

## UC 416 - Objetivos 1.1 e 1.5

Sensores e armas *Underwater Warfare* (UWW)

Comando Naval | 1TEN Luís Soares | Chefe da Seção de Subsuperfície





- Ensino à distância
- Interação reduzida
- Classificação de segurança da informação - NÃO CLASSIFICADO
- Dúvidas a colocar durante os tempos letivos previstos - funcionalidade *levantar a mão* (MS Teams)
- Questões a serem colocadas durante as aulas - sequência aleatória
- Disponibilidade fora do período das aulas - por email
- Abordagem parcial



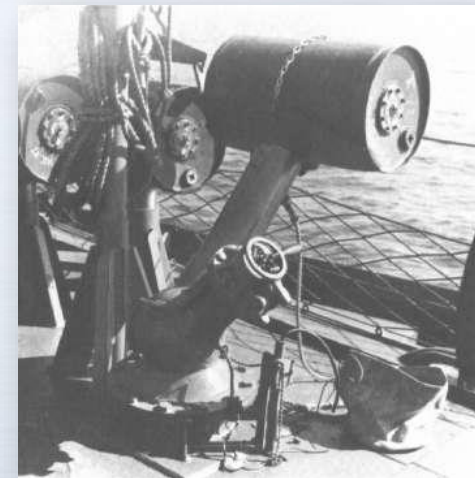
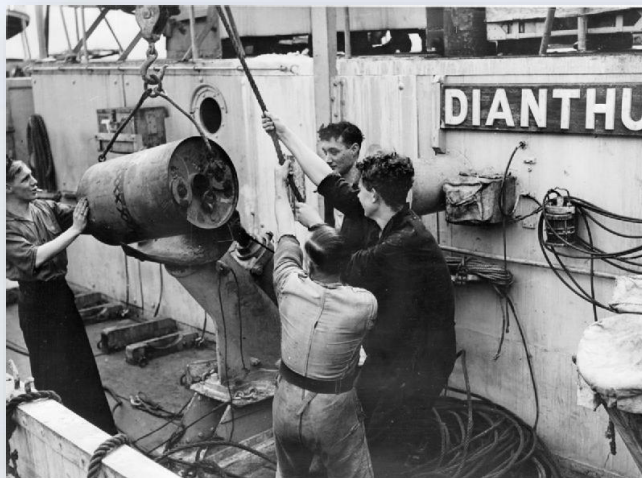
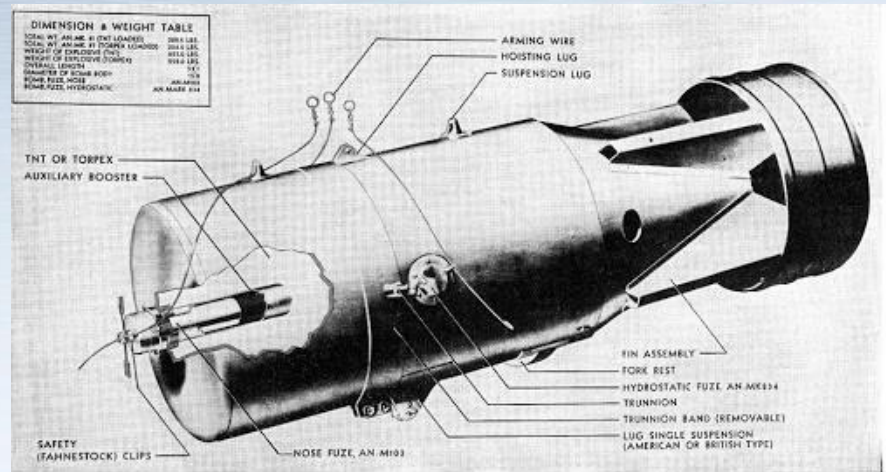
- Aprender funciona nos dois sentidos
- Câmara e microfone desligado - responsabilidade
- Presença e atenção disponibilizada - maior esforço de ambas as partes
- Gestão das expectativas (de ambas as partes) - adaptação e resiliência
- Sobreposição de objetivos - esperada e inevitável



- Bomba de profundidade
- *Hedgehog* - morteiro ASW
- Torpedo
- *Anti-submarine Rocket (ASROC)*
- Minas







- A arma antissubmarina mais antiga (1911) - 1.<sup>a</sup> Guerra Mundial
- *Dropping mine*
- Primeira bomba de profundidade
  - Barril com 140 Kg de alto explosivo
  - Detonador acionado pela pressão da água à profundidade pré-configurada

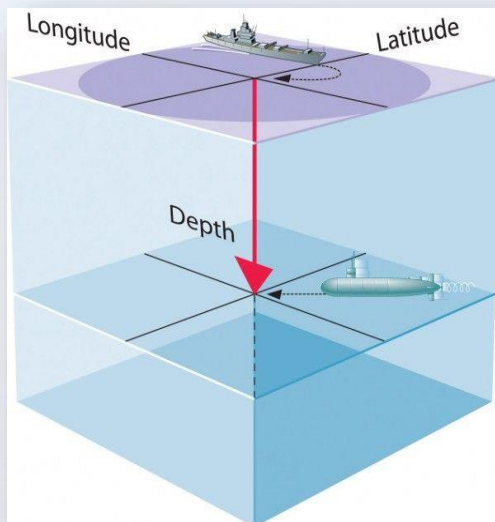


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NÃO CLASSIFICADO

- Arma pouco eficiente no início da sua utilização
- O casco resistente dos U-boat suportava as explosões a  $\approx 3$  metros
- TORPEX, 50% mais potente que o TNT, tornou a arma mais eficaz (1943)
- Difícil solução de fogo - largar a arma sobre o submarino



