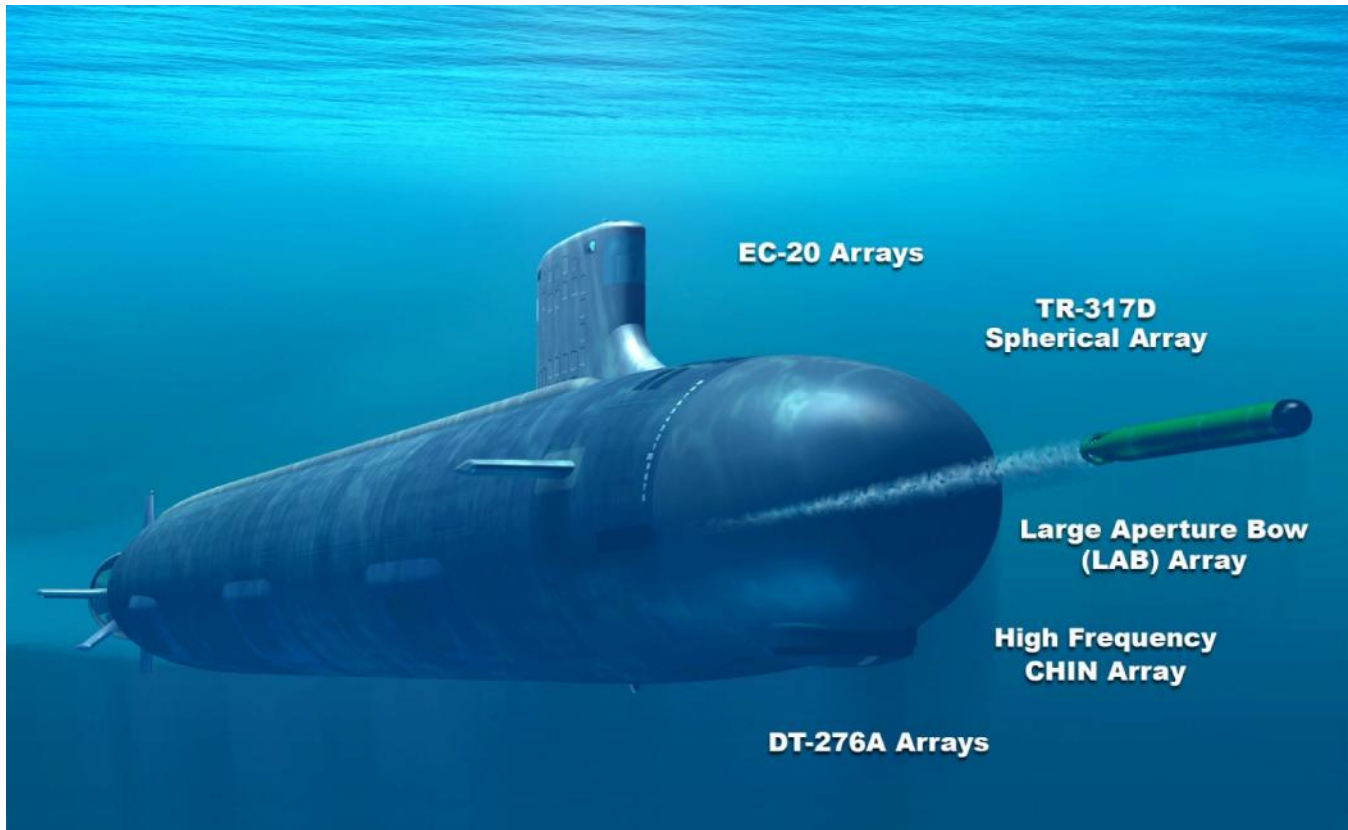


## **Some of the Submarine Transducers Developed and Manufactured by Massa**

- TR-317 Transducer (2000's - Present)
- DT-574 Hydrophone (2000's - Present)
- TR-353 Transducer (2000's - Present)
- EC-20 Array (2000's - Present)
- High Frequency Chin Array (HFCA)  
Projector and Hydrophone Arrays  
(2000's - Present)
- TR-242B/BQS-15 (1990's)
- TR-316/BQS-8,14 (1990's)
  - Under ice navigation sonar
- DT-276A/BQR-7 (1970's - Present)
- BQG-2 & BQG-4 Line Hydrophones  
for PUFFS (1970's)
  - Most precise production Hydrophone  
ever mass produced

## A Number of Transducers Manufactured by Massa are Used in Different Sonar Systems on U.S. Navy Submarines



- Many of these transducer designs have enhanced performance and lowered system costs

