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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy **Date:** February 2020

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0604258N / <i>Target Systems Development</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	0.000	10.686	12.027	10.224	-	10.224	15.198	13.931	11.173	12.356	Continuing	Continuing
0609: <i>Aerial Target System Dev</i>	0.000	9.415	7.874	8.839	-	8.839	13.784	12.489	9.702	10.856	Continuing	Continuing
0612: <i>Surface Targets Development</i>	0.000	1.271	1.353	1.385	-	1.385	1.414	1.442	1.471	1.500	Continuing	Continuing
2159: <i>ASW TARGET</i>	0.000	0.000	2.800	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.800

A. Mission Description and Budget Item Justification

This program element funds the development of Aerial Target Systems, Unmanned Aerial Vehicle targets, Sea Surface Target Systems, Target Control systems, and associated Target Mission Support Systems, Target Threat Simulation Program and Target Augmentation and Auxiliary Systems required to simulate real world threats. These capabilities are required to execute developmental/operational test and evaluation of naval combat weapon systems and to satisfy advanced fleet training requirements while ensuring the Navy continues to develop threat simulations of emerging threat requirements.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under RESEARCH, DEVELOPMENT, TEST AND EVALUATION MANAGEMENT SUPPORT because it supports efforts directed toward sustaining or modernizing installations or operations required for general research, development, test and evaluation.

B. Program Change Summary (\$ in Millions)

	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>
Previous President's Budget	10.981	12.027	8.569	-	8.569
Current President's Budget	10.686	12.027	10.224	-	10.224
Total Adjustments	-0.295	0.000	1.655	-	1.655
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.295	0.000			
• Program Adjustments	0.000	0.000	1.655	-	1.655
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Change Summary Explanation

Project 0609 Aerial Targets Systems Development FY2021 funding request had a slight net increase with a \$4.000M increase to support Target Capability Enhancement focus and then a reduction of \$2.345M to account for the availability of prior year execution balances. Total overall adjustment of \$1.655M.

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Project 0612 Surface Targets Development FY2021 funding request increased slightly above inflation due to increased weapon system Test and Evaluation and Fleet training requirements.

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Appropriation/Budget Activity 1319 / 6					R-1 Program Element (Number/Name) PE 0604258N / <i>Target Systems Development</i>				Project (Number/Name) 0609 / <i>Aerial Target System Dev</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
0609: <i>Aerial Target System Dev</i>	0.000	9.415	7.874	8.839	-	8.839	13.784	12.489	9.702	10.856	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The mission of the Aerial Target Systems Development program is the design and development of threat representative subsonic and supersonic aerial targets that simulate threat weapon systems, threat aircraft or threat Unmanned Aerial Vehicles. In addition to representative air vehicles, this includes development of Target Control (TC) systems, and associated Target Augmentation and Auxiliary Systems (TA/AS) which are used to replicate specific threats. Targets and auxiliary payloads are developed to support test and evaluation of combat systems required to defend fleet surface and air units in a hostile environment. As to specific hardware development, this project includes:

- **Supersonic Targets:** Portfolio includes GQM-163A Supersonic Sea-Skimming Target (SSST), GQM-173A Multi-Stage Supersonic Target (MSST), and AQM-37 programs. Supersonic targets represent supersonic anti-ship cruise missile threats. The design and development of GQM-163A capabilities provide threat representative targets that are used in direct support of Developmental Test and Evaluation, Operational Test and Evaluation, and Live Fire Test and Evaluation of major combat weapons programs and to a lesser degree, support fleet training. Critical live-fire Test and Evaluation events are supported for AEGIS, DDG-1000, LHA-6, CVN-78, LCS, and LSD-41/49 (SM-6, SM-2, RAM, SSDS, and ESSM). The GQM-163A is a non-recoverable supersonic sea skimming aerial target, capable of speeds in excess of Mach 2.5 and cruise altitudes from 13.0 to 66 ft. The GQM-163A has also demonstrated higher altitude diving threat profiles. MSST was a supersonic development effort that was terminated on September 25, 2015. Once the contract termination costs have been determined by DCMA, funds may be required to cover settlement costs. However, the requirement still exists to provide a multi-stage vehicle presentation. New supersonic target development efforts include a replacement target for AQM-37.

- **Subsonic Targets:** Portfolio includes BQM-177A, and BQM-34 & BQM-74 subsonic target programs. The BQM-177A SSAT development primarily represents subsonic anti-ship cruise missile threats, replacing legacy BQM-74E targets with a modernized subsonic target with increased capabilities. The BQM-177A SSAT provides threat representation for developmental and operational test & evaluation events of major combat weapons systems programs and in support of fleet training events. Specifically, the BQM-177A SSAT provides critical live-fire test and evaluation events for AEGIS, SM-6, SM-2, RAM, and ESSM. BQM-34s are undergoing product improvement program efforts to increase their current performance envelope to meet evolving Fleet training requirements and weapon system test events.