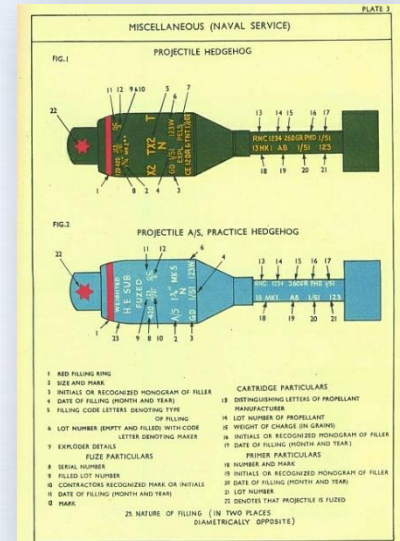








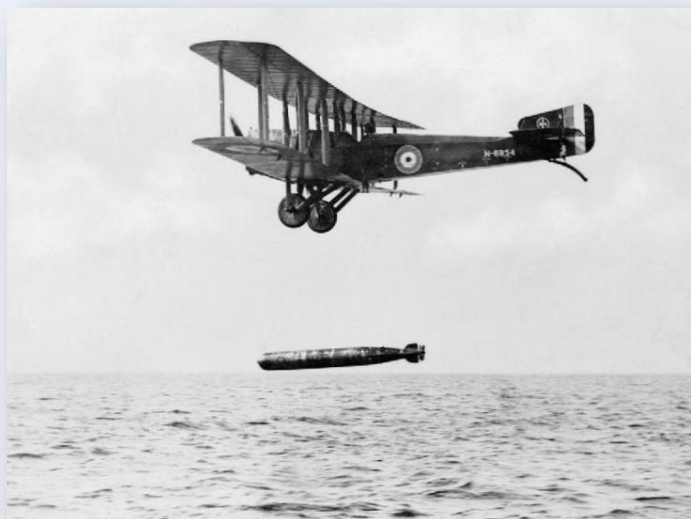
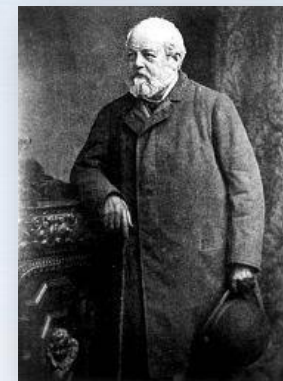
- Características
  - Morteiro ASW lançamento para a frente
  - Não afundou *U-boats* até 1942
  - Melhorou a eficácia após conjugar emprego com deteção sonar
  
- Vantagens na época
  - Explodiam apenas com contacto
  - Ataques sem sucesso não prejudicavam a deteção sonar
  - Afundavam-se mais rápido do que as cargas de profundidade





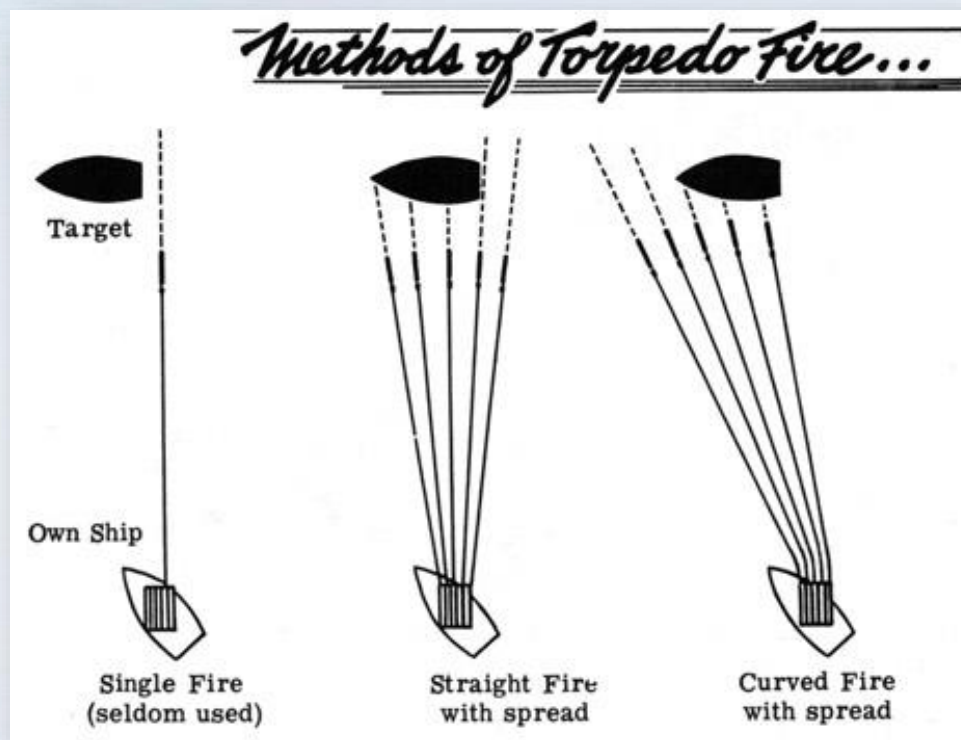


- Características
  - Robert Whitehead projetou o primeiro torpedo (1866)
  - Arma autopropulsionada - aproxima-se do alvo e não o contrário
  - Velocidade de  $\approx 7$  nós e alcance de 200 jardas
  - Primeiro lançamento por uma aeronave americana em 1920





