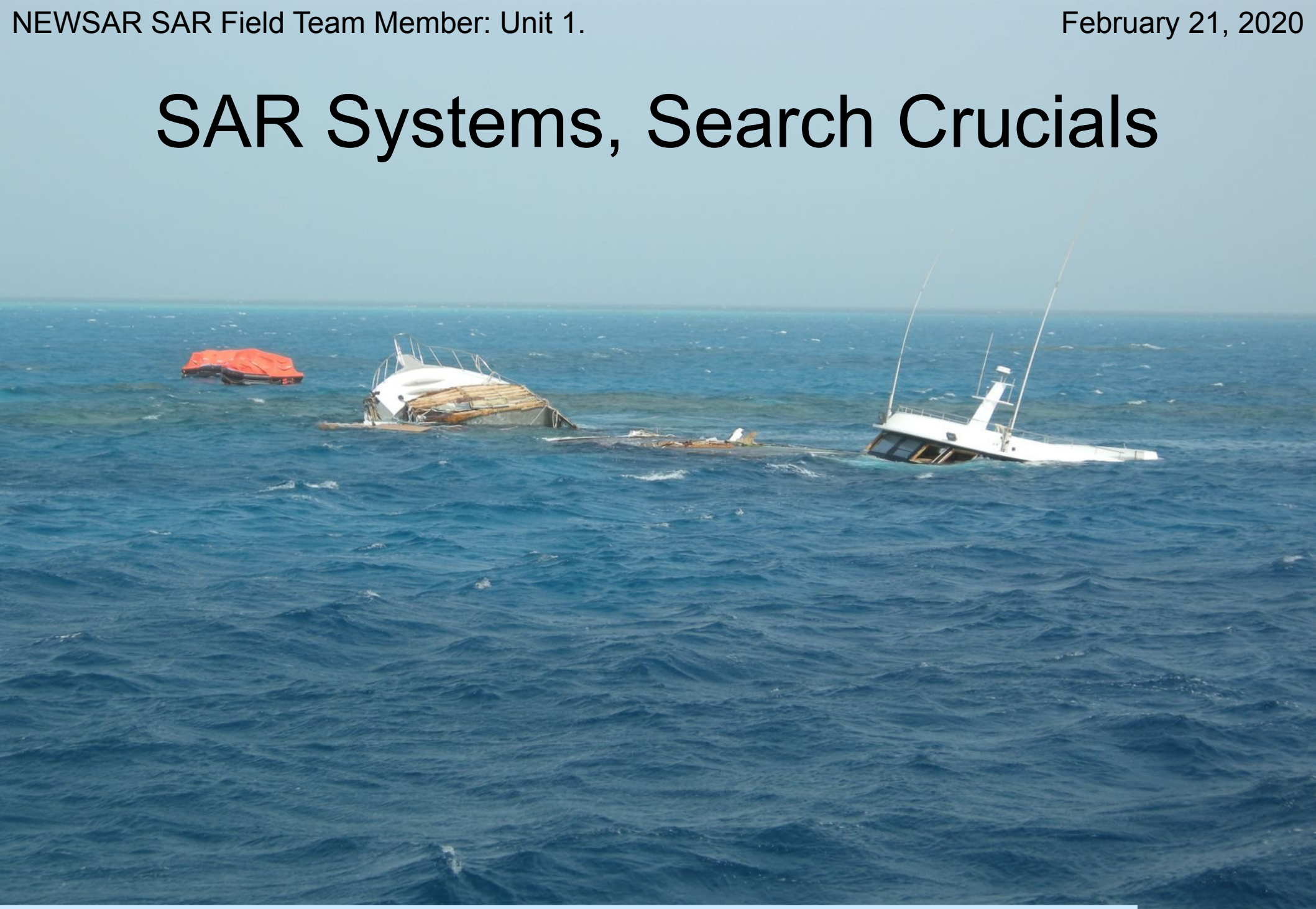
SAR Systems, Search Crucials



“Emperor Fraser hits reef and sinks near Dunraven”

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Search and Rescue

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Search and Rescue

- **Search**
  - **Locate Persons in Distress**
- **Rescue**
  - **Retrieve Persons in Distress**
    - **Access, Stabilize, and Transport persons in distress**

- LAST: **Locate**, **Access, Stabilize, Transport**

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Maritime and Aeronautical SAR: International Agreements

- Convention on International Aviation
- International Convention on Maritime Search and Rescue
- SOLAS – International Convention on Safety of Life At Sea

  Parties agree to provide Maritime and Aeronautical SAR coordination and services
- Implementation in the US: NSARC: National Search and Rescue Committee.

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Global Coordination

- ICAO: International Civil Aviation Organization
- IMO: International Maritime Organization

- Produce the IAMSAR manual: International Aeronautical and Maritime Search and Rescue manual (3 volumes, with national supplements).
- US: NSARC produces:
  - US National SAR Plan (Federal Inter-Agency)
  - US National supplement to the IAMSAR manual

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Land SAR

- There is no international treaty governing land search and rescue within national sovereign territories
- Aeronautical SAR over land :Governed by the Convention on International Aviation
- The US National SAR Plan includes Land SAR responsibilities for Federal agencies.
- Key Agencies: DoD, USCG, FEMA, and the NPS (National Park Service)
- In the US, NIMS/ICS applies at all levels (local/ county/state/federal)

