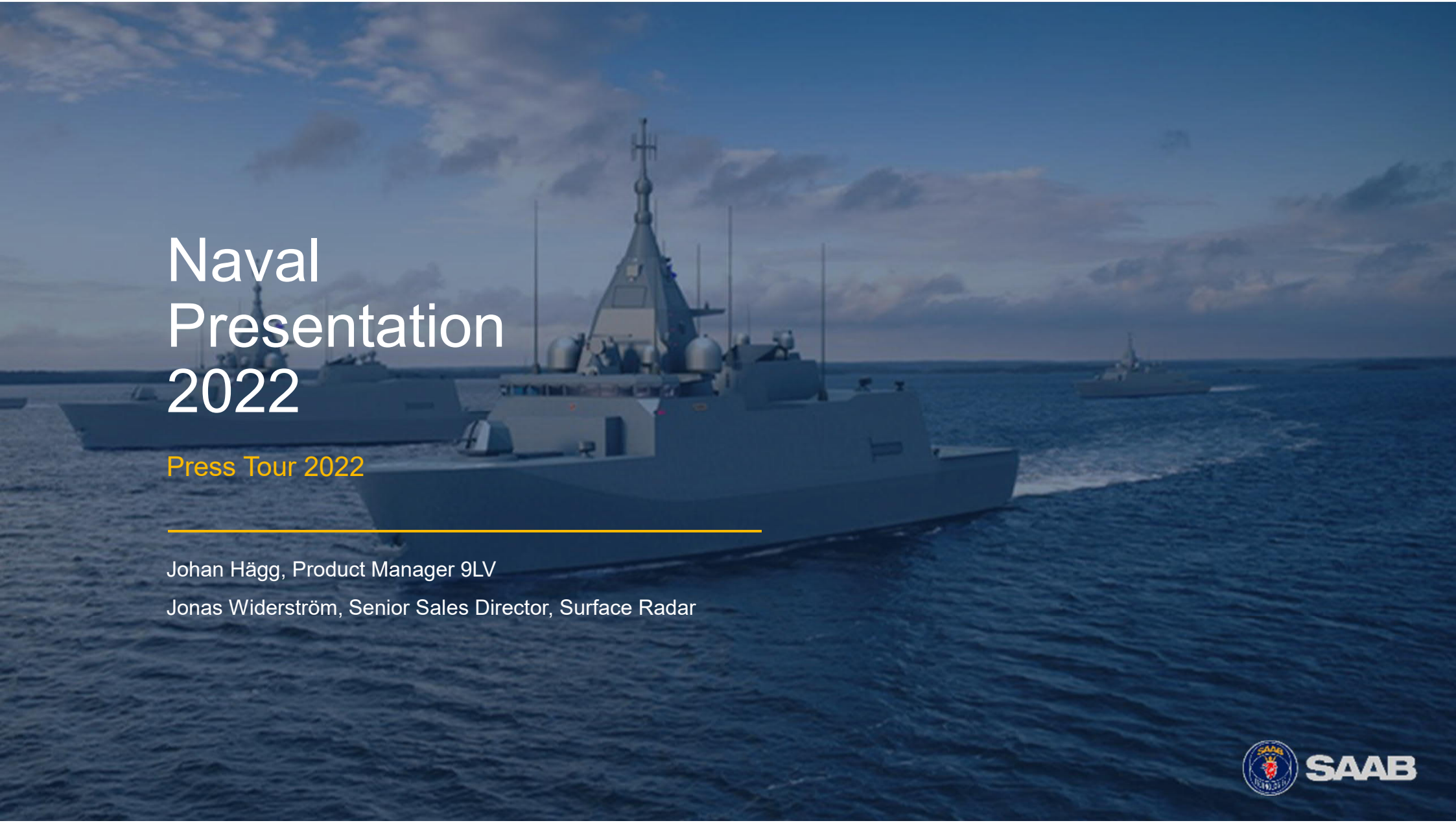


Naval Presentation 2022

Press Tour 2022

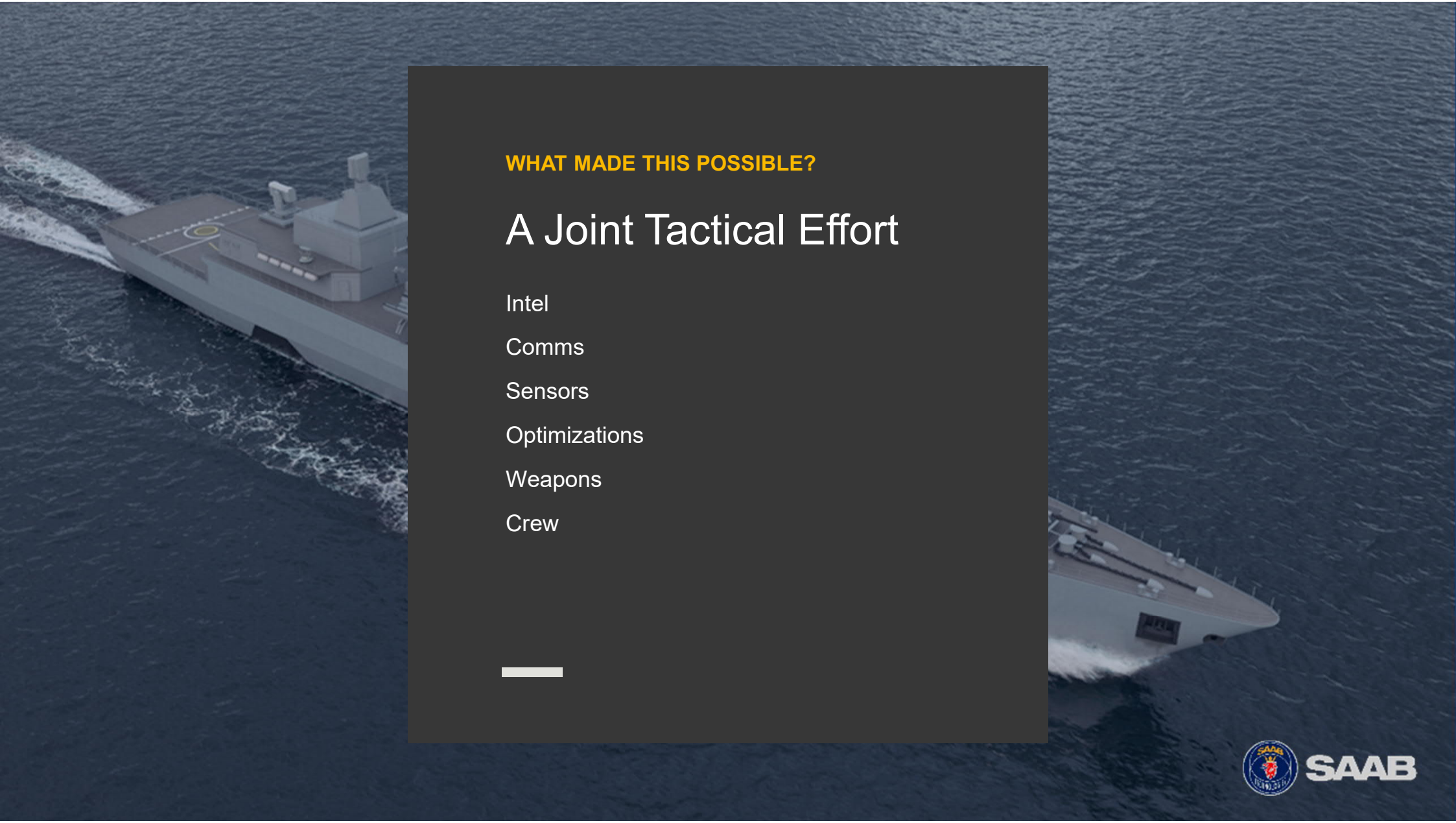
Johan Hägg, Product Manager 9LV

Jonas Widerström, Senior Sales Director, Surface Radar

SAAB

Building
the
picture
Let's imagine a scenario…
SAAB

BREAKING NEWS
At 02.36 an incoming ballistic missile was taken out by a Patriot
Battery as part of a joint layered air defence around a city
SAAB



WHAT MADE THIS POSSIBLE?

A Joint Tactical Effort

Intel

Comms

Sensors

Optimizations

Weapons

Crew

SAAB

SAAB

SAAB

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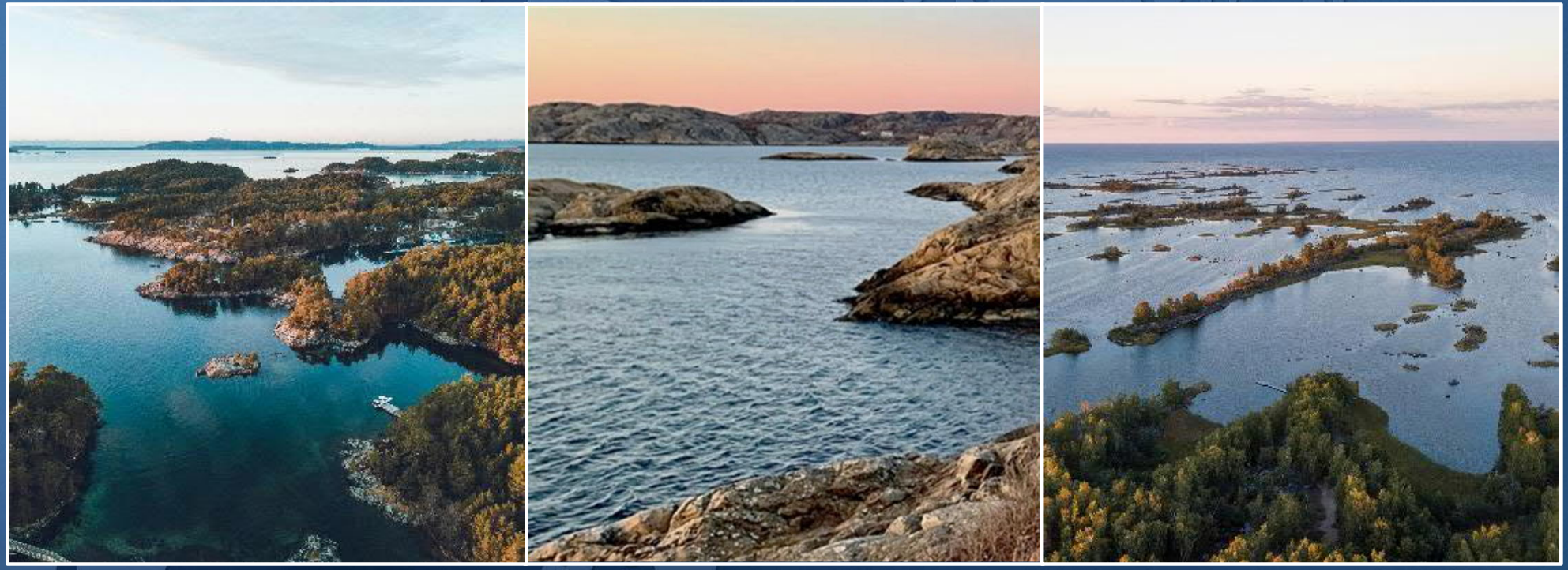
CYBER SECURITY – IN PRACTICE
An Array of Choices
• Preventing supply chain attacks
• Securing the development environment
• Separation of physical machines
• Intrusion detection and prevention
• Spares certified and signed at delivery
• PKI with two-factor authentication
• Local Cloud / NAS storage
• Encrypted communication between containers
SAAB