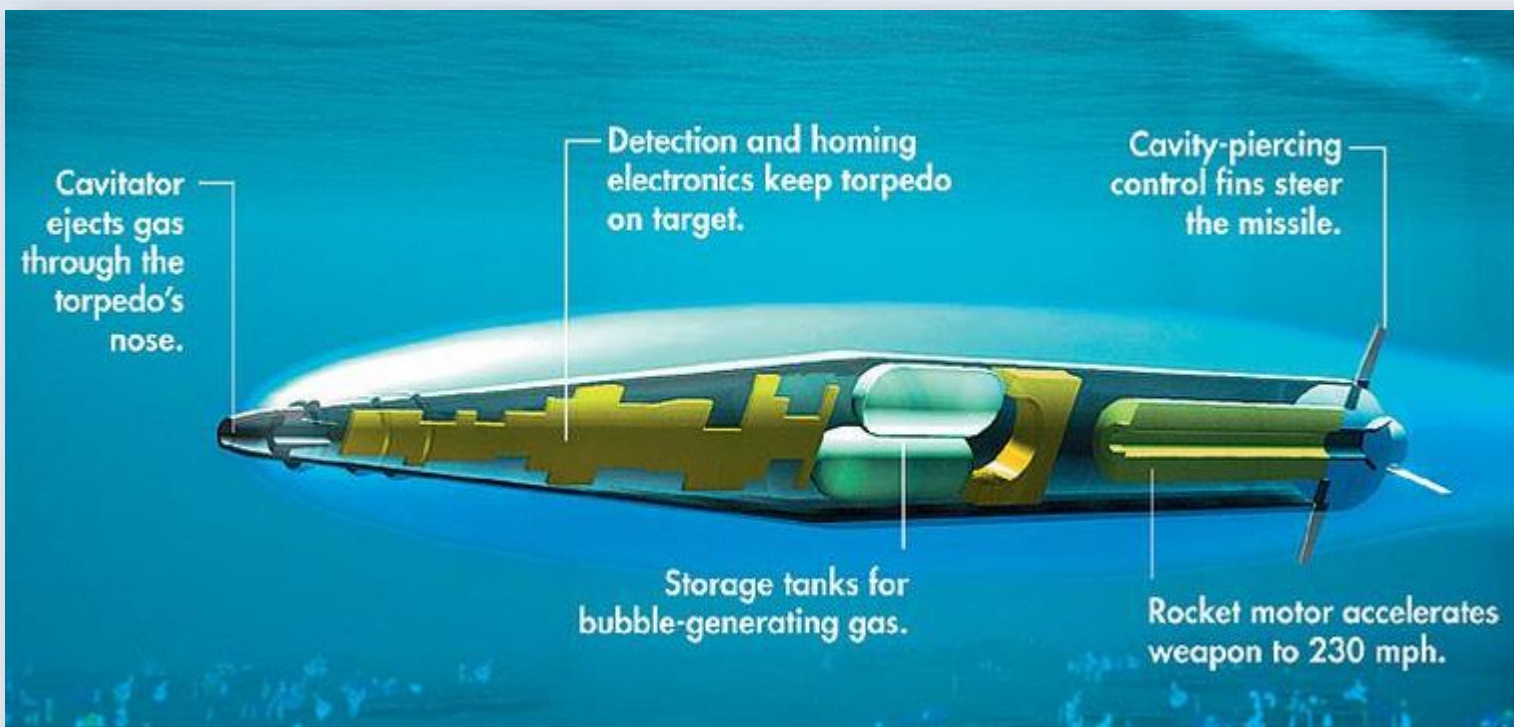
- Tipos
- Carreira retilínea



- Tipos

- Carreira retilínea

Supercavitante - bolha de ar permite que o torpedo se mova a alta velocidade

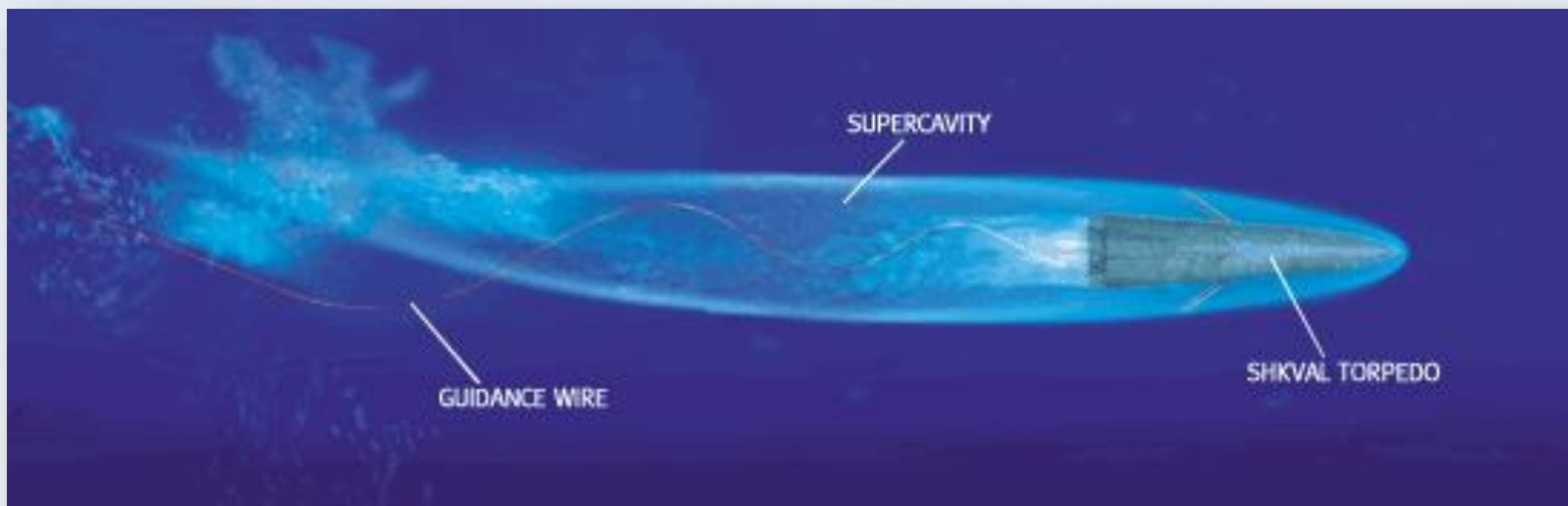




