

AESA radar developments at Thales Nederland B.V.

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Thales in the Netherlands

Thales is a technology leader providing safety and security



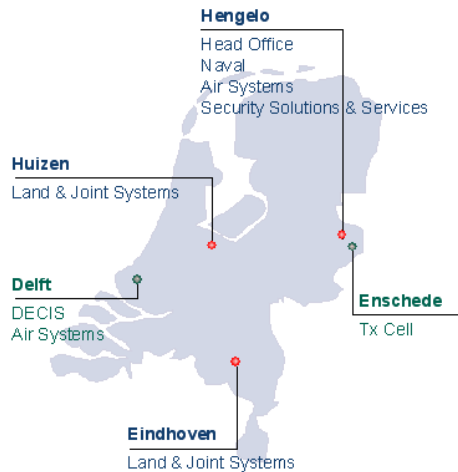
Defence

Aerospatial

Ground Transportation

Security Cybersecurity

Space



Hengelo division is main centre of excellence for Thales naval activities

2000 employees in NL
1300 in Hengelo

Naval surveillance (far) before WW2

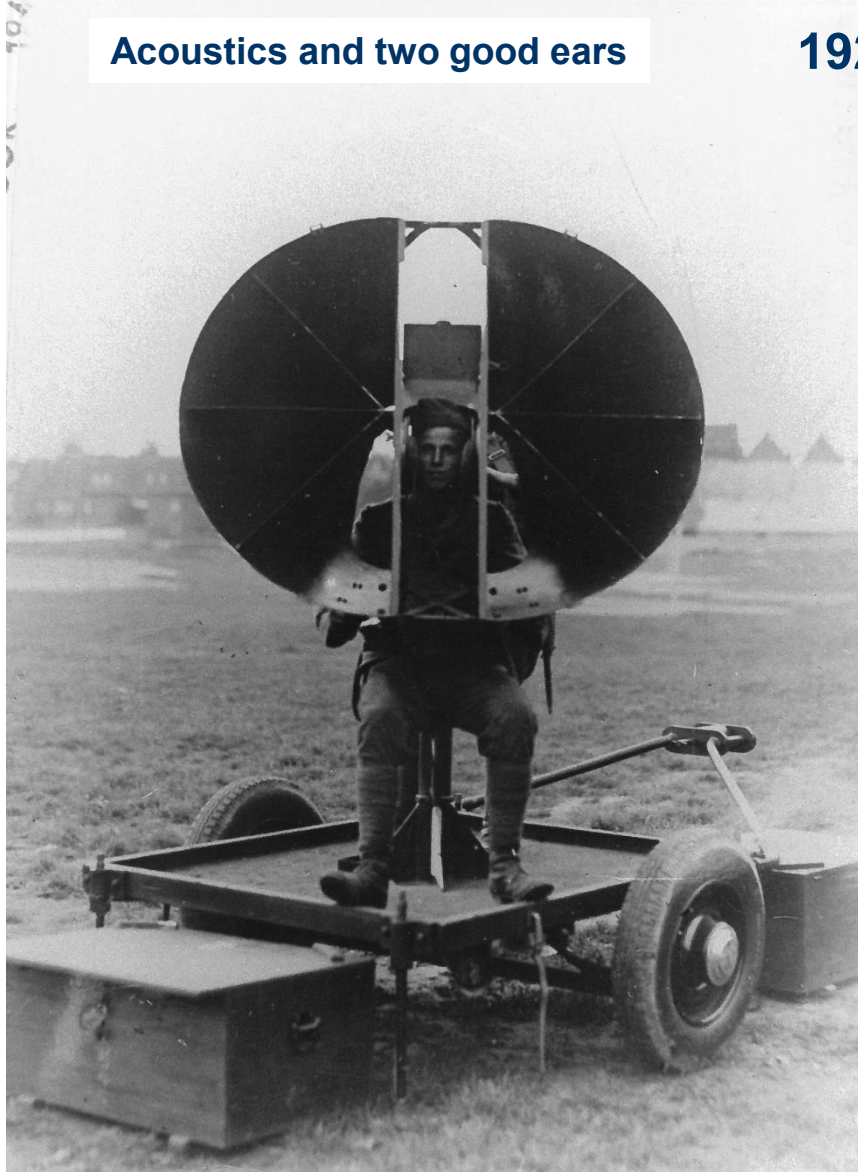
Optics and at least one good eye



Zeven Provinciën (1665-1694)

