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

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>					R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</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
Total Program Element	-	494.485	576.000	381.862	0.000	381.862	198.898	0.000	0.000	0.000	Continuing	Continuing
643882: <i>Air-Launched Rapid Response Weapon (ARRW)</i>	-	213.299	286.000	381.862	0.000	381.862	198.898	0.000	0.000	0.000	0.000	1,080.059
643885: <i>Hypersonic Conventional Strike Weapon (HCSW)</i>	-	281.186	290.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Hypersonic Prototyping program enables integration and demonstration of emerging hypersonic technologies in an operational or operational-like environment to capitalize on successful laboratory hypersonic research and development efforts with high warfighter priority. Integration and demonstration of hypersonic prototypes also allows leadership to make informed strategy and resource decisions based for future programs on the results of such hypersonic prototype demonstrations.

Hypersonic Prototyping enables a key linkage between research and development in the lab and fielding advanced technologies to the warfighter. Under this program, Air-Launched Rapid Response Weapon (ARRW) and Hypersonic Conventional Strike Weapon (HCSW) will accelerate the technology transfer of hypersonic technologies to enable a responsive, long range strike capability.

The Hypersonics Prototyping Program Element was new for FY 2019. In FY 2019, the entirety of Hypersonics prototyping efforts were transferred from PE 0604858F, Tech Transition Program, in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Department of Defense Appropriation Act 2019.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Hypersonic Prototyping weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	PE 0604033F / <i>Hypersonics Prototyping</i>

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	508.858	576.000	201.200	0.000	201.200
Current President's Budget	494.485	576.000	381.862	0.000	381.862
Total Adjustments	-14.373	0.000	180.662	0.000	180.662
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	2.761	0.000			
• SBIR/STTR Transfer	-17.134	0.000			
• Other Adjustments	0.000	0.000	180.662	0.000	180.662

Congressional Add Details (\$ in Millions, and Includes General Reductions)

	FY 2019	FY 2020
Project: 643882: Air-Launched Rapid Response Weapon (ARRW)		
Congressional Add: <i>Program increase - air-launched rapid response weapon</i>	48.800	0.000
Congressional Add Subtotals for Project: 643882	48.800	0.000
Project: 643885: Hypersonic Conventional Strike Weapon (HCSW)		
Congressional Add: <i>Program Increase - Hypersonic Conventional Strike Weapon</i>	193.555	0.000
Congressional Add Subtotals for Project: 643885	193.555	0.000
Congressional Add Totals for all Projects	242.355	0.000

Change Summary Explanation

Increase in FY 2021 of \$180.662 million to fully fund the Air-Launched Rapid Response Weapon (ARRW) effort.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>				Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</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
643882: <i>Air-Launched Rapid Response Weapon (ARRW)</i>	-	213.299	286.000	381.862	0.000	381.862	198.898	0.000	0.000	0.000	0.000	1,080.059
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Air-Launched Rapid Response Weapon (ARRW) project integrates Air Force and DARPA enabled system technologies into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. ARRW will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning ARRW acquisition and production.

In FY 2019, ARRW efforts were transferred from PE 0604858F, Tech Transition Program to PE 0604033, Hypersonics Prototyping , Project 643882, Air-Launched Rapid Response Weapon (ARRW), in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Department of Defense Appropriations Act 2019.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Air-Launched Rapid Response Weapon (ARRW) weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021
Title: Air Launched Rapid Response Weapon (ARRW)	164.499	286.000	381.862
Description: Integrates Air Force and DARPA enabled system technologies into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. ARRW will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning ARRW acquisition and production.			
FY 2020 Plans: Continue with ARRW design activities and complete the system critical design review. Construct and test the booster test vehicles.			
FY 2021 Plans: Continue with ARRW booster test flights 2 and 3. Manufacture and begin testing of the ARRW all-up round test vehicles.			
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$95.862 million. Funding increased in order to fully fund the ARRW program which includes hardware purchases for all-up round test vehicle manufacturing and flight test execution costs.			
Accomplishments/Planned Programs Subtotals	164.499	286.000	381.862

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i>
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	FY 2019	FY 2020
Congressional Add: Program increase - air-launched rapid response weapon	48.800	0.000
FY 2019 Accomplishments: Conducted Congressionally directed efforts		
FY 2020 Plans: Not applicable		
Congressional Adds Subtotals	48.800	0.000

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

N/A

Remarks

Program office may require temporary relocatable structures for expansion to support workforce and meet mission requirements.

