



Small UAS Utility Assessment During Oil Spill Response Exercise

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Learning Objectives



- Increase understanding and awareness of how a Small UAS can effectively be utilized to provide rapid initial assessment as well as support a major maritime oil spill response.
- Small UAS provide unique capabilities and limitations to support oil spills, which will be presented based on employment of sUAS from a vessel, during a major multi-agency oil spill exercise.

Participants



- NOAA UAS Program
- NOAA Channel Islands National Marine Sanctuary
- AeroViroment Inc
- Chevron Shipping
- Reality Mobile
- NAWS Point Mugu/NAVAIR Range Control
- Ventura Co Office of Education
- Channel Islands National Park
- USCG Sector LA-LB and USCGC Blacktip
- USCG CG-711 Office of Aviation Forces

Demonstration Objectives

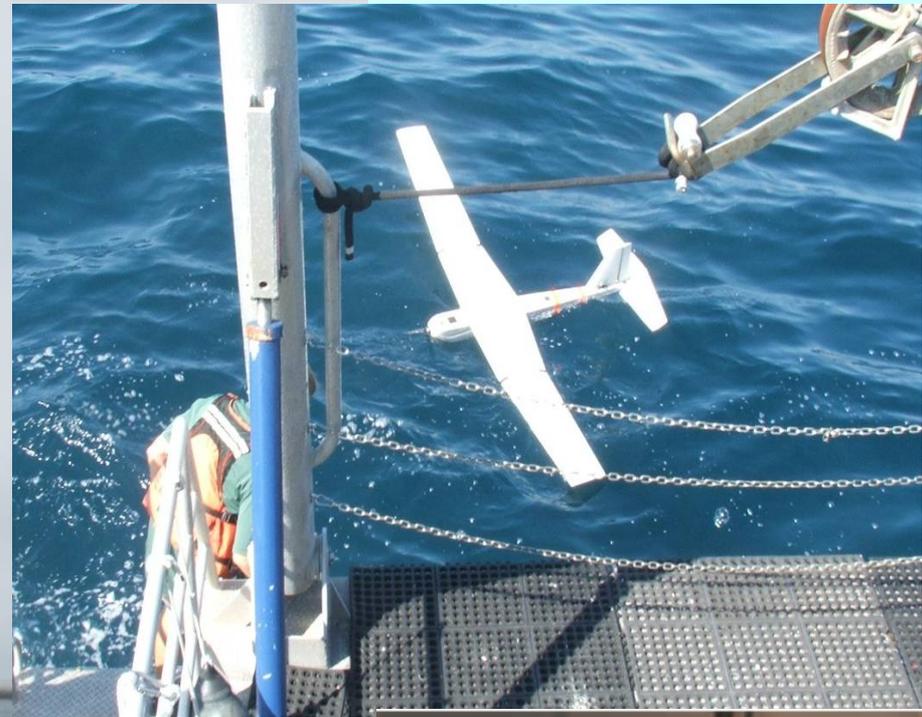
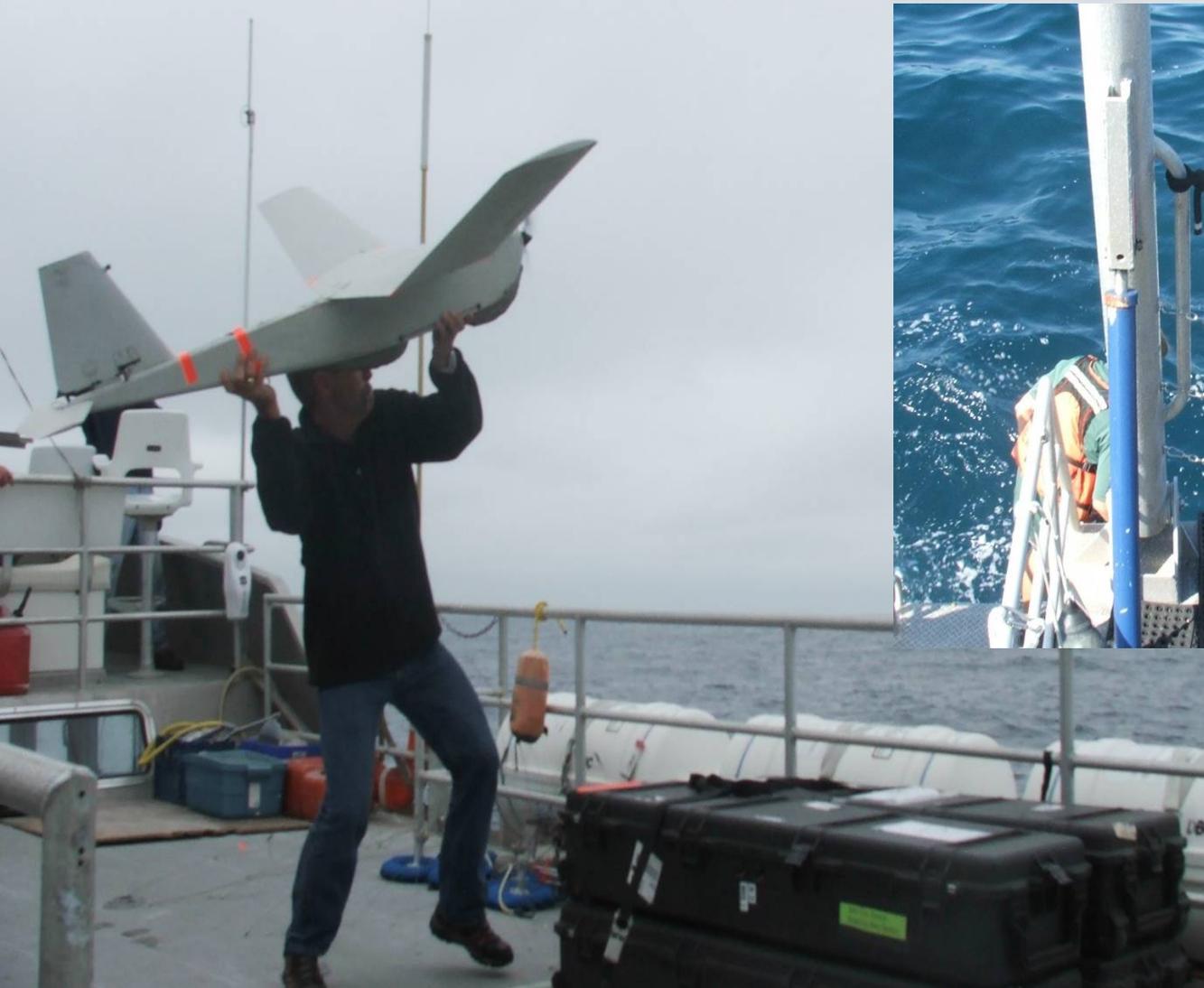


