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

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - OPERATIONAL SYSTEMS DEV	**0203752A - Aircraft Engine Component Improvement Program**	**106**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
106 A/C COMPON IMPROV PROG	3757	5873	13017	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification:

PLEASE NOTE: This administration has not addressed FY2003-2007 requirements. All FY 2003-2007 budget estimates included in this book are notional only and subject to change.

Aircraft Engine Component Improvement Program (CIP) develops, tests, and qualifies improvements to aircraft engine components to correct service-revealed deficiencies, improve flight safety, enhance readiness and reduce operating and support (O&S) costs. In addition, CIP provides the test vehicles for the testing and qualification efforts required as a part of the Army's Flight Safety Parts program. CIP is included in the RDTE budget vice procurement appropriations in accordance with congressional direction. This system supports the Legacy to Objective (LO) transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 1365 T700 Engine: Started the development of the Improved 701C engine to reduce O&S costs and improve engine on-wing time. Complete heat transfer analysis and start stress analysis modeling for the Power Turbine Module model to re-analyze and update service life limits. Continued development of new repair procedures for high-dollar hardware. Continued work on the GGT spin pit testing to validate service life models. Completed Blackhawk Digital Electronic Unit (DECU) EMI testing to qualify internal component replacement due to obsolescence.
- 909 T55 Engine: Continued qualification of new plumbing system to improve safety, and reduce weight and O&S costs while improving reliability. Continued development of new depot/field level repair procedures to reduce O&S costs and improve readiness. Completed life analysis of GA-714A compressor and turbine sections for improved flight safety. Completed 150 hour endurance test for bearing improvements. Investigated compressor case, impeller shroud, coating delamination on repaired compressor cases.
- 916 Fuel Delivery Units: Development of new technology that is adaptable to fuel delivery units for gas turbine engines.
- 357 GTCP 36 APU: Relocated and redesigned Fuel Solenoid Bracket to preclude damage/fire hazard; Life Analysis of compressor and turbine wheels to insure safe operation. Redesigned gearbox venting system to eliminate excessive oil leakage during cold weather starting.
- 80 IN-HOUSE: In-house support for the CIP engineers.
- 95 Redstone Technical Test Center (RTTC): Digital Electronic Control Unit (DECU) 2000 Support
- 35 Camber: Support of Subsystem Power Unit (SPU)/Fuel Delivery Unit (FDU) and Reversionary Channel Fully Authority Digital Engine Control (FADEC).

Total 3757

FY 2001 Planned Program

•	1460	T700 Engine: Continue the development of the Improved 701C engine to reduce engine O&S costs and improve engine on-wing time. Complete stress analysis modeling and start life analysis modeling for the Power Turbine Module to re-analyze and update service life limits. Perform Apache Digital Electronic Unit (DECU) EMI testing to qualify internal component replacement due to obsolescence. Begin analysis of Titanium Nitride compressor coating for improved on-wing time and reduced O&S costs.
•	941	T55 Engine: Continue development of new repair procedures to reclaim high dollar hardware. Continue applying engineering effort to unanticipated flight safety problems revealed in the field and provide timely support. Complete life analysis of -714 engine. Complete qualification of enhanced plumbing system. Complete bearing redesign qualification testing to optimize all current mainshaft and accessory bearing designs and reduce the overall O&S costs. Design and qualify an improved Stage 2 Disk to improve life and reduce O&S costs. Design and qualify an improved bleed system to improve reliability and reduce support costs.
•	190	T62T APU: Perform component life analysis to determine compressor and turbine wheel safe life limits.
•	178	GTCP 36 APU: Conduct field evaluation of longbow APU oil venting solution. Complete the Dual Alloy Turbine Wheel Development program to improve durability, extend service life, and reduce cost.
•	67	IN-HOUSE: In-house support for the CIP engineers.
•	1800	Design, develop and test a "universal" FADEC utilizing new technology for improved obsolescence resistance and reduced costs.
•	10	Funds provided to Redstone Technical Test Center for Digital Electronic Control Unit (DECU) 2000 support.
•	1000	FDUs: Development of new technology that is adaptable to fuel delivery units (FDU) for gas turbine engines. Develop and qualify a fuel delivery unit for the RAH-66 Comanche Secondary Power Unit (SPU)
•	54	Support Contract for the FDU and FADEC.
•	173	Small Business Innovative Research (SBIR) and Science and Technology Transfer (STTR)
Total	5873	