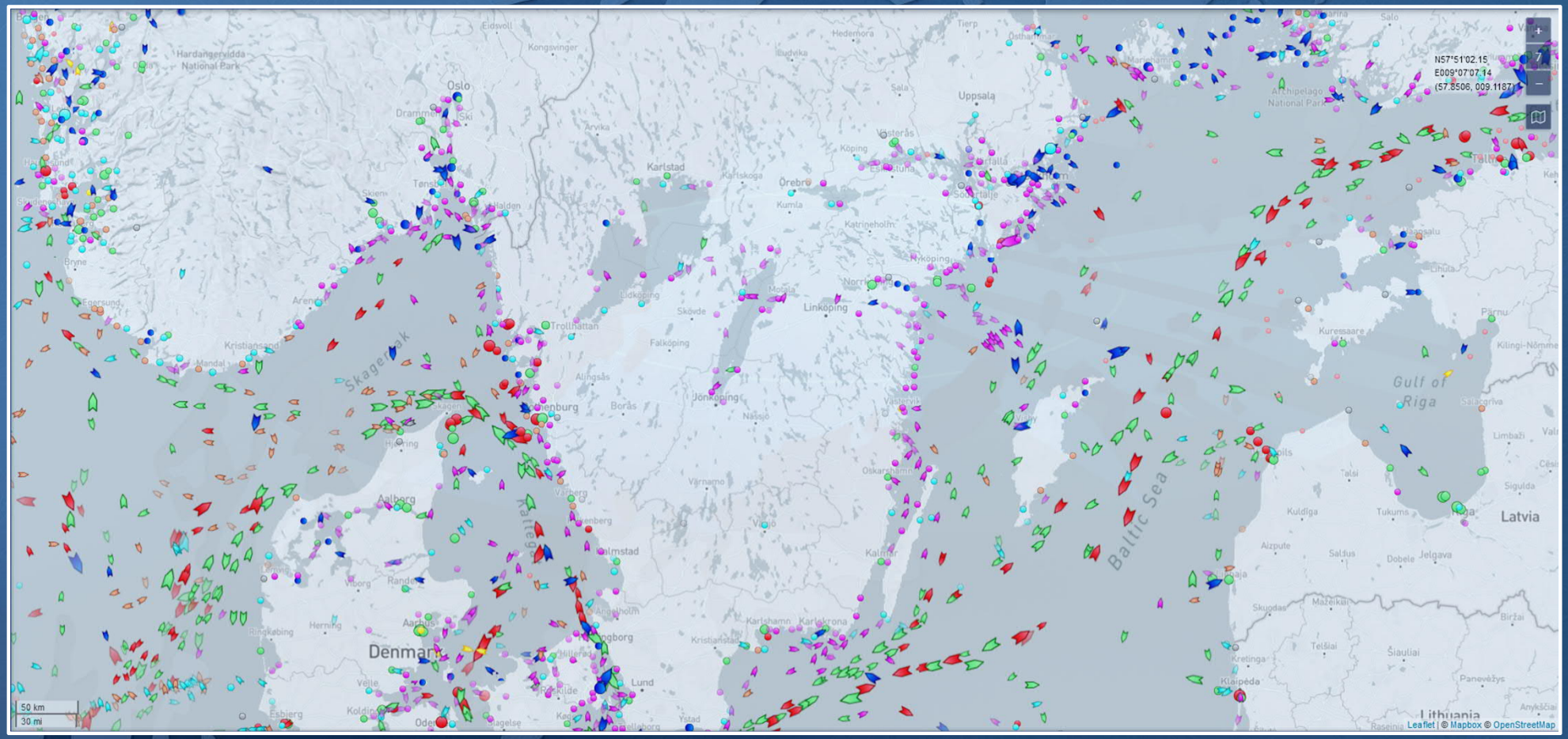
RADAR SURFACE LIMITATIONS IN LITTORAL ENVIRONMENT

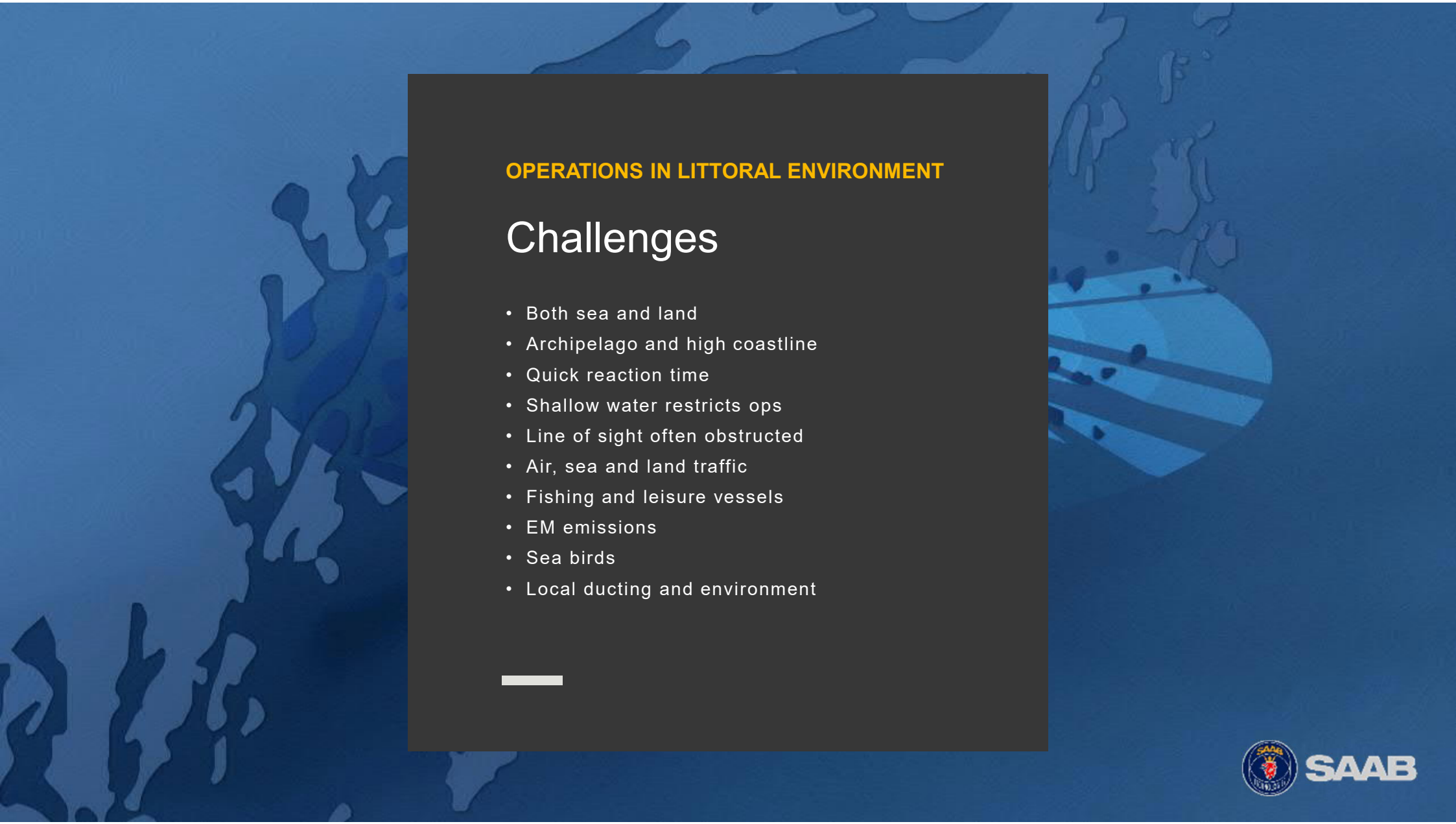
SAAB

LITTORAL ENVIRONMENTS



MARINE TRAFFIC





OPERATIONS IN LITTORAL ENVIRONMENT

Challenges

- Both sea and land
- Archipelago and high coastline
- Quick reaction time
- Shallow water restricts ops
- Line of sight often obstructed
- Air, sea and land traffic
- Fishing and leisure vessels
- EM emissions
- Sea birds
- Local ducting and environment

SAAB

BUILDING THE PICTURE

BUILDING THE PICTURE

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BUILDING THE PICTURE
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BUILDING THE PICTURE

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BUILDING THE PICTURE
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SAAB

BUILDING THE PICTURE

The Joint Tactical Picture

- Available sensors, networked
- Supports both active and passive postures
- A correlated and structured picture

- GlobalEye Airborne Early Warning & Control system
  - Solving the factor of the horizon
  - Tracks different target types simultaneously
  - A joint asset for air, maritime, ground forces
  - Simultaneous passive ISR and active sensors
  - Shared through data link

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ROCKET ARTILLERY MORTAR
DETECTION

ROCKET ARTILLERY MORTAR
DETECTION

ROCKET ARTILLERY MORTAR
DETECTION

ROCKET ARTILLERY MORTAR
DETECTION
SAAB

ROCKET ARTILLERY MORTAR
DETECTION
SAAB

ROCKET ARTILLERY MORTAR DETECTION

The Sea Giraffe at work

- Detects, tracks and classifies ballistic objects, even in severe clutter environment
- Provides Firing position, Impact position and Time to impact
- Alerts the ship's CMS to initiate countermeasures
- Increases own ship survivability close to land
- Useful for site- and force protection

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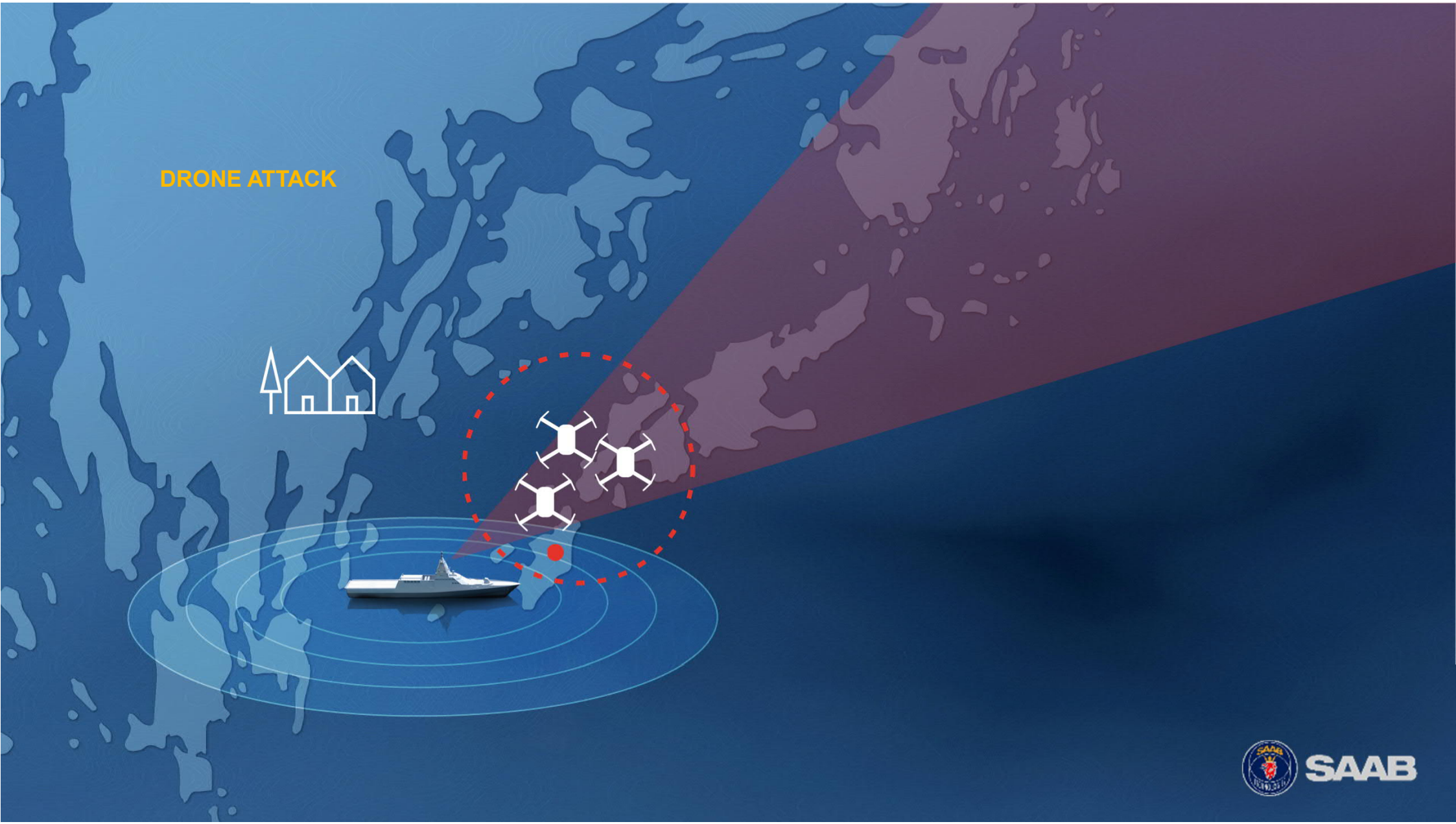
DRONE ATTACK
SAAB


DRONE ATTACK
SAAB

DRONE ATTACK

SAAB

THE DRONE ATTACK

Detection and decision

- Challenge: Separate drones from birds
- Detects small UAVs at a significant distance
- Classification algorithms indicates UAV-probability
- Alerts the ship’s CMS to initiate countermeasures