- Vessel Based sUAS Operations to characterize and quantify geographic extent of simulated oil spill
- Vessel Based sUAS Operations to conduct shoreline assessments
- Transmit real-time Video (FMV + telemetry) from the field to Incident Command Center and others over the Internet
- Demonstrate sUAS to sUAS data/communications relay

Puma All Environment (AE)



AeroVironment Puma All Environment (AE)





AV Ground Control Station (GCS)



AV GCS/RVT on R/V Shearwater



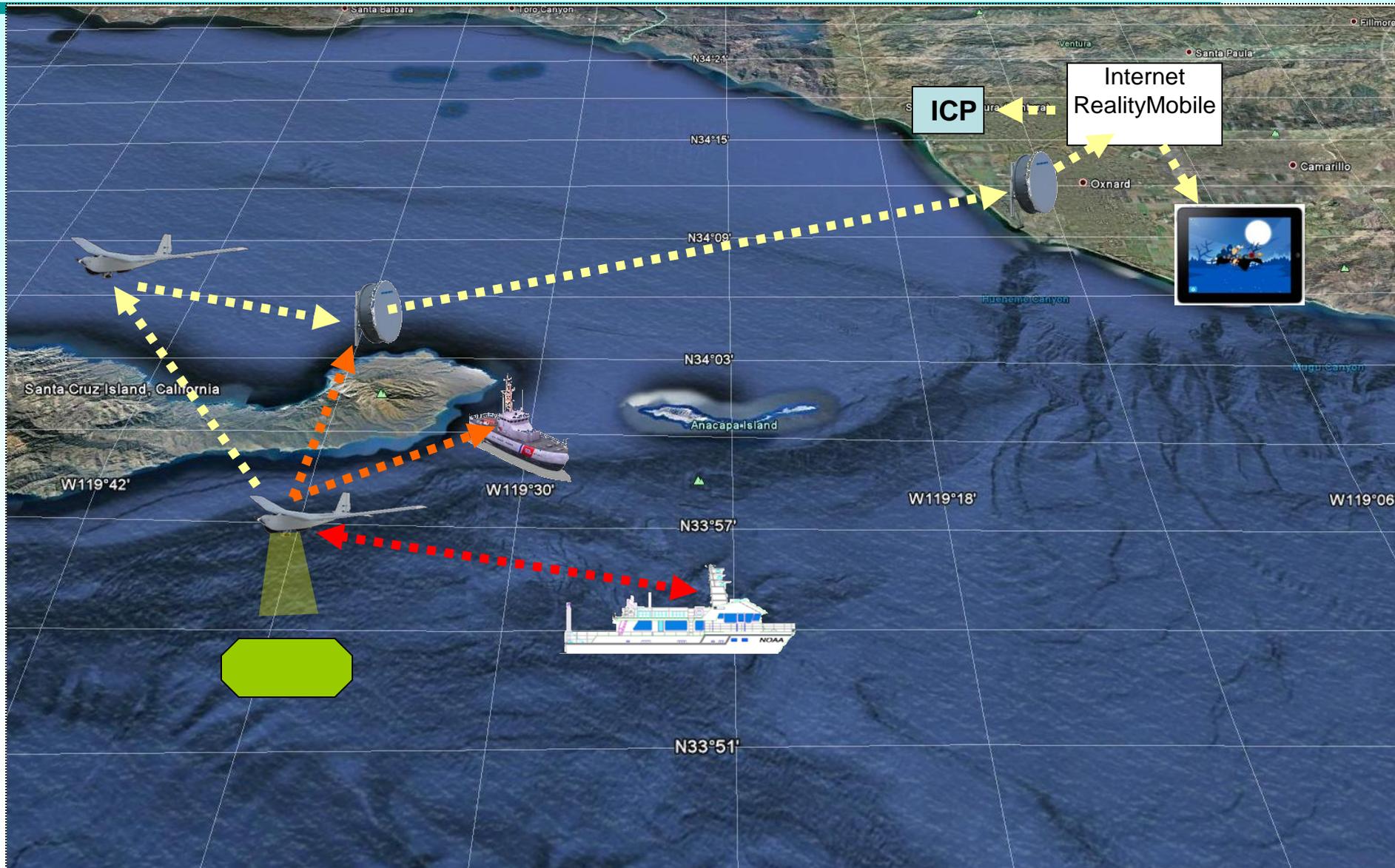
Video data out to large monitor



Antenna & RVT Aboard 87' USCG Cutter & RHIB



Data distribution architecture



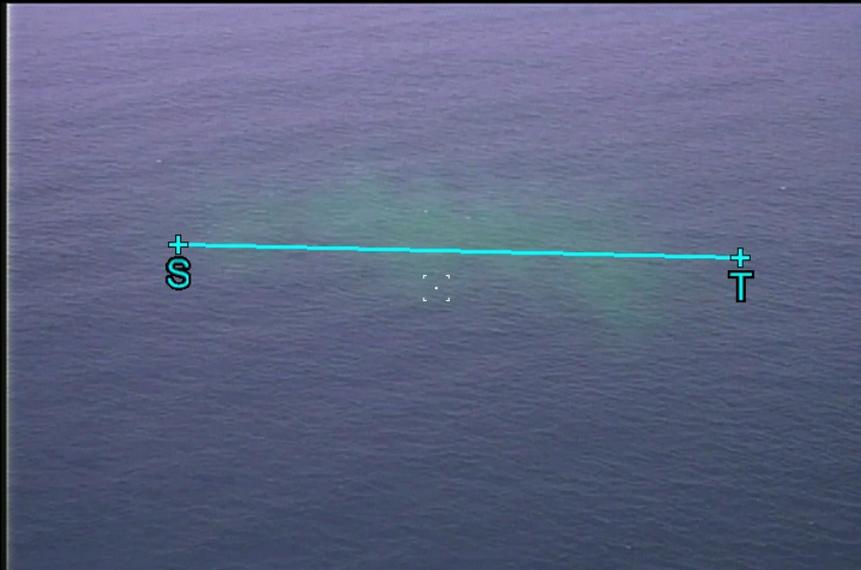
Simulated Spill



Measurement Tools