- **Target Threat Simulation Program (TTSP), Target Mission Support Systems (TMSS), and Target Control and Target Augmentation and Auxiliary Systems (TC/TA/AS) development:** the TTSP portfolio provides the payload equipment required to electronically enhance aerial targets to provide threat representative radio frequency signatures, specifically the electronic attack and threat radar emissions (active emitters). Development of threat representative simulation components is on-going and required to keep pace with evolving threats and ensure that the Navy's threat simulation capabilities maintain warfighter readiness in the current environment. TC provides command and control of targets to enable the execution of threat-representative mission profiles. The mission also includes the design, development and qualification of various TMSS projects including but not limited to: Target RF datalink hardware, ground control hardware and software, scorer transponders, scoring ground stations, telemetry antennas, radar and locator beacons, identification, friend or foe transponders, and associated test sets. TA/AS enables each target to be

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uniquely configured for specific mission profiles and provide for high fidelity simulation of foreign threats. TA/AS-configured targets are used for radar acquisition test, electronic countermeasures (jamming) evaluation, infrared measurement and testing, radar cross section evaluation, decoy-effectiveness testing, maneuver analysis, electronic warfare evaluation, warhead-effectiveness testing and evaluation of fleet tactics. TA/AS scoring capabilities include both surface and airborne scalar scoring systems.

In addition to the design and development of target hardware and software, funding supports studies performed by a University Affiliated Research Center (UARC) to specify and verify needed target performance for future target development. For the design and validation of targets under development, the UARC will provide engineering studies in areas such as structures, controls, guidance, and propulsion. For those hardware and software items presently under development by commercial vendors, the UARC will provide oversight and validation of vendor design and development approach.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>Title: Supersonic Targets - Development & Upgrades of Supersonic targets</p> <p align="right">Articles:</p> <p>Description: Provides funding for the development of GQM-163A upgrades/evolutionary development to keep pace with evolving threat characteristics. Efforts include continued development of performance envelope characteristics to include flight termination performance, enhanced speed and distance capabilities, and multiple target launch capability. Funding will also support the development of other unique supersonic targets as required, and the close out of the GQM-173 development effort.</p> <p>FY 2020 Plans: Complete the Orbital Front End System Space Allocation study. Continue the development of GQM-163A Supersonic Sea Skimming Targets (SSST) improvements and increased capability efforts including deployable chaff, Electronic Warfare (EW) payloads, and enhanced flight performance. Continue SSST redesign and development efforts as required for improvements and infrastructure upgrades to include those required to accommodate increased simultaneous launches. Continue to support the development and test of other unique supersonic targets as required.</p> <p>FY 2021 Base Plans: Continue the Orbital Front End System Space Allocation study. Continue the development of GQM-163A Supersonic Sea Skimming Targets (SSST) improvements and increased capability efforts including deployable chaff, Electronic Warfare (EW) payloads, and enhanced flight performance. Continue SSST redesign and development efforts as required for improvements and infrastructure upgrades to include those required to</p>	0.600	0.237	0.242	0.000	0.242
	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
<p>accommodate increased simultaneous launches. Continue to support the development and test of other unique supersonic targets as required.</p> <p>FY 2021 OCO Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Increase of \$0.005 million from FY2020 to FY2021 to account for potential future Supersonic developments and inflation.</p>					
<p>Title: Subsonic Targets - Development & Upgrades of subsonic aerial targets with increased capabilities</p>					
<p align="right">Articles:</p>					
<p>Description: A Subsonic Aerial Target (SSAT) replacement air vehicle, for the currently fielded BQM-74E target no longer in production, is required. The BQM-177A is a modernized subsonic target with increased capabilities providing realistic threat representation in support of critical live-fire Test and Evaluation events for major weapons systems and Fleet combat training. The target features increased capabilities to include higher speed, longer range, lower cruise altitudes and greater maneuverability. Other subsonic target alternatives are being explored, including the BQM-74G.</p>					
<p>FY 2020 Plans: Complete WSESRB approval of shipboard operations. Complete required shipboard suitability testing in preparation of FOC. Continue engineering, manufacturing, training, logistics and test efforts of the BQM-177A SSAT towards FOC including site activation, shipboard qualification and operations. Incorporate Engineering Change Proposals and modernizations in the baseline design configuration as mission and threats evolve. Continue studies & development efforts on other subsonic target alternatives, including the BQM-74G.</p>					
<p>FY 2021 Base Plans: Complete site activations and required shipboard suitability testing in preparation of FOC. Continue engineering, manufacturing, training, logistics and test efforts of the BQM-177A SSAT. Incorporate Engineering Change Proposals and modernizations in the baseline design configuration as mission and threats evolve. Continue studies & development efforts on other subsonic target alternatives.</p>					
<p>FY 2021 OCO Plans: N/A</p>					
<p>FY 2020 to FY 2021 Increase/Decrease Statement:</p>					
	1.357	1.020	1.040	0.000	1.040
	-	-	-	-	-

