SYNTHETIC HYDRAULIC LUBRICANT FOR NAVY SUBMARINE AND SURFACE SHIP APPLICATIONS (METSS 2190-S)

METSS Corporation
300 Westdale Avenue
Westerville, Ohio 43082

Brian Collett
bcollett@metss.com; 614.797.2200

www.metss.com

METSS CORPORATION

Outline

METSS CORPORATION

- What is METSS 2190-S?
- Why replace 2190-TEP?
- Why synthetics?
- Testing, MIL-SPECs, A&Is, and ShipAlts
- METSS 2190-S Timeline
- Technology Insertion
- Predicted Engineered Overhaul FY Schedule
- Acquisition Process
- Our Company
- Acknowledgements

What is METSS 2190-S?

METSS CORPORATION

- METSS 2190-S is a dual-use, high-grade synthetic lubricating *and* hydraulic fluid developed to replace the 50+ year old technology 2190-TEP currently used in Navy submarine applications
  - Originated from SBIR Topic N04-160
- Systems affected: Steering & Diving, Propulsion Lube Oil, Turbine Generator, and Ship Service Hydraulics
- Benefits
  - Extends duration between oil changes
  - Reduces risk of sticky and sluggish valve operation
  - Reduces machinery downtime due to carbon/varnish build-up
  - Improves fluid flow in equipment exposed to cold temperatures
  - Prevents a fail to sail conditions previously caused by sticking or sluggish valves

Why replace 2190-TEP?

METSS CORPORATION

- Problems with mineral-based 2190-TEP:
  - Developed as a gear oil; never intended to be used in hydraulic systems
  - Sticky/sluggish hydraulic control valves (HCVs)
    - SSN 688 Class boats have ~220 HCVs, other classes have higher valve counts (overhaul cost: $150K/ea)
  - Excessive carbon build-up in high pressure air compressors (HPACs)
  - Discoloration due reduced oxidative resistance and insoluble contaminants
  - Off-gassing and flash point depressions
  - Poor viscosity index

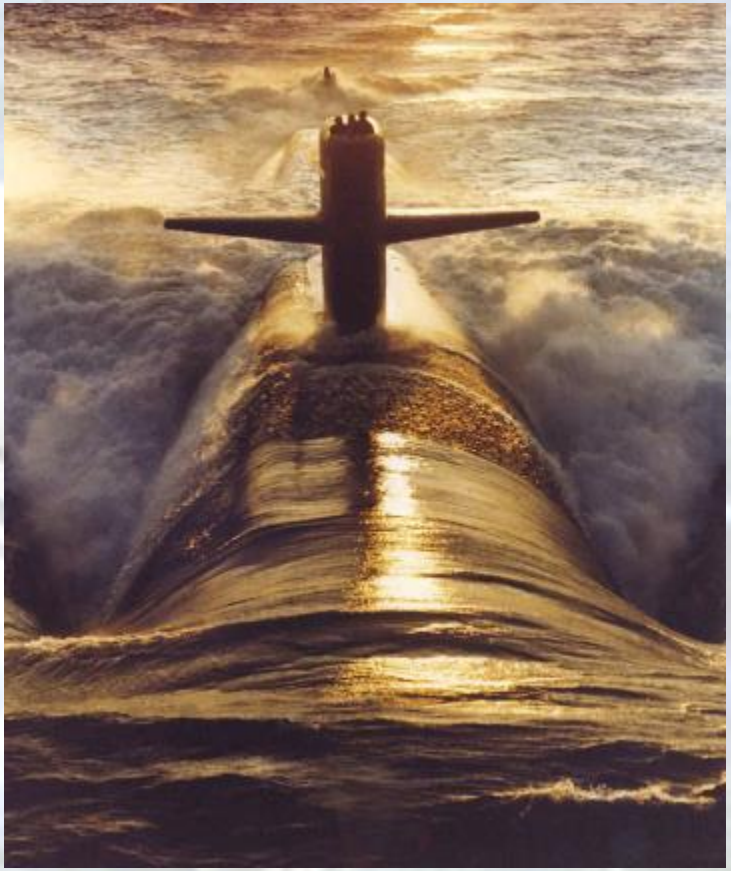
Post-HPAC Testing

2190-TEP

METSS 2190-S

Why synthetics?

METSS CORPORATION



“More time on the pond”