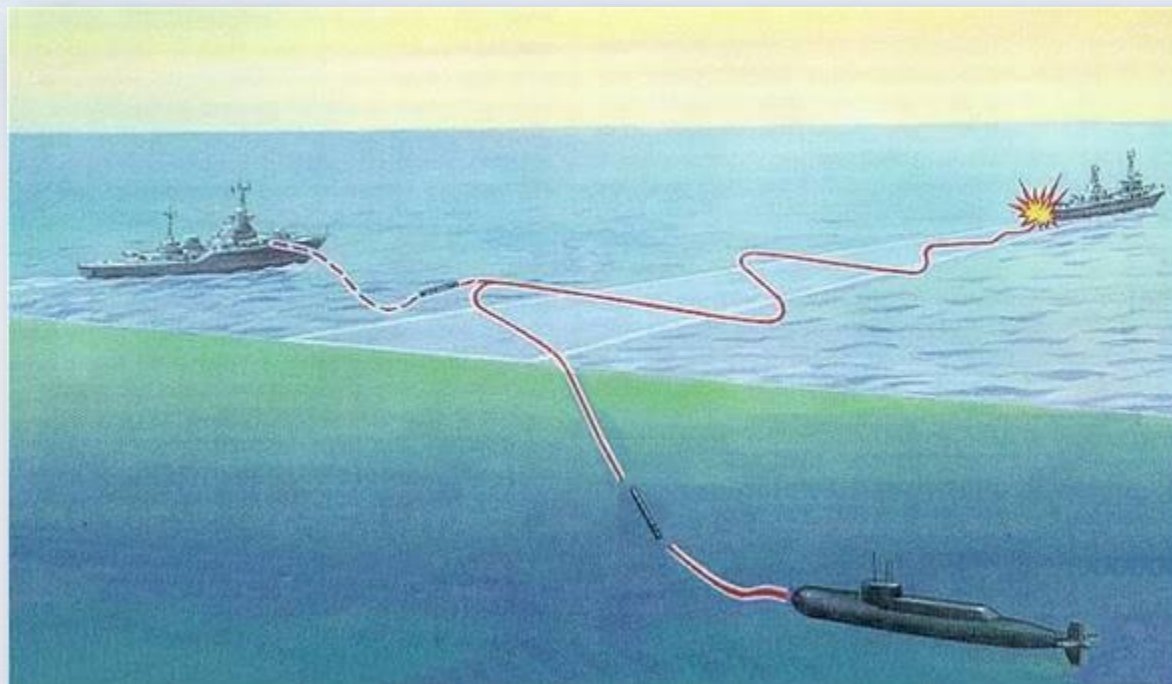
- Tipos

- Carreira retilínea

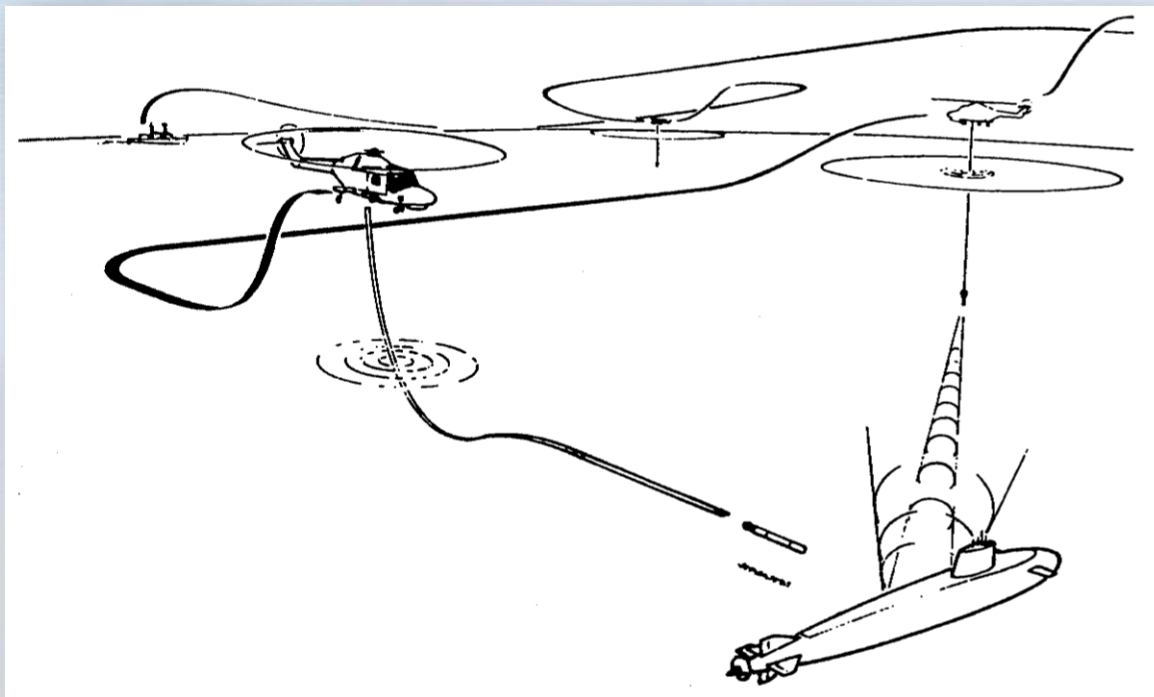
Supercavitante - bolha de ar permite que o torpedo se mova a alta velocidade



