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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)							DATE February 2000					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0203752A Aircraft Engine Component Improvement Program				PROJECT D106				
COST (In Thousands)				FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D106 Aircraft Component Improvement Program (CIP)				6543	3859	2929	3108	3174	3348	3425	Continuing	Continuing
<p>A. <u>Mission Description and Budget Item Justification</u> 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.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 1027 T700 Engine: Continued development of repair procedures to allow use of scrapped high-dollar hardware. Performed materials analysis of power turbine (PT) disks to develop safe operating life limits. Developed and tested new material for Woodward Governor HMU Temperature sensor to increase service life and reduce O&S costs. Completed LOLA fuel pump effort to improve flight safety and reduce O&S costs. • 1056 T55 Engine: Completed the development and testing of redesigned tailpipe to improve reliability and readiness and extend service life while reducing performance losses and O&S costs. Began development of depot/field level repair techniques for high-dollar hardware to reduce O&S costs and improve readiness. Completed testing of the improved bearings which will increase life and reduce O&S costs. Designed optimized plumbing system to reduce maintenance costs and weight while improving reliability. • 75 T53 Engine: Developed life limits for centrifugal compressor to improve flight safety. • 400 GTCP 36 APU: Continued design of a common dual alloy turbine wheel for use on both Apache and Blackhawk. Initiated investigation of Apache PTO clutch problems, theorizing that overservicing may be the source of the problem. Performed material analysis to identify cause of recent Blackhawk APU compressor wheel failures. Began teardown and analysis of high-time Blackhawk APU to determine cause of premature erosion and labyrinth seal failure and to identify potential component redesign candidates to extend service life and reduce O&S cost. Continued fuel solenoid bracket redesign and testing to eliminate maintainer-induced failure. Continued clutch vent tube redesign to eliminate cold day leakage problem. • 1800 SPU/FDU: Developed a Fuel Delivery Unit (FDU) for the Subsystem Power Unit (SPU) for the RAH-66 Comanche. • 1800 FADEC: Developed a Fully Authority Digital Engine Control (FADEC) training device for the New Training Helicopter (NTH) Engine that will permit manual control of the engine. • 10 WESTAR: Supported SPU/FDU and FADEC • 110 CAMBER: Supported SPU/FDU and FADEC • 265 IN-HOUSE: In-house support for the component improvement program engineers. <p>Total 6543</p>												

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0203752A Aircraft Engine Component Improvement Program	D106
FY 2000 Planned Program:		
• 880	T700 Engine: Complete materials analysis of PT disks and begin analysis of blisks. Continue development of new repair procedures for high-dollar hardware. Develop an improved stage 1 and 2 damper to increase installed life. Develop and qualify improved -700 and -701C Stage 1 shrouds for reduced wear and O&S costs and improved on-wing life. Begin analysis of TiN compressor coating for improved on-wing life and reduced O&S costs.	
• 804	T55 Engine: Qualify new plumbing system to reduce weight and O&S costs while improving reliability. Continue development of new depot/field level repair procedures to reduce O&S costs and improve readiness. Complete life analysis of GA-714 compressor and turbine sections for improved flight safety.	
• 505	T53 Engine: Continue development of life limits for critical rotating engine components to improve flight safety. Begin development of program to control turbine tip clearance to improve on-wing life and reduce O&S costs.	
• 177	T62 APU: Investigate service revealed difficulties arising during the course of the year to improve readiness.	
• 910	LOLA Pump: Develop and qualify variable-vane LOLA pump.	
• 357	GTCP 36 APU: Based on candidates identified in FY 1999 Black Hawk erosion / labyrinth seal investigation program, begin component redesign to eliminate premature erosion and labyrinth seal failure. Initiate development of a ceramic turbine nozzle in order to reduce premature and erosion. Investigate service revealed difficulties arising during the course of the year to improve readiness.	
• 124	IN-HOUSE: In-house support for the component improvement program engineers.	
102	Small Business Innovative Research/Small Business Technology Transfer Program (SBIR/STTR)	
Total	3859	
FY 2001 Planned Program:		
• 1203	T700 Engine: Continue development of new repair procedures to allow refurbishment of high dollar hardware which will reduce O&S costs while improving readiness. Complete materials analysis of blisks and begin analysis of tierod and spacer to improve flight safety. Complete development and qualification of improved -700 and -701C shrouds to improve on-wing life and reduce O&S costs. Begin development of improved stage 3 PT blades to improve on-wing life and reduce O&S costs. Initiate design of improved durability stage 2 nozzle to increase on-wing life.	
• 900	T55 Engine: Begin development of an improved 1 st stage GP nozzle to improve on-wing life and readiness while reducing O&S costs. Begin design of an improved N2 sensor which will reduce parts count and reduce O&S costs while improving readiness. Begin development of an improved EGT measurement system to improve reliability and on-wing life while reducing O&S costs.	
• 500	T53 Engine: Complete development of life limits on critical rotating parts to improve flight safety. Complete turbine tip clearance control program to improve on-wing life and reduce O&S costs. Initiate design of improved turbine nozzle to reduce O&S costs.	
• 50	T62 APU: Investigate service revealed difficulties arising during the course of the year to improve readiness.	
• 250	GTCP 36 APU: Begin 200 hour engine test to qualify improved hardware developed in previous CIP efforts. Investigate service revealed difficulties arising during the course of the year to improve readiness.	
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<p>FY 2001 Planned Program: (continued)</p> <ul style="list-style-type: none"> • 26 IN-HOUSE: In-house support for the component improvement program engineers. <p>Total 2929</p>							
B. Program Change Summary							
	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>				
Previous President's Budget (<u>FY 2000/2001 PB</u>)	6901	2900	2946				
Appropriated Value	6948	3900					
Adjustments to Appropriated Value							
a. Congressional General Reductions	-47						
b. SBIR / STTR	-181						
c. Omnibus or Other Above Threshold Reductions		-16					
d. Below Threshold Reprogramming	-149						
e. Rescissions	-28	-25					
Adjustments to Budget Years Since <u>FY 2000/2001 PB</u>			-17				
Current Budget Submit (<u>FY 2001 PB</u>)	6543	3859	2929				
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							
	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
T700 – Perform materials analysis of PT disks, design and qualify new WGC HMU T2 sensor material, complete LOLA pump qualification, develop and test new repair procedures.	4 th Qtr						
T700 – Perform materials analysis of blisks, design and test improved –700 and –701C stage 1 shrouds, develop new repair procedures, develop an improved stage 1 and 2 GGT damper.		2 nd Qtr					