D. Acquisition Strategy

Acquisition Decision Memorandum (signed 3 May 2018) designated Air-Launched Rapid Response Weapon (ARRW) as Section 804 Rapid Prototyping Program.

The Air Force awarded in August 2018 an undefinitized contract in order to complete a critical design review and procure all long lead parts and materials. The ARRW Program definitized this contract December 2019 to include the entire RDT&E effort (through the end of flight test). The cost type contract includes schedule incentives to earn a higher fixed fee. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Armament Directorate, Eglin AFB, FL.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i>
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ARRW - Contract	C/CPFF	LMCO: Various : TBD	-	186.378	Feb 2019	233.355	Feb 2020	312.971	Feb 2021	-		312.971	Continuing	Continuing	-
ARRW - Mission Planning	C/CPFF	Boeing: Tapestry : TBD	-	0.329	Mar 2019	1.000	Mar 2020	1.450	Mar 2021	-		1.450	Continuing	Continuing	-
ARRW - Aircraft Integration	Various	Various : TBD	-	5.272	Dec 2018	10.650	Dec 2019	10.239	Dec 2020	-		10.239	Continuing	Continuing	-
Subtotal			-	191.979		245.005		324.660		-		324.660	Continuing	Continuing	N/A

Remarks

ARRW - This effort is part of the DARPA Other Transaction Authority (OTA) and Air Force contracts.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ARRW - Government Test	Various	Various : TBD	-	15.470	May 2019	31.094	May 2020	46.728	May 2021	-		46.728	Continuing	Continuing	-
Subtotal			-	15.470		31.094		46.728		-		46.728	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ARRW - Program Management Administration	Various	Multiple : TBD	-	5.850	Sep 2019	9.901	Sep 2020	10.474	Sep 2021	-		10.474	Continuing	Continuing	-
Temporary Relocatable Structure	C/TBD	Not specified : TBD	-	-		-		-		-		-	Continuing	Continuing	-
Subtotal			-	5.850		9.901		10.474		-		10.474	Continuing	Continuing	N/A

Remarks

Includes A&AS support requirements plus TDY, and office supplies.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force								Date: February 2020					
Appropriation/Budget Activity 3600 / 4				R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>				Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i>					
	Prior Years	FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	213.299		286.000		381.862		-		381.862	Continuing	Continuing	N/A

Remarks

Additional details on Hypersonics prototyping concepts can be provided in the appropriate forum.

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i>

FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

<i>Air Launched Rapid Response Weapon (ARRW)</i>	
ARRW- Contract	[REDACTED]
Design and Preliminary Design Review	[REDACTED]
Design and Critical Design Review	[REDACTED]
Flight Tests	[REDACTED]

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Air Launched Rapid Response Weapon (ARRW)</i>				
ARRW- Contract	1	2019	4	2022
Design and Preliminary Design Review	1	2019	2	2020
Design and Critical Design Review	2	2020	4	2020
Flight Tests	3	2019	4	2022

Note

Further schedule details can be provided in the appropriate forum.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>				Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</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
643885: <i>Hypersonic Conventional Strike Weapon (HCSW)</i>	-	281.186	290.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Hypersonic Conventional Strike Weapon (HCSW) Project integrates Air Force, Strategic Capabilities Office, and Conventional Prompt Strike (CPS) glide body into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. HCSW will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning future HCSW acquisition and production.