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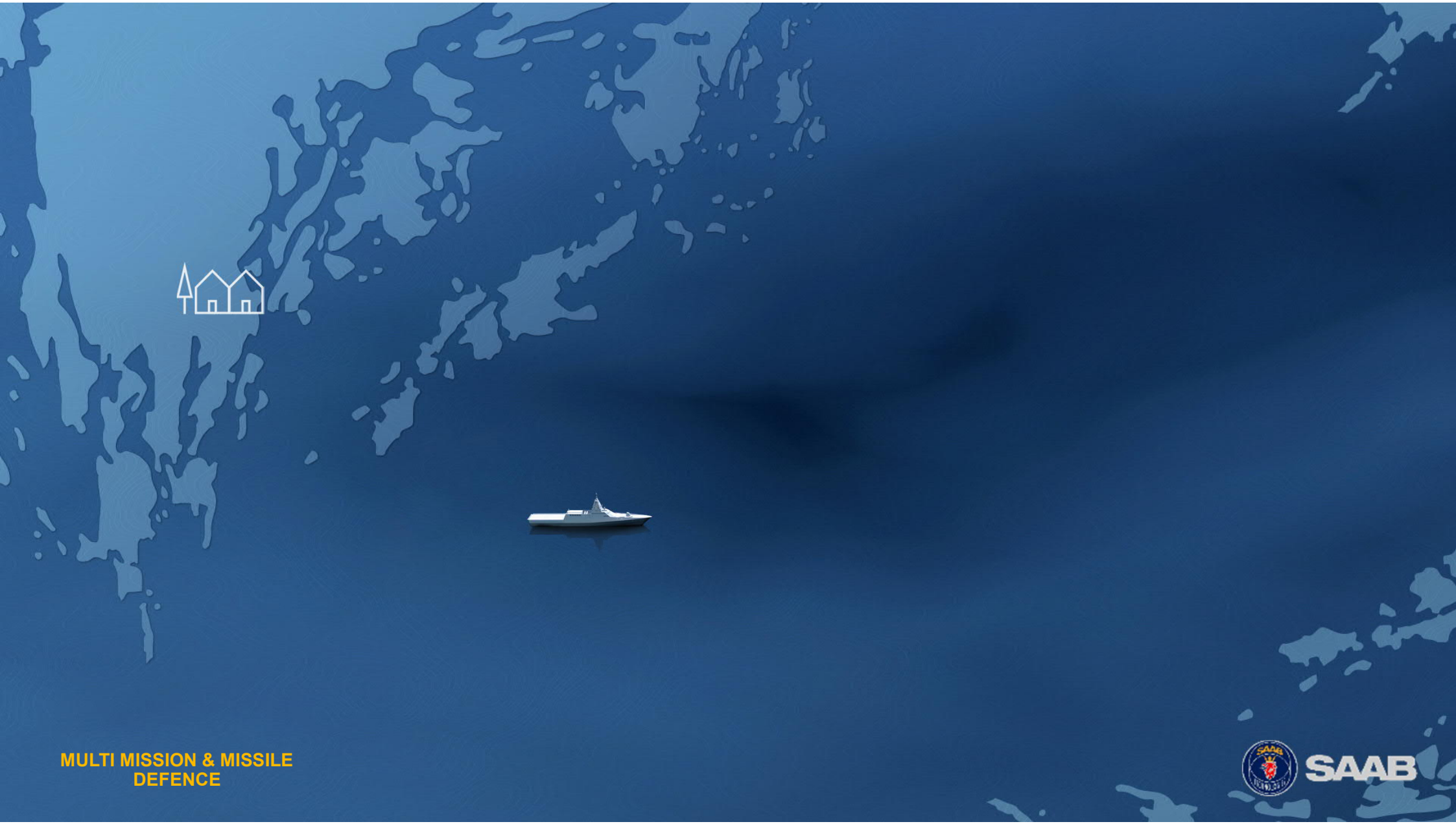
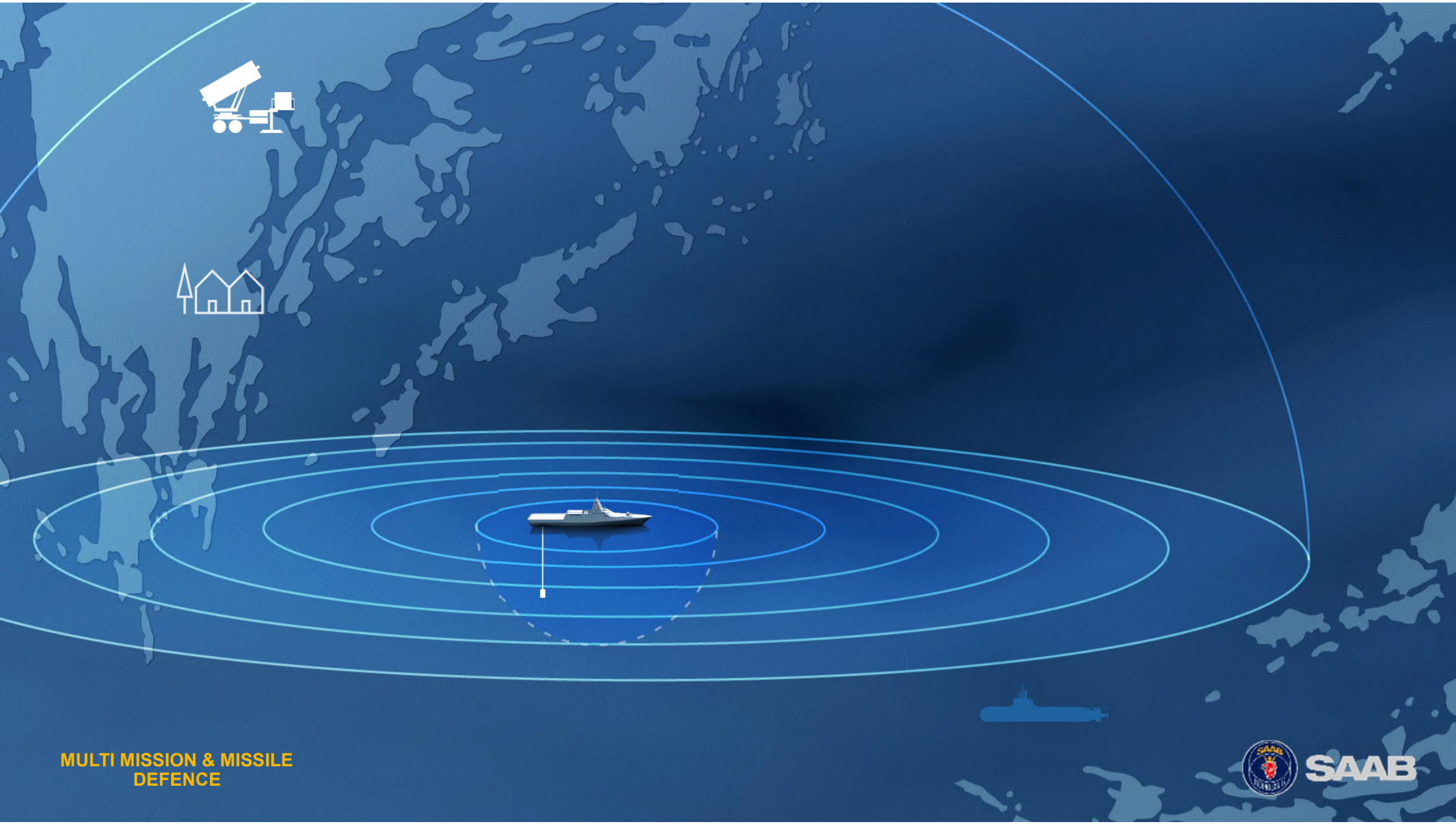


