Providing full-spectrum undersea warfare dominance from find to finish

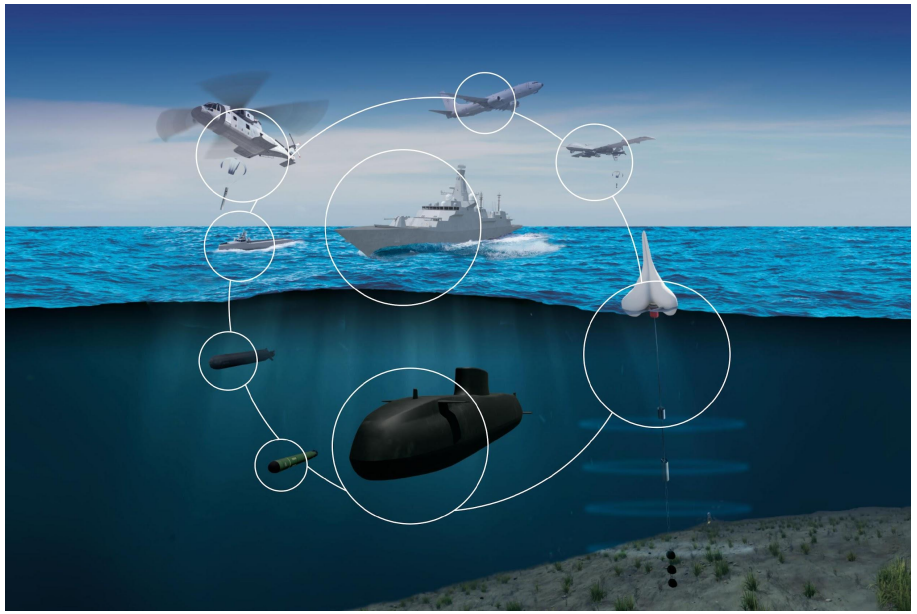
ULTRA MARITIME

Evolution of ASW Hull Mounted Sonar (HMS) Technology

A presentation for Combined Naval Event, Farnborough International E&CC
23 May 2023

Agenda

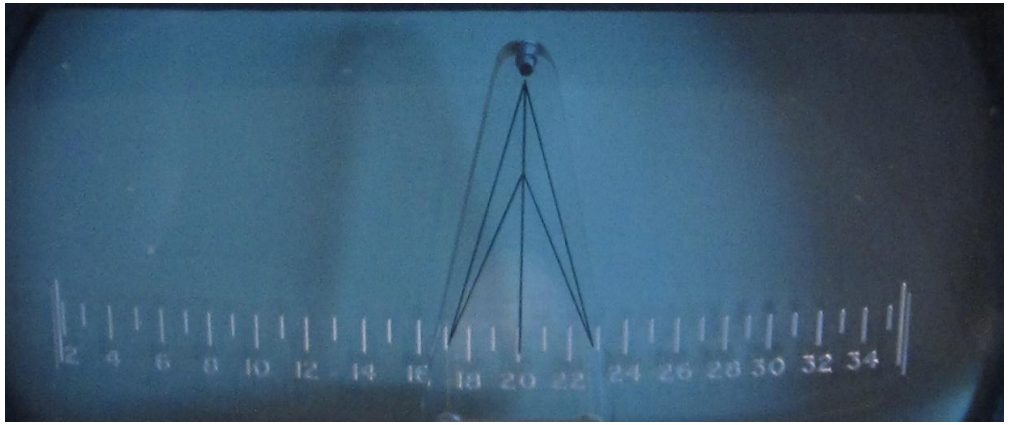
02	Ultra Maritime's capabilities
03	Evolution of high capability, low size, weight, power and cooling (SWaP-C), HMS for naval platforms
04	Deployment of interoperable HMS on the Global Combat Ship
05	Future HMS developments
06	Summary of HMS technology evolution
07	Exploitation of Maritime Uncrewed Systems



Quiz: Early Sonar Displays

Question 1

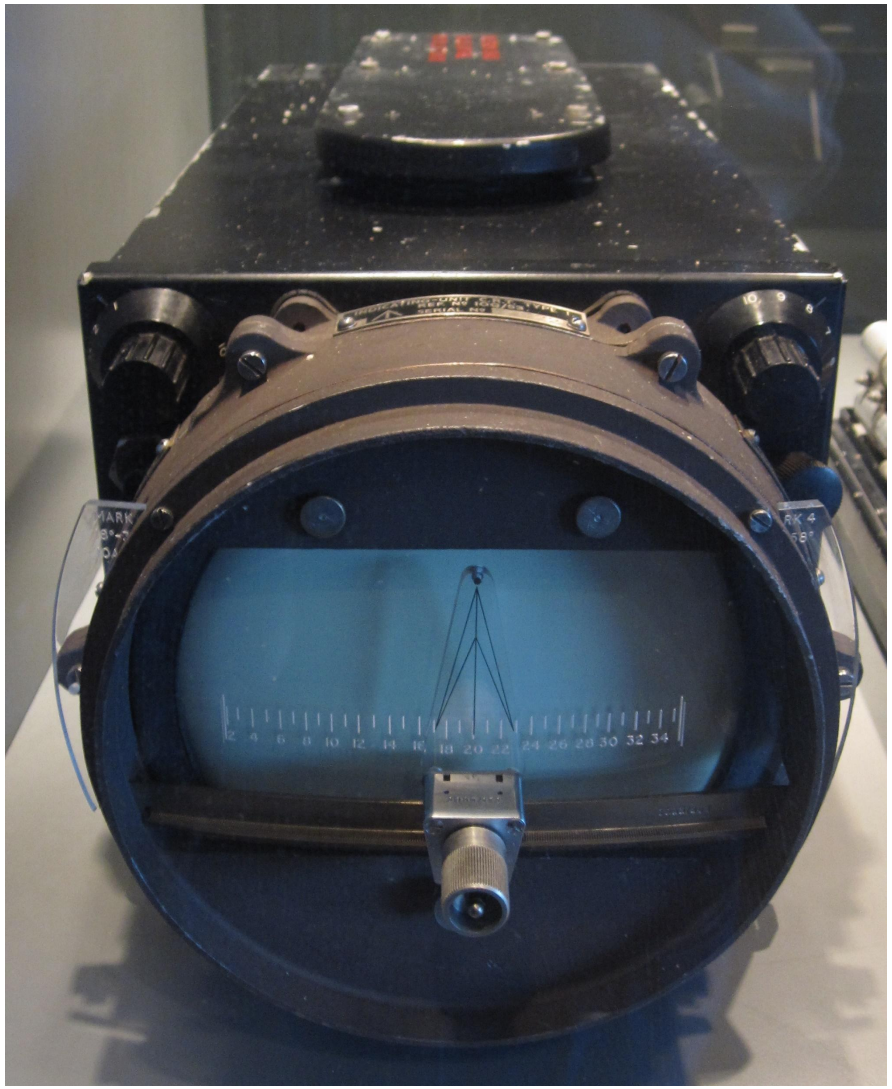
- Name: ?
- Date: ?