Naval surveillance (far) before WW2

Acoustics and two good ears



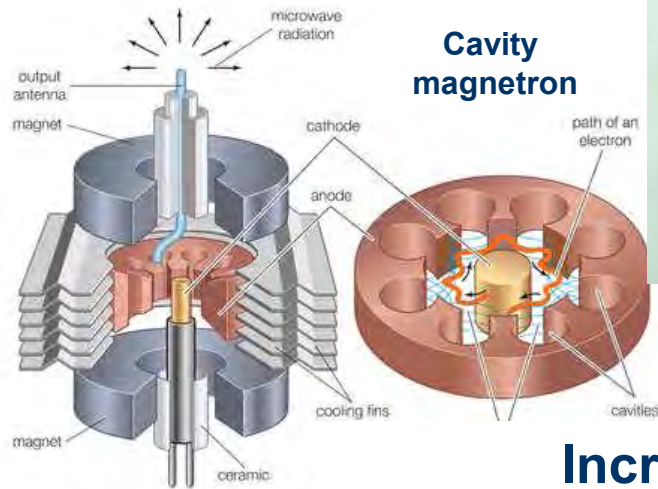
1920s



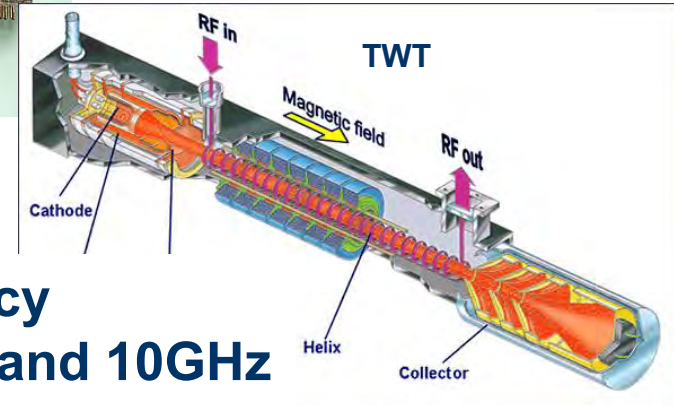
Lab for Physical Developments

World War 2 : Radar technology push

1925 First patent for a Radio Detection and Ranging (RADAR) system



Reflex klystron



**Increase in frequency
from 50MHz towards 3 GHz and 10GHz
enable smaller radars**



H2S targeting radar on Halifax airplane



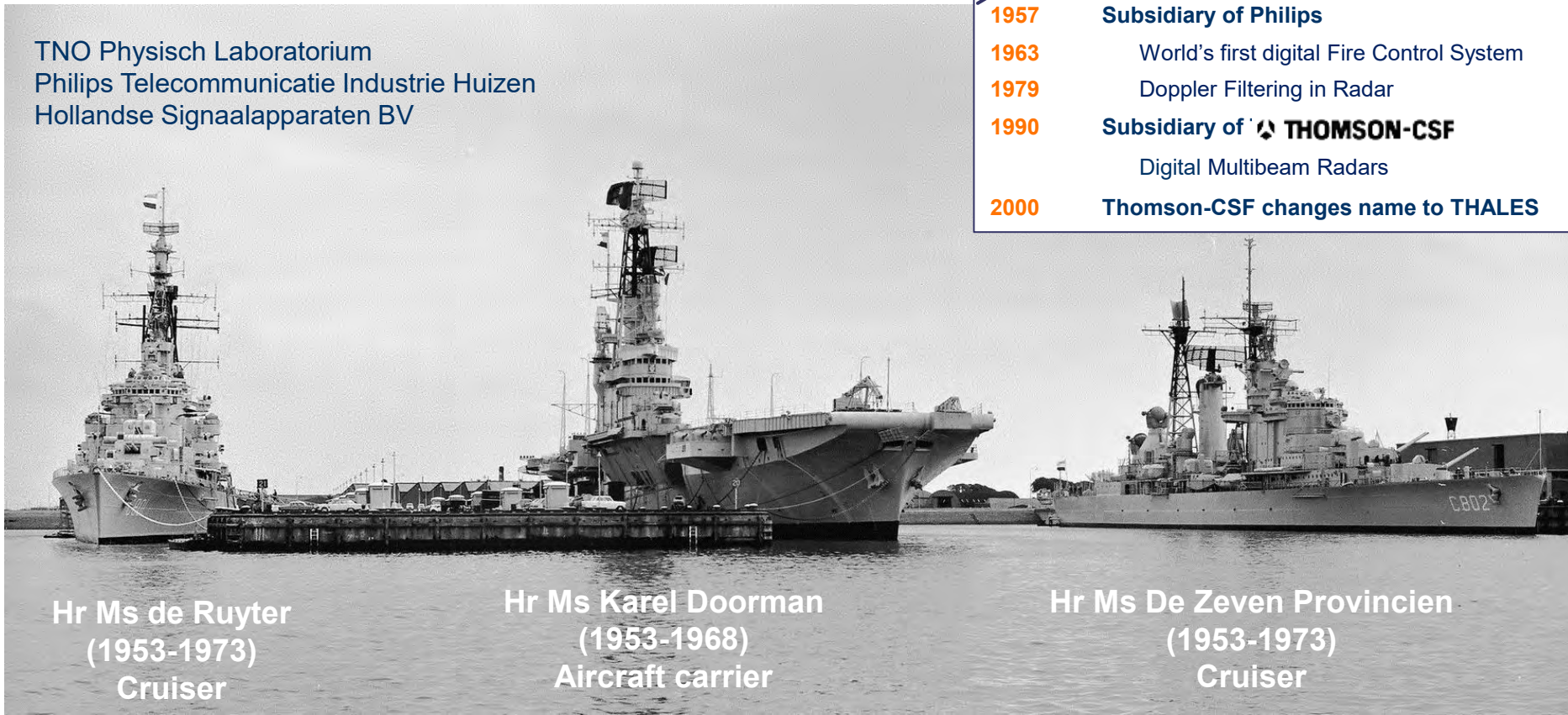
Radar sensors for naval ships : '50-'70

Rebuilding the Royal Netherlands Navy after WW2

➤ Radar equipped naval ships

TNO Fysisch Laboratorium
Philips Telecommunicatie Industrie Huizen
Hollandse Signaalapparaten BV

- 1922 Foundation N.V. Hazemeyer's fabriek van Signaalapparaten
- 1945 Introduction of Radar Systems
- 1948 Hollandse Signaalapparaten BV
- 1957 Subsidiary of Philips
- 1963 World's first digital Fire Control System
- 1979 Doppler Filtering in Radar
- 1990 Subsidiary of THOMSON-CSF
- Digital Multibeam Radars
- 2000 Thomson-CSF changes name to THALES



