

# **S&T Airborne Systems**

Your solution provider in Airborne Maritime Surveillance



**Bonn Agreement seminar Middelburg, April 14, 2015**

Olov Fäst

S&T Airborne Systems

**S&T Airborne Systems**  
Experts in airborne maritime surveillance  
Member of the Sjöland & Thyselius Group

# Sjöland & Thyselius (S&T)

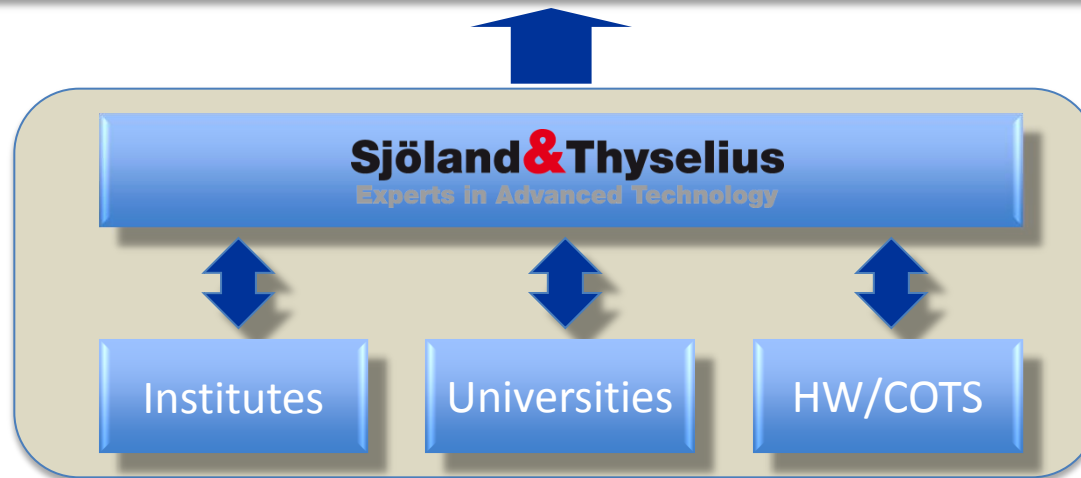
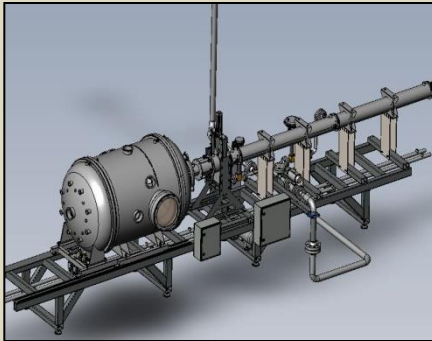
- **Swedish Consultancy Company established 1989**
- **From turn-key assignments to expert consultancy**
  - System Development
  - System Integration
  - Communication
  - Simulation and Modeling
- **Customers in Europe, Asia, North and South America**
- **160 employees**



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# Sjöland & Thyselius

Provides innovative customer specific solutions



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# > 35 years of experience

## **S&T** Airborne Systems



- > 35 years experience
- > 80 systems delivered worldwide
- Multiple platforms
- Multi-mission systems (Integrated & user friendly!)
- Real time reporting



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# SSC Airborne Systems -> **S&T Airborne Systems**



Airborne Maritime Surveillance Systems in use in >20 countries for:

- **Environmental Protection/  
Oil pollution**
- **EEZ Protection/Border control**
- **Law enforcement**
- **Fishery patrol**
- **Search and rescue**
- **Ship traffic management**
- **Ice patrol**

# 1982 first installation for Rijkswaterstaat

- SLAR (Side Looking Airborne Radar) for large area patrol, optimised for detection of oil spills and small targets
- IR/UV scanner for wake inspection and oil pollution mapping
- Photographic and video camera system for documentation and courtroom evidence