- Tipos
  - Carreira retilínea
  - Seguidores de esteira

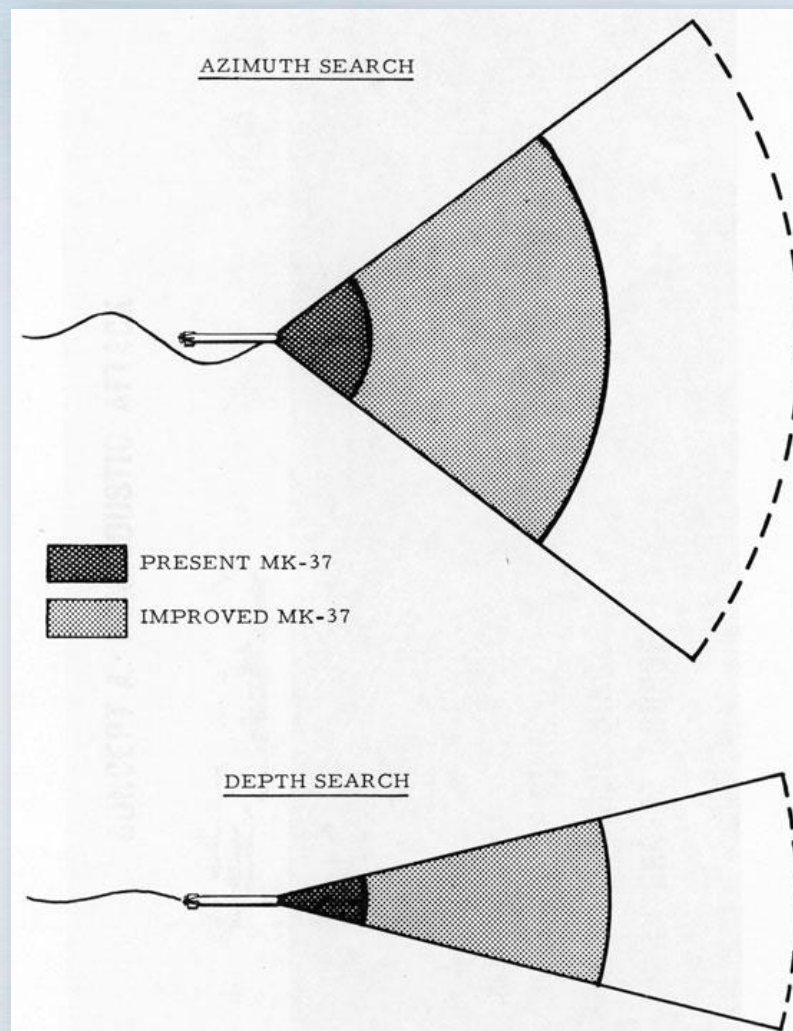


- Tipos
  - Carreira retilínea
  - Seguidores de esteira
  - Seguimento acústico

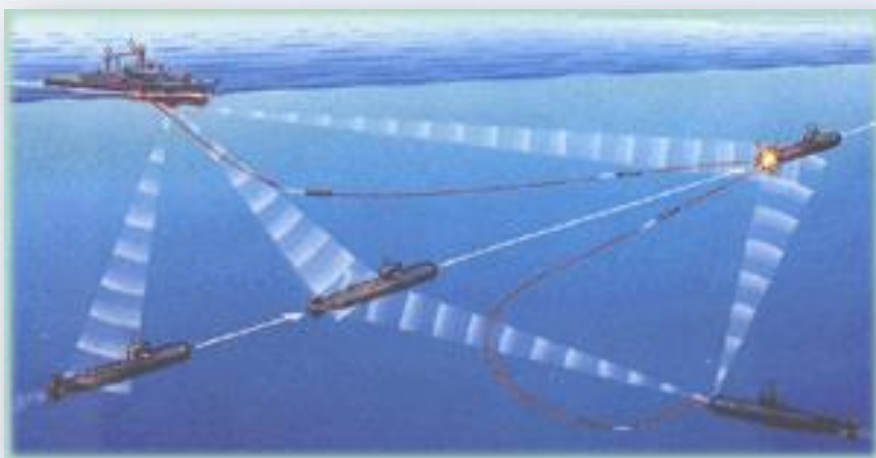




- Tipos
  - Carreira retilínea
  - Seguidores de esteira
  - Seguimento acústico



- Tipos
  - Carreira retilínea
  - Seguidores de esteira
  - Seguimento acústico
  - Filoguiado





- Torpedos *lightweight* (LWT) e *heavyweight* (HWT)



### SPEARFISH HEAVYWEIGHT TORPEDO

**FASTER UNDERWATER THAN A CHEETAH ON LAND**

Weighing in at just under 2 tonnes

**SPEED:** 70 mph

**LENGTH:** 5 metres

**MATERIALS:** aluminium and titanium - the same materials are used in fighter aircraft

**UPGRADE:** from 2020 the new Mod-1 version will include a single fuel system, insensitive munition warhead and improved data links with the submarine