## High Frequency Chin Array Projectors and Receivers

- Massa developed the Projector Array for the anti-mine
- Massa delivered the first three production HFCA Projectors and Cable Assemblies in 2002 and has so far delivered Projectors for the first 18 shipsets under subcontract to Lockheed Martin
- Massa has supplied the Receiving Hydrophone Arrays for shipsets 11-18 under subcontract to Lockheed Martin
- Massa has twice received the prestigious Star Supplier Award from Lockheed Martin for its work on the Chin Program
  - Only 121 suppliers were recognized from a total of over 10,000 approved companies in Lockheed's strategic supplier base

## Massa BQG-2 & BQG-4 Line Hydrophones for Puffs

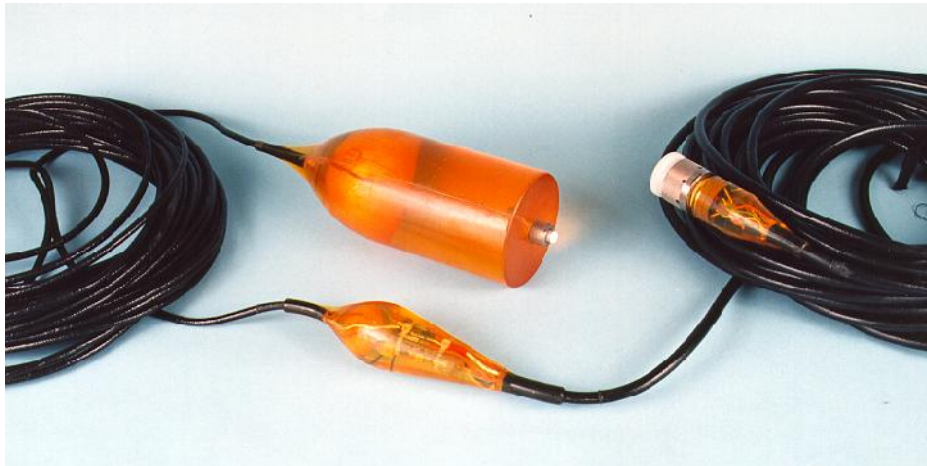


- Most precise production hydrophone ever mass produced
  - Acoustic center of 6 ft. line was held to within .010 inches from the face of mounting flange
  - The First Article Test Report stated that the uniformity of the Massa production units was greater than the precision of measurement of the Navy test equipment
- Massa delivered on 12 separate production contracts
  - All other manufacturers took exception to the performance specifications

## **Some of the Sonars Developed and Manufactured by Massa for Use With Torpedoes and Torpedo Tube Launched Systems**

- **MK-30 MOD 2 Towed Array (2000's - Present)**
  - Massa was the first contractor to be First Article Approved
- **MK-30 MOD 1 Towed Array (1990's - Present)**
  - Massa redesigned the system to improve performance
  - Massa is the only contractor First Article Approved
  - Massa manufactured 7,000 units at a third of the Government's estimated cost
- **MK-84 Pinger (1990's)**
  - Massa redesigned the system to meet shock requirements
- **CACHE (1970's)**
  - The sea unit is launched from a torpedo tube
  - The command unit is diver operated
- **Deep Ocean Transponder (1970's)**
  - Acoustic Navigation Systems
  - Launched from torpedo tubes
- **MK-44 Acoustic Torpedo (1965-1975)**