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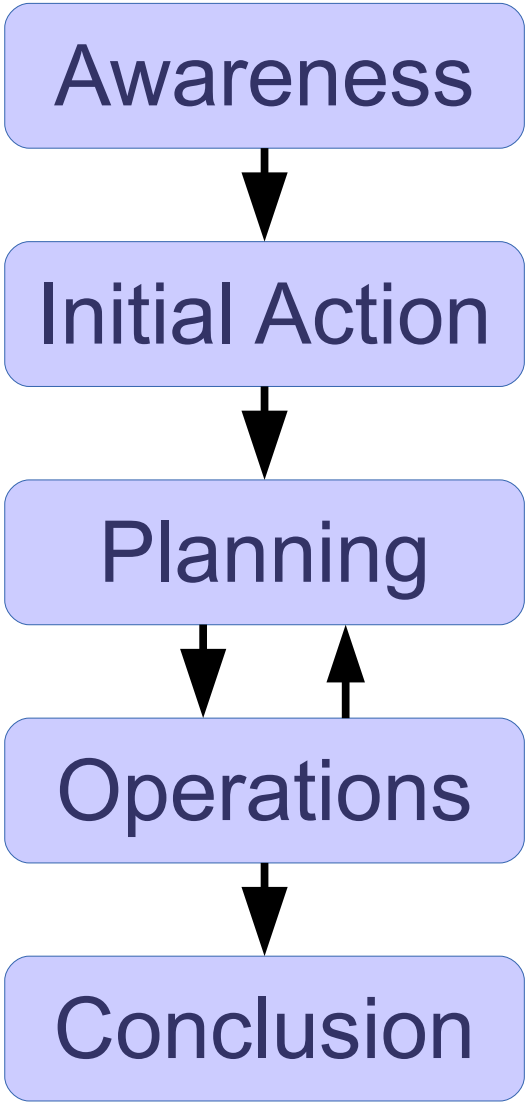
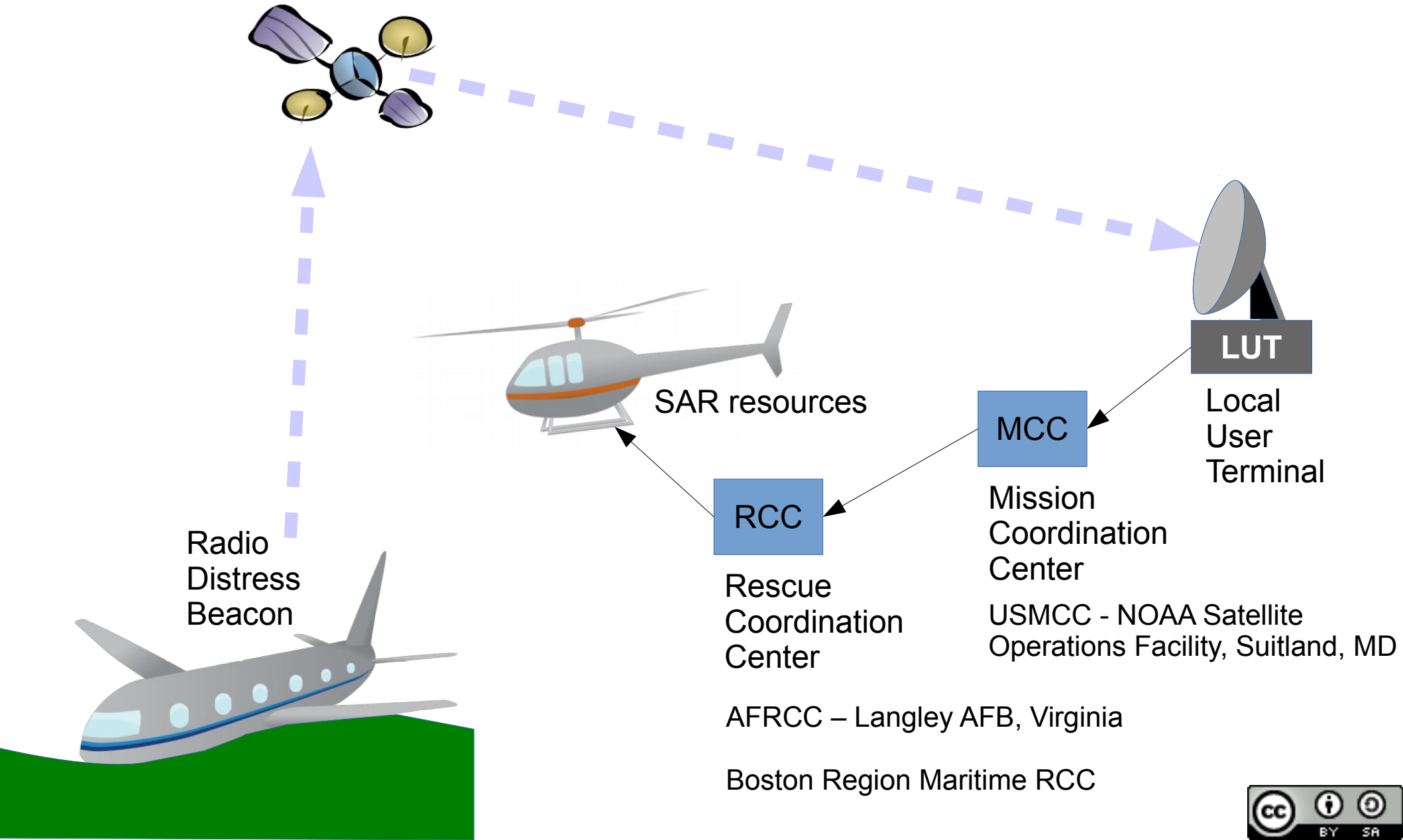
IAMSAR Manual: SAR Stages



“Grate” © 2006 CC-BY Some rights reserved by Tom “singlefin”

