RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603302F Space and Missile Rocket Propulsion

	COST ($ in Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	26,703	0	0	0	0	0	0	Continuing	TBD
4373	Launch and Orbit Transfer Propulsion Technology	22,864	0	0	0	0	0	0	Continuing	TBD
6340	Satellite Control and Maneuvering Propulsion Technology	3,839	0	0	0	0	0	0	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: In FY 2002, efforts transferred to PE 0603216F, Project 4922, in order to align projects with the Air Force Research Laboratory (AFRL) organization.

(U) A. Mission Description

This program develops and demonstrates advanced rocket propulsion and space launch technologies. It provides the technological steps necessary to transition the most promising rocket propulsion and space launch technologies to applications using full-scale, proof-of-principle demonstrations. The projects within this program are structured to support Air Force Space Command's and Air Combat Command's mission area requirements for space and missile technologies which include the goals established in the Integrated High Payoff Rocket Propulsion Technology (IHPRPT) program, a multi-agency/industry effort to focus the development of U.S. rocket propulsion technology. New and improved components will be integrated with the environmentally improved propellants developed in this program to create new propulsion systems for the next generation of launch vehicles and satellites. Anticipated technological advances in this program will improve the performance of expendable systems' payload capabilities by 21 percent and reduce the launch and operations and support (O&S) costs by 28 percent. In a reusable launch system, the anticipated improvements are an increase in payload capability of 170 percent and a reduction in launch and O&S costs of 79 percent. The advances in propulsion in this program result from the achievement of the 2010 goals of the IHPRPT program. The development of these technologies has been coordinated with National Aeronautics and Space Administration to eliminate duplication of efforts. The space launch and missile propulsion industry will leverage the technologies from this program to enhance the country's industrial competitiveness.

(U) B. Budget Activity Justification

This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new system developments that have military utility and address warfighter needs.

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(U) C. Program Change Summary ($ in Thousands)

		FY 2001	FY 2002	FY 2003	Total Cost
(U)	Previous President's Budget	27,776	0	0	
(U)	Appropriated Value	28,033	0		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions				
	b. Small Business Innovative Research	-658			
	c. Omnibus or Other Above Threshold Reprogram				
	d. Below Threshold Reprogram	-415			
	e. Rescissions	-257			
(U)	Adjustments to Budget Years Since FY 2002 PBR				
(U)	Current Budget Submit/FY 2003 PBR	26,703	0	0	TBD

(U) Significant Program Changes:

In FY 2002, remaining efforts in this PE will transfer to PE 0603216F, Project 4922.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603302F Space and Missile Rocket Propulsion

PROJECT: 4373

COST ($ in Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
4373	Launch and Orbit Transfer Propulsion Technology	22,864	0	0	0	0	0	0	Continuing	TBD

Note: In FY 2002, efforts transferred to PE 0603216F, Project 4922, in order to align projects with the Air Force Research Laboratory (AFRL) organization.

(U) A. Mission Description

This project develops advanced and innovative, low-cost rocket turbomachinery and components, low-cost space and missile launch propulsion system manufacturing technologies, and advanced propellants. Characteristics such as environmental acceptability, affordability, reliability, reduced weight, reduced operation and launch costs, and increased life and performance of propulsion systems are emphasized in this project. Technological advances developed in this program will improve the performance of expendable systems' payload capabilities by 21% and reduce the launch and operations and support costs by 28%. The advances in propulsion in this program will result from the achievement of the 2010 goals of the Integrated High Payoff Rocket Propulsion Technology (IHPRPT) program.

(U) FY 2001 ($ in Thousands)

(U) $8,663 Developed propulsion technology for existing and future launch vehicles. Continued to develop turbomachinery components for integration into advanced liquid test bed demonstrator. Continued fabrication and assembly of combustion chamber and injector. Continued fabrication of oxygen turbopump for integration into an advanced liquid booster engine. Continued testing of oxygen and hydrogen turbopump assemblies and preburner components for integration into an advanced liquid booster engine. Installed oxygen turbopump assembly into test facility and prepared for hot fire testing of pump assembly. Completed fabrication of oxygen and hydrogen preburner components for integration into an advanced liquid booster engine. Initiated the design of advanced hydrocarbon test bed engine.