MULTI MISSION & MISSILE DEFENCE

SAAB


MULTI MISSION & MISSILE
DEFENCE
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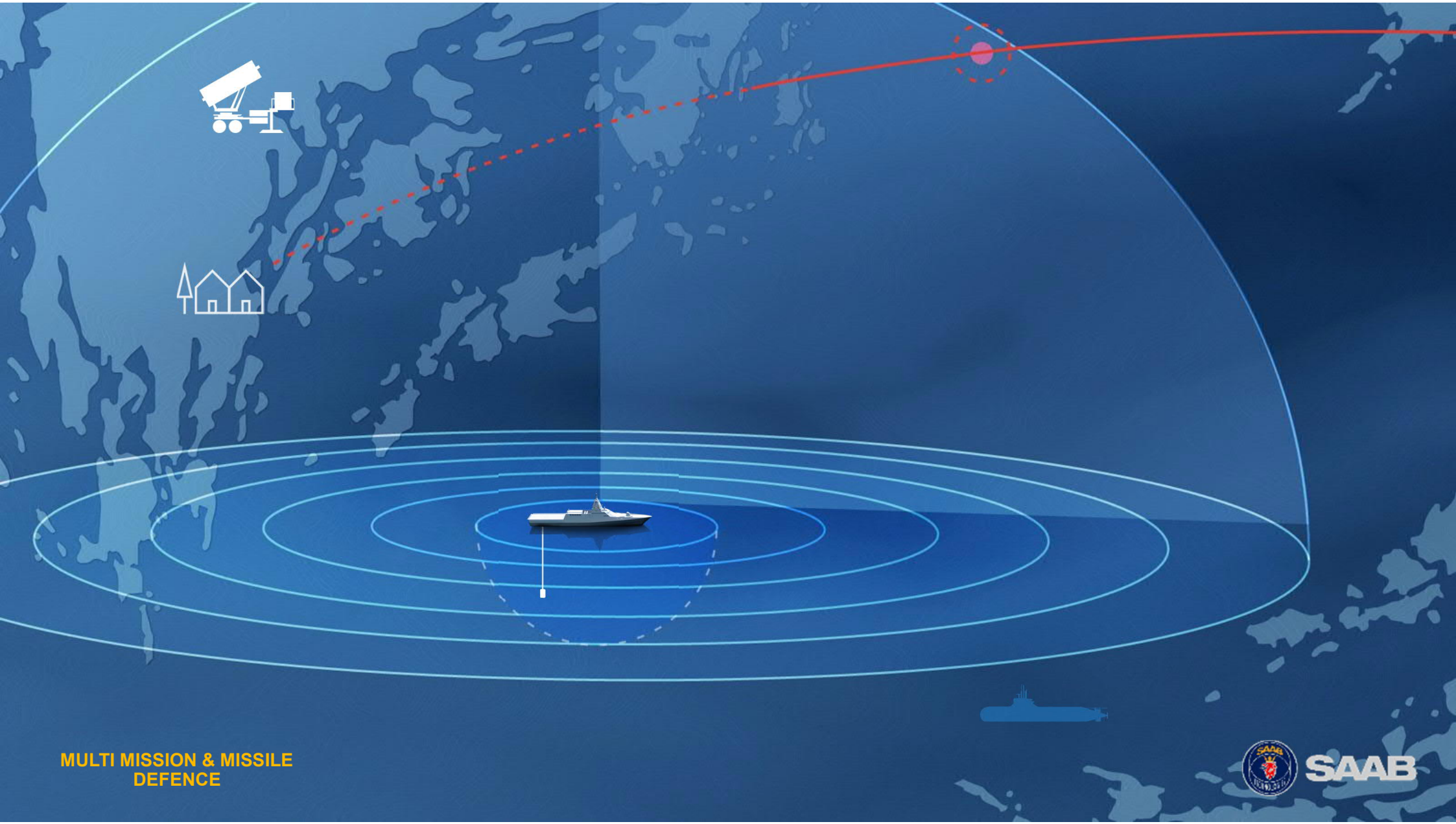
MULTI MISSION & MISSILE
DEFENCE
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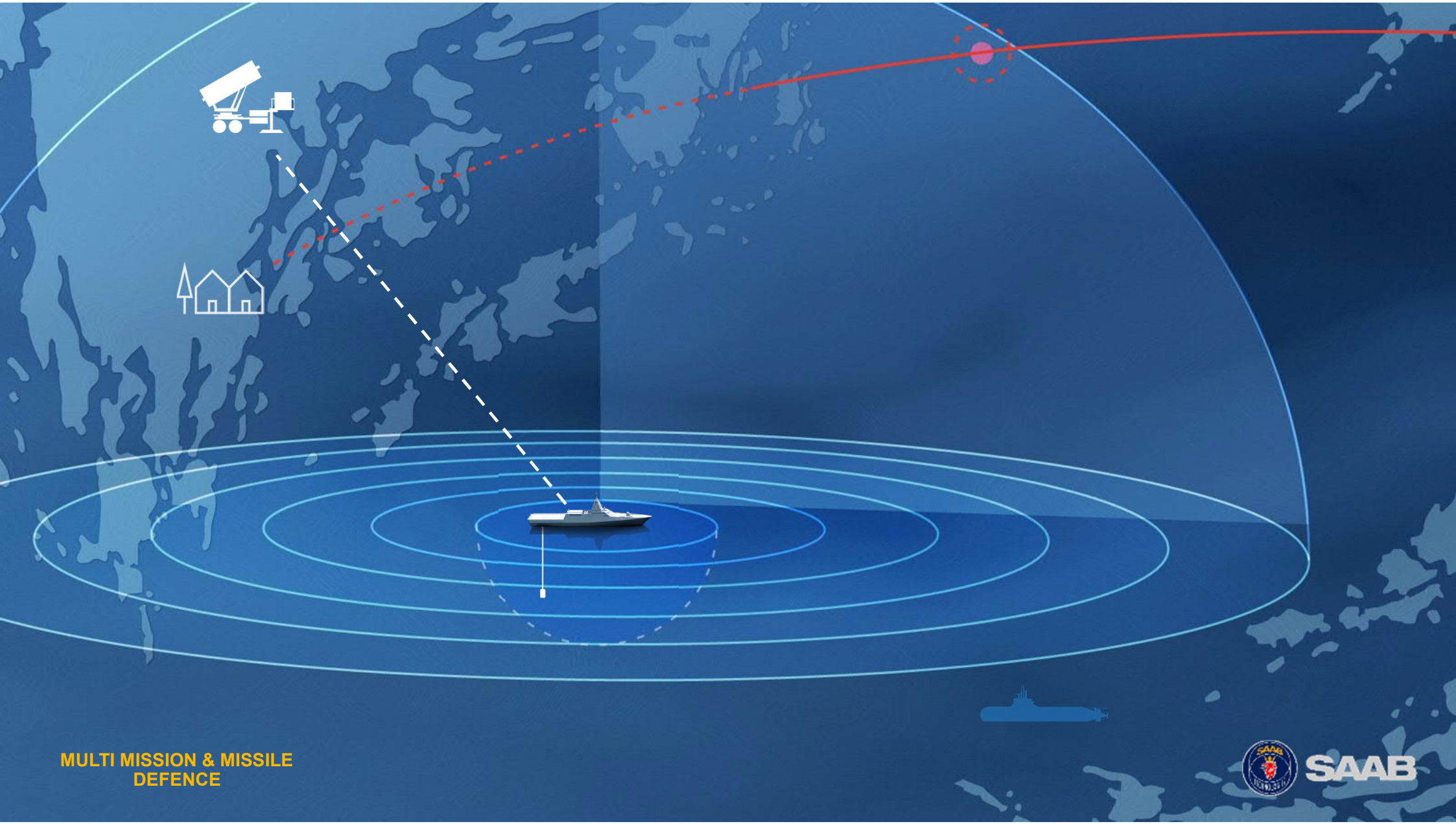
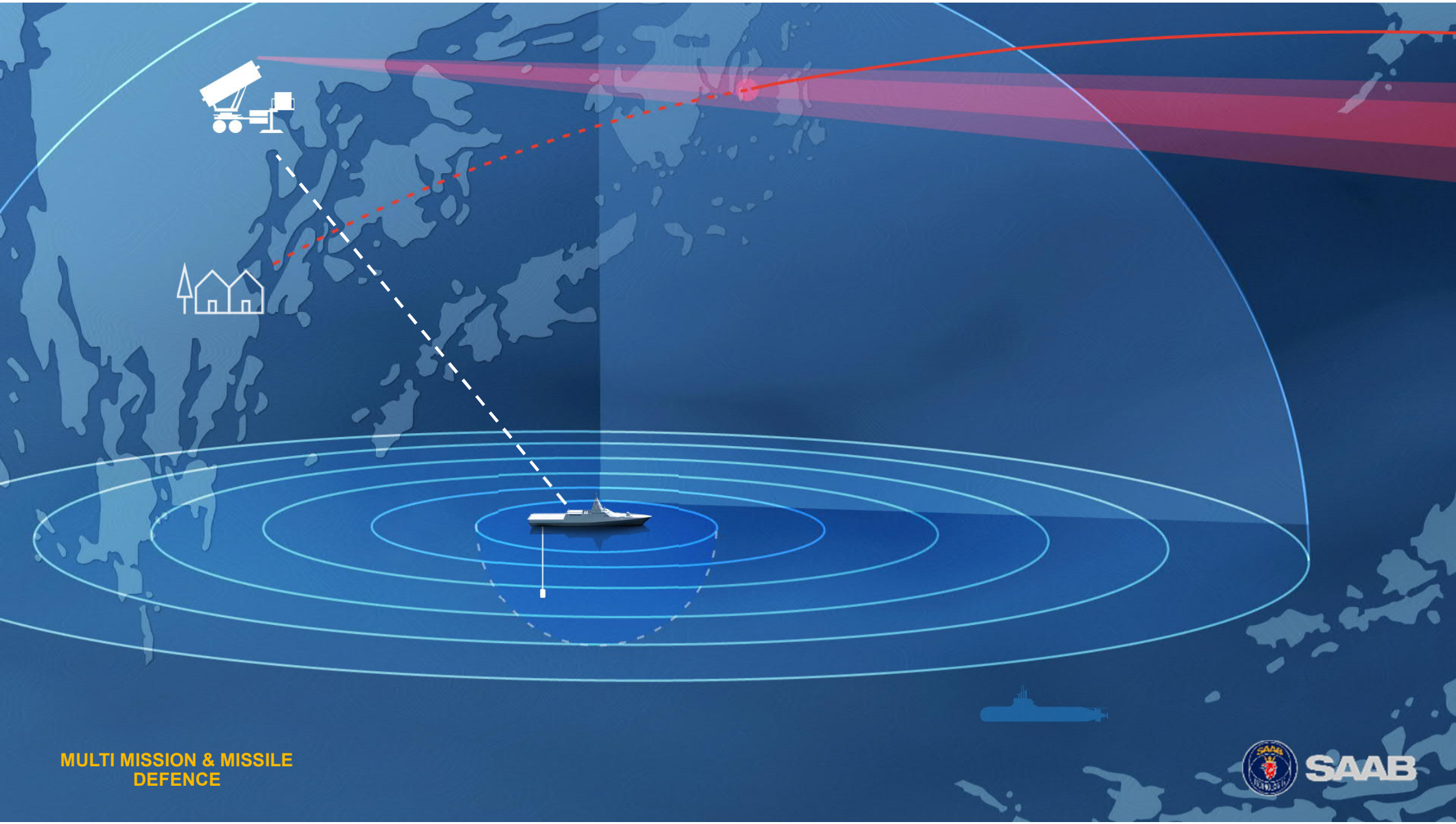
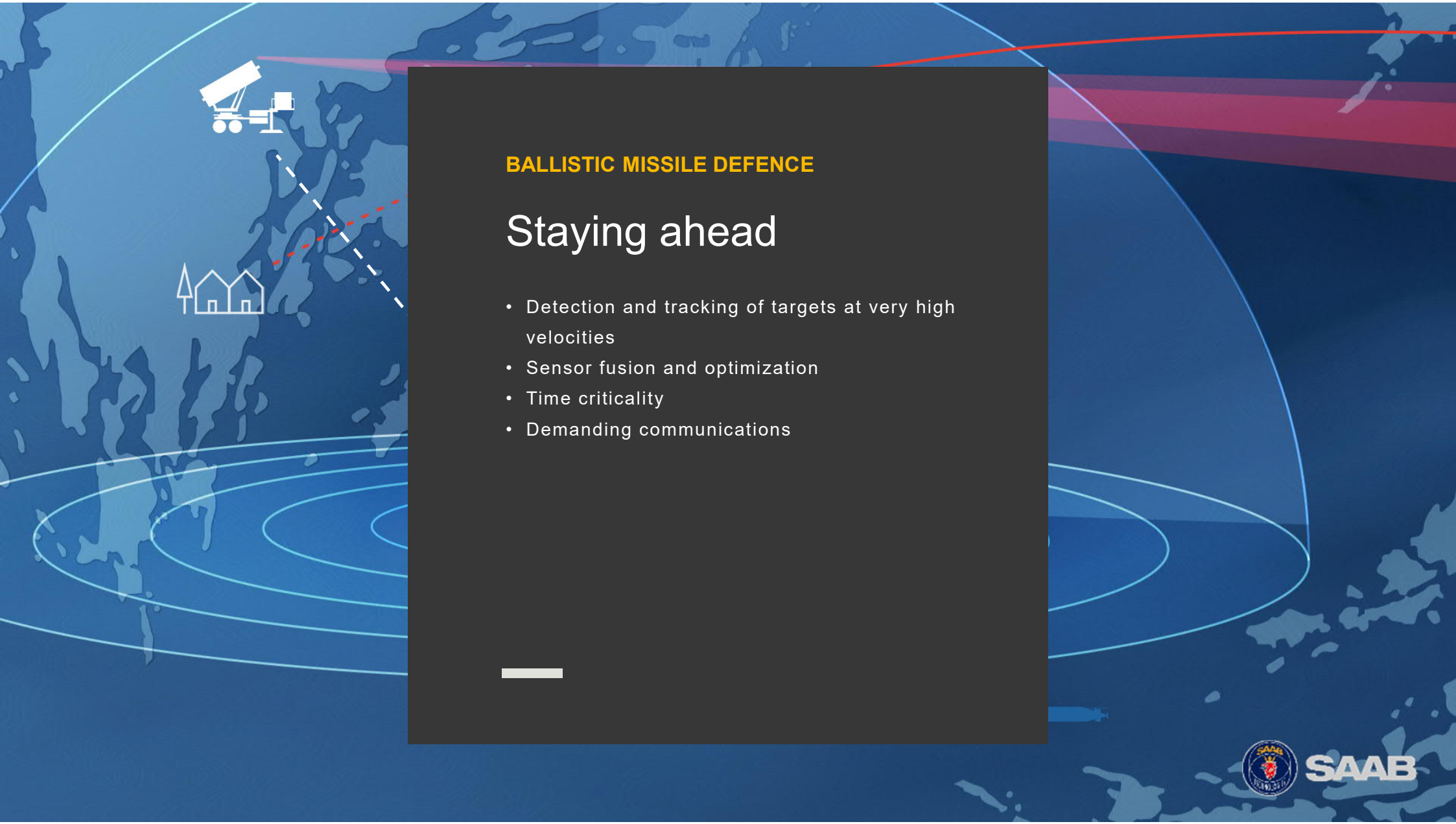

MULTI MISSION & MISSILE
DEFENCE
SAAB


MULTI MISSION & MISSILE
DEFENCE
SAAB



BALLISTIC MISSILE DEFENCE

Staying ahead

- Detection and tracking of targets at very high velocities
- Sensor fusion and optimization
- Time criticality
- Demanding communications

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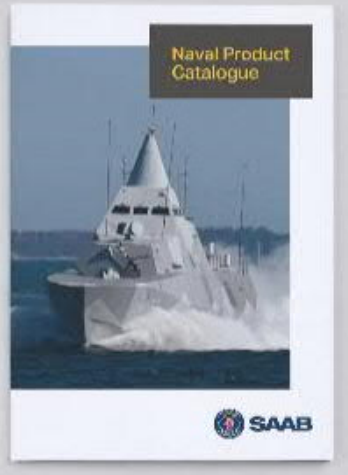
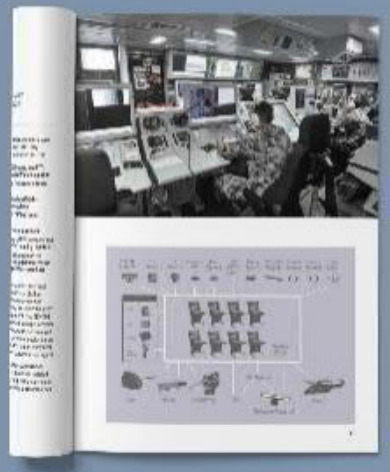
SAAB Surveillance

Focus for forward steps

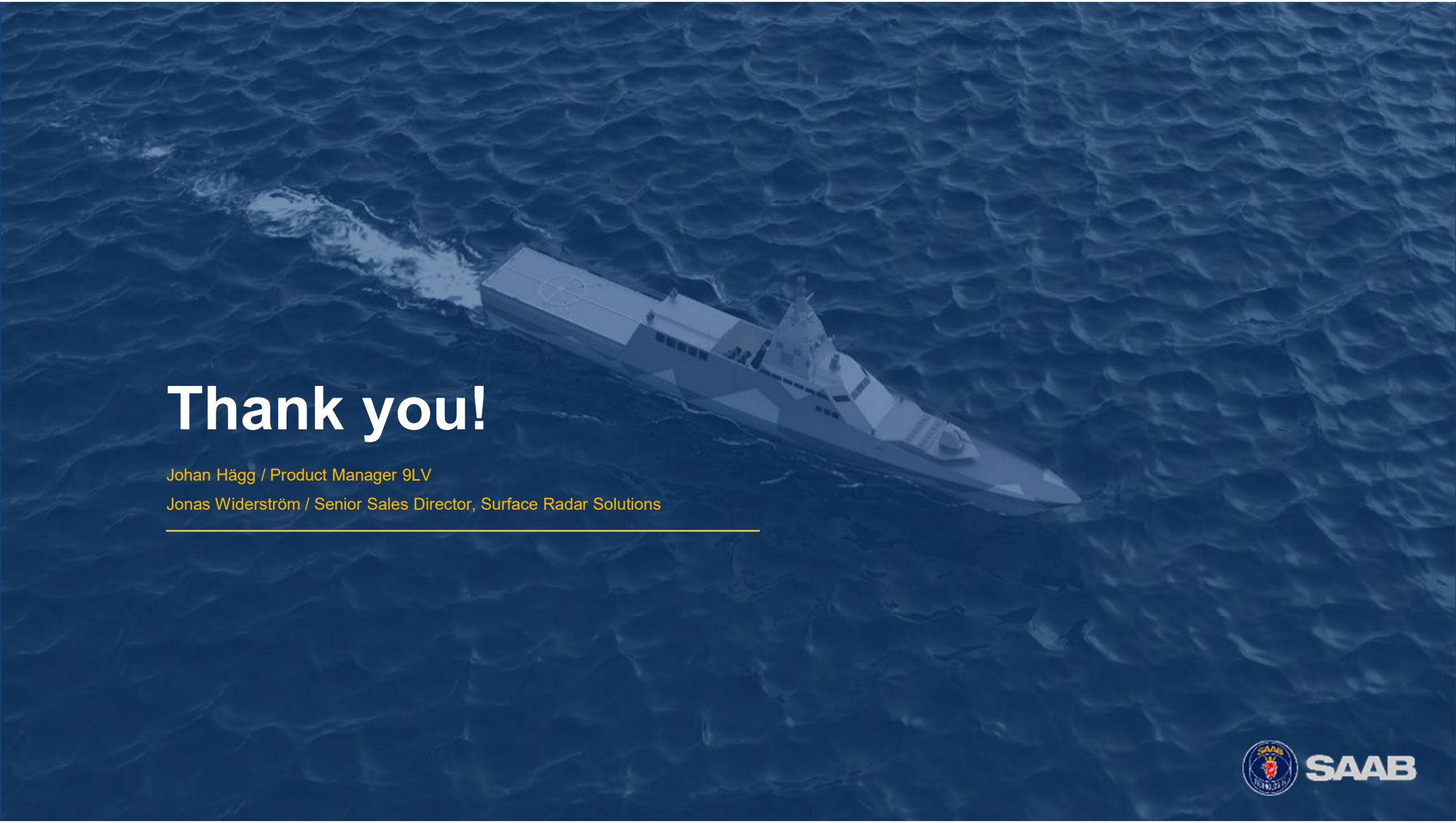
- New warfighting functionality and improved operator interaction
- Force level capabilities
- Increase automation and operator support
- Increased ship defence against new and emerging threats
- UxV integration and system of systems optimization
- Continuous SW upgrades
- Technology leaps

SAAB


Naval Product
Catalogue
SAAB



K35
SAAB



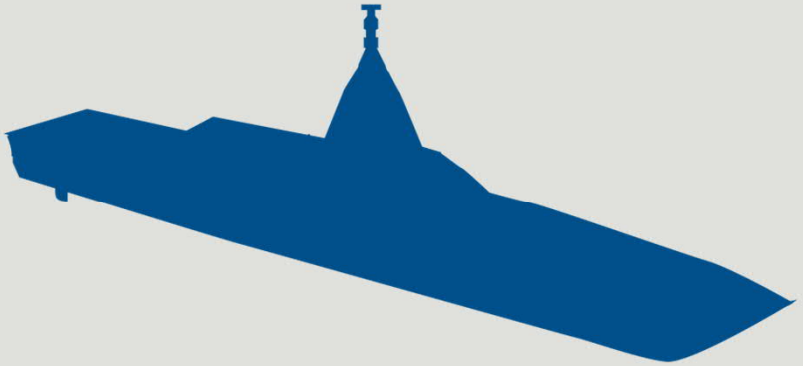
Thank you!