Question 1: answer

- Name: UK ASDIC chart display unit
- Date: 1944

ASD: Anti-Submarine Division'ics



Question 2

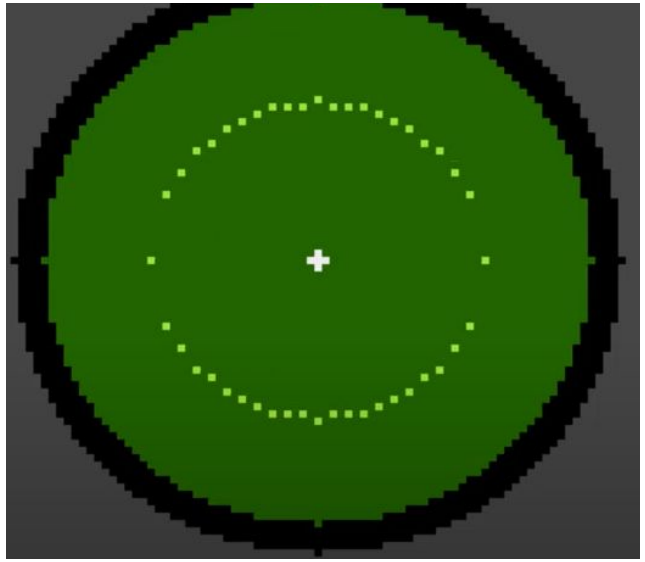
- Name: ?
- Date: ?

Question 2: answer

- Name: AN/BQQ-5 multifunction active/passive digital sonar system, IBM
- Date: circa 1990s

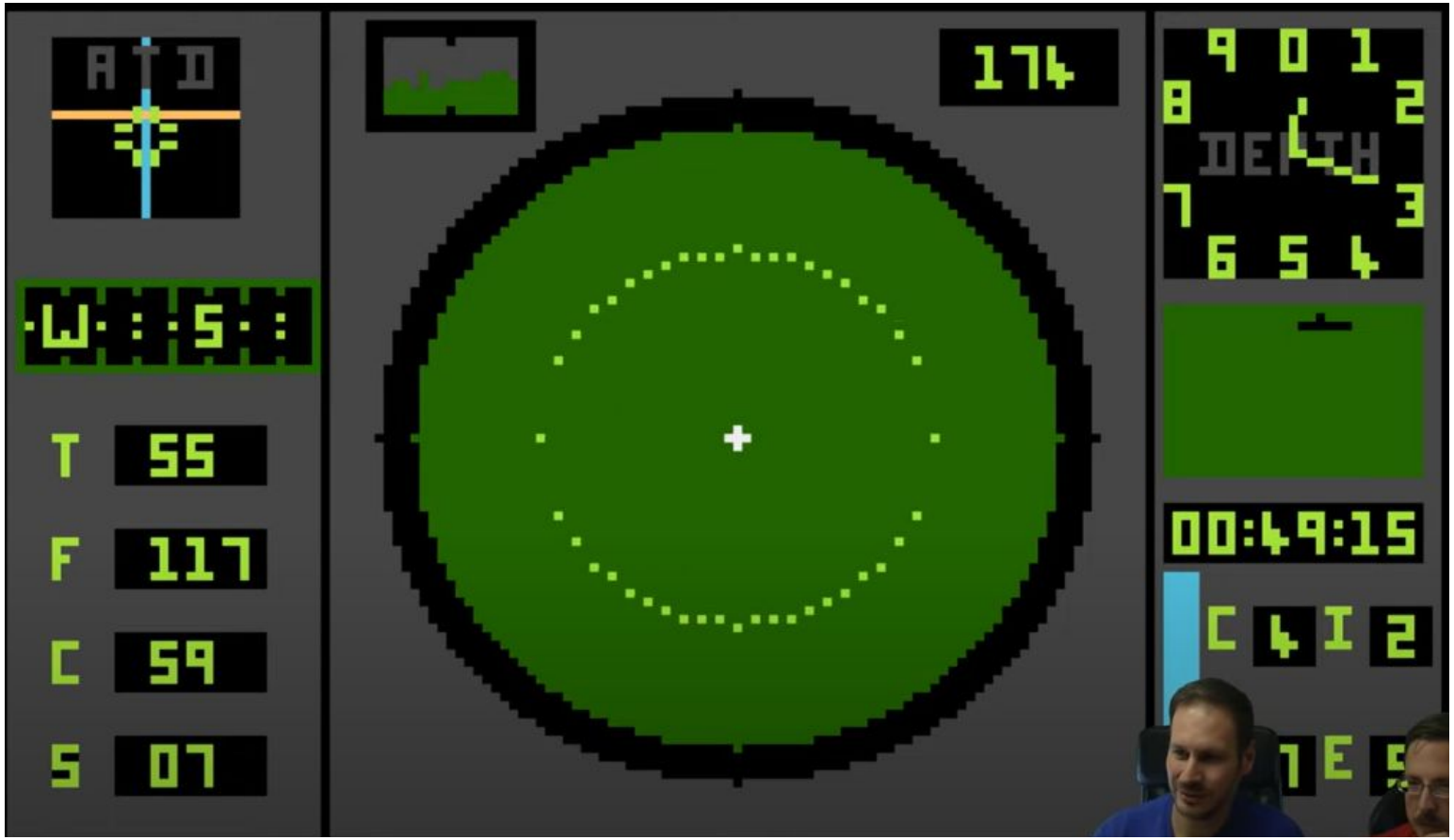
Question 3

- Name: ?
- Date: ?



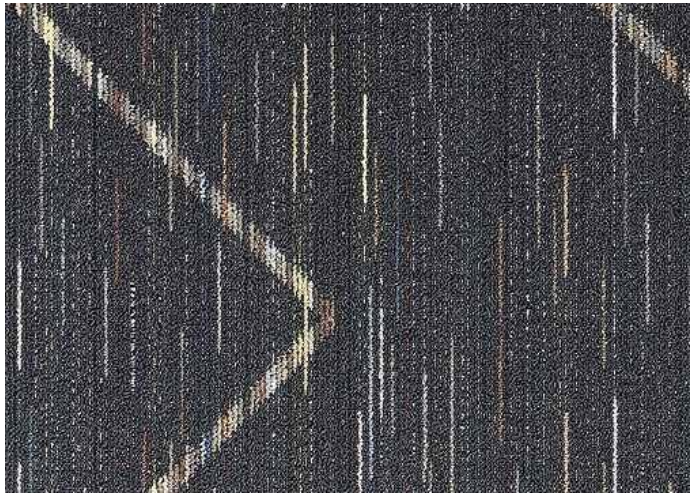
Question 3: answer

- Name: Submarine Commander #3, Atari, Creative Sparks, Sparklers, Thorn EMI Video Ltd.
- Date: 1980s



Question 4

- Name: ?
- Date: ?



