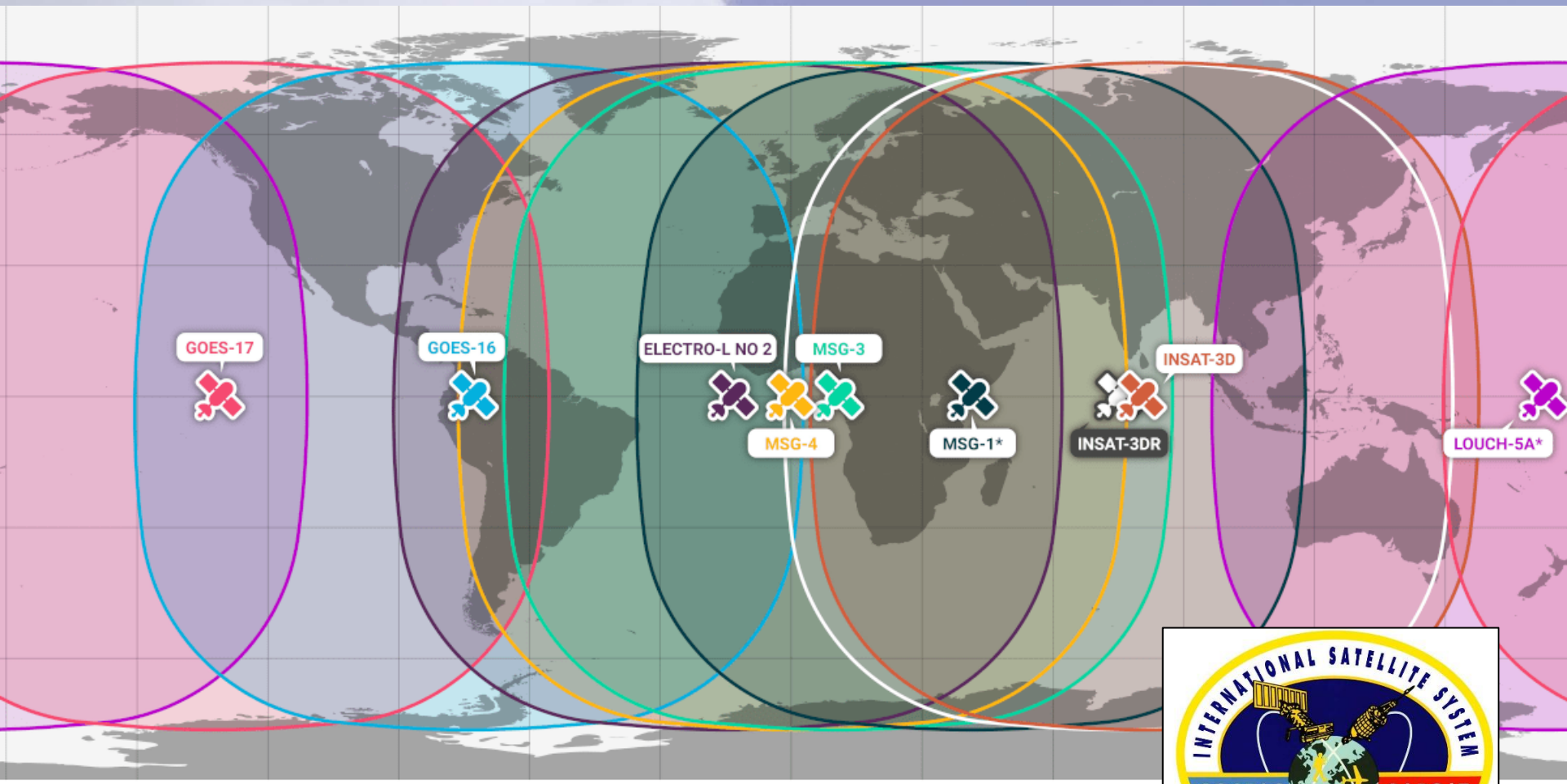
ACR ResQLink View



Emergency Location Devices

Acratex ACR ResQlink View

Personal Locator Beacons (PLB)
SARSAT GEOSAR Satellite Coverage



WORLDWIDE GEOSAR SATELLITE COVERAGE

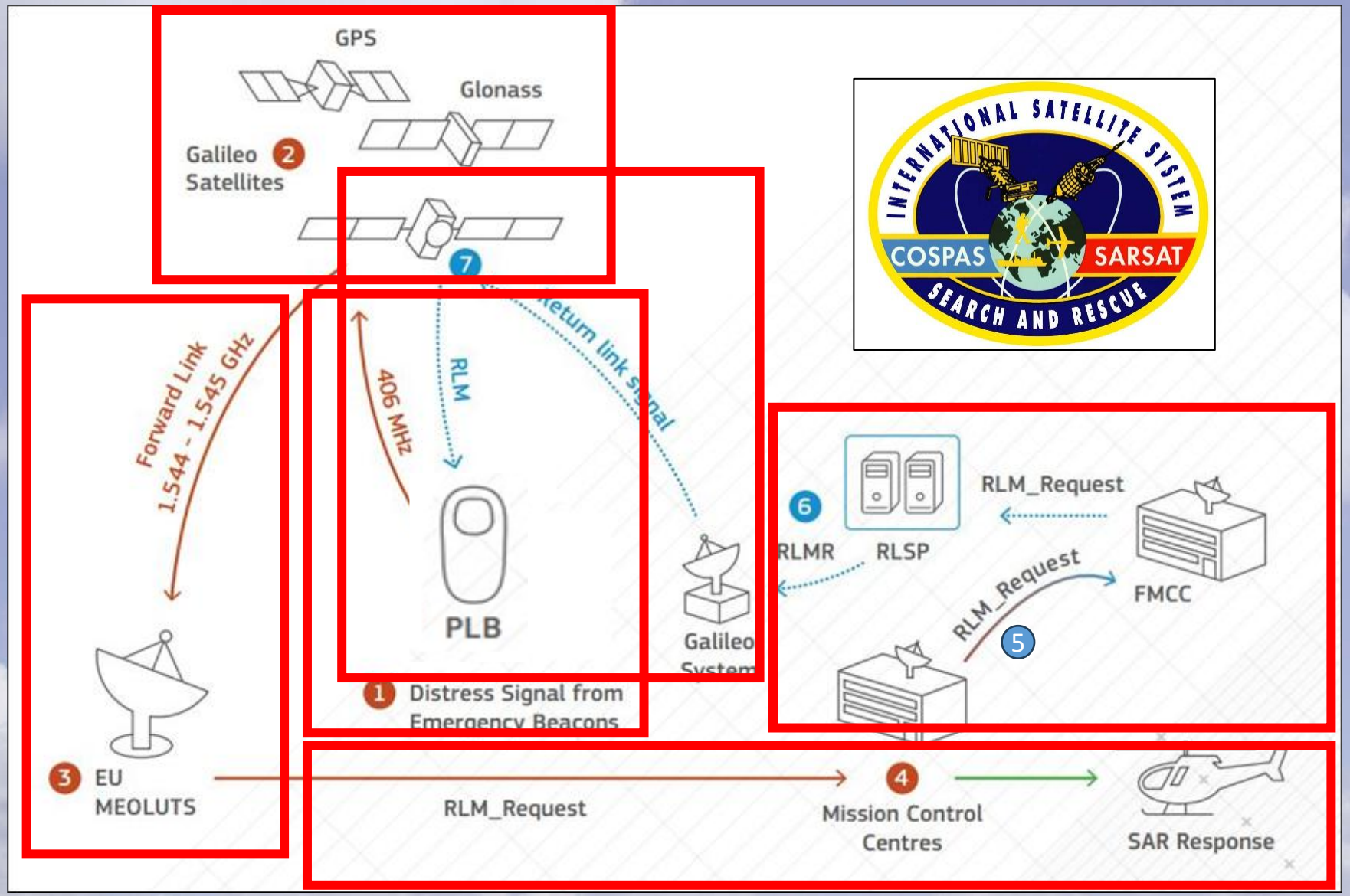
INTERNATIONAL SATELLITE SYSTEM
COSPAS SARSAT
SEARCH AND RESCUE

Personal Locator Beacons (PLB)
Return Link Service (RLS)

Return Link Service (RLS) provides a confirmation message from Search and Rescue back to the beacon to let the survivors know their distress message was received.

The new **MEOSAR satellite system** provides the framework along with the Galileo Global Navigation Satellite System (GNSS) for EPIRBs, PLBs, and EPIRBs to utilize this new system

Personal Locator Beacons (PLB) Return Link Services (RLS) Steps 1-7



Personal Satellite Communicators

Personal Satellite Communicators

Not Covered in this presentation

Covered in this presentation

Garmin InReach Mini 2
$400

SPOT Gen 4
$150

SPOT X
$250

Garmin InReach SE+
$600

Not Shown to Scale

Personal Satellite Communicators

Relative Size Comparison - PLBs and Trackers

ACR AquaLink | **ResQLink View** | **RescueMe PLB1** | **SPOT Gen 3** | **InReach Mini**

Personal Satellite Messengers

Garmin InReach Messenger Plus
“Satellite Communicators”
$500

SPOT Trace
“Satellite Tracking Devices”
$130

Not Covered in this presentation

Prices are MSRP as of Oct 26, 2024

Emergency Location Devices

Personal Satellite Communicators

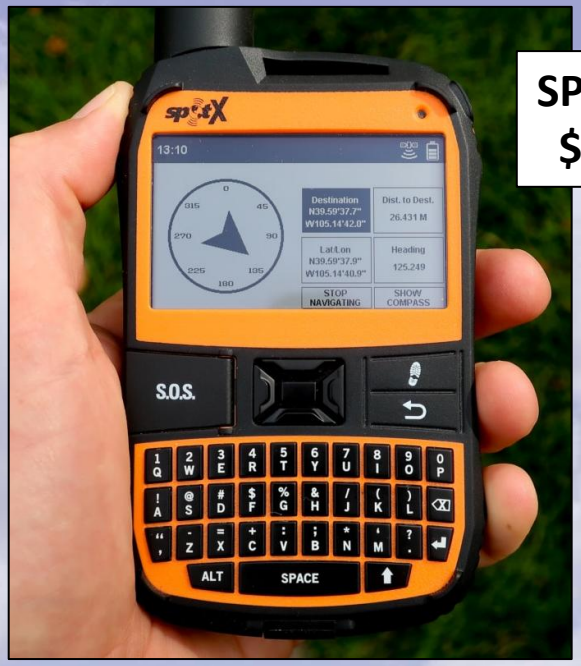
- **Description -** A "Personal GPS tracker" is classified as an emergency GPS locator device with **both transmit and receive capabilities**. It is a portable battery powered radio transmitter receiver used in emergencies to locate airplanes, vessels, and persons in distress and in need of immediate rescue and to provide tracking capability.
- **Satellite Systems (non-governmental)** ← More about these in Later Slides
  - **Iridium System** - Garmin InReach, Somewear, Bivy & others
  - **Globalstar System** – SPOT
- GPS based which is accurate to 100 meters or less
- Utilizes the non-governmental **GEOS** organization to alert and communicates with rescue services ← More about GEOS in Later Slides
- Cost: See Following Slides
- Specifications: See Following Slides
- Pros/Cons: See Following Slides
- Subscription Service Contract: Required. See the following slides.