Hr Ms de Ruyter
(1953-1973)
Cruiser

Hr Ms Karel Doorman
(1953-1968)
Aircraft carrier

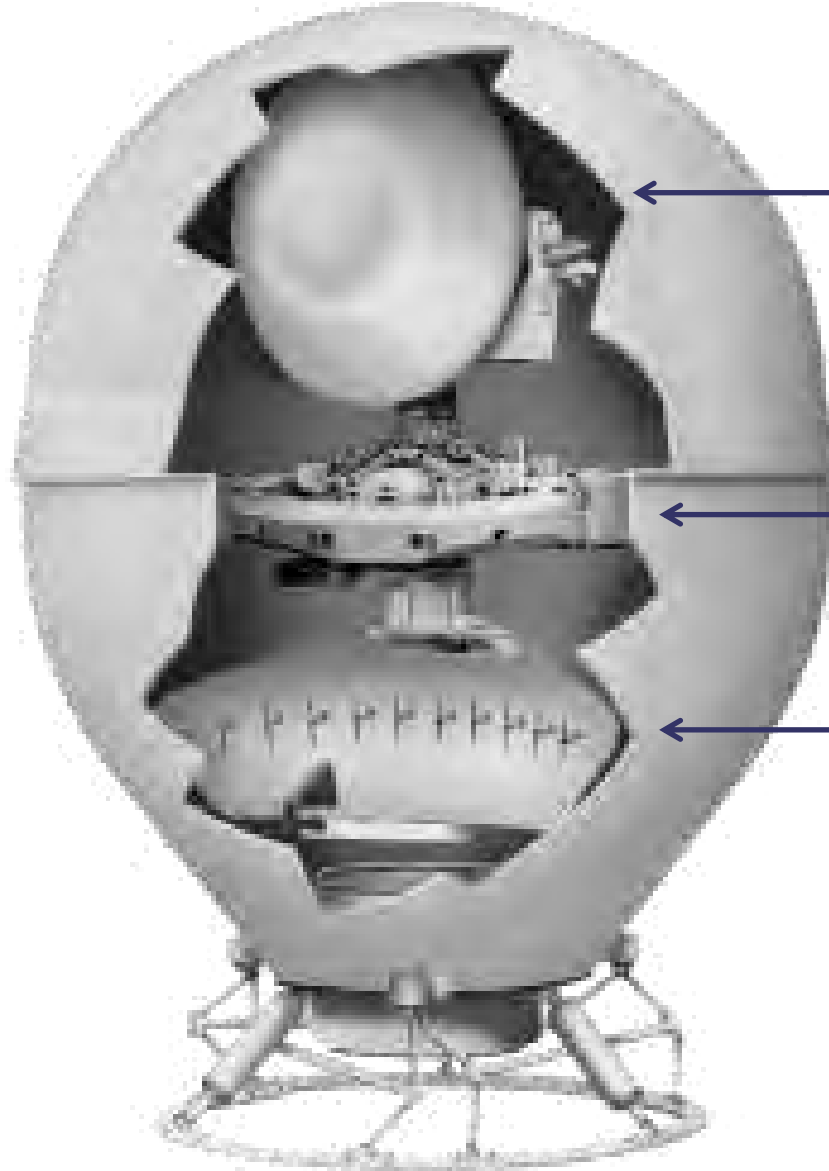
Hr Ms De Zeven Provinciën
(1953-1973)
Cruiser

In
Air
Re
Hi

WM25 (X-band)

Gun control
and control of
semi-active
homing missiles

mes



← Monopulse
track radar

← Stabilization
platform

← Search antenna
with
integrated IFF

Radar sensors for naval ships : '80-'90

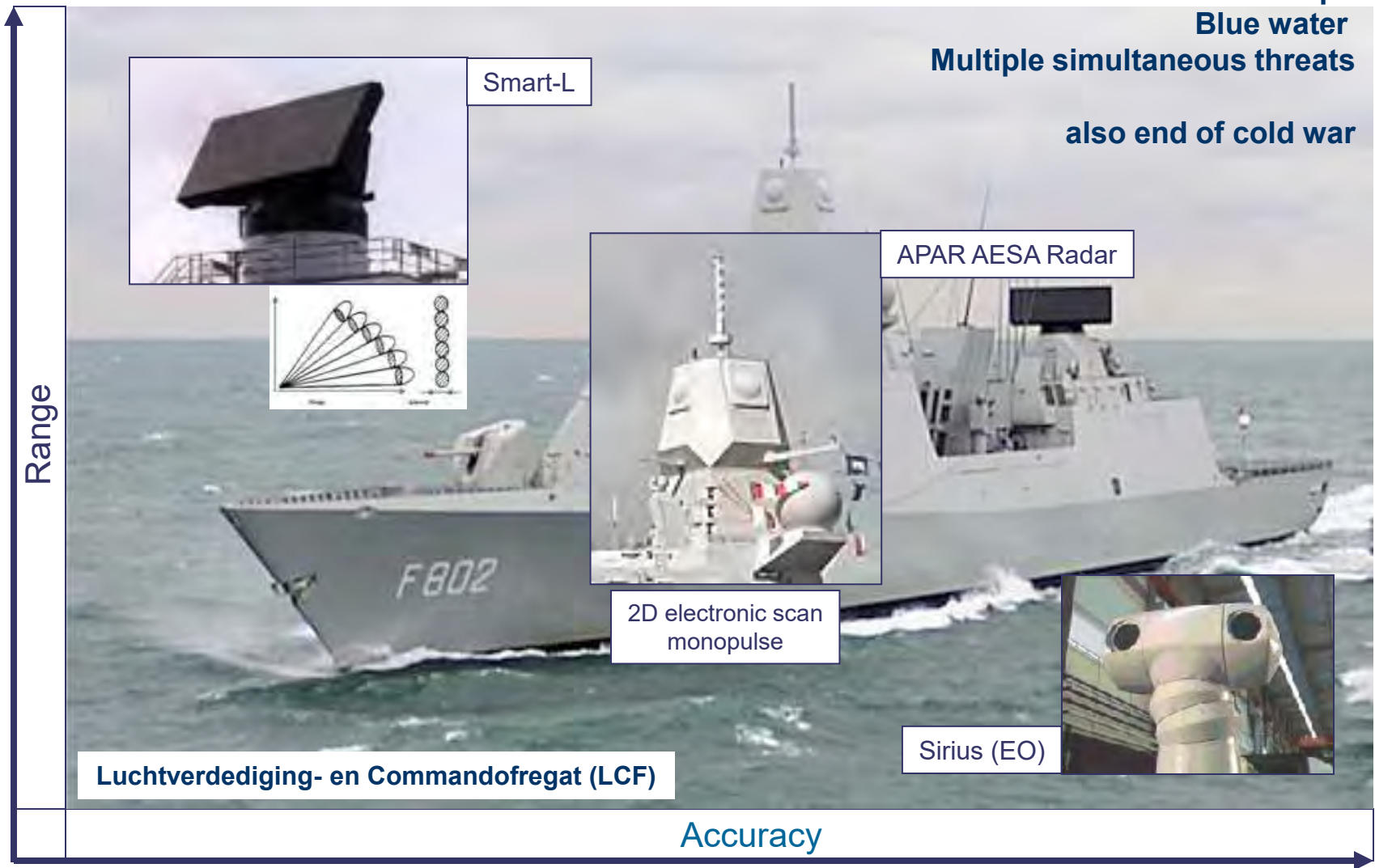
Improved awareness
Doppler Track & Illumination radar
Medium range surveillance with 1D digital RX beamforming