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Increase of \$0.020 million from FY2020 to FY2021 to account for potential future Subsonic developments and inflation.					
Title: Target Threat Simulation Program (TTSP), Target Mission Support Systems (TMSS), Target Control (TC) and Target Augmentation and Auxiliary Systems (TA/AS)	7.458	6.617	7.557	0.000	7.557
Articles:	-	-	-	-	-
<p>Description: The Target Threat Simulation Program (TTSP) provides the payload equipment required to electronically enhance aerial/surface targets to provide threat representative Radio Frequency signatures, specifically the Electronic Attack and Threat Radar Emissions (Active Emitters). The TTSP accomplishes this by providing a collection of modules which are integrated into individual targets in various configurations to provide the ability to simulate the RF environment. TTSP equipment in various configurations is certified for carriage in aerial/surface targets. Funding supports the continued development of the TTSP portfolio so that the Navy can keep pace with emerging enemy threats. Funding is provided for the development of Target Control (TC) systems and Target Augmentation and Auxiliary Systems (TA/AS) capable of supporting Test and Evaluation (T&E) and fleet training activities to ensure emerging threat simulation requirements are met. Target Control Systems (TCS) involve the improved command and control systems capable of controlling multiple targets simultaneously while delivering adequate fidelity of T&E telemetry data. The TMSS program portfolio provides target control, scoring, location, and navigation of air, land and seaborne targets for fleet training and weapons systems test and evaluation. Funding also supports the design, development and qualification of TMSS including but not limited to the current and next generation TC systems, scalar scorers, scoring ground station, telemetry antennas, radar and locator beacons, identification friend or foe and associated test sets. Augmentation and auxiliary systems must be capable of augmenting targets in support of radar acquisition test, electronic countermeasures (jamming) evaluation, infrared measurement/test, radar cross section evaluation, decoy effectiveness, maneuver analysis, electronic warfare, warhead effectiveness and evaluation of fleet tactics, readiness, and training.</p> <p>FY 2020 Plans: Continue development, prototyping and integration of threat electronic attack & active emitter simulators to ensure the Fleet meets emerging threat requirements. Gather and exploit threat intelligence. Continue development and qualification of the SNTC BLK 4 Ground Control Station with associated hardware and software upgrades. Commence development of the DSQ-50B Vector Scorer. Begin fielding the replacement AN/DPN-90 Radar Beacon and the AN/DPN-88 IFF replacement. Continue fielding the DSQ-50A Scalar Scorer</p>					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
and its associated Ground Telemetry Station and the TCS Radio Frequency Subsystem (SNTC BLK 3) upgrade hardware, both two to three year processes.					
<i>FY 2021 Base Plans:</i> Continue development, prototyping and integration of threat electronic attack & active emitter simulators to ensure the Fleet meets emerging threat requirements. Begin development of miniaturized electronic payloads. Continue development and qualification of the SNTC BLK 4 Ground Control Station with associated hardware and software upgrades. Continue development of the DSQ-50B Vector Scorer. Continue fielding the replacement AN/DPN-90 Radar Beacon. Continue fielding the DSQ-50A Scalar Scorer and its associated Ground Telemetry Station and continue fielding the TCS Radio Frequency Subsystem (SNTC BLK 3) upgrade hardware, both two to three year processes.					
<i>FY 2021 OCO Plans:</i> N/A					
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Increase of \$0.94 million from FY2020 to FY2021 for TTSP Target Capability Enhancement focus, which is the development of miniaturized TTSP payloads currently used on the BQM-34S subsonic target, for incorporation into the BQM-177A and to develop and miniaturize additional payloads for the GQM-163A supersonic target. The funding covers both development of the new payloads and prototypes.					
Accomplishments/Planned Programs Subtotals	9.415	7.874	8.839	0.000	8.839

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• WPN 2280: <i>Aerial Targets</i>	133.937	150.561	174.336	-	174.336	170.948	177.239	178.608	180.466	Continuing	Continuing

Remarks

D. Acquisition Strategy
Supersonics: The GQM-163A Supersonic Sea-Skimming Target (SSST) is an Acquisition Category II program. The acquisition strategy includes the continued development of Quad Launch, design efforts for integration of new Radome and Radar Altimeter, Electronic Warfare (EW) systems and other Engineering Change Proposals as required to emulate emerging threat systems. These development efforts will continue to be rolled into the production baseline. Production efforts are expected to continue at higher quantities in order to meet projected MDAP T&E requirements. Additionally, development of alternative supersonic targets is being explored.