spot™

Globalstar

GEOS worldwide

SPOT Gen 4
$150



SPOT X
$250

Shown Approximately to Scale

Prices are MSRP as of Oct 26, 2024

Personal Satellite Communicators

SPOT Gen 4 - Specifications

- Cost: $150 MSRP as of Oct 26, 2024
- Size: 3.48" x 2.56" x 0.93"
- Transmit: <1W
- Subscription Fees: See Following Slide
- Weight: 5.0 oz
- 121.5Mhz Homing beacon: **None**
- Water Resistance: Submersible up to 1m for 30 minutes
- Tracking: 5, 10, 30 or 60 min selectable
  (2.5 min at additional recurring cost)
- Strobe and/or Infrared Strobe: **None**
- Satellite System: GlobalStar
- Emergency Response Center:
  GEOS services ← More on the GEOS system in later slides
- Battery Life: 4 AAA lithium cells > Sends 1,250 Check In and Custom Messages
- Text Messaging: **Yes (only pre-configured messages)**
- External Power Charging: **None**
- Bluetooth Pairing: **None**

Personal Satellite Communicators

SPOT Gen 4 - Service Plans

BASIC
$11.95/MO. *12 Month Term Applies*
SOS *UNLIMITED*
HELP *UNLIMITED*
CHECK IN *UNLIMITED*
CUSTOM MESSAGES *UNLIMITED*
BASIC TRACKING *5, 10, 30 or 60 minutes*
EXTREME TRACKING *Additional Charge* *2½ mins $4.95/mo*
ACTIVATION FEE: $29.95

FLEX BASIC
$14.95/MO. *1 Month Minimum Term Applies*
SOS *UNLIMITED*
HELP *UNLIMITED*
CHECK IN *UNLIMITED*
CUSTOM MESSAGES *UNLIMITED*
BASIC TRACKING *5, 10, 30 or 60 minutes*
EXTREME TRACKING *Additional Charge* *2½ mins $6.25/mo*
ACTIVATION FEE: $29.95 **FLEX CHARGE: $34.95***

Comparison tables of all Emergency Location Devices is shown in a later set of slides

As of October 26, 2024 - https://www.findmespot.com/en-us/products-services/spot-gen4#service-plans

Personal Satellite Communicators

SPOT X - Specifications

- Cost: $250 MSRP as of Oct 26, 2024
- Fee Subscription Services: See Following Slide
- Size: 6.54” x 2.9” x 0.94”
- Weight: 7.0 oz with lithium batteries
- Transmit: >1W
- Water Resistance: Submersible up to 1m for 30 minutes
- 121.5Mhz Homing beacon: **None**
- Real Time Tracking: 10, 30 or 60 min selectable (2.5 min or 5 min at additional recurring cost)
- Satellite System: Global Star
- Emergency Response Center: GEOS services ← More on the GEOS system in later slides
- Strobe and/or Infrared Strobe: **None**
- Battery: Internal for 240 hours (10 days) of battery life in continuous 10 minute tracking mode
- Text Messaging: **Yes**
- External Power Charging: **Micro USB**
- Pairing: **Bluetooth**

Globalstar

GEOS worldwide

Personal Satellite Communicators

SPOT Gen X - Service Plans

BASIC	ADVANCED	UNLIMITED
$11.95/MO. *12 Month Term Applies*	$19.95/MO. *12 Month Term Applies*	$29.95/MO. *12 Month Term Applies*
20 CUSTOM MESSAGES *Overages: 25¢ per msg*	**100 CUSTOM MESSAGES** *Overages: 25¢ per msg*	**CUSTOM MESSAGES** *UNLIMITED*
SOS *UNLIMITED*	**SOS** *UNLIMITED*	**SOS** *UNLIMITED*
CHECK IN MESSAGES *UNLIMITED*	**CHECK IN MESSAGES** *UNLIMITED*	**CHECK IN MESSAGES** *UNLIMITED*
PREDEFINED MESSAGES *UNLIMITED*	**PREDEFINED MESSAGES** *UNLIMITED*	**PREDEFINED MESSAGES** *UNLIMITED*
TRACKING *10, 30, 60 minutes* *Tracking will have to be reset after 24-hours.*	**TRACKING** *5, 10, 30, 60 minutes*	**TRACKING** *2.5, 5, 10, 30, 60 minutes*
MOVEMENT ALERT *Not Included*	**MOVEMENT ALERT** *30 min, 60 min, 4 hr, 12 hr*	**MOVEMENT ALERT** *30 min, 60 min, 4 hr, 12 hr*
ACTIVATION FEE: $29.95	**ACTIVATION FEE: $29.95**	**ACTIVATION FEE: $29.95**

Tables of comparisons with other Emergency Location Devices is shown in a later set of slides

As of October 26, 2024 - https://www.findmespot.com/en-us/products-services/service-plans#spot-x-plans

Garmin InReach

GARMIN™

iridium®

GEOS worldwide

Personal Satellite Communicators

Garmin InReach Mini 2 - Specifications

- Cost: $400 MSRP as of Oct 26, 2024
- Subscription Fees: See Following Slide
- Size: 2.04” x 3.90” x 1.03”
- Weight: 3.5 oz
- Transmit: >1W
- Homing beacon: **None**
- Water Resistance: Submerged in 1 meter of water for 30 minutes
- Real Time Tracking: 2 or 10 min depending on model
- Satellite System: Iridium
- Emergency Response Center:
  GEOS System ← More on the GEOS system in later slides
- Strobe and/or Infrared Strobe: **None**
- Battery Life: Internal Lithium - Up to 14 days at 10-minute tracking send interval with standard activity
  Text Messaging: **Yes**
- External Power Charging: **Yes, USB-C**
- Pairing: **Bluetooth**

Garmin InReach Mini – SOS Triggering

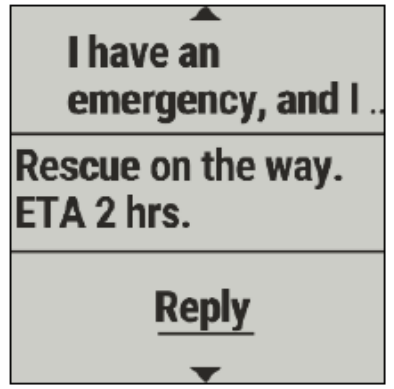
TRIGGERING AND CANCELING AN SOS

You can trigger an SOS on your inReach device, Earthmate® app, Garmin Explore app or a paired compatible device.

Triggering an SOS on an inReach device:

1. Press and hold the SOS Button
2. Wait for the SOS countdown
3. Message with GEOS if possible
   - If you are unable to respond, GEOS will still initiate a rescue response
4. Select **Cancel SOS** if help is no longer needed

Detailed slides of triggering and canceling an SOS on select inReach devices, apps, and paired devices are included at the end of this presentation.



Personal Satellite Communicators

Service Plans

Tables of comparisons with other Emergency Location Devices is shown in a later set of slides

- **Consumer Plans**
  - Essential - $14.99 per month (Used by Author)
  - Standard - $29.99 per month
  - Premium - $49.99 per month
- **Pro Plans**
  - Basic - $19.99 per month
  - Advanced - $34.99 per month
  - Premier - $54.99 per month
- **Flex Team Plans**
  - Team - $99.99 per month
  - Team Plus - $174.99 per month
  - Team Max - $249.99 per month

As of Oct 26, 2024 https://www.garmin.com/en-US/p/837461/pn/010-04015-SU

Personal Satellite Communicator

Garmin InReach Service Plan Details

Consumer

Used by Author

	ESSENTIAL	STANDARD	PREMIUM
Emergency SOS messaging	Included	Included	Included
Check-in messages/Reactions	Unlimited	Unlimited	Unlimited
Text messages/Weather requests	50 total	150 total	Unlimited
Photo and voice messages[2]	10 total	25 total	50 total
Live tracking/Location requests	$0.10 ea (10 min+ interval)	Unlimited (10 min+ interval)	Unlimited (2 min+ interval)
		ADDITIONAL CHARGES	
Activation fee	$39.99	$39.99	$39.99
		OVERAGE CHARGES	
Text messages/Weather requests	$0.50 ea	$0.50 ea	N/A
Photo and voice messages	$1 ea	$1 ea	$1 ea

As of Oct 26, 2024 https://www.garmin.com/en-US/p/837461/pn/010-04015-SU

Personal Satellite Communicator

Garmin InReach Service Plan Details

PRO

	PRO BASIC	PRO ADVANCED	PRO PREMIER
Emergency SOS messaging	Included	Included	included
Check-in messages/Reactions	Unlimited	Unlimited	Unlimited
Text messages/Weather requests	50	150	Unlimited
Photo and voice messages[2]	10	25	50
Live tracking/Location requests	$0.10 ea (10 min+ interval)	Unlimited (10 min+ interval)	Unlimited (2 min+ interval)
		ADDITIONAL CHARGES	
Activation fee	$39.99	$39.99	$39.99
		OVERAGE CHARGES	
Text messages/Weather requests	$0.50 ea	$0.50 ea	N/A
Photo and voice messages	$1 ea	$1 ea	$1 ea
Suspend fee	$4.99	$4.99	$4.99

As of Oct 26, 2024 https://www.garmin.com/en-US/p/837461/pn/010-04015-SU

Personal Satellite Communicator

Garmin InReach Service Plan Details

TEAM

	FLEX TEAM	FLEX TEAM PLUS	FLEX TEAM MAX
Team Tracking Intervals	2-4 minutes	1-2 minutes	30 seconds to 1 minute
Unlimited Team Tracking	✔	✔	✔
Unlimited SOS	✔	✔	✔
Unlimited Text Messages	✔	✔	✔
Unlimited Check-in Messages	✔	✔	✔
ADDITIONAL PLAN COSTS			
Activation Fee	$34.95	$34.95	$34.95
Suspend Fee	$5.00	$5.00	$5.00