Hr Ms Jacob van Heemskerck 1986-2005

Radar sensors for naval ships : '90-'00

NATO Anti Air Warfare Concept
Blue water
Multiple simultaneous threats
also end of cold war



Hr Ms De Zeven Provinciën 2002-present

Role of radar today ?

> Recognised Air Picture

- Detection, tracking and target recognition

> Recognised Surface Picture

- Detection, tracking and target recognition

> Weapon support for gun, missile, soft kill

- Target acquisition and tracking
- Target recognition and identification
- Guidance support, illumination
- Kill assessment

> Protection of high value objects

- Intruder detection, defence

> Multiple Mission support

- Radar optimisation & reconfiguration depending on mission profiles

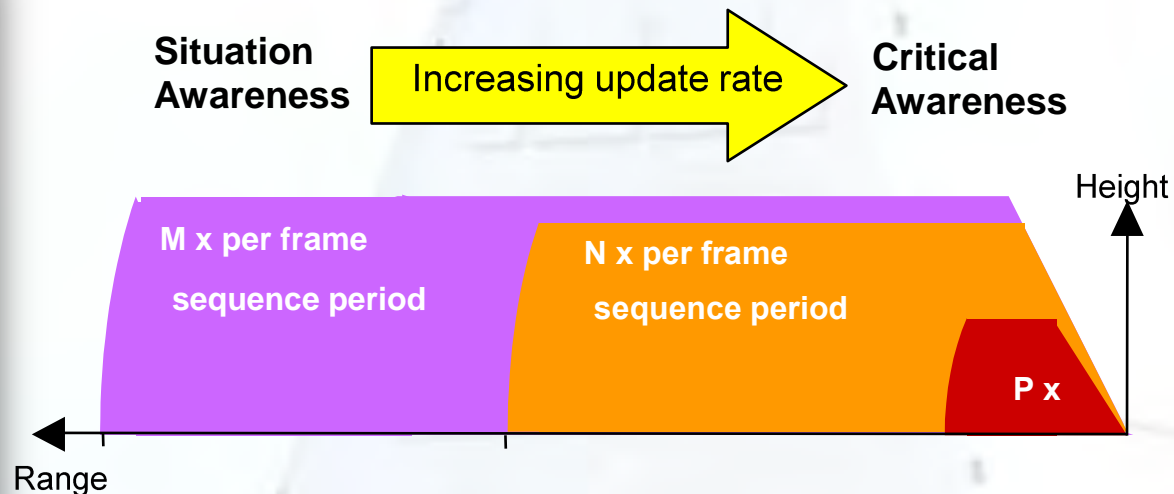
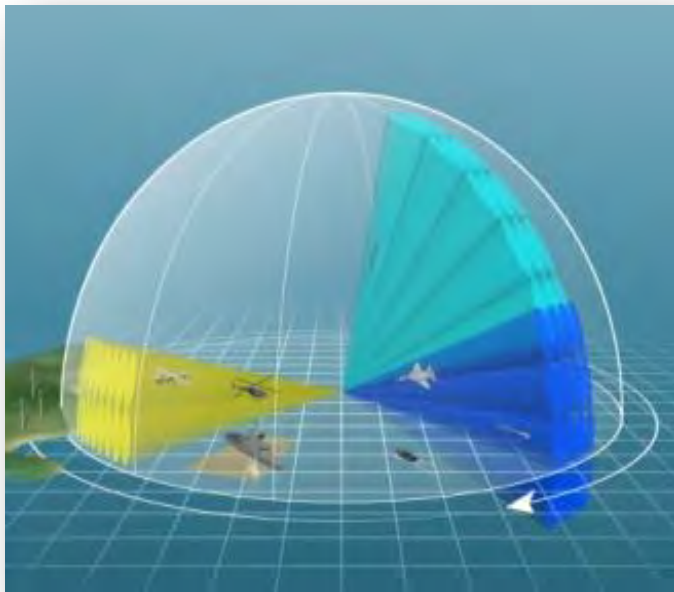
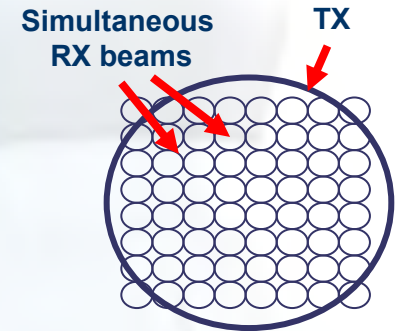