COPAS-SARSAT



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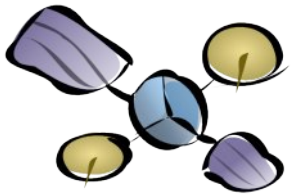
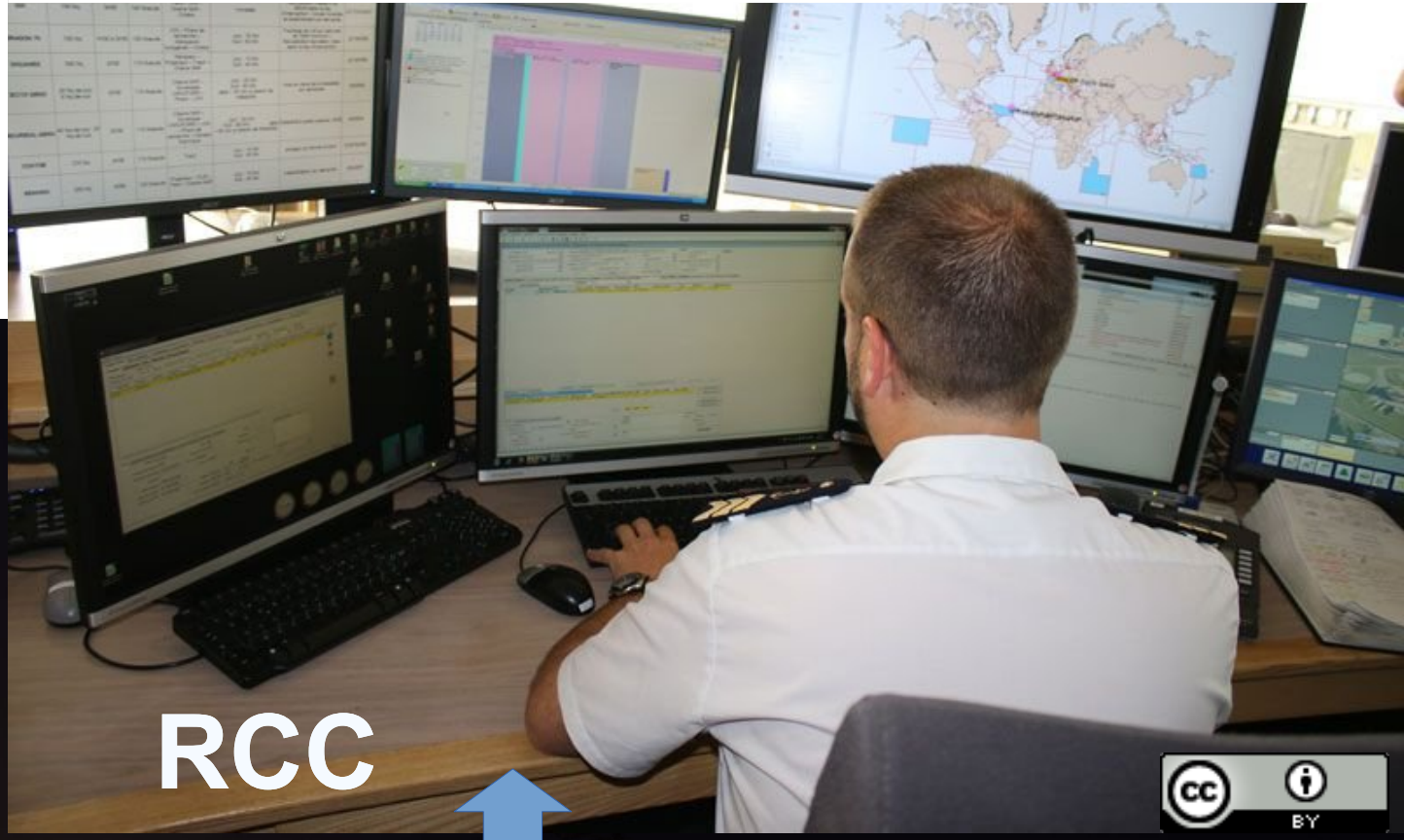
© 2014 CC Attribution Some rights reserved by IMO:International Maritime Organization: A Search and Rescue Center in France





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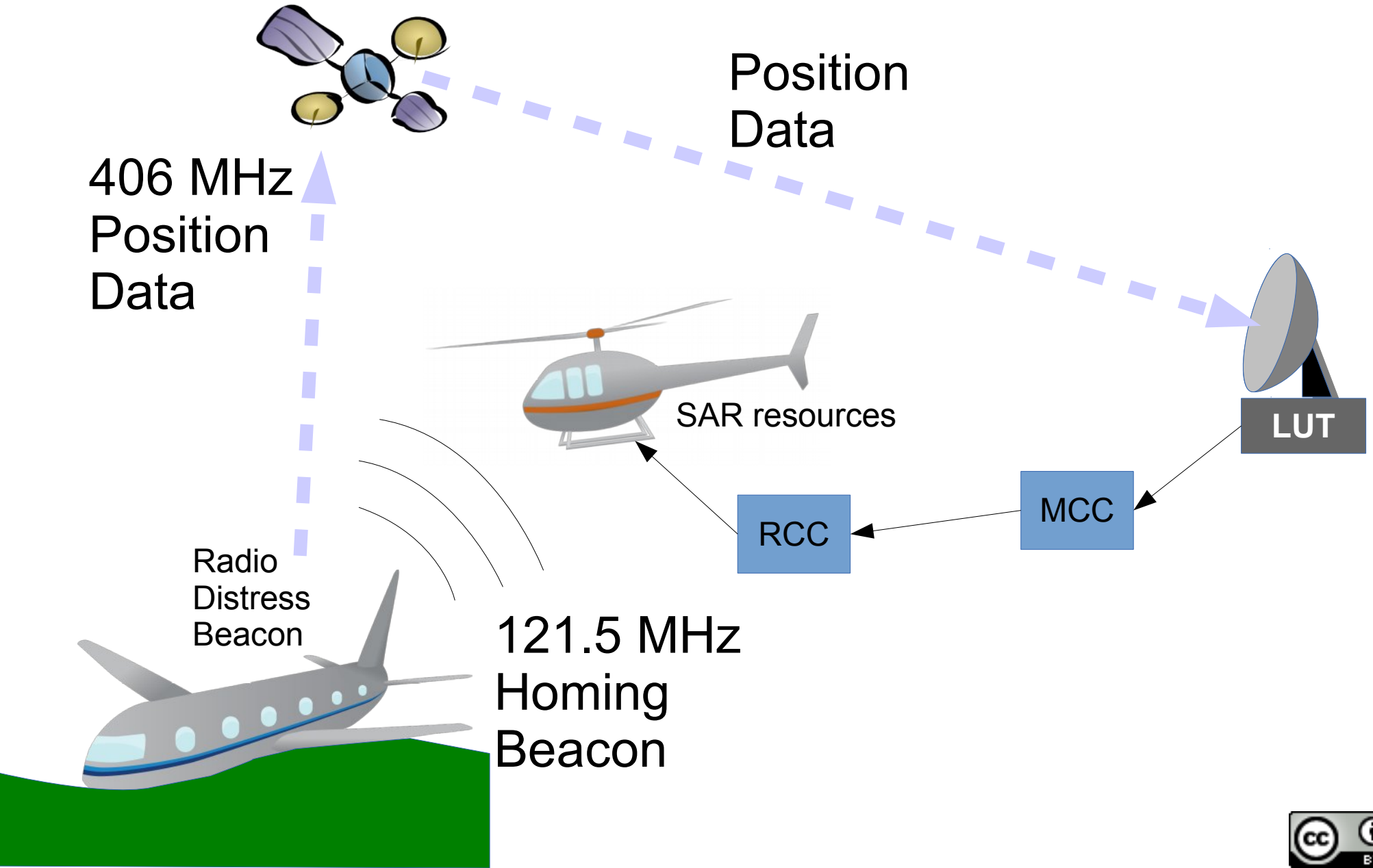
COPAS-SARSAT



