



Background stories Sea Giraffe

Naval Press Tour June 2, 2022



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

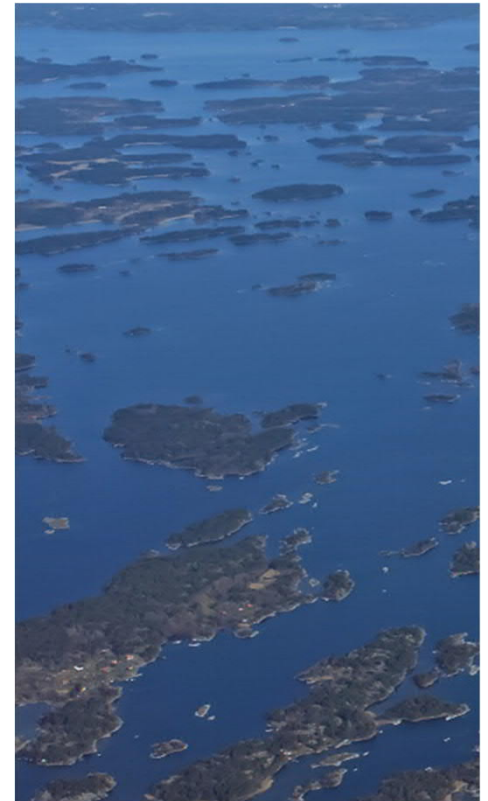
Snow, Ice and 200 000 islands

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 using the C-band for 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.



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



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 fast update rate and 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

Dual Sensor Solution

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

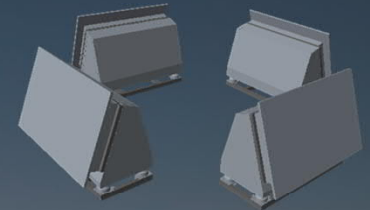
Key Features

- 360° coverage with an update rate exceeding 4Hz (Fixed Face Solution).
- 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



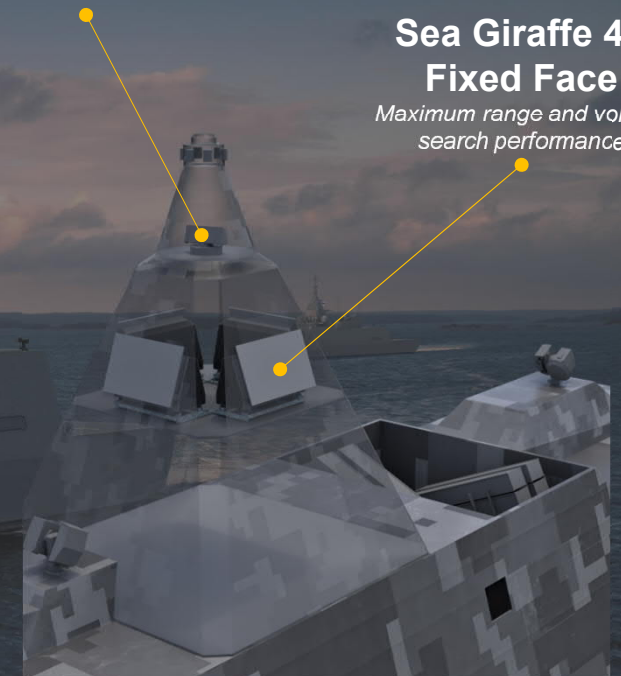
Sea Giraffe 1X

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.