As of Oct 26, 2024 https://www.garmin.com/en-US/p/837461/pn/010-04015-SU

Worldwide Emergency Response Centers

Personal Locator Beacons

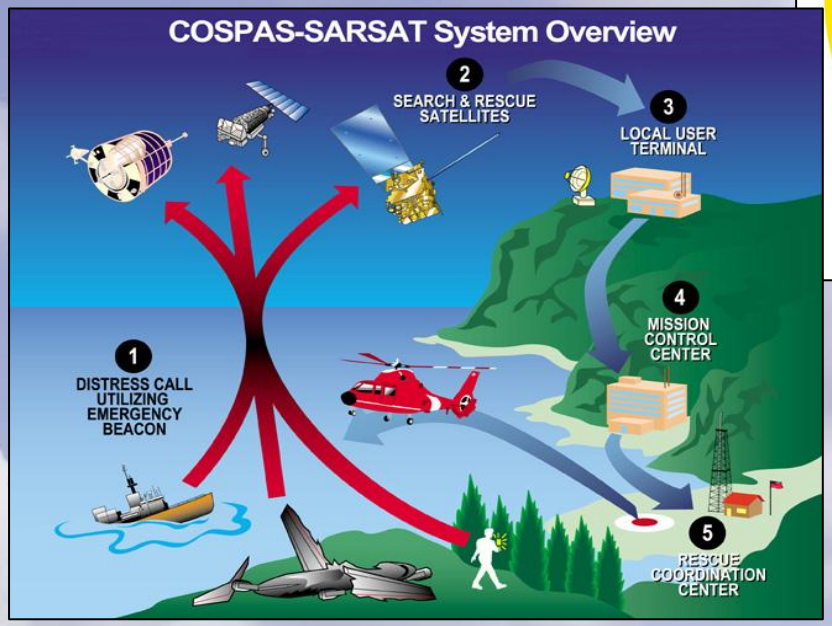
Satellite Communicators

GEOS worldwide

COSPAS-SARSAT

Emergency Response Center

Used by
Personal Locator Beacons
and ELTs



COSPAS-SARSAT Overview

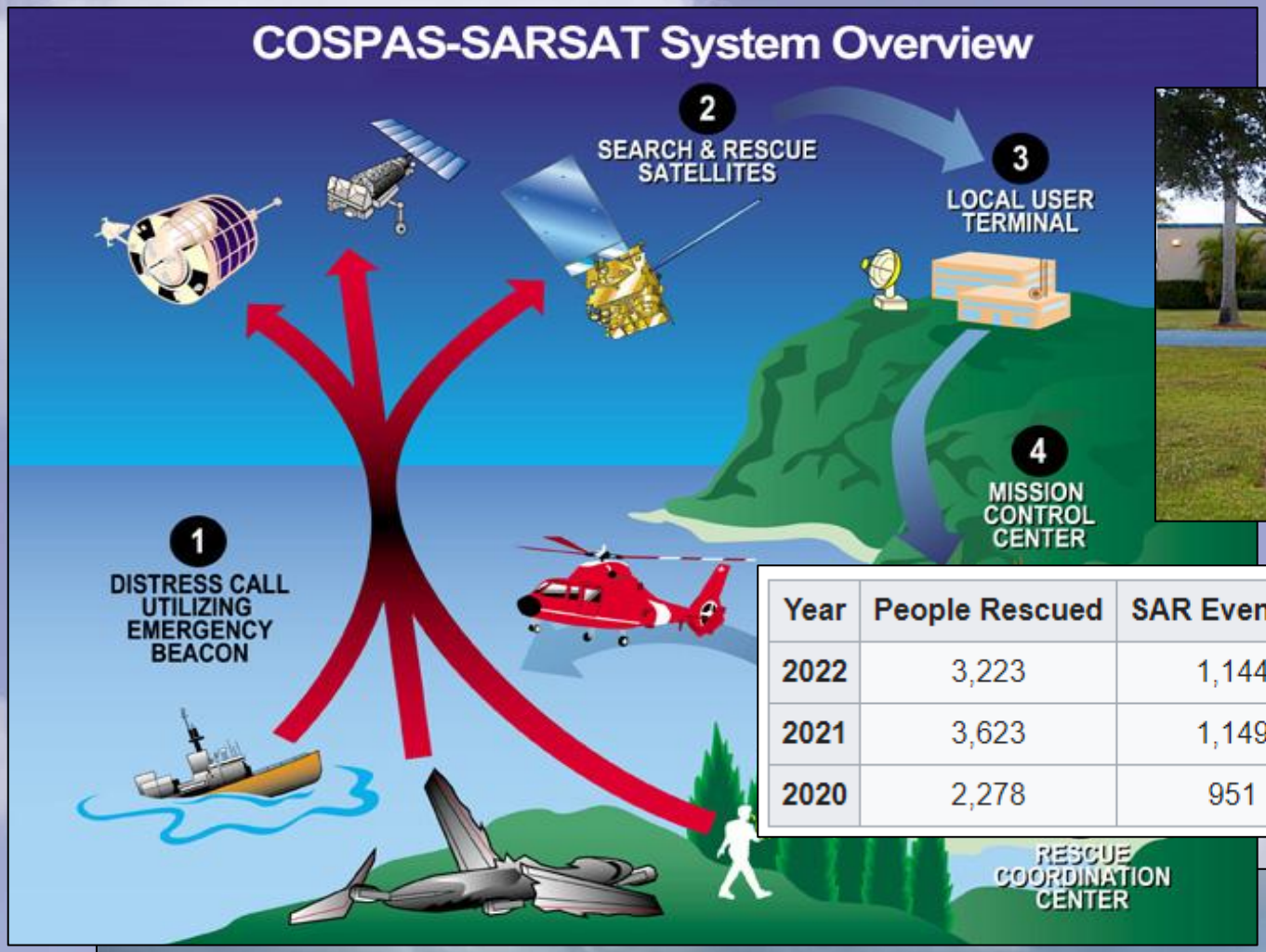
Used by all PLBs and the latest models of ELTs

- **Created in 1982 by US, UK, Canada and USSR**
- **COSPAS-SARSAT** stands for;

  Cosmicheskaya **S**istyema **P**oiska **A**variynich **S**udov

  Search **A**nd **R**escue **S**atellite **A**ided **T**racking
- Network of **54 satellites** that provide coverage everywhere on Earth both Geosynchronous and Low Earth Orbit for enhanced coverage
- Distress alerts are detected, located and forwarded to governmental organizations in **43 countries and territories** at no cost to beacon owners or the receiving government Dedicated to detecting and locating radio beacons activated and forwarding this alert information to authorities that take rescue action.
- Device distress beacon is a digital 406-MHz radio transmission encoding the GPS location of the subject.
- Must re-register every 2 years with (NOAA) National Oceanic and Atmospheric Administration at no cost.

https://www.sarsat.noaa.gov/background.html
https://www.icao.int/Meetings/GTM/Documents/COSPAS-SARSAT.pdf



Year	People Rescued	SAR Events →	Aviation	Land	Maritime
2022	3,223	1,144	20%	39%	41%
2021	3,623	1,149	18%	45%	37%
2020	2,278	951	23%	37%	40%

United States SARSAT Mission Control Center (USMCC) in Suitland, MD

SARSAT

Anatomy of a Rescue

https://www.acrartex.com

Anatomy Of A Rescue

HOW THE BEACON WORKS

How your beacon summons help

406 MHz beacons are a type of portable emergency equipment that transmits a distress signal to search and rescue (SAR) organizations. The purpose of these beacons is to aid SAR teams in tracking and locating ships or individuals in jeopardy as rapidly as possible.

The 406 MHz frequency is a worldwide dedicated emergency frequency that is detected by a network of satellites called the Cospas-Sarsat system. This satellite system was established by, and continues to be supported by, its primary benefactors - the USA, Russia, Canada and France. The Cospas-Sarsat system has saved over 30,500 lives - and counting - since its inception. To learn more about the system visit www.cospas-sarsat.org.

When a 406 MHz beacon is activated, the digital distress message is sent to Cospas-Sarsat satellites and, in turn, the distress message is relayed to SAR forces. The distress message contains the beacon UIN and on some models the GPS location of the beacon. Additional information about the beacon is accessed by SAR forces from the beacon registration database. At the same time the 406 MHz signal is activated, a 121.5 MHz signal is turned on. The 121.5 MHz signal is used by SAR forces to home in on the beacon as they approach it.

The 406 MHz signal is detected by multiple satellites and from that information the location of the beacon can be calculated. This data alone is sufficient for SAR to find persons or ships in distress in a reasonable timeframe. However, as a further enhancement, some beacons have a GPS engine onboard. This feature allows the beacon to acquire current location coordinates from an internal GPS receiver. The purpose of this feature is to send an even more precise location of the beacon to the satellites, i.e., latitude and longitude data. This helps SAR to reach the location even faster.

