

UNCLASSIFIED

PE NUMBER: 0401119F
 PE TITLE: C-5 Airlift Squadrons

Exhibit R-2, RDT&E Budget Item Justification	DATE February 2007
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BUDGET ACTIVITY 07 Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons
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Cost (\$ in Millions)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
Total Program Element (PE) Cost	225.730	150.638	203.585	28.276	28.405	20.259	10.103	0.000	0.000	1,928.449
4495 Avionics Modernization Program	3.000	0.000	12.615	1.845	0.000	0.000	0.000	0.000	0.000	409.501
4835 Reliability Enhancement & Reengining Program	222.730	150.638	190.970	26.431	28.405	20.259	10.103	0.000	0.000	1,518.948

(U) A. Mission Description and Budget Item Justification

674495: Avionics Modernization Program (AMP): Phase I of an Air Force planned two-phase modernization effort for the C-5 (Phase II is the Reliability Enhancement and Re-engining Program (RERP)). AMP implements communication, navigation, surveillance/air traffic management (CNS/ATM) [formerly, Global Air Traffic Management (GATM)] and navigation/safety capability and the All Weather Flight Control System (AWFCS). It installs Deputy Secretary of Defense (DepSecDef) directed navigation/safety equipment: Terrain Awareness and Warning System (TAWS) and Traffic Alert and Collision Avoidance System (TCAS), reducing the threat of controlled flight into terrain and mid-air collisions. CNS/ATM capability requirements will be incorporated into the aircraft to meet current and future International Civil Aviation Organization (ICAO)/Federal Aviation Administration (FAA) requirements and to progress towards free flight capability. The AWFCS portion of AMP replaces low reliability line replaceable units (LRUs) in the automatic flight control system and replaces aging, non-supportable mechanical instruments in the engine and flight systems. Connectivity to mobility command and control capabilities will also be incorporated in the AMP design. The TCAS portion was accelerated ahead of the rest of the AMP mod and was completed 31 Oct 02. Two AMP RDT&E test articles were funded in FY99 for installation and flight test in FY02/03/04/05. AMP's first flight occurred in Dec 02. The final software build completed Jun 05, and operational testing completed Jul 06. Avionics capability required for modernization that is not complete at the end of AMP development will be captured and funded in RERP, which is Phase II of the C-5 Modernization program, or in a follow-on software block upgrade program. The C-5 modernization program was approved in FY04 to use the contractor supported weapon system (CSWS) support concept. Initial spares in support of CSWS will be purchased with 3010, BP11 funds instead of 3010, BP16 funds. This project is comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development. AMP requirements have been expanded to incorporate updates to the new avionics architecture, to include security enhancements to the Global Positioning System.

674835: Reliability Enhancement and Re-engining Program (RERP): Phase II of an Air Force planned two-phase modernization effort for the C-5 (Phase I is the Avionics Modernization Program (AMP)). RERP is a comprehensive modernization effort to improve aircraft reliability, maintainability and availability. RERP will enable the C-5 to achieve wartime mission requirements by increasing fleet availability (mission capable rate, departure reliability) while reducing Total Ownership Costs (TOC). This effort centers around replacing TF39 engines with a more reliable, Commercial Off-the-Shelf (COTS) turbofan engine with increased takeoff thrust and stage three noise compliance. These new engines (along with new pylons, wing attach fittings and upgrades, and thrust reversers) increase payload capability and access to Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) airspace. The modification also decreases aircraft time to climb, increases engine-out climb gradient for takeoff, improves transportation system throughput, and decreases engine removals. Additionally, numerous other system modifications will be performed (e.g., auxiliary power units, electrics, hydraulics, fuel system, fire suppression system, pressurization/air conditioning system, landing gear, and airframe) to increase fleet availability and reduce TOC. Three RDT&E test articles were funded in FY04 for installation and flight test in FY05-09.