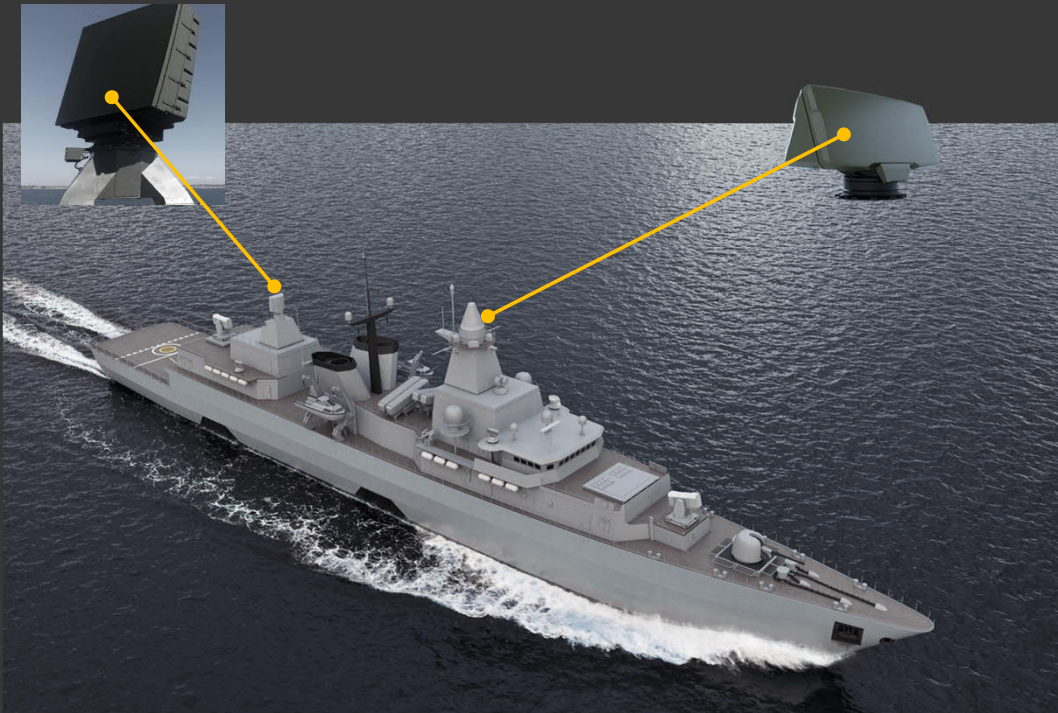
- **REDUDANCY**

Full Self-Defense redundancy to secure ship survival

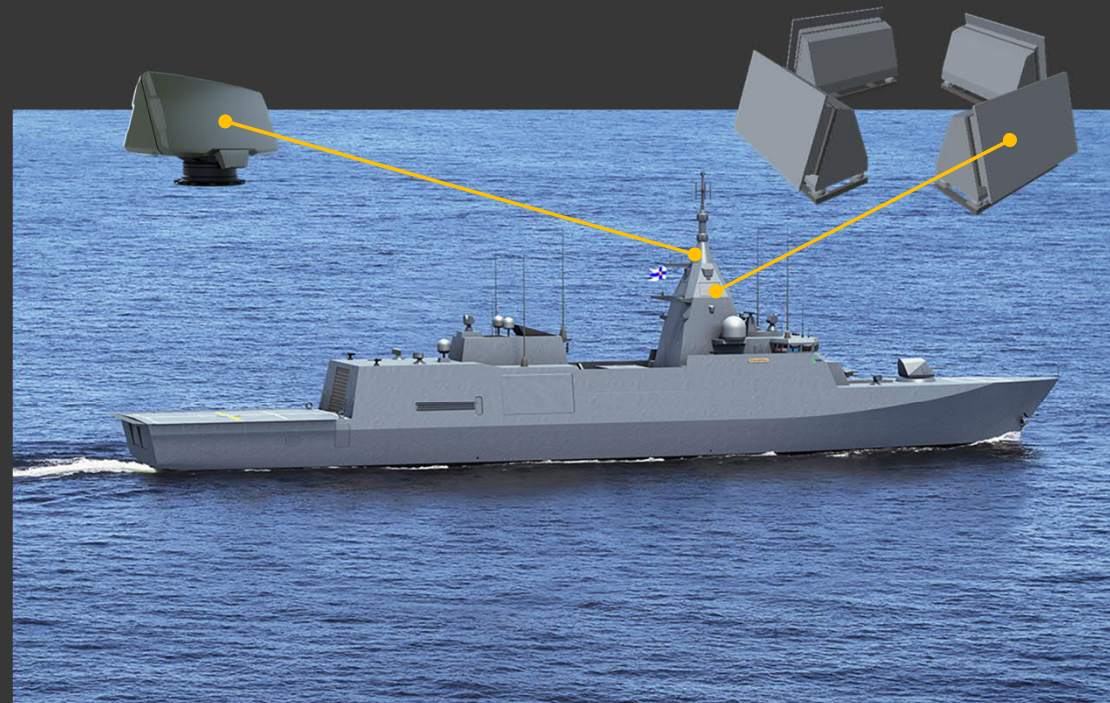
- **FOOTPRINT**

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

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

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.

