



SPIRAL DEVELOPMENT OF RADAR AND ELECTRONIC WARFARE RF SENSORS

It's about Critical Mass

*Co-funded by FMV, EDA/FMV,
NFFP/Vinnova/FMV/Swedish Armed Forces, Vinnova*

Fredrik Wising, Ph D, Strategic Portfolio Manager
Solna, Oct 11, 2016
FT2016 – Presentation C1-25279



GOTHENBURG

A LEADING EUROPEAN MICROWAVE REGION. SPIN-OFF AND SPIN-IN.



CHALMERS
UNIVERSITY OF TECHNOLOGY



Chalmers University of Technology



SAAB

SP Technical Research Institute

ERICSSON



Electronic Defence Systems

RUAG

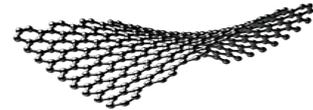


Microwave radios, base stations,
R&D units design & antennas

Satellite communication & sensing

Industrial applications

Many more (Huawei, Bluetest, Omnisys, Wasa, Qamcom,
Medfield, Norse etc)

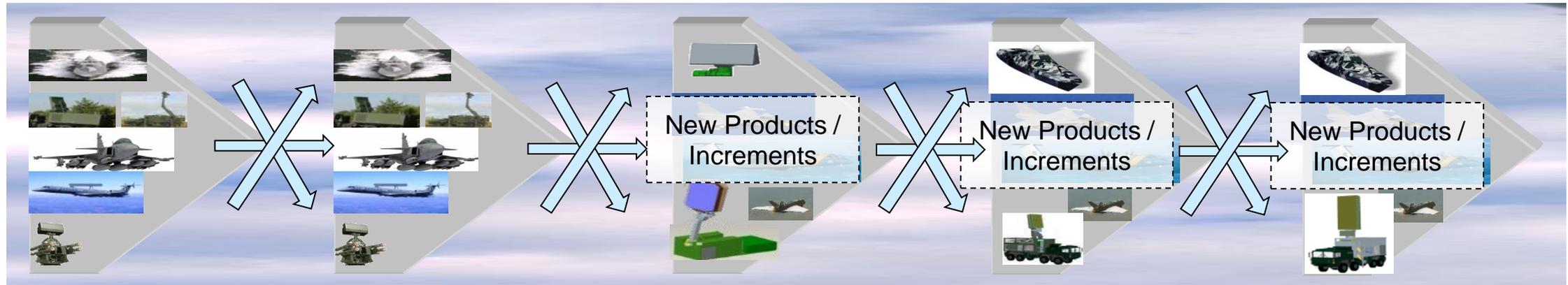


FROM ASYMMETRIC TO MODERN THREATS



SAAB SENSOR DEVELOPMENT

Products and Product Generations