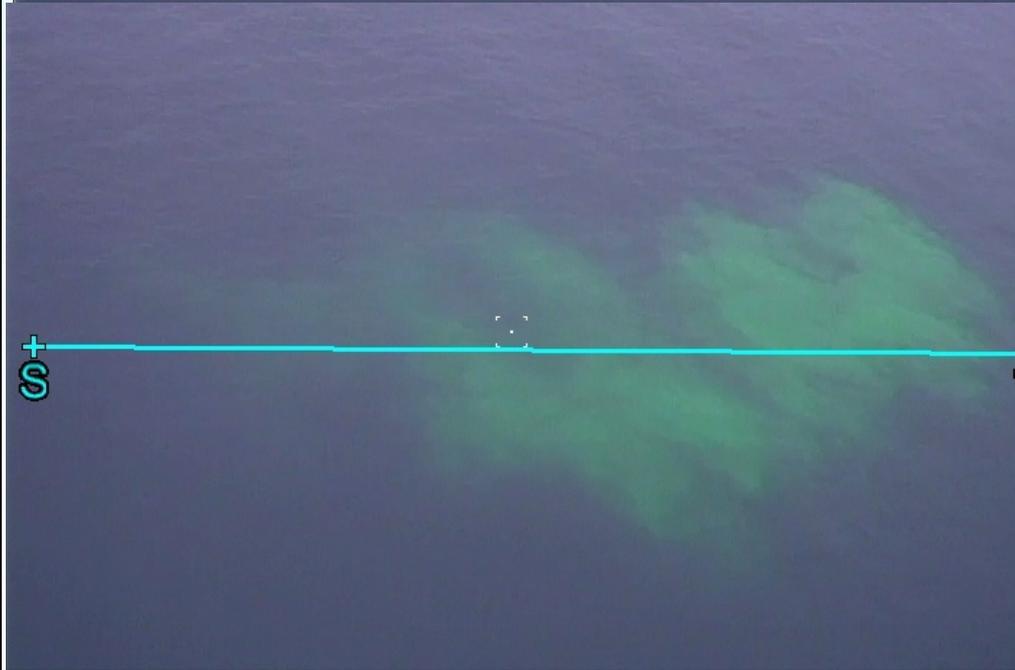
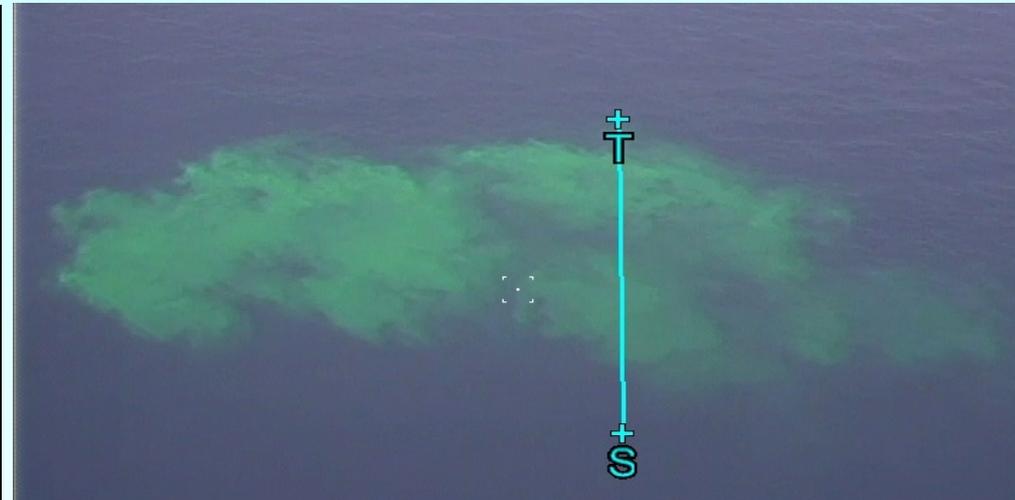


Lat/Lon: N 33° 48' 31.53" W 119° 46' 18.60"
Alt: 351 ft MSL
Mag: 39°



Gimbal
FOV Data:
Slant Rng: 259 m
CFOV Hdg: 320°
CFOV Lat/Lon: N 33° 48' 37.61" W 119° 46' 23.82"
Horiz. FOV: 29.6°

Targeting Data:
Target S Lat/Lon: N 33° 48' 36.66" W 119° 46' 26.12"
Target T Lat/Lon: N 33° 48' 39.29" W 119° 46' 23.45"
ADD 94 m RIGHT 48 m
Range: 106 m Mag Bearing: 27°



Shoreline Assessment



Metadata/Telemetry



Data examples

2009-04-14 16:58:06
N 33° 58.559' W 119° 40.005'
Alt: 492 ft MSL
True Heading: 269°



CFOV Hdg: 298°
CFOV Position:
N 33° 58.591' W 119° 40.068'

Pod of Dolphins

2009-04-13 22:29:51
N 33° 56.202' W 119° 42.029'
Alt: 354 ft MSL
True Heading: 20°



CFOV Hdg: 319°
CFOV Position:
N 33° 56.263' W 119° 42.074'

Santa Cruz Island Relay Point



NOAA & USCG Vessels with Communications relay point and Puma UAS in background





Lessons learned (from NOAA PMR):

1. Immediate & “ready” launch capabilities into the airspace is critical.
2. Immediate availability of operators (organic to the organization) for science, operational & immediate mission.
3. Ensure proper shipboard end-to-end pre-op testing is complete to include RFI & spectrum analysis.
4. Ensure a hardy and redundant communications plan is available and tested.
5. Improved analysis tools (mosaicing with 2D/3D modeling).
6. Improved communication & video relay to include sat links.