Question 4: answer

- Name: Sea Breeze 585, Carpet Bargains.com
- Date: Available now

Ultra Maritime’s capabilities

Ultra Maritime capabilities

- Anti Submarine Warfare (ASW) sonar systems
  - Hull Mounted Sonars (HMS): bow or keel fit
  - Variable Depth Sonars (VDS): In-line and hard-body tow, inc. Mission Modules
  - Towed Arrays
  - Torpedo detection and defence systems
  - Distributed ASW
- Signature management, range systems & sensors
- Power conversion, control and motor drives

VISIT US AT BOOTH D23 TO DISCOVER MORE

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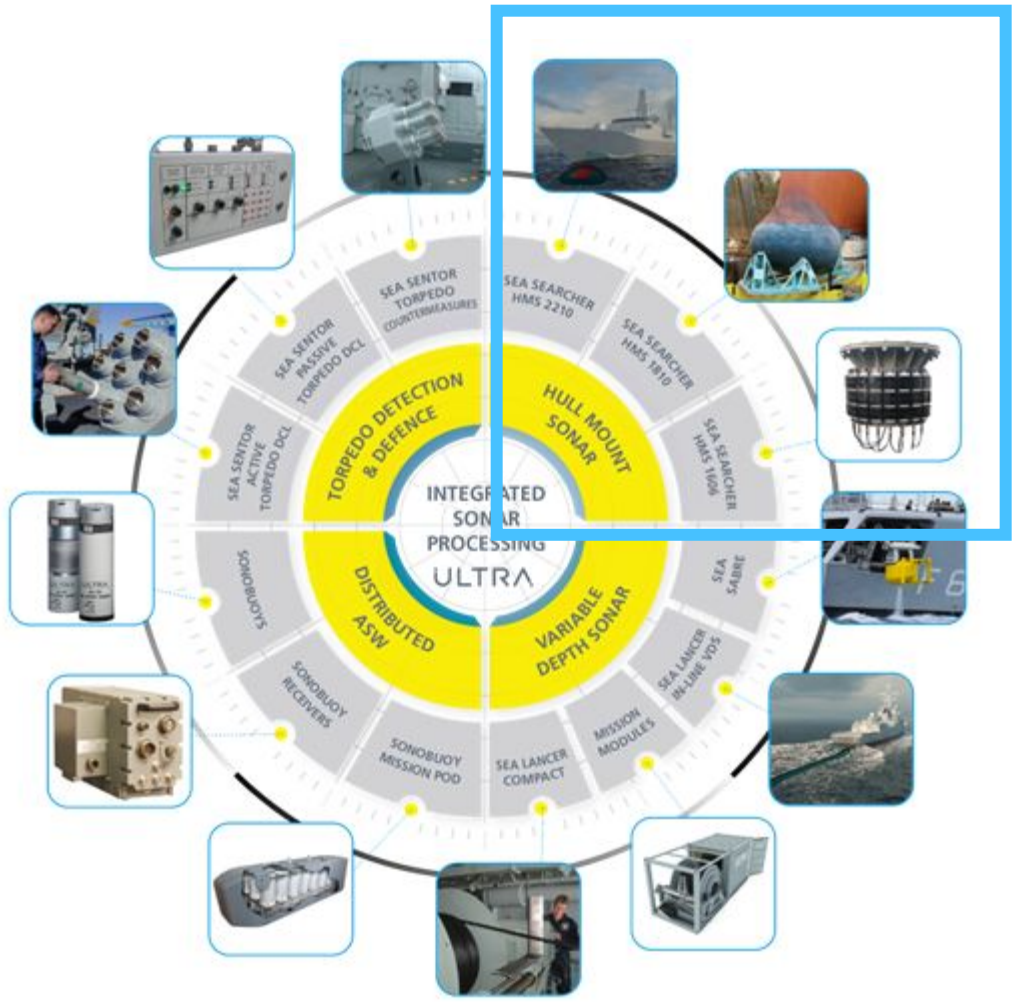

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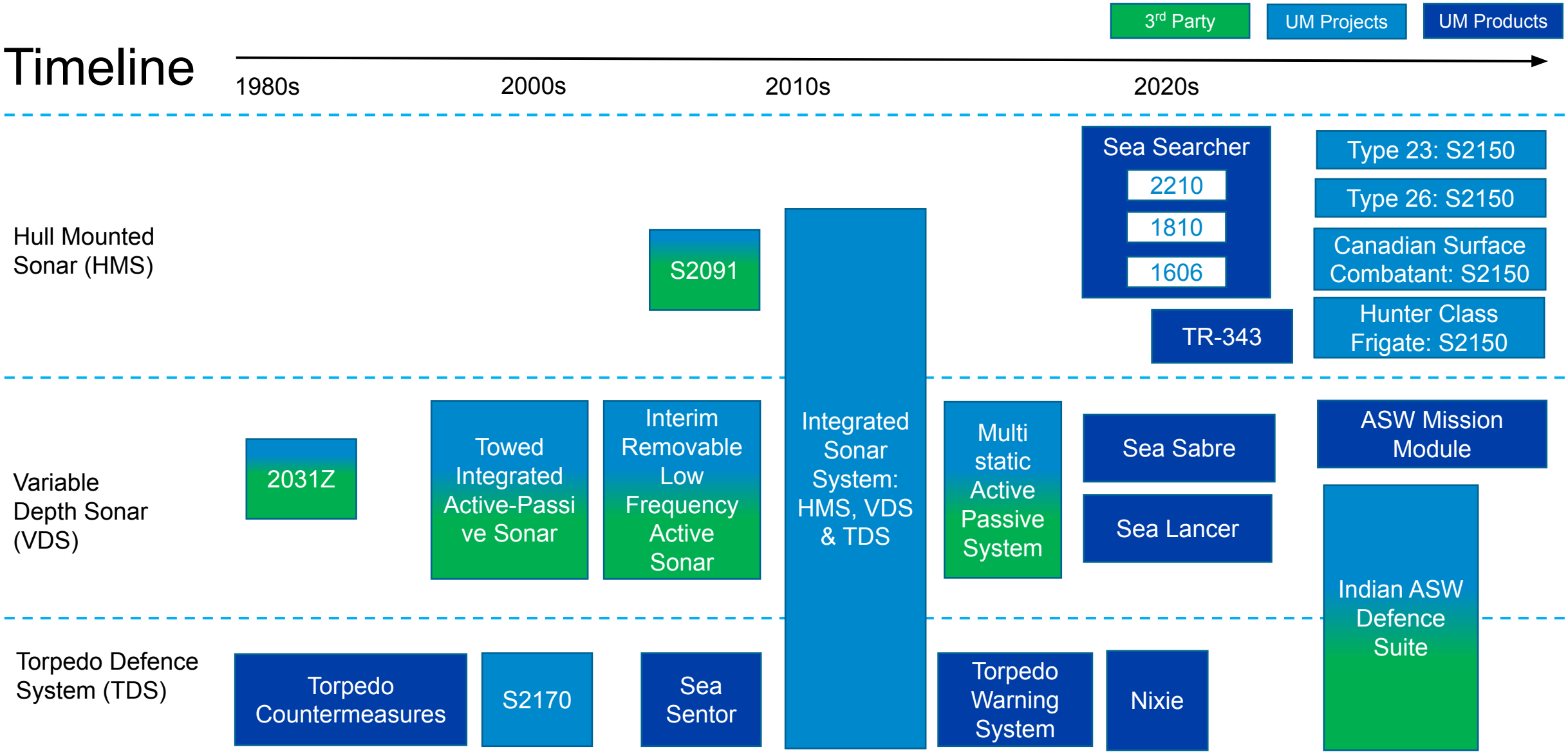
Evolution of high capability, low SWaP-C, HMS for naval platforms