SARSAT Satellite Coverage

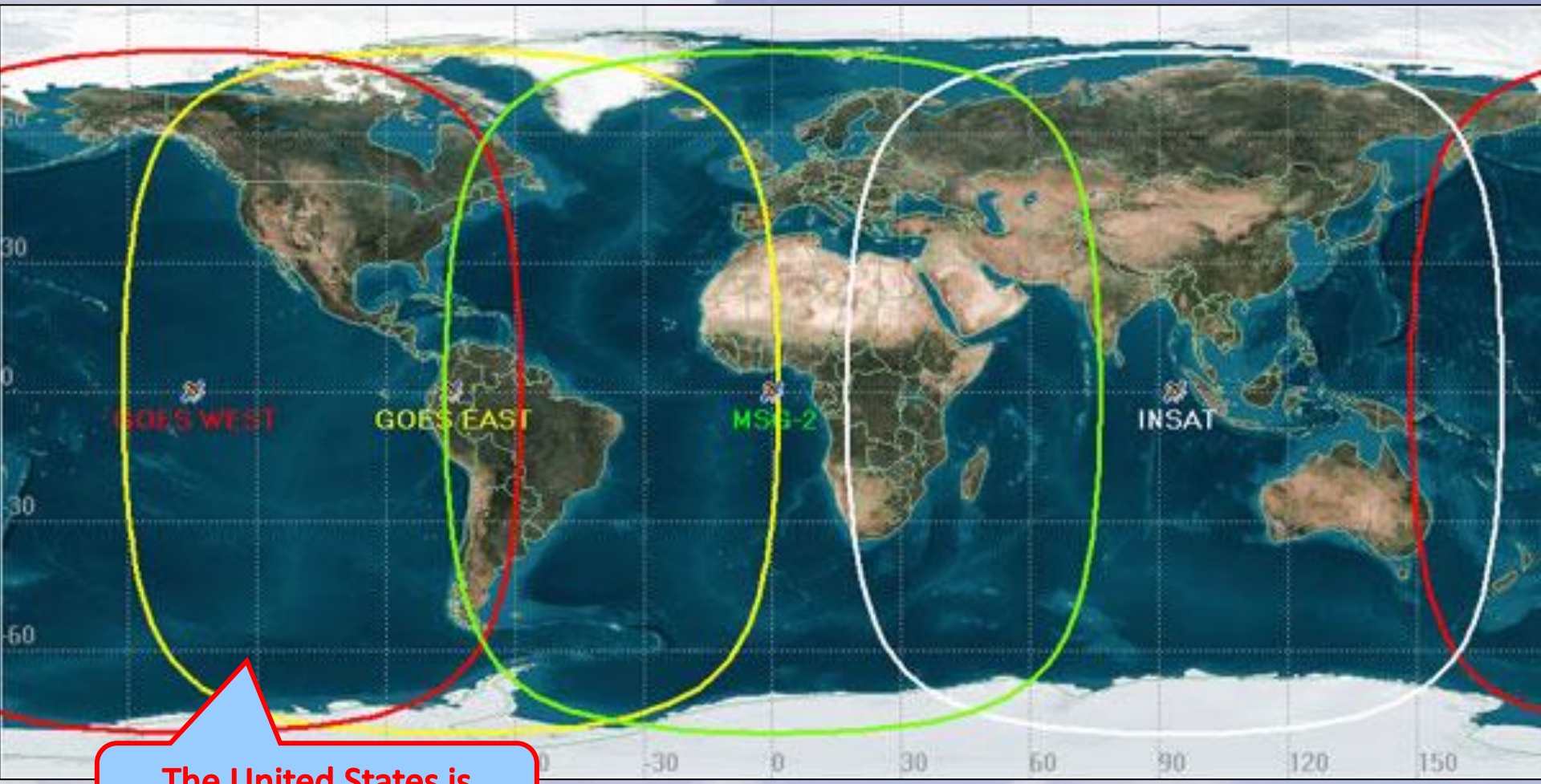
https://www.sarsat.noaa.gov/usmcc.html

The United States Mission Control Center (USMCC) serves as the focal point of U.S. Cospas-Sarsat alert data. The USMCC matches beacon signals to identify those coming from the same source and merges them to improve position accuracy. Registration information is then appended to the 406 MHz beacon distress alerts that are registered in the U.S. The location of the alert is geographically sored and the data is distributed to the appropriate recipient (Rescue Coordination Center (RCC), foreign SPOC or other MCC).

The USMCC is operated by the National Oceanic and Atmospheric Administration (NOAA) and co-located with NOAA's Satellite Operations Control Center (SOCC) at NOAA's Satellite Operations Facility (NSOF). The operation is manned 24 hours a day, 365 days a year. However, the vast majority of alert data distribution is handled automatically. The USMCC is administered by the Direct Services Branch of NOAA which also represents U.S. interests in international Cospas-Sarsat meetings.

SARSAT Satellite Coverage

For 406Mhz Use



The United States is Covered by GOES WEST

SARSAT Satellite Coverage

For 406Mhz Use

SARSAT Emergency Response Centers

Overall - https://www.sarsat.noaa.gov/rcc.html

Land Based - https://www.1af.acc.af.mil/units/afrcc

Maritime - https://www.uscg.mil

If you have **accidentally activated your beacon** but do not need assistance, please contact the appropriate RCC right now (24x7 - day or night) to cancel the search efforts.

- **For ELTs and PLBs, contact the Air Force RCC at 1-800-851-3051**
- **For EPIRBs, contact the U.S. Coast Guard at 1-855-406-USCG (8724)**

GEOS Emergency Response Center

Personal Satellite Messengers

spot™

GARMIN™

Globalstar

iridium®

GEOS worldwide

Personal Satellite Communicators

GEOS Worldwide Response Center

GEOS worldwide

https://www.geosworldwide.com/

Wherever you are, GEOS is there for you!

GEOS has been the leading provider of premier and innovative travel safety and security services, and monitored services since 2004. GEOS was originally Travel Safety Group, ltd. and was the first company to incorporate technology with travel safety and security. GEOS has continued this mission by adding the GEOS International Emergency Response Coordination Center (IERCC) in 2007. GEOS continues to deliver best-in-class services to our clients and members, who choose GEOS for the value and the global reach that only GEOS can offer. Each year, GEOS introduces new emergency alerting technology through our partnerships, bringing to you the solutions that best fit your needs, wherever you are in the world.

The IERCC based just outside of Houston, Texas, has your back 24x7 and is backed by regional crisis management cells around the globe. GEOS has operated and coordinated rescues in over 160 countries, providing people with valuable peace of mind. GEOS continues to be a critical participant in global response protocols, and works very closely with official response agencies to better serve you!

GEOS GLOBAL EMERGENCY OPERATIONS

+1.936.582.3190 EMERGENCY OPERATIONS (IERCC)

+1.855.444.2937 EMERGENCY OPERATIONS (IERCC)

Personal Satellite Communicators

Spot and GEOS

GEOS worldwide

GEOS MEMBER BENEFITS

GEOS provides the SOS/911 monitoring included in your Basic Service. You can upgrade to the GEOS Member Benefit for reimbursement of up to $100K in Search and Rescue (SAR) expenses – even coordinating a private SAR contractor if needed to get you to safety.

Learn more about GEOS group pricing.

Compatible Products:

Price varies by product. Select product to see price.

SPOT X
SPOT Gen3
SPOT Satellite GPS Messenger
SPOT Personal Tracker
SPOT Hug
SPOT Connect

https://www.findmespot.com/en-us/products-services/additional-services/all-devices

Personal Satellite Communica

Garmin and GEOS

GARMIN

GEOS worldwide

GEOS SOS Coverage

If you encounter an at-risk situation in a remote location or offshore, and inReach quickly becomes the most valuable tool in your survival kit. It provides global, interactive SOS capabilities — and that means you're able to trigger a distress signal, receive delivery confirmation that help is on the way, and maintain a 2-way text conversation with the GEOS emergency monitoring center. GEOS is standing by 24/7 to assist with your emergency, track your location and notify the most appropriate emergency response for your unique situation. Whenever, wherever — the GEOS team will stay in communication with you until your situation is resolved.

GEOS is the world leader in emergency response solutions and monitoring. They have supported rescues in more than 140 countries, saving many lives in the process. Check out our blog to see how some of our customers have relied on their inReach and GEOS to save the day.

Note: In the event that you have triggered a SOS for any reason, and you have follow-up questions or concerns, contact GEOS directly.

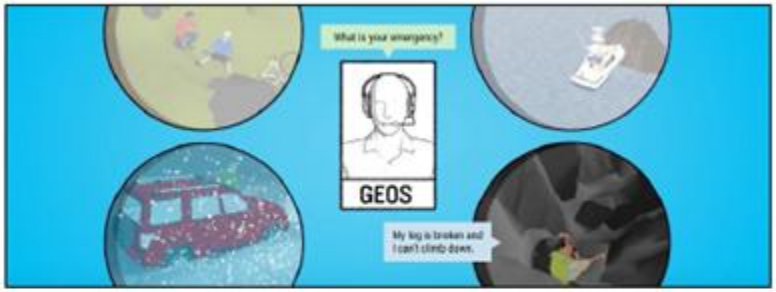
https://support.garmin.com

Personal Satellite Communicators

GEOS Response Center

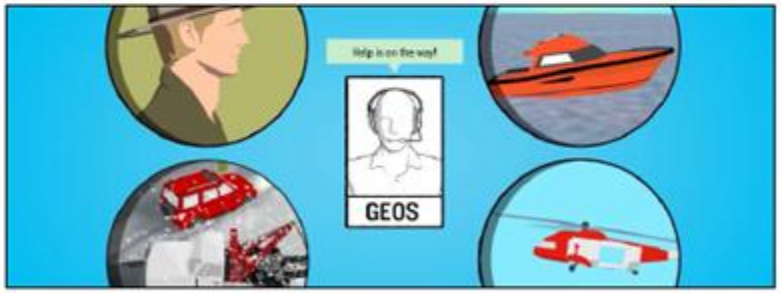
SOS PROCESS AND RESPONSE

When a user triggers an SOS, a message and device location are sent to GEOS, GEOS can also view emergency contacts and notes



Within minutes, GEOS responds and, if possible, the user responds with additional information

As GEOS is confirming the SOS, they are also reaching out to emergency responders in the area

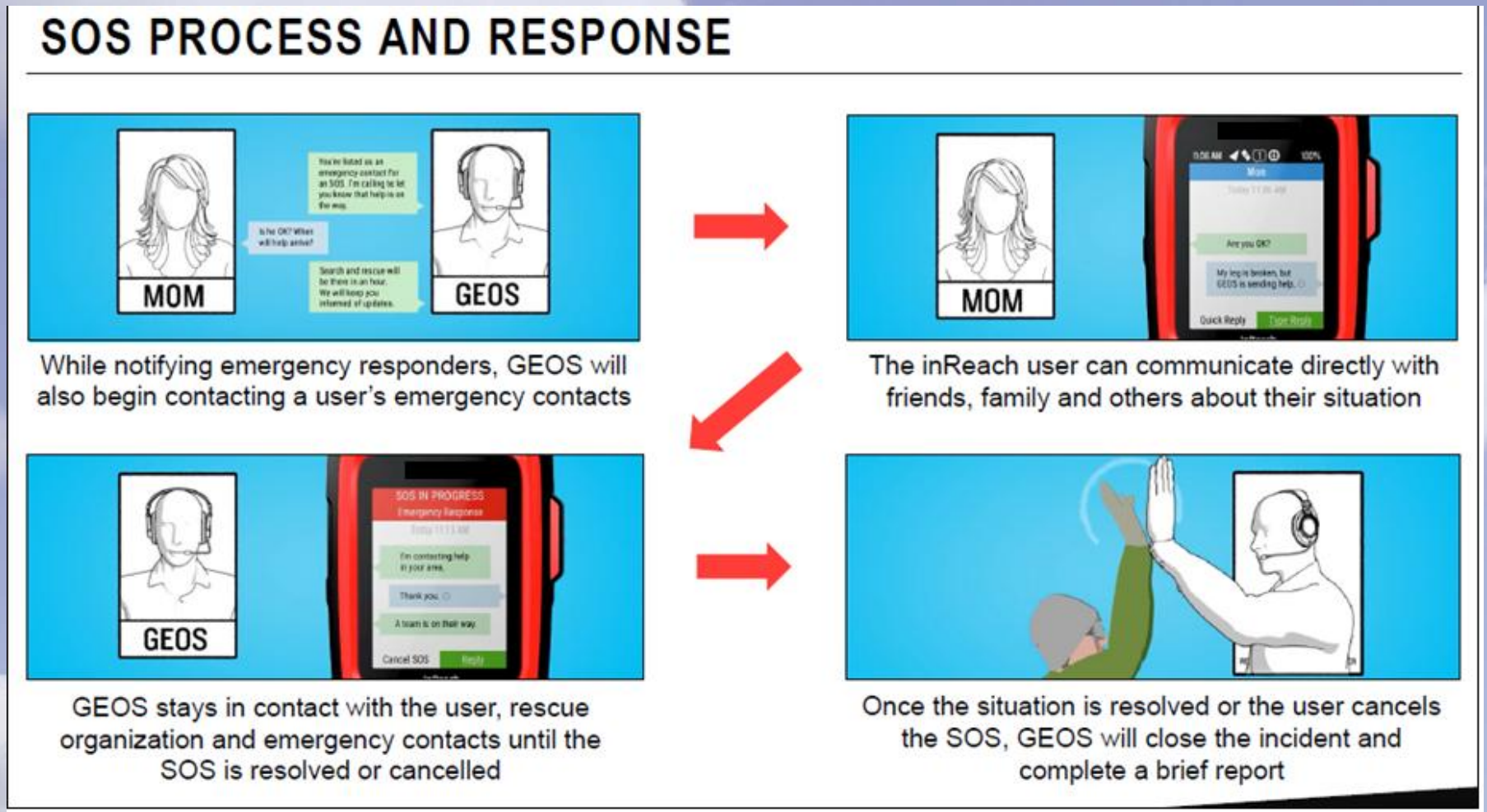


GEOS will update the user on the response and may ask the user to reach out to a point-of-contact at the responding emergency organization

Continued on the Next Slide

Personal Satellite Communicators

GEOS Worldwide Response Center



Emergency Location Devices

The Bottom Line - Who Responds to Your Emergency?