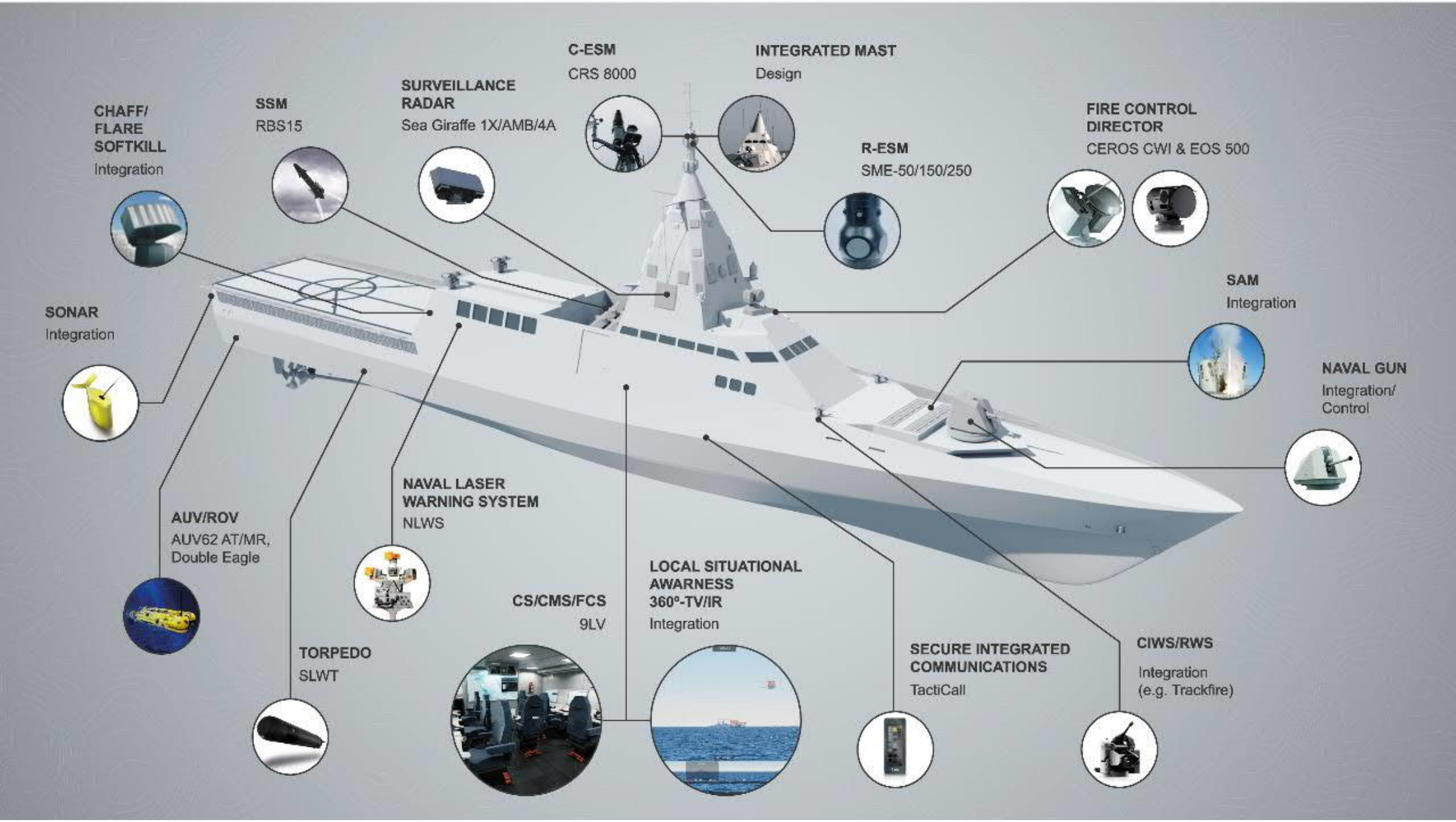
Johan Hägg / Product Manager 9LV

Jonas Widerström / Senior Sales Director, Surface Radar Solutions

Descriptions and overviews

References and information slides




C-ESM
CRS 8000
INTEGRATED MAST
Design
SURVEILLANCE RADAR
Sea Giraffe 1X/AMB/4A
SSM
RBS15
CHAFF/ FLARE SOFTKILL
Integration
R-ESM
SME-50/150/250
FIRE CONTROL DIRECTOR
CEROS CWI & EOS 500
SAM
Integration
SONAR
Integration
NAVAL GUN
Integration/ Control
NAVAL LASER WARNING SYSTEM
NLWS
AUV/ROV
AUV62 AT/MR, Double Eagle
CS/CMS/FCS
9LV
LOCAL SITUATIONAL AWARNESS 360°-TV/IR
Integration
TORPEDO
SLWT
SECURE INTEGRATED COMMUNICATIONS
TactiCall
CIWS/RWS
Integration
(e.g. Trackfire)

9LV

9LV – a brief overview

Saab’s 9LV offer comprises everything from complete combat system deliveries to provision of systems and sub-systems, as well as components and services.

Saab’s 9LV offers complete C4I for every type of naval platform ranging from combat boats, inshore and offshore patrol vessels, submarines to large through-deck ships and multi-purpose frigates.

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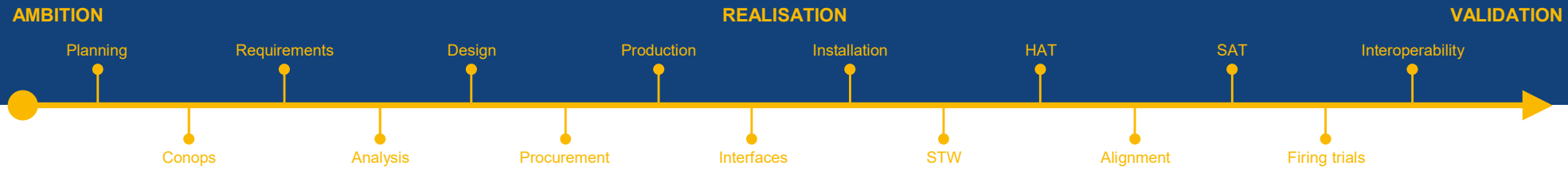
9LV Combat system (CS)

We make all subsystem choices work as one through knowledge, experience, skills and professionalism.

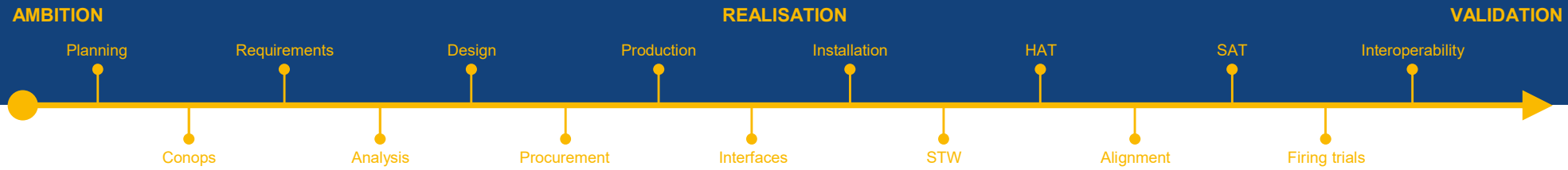
- Complete customized Combat System, Combat Management System and Fire Control System capabilites for new and upgraded surface and submarine platforms
- Fulfillment of all agreed requirements
- Through-life management and risk reduction



SAAB

9LV Combat system (CS)

- The 9LV CS process takes the current combat system know-how and applies it to each specific project. Risk management requires prior experience and an understanding of the customer's environment
- 9LV is always tailored according to customer requirements to ensure that the correct and necessary engineering expertise is provided during the development and modification of the system.



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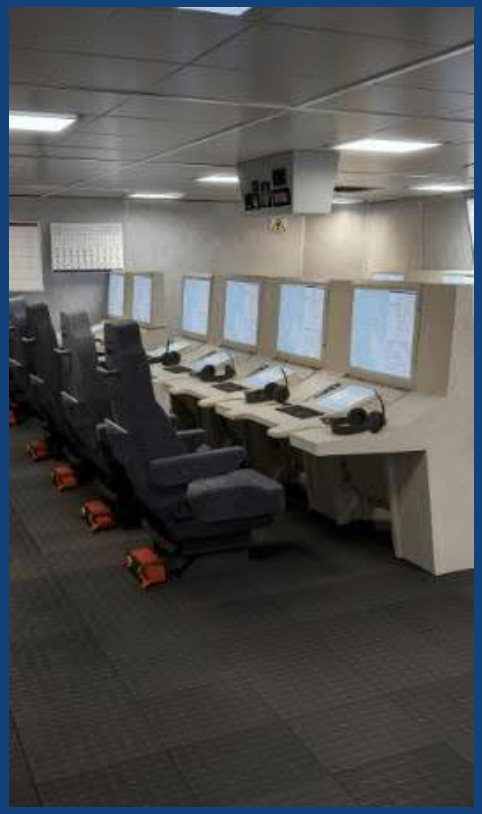


9LV CMS

The 9LV CMS technology comprises a range of software and hardware components that are designed to fit together in different configurations to meet the needs of your Navy.

- A single clear image of the naval domain, graphically presented with chart or map and tactical overlays
- Command and control in all naval warfare areas
- Air and Surface defence coordination
- Built-in capacity for upgrades & extensions

SAAB

9LV FCS

The 9LV FCS is an innovative combat system solution that provides rapid, reliable response against any threat in any environment.

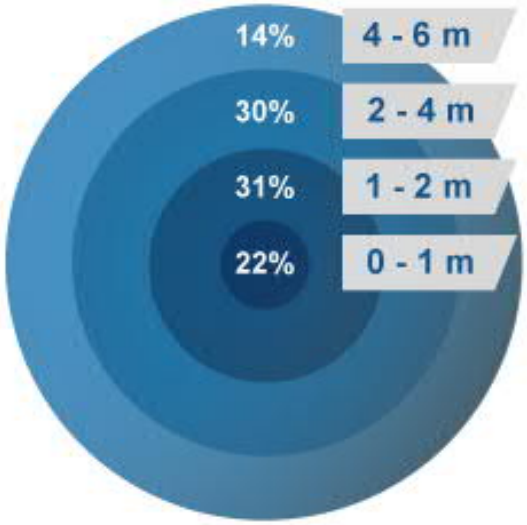
- The 9LV FCS is market leading in terms of accuracy and engagement speed.
- Features a range of manual, automatic and semi-automatic modes for controlling sensors and weapons.

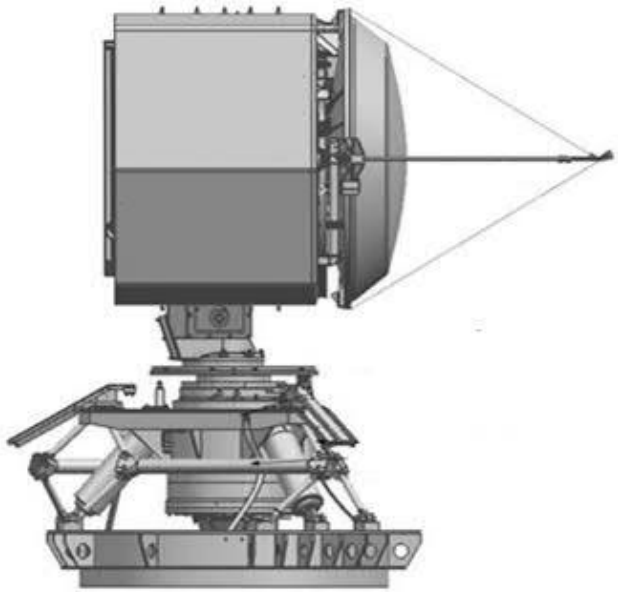
Learn more

SAAB

CEROS 200

- Extremely high accuracy
- Multiple target tracking
- Missile detection / warning
- Jamming resistant
- Effective in all weather conditions





EOS 500

- Features some of the most capable sensors on the market.
- Exceptional stabilisation performance
- Low weight
- Low profile
- Easy maintanence

Air and Surface Defence

Air Defence Coordination (ADC) provides solutions that automate and accelerate an optimal response using a ship’s AAW self-defence assets.