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Radio Distress Beacons

- PLB – Personal Locator Beacon
  - Manual activation
- EPIRB – Maritime – Emergency Position Indicating Radio Beacon
  - Activates when submerged in water
- ELT – Aviation – Emergency Location Transmitter
  - Activates on high G forces (sudden deceleration)

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PLB © 2010 CC Attribution Share Alike Some rights reserved by "F1jmm"
EPIRB © 2013 CC Attribution Share Alike Some rights reserved by "GMacMaritime
ELT © 2013 CC Attribution Share Alike Some rights reserved by "Cosy-ch"

PLB

“ACR ResQLink 406MHz Personal Locator Beacon (PLB) with GPS”
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Non-COPAS/SARSAT SENDs

- SEND - Satellite Emergency Notification Device
- Like a PLB – Personal Locator Beacon
  - Manual activation
  - Can Include Non-Emergency messaging functions
  - Annual Subscription
  - Use Satellite Phone Communication (Iridium or GlobalStar)
  - Contacts a 911 center, rather than an RCC
    - Notification may not reach authority having jurisdiction
- SPOT, inReach, Spidertracks, Yellowbrick

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Non-COPAS/SARSAT SEND

“A SPOT Satellite GPS Messenger in a floation case.”
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Land SAR

- Federal
  - NSARC: National Search and Rescue Committee
    - US National Search and Rescue Plan
    - National SAR Supplement to the IAMSAR manual
  - National Land SAR Coordinator: AFRCC
  - National Park Service (Lead SAR Agency in National Parks)
- State/County/Local
  - State SAR Plans
  - State/County/Local Authorities having Jurisdiction
- NIMS: ESF 9: Search and Rescue