- Personal Location Beacons (PLB) & ELTs – SARSAT (Governmental)
  - *"The SARSAT system uses NOAA satellites in low-earth and geostationary orbits … to detect and locate aviators, mariners, and land-based users in distress. The satellites relay distress signals from emergency beacons to a network of ground stations and ultimately to the U.S. Mission Control Center (USMCC) in Suitland, Maryland. The USMCC processes the distress signal and alerts the appropriate search and rescue authorities to who is in distress and where they are located."*
- Personal Satellite Communicators – GEOS (Commercial)
  - *"The GEOS International Emergency Response Coordination Center provides the S.O.S./911 monitoring included in your Basic Service."*
    - *"**SPOT** Gen4 lets family and friends know you're okay, or if the worst should happen, sends emergency responders to your GPS location."*
    - *"**Garmin** InReach devices feature a dedicated SOS button that notifies GEOS, a professional 24/7 global emergency monitoring and response coordination center, upon activation. Their trained staff is available to respond to your messages, track your device and notify emergency responders in your area"*

Comparisons & Conclusions

	is/are	do/does/did	can	would	will	might/could
What						
Who						
Where						
When						

Specification	ACR PLB	SPOT Gen 4	SPOT X	InReach Mini 2
Size	4.52” x 2.03” x 1.49”	3.43" x 2.56" x 1"	6.54” x 2.9” x 0.94”	3.90” x 2.04” x 1.03”
Weight	5.28 oz (with Internal Battery)	4.0 oz (with AAA Lithium Batteries)	7.0 oz (with Internal Battery)	3.5 oz (with Internal Battery)
Water Resistance	Waterproof to 5 meters for 1 hour + Buoyant	Submersible up to 1m for 30 minutes	Submersible up to 1m for 30 minutes	Submersible up to 1m for 30 minutes
Strobe	Yes (Visible and IR)	No	No	No
Battery Type	5 year Life Internal Lithium Non-rechargeable	4x AAA Lithium or NIMH	Internal Rechargeable Lithium Polymer	Internal Rechargeable Lithium
External Data and Power Input	None	Micro-USB (Data only)	Micro-USB (Charging and Data)	USB-C (Charging and Data)
Homing Beacon	Yes	None	None	None
Pairing	None	None	Bluetooth	Bluetooth
Messaging	RLS (Receive Conf)	Yes (Custom Msg only)	Yes	Yes
Tracking	None	Yes	Yes	Yes
Transmit Power	5 Watts	>1 Watt	>1 Watt	>1 Watt
Subscription Required?	None Required	Required (See Costs on Next Slide)	Required (See Costs on Next Slide)	Required (See Costs on Next Slide)
Battery Life	Internal 5 Year Lithium battery life with 28 hour operational life	120 hours during continuous 5 minute tracking mode	240 hours during continuous 10 minute tracking mode	Up to 35 hr during 10-minute tracking send interval and 1-second log interval
Satellite System	COSPAS - SARSAT (GEO and LEO)	GlobalStar (LEO)	GlobalStar (LEO)	Iridium (LEO)

Emergency Location Devices
Messaging & Tracking Capabilities

Specification	ACR PLB	SPOT Gen 4	SPOT X	InReach Mini 2
Text Messaging (Send)	None	Three preset messages (OK, Help, and SOS) and one Custom message	20 to unlimited custom messages depending on service plan	20 to unlimited custom messages depending on service plan
Text Messaging (Receive)	None	None	Yes	Yes
Confirmation Message	Yes, but only if the model has RLS	Yes	Yes	Yes
Real Time Tracking	None	5, 10, 30 or 60 min selectable (2.5 min at additional recurring cost)	10, 30 or 60 min selectable (2.5 min or 5 min at additional recurring cost)	2 or 10 min depending on model

Emergency Location Devices

Pricing Comparisons – As of October 26, 2024

Pricing Item	ACR PLB	SPOT Gen 4	Spot X	InReach Mini 2
Unit Price (MSRP)	$485	$150	$250	$400
Subscription Plan (Other plans are available)	N/A	Basic	Basic	Consumer: Essential
Recurring Fee (Monthly)	N/A	$12	$12	$15
Activation Fee	N/A	$30	$30	$40
Message Fee	N/A	$0 (predefined msg only)	$0 (first 20 msg per month)	$0 (first 50 msg per month)
First Year Cost	$485	$324	$424	$620
5 Year Cost*	$635	$900	$1,000	$1,340
Monthly "Flex" Plan?	N/A	$35/year (no re-activation fee)	$35/year (no re-activation fee)	Not Available (under the Consumer plans)

* Includes a $150 battery replacement fee

Emergency Location Devices

Pros and Cons of the Devices

Personal Location Beacons

- **Pros**
  - High Power (5W)
  - Homing beacon on 121.5
  - Strobe (visible and IR)
  - Long battery shelf life (5 years)
  - Lower overall costs
  - No subscription Fees
- **Neutral** - Emergency response center is governmental (SARSAT)
- **Cons**
  - No ability to broadcast custom messages
  - No tracking capability
  - Larger footprint
  - Expensive battery replacement

Personal Satellite Comms

- **Pros**
  - Alert confirmation ACK
  - Lower purchase price (SPOT only)
  - Smaller footprint
  - Can receive status information
  - Can broadcast messages
  - Tracking capability
  - Inexpensive battery system
- **Neutral** - Emergency response center is non-governmental (GEOS)
- **Cons**
  - Low Power (>1W)
  - No homing beacon on 121.5
  - No strobe
  - Shorter battery shelf life
  - Subscription fees

Other Information

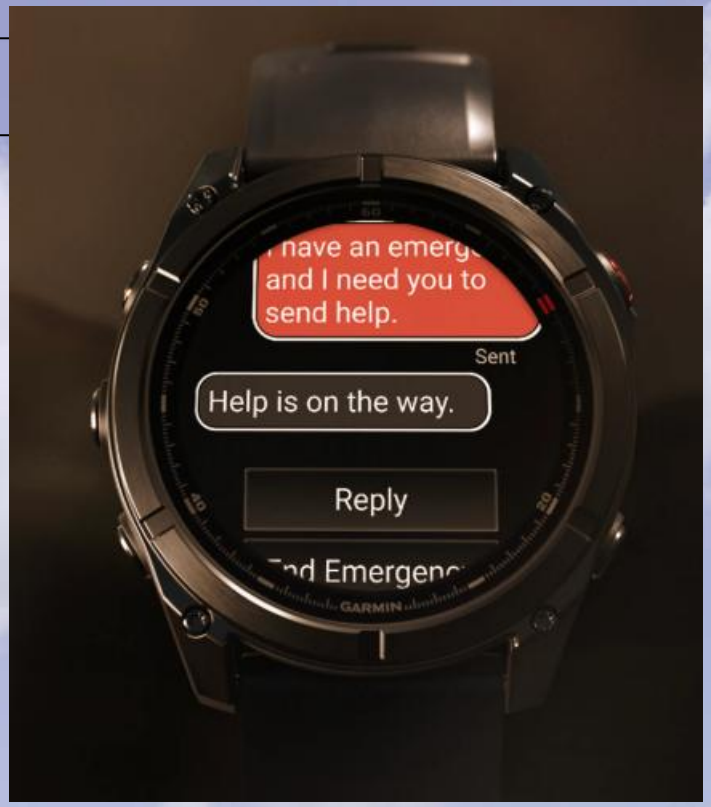
- Garmin InReach Watch
- IPhone SOS
- ADS-B
- Survival Kits
- Tracking Examples
- Bailout
- Parachute Gear
- Safety Info Sources

Garmin InReach Watch!

Announced: April 2026

A REVOLUTION IS AT HAND

For the first time, Garmin is bringing inReach® technology to our smartwatches for a world of connectivity — without your phone[1].



https://www.garmin.com/en-US/c/wearables-smartwatches/?FILTER_FEATURE_CELL_SATELLITE_CONNECTIVITY=true#shopwearables

iPhone SOS via Satellite

"With iPhone 14 or later (all models), you can use Emergency SOS via satellite to text emergency services when you're off the grid with no cellular and Wi-Fi coverage."

How Emergency SOS via satellite works

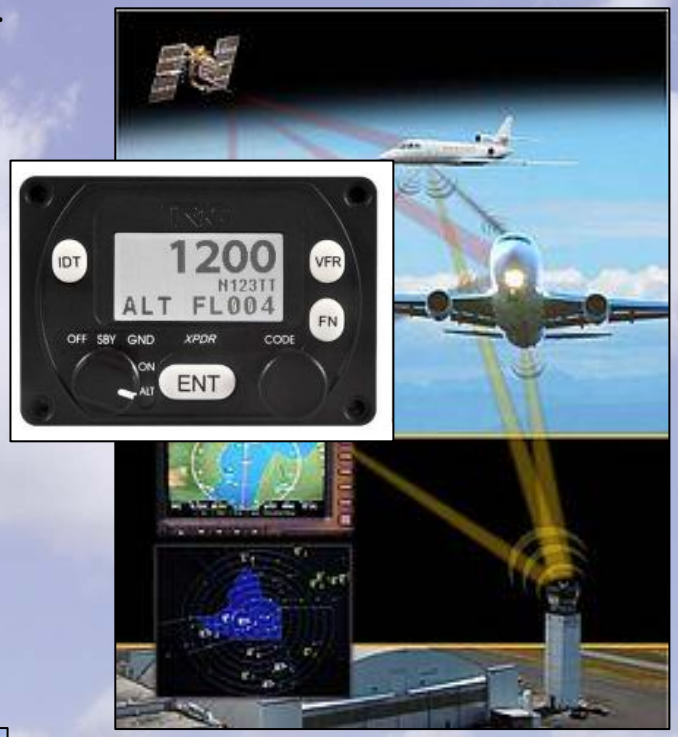
Emergency SOS via satellite can help you connect with emergency services under exceptional circumstances when no other means of reaching emergency services are available. If you call or text emergency services and can't connect because you're somewhere with no cellular and Wi-Fi coverage, your iPhone tries to connect you via satellite.

https://support.apple.com/en-us/101573

Emergency Location Devices

What About ADS-B as an Emergency Device?