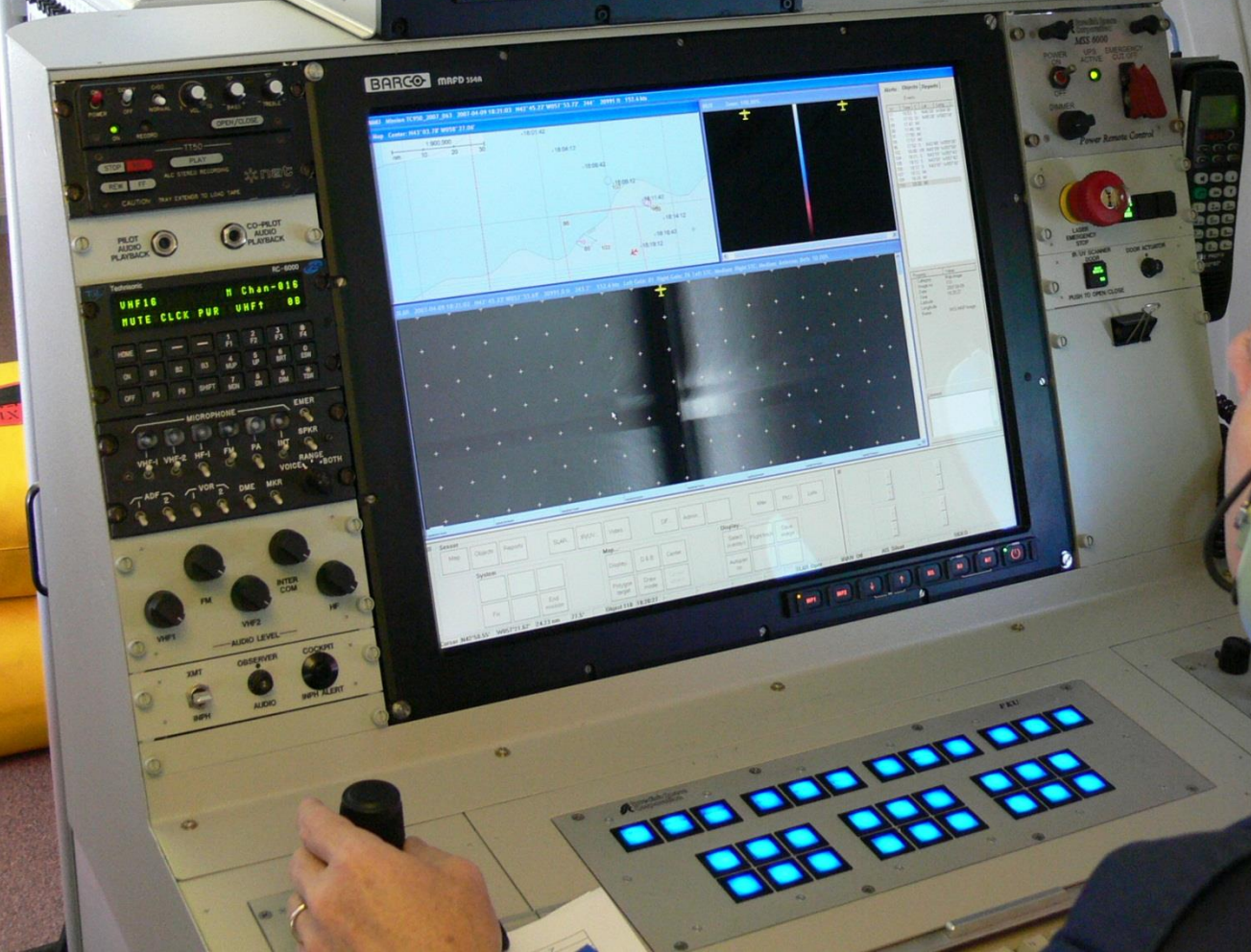


# MSS 6000 in operation with Transport Canada since 2006



- SLAR
- IR/UV
- AIS
- EO/IR (FLIR)
- Still camera
- Video camera
- Direction Finder
- SATCOM

*Photo Paul Minnaar, Transport Canada*





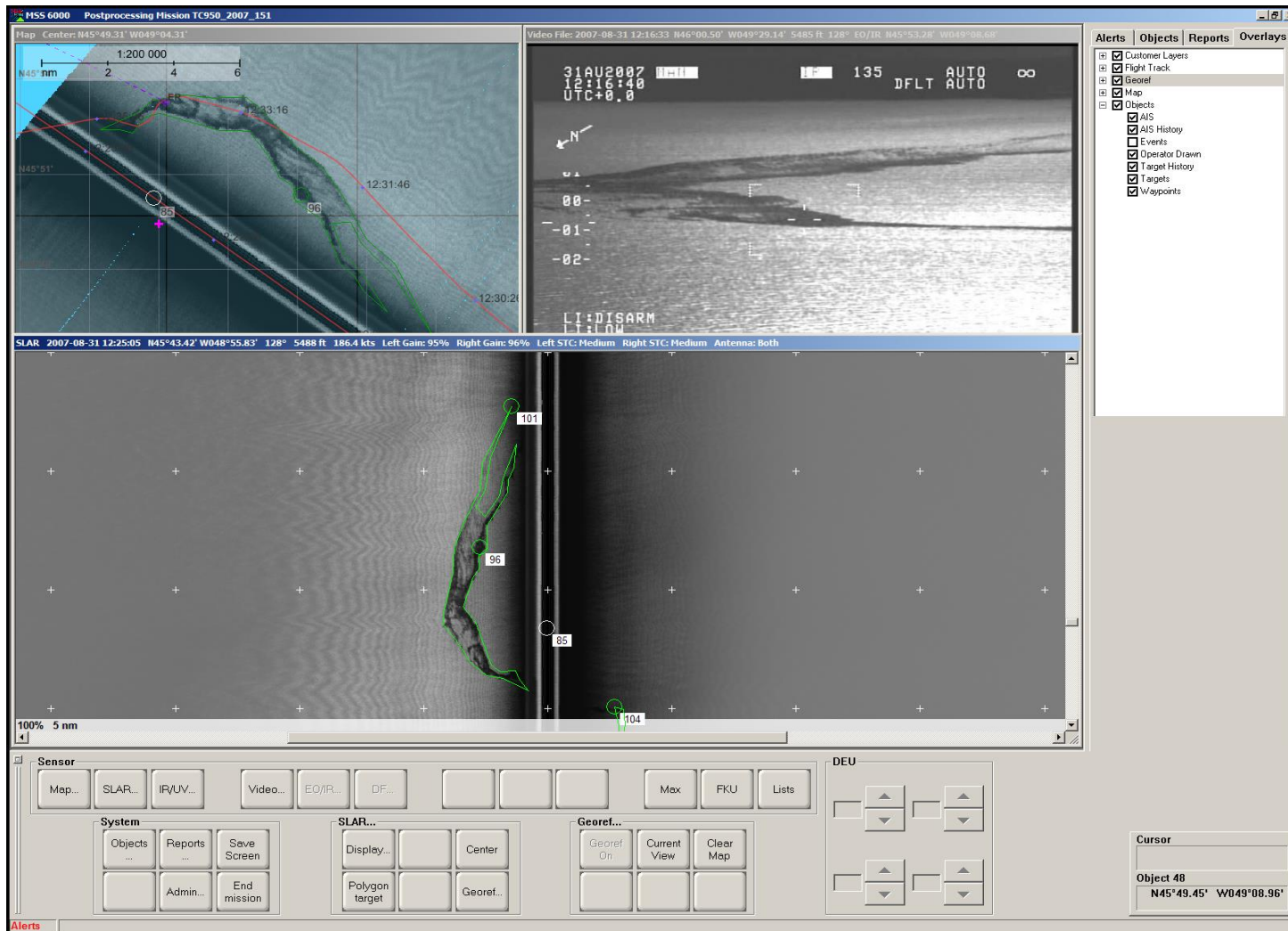
# Correlated observation and documentation

The screenshot displays the MSS 6000 software interface, which is used for maritime surveillance. The interface is divided into several sections:

- Map (Top Left):** Shows a map with a scale of 1:20,000. The map center is at N42°40.91' W079°29.54'. A red line indicates a track, and a green circle marks a target labeled '128'. Other labels include 'ER' and 'VCR'.
- Video Feed (Top Right):** Shows a live video feed of a ship. The video file path is 2007-06-05 19:32:52. The video shows a ship with the name 'LI DISARM' and 'COM' visible. The video is playing at 17 COL AUTO 5.
- Alerts, Objects, Reports, Overlays (Right Panel):** Contains a table of target data and a property table for target 74.
- Property Table (Right Panel):**