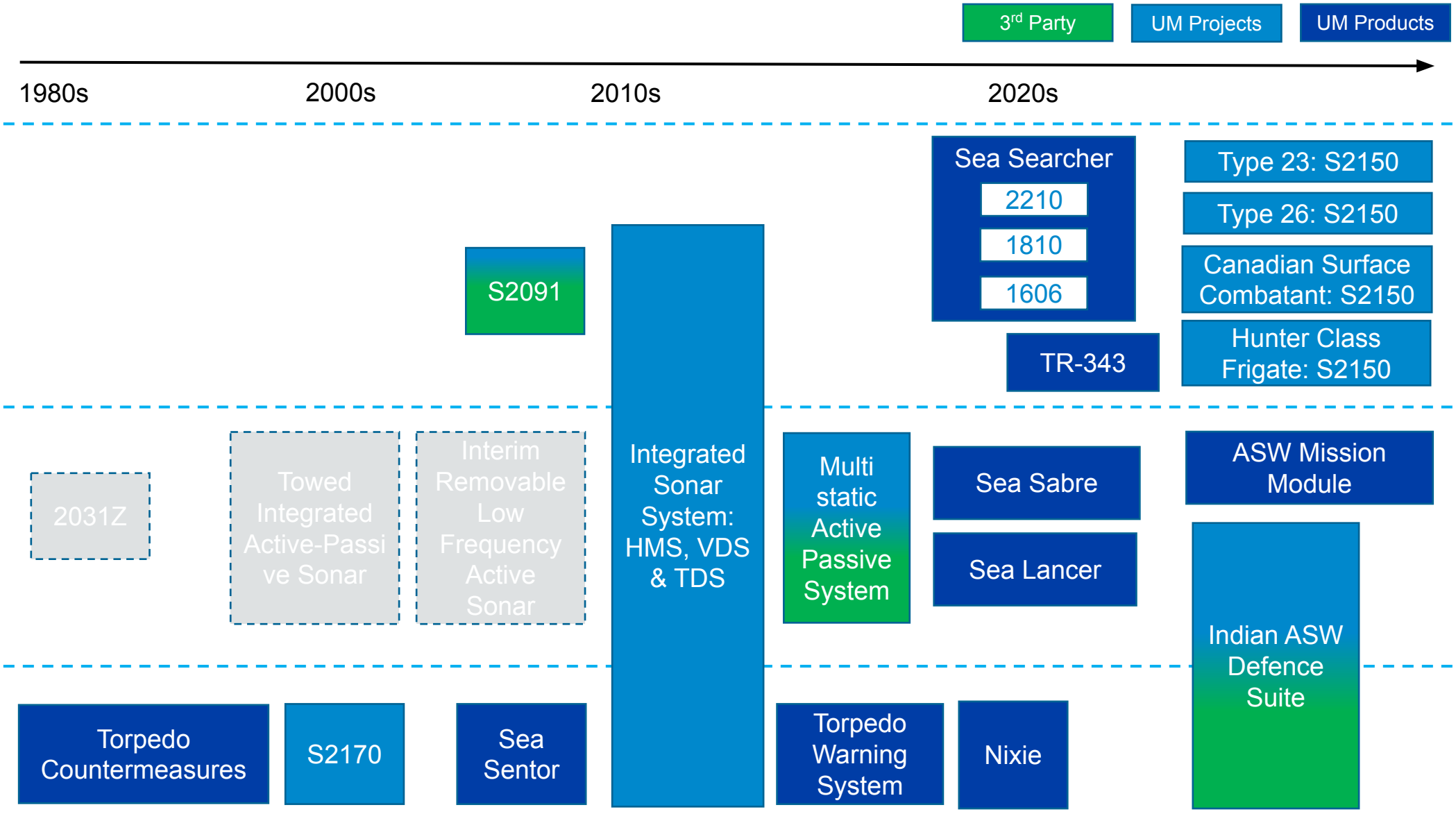
- the Ultra Maritime perspective

Timeline



Over 40 years experience of ASW and Torpedo Defence Systems

Timeline



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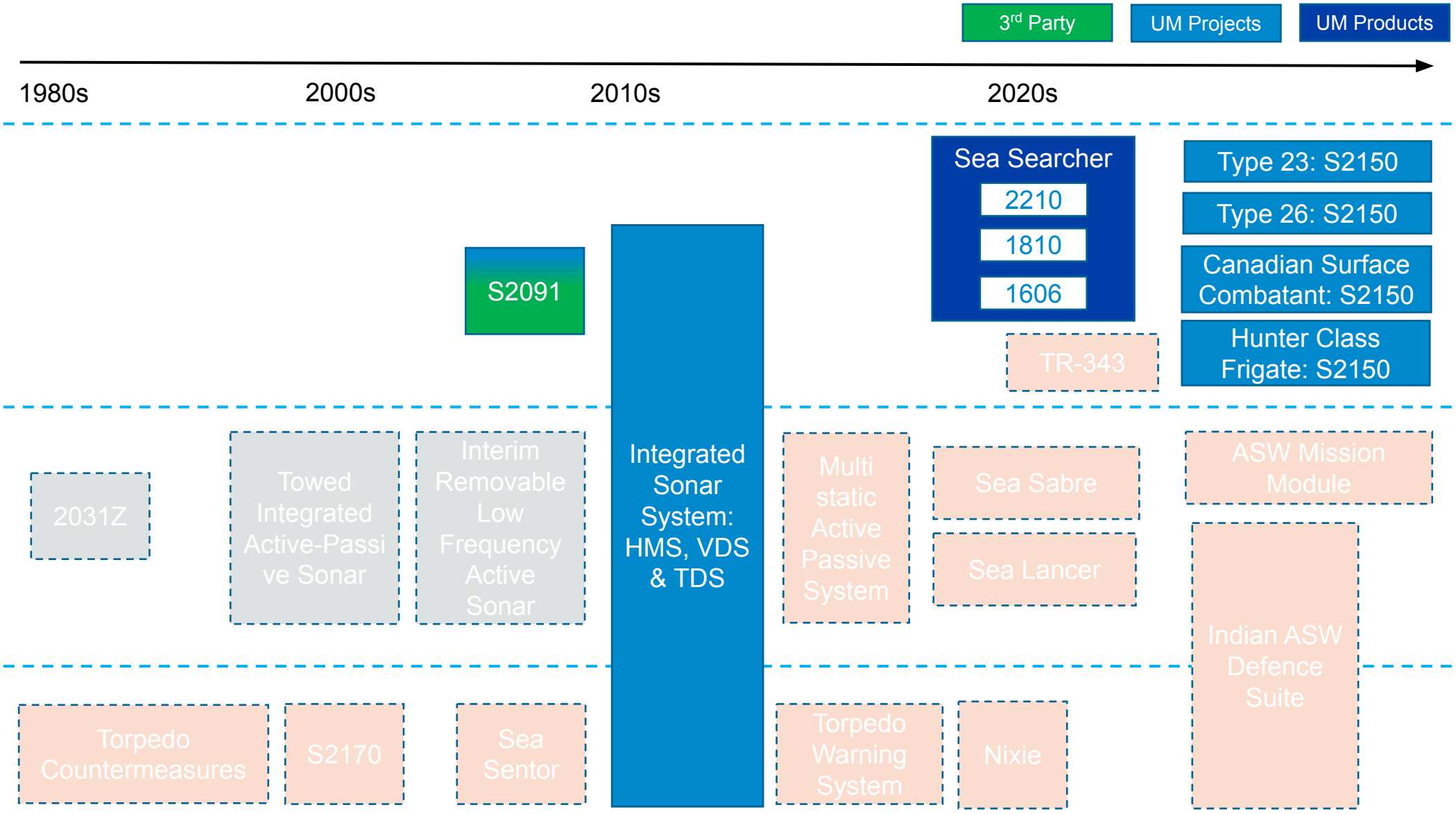
Timeline