(U) $8,735 Developed propulsion technologies for existing and future upper stage and orbit transfer vehicles. Completed thrust chamber testing and achieved performance above predicted levels. Initiated turbopump testing and demonstrated progress in hardware operation Continued to demonstrate solar thermal propulsion technologies, such as strut development and pointing and tracking, for orbit transfer and maneuvering propulsion technology. Continued program to develop electric propulsion systems for orbit transfer by developing high-power Hall thrusters capable of low earth orbit-geosynchronous orbit transfer. Initiated the design of the advanced smallsat propulsion demonstration to develop microsat formation flying for Air Force imaging missions.

(U) $1,750 Developed technologies for the sustainment of strategic systems. Continued the Strategic Sustainment Demonstration program which integrates advanced propellant, case, and nozzle technologies and demonstrates all cost and performance goals.

(U) $3,716 Developed technologies for Pulse Detonation Engines (PDE) to enable next generation propulsion options for affordable access to space and unmanned missions. Defined PDE performance requirements. Designed PDE engine and key subsystems including inlet, intake valve, fuel

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE: February 2002
BUDGET ACTIVITY: 03 - Advanced Technology Development	PE NUMBER AND TITLE: 0603302F Space and Missile Rocket Propulsion — PROJECT: 4373

(U) A. Mission Description Continued

(U) FY 2001 ($ in Thousands) Continued

injection, initiation, control, and thrust tube. Fabricated components and evaluated fuel injection, initiation, and cooling systems.

(U) $22,864 Total

(U) FY 2002 ($ in Thousands)

(U) $0 Effort moved to PE 0603216F, Project 4922.

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 No activity.

(U) $0 Total

(U) B. Project Change Summary

Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

(U) Related Activities:

(U) PE 0602203F, Aerospace Propulsion.

(U) PE 0602601F, Spacecraft Technology.

(U) PE 0603853F, Evolved Expendable Launch Vehicle Program.

(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603302F Space and Missile Rocket Propulsion

PROJECT: 6340

COST ($ in Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
6340	Satellite Control and Maneuvering Propulsion Technology	3,839	0	0	0	0	0	0	Continuing	TBD

Note: In FY 2002, efforts transferred to PE 0603216F, Project 4922, in order to align projects with the Air Force Research Laboratory (AFRL) organization.

(U) A. Mission Description

Chemical, electric, and solar rocket propulsion system technologies for station keeping and on-orbit maneuvering applications are developed in this project. Technology areas investigated include ground demonstrations of compact, lightweight, advanced propulsion systems, higher efficiency energy conversion systems (derived from an improved understanding of combustion fundamentals), and high-energy chemical propellants. The payoffs for the Integrated High Payoff Rocket Propulsion Technology (IHPRPT) program include a seven-year increase in satellite on-orbit time, a 50 percent increase in satellite maneuvering capability, a 25 percent reduction in orbit transfer operational costs, and a 15 percent increase in satellite payload.

(U) FY 2001 ($ in Thousands)

(U) $419 Developed propulsion systems for satellite formation flying. Initiated development of mathematical models to address different propulsion technologies that could be used for small satellite formation flying. Using these models, the optimum propulsion system for use in small satellites was downselected.

(U) $325 Developed propulsion for satellite stationkeeping and repositioning. Initiated brass board level testing of a pulsed plasma thruster system. Hot fire tested the thruster in conjunction with the power processing unit.

(U) $3,095 Developed propulsion systems for use in satellite propulsion. Initiated development of propulsion system for fleet of Air Force small satellites (<100 kg) required for key Air Force Space Command concepts. Initiated design of flight hardware and began technology transition of selected propulsion concepts from the laboratory to the commercial sector. Initiated the fabrication of flight hardware for TechSat 21 spacecraft.

(U) $3,839 Total

(U) FY 2002 ($ in Thousands)

(U) $0 Effort moved to PE 0603216F, Project 4922.

(U) $0 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE: February 2002
BUDGET ACTIVITY: 03 - Advanced Technology Development	PE NUMBER AND TITLE: 0603302F Space and Missile Rocket Propulsion	PROJECT: 6340

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands)

(U) $0	No activity.
(U) $0	Total

(U) B. Project Change Summary

Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

(U) Related Activities:
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0602601F, Spacecraft Technology.
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.