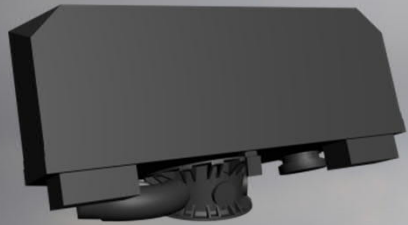
The Sea Giraffe 1X is useful at short distances with its very short inner blind range and makes it ideal for ship-controlled helicopter approach (SCA) and UAV operations with tracking capability to less than 100 meters from the radar.

The radar is designed with a focus on supportability and ease of use under operational conditions, with minimum maintenance and training requirements which minimizes Life 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.

K22



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.

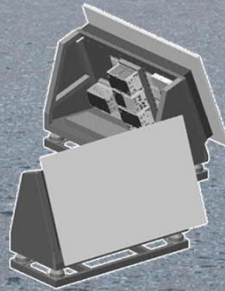
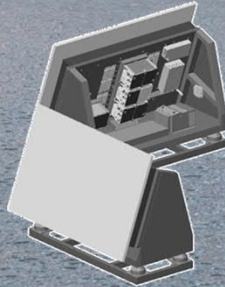
An array of antenna elements powered by a Single transmitter. The feed current for each antenna board passes through a phase shifter, controlled by a computer that forms the radar lobe.

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



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.

Hypersonic Detection Mode

Time to act when every second counts

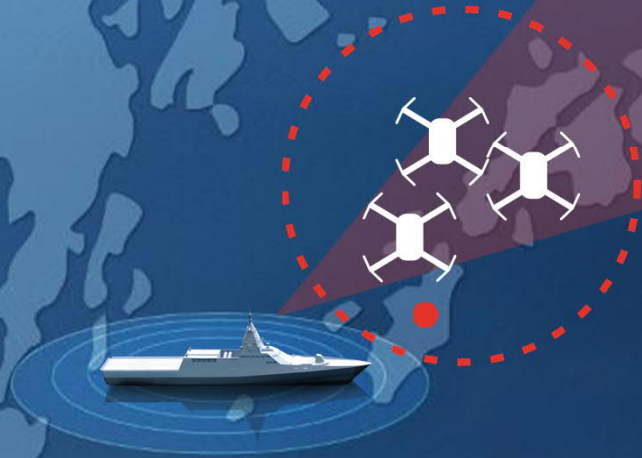
- Next generation track while scan enables early detection and tracking of all threats even in a cluttered and jammed battlespace
- By processing the entire search volume several times per second our solution secures detection of all target speeds – even hypersonic
- HDM will provide more time to act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



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Drone Tracker

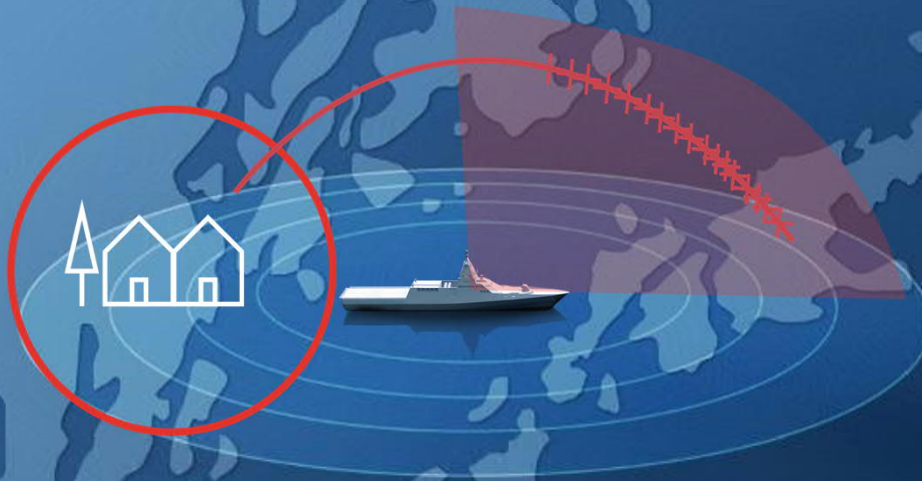
- Challenge: Separate birds from drones
- Detects small UAVs at a significant distance
- Classification algorithms indicates UAV-probability
- Alerts the ship's CMS to initiate countermeasures