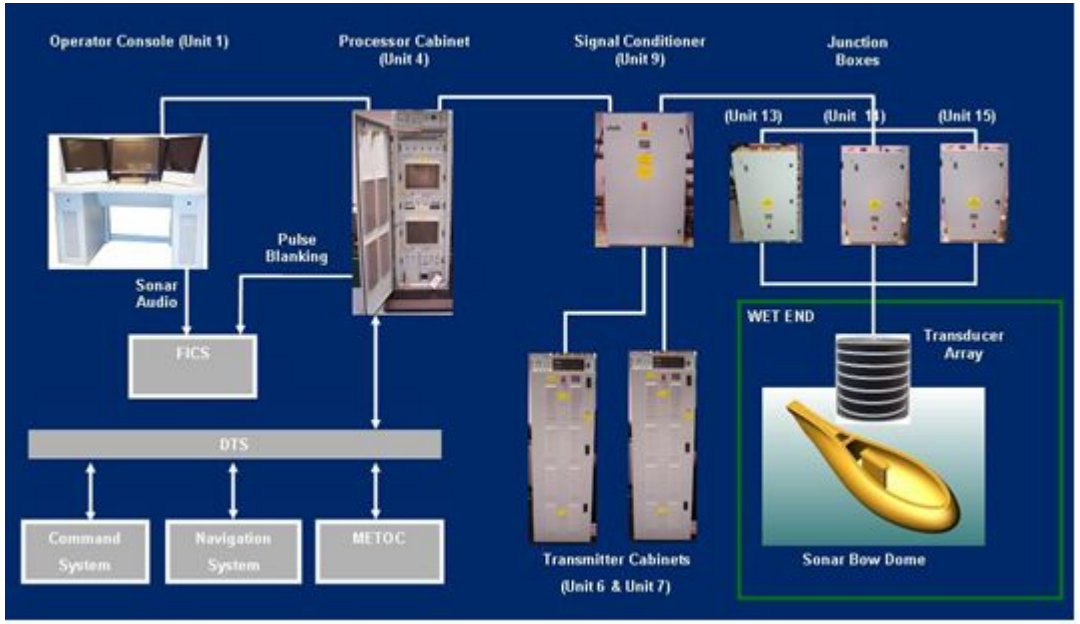


Over 40 years experience of ASW and Torpedo Defence Systems

S2091 Hull Mounted Sonar

- Ultra's first surface ship hull mounted sonar programme
- Decade: Late 2000s
- Platforms: UK Type 45 destroyer
- Capability: Tactical, Active & Passive ASW, Torpedo Detection
- Sensor: Analogue, cylindrical Tonpilz array
- Number of Cabinets: Seven
- Benefits: Full colour, high-resolution windowed displays, automatic classification and tracking, COTS processing technology
- Developer: EDO (now part of L3Harris) & Ultra Maritime
- Status: Fitted, but not in use

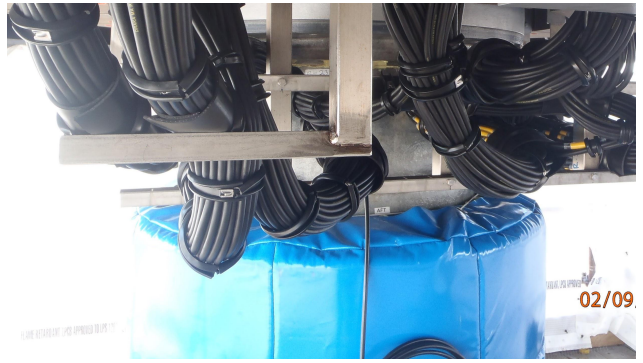
S2091 HMS array in protective jacket, pre-installation