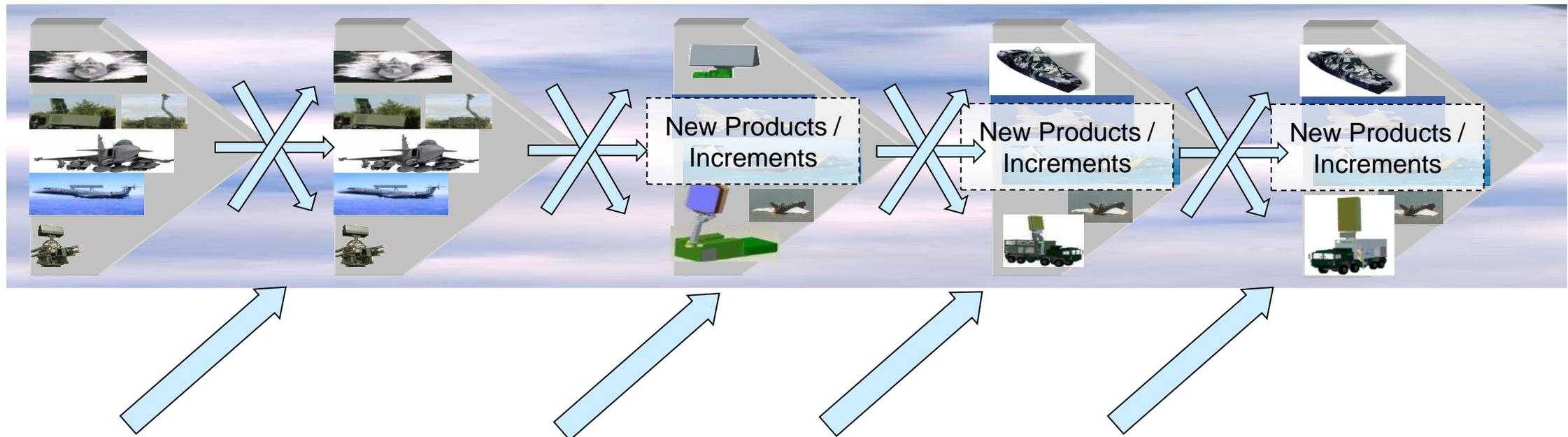


Spiral development
Modularity
Reuse

WITHIN and BETWEEN products

SAAB SENSOR DEVELOPMENT

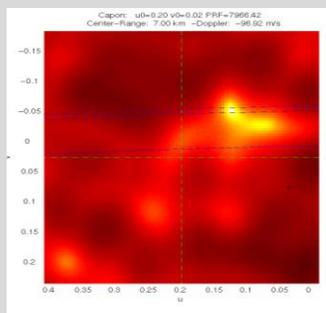
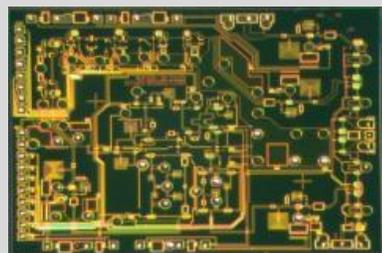
Products and Product Generations



- FoT & Demonstrators, EDA, e.g.
- NORA, MIDAS, GENA, M-AESA
 - EDA KORRIGAN, MAGNUS, ACACIA
 - El-o-Bygg, Radar, Telekrig

Supporting R&T Roadmaps and Programs
Technology and competence provisioning

TECHNOLOGY MATURATION WITH KEY PARTNERS



System Test,
Launch & Mission
Operations

System/
Subsystem
Development

Technology
Demonstration

Technology
Development

Research to
Prove
Feasibility

Basic/Applied
Research

TRL 9

TRL 8

TRL 7

TRL 6

TRL 5

TRL 4

TRL 3

TRL 2

TRL 1



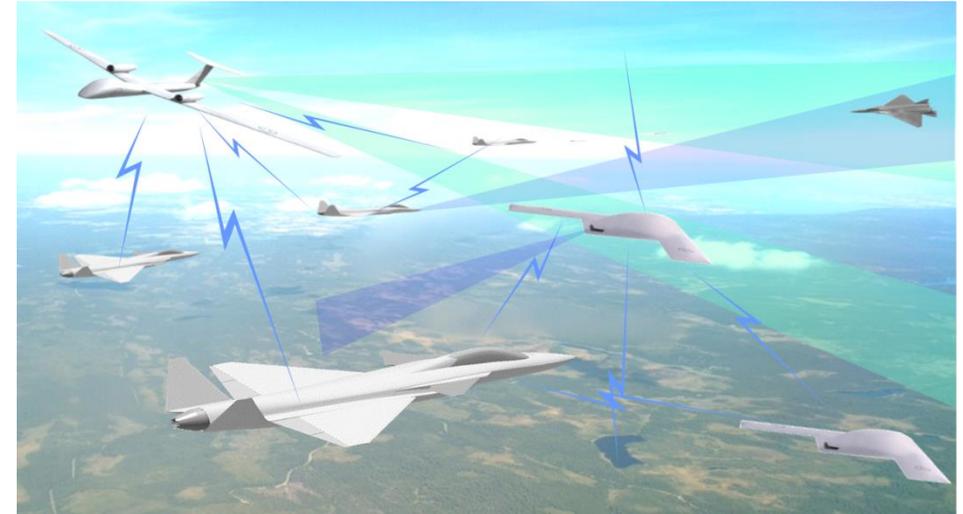
FFI Forsvarets
forskningssinstitutt
Norwegian Defence Research Establishment



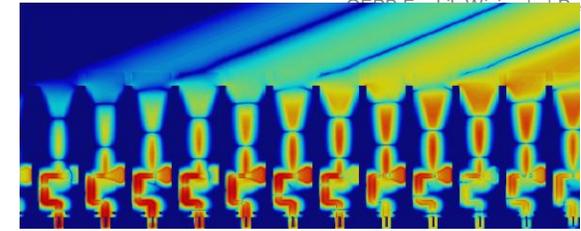
WHERE ARE WE GOING?