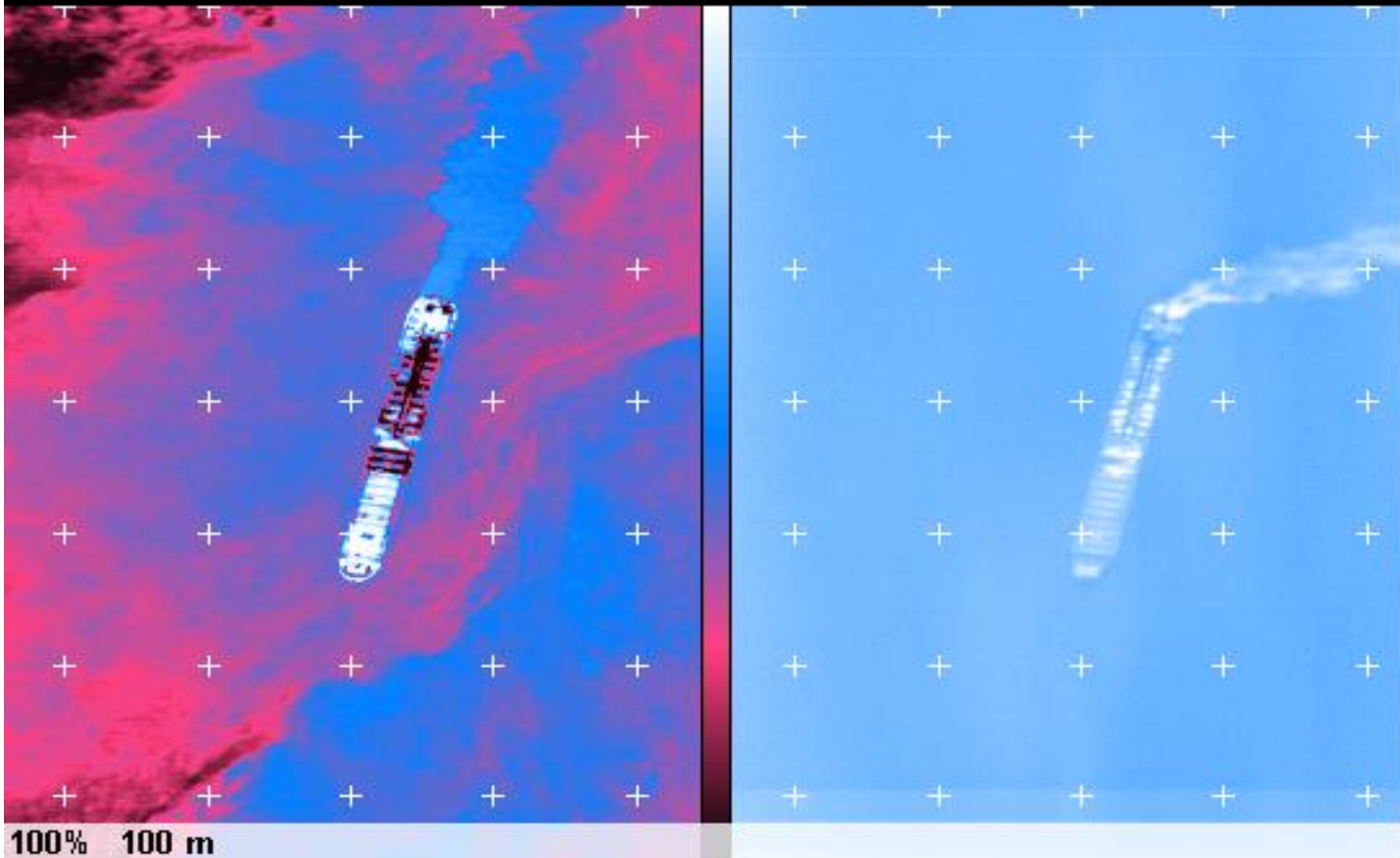
Property	Value
Category	AIS
Date	2007-06-05
Time	20:42:19
Latitude	N42°50.10'
Longitude	W079°16.01'
Course	21°
Speed	11.1 kts
MMGSI	31601637
Status	Inactive
Repetitions	0
Name	CSL LAURENTIEN
Call sign	VCAV
IMO no.	7423108
Ship/cargo type	70 Cargo ship
Length/width	225 m/24 m
True heading	19°
ROT	-713°/min
Nav. status	UNDER WAY
Max draught	6 m
Destination	NANTICOKE OPG
ETA	.
- SLAR (Bottom Left):** Shows Synthetic Aperture Radar (SLAR) data for the same area as the map. The scale is 100% 5 nm. A green circle marks target '128'.
- Control Panel (Bottom):** Contains various buttons for sensor control (Map, SLAR, IR/UV, Video, EO/IR, DF, Max, FKU, Lists), system functions (Objects, Reports, Save Screen, Admin, End mission), SLAR functions (Display, Center, Polygon target, Georef), and Georef functions (Georef On, Current View, Clear Map).

# Correlated observation and documentation



# IR/UV

Mission: TC951\_2007\_002  
IRUV Top center: 2007-12-10 17:54:07 N44°10.22' W076°46.78' 57° 990 ft 180.1  
kts  
POSTPROCESS



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# Cameras for documentation and information

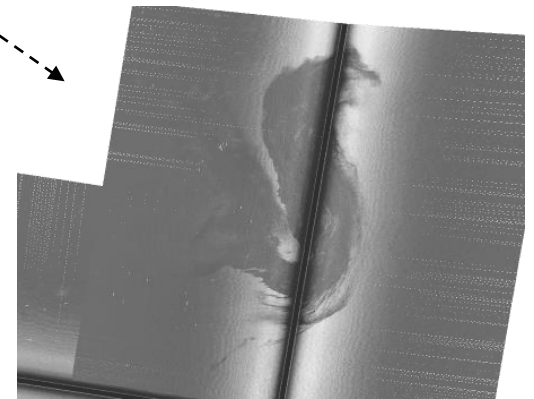


# Real time data transfer

- Satellite data transmission system (high-speed INMARSAT)
- Map overlay images, photos, video, reports to command centre in flight



Command centre



SLAR radar image with geographic references (GeoTIFF)