Radar plays a crucial role in Defence and Security operations

AESA 4D Surveillance Radar

AESA radars support improved detection and classification

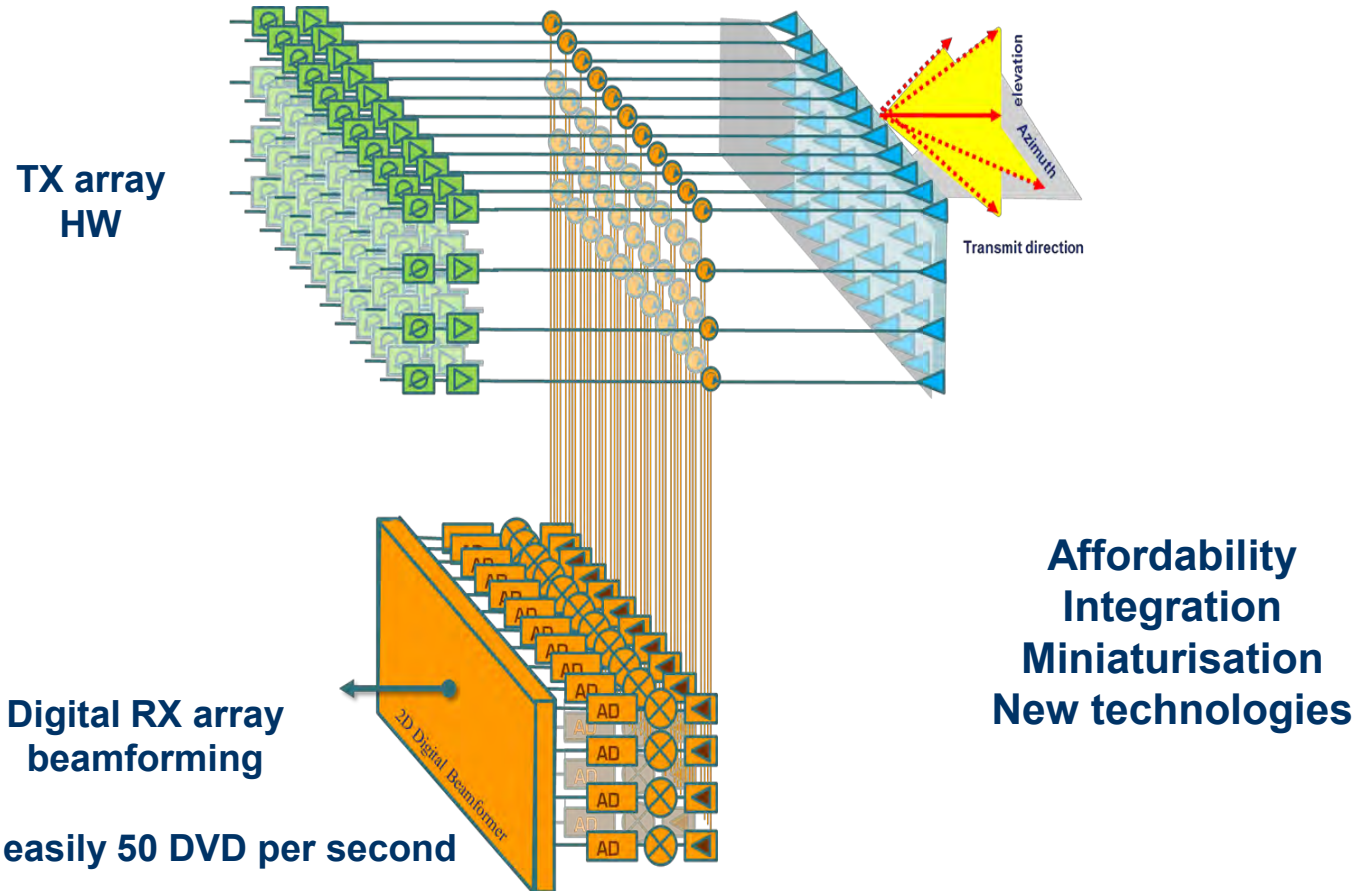
- Electronic scan, TX beamwidth covered by simultaneous RX beams
- More time on target, radial velocity
- Optimized radar transmissions and processing
 - Dedicated antenna beam shapes
 - Improved awareness (range, velocity, rotation speed)
 - Surveillance, Defense and Asymmetric warfare tasks
 - Near-simultaneous



Radar platform architecture

- Platform architecture to enable reuse & short development times

Dedicated Front-End HW for L-S-X bands



Radar sensors for naval ships : '00-'15

Joint Logistic Support Ship (JSS)



I-Mast 400



Hollandklasse Ocean Patrol Vessels (2012-heden)

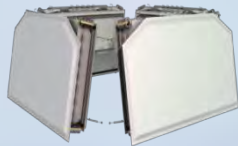
Integrated Mast (multiple sensors)