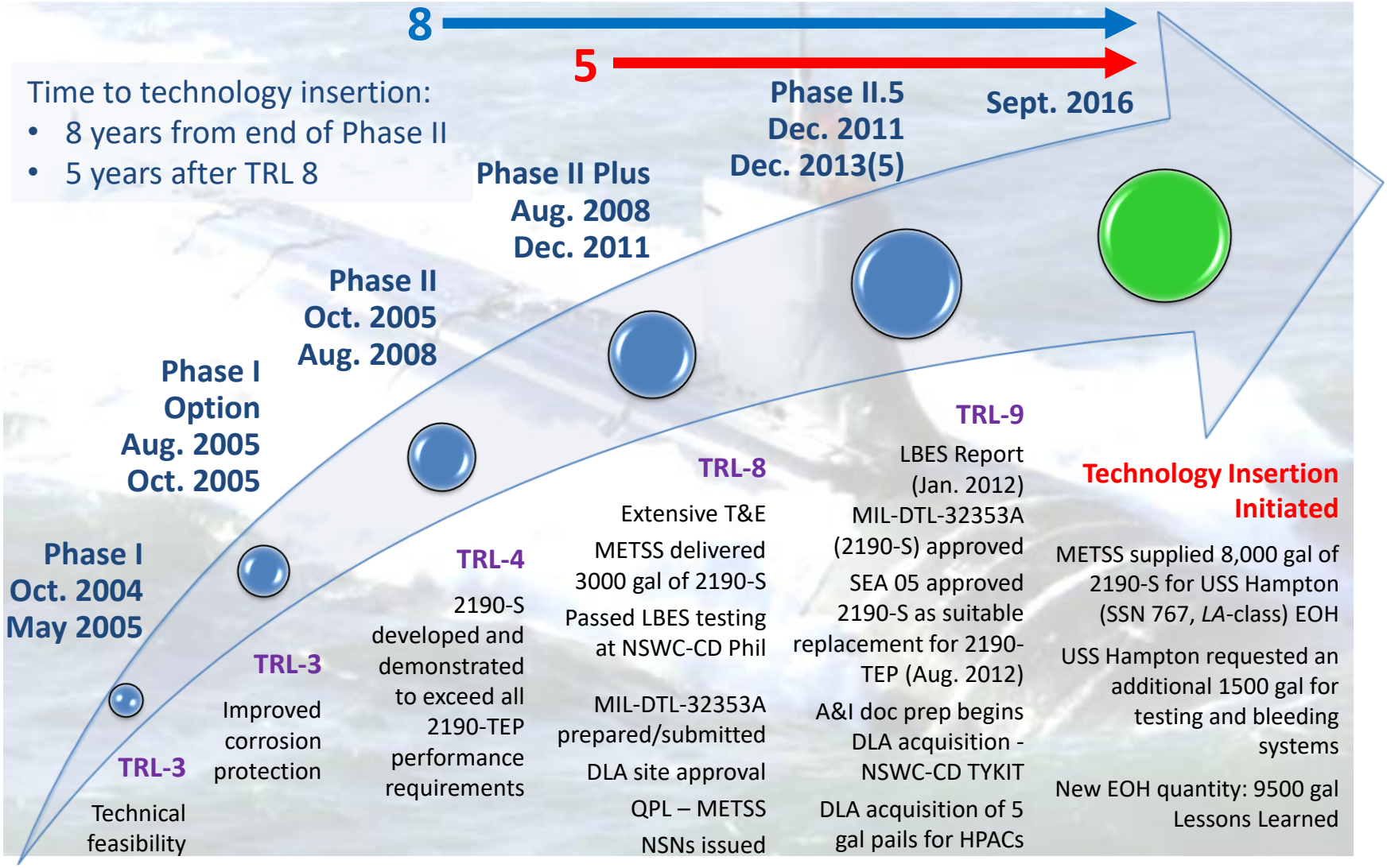
Testing, MIL-SPECs, A&Is, and ShipAlts

METSS CORPORATION

- Land Based Engineering Site (LBES)
  - Testing based on Arleigh Burke-class Guided Missile Destroyer (DDG-51)
  - Side-by-side mechanical evaluation between 2190-TEP and 2190-S
  - Provides critical testing prior to shipbuilder sea trials
- METSS 2190-S (MIL-DTL-32353A) was approved as replacement for 2190-TEP (MIL-PRF-17331)
- A&I N-3581: 2190-S was installed in HPACs on 10 boats saving 67 man-hours in PM/year
- ShipAlts 4667D and 4783D approved for full adoption in LA-class
- ShipAlt TZ-0961 awaiting approval for SSBN/GNs (OH-class)
- ShipAlt 4808 awaiting approval for SSN-21s (SEAWOLF-class)
  - HII-NNS is funded to complete the second of two ShipAlts for SSN-21s
  - Drain and replace ShipAlts expected to be approved late Dec/early Jan

METSS 2190-S Timeline

METSS CORPORATION



Technology Insertion

METSS CORPORATION

- Transition to in-service submarines moved slower than forecasted
  - Drydock limitations
  - EB's contractual obligations to deliver 2190-TEP onto VA-class boats
    - Broken-in with old technology
- 2190-S integration into Virginia-class at new construction pending results of Los Angeles-class conversions
- The Navy and Shipbuilders are nearing a determination for 2190-S integration into Columbia-class at new construction
- If integrated in Virginia-class hydraulic systems at new construction, the Navy projects up to $200M in potential lifecycle cost savings
- Transition to surface ships not initiated
  - Larger volumes will help reduce costs