- **A**utomatic **D**ependent **S**urveillance–**B**roadcast (ADS–B) is a surveillance technology (coupled with transponders) in which an aircraft determines its position via satellite navigation and periodically broadcasts it, enabling it to be tracked. The information can be received by air traffic control ground stations as a replacement for secondary surveillance radar, as no interrogation signal is needed from the ground. It can also be received by other aircraft to provide situational awareness and allow self-separation. ADS–B is "automatic" in that it requires no pilot or external input. It is "dependent" in that it depends on data from the aircraft's navigation system.
- **Pros**
  - Continuous satellite based GPS location transmitter
  - Real time tracking of known tail numbers via web sites and smartphone applications
- **Cons**
  - Not a portable carry-with, or bail out, solution
  - No ability to send an "SOS" message
  - No ability to send textual messages
  - Not received by FAA ground stations in some locations (low and/or remote locations)
  - Satellites unlikely to receive data from bottom-mounted transponder antennas*



* For details see https://aireon.com/resources/overview-materials/its-just-ads-b

Survival Kits
Bailout and Landout

Survival Kits – SMAK-PAKs

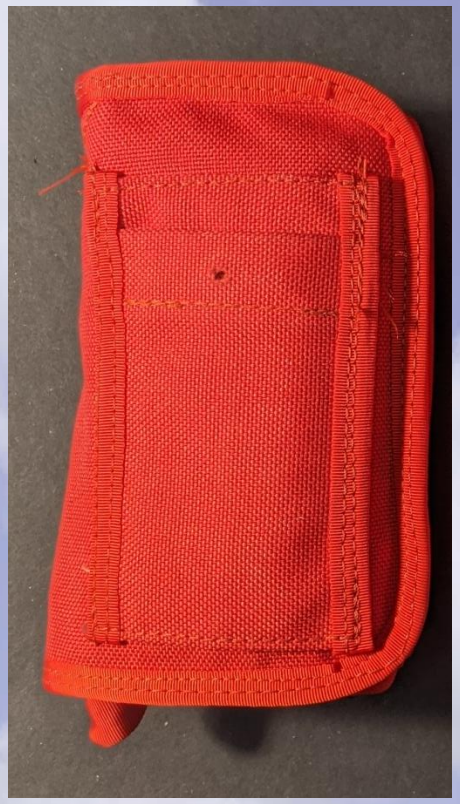
Small SMAK-PAK

Small SMAK-PACK

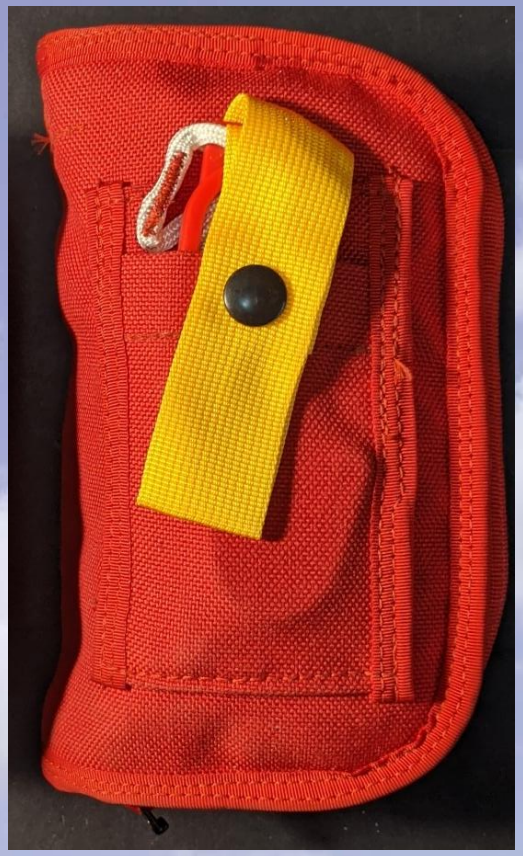
Contents:

- Hook Knife on 4ft lanyard
- Signal Mirror
- Whistle
- Fire Starter

Medium SMAK-PAK



Large SMAK-PAK



Available from:
http://silverparachutes.com/smak-pak-survival-kits
https://wingsandwheels.com/smak-pak.html

Survival Kits - SMAK-PAKs

LARGE SMAK-PAK

Standard Contents:

- Strobe on lanyard
- Hook Knife on 4ft lanyard
- Space Blanket
- Survival Kit*

My Additional Contents:

- Money
- Folding Knife (Swiss)
- Miniature Eyeglasses!

*** Survival Kit Contents:** Signal mirror, whistle, fire starters, compass, fishing kit, scalpel blade, duct tape, aluminum foil, wire, safety pins, pencil, and notepad

Survival Kits - SMAK-PAKs

MEDIUM SMAK-PAK

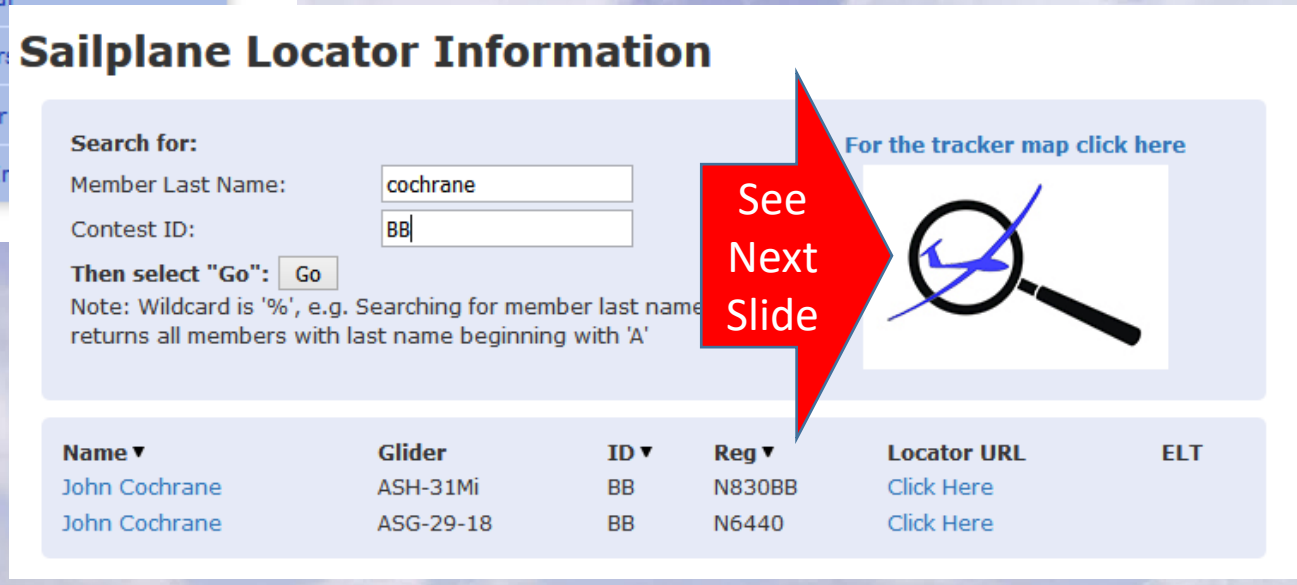
My Contents:

- PLB on lanyard (with instructions)
- Permanent Marker
- Firestarter and kindling
- Folding knife (Utility)
- Paracord
- Handwarmers
- First aid kit