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Congress was notified on September 25, 2015 that the Department of the Navy made the decision to terminate the Multi-Stage Supersonic Target (MSST) development program. Termination settlement efforts are ongoing with DCMA.

Subsonics: The Subsonic Aerial Target (SSAT) program is an ACAT-IV program. The Low Rate Initial Production (LRIP) 3 contract was awarded in 3rd Quarter of FY19 with Full Rate Production (FRP) Contracts to follow. Engineering Change Proposals will be contracted as required via IDIQ contract vehicles to keep pace with emerging threat systems and changes rolled into the production baseline. Development efforts for other subsonic targets will be resourced via other contracting efforts as required.

Target Threat Simulation Program (TTSP), Target Mission Support Systems (TMSS), Target Control, and Target Augmentation and Auxiliary Systems: The acquisition strategy for these components vary, depending on industry responses to government issued Requests for Information, but most are acquired via Firm Fixed Price IDIQ contracts.

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Appropriation/Budget Activity 1319 / 6					R-1 Program Element (Number/Name) PE 0604258N / <i>Target Systems Development</i>				Project (Number/Name) 0612 / <i>Surface Targets Development</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
0612: <i>Surface Targets Development</i>	0.000	1.271	1.353	1.385	-	1.385	1.414	1.442	1.471	1.500	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops seaborne targets and their related target augmentation systems in support of air-to-surface and surface-to-surface weapons test and evaluation and fleet training.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Surface Targets Development	1.271	1.353	1.385	0.000	1.385
Articles:	-	-	-	-	-
FY 2020 Plans: Develop new hardware for Portable Command and Control Unit (PCCU) with reduced footprint to enhance portability. Develop post-exercise analysis system for target swarm exercises. Develop chaff countermeasure launch controller for seaborne targets. Research large-scale electronic scoring systems for application to seaborne target exercises. Develop improvements to SeaCAN data bus and signal processing. Develop encryption method for SeaCAN data. Develop improvements to SeaCAN system to reduce potential for Electro-Magnetic Interference (EMI) and perform testing on new system components. Research and develop station-keeping capability for towed target platforms.					
FY 2021 Base Plans: Research extension and integration of swarm remote control capabilities to other powered seaborne targets including Fast Attack Craft Target (FACT) and QST-35. Develop refinements to swarm remote control system based upon feedback from Fleet end users and target operators. Research potential manufacturing of seaborne targets from materials with lower environmental impact. Integrate marine traffic awareness/Automatic Identification System (AIS) capability into Portable Command and Control Unit (PCCU). Develop improved cyber security on seaborne target command and control systems. Research replacement low-cost stationary floating target for crew-served weapons training. Research improved system for over-the-horizon command and control for Seaborne Targets. Develop and test replacement human-representative training target for use on seaborne targets.					
FY 2021 OCO Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A					
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Minimal increase in funding from FY 2020 to FY 2021.					
Accomplishments/Planned Programs Subtotals	1.271	1.353	1.385	0.000	1.385

C. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• OPN/5429: ASW SE	21.309	18.181	26.584	-	26.584	24.888	27.180	28.333	25.556	Continuing	Continuing

Remarks

D. Acquisition Strategy

Not applicable.

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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
2159: <i>ASW TARGET</i>	0.000	0.000	2.800	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.800
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note
This project is a new start in FY2020.

A. Mission Description and Budget Item Justification

RDT&E,N Budget provides funding for Small Business Innovation Research (SBIR) Phase 2.5 for sprint speed and frequency expansion to improve performance capability for the Mk39 Mod 3 Expendable Mobile ASW Training Target (EMATT). This effort supports the transition of the Sprint Speed and Low Frequency Improvement Phase 2.5 efforts into MK 39 Mod 3 EMATT production and starts to investigate Continuous Active Sonar (CAS) capability to provide better detection performance and provide operators with a continuous track. Sprint Speed and Frequency Expansion upgrade allows EMATT to more closely represent submarine tactics for evasion and will make it compatible with new ASW sensors like the LCS ASW mission package.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: New Accomplishment/Planned Program Entry	0.000	2.800	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2020 Plans: RDT&E,N funding in FY20 will be used to continue to address performance shortfalls in the current fleet of MK39 Mod 3 EMATTs to add Sprint Speed and Frequency Expansion upgrades to be more compatible with New ASW Sensors.					
FY 2021 Base Plans: N/A					
FY 2021 OCO Plans: N/A					
FY 2020 to FY 2021 Increase/Decrease Statement: No additional development funding provided FY21+.					
Accomplishments/Planned Programs Subtotals	0.000	2.800	0.000	0.000	0.000

C. Other Program Funding Summary (\$ in Millions)

N/A

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C. Other Program Funding Summary (\$ in Millions)

Remarks

D. Acquisition Strategy

N/A