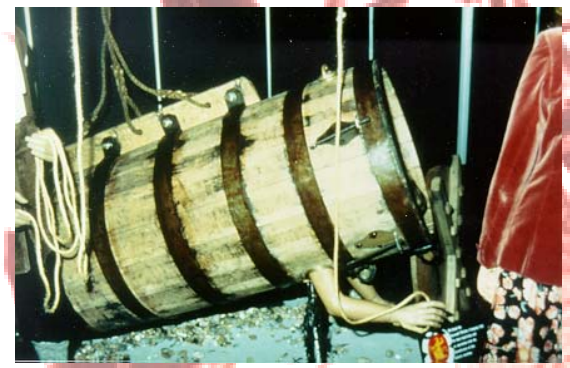
HARDSUIT 2000: How the U.S. Navy has Adapted the HS2000 for Submarine Rescue

NDCS(DSW/SS) Daniel Jackson

History of Hard Suits

- Lethbidge Suit (1715)
- “Tritonia” (1932)
- Jim Suit (1969)
- Wasp (1979)
- Newt Suit (1981)
- HardSuit 2000 (1999)



HS2000-ADS2000

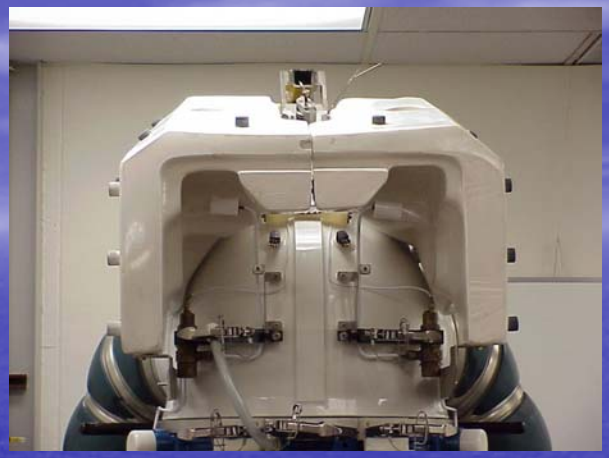
- HardSuit 2000-Built after U.S. Navy performed initial trials on HS1200
  - DSU test pool in 1999
  - Exercise Sorbet Royale, August 2000, Singapore.
- Navy needed 2000' capablilty and contracted OceanWorks Intl. (formerly HardSuits Intl.) to build the new design.

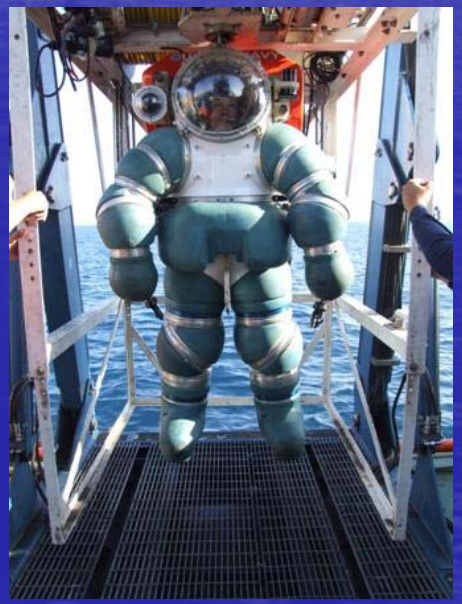
ADS 2000 System

- Atmospheric Diving System (ADS) Suit
- Launch and Recovery System (LARS)
- Control Van

Suit Design

- Oil compensated joints
- Ortman rods
- Sized for individual pilot
- Negative cabin pressure (-.5 psi)
- Hull machined from aluminum forging