METSS 2190-S/Engineered Overhauls

METSS CORPORATION

- **FY2017**
  - USS Hampton (SSN 767), Portsmouth Naval Shipyard; completed!
- **FY2018**
  - USS Springfield (SSN 761), Portsmouth Naval Shipyard, in progress
  - USS Columbia (SSN 771), Pearl Harbor Naval Shipyard, in progress
  - USS Columbus (SSN 762), Huntington Ingalls Industries/Newport News Shipbuilding
- **FY2019:**
  - USS Santa Fe (SSN 763)
  - USS Charlotte (SSN 766)
  - USS Boise (SSN 764)
- **FY2020:**
  - USS Tucson (SSN 770), USS Cheyenne (SSN 773), USS Toledo (SSN 769), USS Montpelier (SSN 765), USS Hartford (SSN 768)
- **This SBIR program has been a huge success!**
  - Despite the 12-year journey, the Navy personnel that managed this SBIR topic fought hard to keep this project moving forward, and they continue to go the extra mile(s) to get the 2190-S technology inserted into the fleet.

Acquisition

METSS CORPORATION

- Defense Logistics Agency (DLA) is a good procurement vehicle for mature technologies being used across the DoD (e.g., 2190-TEP and toilet paper)
- DLA is not good for products being transitioned into DoD
  - Inventory based on historical use algorithm
  - Creates undue burden and risk on the small business
- METSS manufactures 2190-S at risk to support Navy needs and schedules
  - Lead time for 2190-S raw materials is up to 6 weeks
  - Third-party qualification testing requires 3 weeks minimum
  - Polyalphaolefins (basestock) in 2190-S is in tight supply
    - NSN 9150-00-985-7233 (drum)
    - NSN 9150-00-985-7232 (pail)
    - NSN 9150-00-985-7231 (quart)
- Direct purchase of 2190-S from METSS is possible

METSS Corporation

METSS CORPORATION

- Formed in 1994
- Mission: provide innovative, practical and technical solutions to industry and government clients
- 19 full-time, highly trained technical staff (7 PhDs)
- Core strengths include:
  - Advanced chemistries and materials
  - Environmentally friendly products and processes
  - Materials performance in aggressive environments
- Specific experience:
  - Deicing and anti-icing fluids, lubricants, self-sealing fuel cell tanks, paint and coatings removal, CBW defense, high voltage protection, etc.
- Current submarine related SBIRs: TB-16/34 Fat Line Tow Cable and external hydraulic (2075-S) HEX systems

Practical Solutions

METSS CORPORATION

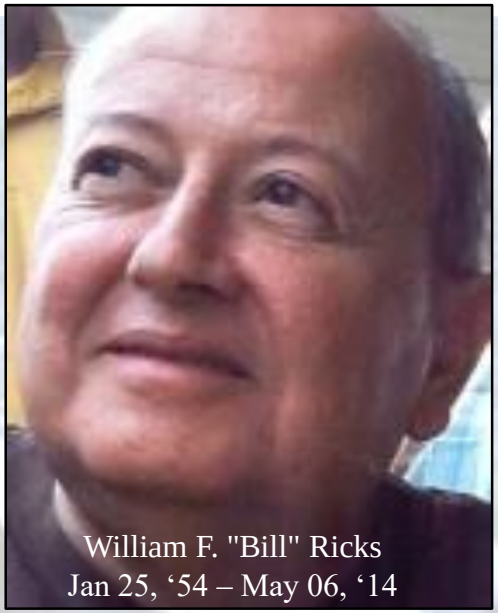
Facilities

METSS CORPORATION

- METSS is located in Columbus, Ohio. Our 26,000 ft^2 facility contains our offices, as well as the laboratory and production space needed to support our current business operations.
- METSS is compliant with all federal, state, and local regulations.
- METSS maintains a DoD Secret Level clearance to support our sensitive programs.
- METSS provides on-site support at AFRL, WPAFB, Ohio.

Acknowledgements

- **Legacy**
  - Chuck Boyle, NAVSEA 05U7T SME
  - Tom Mason, SEAS 07 PMS 392T
  - Amy Shuman, SEA 05 PMS392T
- **Current**
  - Steve Weinstein, SEA 07, 073
  - Whitney Taylor, SEA07, 07
  - Doug Olivieri, SEA 07 392
  - Paul Polakowski, SEA 05
  - Steve Marzelli, 05Z
  - Gregory Toms, SEA 05P2
  - Dean Putnam, SEA 05
  - Jeremy Pryor, SEA 05
  - Angelle Dent-King, PEO-SUB SBIR Asst. Manager
  - Ilya Rakhman, NSWC Philadelphia
  - Joseph Zerby, NSWC Philadelphia
  - Richard McNamara, SEA 05, SES
  - Christy Goff, NSRP NAVSEA Program Manager



William F. "Bill" Ricks
Jan 25, '54 – May 06, '14

Brian Collett, METSS Director-R&D Ops
USS Alaska SSBN 732 Gold Crew ('87 – '93)

METSS Corporation
300 Westdale Avenue
Westerville, Ohio 43082

Brian Collett
bcollett@metss.com, 614.797.2200

www.metss.com

METSS CORPORATION