I-Mast 400

**Surface Surveillance radar
SEA WATCHER 100**



**S-band Surveillance radar
SeaMaster 400**



SHF Satcom

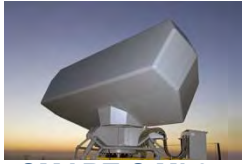
Non Rotating IFF

**Integrated Communication
Antennas System (ICAS)**

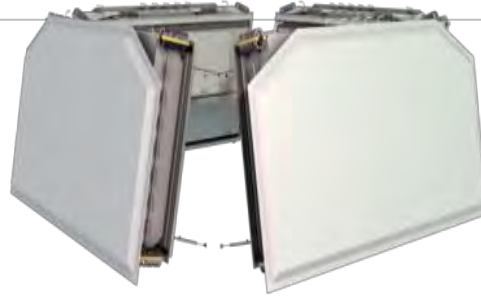
**Panoramic E/O system
GATEKEEPER**

UHF Satcom

S-band surveillance product family of radars



SMART-S Mk2
3D Surveillance Radar



Sea Master 400
Non-Rotating Radar

S-band Radar
Building Blocks



DCC Cabinet



IFF Antenna



Air Drier



NS100 EED

NS100 SD

NS200 EED

SM400 BL1

SM 400 BL1 SM

MM radar



Other threats : Theater Ballistic Missile Defence

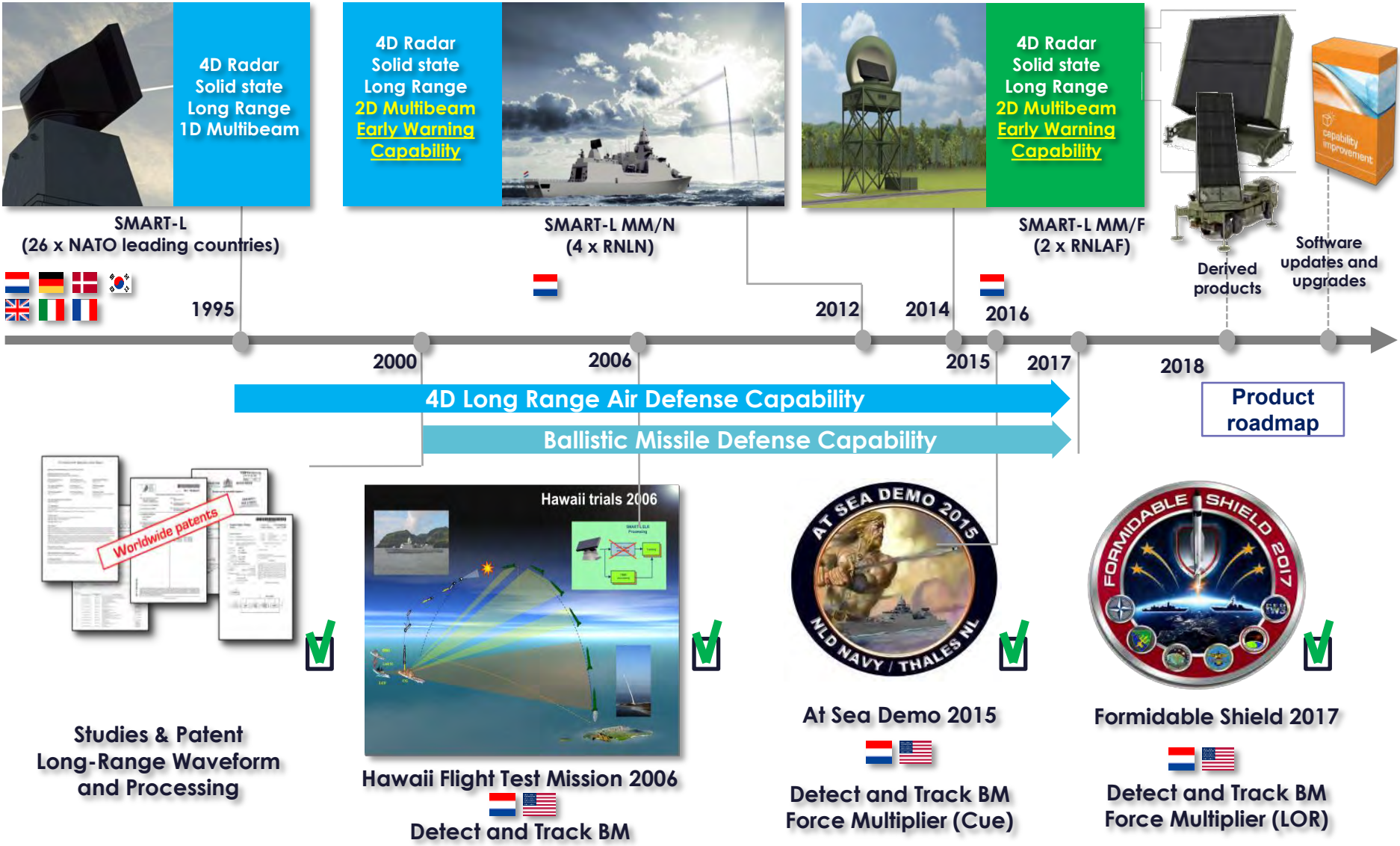
NATO Ballistic Missile Defence



Smart-L product evolution

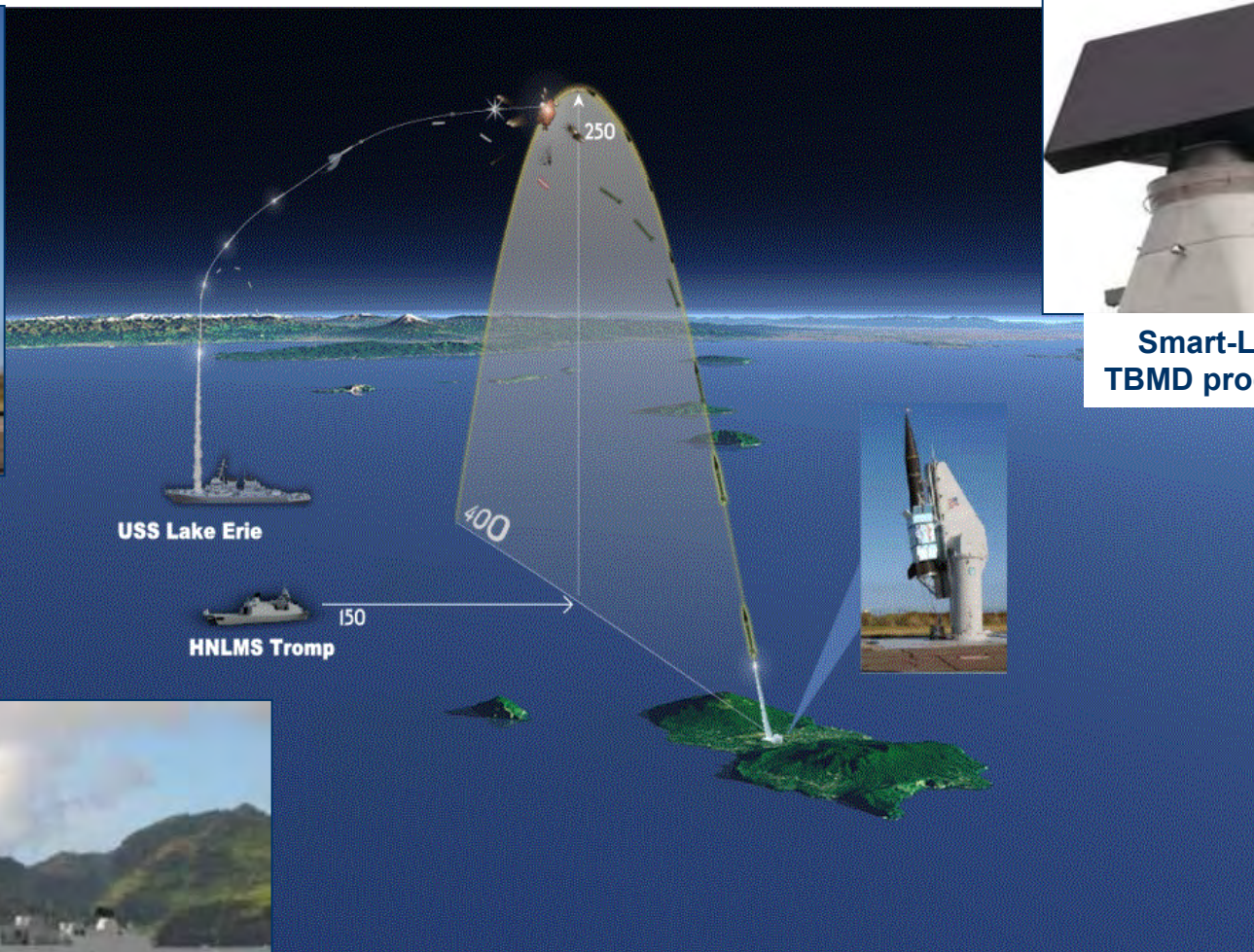
- Low range surveillance capability
- Target localization and (cued) weapon support