In FY 2019, HCSW efforts were transferred from PE 0604858F, Tech Transition Program, to PE 0604033F, Hypersonics Prototyping, Project 643885, Hypersonic Conventional Strike Weapon (HCSW), in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Department of Defense Appropriations Act 2019.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver HCSW weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021
Title: Hypersonic Conventional Strike Weapon (HCSW)	87.631	290.000	0.000
Description: Integrates Air Force enabled system technologies into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. Hypersonic Conventional Strike Weapon (HCSW) will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning HCSW acquisition and production.			
In FY 2019, HCSW completed System Requirements Review (SRR) and Preliminary Design Review (PDR).			
FY 2020 Plans: Continue integration and design activities for the Hypersonic Conventional Strike Weapon. Identified key performance parameters and conduct Critical Design Review (CDR) leading up to the first flight test in December 2020.			
FY 2021 Plans: Not applicable based on current budget resources.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
FY 2021 decreased compared to FY 2020 by \$290.000 million. Funding decreased due to higher Department of Defense and Air Force priorities to fund only one of the two Air Force hypersonic prototyping efforts.				
Accomplishments/Planned Programs Subtotals		87.631	290.000	0.000
		FY 2019	FY 2020	
Congressional Add: Program Increase - Hypersonic Conventional Strike Weapon		193.555	0.000	
FY 2019 Accomplishments: Conducted Congressionally directed activities.				
FY 2020 Plans: Not Applicable				
Congressional Adds Subtotals		193.555	0.000	
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
Program office requires relocatable facilities for expansion to support workforce and meet mission requirements.				
D. Acquisition Strategy				
Acquisition Decision Memorandum (signed 3 May 2018) designated Hypersonic Conventional Strike Weapon (HCSW) as Section 804 Rapid Prototyping Program.				
In April 2018, the Air Force awarded an Indefinite Delivery/Indefinite Quantity to Lockheed Martin Corporation Space for the design, development, engineering, systems integration, test, logistics, planning, and aircraft integration support of all the elements of a hypersonic, conventional, air-launched, stand-off weapon. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Armament Directorate, Eglin AFB, FL.				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
3600 / 4				PE 0604033F / Hypersonics Prototyping				643885 / Hypersonic Conventional Strike Weapon (HCSW)							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Hypersonic program office support, analysis, technical risk reduction, and development.	C/CPFF	Lockheed Martin : Huntsville, AL	-	238.442	Jan 2019	216.889	Nov 2019	0.000		-		0.000	Continuing	Continuing	-
Subtotal			-	238.442		216.889		0.000		-		0.000	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Development & Prototyping	C/CPFF	Multiple: TBD : Various	-	30.888	Apr 2019	23.298	Nov 2019	0.000		-		0.000	Continuing	Continuing	-
Subtotal			-	30.888		23.298		0.000		-		0.000	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	C/CPAF	Multiple: TBD : Various	-	7.168	Jan 2019	38.026	Jan 2020	0.000		-		0.000	Continuing	Continuing	-
Subtotal			-	7.168		38.026		0.000		-		0.000	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Temporary Relocatable Structure	C/TBD	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
Management Services	C/TBD	Multiple: TBD : Various	-	4.688	Sep 2019	11.787	Mar 2020	0.000		-		0.000	Continuing	Continuing	-
Subtotal			-	4.688		11.787		0.000		-		0.000	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i>
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			

Remarks
Includes A&AS support requirements, TDY, office supplies, and assessed penalties/withholds.

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	281.186	290.000	0.000	-	0.000	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i>

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

<i>Hypersonic Conventional Strike Weapon (HCSW)</i>	
Design and Preliminary Design Review	██████████
Critical Design Review and First Flight Test	████████████████████

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i>	Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Hypersonic Conventional Strike Weapon (HCSW)</i>				
Design and Preliminary Design Review	1	2019	4	2019
Critical Design Review and First Flight Test	1	2020	1	2021

Note
Further schedule details can be provided in the appropriate forum.