MODUS OPERANDI

- Methodology
 - Operational reqts & scenarios, CONOPS, Operational analysis
 - Sensors, Platforms and Systems-of-Systems concepts
 - Modelling & Simulations
 - Technology forecasting
- Domains
 - Air
 - Land
 - Sea



MODERN SENSOR TECHNOLOGY



**AESA with ~20
T/R-modules / Channels**

In Service since early 1990's



**AESA with ~200
T/R-modules / Channels**

In Service since late 1990's

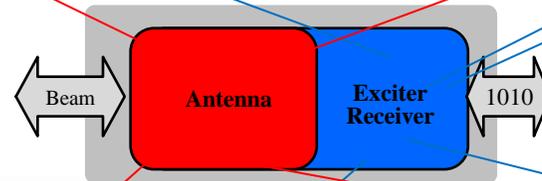
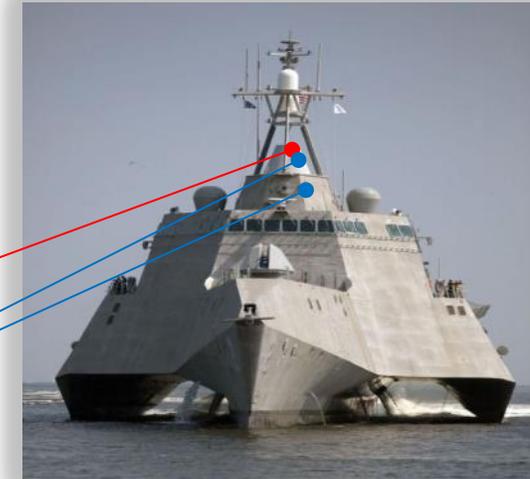
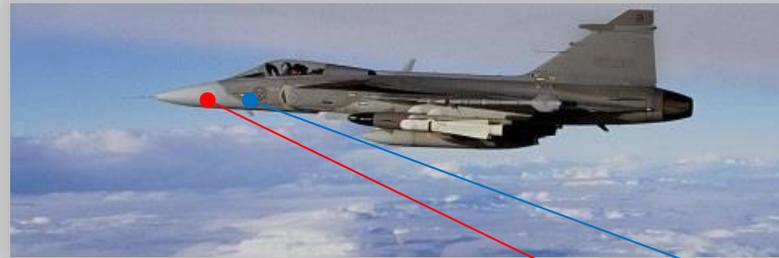


**AESA with ~2000 or ~4000
T/R-modules / Channels**

NOW

AESA AND MICROWAVE SYSTEM

COMMON DEVELOPMENT – CRITICAL MASS



GENERIC SIGNAL GENERATION

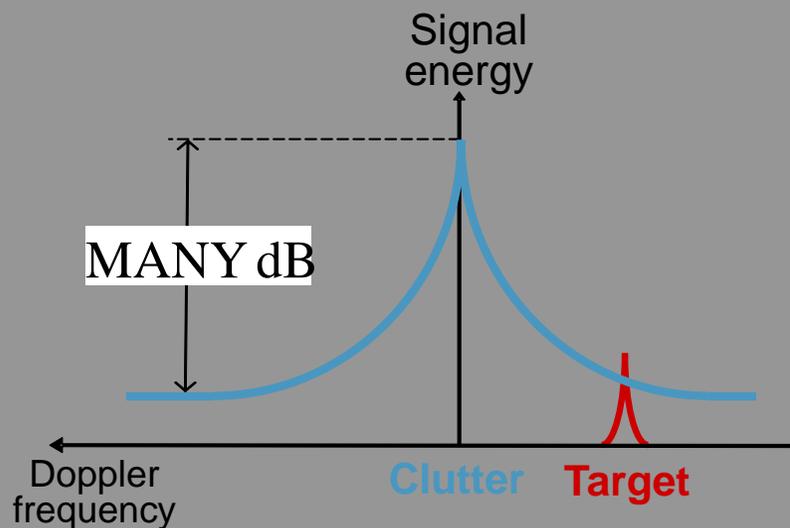
STATE OF THE ART

- World class - Ultra stable, High Doppler purity
- Detection of difficult targets, e.g. small and slow
- Spiral from R&T → Rig → AEW → GIRAFFE → GRIPEN