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E. Schedule Profile	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
T700 – Develop improved PT blade, begin development of improved stage 2 nozzle, complete design of improved stage 1 shrouds, complete materials analysis of blisks, continue development of repair procedures			2 nd Qtr				
LOLA Pump – Develop and qualify variable displacement vane pump (VDVP)			2 nd Qtr				
T55 – Complete qualification of improved plumbing system, complete development of improved tailpipe, complete bearing qualification, develop new repair procedures	4 th Qtr						
T55 – Complete qualification of optimized plumbing system, continue development of repair procedures for high cost hardware, develop life limits for GA-714 compressor and turbine.		4 th Qtr					
T55 - Begin development of improved 1 st stage GP nozzle and N2 sensor, start design of improved EGT measurement system			2 nd Qtr				
T53 – Develop life limits for centrifugal compressor	4 th Qtr						
T53 – Continue development of life limits, begin development of turbine tip clearance control		4 th Qtr					
T53 – Complete life limits development, complete qualification of turbine tip clearance control, begin improved turbine nozzle program			4 th Qtr				
SPU – Dev. & Qualify a Fuel Delivery Unit (FDU)		3 rd Qtr					
FADEC – Dev. & Qualify an advanced reversionary control for Kiowa Warrior and other potential aircraft applications		3 rd Qtr					

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E. Schedule Profile	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
T62 APU – Investigate service revealed difficulties arising during the course of the year to improve readiness	4 th Qtr						
GTCP36 APU – Continue design of common dual alloy turbine wheel, initiate investigation of Apache PTO clutch problems, perform Blackhawk material analysis to identify cause of compressor wheel failures, begin teardown and analysis of high-time Blackhawk APU, continue fuel solenoid bracket redesign and testing to eliminate maintainer-induced failure, continue clutch vent tube redesign to eliminate leakage problem.	4 th Qtr						
T62 APU – Investigate service revealed difficulties arising during the course of the year to improve readiness.		4 th Qtr					
GTCP36 APU – Based on candidates identified in FY 1999 Black Hawk erosion / labyrinth seal investigation program, begin component redesign to eliminate premature erosion and labyrinth seal failure. Initiate development of a ceramic turbine nozzle in order to reduce premature sand erosion. Investigate service revealed difficulties arising during the course of the year to improve readiness.		4 th Qtr					
T62 APU – Investigate service revealed difficulties arising during the course of the year to improve readiness.			4 th Qtr				
GTCP36 APU – Begin 200 hour engine test to qualify improved hardware developed in previous CIP efforts. Investigate service revealed difficulties arising during the course of the year to improve readiness.			4 th Qtr				

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ARMY RDT&E COST ANALYSIS (R-3)										DATE February 2000		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0203752A Aircraft Engine Component Improvement Program						PROJECT D106		
I. Product Development												
Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	FY 2001 Cost	FY 2001 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
a. General Electric	SS/CPFF	Lynn, MA	40623	1027	1 st Qtr	880		1403		Cont	43933	44821
b. Honeywell	SS/CPFF	Phoenix, AZ	19217	1131	1 st Qtr	1486		1200		Cont	23034	22817
c. Air Force	MIPR	Kelly AFB, TX	13200	400	2 nd Qtr	357		300		Cont	14257	14100
d. CECOM	MIPR	Ft. Monmouth, NJ	0	3600	3 rd Qtr	910					4510	4510
Subtotal Product Development:			73040	6158		3633		2903			85734	
II. Support Costs												
Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	FY 2001 Cost	FY 2001 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
a. Westar	SS/CPFF	St. Louis, MO	0	10	3 rd Qtr						10	10
b. Camber	SS/CPFF	Huntsville, AL	0	110	3 rd Qtr						110	90
Subtotal Support Costs:			120								120	100
III. Test and Evaluation: Not Applicable												
IV. Management Services												
Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	FY 2001 Cost	FY 2001 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
a. ATCOM In-house		St. Louis, MO	10342	0		0		0		0	10342	10342
a. AMCOM In-house		Redstone Arsenal, AL	149	265		226		26		Cont	666	Cont
Subtotal Management Services:			10491	265		226		26			11008	Cont
Project Total Cost:			83531	6543		3859		2929			96862	Cont