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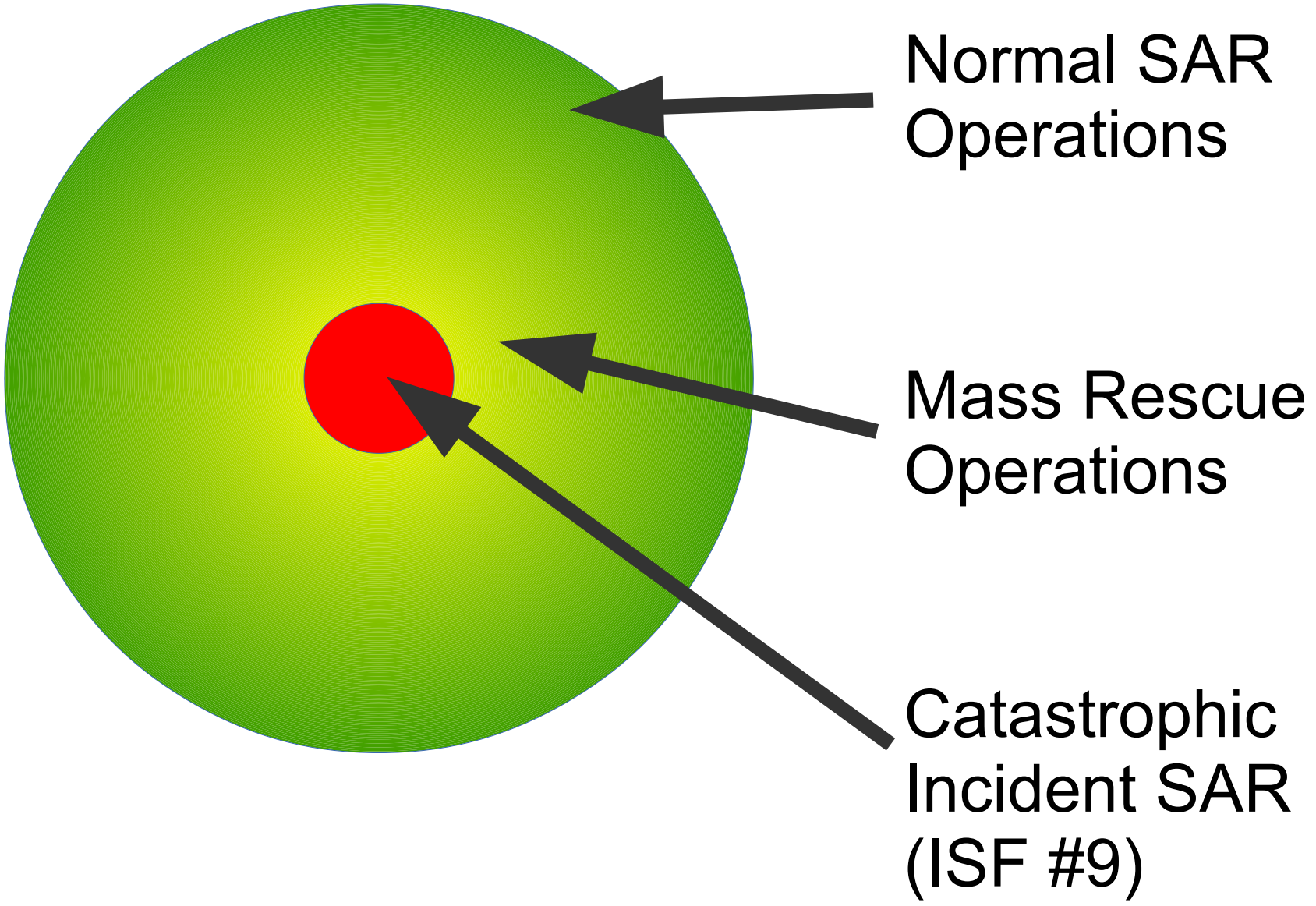
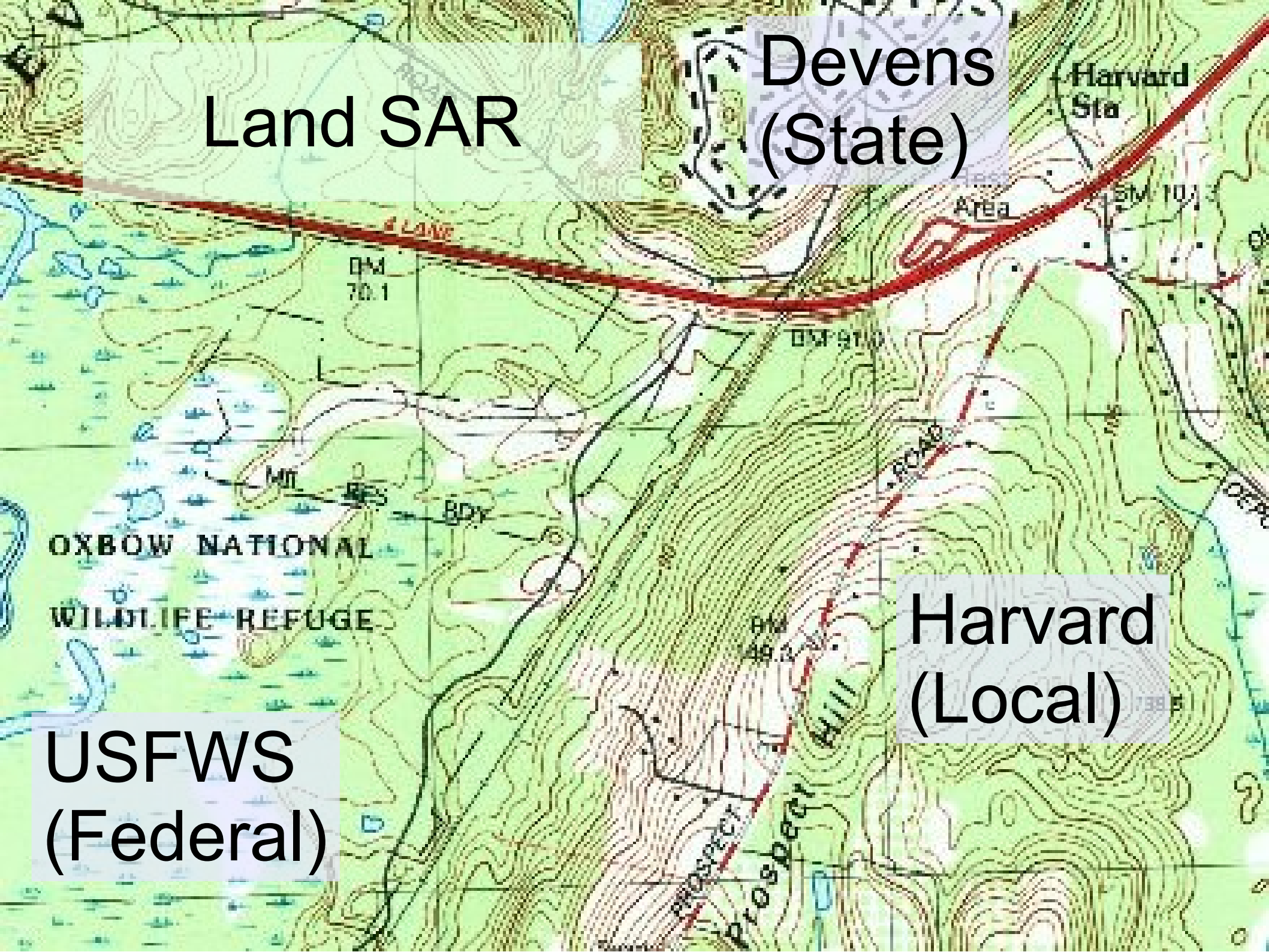
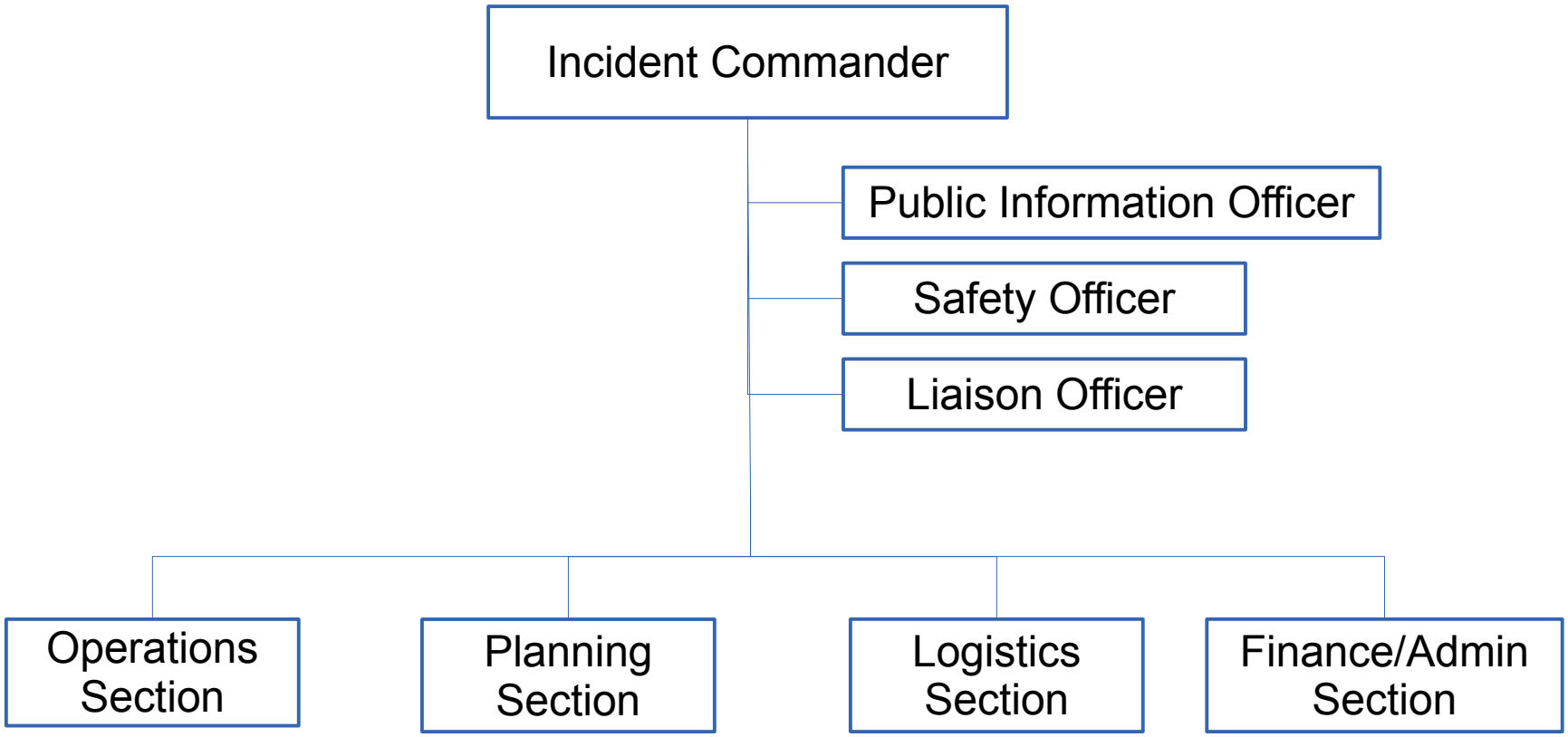
The Olive model for SAR incidents