FY 2002 Planned Program

- 10950 T700 Engine: Continue the development of the Improved 701C engine to reduce engine O&S costs and improve engine on-wing time. Complete Power Turbine Module life analysis modeling and update service life limits. Start development of the Full Authority Digital Electronic Control (FADEC) for the 701C engine to reduce O&S Costs and improve flight safety. Develop an internal coating for the Stage 2 Turbine nozzle to improve on-wing time and reduce O&S costs. Develop a reduced leakage Compressor Discharge Pressure (CDP) seal to improve on-wing life and reduce O&S costs.
- 1398 T55 Engine: Continue development of new repair procedures to reclaim high dollar hardware. Continue applying engineering effort to unanticipated flight safety problems revealed in the field and provide timely support. Continue Improved Bleed System Qualification. Design and qualify an improved 1st Stage GP Nozzle to increase on-wing life and reduce O&S costs. Complete the qualification of the improved tailpipe to reduce removals and O&S costs.
- 280 GTCP36 APU: Determine root cause of Apache gearbox mechanical failures. Update initial cost driver analysis done in 1997 with latest depot repair data. Design a common digital Electronic Control Unit (ECU) for the Apache, Longbow, and Black Hawk APUs. Perform Dual Alloy Turbine Wheel containment analysis.
- 325 T62T APU: Perform Spin Pit Testing to validate compressor wheel life analysis.
- 64 IN HOUSE: In-house support for the CIP engineers.

Total 13017

B. Program Change Summary	FY 2000	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2001 PB)	3859	2929	3108	0
Appropriated Value	3900	5929	0	0
Adjustments to Appropriated Value	0	0	0	0
a. Congressional General Reductions	0	0	0	0
b. SBIR / STTR	-102	0	0	0
c. Omnibus or Other Above Threshold Reductions	-16	0	0	0
d. Below Threshold Reprogramming	0	0	0	0
e. Rescissions	-25	-56	0	0
Adjustments to Budget Years Since FY2001 PB	0	0	9909	0
Current Budget Submit (FY 2002/2003 PB)	3757	5873	13017	0

Increases to FY 2002 and FY 2003 were provided to support component reliability for the UH-60M program.

C. Other Program Funding Summary: There are no other RDTE or other Appropriation efforts.

D. Acquisition Strategy: Improved designs will be implemented via Engineering Change Proposal (ECP) and follow-on procurement or modification to a production contract to introduce the improved hardware.

E. Schedule Profile	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
T700 - Begin Development of Improved 701C Engine	4Q			0	0	0	0	0
T700 - PT Heat Transfer/Stress Analysis	4Q			0	0	0	0	0
T700 - GGT Spin Pit Testing	3Q			0	0	0	0	0
T700 - Continue Development of Improved 701C Engine		2Q		0	0	0	0	0
T700 - PT Stress Analysis Modeling		2Q		0	0	0	0	0
T700 - Apache DECU EMI Testing		2Q		0	0	0	0	0
T700 - Begin Analysis on TIN Coating		3Q		0	0	0	0	0
T700 - Continue Development of Improved 701C Engine			2Q	0	0	0	0	0
T700 - Complete PT Life Analysis			2Q	0	0	0	0	0
T700 - Start Development of 701C FADEC			2Q	0	0	0	0	0
T700 - Develop Stage 2 Nozzle Internal Coating			2Q	0	0	0	0	0
T700 - Develop Reduced Leakage CDP Seal			2Q	0	0	0	0	0
T700 - Continue Development of Improved 701C Engine				0	0	0	0	0
T700 - Complete Qualification of CDP Seal				0	0	0	0	0
T700 - Redesign to Eliminate Rare/Precious Materials				0	0	0	0	0

E. Schedule Profile (continued)	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
T55 - Complete Qualification of Hard Line Plumbing System		4Q		0	0	0	0	0
T55 - Continue Development of New Repair Procedures and Providing Flight Safety Spt		4Q		0	0	0	0	0
T55 - Complete Bearing Redesign Qualification Testing		4Q		0	0	0	0	0
T55 - Design and Qualify Improved Stage 1st GP Nozzle			4Q	0	0	0	0	0
T55 - Design and Qualify Improved Stage 2 Disk			4Q	0	0	0	0	0
T55 - Complete the Qualification of Improved Tailpipe to Reduce Removals & O&S Costs			4Q	0	0	0	0	0
T55 - Develop Improved Bleed System Actuator			4Q	0	0	0	0	0
T55 - Design and Qualify Improved Stage 3 Nozzle				0	0	0	0	0
T55 - Development of Improved EGT Measurement System				0	0	0	0	0
GTCP36 - Complete Life Analysis for Compressor and Turbine Wheels	1Q			0	0	0	0	0
GTCP36 - Relocate & Redesign Fuel Solenoid Bracket	4Q			0	0	0	0	0
GTCP36 - Vent Oil Leakage Investigation and Solution	4Q			0	0	0	0	0
GTCP36 - Field Evaluation of Oil Leakage Solution		1Q		0	0	0	0	0
GTCP36 - Complete Dual Alloy Turbine Wheel Development		2Q		0	0	0	0	0
GTCP36 - Gearbox Failure Investigation			1Q	0	0	0	0	0
GTCP36 - Dual Alloy Turbine Wheel Containment Analysis			2Q	0	0	0	0	0
GTCP36 - Component Qualification Tests				0	0	0	0	0
GTCP36 - Complete Spin Pit testing				0	0	0	0	0
T62T - Complete Material Analysis for Component Lifing		1Q		0	0	0	0	0
T62T - Compressor Wheel Spin Pit Testing			1Q	0	0	0	0	0
T62T - Reduction Drive Housing Design				0	0	0	0	0
T62T - High Reliability Wiring Harness				0	0	0	0	0
T62T - One-piece Cast Turbine Nozzle				0	0	0	0	0
FADEC - Completed MPC 555 and other core schematics	3Q			0	0	0	0	0
FADEC - Initial power supply design, prototype power supply in build	3Q			0	0	0	0	0
FADEC - Preliminary stepper motor control logic defined	4Q			0	0	0	0	0
FADEC - Complete hardware design, conduct CDR		2Q		0	0	0	0	0