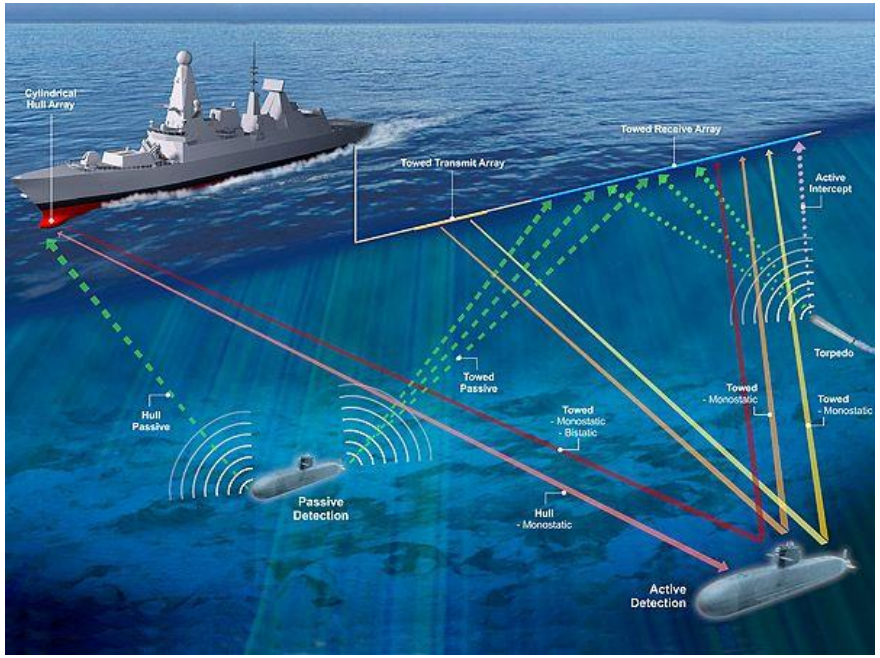
Our first hull mounted sonar programme

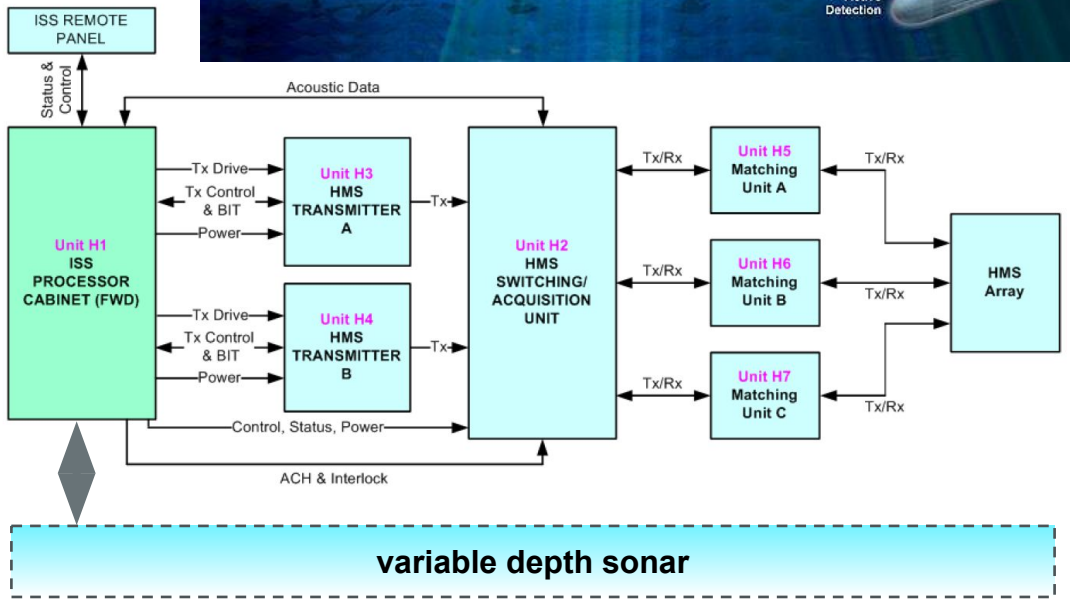
Integrated Sonar System

- Ultra's first integrated HMS, VDS and TDS
- Decade: Late 2010s
- Platforms: Australian Hobart class destroyer
- Capability: Tactical, Active & Passive ASW, Sea Sentor Torpedo Defence
- Sensor: Analogue, cylindrical Tonpilz array (plus in-line active/passive single tow sonar)
- Number of Cabinets: Seven (HMS only)
- Benefits: Fully integrated sonar, unified displays, tactical plan position indicator display, transmission optimisation
- Developer: Ultra Maritime
- Status: In service



ISS HMS array in protective jacket, installed

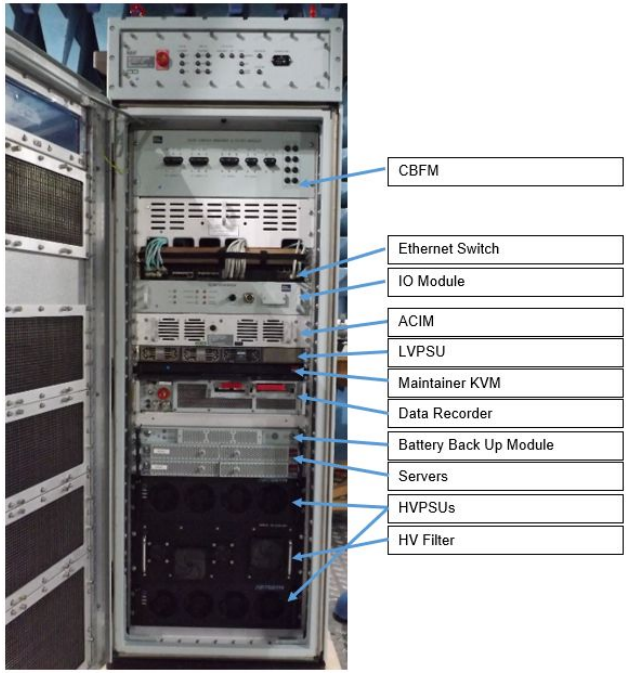


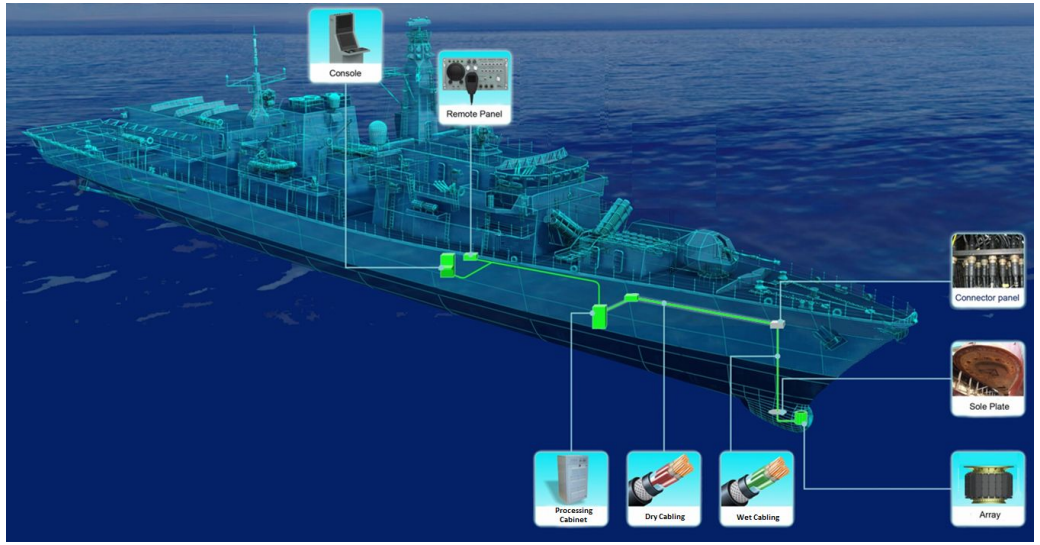


Our first fully integrated HMS, VDS and Torpedo Detection System

Sea Searcher HMS 2210

- Ultra Maritime's first digital HMS array architecture
- Decade: 2020s
- Platforms: UK Type 23 & Type 26 frigate
- Capability: Tactical, Active & Passive ASW, Torpedo Detection, built in Underwater Telephone and IFF
- Sensor: Digital, cylindrical Tonpilz array
- Number of Cabinets: One
- Benefits: Low SWaP-C, minimal installation and cabling, operator aids: chart overlays, behavioural classifier
- Developer: Ultra Maritime
- Status: In service as S2150 in UK, replacement to S2050





Our first low SWaP-C digital HMS array, with simplified installation and cabling

Deployment of interoperable HMS on the Global Combat Ship

Sea Searcher HMS: a global solution

S2150 contracts:

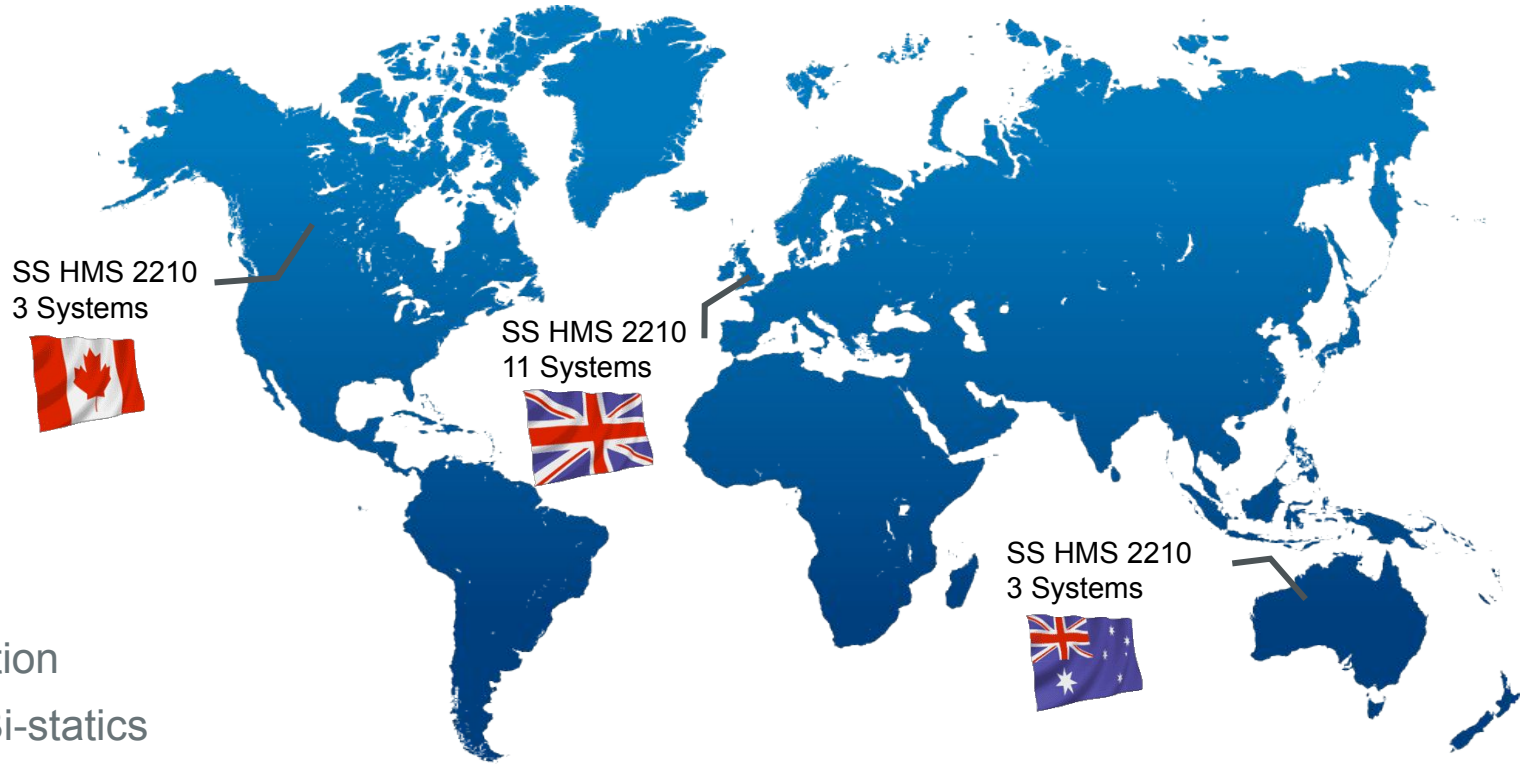
- UK Type 23 (QTY 8)
- UK Type 26 (QTY 3)
  - Potentially up to 8
- Canadian Surface Combatant (QTY 3)
  - Potentially up to 15

S2150 selected for:

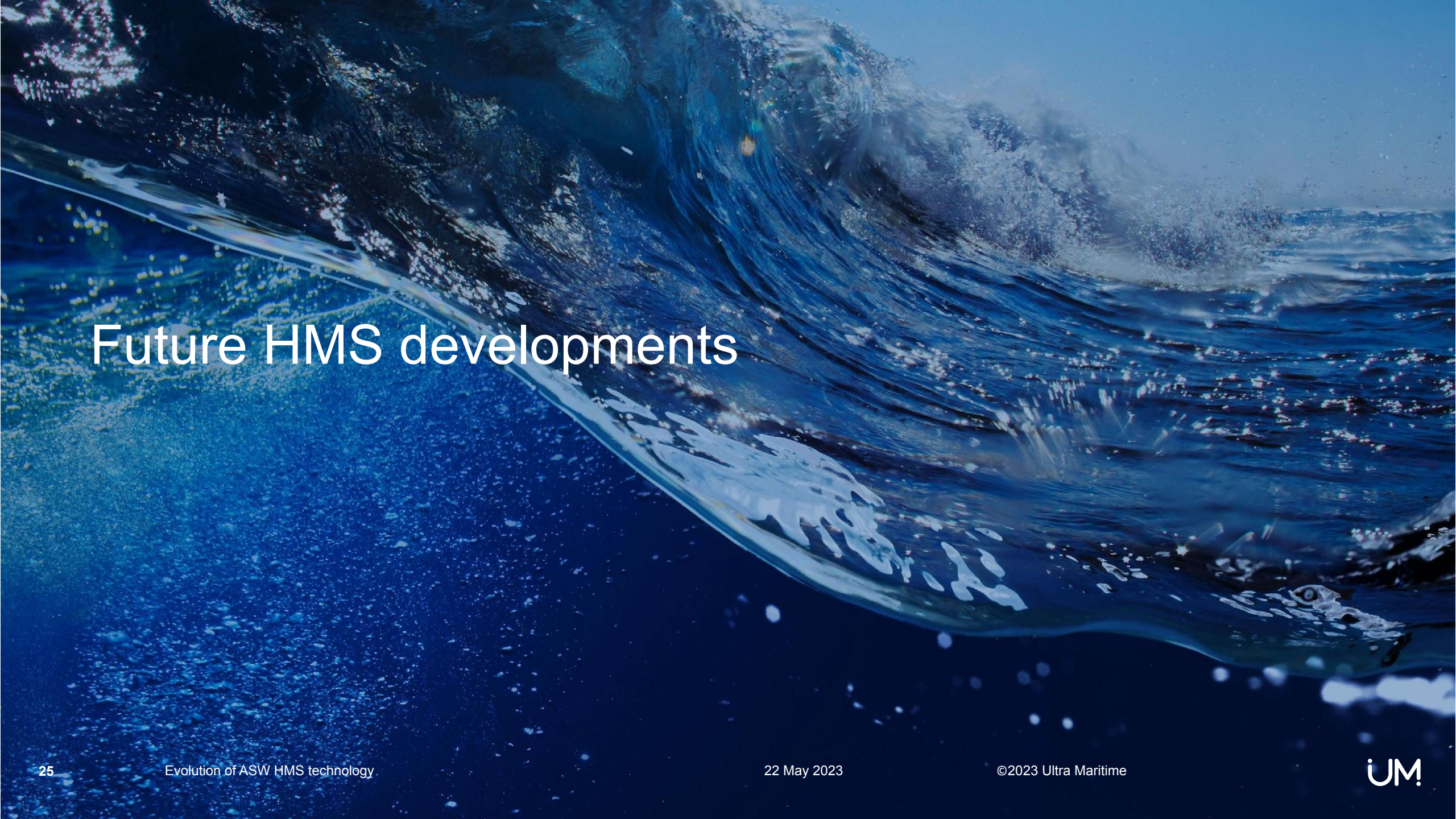
- Australian Hunter class frigate (QTY 3)
  - Potentially up to 9