90% Generic

Doppler Radar Small target capability



MANY dB translated to human capacity



distinguish a bumble bee buzz in the presence of a jet engine roar

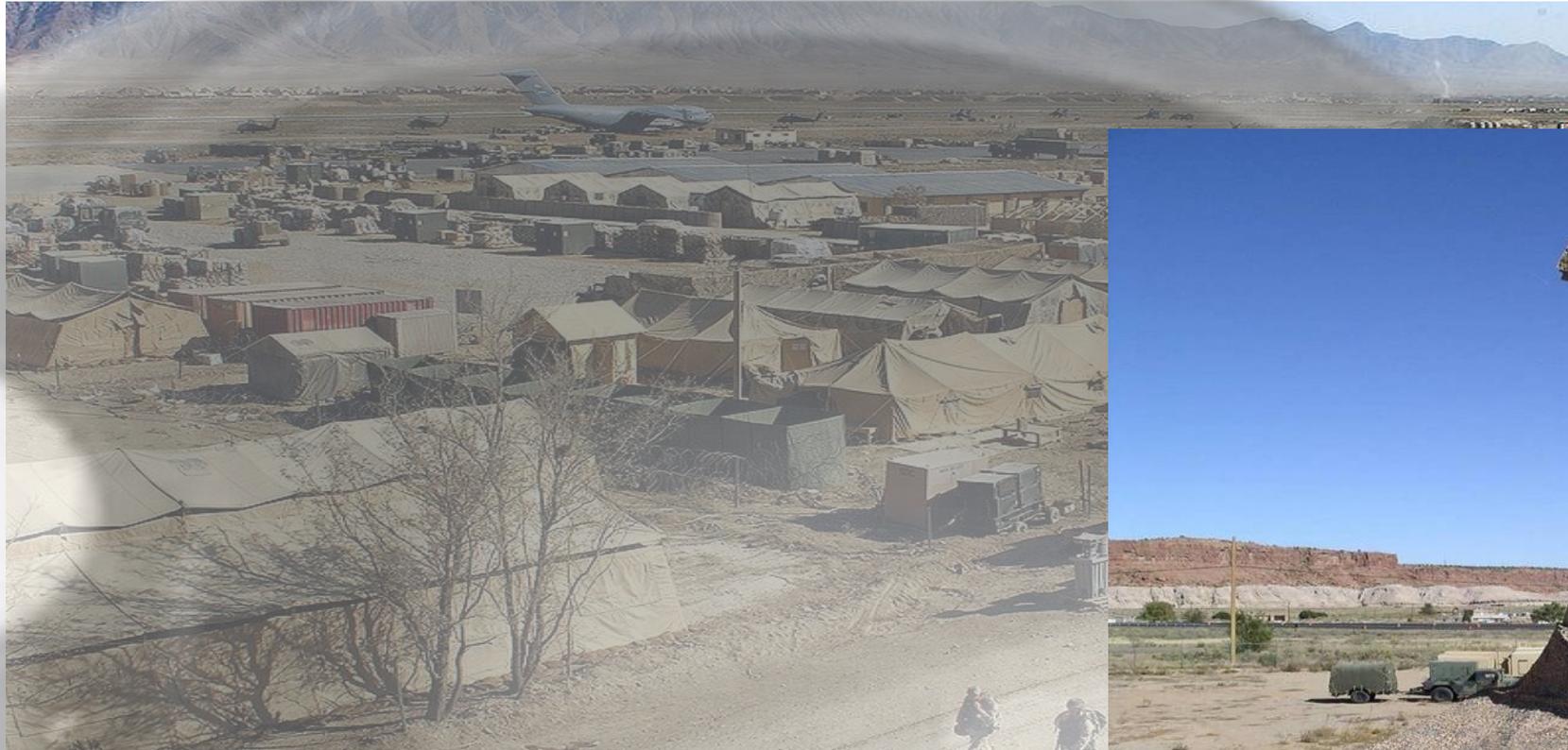


MANY dB translated to difficult targets



CAMP PROTECTION

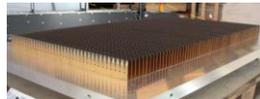
SAVING LIVES



AESA DEVELOPMENT



EU



Demo



FoT



Demo

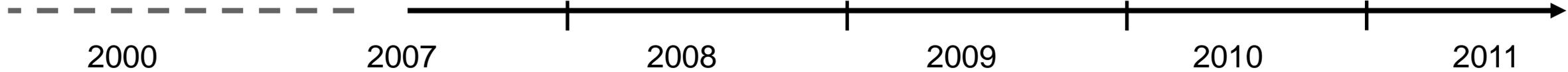


Demo



FoT

Product devpt



MICROWAVE MODULES

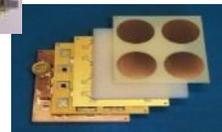
45 YEARS OF EXPERIENCE



Technologies in use for
missiles, radar and
electronic warfare products

Digitalization

GaN



1970s

1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

PROCESSING

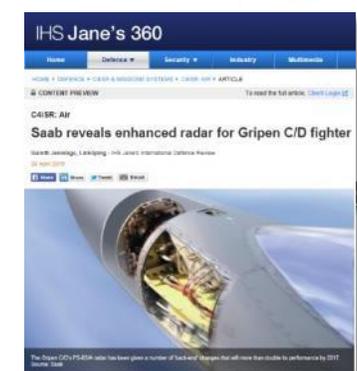
- Signal processing
 - Space Time Adaptive Processing
 - SAR, GMTI
 - Classification
- Data processing
 - Multiple hypothesis
 - Ballistic targets
 - Very small, low and slow targets in strong clutter, e.g. UAS among birds
- Sensor fusion
 - Primary radar, IFF, ADS-B, ESM, Nav, Adaptivity and sensor control, Single or multiple platforms



UNPARALLELED PARALLEL DEVELOPMENT

PRODUCT LAUNCHES 2013-2016

- Robust and rapid development of new AESA radar and EW based on long term synergistic Swedish development
- Roadmap based spiral development
 - Countering ever more difficult threats – Stealth, TBM, EW, radar
- Hallmarks
 - World Class – Affordable – Small Logistical Footprint



DIGITAL BATTLESPACE

SHEPHARD

Saab expands Giraffe radar family

13 May 2014 - 8:11 by **Beth Stevenson** in **Göteborg**

SEA GIRAFFE 1X 3D AESA X-Band	SEA GIRAFFE 4A 3D-C-Band	SEA GIRAFFE 4A 3D Full AESA S-Band
		
Maritime Security Operations Self defence	Multi Role - Medium Range Self defence	Multi Role - Medium/Long range Self defence