Take aways:



- Vessel based sUAS operations are not that complicated to do operationally.
- A system that does not require vessel modifications is more simple to integrate and offers much more potential for “spontaneous” operations from vessels of opportunity.
- Airspace is still an issue. We worked in a Military Warning Area. COA still to Federal agency for oil spill work, rather than direct to clean up entities.
- Streaming real-time FMV (or frame snaps) is very valuable to command, but is fairly complicated to set up and relatively expensive to operate and maintain. Simply relaying information via radio or satellite telephone may suffice, depending on the situation.
- Good communications and observers are very important
- Measurement tools were good, probably better than traditional methods for quantification.
- Camera resolution can always be better...
- The relay is a promising technology for use in post-spill operation to keep in communication with scientists working below coastal bluffs as a VHF or cell phone repeater.
- sUAS will be effective tools once routinely available to be operated from government vessels and/or OSRVs.

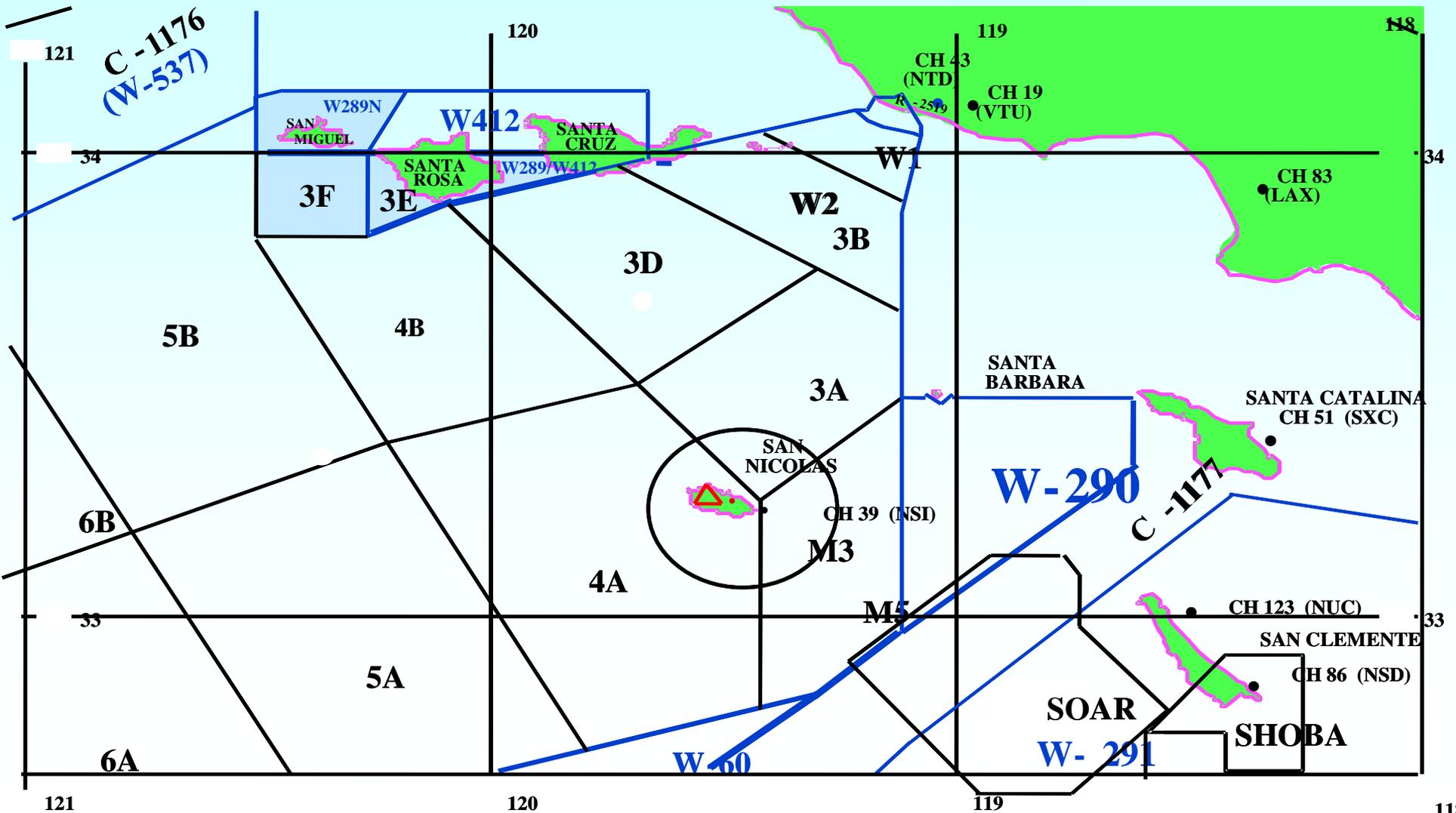
Future missions:



Additional sUAS mission sets to further support oil spill response and mitigation include:

- International Oil Spill Conference (Savannah, GA) 2014
- Direct support of oil skimming (Prince William Sound. Date TBD)
- Oil boom protection monitoring (Hawaii, October 2012)
- Long term habitat and wildlife assessment (ongoing):
 - Sea turtles:
 - » Key West, October 2012
 - Seabirds and marine mammals:
 - » Channel Islands, August 2012 and ongoing
 - » Olympic Coast, May/June 2013
 - » NWHI, Summer 2013

NAS Point Mugu W-289/W-412



25 knot winds during recent exercise



Lat/Lon: N 34° 03' 25.05" W 120° 19' 48.23"
Alti: 453 ft MSL
Rng: 259'



Class: 1
FOV Data:
Slant Rng: 254 m
FOV Hgt: 275°
FOV Lat/Lon: N 34° 03' 18.01" W 120° 19' 47.36"
Horiz. FOV: 35.2°

San Miguel Island Sea Bird



SAN MIGUEL ISLAND 1° 03' 00" N 120° 19' 51.70" W
Alt: 450 ft MSL
Mag: 283°



1° 03' 23.80" N 120° 19' 51.68" W
ISL



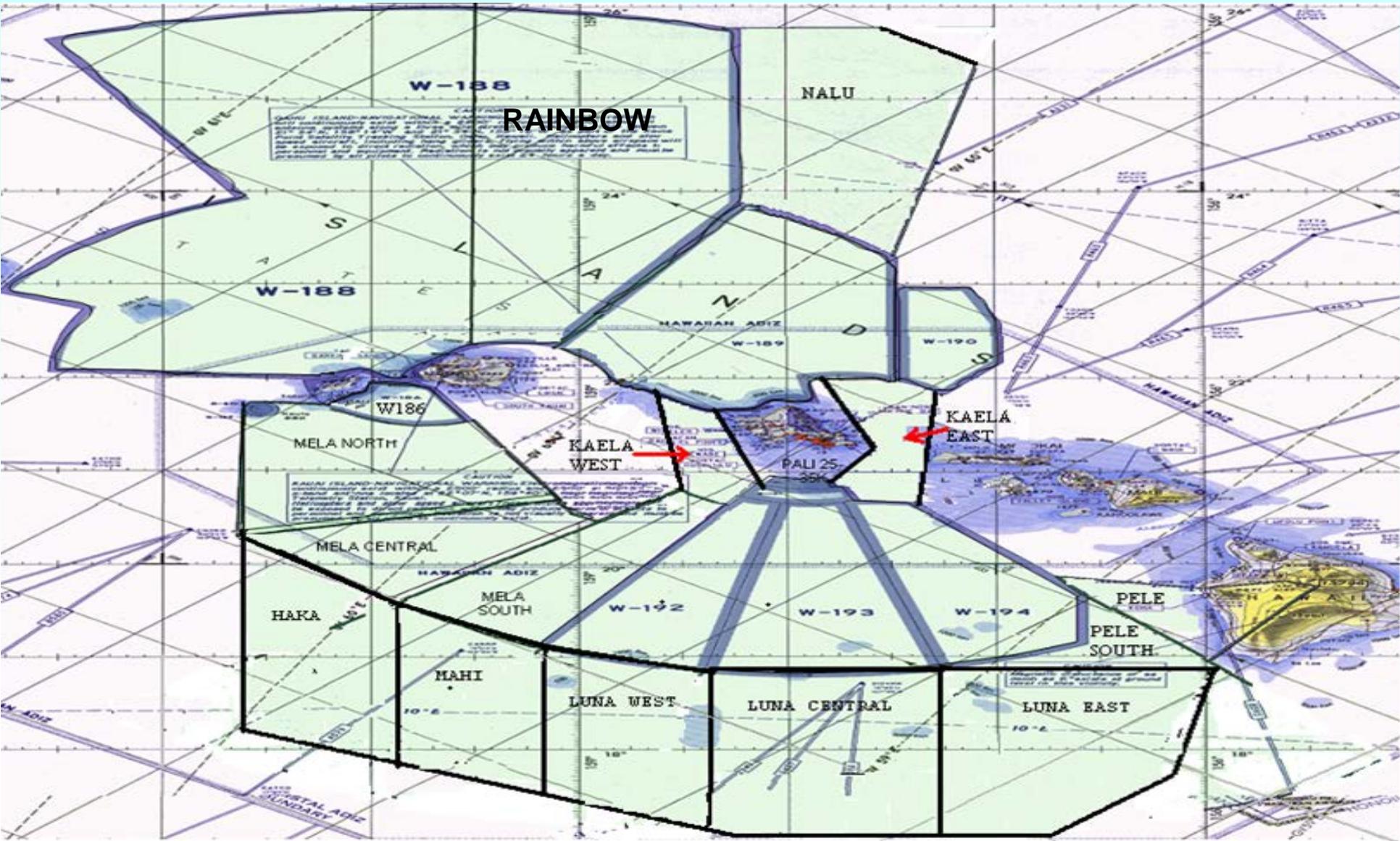
SAN MIGUEL ISLAND 1° 03' 24.00" N 120° 19' 51.60" W
Alt: 450 ft MSL
Mag: 283°