In fully automatic mode, ADC can initiate firing a very short timeframe, only requiring fire permission confirmation from the operators.

Surface Defence Coordination (SDC) provides an automated defence against directly attacking surface threats, e.g. a swarm attack by high-speed craft. SDC models the ADC way of working, applying automated support to the surface dimension.

Sea Giraffe family

Sea Giraffe 1X

Compact and affordable

- Small footprint 3D radar
- X-Band
- 100km

Maritime Security Operations
Self Defence

Sea Giraffe AMB

Optimal all-round solution

- Multirole 3D Radar
- C-Band
- 180km

Multi Purpose – Medium Range
Littoral performance and Self Defence

Sea Giraffe 4A

Maximum range

- Long range Air surveillance
- S-Band
- 400km

AESA Multi Role –
Long range Area Defence

SAAB

Sea Giraffe family

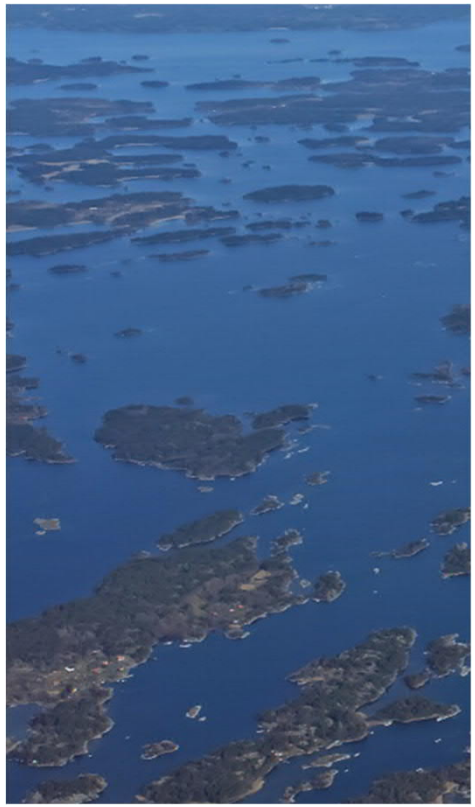
Snow, Ice and 200 000 islands

Sweden has a coastline of 2 700 km and have more than 200 000 islands. With seasonal impact from snow and ice, there is hardly a more complex environment to be found. Our Sea Giraffe radars is developed to perform under these extremely demanding operational conditions and we have the experience needed with more than 60 years of building radars.

Sea Giraffe 1X – the most compact and affordable solution working on the X-band. Dedicated for maritime security operations and self defence - without compromising the need for capable protection against sophisticated threats.

Sea Giraffe AMB – an optimal all-round sensor solution. This is the perfect compromise, using the C-band, between air and surface surveillance with outstanding littoral performance and self defence.

Sea Giraffe 4A – is our most powerful S-band radar for maximum range and volume search performance. It has a clear focus towards medium to long range air surveillance, providing long range area defence. Sea Giraffe 4A can also be configured as a fixed face solution.



SAAB

Where Saab Leads: Multi Role Capabilites

Simultaneously

- Air and Surface Surveillance
- Drone detection
- Sense & warn and weapon locating functionality
- Target classification

High accuracy 3D information for all air targets

- Excellent small-target detection
- Fast reaction time

Extensive Electronic Counter-Counter Measures (ECCM)

Small footprint - physically and weight

SAAB

Where Saab Leads: Multi Role Capabilites

All our Sea Giraffe radars share these characteristics and common capabilities:

- The ability to perform air and surface surveillance simultaneously, with a Sea Giraffe radar there is no need for a dedicated air search radar or a dedicated surface search radar.
- They all have multi-role capabilities. Air and surface surveillance can for example be conducted in parallel with Drone detection and Sense & warn detection.
- Detection of small targets and fast reaction time. All our radars are using 1 Hz update rate - 60 revolutions per minute.
  We only need two revolutions to initiate and track any target.
- ECCM have gained new importance in modern warfare, why all our radars possess extensive electronic counter-counter measures, for example Side lobe blanking and cancellation.
- As part our heritage, really small footprint characterize all our Sea Giraffes

SAAB

Dual Sensor Solution

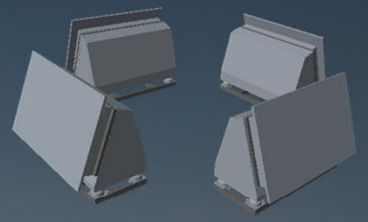
Combined Sea Giraffe (S-Band) and the Sea Giraffe (X-Band)

Key Features

- 360° coverage with an update rate exceeding 4Hz.
- Hypersonic Detection Mode (HDM)
- Capability to track Sea Skimming Missiles down to 5m above sea level.
- Next Generation Track-While-Scan
- The Drone Tracker function
- The Rocket Artillery Mortar (RAM) detection and alert function

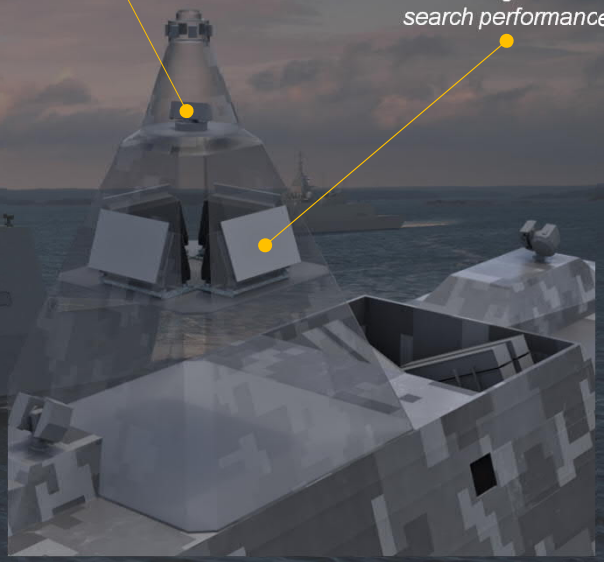
Sea Giraffe 1X

The most compact and affordable solution



Sea Giraffe 4A Fixed Face

Maximum range and volume search performance



Dual Sensor Solution

- Sea Giraffe Multi radar solutions consists of the Sea Giraffe 4A and Sea Giraffe 1X, both belong to Saab´s new generation of multirole-mission radars where the latest high-end technology is perfectly blended with experience from more than 60 years of radar production.
- Sea Giraffe 4A is a S-band medium to long-range range multifunction surveillance radar that can either operate autonomously or in combination with the short to medium range X-band Sea Giraffe 1X Air and surface radar onboard a ship.
- A combination of Sea Giraffe radars will optimize performance, and fully remove the need to compromise in any situation. Both sensors share similar technical advantages and can be individually adjusted to fulfill any requirement. The sensor combination provides Medium to long-range Air Surveillance simultaneously with top Short range Air and Surface surveillance capability without any need to compromise
- Two independent radars provide full redundancy in self-defense capability to secure ship survival. Furthermore combination different frequency band offers a unique possibility to operate with optimized performance in all conditions such as weather variations or jamming.

- **NEVER COMPROMIZE**
Being prepared for the unpredictable increases your mission success and ship survivability.

- **REDUDANCY**
Full Self-Defense redundancy to secure ship survival

- **FOOTPRINT**
Compact design and low weight allow best sensor location with optimal range and performance in mind

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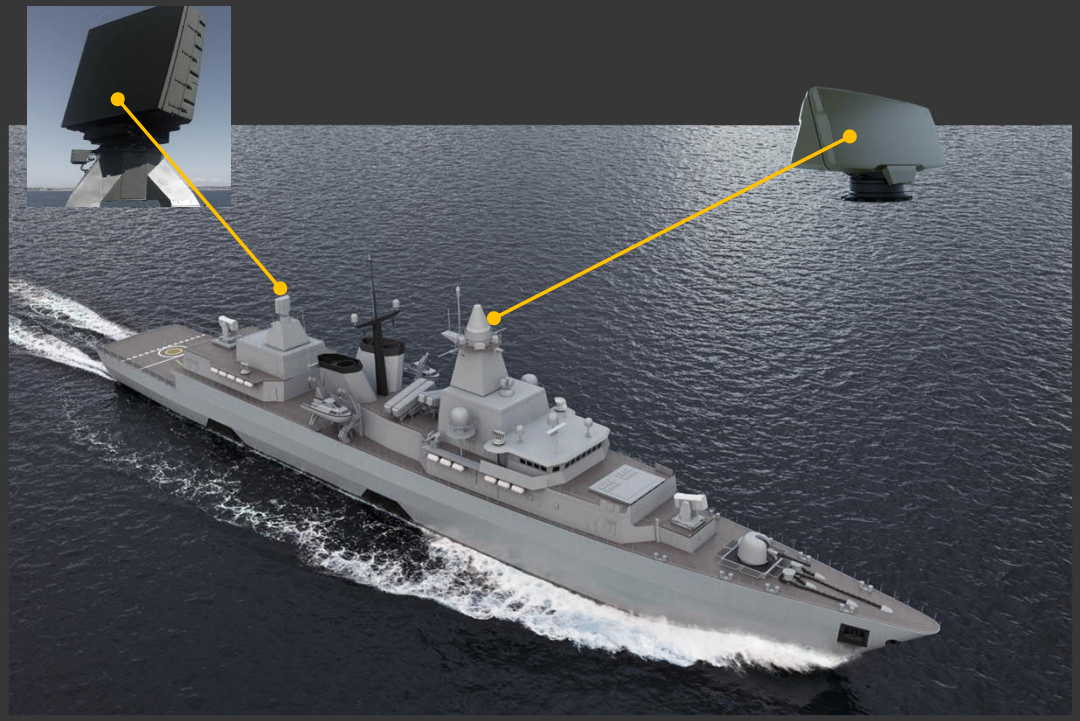
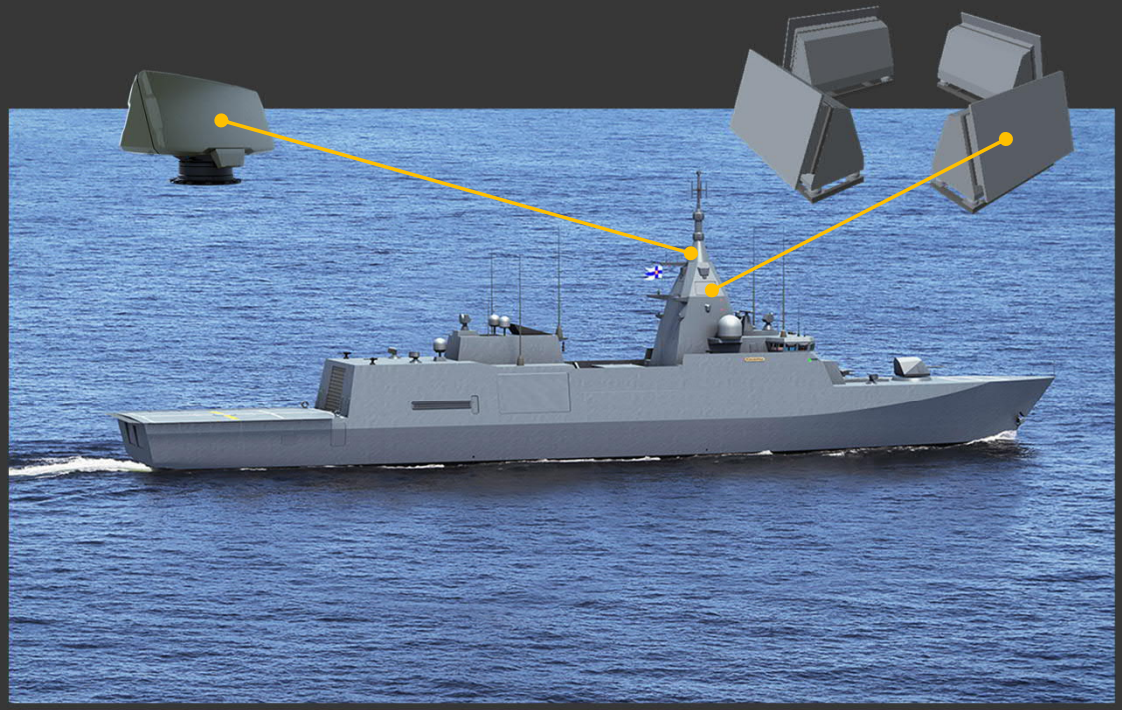
F123 in Germany



SQ2020 in Finland



F123 in Germany

- Last Year, Saab signed a contract with the German Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) and received an order for the delivery and integration of new ship radars and fire control systems for the German Navy's Brandenburg-Class frigates (F123).
- The contract includes the delivery and integration of the Sea Giraffe 4A and Sea Giraffe 1X radars.