The SHEPHARD program includes the initial procurement of three engineering development model radars over a four-year period. Production systems are intended to enter service from the early 2020s, replacing the current AN/SPN-50 S-Band radar.

A request for proposals (RFP) for the AN/SPN-50V was released in September 2015. Saab USA's solution is based on a customized version of the Sea Giraffe AESA (AN/SPN-77) G-band radar. The AN/SPN-77A AESA S-Band version on board the independent variant of the Littoral Combat Ship. According to Saab, the AN/SPN-50V variant is adapted "to provide increased range as well as including the latest reliability improvements for the type".

The AN/SPN-50 S-Band project has been developed by NAVAIR's Naval Air Traffic

Introduced five new additions to its **Giraffe surface radar** family, including AESA for sea and land applications, the company has revealed.

During a media event in Gothenburg, Sweden on 12 May, the new systems include three land-based radars and two naval Sea Giraffe systems.

Saab SDAS USA

C4ISR: Air

Saab captures USN's next-generation shipboard ATC radar

Richard Scott, London - IHS Jane's Navy International
 27 September 2014

Saab Defence and Security USA has won the race to provide US Navy (USN) aircraft carriers and large deck amphibious ships with a new replacement air traffic control (ATC) radar.

The company was on 21 September announced as the recipient of a US\$200 million Engineering and Manufacturing Development (EMD) contract for the design, development, manufacture, integration, demonstration, and test of the AN/SPN-50(V) S-Band ATC radar system.

The EMD phase of the programme includes the initial procurement of three engineering development model radars over a four-year period. Production systems are intended to enter service from the early 2020s, replacing the current AN/SPN-50C radar.

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