Land SAR
Devens
(State)
Harvard
(Local)
USFWS
(Federal)
Harvard
Sta
Area
OXBOW NATIONAL
WILDLIFE REFUGE
Prospect Hill
PROSPECT
ROAD


Incident Commander
Public Information Officer
Safety Officer
Liaison Officer
Operations Section
Planning Section
Logistics Section
Finance/Admin Section

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Search Crucials

- **Search is an Emergency**
- **Search is a classic mystery**
- **Search for clues not just the subject**
- **Know if the subject leaves the search area**
- **Close grid search as a last resort**
- **Manage by objectives**
- **Search management is information management**

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Lost

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Lost

Missing

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Lost or Missing?

- Subject, uncharacteristically, stopped at a bar on the way home and stayed there late into the night.
- Wife, concerned that he hasn't come home dials 911.

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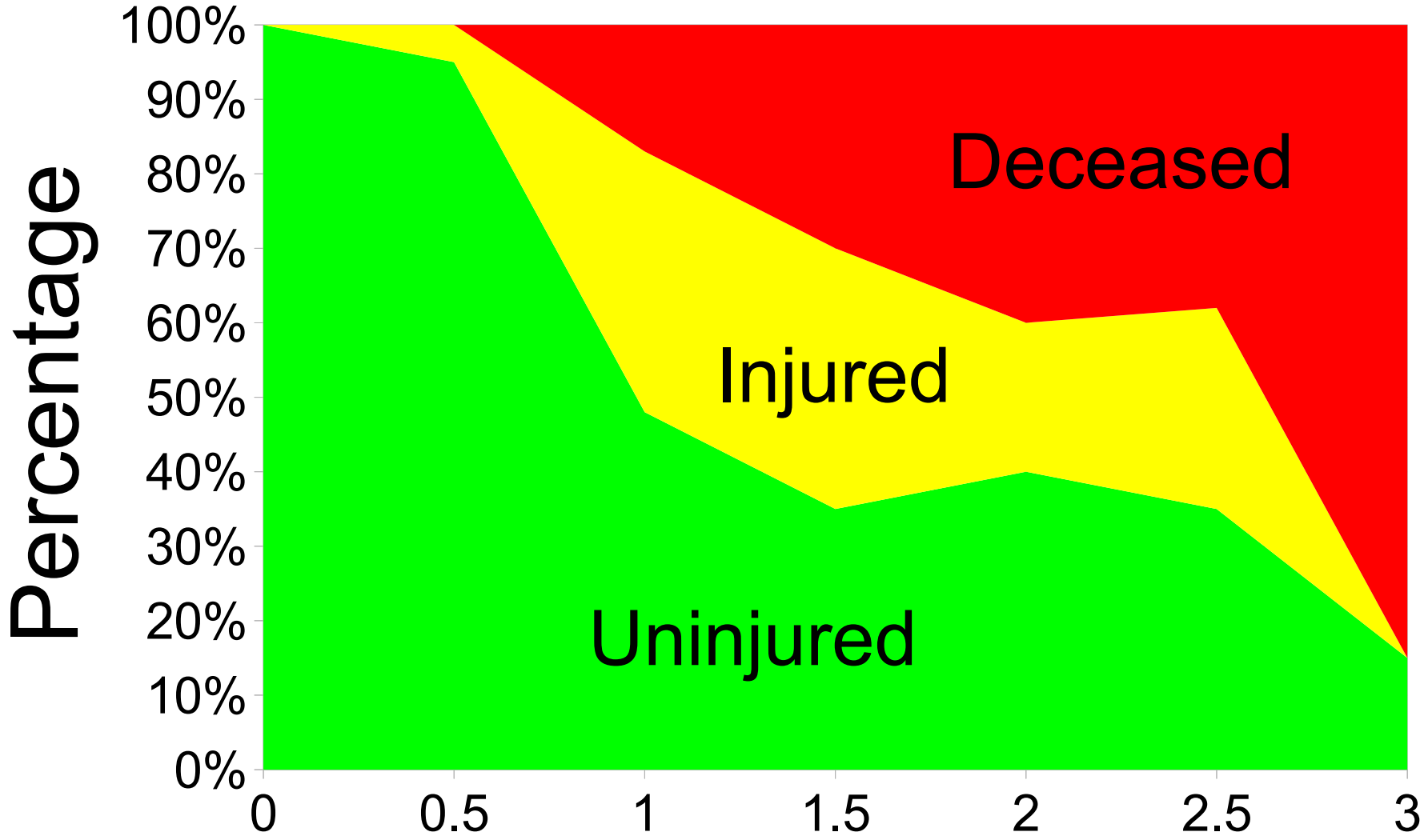
Search is an Emergency