E. Schedule Profile (continued)	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
FADEC - Initiate fabrication of development units		2Q		0	0	0	0	0
FADEC - Complete preliminary software development		3Q		0	0	0	0	0
FADEC - Initiate engine document support		3Q		0	0	0	0	0
FADEC - Complete software development			2Q	0	0	0	0	0
FADEC - Prototype software qualification testing			2Q	0	0	0	0	0
FADEC - Unit durability test program			3Q	0	0	0	0	0
FADEC - Support HALTS and engine testing				0	0	0	0	0
FADEC - Support system level FMECA/SHA				0	0	0	0	0
FDU - Complete layout reviews for main housing, other components	2Q			0	0	0	0	0
FDU - Support specification review and conduct weight/cost reduction program	3Q			0	0	0	0	0
FDU - Fabricate	3Q			0	0	0	0	0
FDU- Develop torquemeter supplier requirements	4Q			0	0	0	0	0
FDU - Finalize pressure sensor integration		2Q		0	0	0	0	0
FDU - Fabricate developmental units		3Q		0	0	0	0	0
FDU - Complete LOLA pump design and testing		3Q		0	0	0	0	0
FDU - Initiate qualification testing program		3Q		0	0	0	0	0
FDU - Support Subsystem Power Unit (SPU) testing		3Q		0	0	0	0	0
FDU - Complete qualification testing			2Q	0	0	0	0	0
FDU - Accelerated mission/endurance testing			3Q	0	0	0	0	0
FDU - Continued support of SPU tests			3Q	0	0	0	0	0

Schedule Profile provided for FADEC and FDU efforts is in anticipation of receiving additional funds for these efforts.

ARMY RDT&E COST ANALYSIS(R-3)

June 2001

BUDGET ACTIVITY
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I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . T-700 Engine	SS/CPFF	Lynn, MA	41988	1460	2-3Q	10950	2-3Q	0	0	0	0	0
b . T-55 Engine	SS/CPFF	Phoenix, AZ	20126	941	2-3Q	1398	2-3Q	0	0	0	0	0
c . APU's	MIPR	Air Force, Kelly AFB, TX	13557	0		0		0	0	0	0	0
d . FADEC/FDU	MIPR	CECOM, Ft. Monmouth, NJ	916	2800	1-2Q	0		0	0	0	0	0
e . DECU	MIPR	RTTC, Redstone Arsenal, AL	95	10	1-2Q	0		0	0	0	0	0
f . APU's	MIPR	Air Force, Hill AFB, UT	0	368	2-3Q	605	2-3Q	0	0	0	0	0
Subtotal:			76682	5579		12953		0		0	0	0

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II. Support Cost	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . Contract Engineering	SS/CPFF	Westar, St. Louis, MO	10	0		0		0	0	0	0	0
b . Contract Engineering	SS/CPFF	Camber, Huntsville, AL	145	54	2-3Q	0		0	0	0	0	0
Subtotal:			155	54		0		0		0	0	0

III. Test and Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal:			0	0		0		0		0	0	0

Remarks: Not Applicable

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IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . In-house Engineering		ATCOM, St. Louis, MO	10342	0		0		0	0	0	0	0
b . In-house Engineering		AMCOM, Redstone Arsenal, AL	229	67		64		0	0	0	0	Continue
c . SBIR/STTR			0	173		0		0	0	0	0	0
Subtotal:			10571	240		64		0		0	0	Continue
Project Total Cost:			87408	5873		13017		0		0	0	Continue