SMART-L Multi-Mission Product Evolution



TBMD Proof-of-concept in Hawaii, November-December 2006

Smart-L Extended Long Range mode offers TBM detection capability



Smart-L with TBMD processing

THALES

Assembly time laps and test-site installation



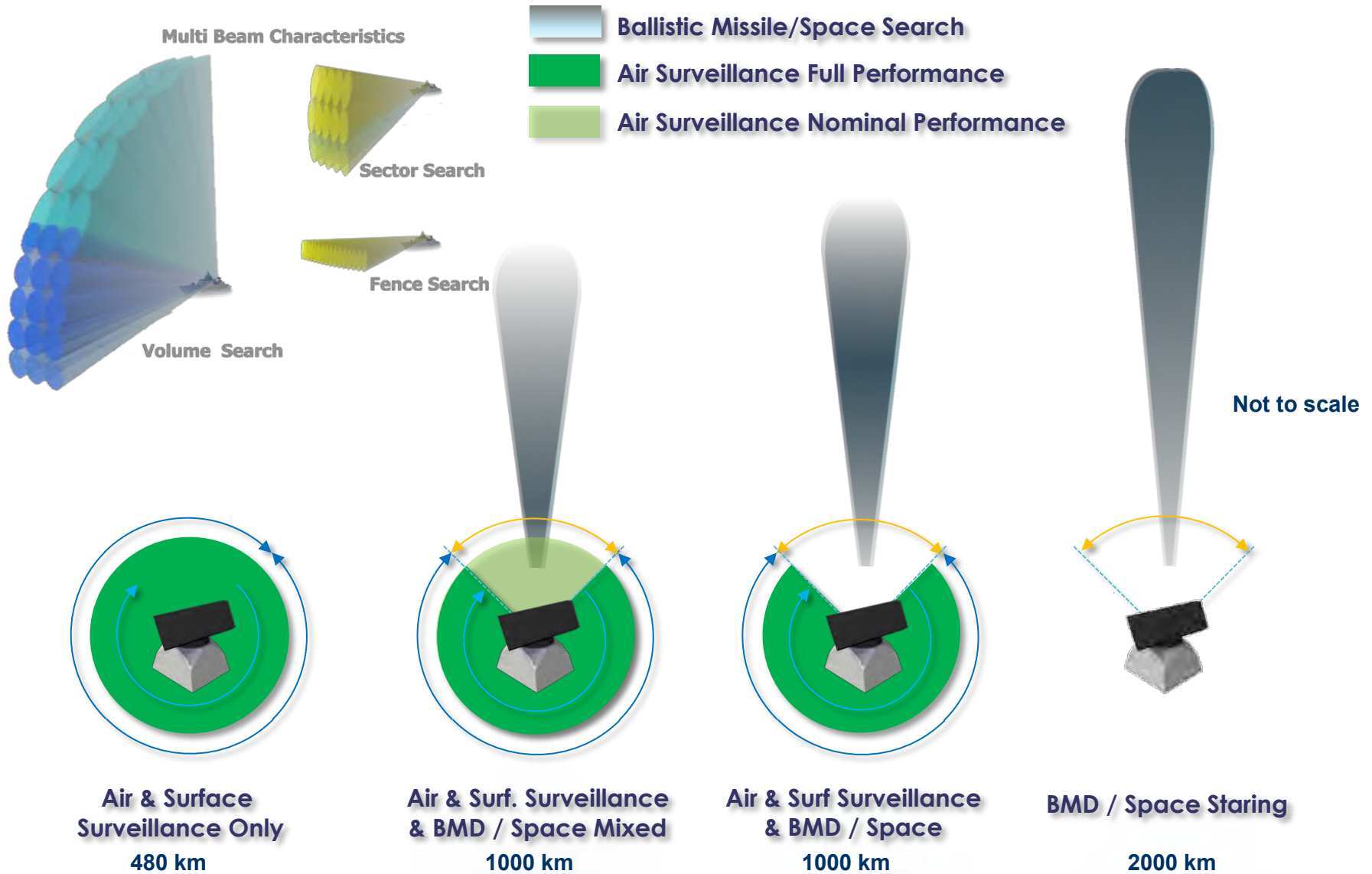
Smart-L MM measured in Near Field Site of RNN Den Helder