Percentage of subjects found by condition at time found.

Subjects with Dementia. Data from ISRID.

Lost or Missing?

- 82 y/o female with dementia wanders out of her nursing home at some point during the day, drops her cane in a field across the road, and gets stuck in bushes 400 meters away.
- Her absence is noted at dinner, and at 8 PM the nursing home staff call for help.

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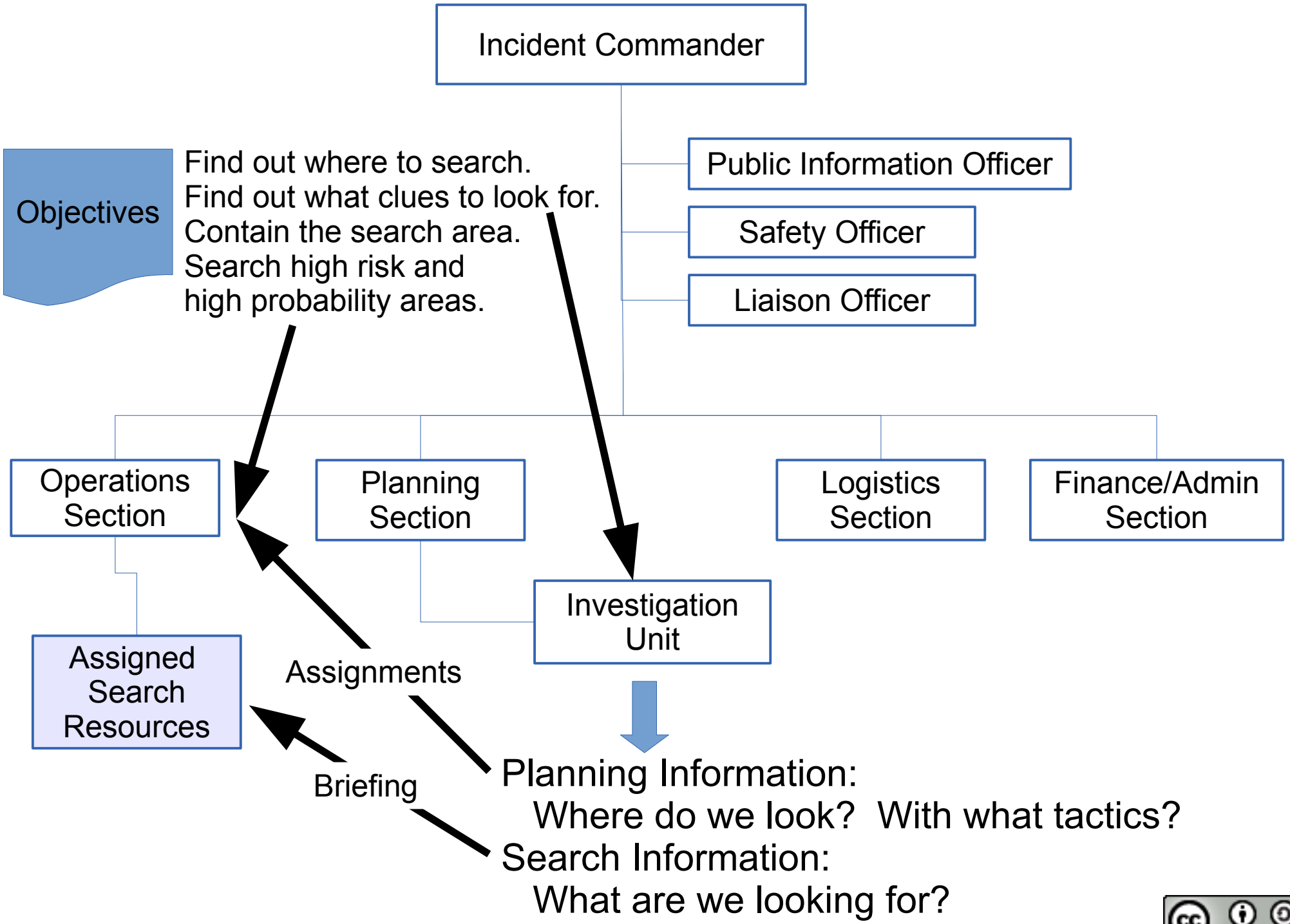
Incident Commander
Public Information Officer
Safety Officer
Liaison Officer
Objectives
Find out where to search.
Find out what clues to look for.
Contain the search area.
Search high risk and
high probability areas.
Operations Section
Planning Section
Logistics Section
Finance/Admin Section
Investigation Unit
Assigned Search Resources
Assignments
Briefing
Planning Information:
Where do we look? With what tactics?
Search Information:
What are we looking for?

Search Crucials

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Lost or Missing?

- 26 y/o male day hiker takes a wrong turn at a switch back, ends up in the woods over the ridge, can't find the trail, bivouacs for the night, then continues hiking down a drainage in that valley the next morning.
- Family reports him overdue the first evening.
- His car is located at the trailhead.
- A party camping at a lean-to in the trail system, reports seeing someone matching his description on the trail that day.