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.

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

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.

GlobalEye – A Multi 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

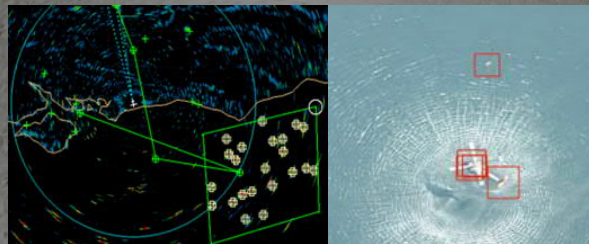
One solution – multiple roles



Air Domain

Air targets of all types and sizes;

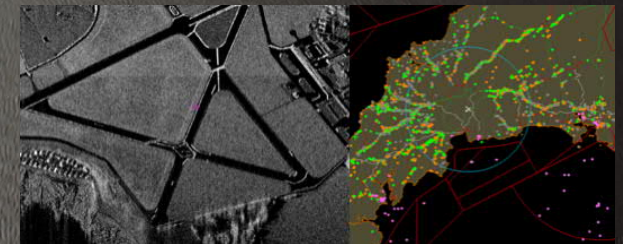
- 5th Gen fighters and very low RCS targets
- High speed, hypersonic and high energy targets
- Small and slow e.g. cruise missiles and microlights
- Helicopters, including hovering



Maritime Domain

Sea targets of all types and sizes;

- From largest targets down to jet-ski (200 nm) and periscope size (80 nm)
- High performance in littoral (archipelago) and open water