From 2016 - present
Planar & Spherical NF



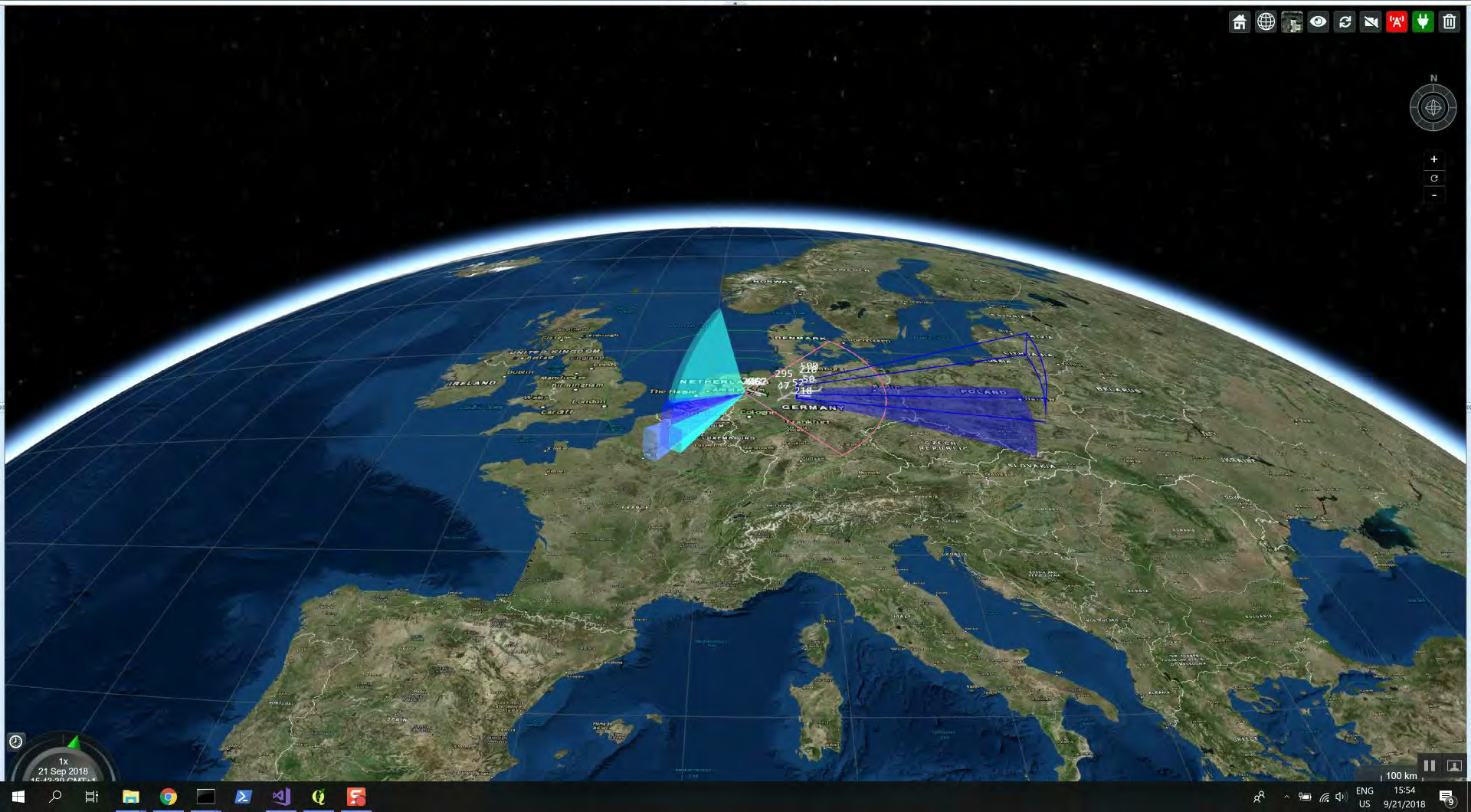
Surface, Air, Space and Ballistic Missile Surveillance

Two Radars in One



Example AAW & BMD mixed mode

Thales Nederland BV - SMART-L MM Insights



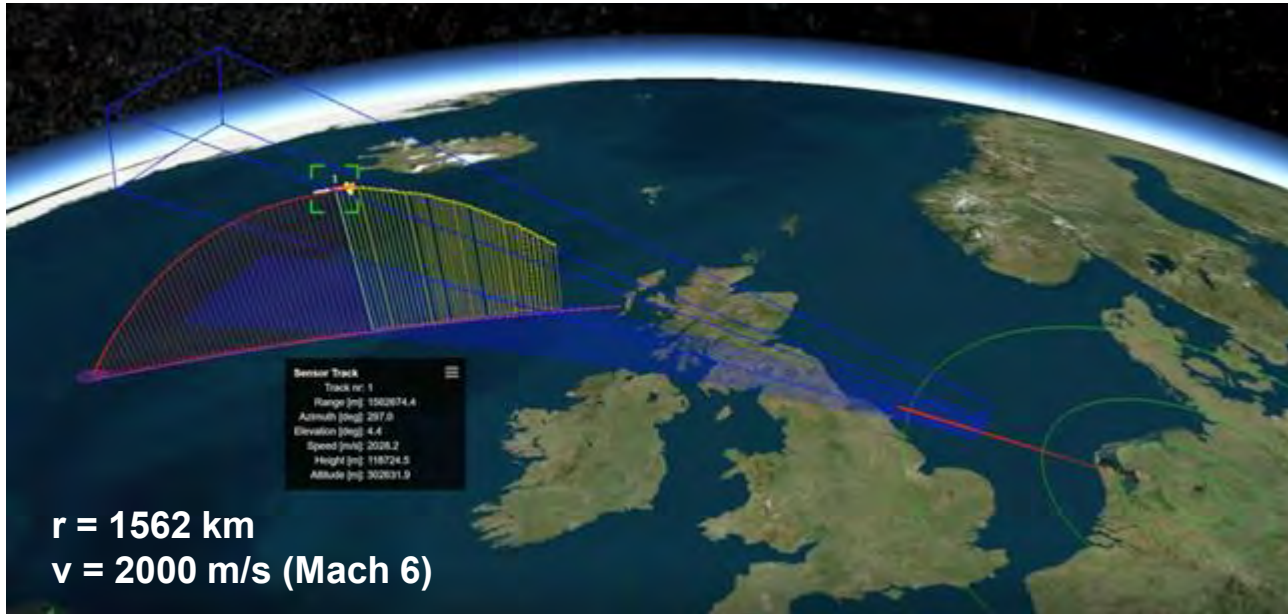


Detection & track on ballistic missile SM3 'Launch on Remote'





New SMART-L MM Missile tracking from Thales in Hengelo



RNN & Thales on Formidable shield (youtube 02.33 min)





**Thanks for your attention
Questions ?**

Oh yes .. we are hiring !