Suit Overview

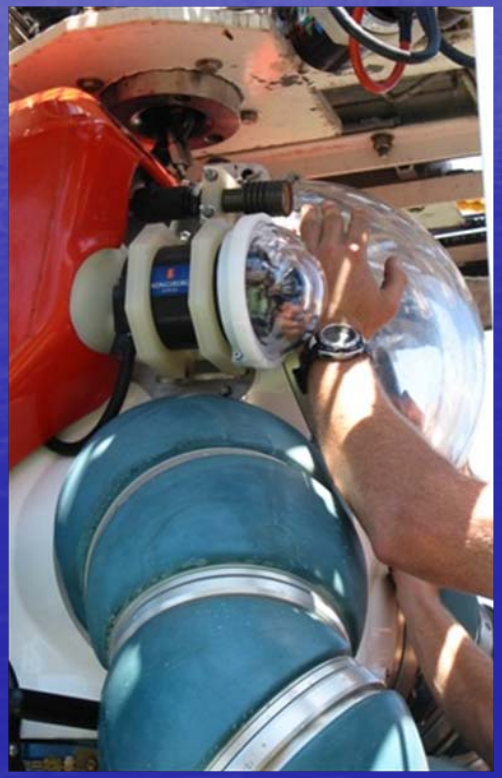
- 2000fsw w/ pilot at 1ata
- 48hr life support duration
- World wide fly-away capable
- No HP O_2 or high voltage internal to suit
- Propulsion via constant speed, variable pitch thrusters
- Umbilical contains power, comms and data
- O_2 supply and CO_2 scrubber carried on suit

Suit Systems

- HP/LP O_2 Supply
- CO_2 Scrubber
- Electronics
- Thrusters
- Vision Dome

Suit Systems

- Atmosphere Monitoring System
- Manipulators
- Limbs
  - Joints
  - Spacers
  - Extensions
- Camera
- Sonar



Launch and Recovery System (LARS)

- Shipped as Standard ISO Container
- Hydraulically Operated
- Required Deeper than 950 fsw
- Tether Management System
- Primary and Secondary Winches

Program Concept

- The Submarine Rescue Diving and Recompression System (SRDRS) is the next generation of Submarine Rescue Equipment for the United States Navy. It is composed of of two distinct subsystems, Advance Underwater Work System (AUWS) and the Submarine Rescue System (SRS).
- Advanced Undersea System Program Manager (NAVSEA PMS 394) has reviewed/approved the concept and key components for manufacture and phased system activation.
- The AUWS is the first phase of equipment and rescue concept to be activated in the fleet.

AUWS

- The AUWS consists of the Light Weight Mooring System (LWMS), Atmospheric Diving System (ADS) (ADS2000) and the Side Looking Sonar (SILOS) (Klein 3000).
- This program is operated by a joint Military/Contractor team out of the Deep Submergence Unit at Naval Air Station North Island, San Diego, CA.

Atmospheric Diving System

- ADS2000 and its Launch and Recovery System (LARS) have been in development for integration since 1993.
- The key players:
  - Ocean Works International (OWI)
    Manufacturer
  - Coastal System Station (CSS)
    Development and design
  - Portsmouth Naval Ship Yard (PNS)
    System certification and fleet delivery
  - Phoenix International, Inc (PII)
    Maintenance Contractor
  - Deep Submergence Unit (DSU)
    Fleet System Operations

ADS Operations

Deployments:

a. Builders' Trials at NEDU, P.C.B., FL
   11DEC97-19SEP98, 42 dives/36hr 12min

b. Santa Catalina Island
   17-25MAY05, 11 dives/33hr 56min

c. Sorbet Royal, Taranto, Italy
   17-30JUN05 15 dives/32hr 56min

d. Santa Catalina Island
   SEP06, dives, hr, min

e. Santa Catalina Island
   10-18JAN07, dives, hr min

f. Deep Throne UUV Recovery, Off Torrey Pines
   05FEB07, 1 dive/5hr 19min

g. Santa Catalina Island
   12-26APR07, 24 dives/106hr 30min

ADS Operations

Configurations:

a. Hand Tended Mode (Limited to 950fsw)
b. LARS Mode (2000fsw)

Vessels Of Opportunities (VOO) used to date:

a. MV Kendrick (Initial testing phase, Singapore)
b. MV Kellie Chouest (San Diego)
c. USS Grasp (Italy)

M/V Kendrick


Initial Trials


M/V Kellie Chouest

Kellie Loadout

USS Grasp (ARS-51)