SQ2020 in Finland

- As part of the combat system delivery and integration for the Finnish Navy's new Pohjanmaa-class corvettes in context to the Squadron 2020 order, Saab is supplying the Sea Giraffe Multi Sensor Solution, which includes Sea Giraffe 1X and the sophisticated Sea Giraffe 4A Fixed Face radar.
- The Multi Sensor Solution provides optimal overlapping performance and redundancy for air and surface surveillance

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Sea Giraffe 1X – Any Threats, Any Waters

The most compact and affordable solution

- Small
- Lightweight
- Energy efficient
- High performing
- 100 km instrumented range
- Air and Surface 3D surveillance
- High level of automation
- Minimal maintenance needs

Sea Giraffe 1X - Any Threats, Any Waters

Small size fits all platforms

Sea Giraffe 1X is an X band multi-channel AESA radar with Solid State technology at a technology readiness level 9.

The total system weight is less 150 kg, with a topside weight of only 100 kg. Sea Giraffe 1X radar is our most compact and affordable 3D AESA radar.

The small size makes it suitable for any kind of naval vessel, from small unmanned vessels, up to large Frigates like the F123 Brandenburg class in Germany.

Sea Giraffe 1X is designed to automatically and simultaneously initiate and track more than 600 surface and air targets including fixed wing Aircraft and Helicopters, fast moving missiles, jammers, rockets, mortars and drones.

Sea Giraffe 1X is ideal for detection and tracking of surface- and air targets at low elevation angles in a littoral environment like the Baltic Sea.

The Sea Giraffe 1X is useful at short distances with its very short inner blind range and makes it ideal for ship-controlled helicopter approach (SCA) and UAV operations with tracking capability to less than 100 meters from the radar.

The radar is designed with a focus on supportability and ease of use under operational conditions, with minimum maintenance and training requirements that significantly shorten mean time to repair (MTTR) and minimizes Lice Cycle Cost (LCC).

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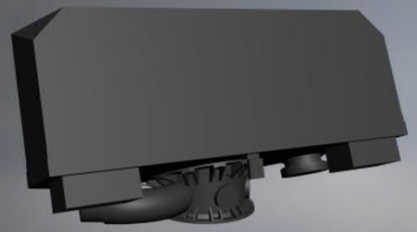

Sea Giraffe AMB

An optimal all-round sensor solution

Medium range, multi-role surveillance radar optimised for detection of small air and surface target with high update rate in all kinds of environments, including the littorals.

Radar type:	Stacked beam 3D radar
Antenna type:	Phased Array
Frequency	C (G) band
Elevation coverage	70°
Rotation rate:	60, 30 RPM
Search volume:	360°
Instrumented range:	180 km
Tracking capacity Air/Surface targets:	200/500 tracks
Climate zones:	All climate zones
Sensor weight:	650 kg
Power consumption:	12 kW peak
Stabilzation:	Electronic
Power supply:	MIL-STD 1399 type 1

Sea Giraffe AMB

The SEA GIRAFFE AMB is a C-band stacked beam 3D radar, using a phased array antenna. It has the capability of electronic beam steering in elevation, thus removing the need for a mechanically stabilized platform. The 3D capability delivers an updated situation aspect every second in the full search volume up to 70 degrees of elevation and 360 degrees in azimuth.

The radar operates at 60 or 30 rpm, with a instrumented range of 180km. It provides a tracking capacity of 700 air and surface tracks. It is designed to operate in all climate zones.

The sensor itself, that is the antenna weight is only 650kg and peak power consumption is on 12 kW.

An array of antenna elements powered by a Single transmitter. The feed current for each antenna board passes through a phase shifter, controlled by a computer that forms the radar lobe.

The SEA GIRAFFE AMB is medium range, multi-role surveillance radar optimised for detection of small air and surface target with high update rate in all kinds of environments, including the littorals.

The SEA GIRAFFE AMB is optimised for, and in service in, vessels like the Swedish Visby and Gävle class Corvettes and the US Littoral Combat Ship Independence class.

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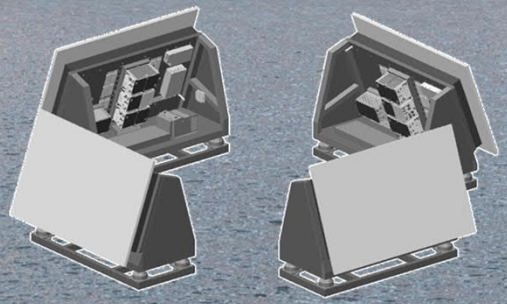

Sea Giraffe 4A

Maximum range and volume search performance

Highly adaptable waveforms Flexible design for optimal use of time Simultaneous Full Multirole Performance Software defined for future growth

Radar type:	Stacked beam 3D radar
Antenna type:	AESA, digital beam forming
Frequency	S (E/F) band
Elevation coverage	> 70 degrees
Update rate:	Flexible and 60, 30, 15 RPM
Search volume:	360º
Instrumented range:	400 km
Tracking capacity Air/Surface targets:	1000 tracks
Climate zones:	All climate zones
Sensor weight:	1750 kg
Power Consumption:	30 kW
Stabilzation:	Electronic
Power supply:	STANAG 1008 edition 9

Sea Giraffe 4A

- The SEA GIRAFFE 4A is a S-band AESA radar with Solid State technology at technology readiness level 9. It has the capability of electronic beam steering in elevation, thus removing the need for a mechanically stabilized platform.
- The 3D capability delivers an updated situation aspect every second in the full search volume up to 70 degrees of elevation and 360 degrees in azimuth.
- The radar operates at flexible update rates depending on configuration, with a instrumented range of 400km. It provides a tracking capacity of 1000 air and surface tracks. It is designed to operate in all climate zones.
- The sensor itself, that is the antenna weight is only 1750kg and peak power consumption is on 30 kW.

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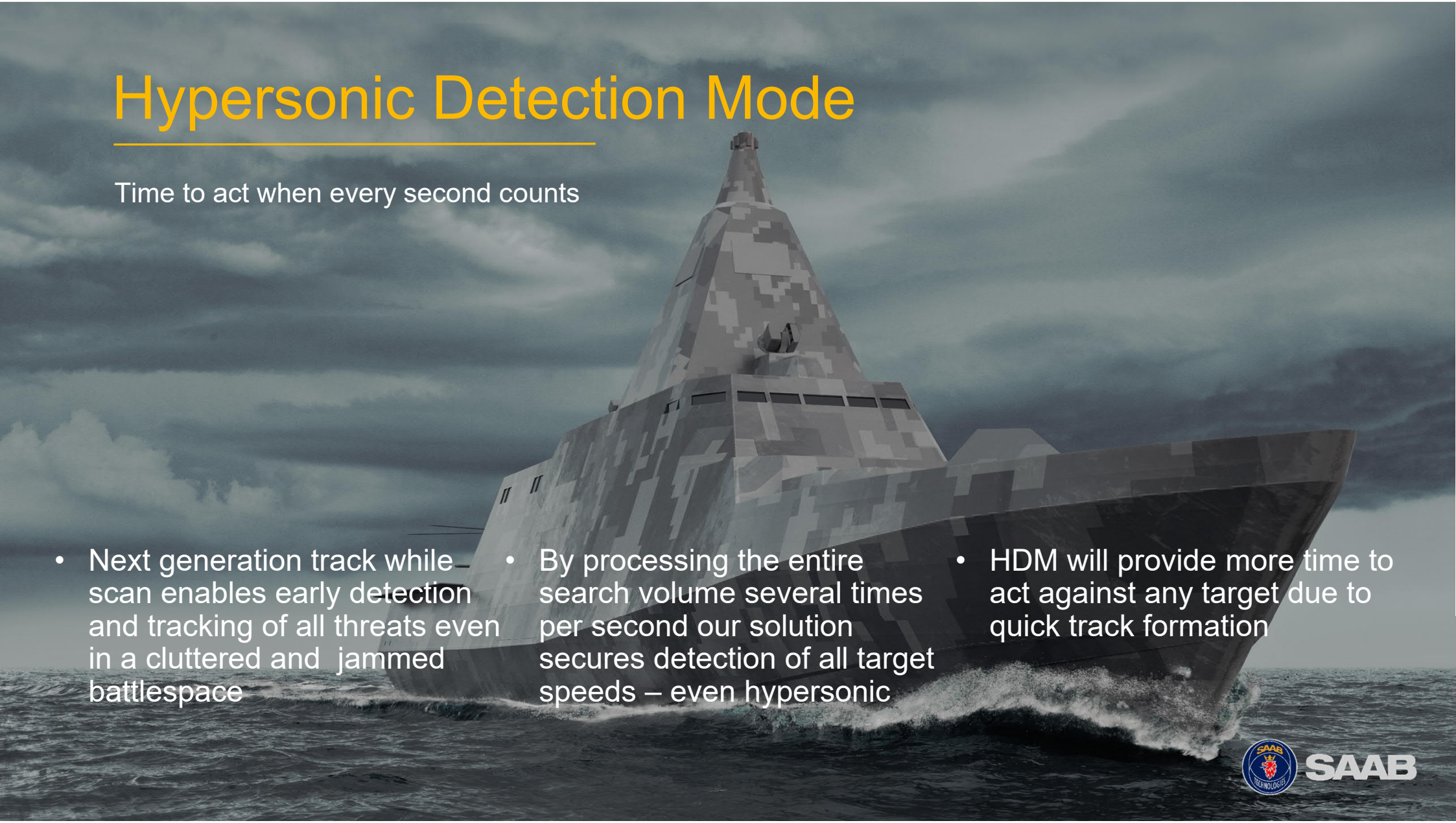

Hypersonic Detection Mode

Time to act when every second counts

- Next generation track while – scan enables early detection and tracking of all threats even in a cluttered and jammed battlespace
- By processing the entire search volume several times per second our solution secures detection of all target speeds – even hypersonic
- HDM will provide more time to act against any target due to quick track formation

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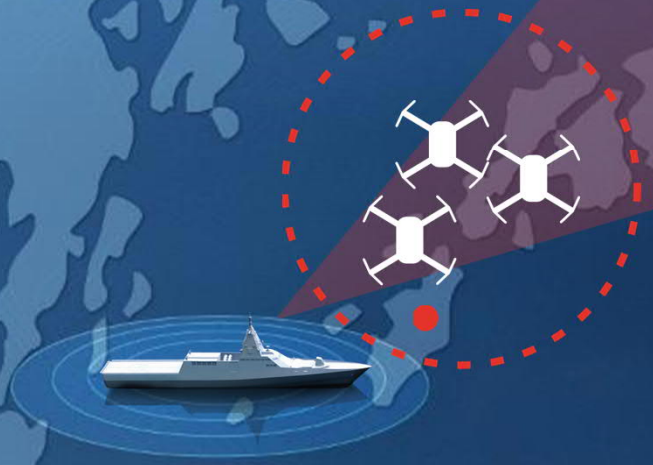
Drone Tracker

- Challenge: Separate birds from drones
- Detects small UAVs at a significant distance
- Classification algorithms indicates UAV-probability
- Alerts the ship’s CMS to initiate countermeasures



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Drone Tracker

- Small targets require enough transmitted power towards them to be detected – therefore larger radars than expected are needed to detect small UAVs at a significant distance
- By lowering thresholds for speed and size the small targets of interest are possible to detect and track – the drawback is that also all other objects with similar characteristics are being visible for the radar.
- Saab radars are, in general, good at detecting and tracking small targets with high accuracy.
- By adding classification algorithms that are based on a number of aspects to the already existing target data quality all tracked objects can be provided a value that indicates UAV-probability - objects with high probability are classified as UAV-targets with very high probability and low false alarm rate.
- Since a significant number of objects are continuously tracked and classified a high data processing capability is required.

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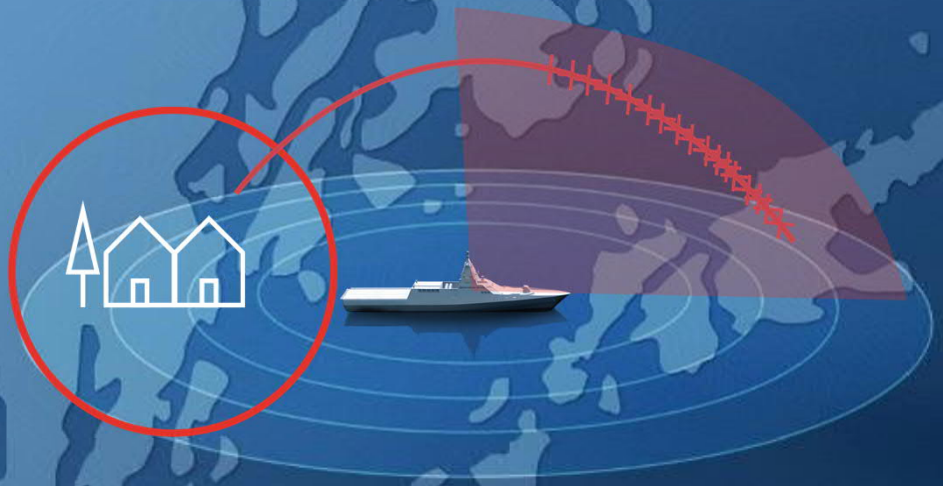
Rocket, Artillery and Mortar (RAM) detection



- Detects, tracks and classifies ballistic objects
- Even in severe clutter environment
- Provides Firing position, Impact position & Time to impact
- Alerts the ship's CMS to initiate countermeasures
- Increases own ship survivability close to land
- Useful for site- and force protection

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Rocket, Artillery and Mortar (RAM) detection

- With a background in the ARTHUR Weapon Locating Radar System, Saab has developed sophisticated software for signal and data analysis that can be integrated in the Sea Giraffe radars processing.
- The Rocket, Artillery and Mortar (RAM) detection and alert function operates simultaneously with the air and surface channel. The firing position and the ballistic trajectory are calculated. This provides outstanding accuracy for Point Of Impact as well as proven weapon classification and estimation of accuracy.
- A warning signal is given well in advance of impact. Data from the Rocket, Artillery and Mortar (RAM) detection and alert function can be used by the ship's Command Management System to initiate for example an evasive manoeuvre. This function increases own ship survivability especially close to land and in the littorals. It can also be used for site- and force protection.