Tracking Information

Emergency Location Devices

Sailplane Locator at SSA.org

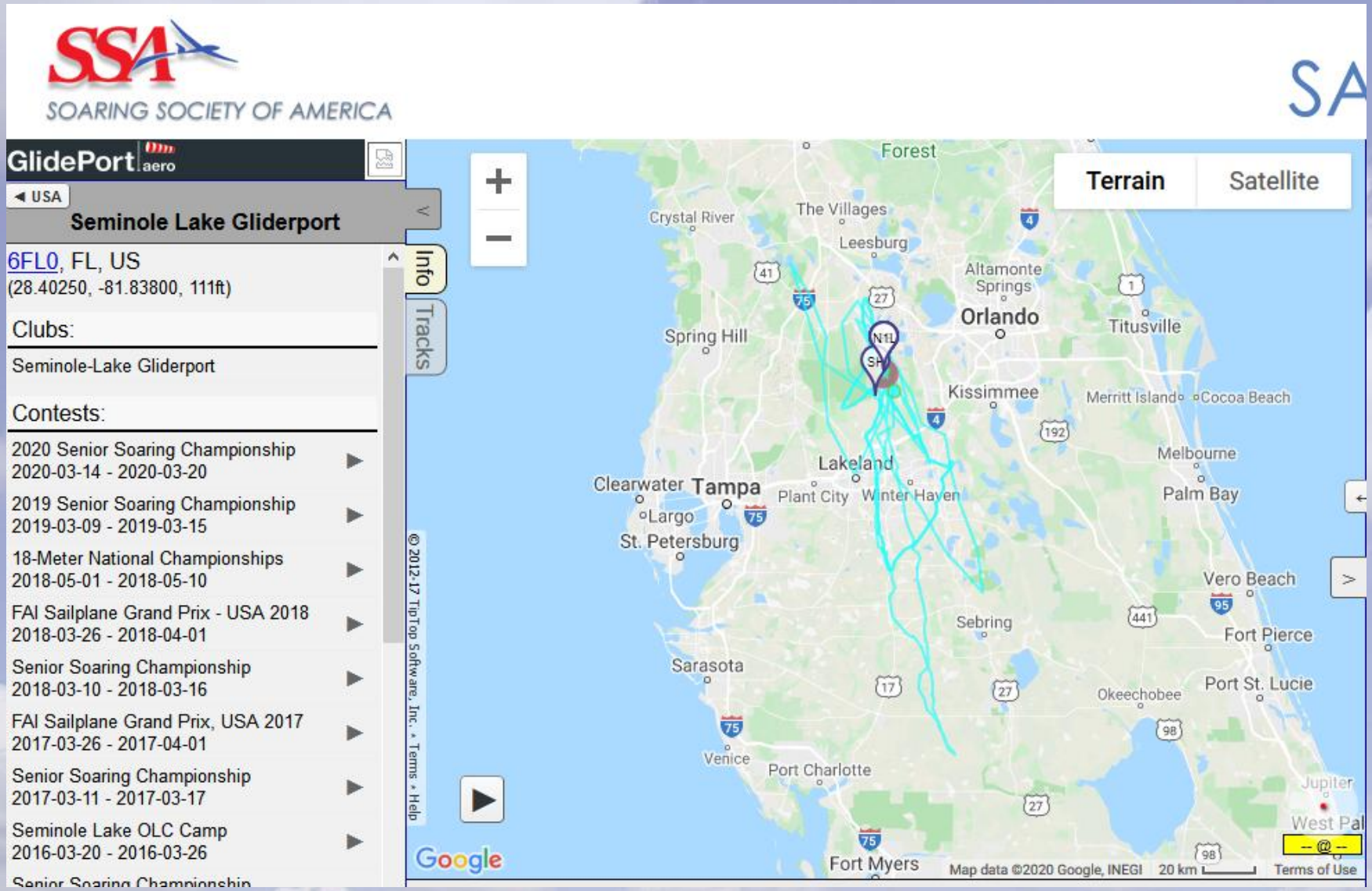


Emergency Location Devices

Live Contest Tracking on SSA.org

Emergency Location Devices

Sailplane Locator at SSA.org



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Bailout and Landout

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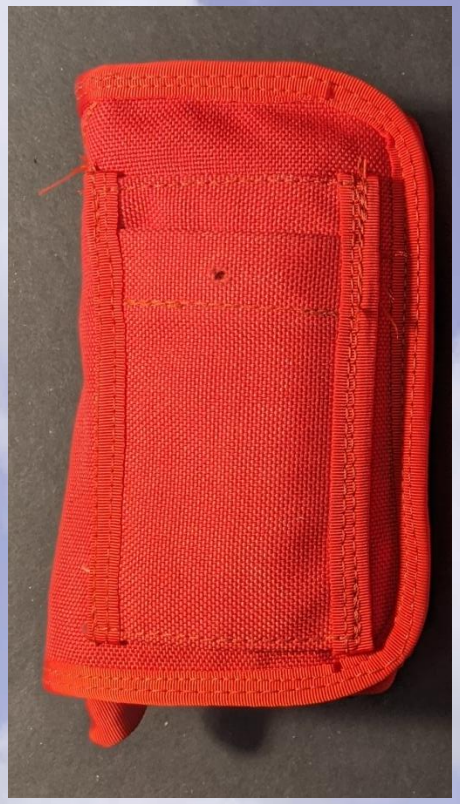
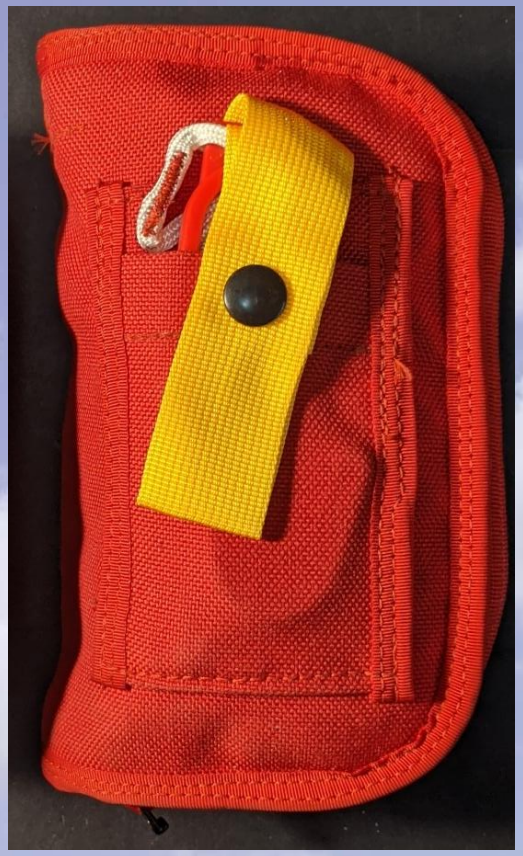


Large SMAK-PAK



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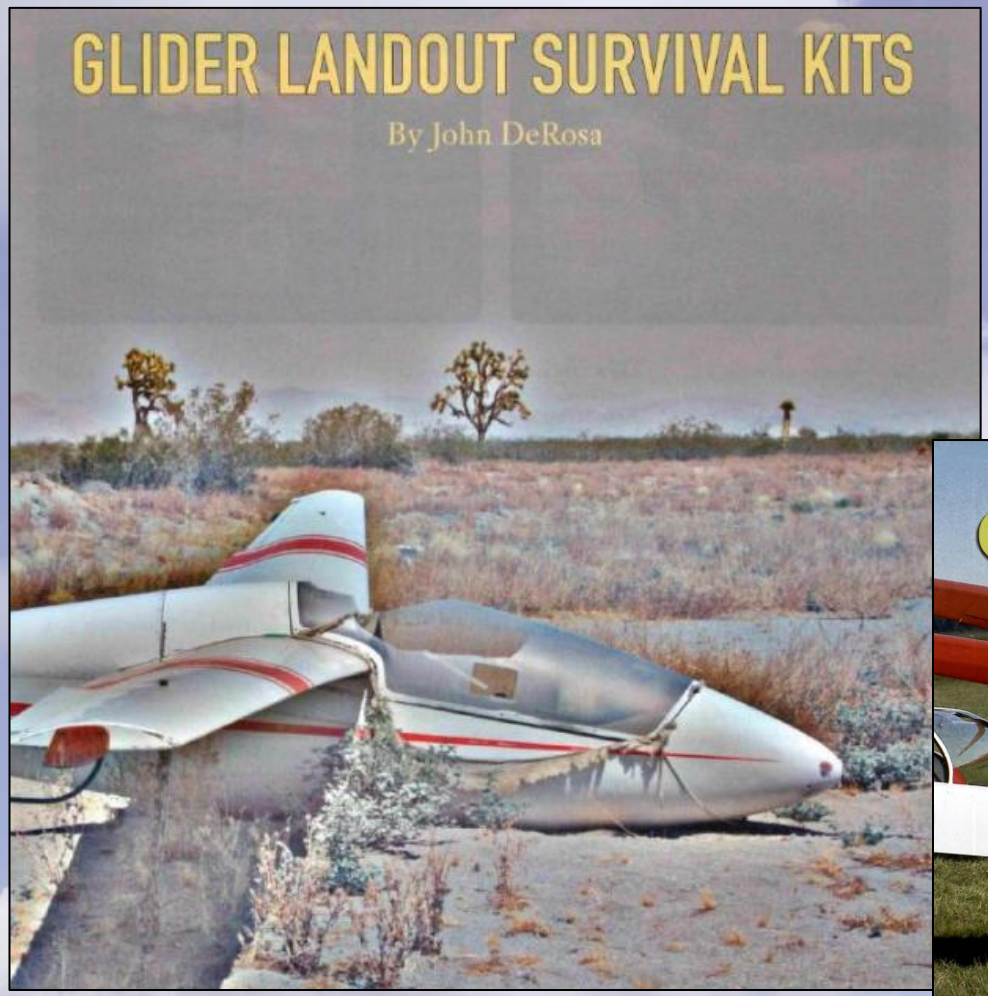
- First aid kit

Survival - Land Out Kits



Soaring Magazine

May 2010 Issue

Pages 27-29

http://aviation.derosaweb.net/survival/

Survival – Bailing Out

https://www.dailymail.co.uk/news/article-2713010/The-amazing-moment-glider-pilot-bail-aircraft-parachute-safety-wing-fell-dramatic-mid-air-collision.html

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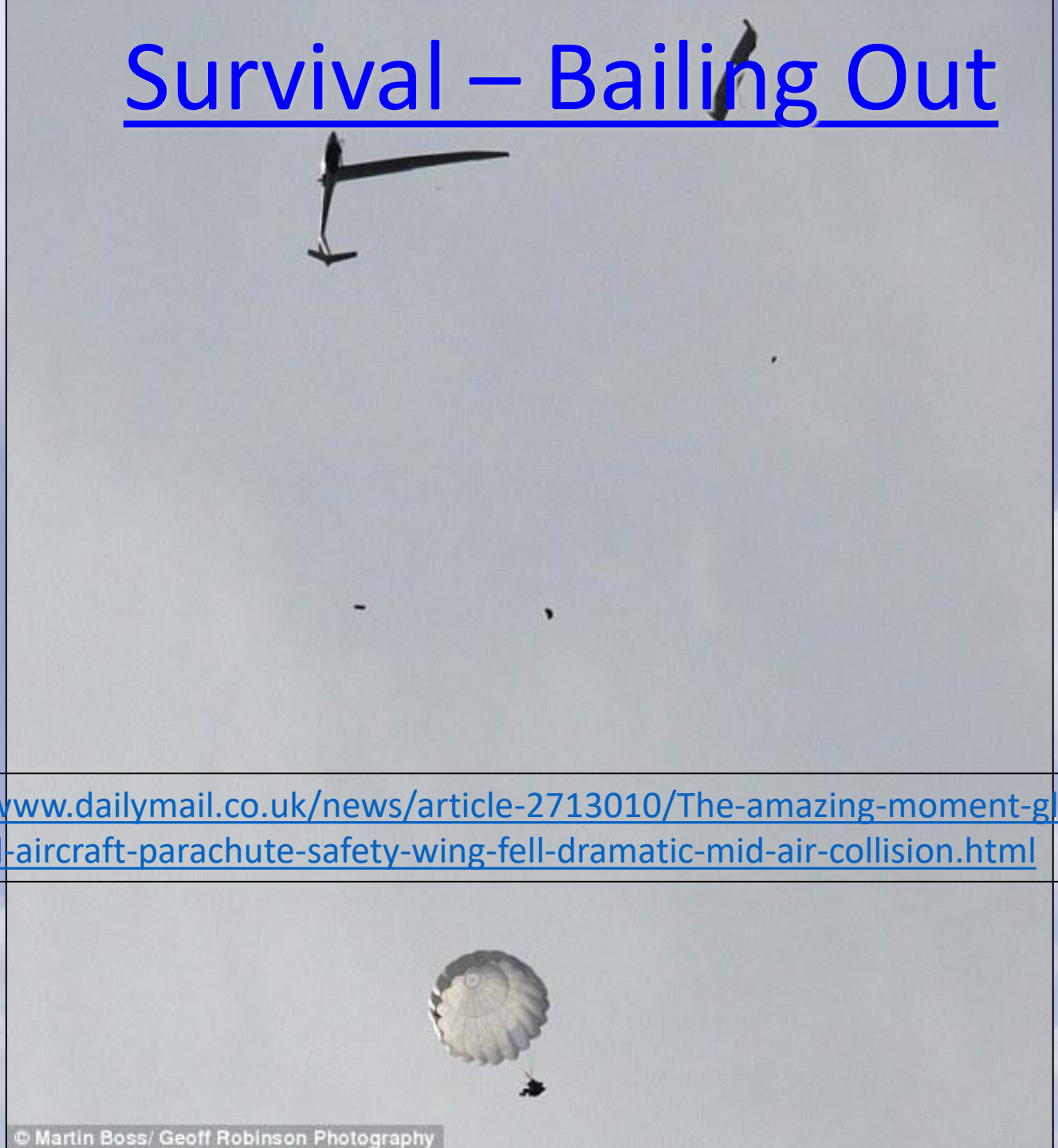

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Survival - Bail Out Kits

"Anything not attached to your body or parachute is JUST CAMPING GEAR!"