915041
EVG Data
Elev: 301.5 m
CPGV: 3104
CPGV Lat/Long: 1° 03' 24.00" N 120° 19' 52.50" W
MAG: 283.1°

76 m
22° N
3°



W-189 (Hawaii)



Hawaii Marine Debris testing 6/12



2012-06-20 21:06:10Z
Lat/Lon: N 21° 39.092' W 158° 10.676'
Alt: 344 ft MSL
Mag: 36°

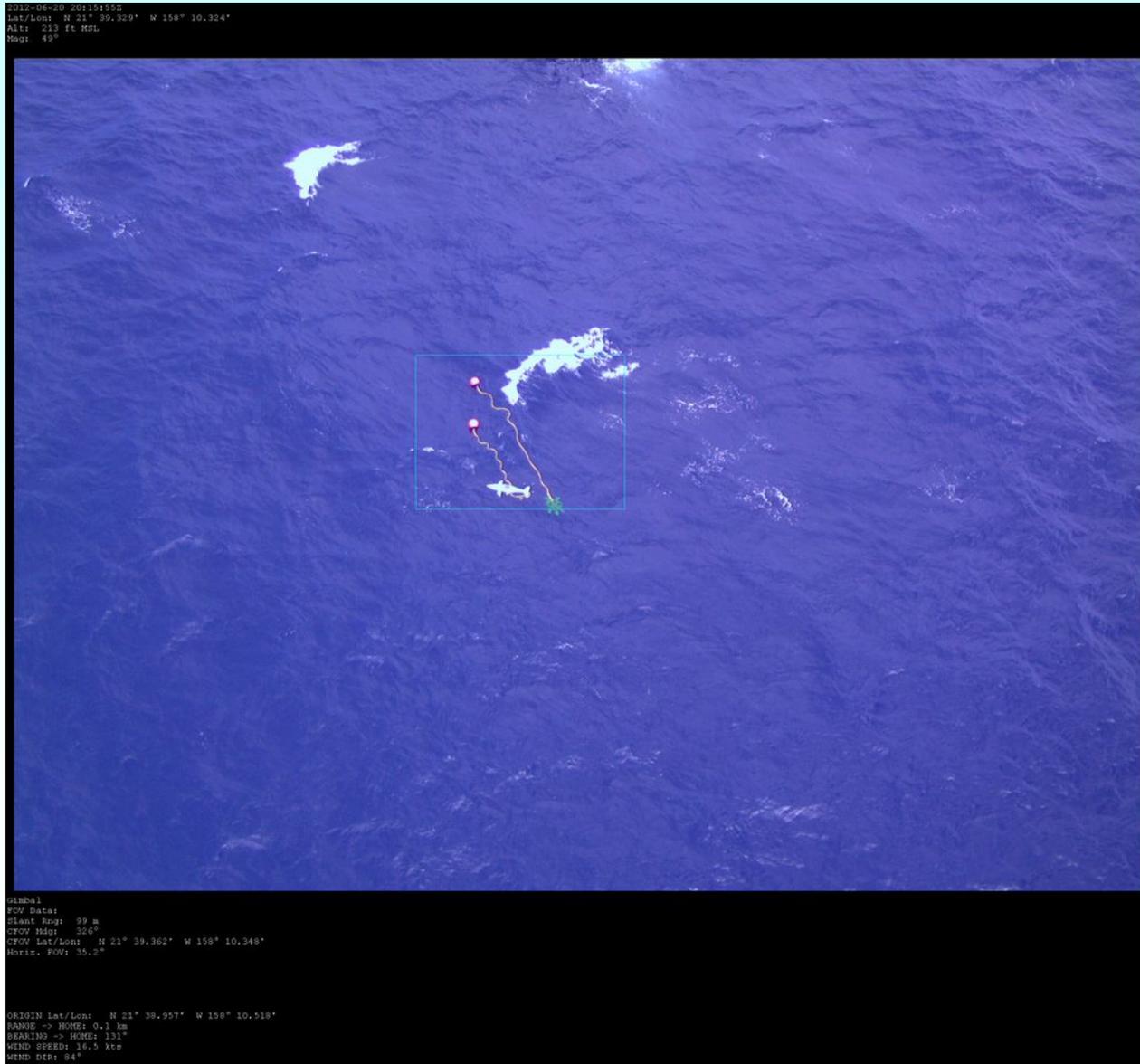


Gimbal
FOV Data:
Slant Rng: 184 m
CFOV Hdg: 339°
CFOV Lat/Lon: N 21° 39.203' W 158° 10.720'
Horiz. FOV: 6.3°