# Finnish Border Guard MSS 6000

Communication & reporting



Dual Operator consoles



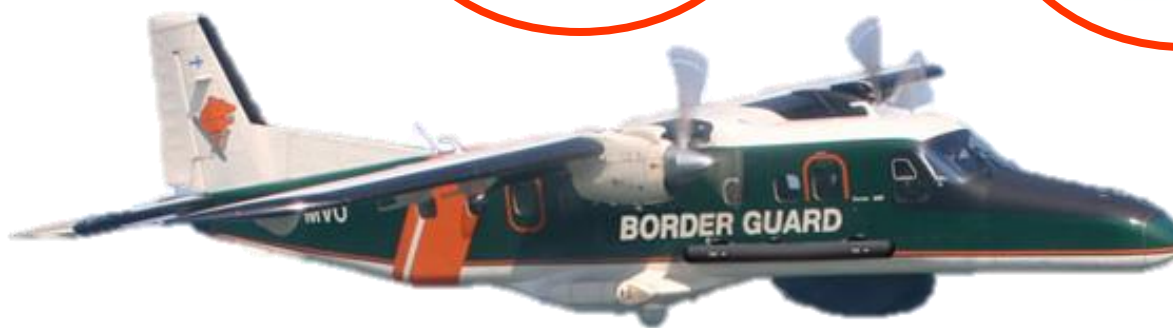
AIS



Search Radar



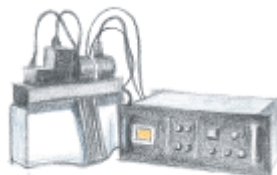
Cameras



DF



IR/UV Scanner



EO/IR



SLAR



**Two identical workstations, with integrated control of:  
Search radar, SLAR, IR/UV, AIS, Cameras, Satcom, FLIR, DF**