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GlobalEye – An all domain resource

World´s most advanced Airborne Early Warning & Control system

Swing-role
Air, maritime, ground and joint
Situation awareness & Battle management
Shared / joint through data link

Sensor fusion
Radar, ESM, SIGINT, AIS, IFF
External data sources

New radar
Reclaiming range vs stealth
Longer range vs traditional targets

GlobalEye – An all domain resource

Key operational criteria's to be met by design

1. Capability to track different target types simultaneously
2. Solving the factor of the horizon
3. Robustness and availability
4. Frequency conflicts and wind farms
5. Mobility and dispersed operations
6. Capability to simultaneous passive ISR in combination with active sensors
7. Future growth potential
8. Performing combat with system of system collaboration
9. Rationales for operating under peace e.g. border, economic zones
10. Allowing different state authorities to coordinate
11. International operations

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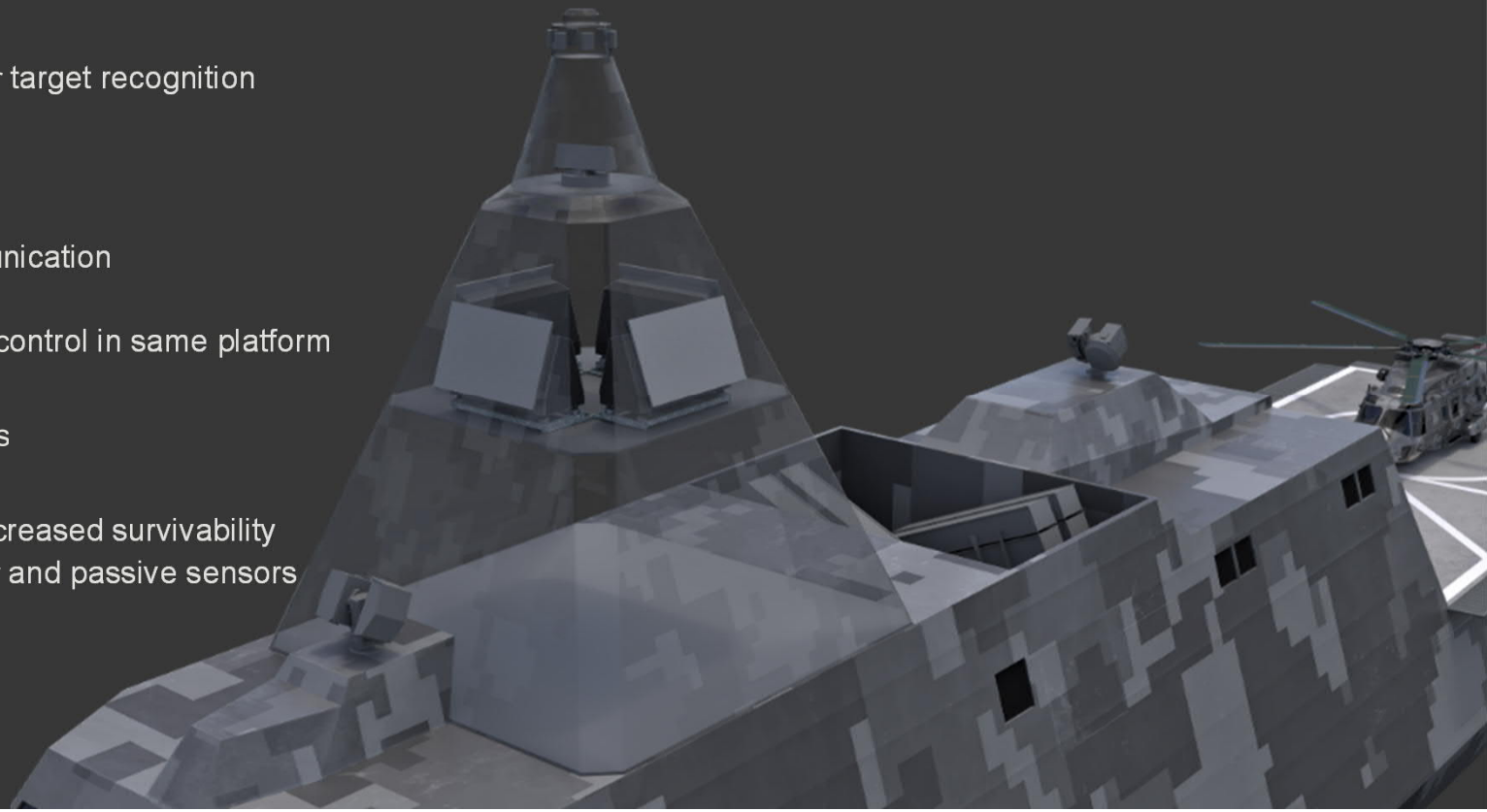
Radar - where we're going

- Software defined
  - Continuous upgrades, not just Mid Life Upgrades
  - Adaptation to emerging threats
    - Faster, Smaller
    - Swarms
  - Artificial Intelligence (AI) for target recognition
- Fixed panel radar
  - Hypersonic threats
  - Multi function
    - Point-to-Point communication
    - Weapon guidance
    - Surveillance and fire control in same platform
- Unmanned Platforms
  - Overcome terrain limitations
  - Increase survivability
- Emission control, EMCON, for increased survivability
  - Cooperation between radar and passive sensors
  - Multi static radar
  - LPI radar



Trackfire – remote weapon station

The family of Trackfire Remote Weapon Stations (RWS) builds on over 40 years of developing electro-optic fire control platforms for both the Land and Naval environments.

- Provides the hit performance required to engage threats effectively under all conditions
- Surveillance and Target Acquisition (STA) cycles are near instantaneous without the operator having to break visual contact with the Gunners Display (GD)

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Trackfire – remote weapon station

- A dual command facilitates shared capabilities, shorter response times and reduced sensor-to-shooter cycles
- Fully prepared for the integration into other platform systems
- A wide range of weapon effects (including complimentary solution such as Non-Lethal effectors) can be mounted
- For maximum crew protection, all Trackfire RWS operations can be performed from below armour or deck

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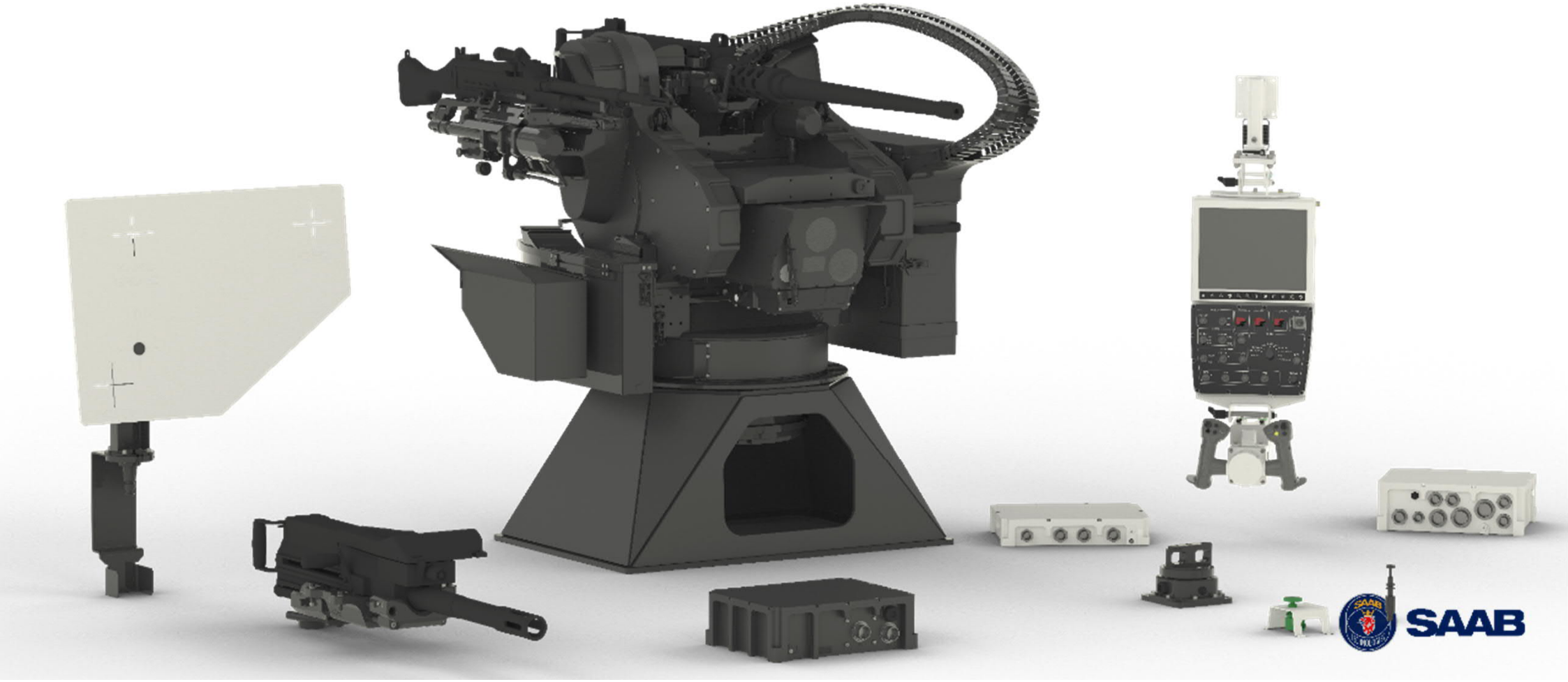
Trackfire – remote weapon station

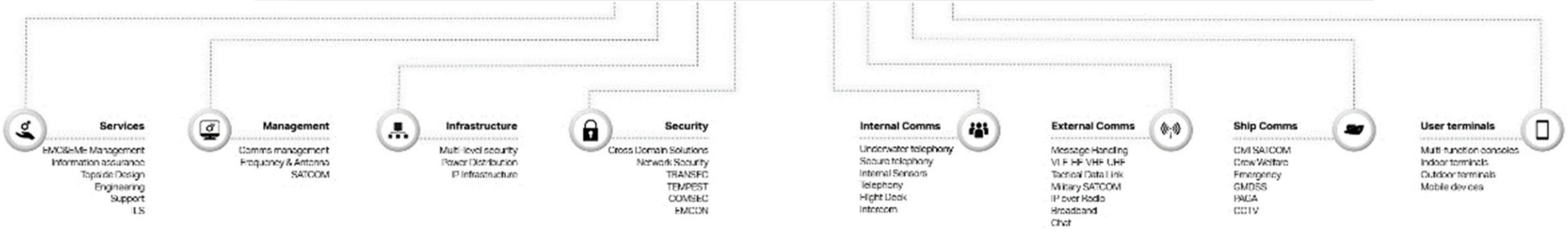


TactiCall Integrated Communications

- **“All Systems – One Interface”** – Scalable and modular **cross domain** integrated communications – including sensor and other **sub-system integration**
- **Internal & External Comms** – connect your staff across
- **System management** - centralized management of terminals, IP network, crypto, modems, radios and RF distribution

Modular & Scalable – system can be easily tailored to **match customer needs**

Easy to manage platform – control all communications from **single end terminal**



Naval Secure Communication

- **Approved & Certified** – multilevel secure VoIP communication, based on **COTS hardware and Common Criteria EAL5+**
- **Multi-level security** – fully secure system as the user terminals do not need to be directly hardwired with individual networks simplifying **red/black AND TEMPEST installations**
- Scalable, fail-safe and **redundant system architecture**
- **Cost efficiency** – TactiCall system can be easily upgraded to a multi-level secure system
    - **Unclassified**
    - **Coalition Secret**
    - **National Secret**

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Our Responsibility

A long-term approach is extremely important to us and in order to continue to create value in the long term, it is imperative that we operate in an environmentally and socially sustainable way.

We contribute to several of the UN's Sustainable Development Goals (SDG)

An important part of Saab's work to reduce its environmental impact is research and development collaborations aimed at creating sustainable solutions.

We take an active role to promote education and an interest in technology among children and young people.

We are committed to support each employee who stands up for our zero tolerance of corruption and refuses to compromise our ethical standards.

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