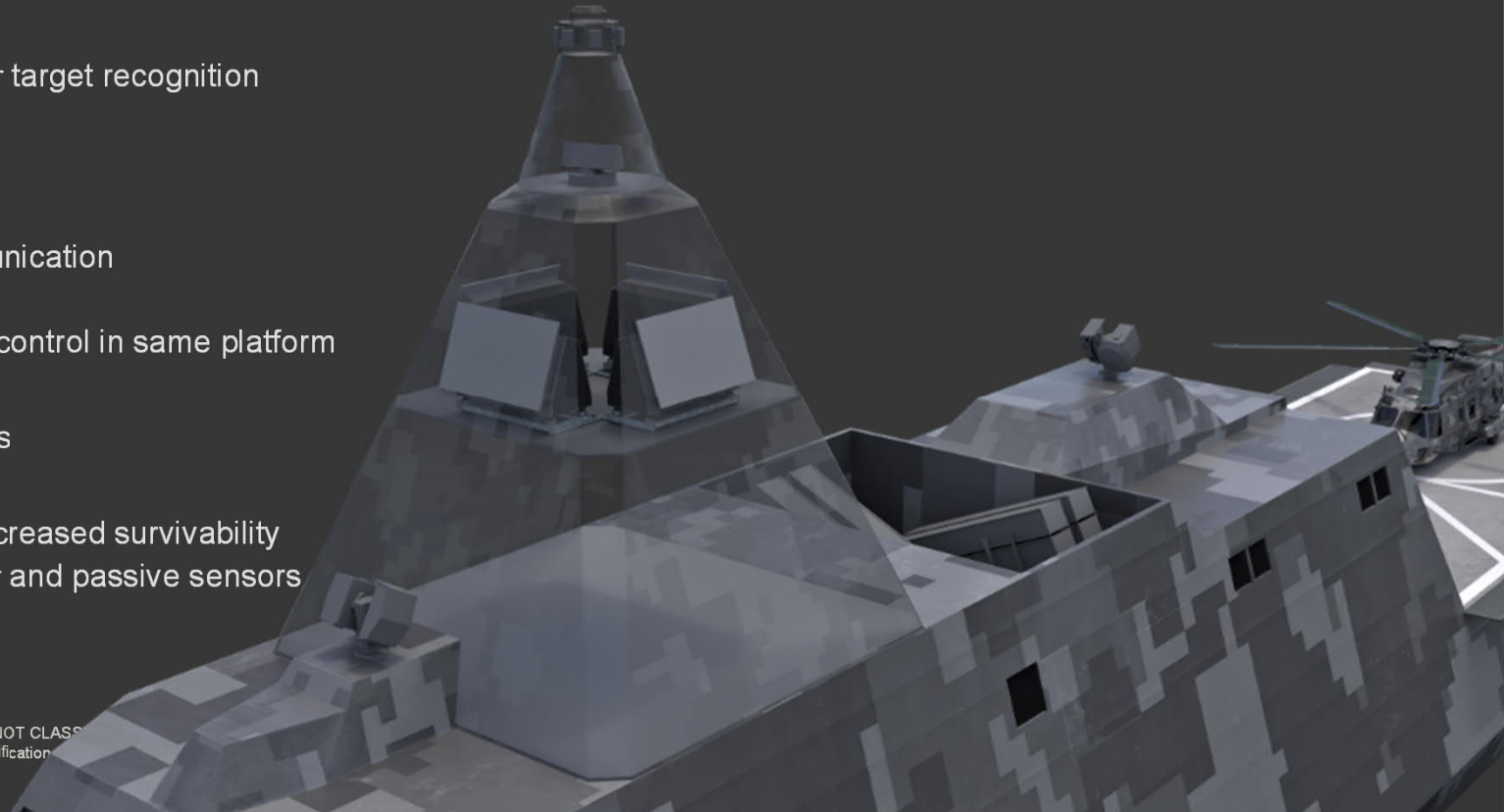
Land Domain

Long range target detection;

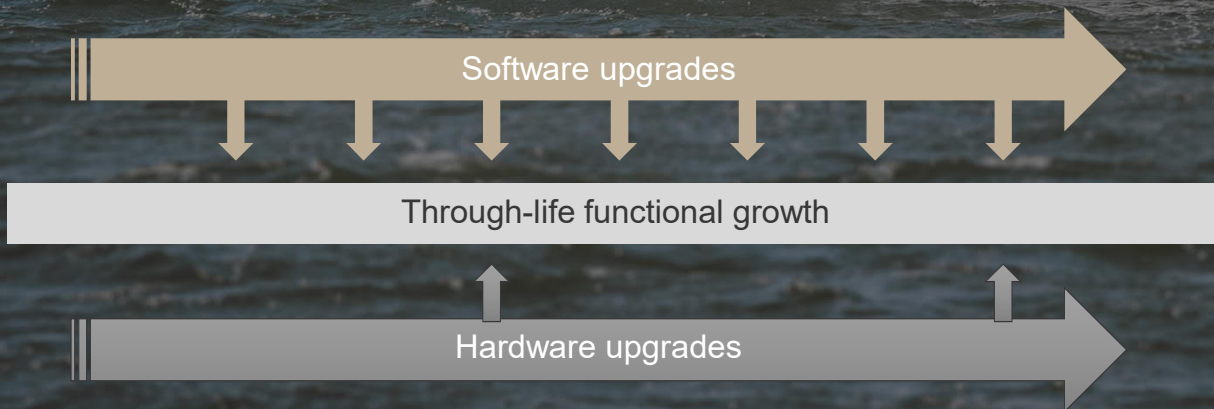
- Wide area GMTI – from largest targets down to small 4x4
- SAR imaging

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



The power of software defined capabilities



- Continuous deployment of new functionalities
- Short lead times to operational implementation through spiral development
- Enabling multi-function, multi-domain

Thank You!