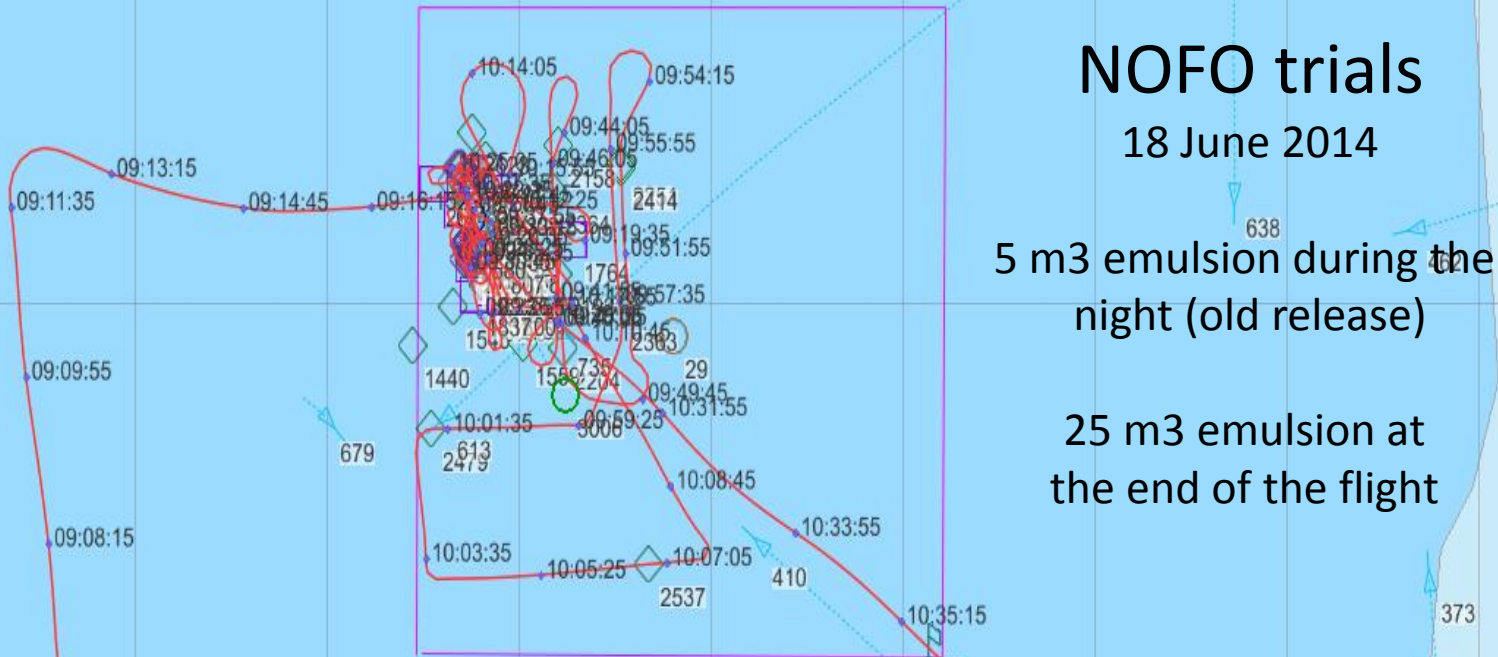


# NOFO trials

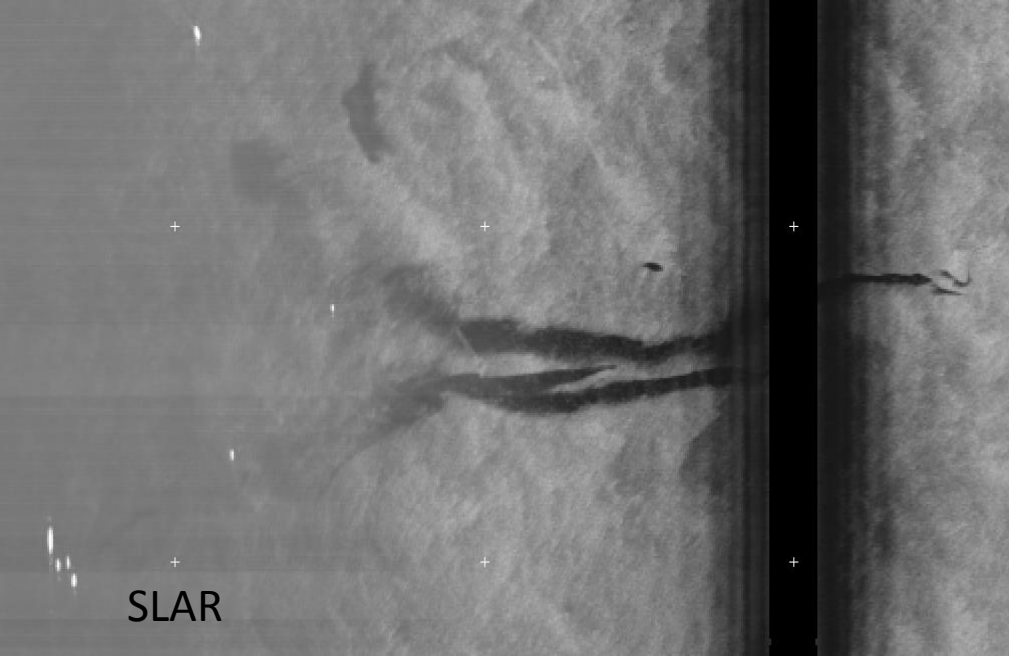
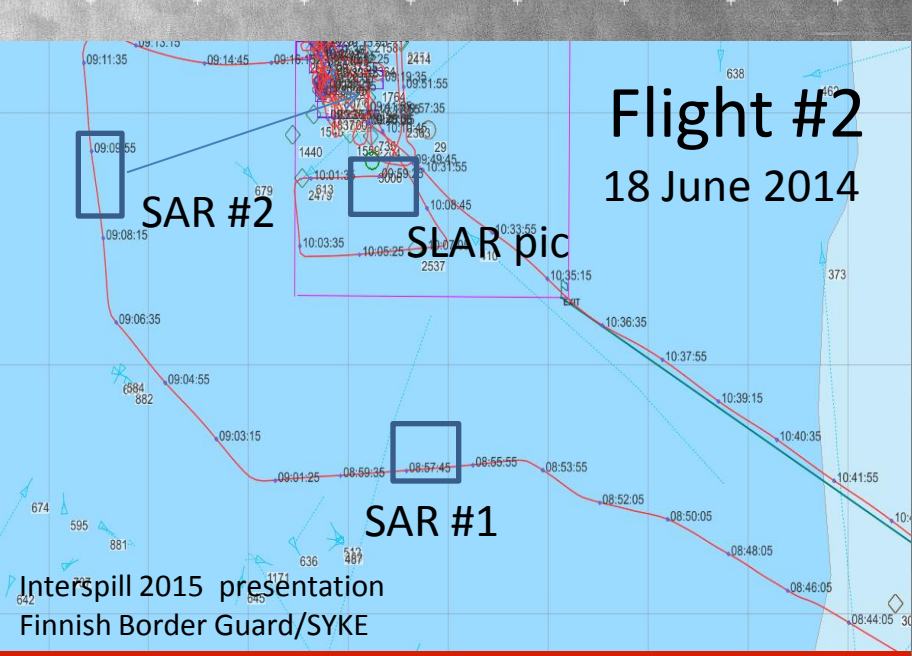
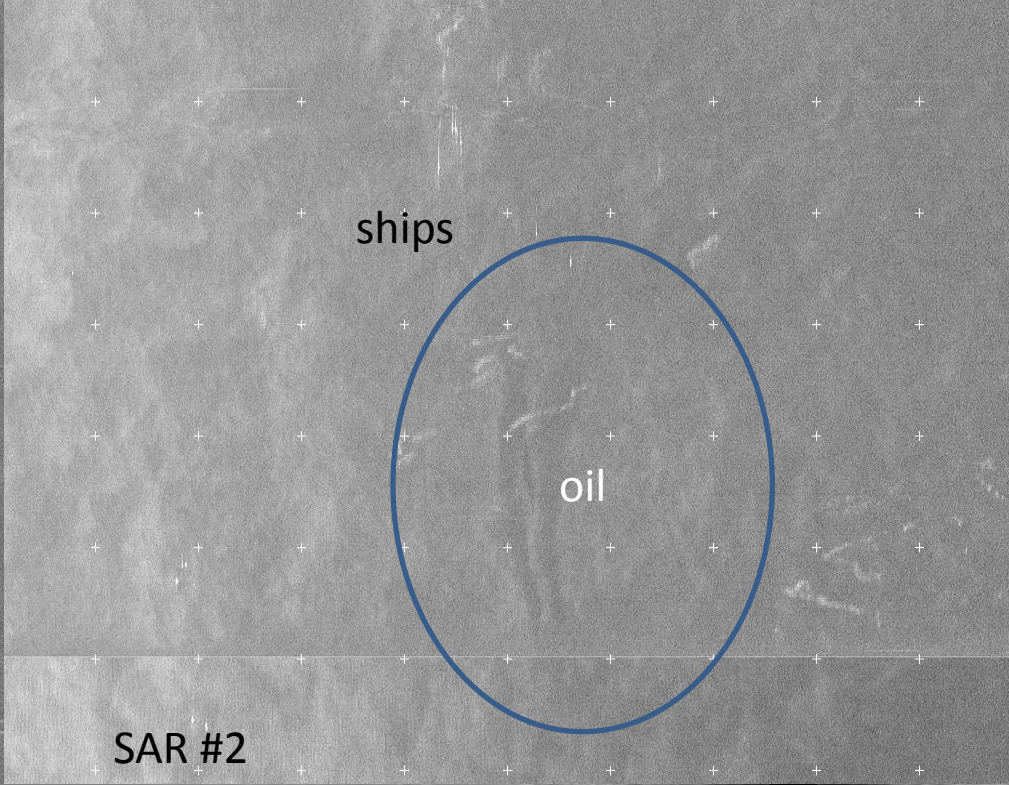
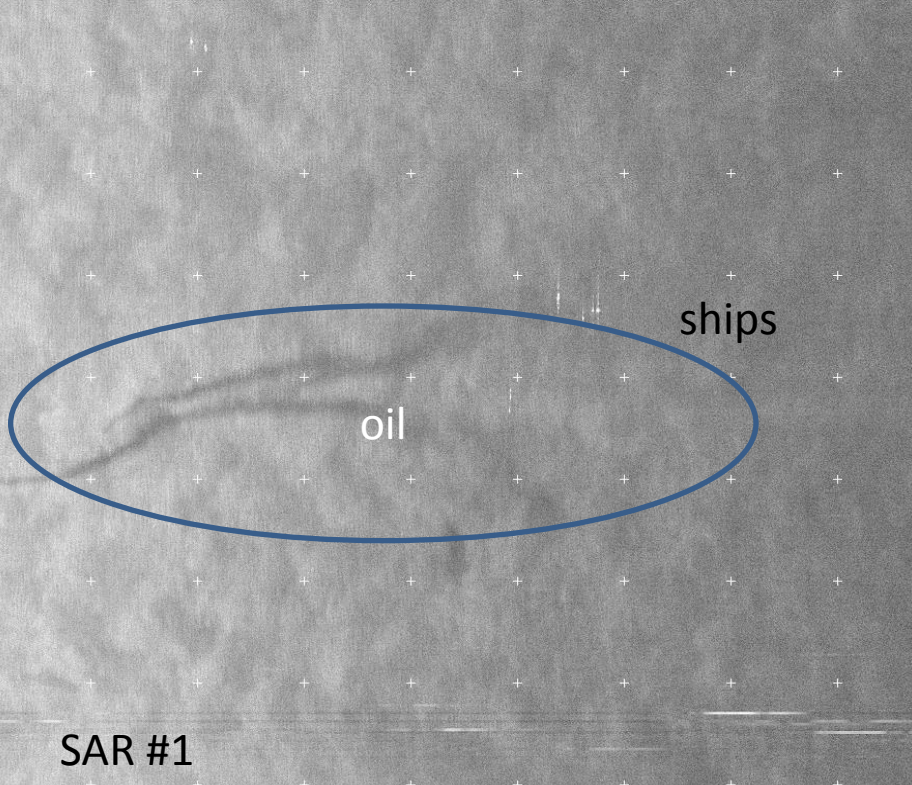
18 June 2014

5 m3 emulsion during the night (old release)