Grasp Loadout

Hand Tended

Submarine Rescue

- SRDRS is to replace the Deep Submergence Rescue Vehicle, MYSTIC (DSRV-1)
- Currently, the next portion of SRDRS, the Pressurized Rescue Module (PRM), is in initial Factory Acceptance Testing

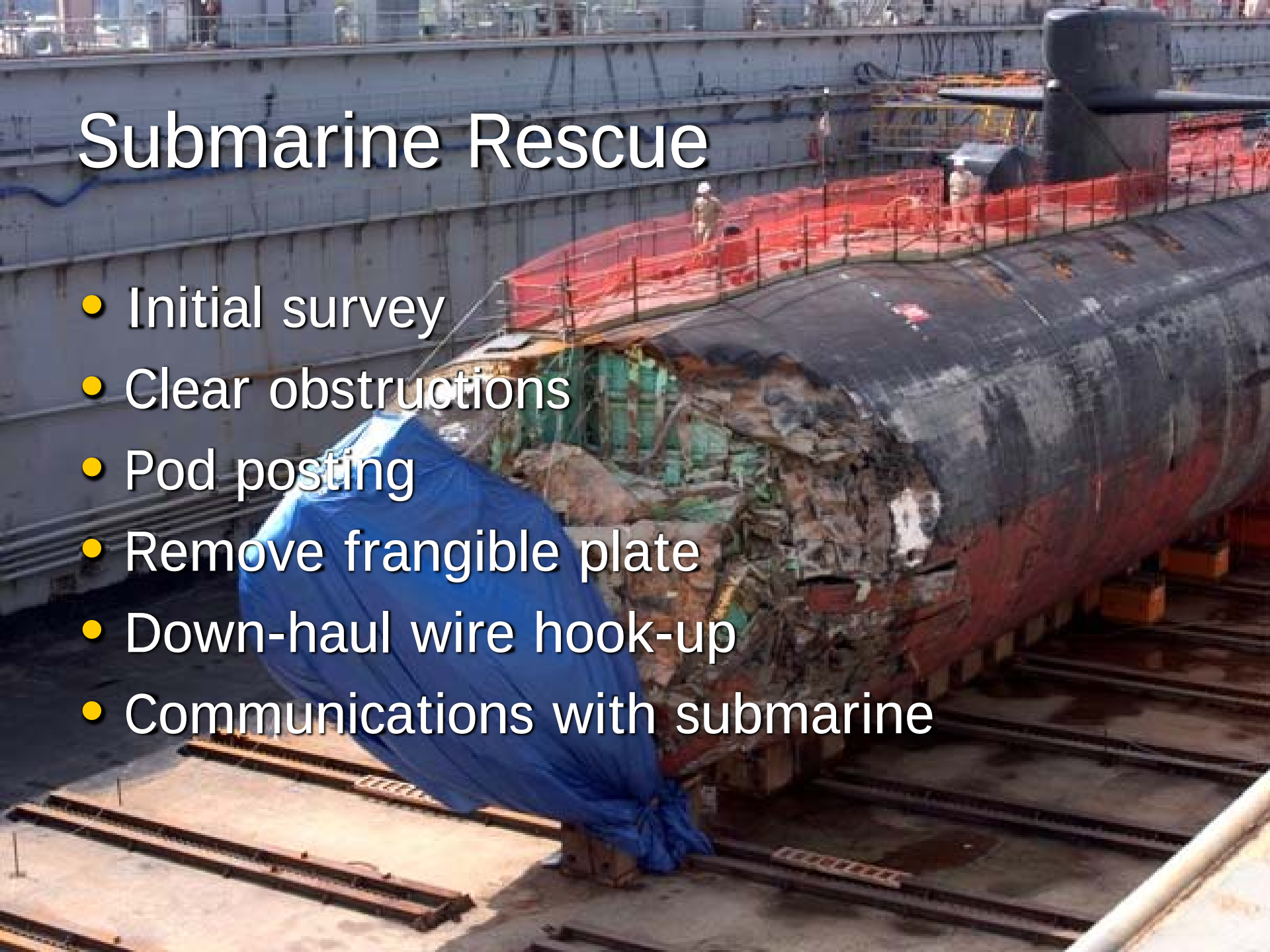
Submarine Rescue

- DSRV and the Submarine Rescue Chamber (SRC) remain as the US Navy's SUBRESCUE assets.
- Until the new system is onboard, ADS will continue to work with these "legacy" systems to effect SUBRESCUE