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RERP's Preliminary Design Review (PDR) completed in Jan 03 and the Air Vehicle Critical Design Review (CDR) completed in Mar 04. First Flight of the first test article occurred in Jun 06. Avionics capability required for modernization that is not complete at the end of AMP development will be captured and funded in RERP, or in a follow-on software block upgrade program. The C-5 modernization program was approved in FY04 to use the Contractor Supported Weapon System (CSWS) support concept. Initial spares in support of CSWS will be purchased with 3010, BP11 funds instead of 3010, BP16 funds. This project is comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development.

(U) **B. Program Change Summary (\$ in Millions)**

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) Previous President's Budget	226.479	151.209	51.691	0.000
(U) Current PBR/President's Budget	225.730	150.638	203.585	28.276
(U) Total Adjustments	-0.749	-0.571		
(U) Congressional Program Reductions				
Congressional Rescissions	-3.234	-0.571		
Congressional Increases				
Reprogrammings	8.758			
SBIR/STTR Transfer	-6.273			

(U) **Significant Program Changes:**

FY08 PB:

FY06 has been reduced by -\$0.7M. This funding reduction was made as a result of Congressional actions, a SBIR transfer, and reprogramming.

FY07 has been reduced by -\$0.571M. This reduction rescinded funds based upon economic assumptions.

FY08 has been increased \$151.9M since the FY07 PB submittal. Increase is a result of an increase in program development testing requirements.

FY09 has been increased \$28.3M since the FY07 PB submittal. Increase is a result of an increase in program development testing requirements.

Exhibit R-2a, RDT&E Project Justification

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BUDGET ACTIVITY 07 Operational System Development					PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons			PROJECT NUMBER AND TITLE 4495 Avionics Modernization Program		
Cost (\$ in Millions)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
4495 Avionics Modernization Program	3.000	0.000	12.615	1.845	0.000	0.000	0.000	0.000	0.000	409.501
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0		

(U) **A. Mission Description and Budget Item Justification**

674495: Avionics Modernization Program (AMP): Phase I of an Air Force planned two-phase modernization effort for the C-5 (Phase II is the Reliability Enhancement and Re-engining Program (RERP)). AMP implements communication, navigation, surveillance/air traffic management (CNS/ATM) [formerly, Global Air Traffic Management (GATM)] and navigation/safety capability and the All Weather Flight Control System (AWFCS). It installs Deputy Secretary of Defense (DepSecDef) directed navigation/safety equipment: Terrain Awareness and Warning System (TAWS) and Traffic Alert and Collision Avoidance System (TCAS), reducing the threat of controlled flight into terrain and mid-air collisions. CNS/ATM capability requirements will be incorporated into the aircraft to meet current and future International Civil Aviation Organization (ICAO)/Federal Aviation Administration (FAA) requirements and to progress towards free flight capability. The AWFCS portion of AMP replaces low reliability line replaceable units (LRUs) in the automatic flight control system and replaces aging, non-supportable mechanical instruments in the engine and flight systems. Connectivity to mobility command and control capabilities will also be incorporated in the AMP design. The TCAS portion was accelerated ahead of the rest of the AMP mod and was completed 31 Oct 02. Two AMP RDT&E test articles were funded in FY99 for installation and flight test in FY02/03/04/05. AMP's first flight occurred in Dec 02. The final software build completed Jun 05, and operational testing completed Jul 06. Avionics capability required for modernization that is not complete at the end of AMP development will be captured and funded in RERP, which is Phase II of the C-5 Modernization program, or in a follow-on software block upgrade program. The C-5 modernization program was approved in FY04 to use the contractor supported weapon system (CSWS) support concept. Initial spares in support of CSWS will be purchased with 3010, BP11 funds instead of 3010, BP16 funds. This project is comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development. AMP requirements have been expanded to incorporate updates to the new avionics architecture, to include security enhancements to the Global Positioning System.