25 m3 emulsion at the end of the flight

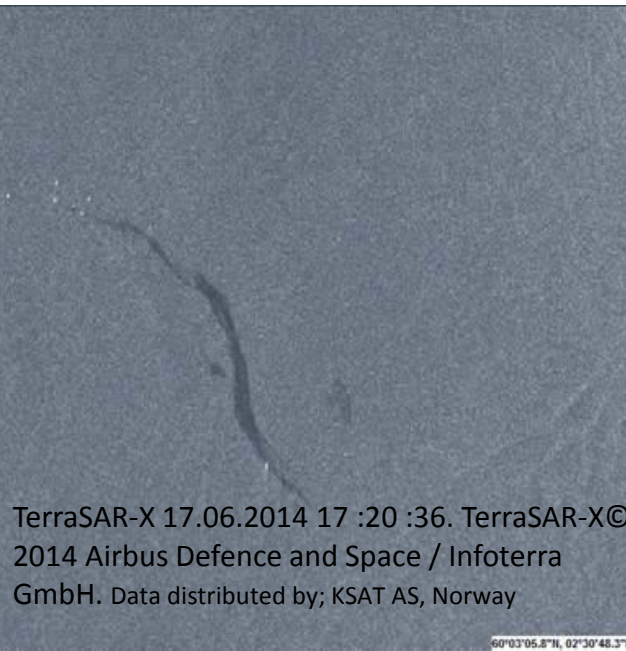
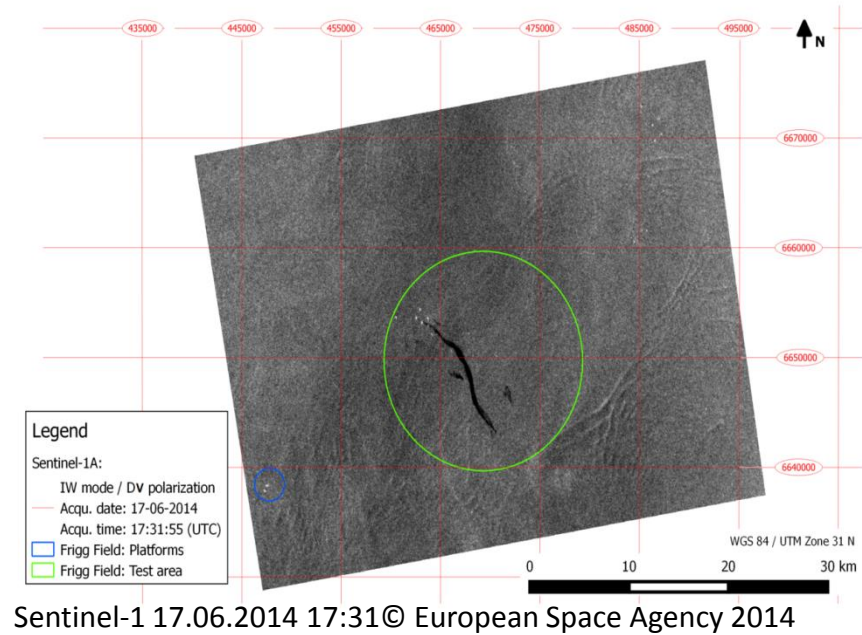






# Airborne SAR vs. Satellite SAR

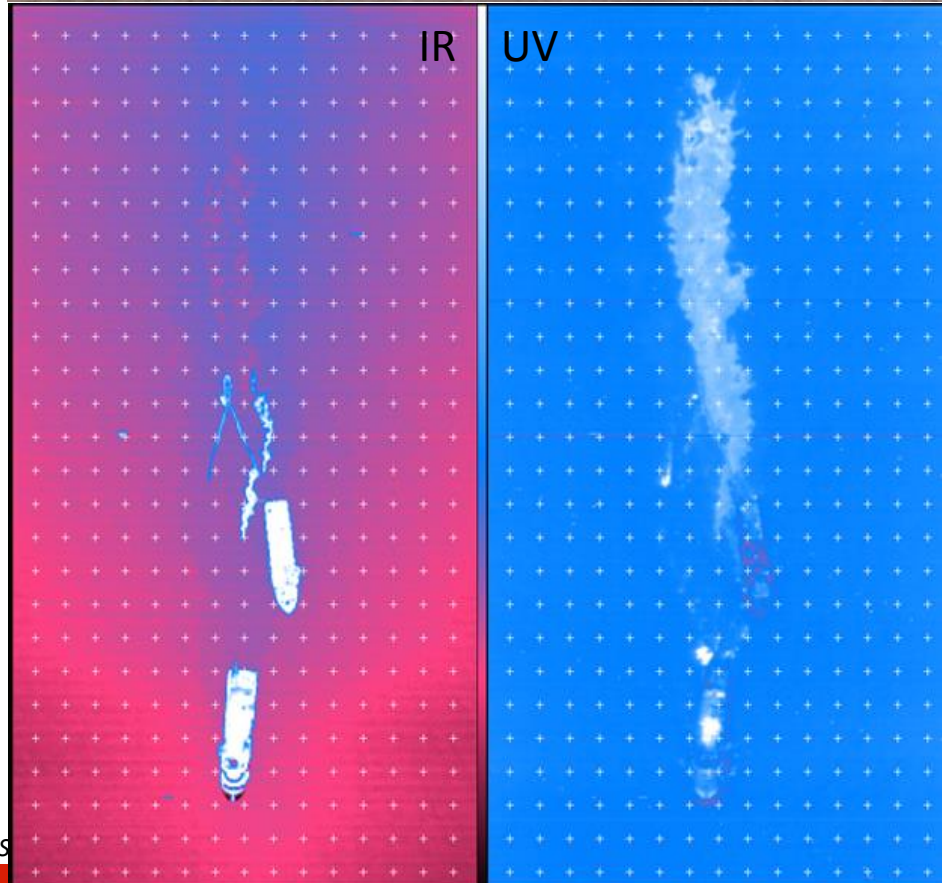
Interspill 2015 presentation  
Finnish Border Guard/SYKE



# IR/UV

Interspill 2015 presentation  
Finnish Border Guard/SYKE

- The thickest parts of the oil spill shown in IR image
  - Guiding the oil response vessels!
- Total extent of oil on the water visible in UV



# Future of airborne surveillance

- **More background information is available**
  - AIS, Satellite AIS
  - Satellite images
  - Databases and trajectory forecasts
- **We are used to geographic information at our fingertips**
- **We are used to real time updates**
- **The task of the surveillance aircraft is still:**
  - To demonstrate a presence, show that we are watching
  - To monitor and document activities on the surface
  - To give a real time situational overview
  - To help direct surface assets

# Few oil spills in the Baltic today

- **Daily patrol of the ship lanes**
  - supported by satellite images
- **Zero tolerance**
  - Even very small spills are reported
- **Well working reception facilities in the ports**
- **....more important than winning court cases**
- **Difficult to build a case if you do not catch the polluter in the act**