**ENGINEERING:** 100 engineers will work on the project at Portsmouth. 40 engineers will be recruited



**IN OPERATION ON ROYAL NAVY ASTUTE, TRAFALGAR AND VANGUARD SUBMARINES**

**BAE SYSTEMS**  
INSPIRED WORK

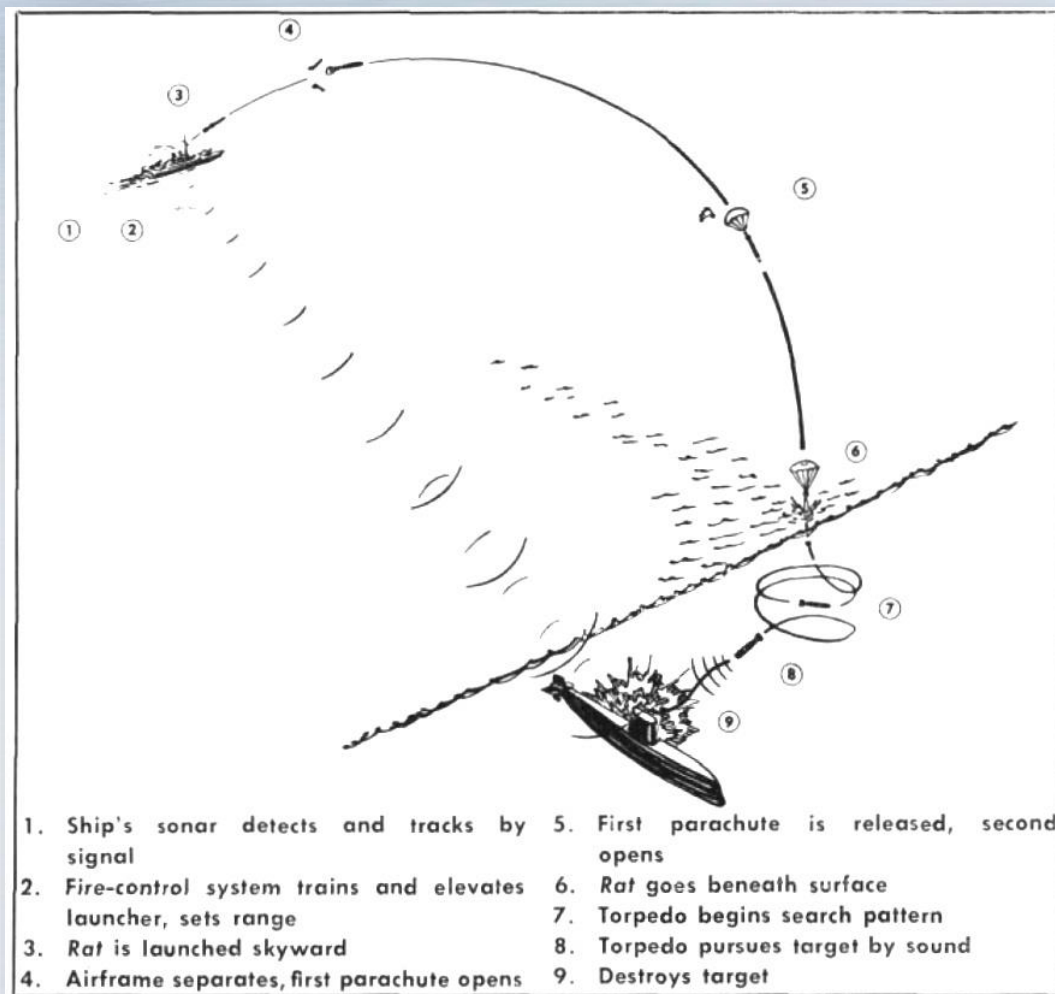


- Torpedos *lightweight* (LWT)
  - Antissubmarinos - regra geral
  - Capacidades inferiores aos HWT - alcance, velocidade, eficácia
  - Passíveis de lançamento aéreo - helicóptero e MPA



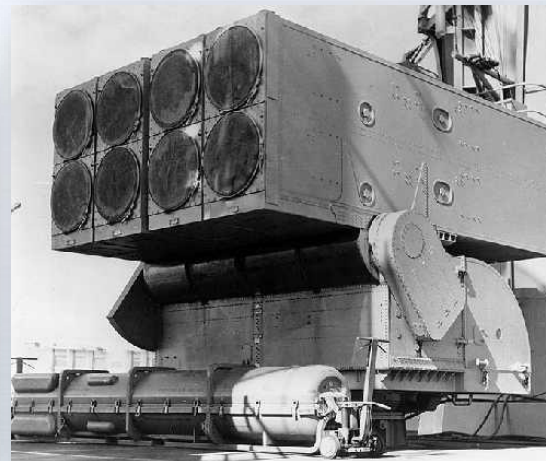
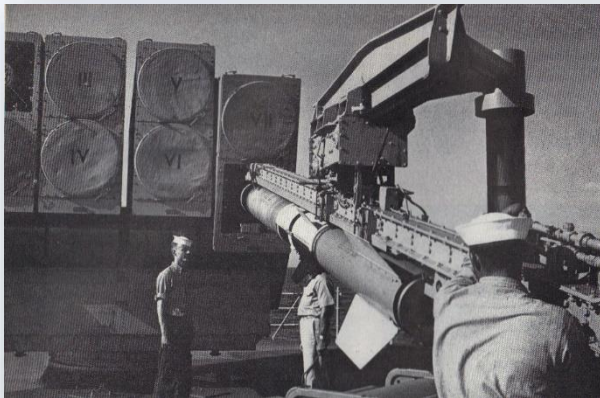
- Torpedos *heavyweight* (HWT)
  - Filoguiados e sobranete capacidade de deteção autónoma
  - Resistência a contramedidas e à contradeteção
  - Velocidades  $\approx$  50 nós
  - Grande alcance  $\approx$  20 Km