Allen Silver - Master Rigger *"Your troubles aren't over once your parachute gets you safely back on earth. While it is possible that you will land in the parking lot of a local pub and can recount your heroic bailout to the stunned bar patrons over a cold one, you will more than likely end up in a field facing several possible problems."*

Bailing Out - Allen Silver

I've been an FAA Master Rigger since 1974 and in 1991 was designated as a Parachute Rigger Examiner for the FAA a position I held until moving to Sonora. I also served three terms as the chairman of the Parachute Industry Association (PIA) Rigging Committee, a worldwide organization that represents the parachute industry.

Having spent 25 years with the California Air National Guard, I retired in 1991. Eighteen of those years were spent as a Survival Equipment Technician working with parachutes, life rafts, and other life support equipment. This background has been beneficial in obtaining contracts with NASA and other aerospace companies requiring services for sophisticated and specialized parachutes.

http://silverparachutes.com/smak-pak-survival-kits

Silver Parachute Sales & Service
Serving Aerobatic, Airshow & Glider Pilots since 1972

Contact Silver Parachute Sales

Office Hours: Semi-Retirement is great. Call between 10:00am -

SMAK PAK Survival Kits

Attention SMAK PAK Owners: Supplemental instructions are available.

SMAK_PAK_supplemental_instructions.pdf
Adobe Acrobat document [281.1 KB]

IMPORTANT NOTICE: On attaching anything to your parachute harness.
Incorrectly attaching Survival Kits (like my SMAK Paks) PLBs, SPOT or InReach units, knives, kitchen sinks or any other item to your parachute harness can cause serious problems. Learn more details by clicking important notice below:

SMAK PAK Attachment instruction article.
Aug 2009.pdf
Adobe Acrobat document [121.8 KB]

Think Survival

Remember: You owe it to yourself and to your family/friends to be found as quickly as possible after a bailout or off field landing! Don't make an already bad day worse by not have a means to be found on you.

Your troubles aren't over once your parachute gets you safely back on earth. While it is possible that you will land in the parking lot of a local pub and can recount your heroic bailout to the stunned bar patrons over a cold one, you will more than likely end up in a field facing several possible problems.

If you land in winds even as light as 6-8 knots, you might be dragged along the

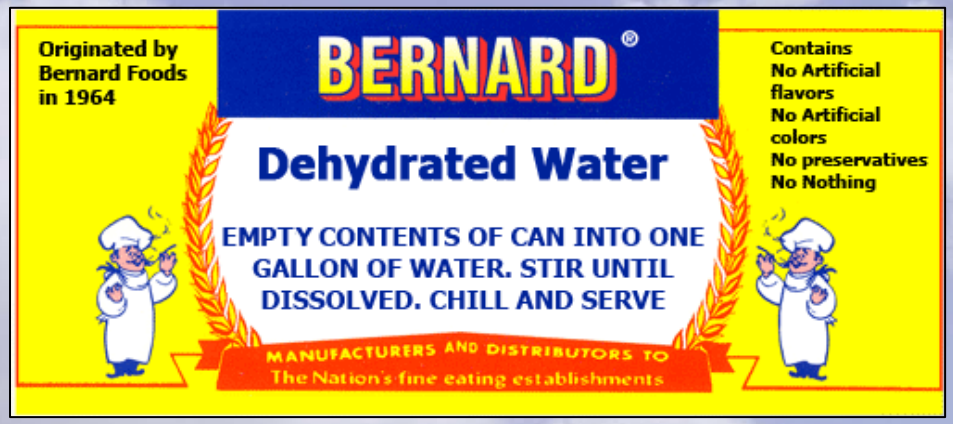
Made of stitched parachute case rugged nylon material with Velcro+snap attach points and zipper+snap closures

Survival – Silver's SMAK-PAKs Kits

My Parachute's SMAK-PAKs

Other Bailout Kit Suggestions

- Clothing
  - Zippered pants, Pocket vest, Warm jacket
- Cell phone for 9-1-1 & the ability to recharge it (old flip model?)
- Miniature held aviation transceiver (Yaesu FTA-250L)
- Wallet
- Multi-tool knife (Leatherman or SOG)
- Water ➔ ➔ ➔ ➔ ➔ ➔ ➔
  - Sealed emergency pouches
  - Water purifying straw
- Food
  - Energy Bars
  - Tootsie Rolls
- Flashlight
- Medicine (OTC and/or prescribed)
- Static line on parachute
- Parachute components (canopy, shrouds)



Safety Information Resources

SSF Soaring Safety Foundation

FEDERAL AVIATION ADMINISTRATION

EAA THE SPIRIT OF AVIATION

YouTube

SSF Soaring Safety Foundation

https://www.soaringsafety.org/
https://www.youtube.com/user/soaringsafety

Home | Flight Training Programs | Operational Resources | Flight Safety Programs | About SSF

ENHANCED BY Go

The Soaring Safety Foundation (SSF) is the Training and Safety arm of the Soaring Society of America (SSA). Our mission is to provide instructors and pilots with the tools needed to teach/learn both the stick & rudder skills and the Aeronautical Decision Making skills needed to safely fly a glider. We also provide information and analysis of incident and accident trends in order to develop better training tools.

Flight Training
Videos and Scenario Database

These videos are introductory in nature and are geared to learning to soar, or a new soaring skill.

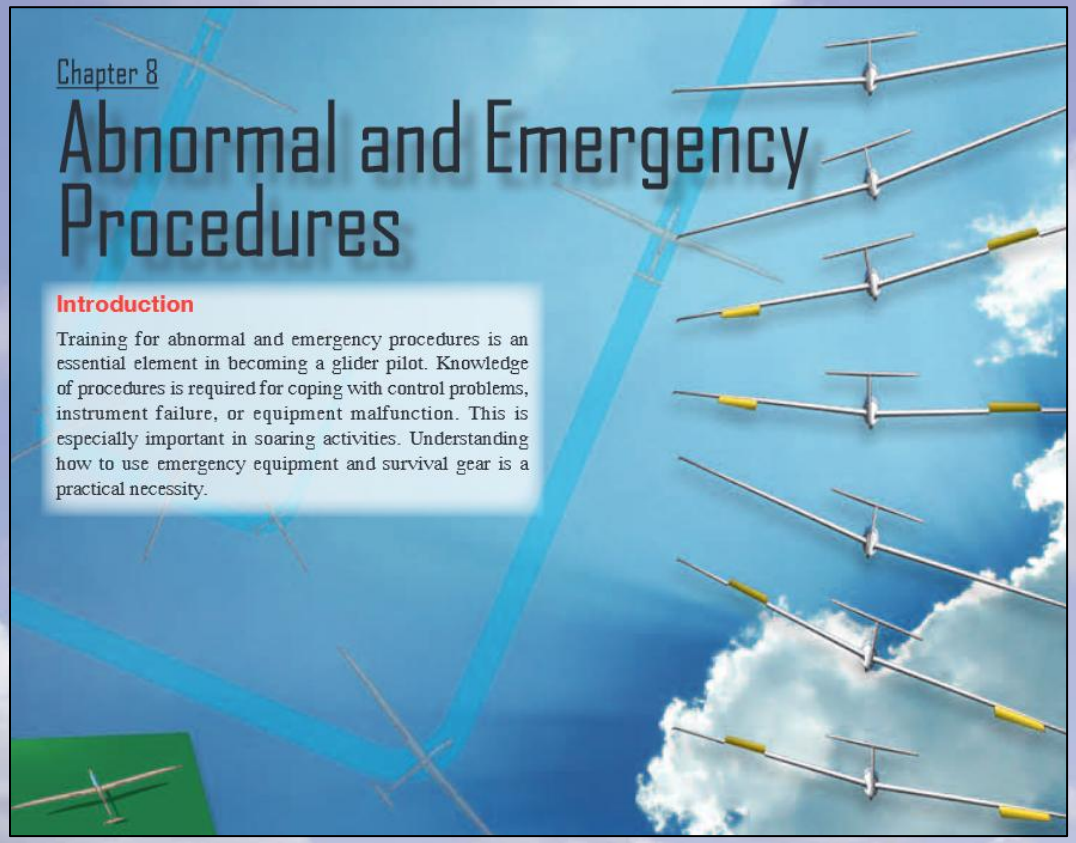
Flight Safety
Videos and Incident Database

These videos are safety oriented and appropriate for glider pilots of any skill level.

Visit the Soaring Safety Foundation's Youtube Channel
The SSA's YouTube Video Playlist

FAA Glider Handbook

FAA Glider Handbook – Abnormal and Emergency Procedures
https://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/glider_handbook/media/gfh_ch08.pdf



"Understanding how to use emergency equipment and survival gear is a practical necessity"

What We Do is Dangerous

https://www.youtube.com/watch?v=v8I3A3dqsu0

Pilots - Dave Nadler and Spence Chanthavane (USAF Academy Cadet)

ONE BAD DECISION THAT ALMOST KILLED ME

Analyzing a Sailplane Crash and How I Survived it

https://www.ssa.org/Webinars

See My Other Presentations

- Glider Electrical Wiring
- Transceiver Troubleshooting
- Oxygen Systems
- Working with Glider Air Lines
- Sailplane Wiring
- Trailer Wiring & LED Lighting
- Soaring Pilot Relief Systems
- Battery Testing
- Spar Alignment Tool
- L'Hotellier Fittings
- Carbon Fiber Panels
- IGC Filename Decoding
- Blanik L-23 Strut Work
- Survival Kits
- Removing Painted Lettering
- Open Glider Network
- Emergency Location Devices & Survival Kits

http://aviation.derosaweb.net/presentations

Let me know of any comments!