# NEXT GENERATION SYSTEM

## S&T MSS 7000



- Ease of operation
- Comprehensive situation overview
- Real time reporting
- Configurable:
  - one or more operators
  - small or large suite of sensors
  - small or large aircraft

# Improved system integration

## S&T MSS 7000 – a new concept built on a proven solution



SatCom  
High Speed dual channel



Lightweight  
Operator console (-s)



Portable  
Display Unit



Observer workstation



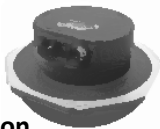
Cameras



Sea VHF  
and  
A/C intercom



AIS



Direction  
Finder



IR/UV-  
scanner



SLAR



EO/IR



AESA 360°  
Search Radar

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# New User Interface





# Target correlation and filtering

## S&T MSS 7000 – a new concept built on a proven solution

The screenshot displays the S&T MSS 7000 software interface. On the left is a map of the Baltic Sea region with various radar returns and target icons. A navigation panel in the top right shows coordinates and speed. On the right side, there is a table of target data and a detailed view of a specific target.

Type	Name	Time	Comment	Lat/Lo	Speed
6	Search Ra...	Radar 273	2014-05-15 17:35...	N57° 4.83' E019° 59.12'	35.0 kts
8	Search Ra...	Radar 283	2014-05-15 17:37...	N57° 52.71' E018° 16.74'	28.2 kts
17	Search Ra...	Radar 269	2014-05-15 17:37...	N57° 18.77' E018° 43.03'	25.3 kts
18	Search Ra...	Radar 281	2014-05-15 17:37...	N57° 33.84' E019° 33.79'	23.3 kts
19	Search Ra...	Radar 275	2014-05-15 17:31...	N57° 28.79' E017° 30.52'	23.3 kts
30	Search Ra...	Radar 266	2014-05-15 17:37...	N57° 44.68' E018° 18.34'	23.3 kts
31	Search Ra...	Radar 278	2014-05-15 17:32...	N56° 44.98' E018° 42.40'	23.3 kts
51	Search Ra...	Radar 277	2014-05-15 17:35...	N57° 9.22' E018° 47.29'	19.4 kts
71	Search Ra...	Radar 268	2014-05-15 17:31...	N57° 12.57' E017° 42.13'	19.4 kts
72	Search Ra...	Radar 274	2014-05-15 17:33...	N57° 5.00' E018° 44.77'	19.4 kts
73	Search Ra...	Radar 286	2014-05-15 17:37...	N57° 46.21' E018° 58.39'	19.4 kts
74	Search Ra...	Radar 280	2014-05-15 17:33...	N57° 5.75' E018° 0.83'	17.5 kts
77	Search Ra...	Radar 276	2014-05-15 17:34...	N58° 13.11' E017° 15.87'	17.5 kts
81	Search Ra...	Radar 285	2014-05-15 17:36...	N58° 17.01' E017° 34.39'	17.5 kts
92	Search Ra...	Radar 279	2014-05-15 17:31...	N56° 51.78' E019° 36.91'	15.6 kts
107	Search Ra...	Radar 284	2014-05-15 17:37...	N57° 25.72' E019° 8.22'	13.6 kts
110	Search Ra...	Radar 265	2014-05-15 17:38...	N57° 29.52' E019° 20.18'	13.6 kts
111	Search Ra...	Radar 271	2014-05-15 17:37...	N58° 6.59' E018° 46.62'	13.6 kts
112	Search Ra...	Radar 272	2014-05-15 17:34...	N57° 9.59' E018° 2.53'	13.6 kts
113	Search Ra...	Radar 282	2014-05-15 17:31...	N56° 49.18' E019° 10.99'	11.7 kts
132	Search Ra...	Radar 270	2014-05-15 17:37...	N57° 53.29' E017° 57.58'	9.7 kts
133	Search Ra...	Radar 288	2014-05-15 17:37...	N58° 29.79' E018° 25.52'	9.7 kts
150	Search Ra...	Radar 287	2014-05-15 17:38...	N57° 25.30' E019° 13.73'	7.8 kts
162	Search Ra...	Radar 289	2014-05-15 17:37...	N58° 1.84' E020° 4.60'	17.5 kts
165	Search Ra...	Radar 290	2014-05-15 17:37...	N58° 33.77' E017° 35.58'	21.4 kts
167	Search Ra...	Radar 291	2014-05-15 17:37...	N58° 36.28' E018° 25.02'	19.4 kts
168	Search Ra...	Radar 292	2014-05-15 17:37...	N58° 31.94' E019° 7.80'	11.7 kts
171	Search Ra...	Radar 293	2014-05-15 17:37...	N57° 29.50' E020° 49.54'	23.3 kts
173	Search Ra...	Radar 294	2014-05-15 17:37...	N58° 11.13' E020° 12.50'	19.4 kts
174	Search Ra...	Radar 260	2014-05-15 17:37...	N58° 39.07' E017° 19.91'	0.0 kts
179	Search Ra...	Radar 295	2014-05-15 17:38...	N58° 16.32' E020° 4.29'	19.4 kts
181	Search Ra...	Radar 296	2014-05-15 17:37...	N58° 1.75' E020° 38.86'	0.0 kts
182	SLAR Geo...	Star/Slice 182	2014-05-15 17:38...	N57° 21.55' E018° 20.59'	200.0 kts

**Navigation**  
 Lat: N57° 22' 24"  
 Long: E018° 21' 63"  
 Speed: 260.0 kts  
 Heading: 39.2°  
 ROT: 0.0 %  
 Altitude: 2750 ft  
 Time: 2014-05-15 17:38:04  
 Duration: 00:06:36

**Name:** PIRATE-7  
**Time:** 2014-05-15 17:33:21  
**Lat:** E019° 56.57'  
**Long:** N57° 5.04'  
**Heading:** 104.5°  
**Speed:** 35.0 kts

**AIS**  
 MMSI: 265280000  
 IMO: 291210  
 Call Sign: xx  
 Nav State: Under way

- Filtering out objects of interest
- Correlation of targets and target tracks

# On-board ship image database

## S&T MSS 7000 – a new concept built on a proven solution

**TANKER-13**

IMO: 20511  
MMSI: 205402000  
Destination: ROTTERDAM  
Call Sign: TNKR13  
Flag: Sweden  
Type: Tanker/Reserved  
Gross Tonnage: 206410 2x57  
Dead Weight: 18.4 kts  
Speed: 18.4 kts  
Status: Under way

Added In Operation

Operator Comments: Operator Comments/Operator Comments/Operator Comments/Operator Comments