- Caracterização
  - Arma *standoff* ASW para navios de superfície
  - Usada entre 1960 e 1980
  - Transporta um torpedo LWT MK 46 ou uma carga de profundidade
  - O *Vertical Launched ASROC* (VLA) é uma versão modificada do ASROC
  - Alcances de 10 a 30 Km





**EYE ! EYE ! SIR !**  
Age doesn't matter — if you can  
**SEE WELL!**  
*(With glasses if worn)*

Mine watching training takes only about 2 hrs. of your spare time a week. Travelling expenses and allowances paid. If mines in Shipping Lanes aren't spotted, plotted, and potted! — in War WE MAY ALL STARVE !

A smart Naval uniform is issued and your "missus" — or your fiancée, can join too !

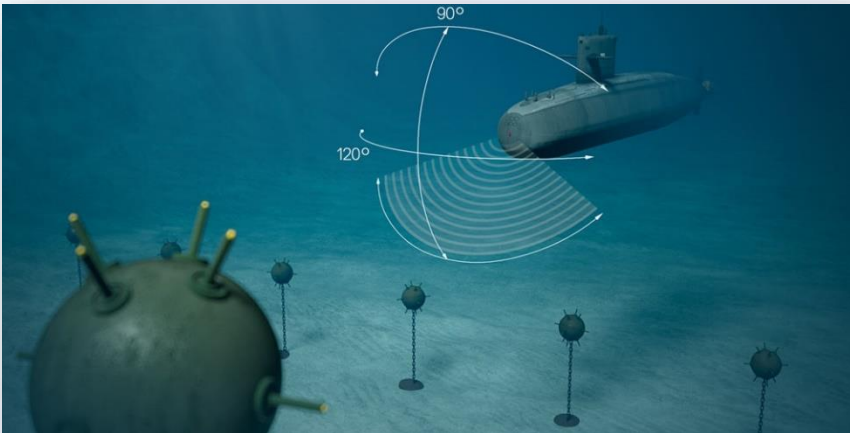
**Royal Naval Mine Watching Service**  
See over for joining local Unit for full or part time service in War

LAST WAR MINE LOSSES

NEW MAC



- Caracterização
  - Arma de fácil emprego e difícil eliminação
  - Antinavio ou antissubmarino
  - Empregues da superfície a  $\approx 2000$  m
  - Encobertas
  - Económicas - custo, manutenção e lançamento





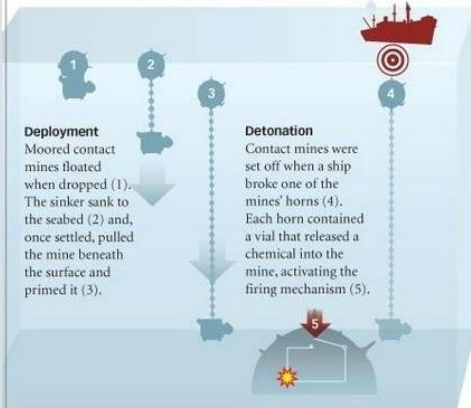
### An Undersea Killer Evolves

The British thwarted German naval mine innovations at every turn

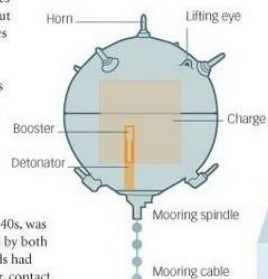
Naval mine warfare reached a fever pitch during the war, pitting the British against the Germans in a battle of mine innovation, recovery, and counterdevelopment. The Germans produced magnetic, acoustic, and pressure mines earlier than the British, but made the mistake of using the devices before they were available in large numbers. That allowed the British to find and develop countermeasures for the new mines before they could cause insurmountable damage.

#### 1939 Contact Mines

The contact mine, in use since the 1840s, was the most common type of mine used by both sides. Though minesweeping methods had been mastered in the First World War, contact mines posed the biggest threat to the enemy because they were laid in such large quantities.