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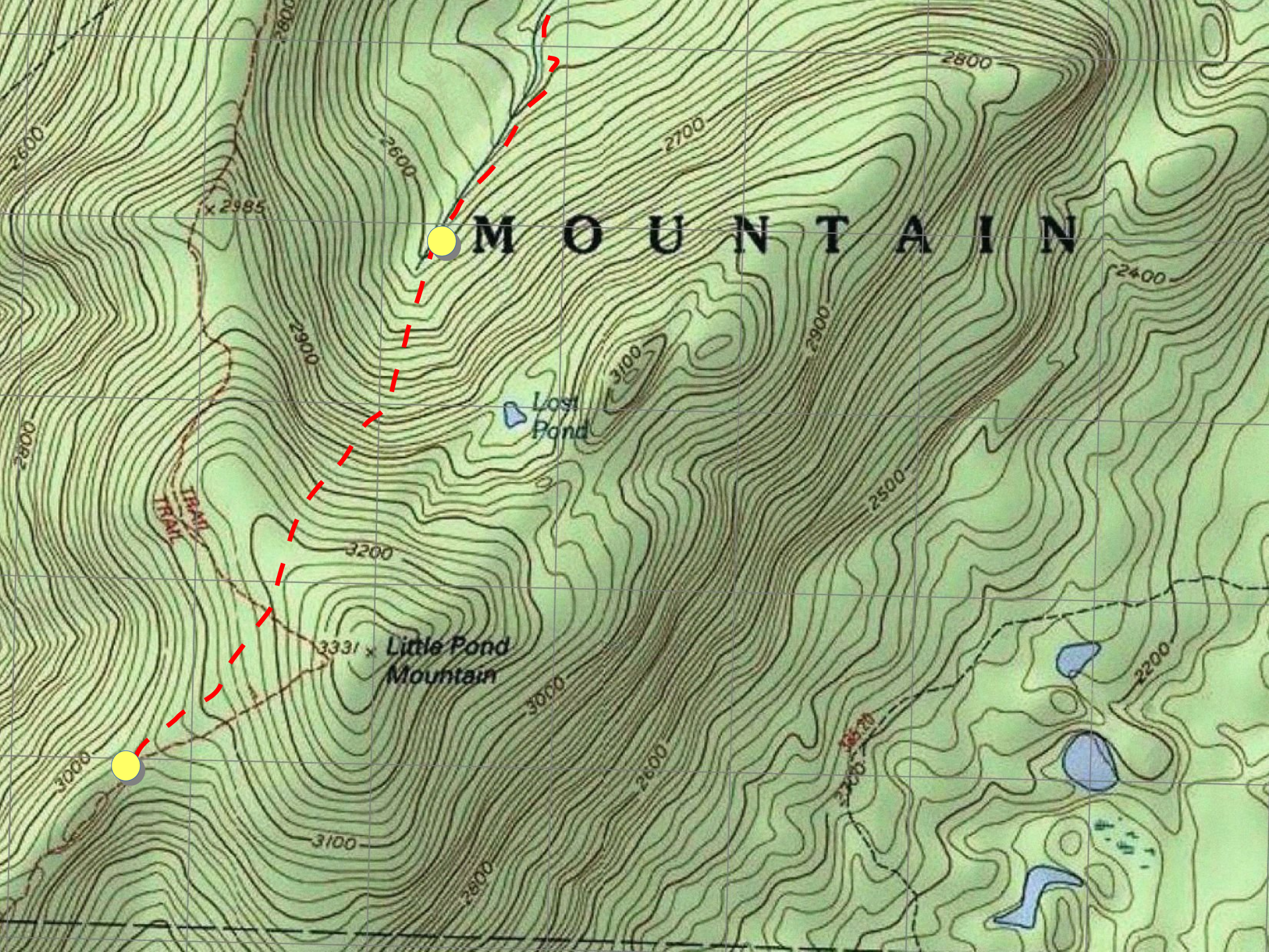
MOUNTAIN
Lost Pond
Little Pond Mountain
TRAIL
TRAIL
2985
3331
2800
2700
2600
2400
2900
3100
2500
3200
3000
2200

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Lost or Missing?

- 42 y/o hunter follows wounded game, becomes disoriented and unable to find his way back to his car. Following folklore, he goes down hill to a stream and follows it (away from roads into dense brush), where he falls and breaks an ankle on a rock.
- That night, his wife reports him overdue.

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Lost or Missing

- Toddler disappears from family picnic in backyard. Family calls 911 within minutes.
- Police, Fire department, ambulance, neighbors show up on scene in minutes.
- More firefighters and Police with canine from neighboring jurisdiction on the scene about 15 minutes later.
- State police and helicopter on scene about 10 minutes after that.

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The missing person response

- Preplanning
- Notification
- Initial Response
- First operational period
- Subsequent operational periods
- Suspension
  - Transition to Limited Continuing Search
- Critique

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The missing person response

- Preplanning
- Notification
- Initial Response
- First operational period
- Subsequent operational periods
- Suspension
- Critique

Where to search?

Taming Chaos

Half of all searches are over in 3 hours and 10 minutes.

A few searches last five or more days.

Accountability

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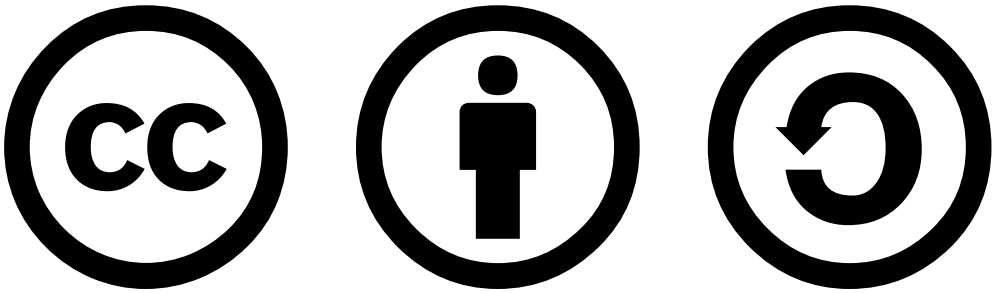

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