ID	Vessel Type	Name	Date	Lat	Long	Speed
58	AIS Vessel	TANKER-13	2014-05-15 17:18:22	N56° 58.34'	E019° 13.00'	19.4 kts
59	AIS Vessel	YACHT-7	2014-05-15 17:18:23	N56° 19.00'	E018° 44.94'	9.7 kts
60	AIS Vessel	PIRATE-11	2014-05-15 17:18:23	N60° 50.52'	E018° 26.90'	21.4 kts
61	AIS Vessel	BARGE-11	2014-05-15 17:18:22	N61° 16.23'	E018° 25.44'	5.8 kts
62	AIS Vessel	TRAWLER-12	2014-05-15 17:18:23	N56° 1.83'	E016° 18.99'	19.4 kts
63	Search Ra...	Radat 242	2014-05-15 17:18:28	N56° 24.35'	E017° 9.10'	23.3 kts
64	AIS Vessel	YACHT-8	2014-05-15 17:18:23	N57° 7.09'	E019° 42.71'	11.7 kts
65	AIS Vessel	BARGE-12	2014-05-15 17:18:23	N62° 6.76'	E020° 56.56'	17.5 kts
66	AIS Vessel	SMUGGLER-13	2014-05-15 17:18:24	N61° 35.03'	E020° 10.32'	25.3 kts
67	AIS Vessel	TUG-8	2014-05-15 17:18:23	N58° 14.99'	E019° 37.88'	11.7 kts
68	AIS Vessel	PIRATE-12	2014-05-15 17:18:23	N58° 52.18'	E019° 43.69'	21.4 kts
69	AIS Vessel	TRAWLER-13	2014-05-15 17:18:24	N57° 3.74'	E018° 40.48'	15.6 kts
70	AIS Vessel	BA...				
71	AIS Vessel	TR...				

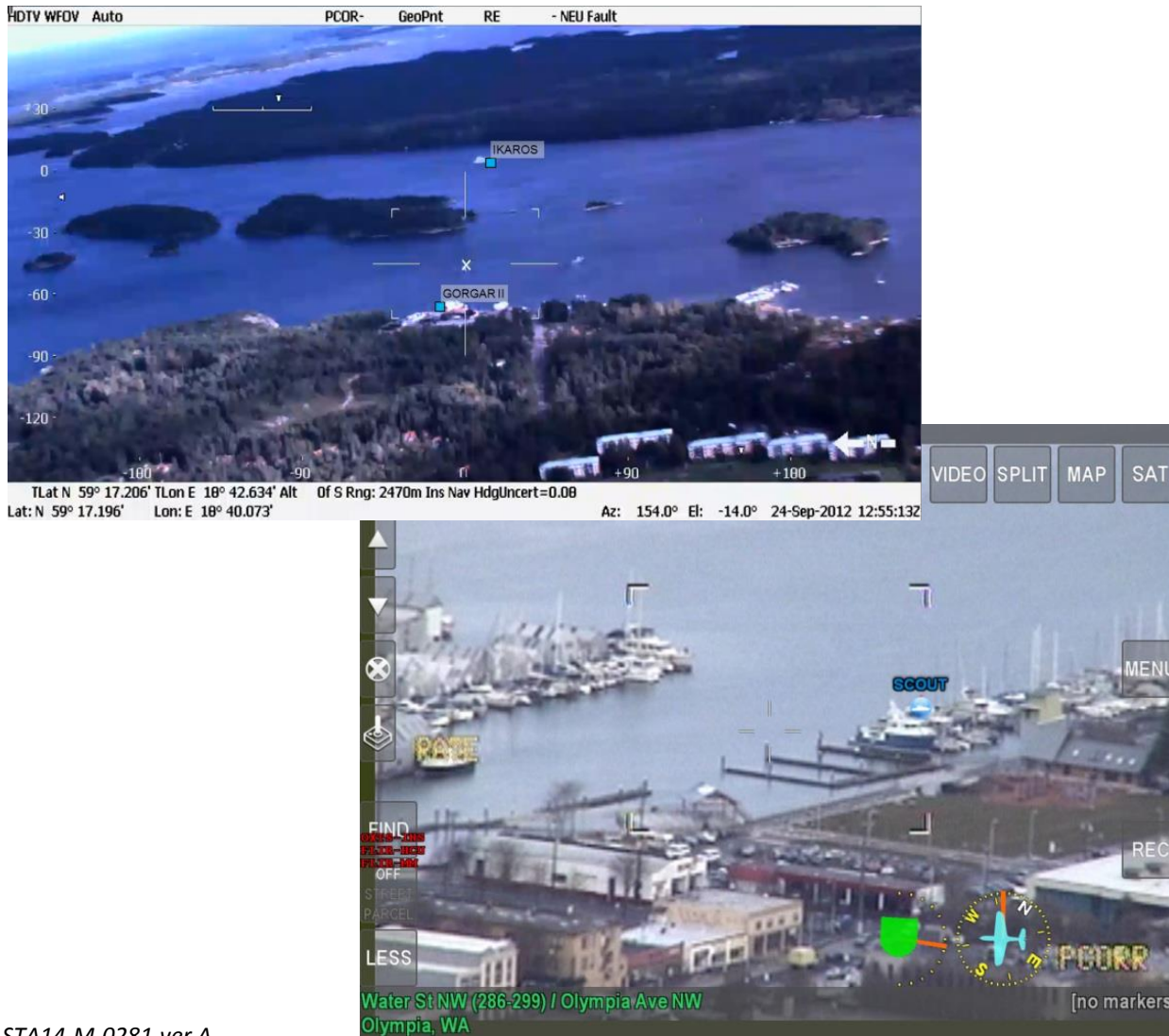
Comment

- Tag and add images
- Build up your own image database over time

# Target data overlay on EO/IR video

## S&T MSS 7000 – a new concept built on a proven solution

- For improved situational awareness
- Known target identity dynamically added to live or recorded video



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# View mission history

## S&T MSS 7000 – a new concept built on a proven solution



- Analyze relative motion of targets and other objects
- Synchronized replay of all collected target data, sensor data and video
- Display of current and accumulated sensor coverage for each sensor

# Real time reporting

## **S&T** MSS 7000 – a new concept built on a proven solution

- Real time streaming video as standard
- New report tools for improved in-flight reporting
  - Sharing the situation overview with the Mission Command Center
  - Guiding cooperating units
- **Data in standard GIS formats – easier to exchange [geographical] information with cooperating authorities**
  - Easy to compare Aircraft and Satellite generated data
  - Improved planning and coordination of airborne patrols



ENABLING YOU TO  
CONTROL AND PROTECT  
YOUR WATERS!

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