## MK-30 Towed Array



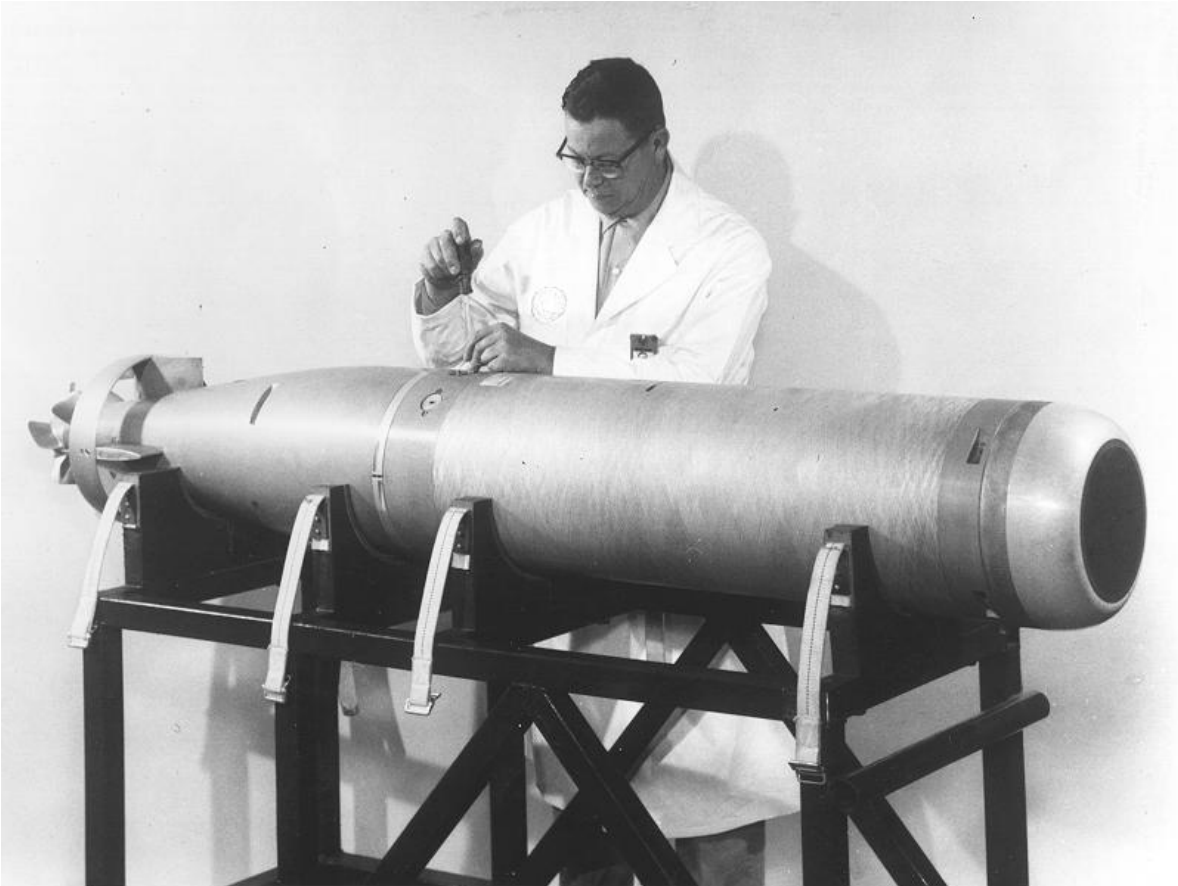
- Array towed by torpedo-like fish
- System simulates a submarine for homing torpedoes by receiving sonar pulse and replying with appropriate echo
- Massa redesigned the receiver to improve uniformity, reliability, and to produce a flat response over the required frequency band

## MK-84 Pinger



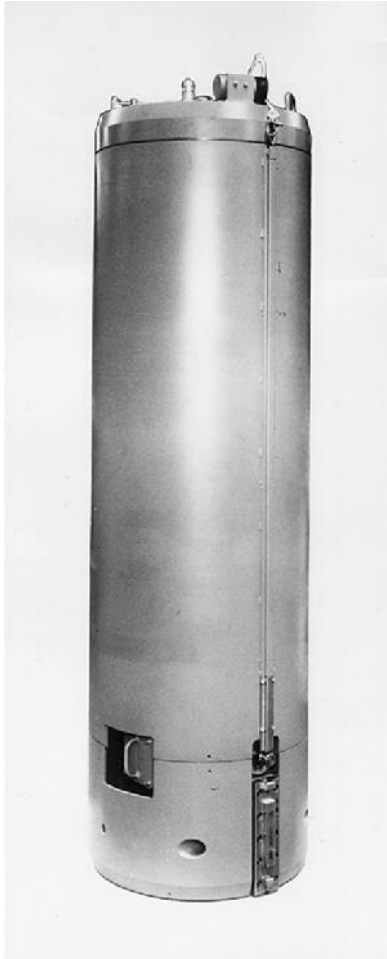
- Attached to torpedoes for tracking on test ranges
- Massa redesigned the system to meet the shock requirements

## MK-44 Acoustic Torpedo



- Acoustic nose cone was subcontracted to Massa for a third of the Government's cost
- Massa manufactured over 7,000 assemblies
  - Massa developed special production procedures to match magnetostrictive stacks to produce the proper acoustic beam

## CACHE Beachhead Supply Delivery System



**Torpedo Tube  
Launched Sea Unit**



**Command Unit**

- Developed by Massa under Government contract
- Sea Unit individually coded
  - Filled with supplies
  - Launched from submarine
- Command Unit
  - Omnidirectional transmitter
  - Directional receiver
  - Acoustically activated
  - Guides operator to acoustic pulses from the Sea Unit that has risen in depth and snubbed anchor line