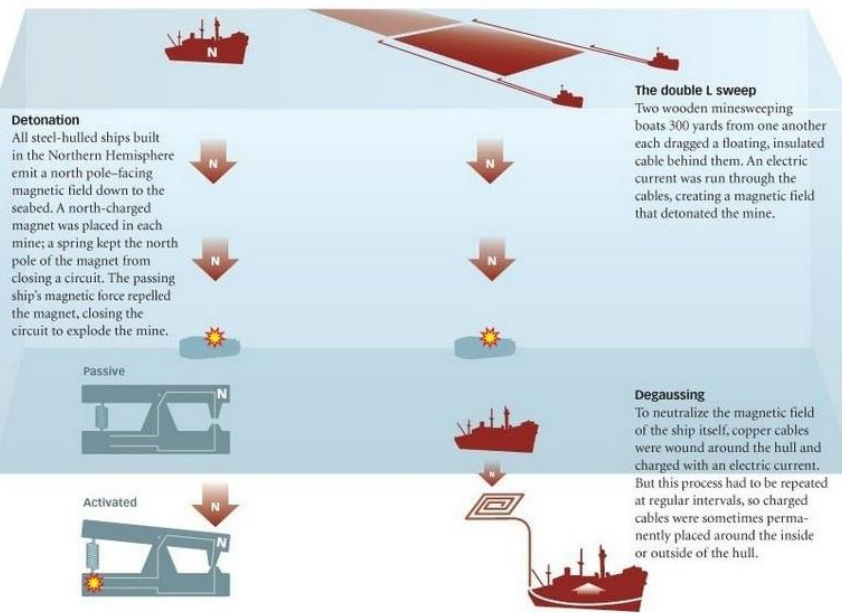


German EMCII Contact Mine



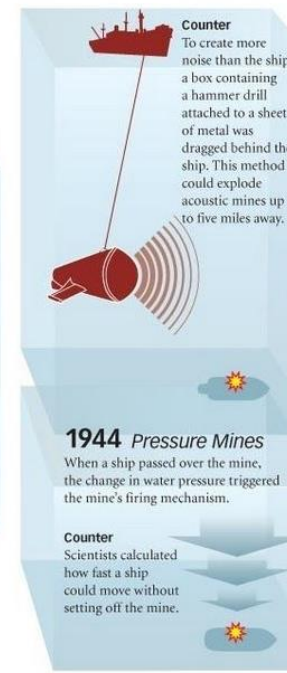
#### 1939 Magnetic Mines

The magnetic mine was developed by Germany and Britain during the First World War, but German scientists perfected the design in the interwar years. When the German navy and Luftwaffe began laying the mines in September 1939, they caused heavy Allied losses.

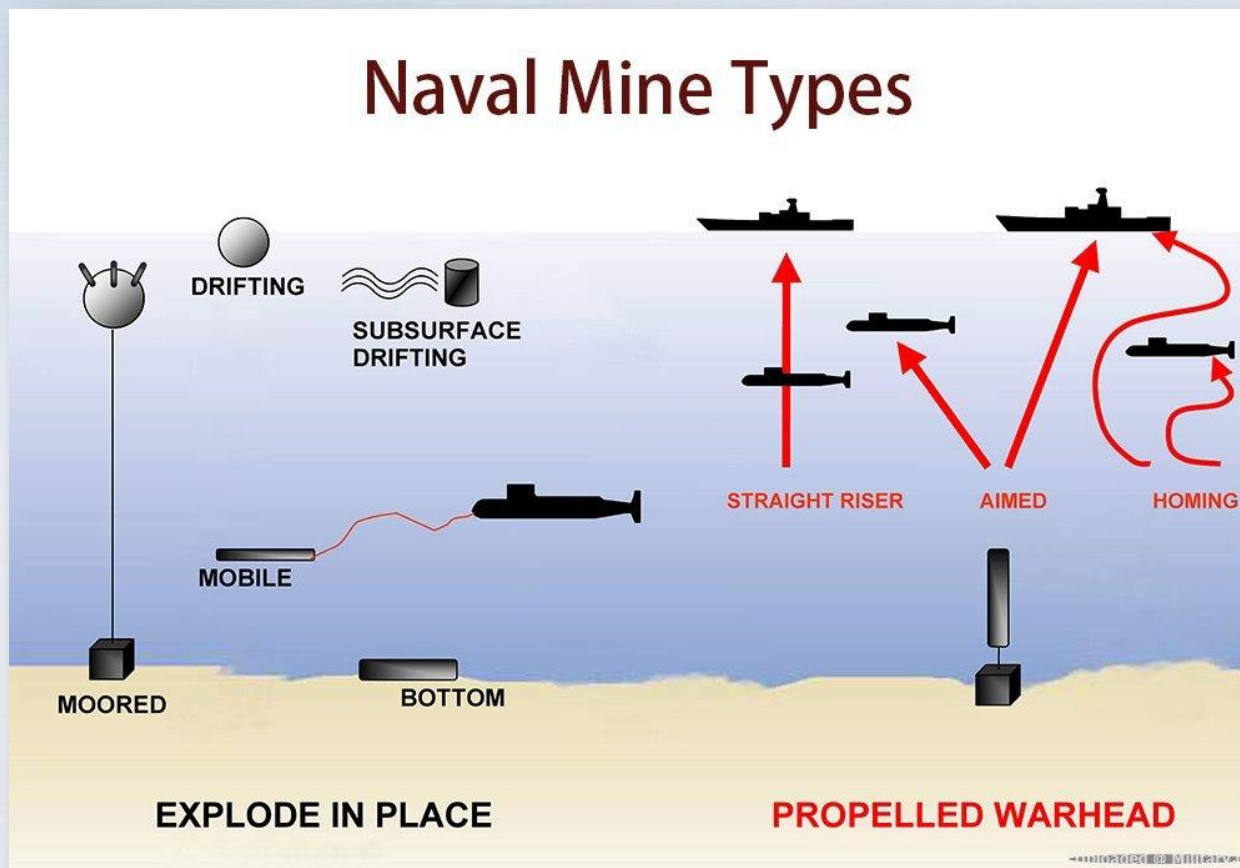


#### 1940 Acoustic Mines

Acoustic mines contained small reeds set in motion by the sound of a passing ship's propeller, conveyed through a microphone. The motion closed a circuit, detonating the mine.



- Tipos





- Mecanismos de detonação
  - Contacto
  - Pressão
  - Magnéticas
  - Elétricas
  - Acústicas
  - Contagem de navios ou identificação de características
  
- Plataformas lançadoras
  - Aeronaves
  - Navios de superfície
  - Submarinos