ORIGIN Lat/Lon: N 21° 39.386' W 158° 10.509'
RANGE -> HOME: 0.1 km
BEARING -> HOME: 176°
WIND SPEED: 00.0 kts
WIND DIR: 68°



Simulated seal and turtle

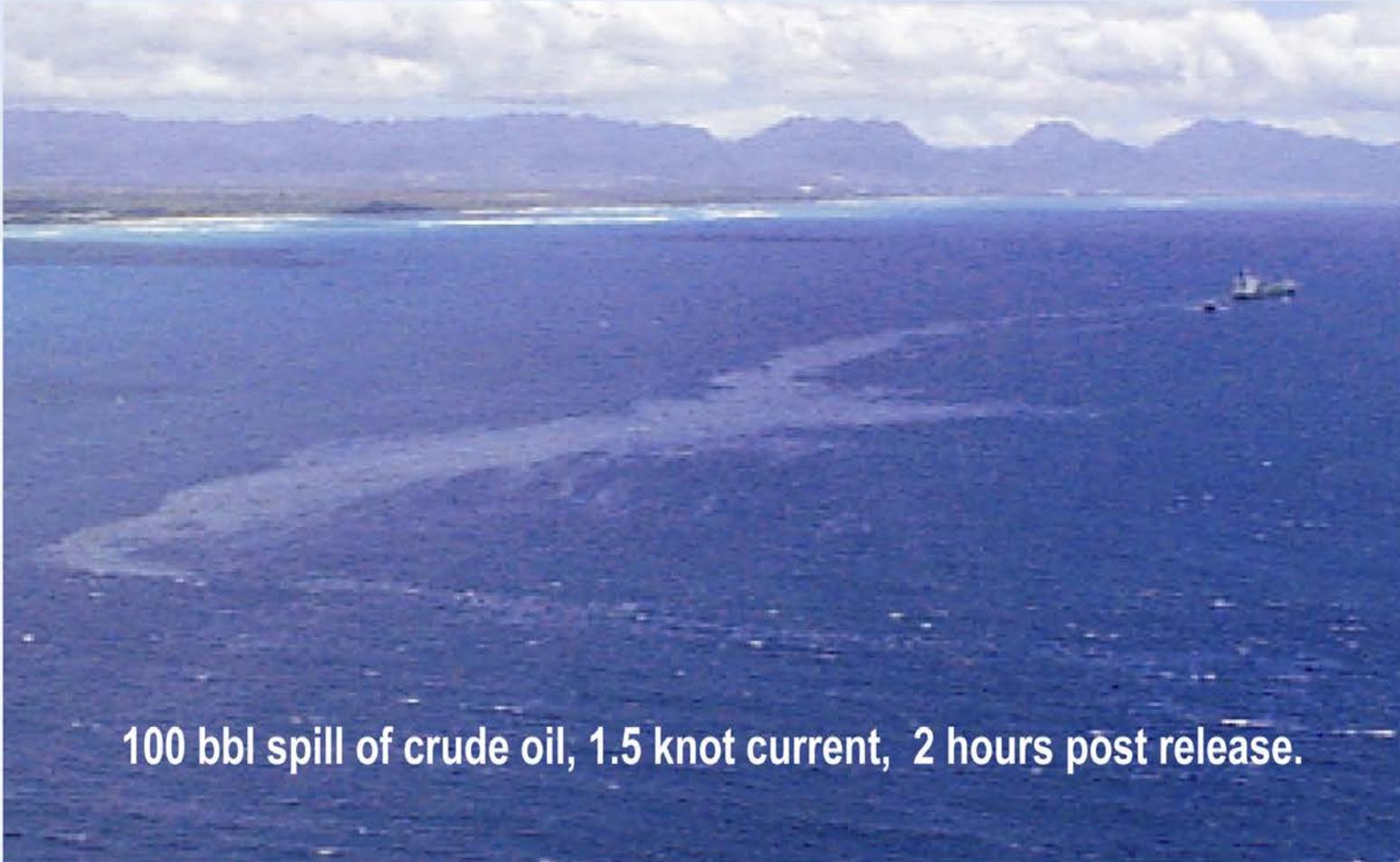


Puma recovery



Aerial Observation of Oil

Fate and Effects



100 bbl spill of crude oil, 1.5 knot current, 2 hours post release.

Oil sheen



Date: 20 May 2006 06:43:47 Lat: 21° 16.239' Long: -158° 5.202' Alt: 427



US UAS Special Use Airspace

