K.05 Submarine Navigation Technology

Objectives. Adapt fiber-optic gyroscope technology (fiber-optic gyros and thermally stable instrument mounts), develop associated thermal control to meet SSBN navigation requirements, and develop accelerometer technology suitable for SSBN applications.

Payoffs. Achieving the objectives will (1) permit the development of modern navigation systems (and the retrofit of existing systems) with components that do not rely on the obsolete- and out-of-production components characteristic of current systems, and that can be manufactured without dependence on ozone-depleting substances; and (2) reduce O&M costs of existing systems.

Challenges. The major technical challenges are (1) obtaining in-depth knowledge of factors affecting interferometer fiber-optic gyroscope (IFOG) temperature sensitivity, and identifying materials and components to reduce IFOG thermal sensitivity; (2) understanding, characterizing, and reducing the magnetic sensitivity of the IFOG; (3) developing a high-power IFOG light source utilizing a very stable wavelength for long periods of time; (4) developing accelerometers with extremely accurate short-term (10^{-11}) and long-term (10^{-6}) stability; and (5) achieving an accurate thermal model and thermal control techniques for instrument-mounted thermal control to reduce temperature-induced gyro drifts to less than 10^{-6} degrees per hour.

Milestones/Metrics.

FY2000: Demonstrate 3X reduction in thermal sensitivity, 5X reduction in magnetic sensitivity, and 4X improvement in wavelength long-term stability over ONR ADM I IFOG.

FY2001: Demonstrate high-power light source operation in breadboard IFOG.

FY2002: Complete thermal, magnetic, and wavelength control characterization of IFOG. Demonstrate SSBN performance requirements.

Customer POC	Service/Agency POC	USD(A&T) POC
Ms. Shiela YOUNG NSSPO	Mr. James CHEW ONR	Mr. Andrew CULBERTSON DUSD/S&T/SS Mr. Jack TAYLOR ODDR&E/AT

K.05 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602232N	00000	3.0	3.0	3.0	3.0	2.3	0.0
	DTO Total	**3.0**	**3.0**	**3.0**	**3.0**	**2.3**	**0.0**

K.01 Post-Boost Control System Technology

Objectives. By FY03, develop and demonstrate solid-propellant post-boost control system (PBCS) component technologies that use readily available materials, thus reducing hardware costs.

Payoffs. Achieving the objectives will permit cost-effective solid-propulsion PBCS design choices that are not dependent on the unique high-temperature (refractory) metals and manufacturing processes currently used. Additionally, achieving the objective will eliminate the current use of a unique high-cost and high-hazards propellant.

Challenges. The most significant technology challenge is to identify cost-effective materials that can be used in the manufacture of PBCS replacement components (compatible with existing or modified propellants) that do not erode in a high-temperature environment, and that maintain current delta velocity increment capability and thrust levels.

Milestones/Metrics.

FY2001: Conduct gas generator, valve, and subscale manifold tests to demonstrate potential for achieving objectives.

FY2003: Complete scale-up and testing of propellant integrated with replacement components (valves, fittings, injectors, tanks, etc.) in a full-scale demonstrator. Demonstrate 25% reduction in the cost of PBCS components.

Customer POC

CAPT Lynn WESSMAN, USN
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Mr. James CHEW
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Dr. Steven RODGERS, USAF
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USD(A&T) POC

Mr. Andrew CULBERTSON
DUSD/S&T/SS

K.01 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602111N	00000	1.3	1.4	0.0	0.0	0.0	0.0
0602203F	4847	0.0	1.5	1.5	1.8	0.0	0.0
0602601F	1011	2.9	0.0	0.0	0.0	0.0	0.0
0603302F	6340	0.0	1.5	1.5	1.5	0.0	0.0
	DTO Total	**4.2**	**4.4**	**3.0**	**3.3**	**0.0**	**0.0**

K.04 Underwater Launch Technology

Objectives. By FY03, develop underwater-launch modeling and simulation tools that permit effective design and analysis of current and future submarine-launched ballistic missile (SLBM) designs; and develop options for new, low-cost underwater test facilities for future SLBMs.

Payoffs. Achieving the objectives will preserve, to a significant extent, the industrial capability to design and develop underwater launch systems by producing an historical compendium of knowledge; and a smart user interface that captures critical underwater launch technology and expertise that will guide future designers to the relevant test data, reports, validated models, and lessons learned. This will reduce the knowledge ramp-up time for new employees and reduce reliance on testing, which will either not be available or be prohibitively expensive, thereby reducing the time and costs associated with underwater missile launch design and analysis.

Challenges. The major technical challenges in developing the tool are the compatibility of underwater launch electronic database with future Strategic Systems program connectivity standards, determining the proper database architecture, dealing with classified data, and verifying and validating the tool in the absence of new testing.

Milestones/Metrics.

FY2001: Develop electronic database. Define future test facility requirements.

FY2002: Validate initial launch model.

FY2004: Validate integrated model; develop user manuals; and document future launch facility requirements and launch facility designs.

Customer POC	Service/Agency POC	USD(A&T) POC
Ms. Shiela YOUNG NSSPO	Mr. James CHEW ONR	Mr. Andrew CULBERTSON DUSD/S&T/SS Mr. Jack TAYLOR ODDR&E/AT

K.04 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602232N	00000	1.0	2.5	3.5	4.0	4.7	6.0
	DTO Total	**1.0**	**2.5**	**3.5**	**4.0**	**4.7**	**6.0**

K.06 Missile Propulsion Technology

Objectives. Develop a multiuse, less-detonable (Class 1.3) solid propellant that meets all ballistic missile requirements; develop component technologies (e.g., nozzles, cases, insulation systems) that are both compatible with the new propellant and reduce hardware costs by 25%; and increase mass friction by 1% and specific impulse (Isp) by 4% to sustain current performance levels.

Payoffs. Achieving the objectives will eliminate the current dependence of SLBMs on unique propellant formulations, materials, and processes, thereby ensuring the future availability of needed propellants and motors. A 25% reduction in missile propulsion system cost is expected.

Challenges. The major technical challenges include tailoring the burn rate with a new propellant oxidizer to control stress levels in the case dome area; controlling nozzle throat erosion with advanced materials; and adapting rapid processing techniques to refractory materials.

Milestones/Metrics.

FY2000: Complete characterization of final propellant formulation. Demonstrate 13% reduction in propellant costs.

FY2001: Complete case material characterization. Conduct large subscale or full-scale case tests to demonstrate 23% reduced cost, 14% reduced weight, and 1.5% increased Isp.

FY2003: Conduct large-scale test of the propellant and nozzle/insulation system to demonstrate 25% cost reduction, 1% increased mass fraction, and 4% increase in delivered Isp.

Customer POC	Service/Agency POC	USD(A&T) POC
CAPT Lynn WESSMAN, USN USSTRATCOM	Mr. James CHEW ONR	Mr. Andrew CULBERTSON DUSD/S&T/SS
	Mr. Drew O. DEGEORGE AFRL/PR	
	Dr. Steven RODGERS, USAF SAF/AQR	

K.06 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602203F	4847	0.0	2.4	1.5	1.3	0.0	0.0
0602601F	1011	1.7	0.0	0.0	0.0	0.0	0.0
0603302F	4373	2.3	1.6	2.0	2.3	0.0	0.0
	DTO Total	**4.0**	**4.0**	**3.5**	**3.6**	**0.0**	**0.0**