Contracted to deliver:

- Marine Mammal Risk Management and Detection
- Hull Mounted Sonar to Variable Depth Sonar Bi-statics
- Digital Underwater Communications (data and/or voice)



Shared commonality between UK, Canada and Australia



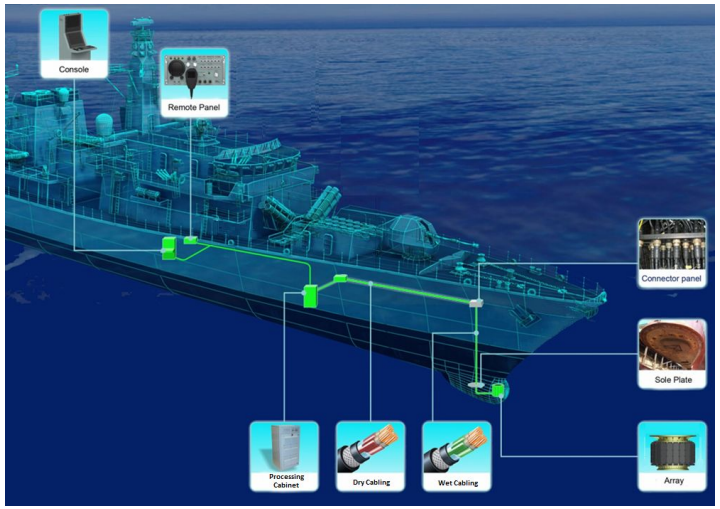
Future HMS developments

Sea Searcher product family

- Small: 1606 – for Frigates, Corvettes and OPVs
  - E.g. UK Type 31 / 32

- Medium: 1810 – for Frigates and Destroyers
  - E.g. UK Type 45 technology refresh

- Large: 2210 – for Frigates and Destroyers
  - E.g. UK Type 26; USA DDG(X) or Constellation class if fitted with HMS

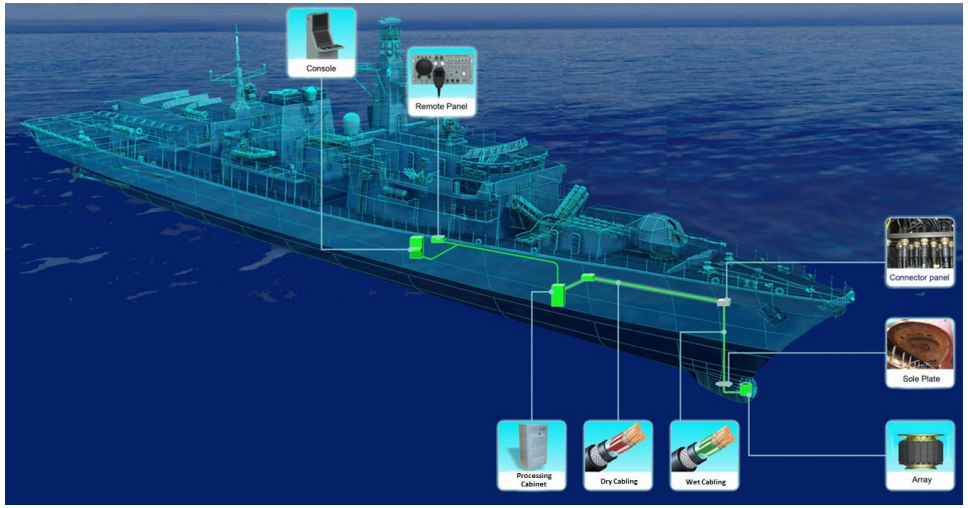


Outboard	HMS-2210	HMS-1810	HMS-1606
Array size (D x H)	1.64m x 1.44m	1.41m x 1.44m	1.24m x 0.92m
Array frame mount height	1.76m	1.65m	1.10m
Total weight	5050kg	3600kg	2012kg

Common architecture, three array sizes suitable a wide range of ships

Summary of HMS technology evolution

- HMS size, weight, power and cooling has evolved (versus ISS) without compromising performance
  - Inboard size reduced by 86%: 7 cabinets to 1
  - Inboard weight reduced by 72%: 1935 to 538 kg
  - Input power reduced by 37%: 70 to 44 kW
  - Wild heat reduced by 51%: 7.2 to 3.5 kW



- HMS have evolved to include
  - Improved sonar displays and operator aids
  - Full integration with variable depth sonar, inc. bistatic operation
  - Automatic torpedo detection, classification and localisation
  - Built-in underwater telephone and IFF

- HMS continues to evolve to include
  - Digital underwater communications
  - Marine mammal risk management and detection
  - Alternative array sizes for a wider range of ships

Exploitation of Maritime Uncrewed Systems (MUS) by Defence

Exploitation of MUS by Defence

- Blockers to large scale exploitation of MUS by defence
  - Requirements / CONEMP / CONOPS: how do they fit in to the wider ASW force?
  - Infrastructure: are the centralised facilities and resources available to support?
  - Platform capabilities: many aren't yet capable of completing an ASW mission
  - Interoperability: need for command, control and communication between them
  - Regulations: how do current regulations apply & and what is missing?
  - Intellectual Property: reluctance to share with competitors, especially on cutting edge
  - Security Classifications: makes things harder and prevents wider participation

- What can defence do to accelerate operational exploitation of MUS
  - Try doing things differently, just do it and learn from experience
  - Adopt an enterprise architecture: modular platforms with specialised & simplified payloads working as part of a wider group to achieve common objectives
  - Incentivise industry e.g. MoD Grand Challenge

- What can industry do to increase operational maturity of MUS
  - Just do it and learn from experience
  - Participate in think tanks and NATO Industrial Advisory Groups
  - Engage in wider collaborations rather than current partnerships

Sea Hunter

Medium USV

Large USV

Source: Cropped version of photograph accompanying Mallory Shelbourne, "6 Companies Awarded Contracts to Start Work on Large Unmanned Surface Vehicle," *USNI News*, September 4, 2020. The caption to the photograph states in part: "A Ghost Fleet Overlord test vessel takes part in a capstone demonstration during the conclusion of Phase I of the program in September." The photo is credited to the U.S. Navy.

Thank you!

Any questions?

Visit us at booth D23

Name	Role	Capability Area
Mark Kenny, RAdm USN (Ret'd)	SrVP, Strategy & Business Development	• Air, Surface and Subsurface ASW
Andrew Anderson	Chief Technology Officer	
Jeff Tupper	Sr Director, Strategy & Capture	• Airborne ASW
Tim Barnes	Sales and Marketing, US	
Gary Morgan	Sales and Marketing, UK	
Alan Meredith	Sales and Marketing, UK	• Hull Mounted Sonars • Variable Depth Sonars • ASW Mission Modules • Towed Arrays • Torpedo Defence
Rob Semmence	Product Manager, Naval Sonar	
Jason Healey	Sales and Marketing, Canada	
Dave Rodwell	Director, Sales and Marketing	• Signature management, range systems & sensors • Power conversion, control and motor drives
Rob Weavill	Sales and Marketing	