Submarine Rescue

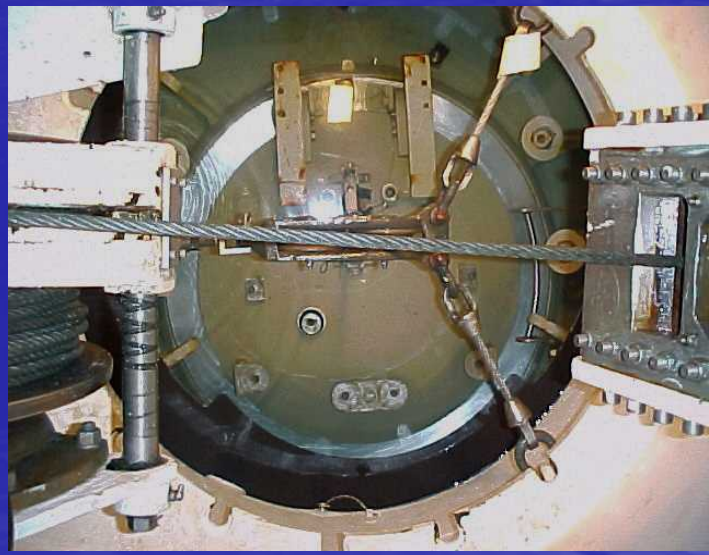
- ADS is used as a “first on the scene” search, survey and inspection asset
- Until SRDRS is onboard, the suit’s primary mission is to attach the SRC downhaul wire to the disabled submarine (DISSUB)
- It can also attach transponders and conduct hatch clearance of the DISSUB

Submarine Rescue



- Initial survey
- Clear obstructions
- Pod posting
- Remove frangible plate
- Down-haul wire hook-up
- Communications with submarine


2006/01/09



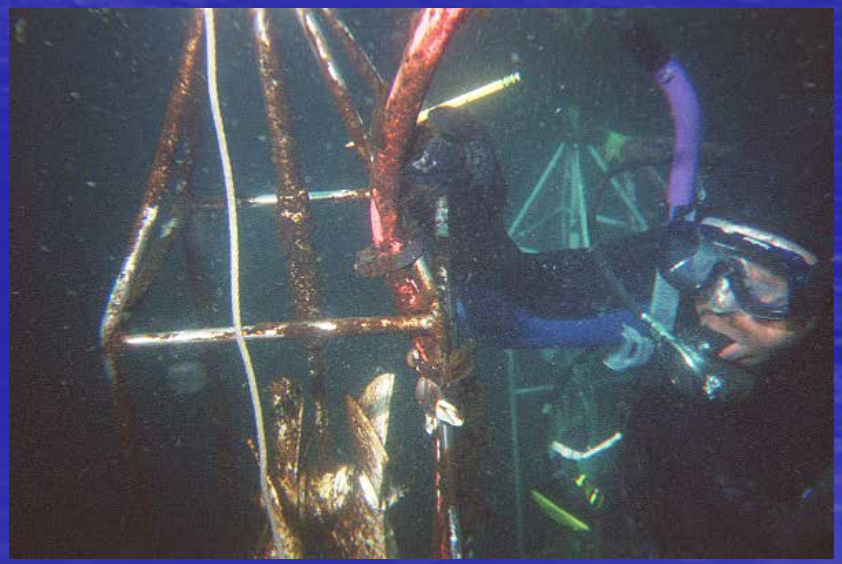
Salvage Operations

- Initial Survey
- 6 - 8 Hr Bottom Time
- No Decompression Required
- Improved Tether Management
- Sea State 4 Launch and 5 Recovery
- MAN AT SCENE

HardSuit in Research?

- Open Discussion


2001. 5. 3




Questions?