(U) **B. Accomplishments/Planned Program (\$ in Millions)**

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) System Engineering/Program Management	0.392		1.387	0.203
(U) AMP Kit Design/Development/Contractor Test	1.887		6.657	0.974
(U) Prototype Fabrication/Install	0.341		1.202	0.176
(U) Mission Support			1.622	0.237
(U) Government Flight Test Cost	0.380		1.747	0.255
(U) Total Cost	3.000	0.000	12.615	1.845

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BUDGET ACTIVITY 07 Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons	PROJECT NUMBER AND TITLE 4495 Avionics Modernization Program
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(U) C. Other Program Funding Summary (\$ in Millions)

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Complete</u>							
(U) AF RDT&E										
(U) Other APPN										
(U) Aircraft Procurement, AF, BA-5, C-5 Mods, Avionics Modernization Program, BP-11	77.820	54.836	94.679	96.166	79.539	75.966	78.155	75.984	21.851	963.366
(U) Aircraft Procurement, AF, BA-5, C-5 Mods, Avionics Modernization Program, BP-19			23.744	7.503	5.019	1.525				37.791
(U) Aircraft Procurement, AF, BA-5, C-5 Mods, Reliability Enhancement and Re-engining Program, BP-11 (to include Advance Procurement)	30.585	143.372	253.262	540.784	845.259	963.558	935.319	940.416	5,166.286	9,818.841

(U) D. Acquisition Strategy

Avionics Modernization Program: Program acquisition strategy establishes a single integrating contractor (Lockheed Martin Aeronautics Company) to modify and qualify integrated Commercial Off-the-Shelf (COTS) line replaceable units (LRUs) and software to meet C-5 performance and communication, navigation, surveillance/air traffic management (CNS/ATM) requirements; update existing C-5 engineering and technical data; develop interface control specifications based on performance requirements; prototype the new system; and support flight testing. The AMP contract was awarded to the Lockheed Martin/Honeywell team on 22 January 1999. \$9.7M in FY99 procurement was added in the FY00 PB to accelerate Traffic Alert and Collision Avoidance System (TCAS) installations ahead of the rest of AMP. The AMP modification is planned for the entire C-5 fleet.

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Exhibit R-3, RDT&E Project Cost Analysis

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BUDGET ACTIVITY				PE NUMBER AND TITLE								PROJECT NUMBER AND TITLE		
07 Operational System Development				0401119F C-5 Airlift Squadrons								4495 Avionics Modernization Program		
(U) Cost Categories (Tailor to WBS, or System/Item Requirements) (\$ in Millions)	Contract Method & Type	Performing Activity & Location	Total Prior to FY 2006 Cost	FY 2006 Cost	FY 2006 Award Date	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost to Complete	Total Cost	Target Value of Contract
(U) <u>Product Development</u>														
Lockheed Martin Aeronautics Co	CPAF		348.525	2.620	Oct-05	0.000		9.246	Oct-07	1.353	Oct-08	0.000	361.744	361.744
N/A													0.000	
Subtotal Product Development			348.525	2.620		0.000		9.246		1.353		0.000	361.744	361.744
Remarks:		Engineering complete.												
(U) <u>Support</u>														
730 ACSG, Robins AFB, GA			9.079										9.079	9.079
716 AESG, Wright-Patterson AFB, OH			14.903					1.622		0.237			16.762	16.762
N/A													0.000	
Subtotal Support			23.982	0.000		0.000		1.622		0.237		0.000	25.841	25.841
Remarks:		Engineering complete.												
(U) <u>Test & Evaluation</u>														
418 Test Squadron		Edwards AFB	19.534	0.380	Apr-06			1.747	Apr-08	0.255	Apr-09		21.916	21.916
N/A													0.000	
Subtotal Test & Evaluation			19.534	0.380		0.000		1.747		0.255		0.000	21.916	21.916
Remarks:		Engineering complete.												
(U) <u>Management</u>														
Subtotal Management			0.000	0.000		0.000		0.000		0.000		0.000	0.000	0.000
Remarks:		Engineering complete.												
(U) Total Cost			392.041	3.000		0.000		12.615		1.845		0.000	409.501	409.501

Exhibit R-4, RDT&E Schedule Profile

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PE NUMBER AND TITLE
0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE
4495 Avionics Modernization Program



**C-5 Summary Schedule
Avionics Modernization Program (AMP)**

U.S. AIR FORCE

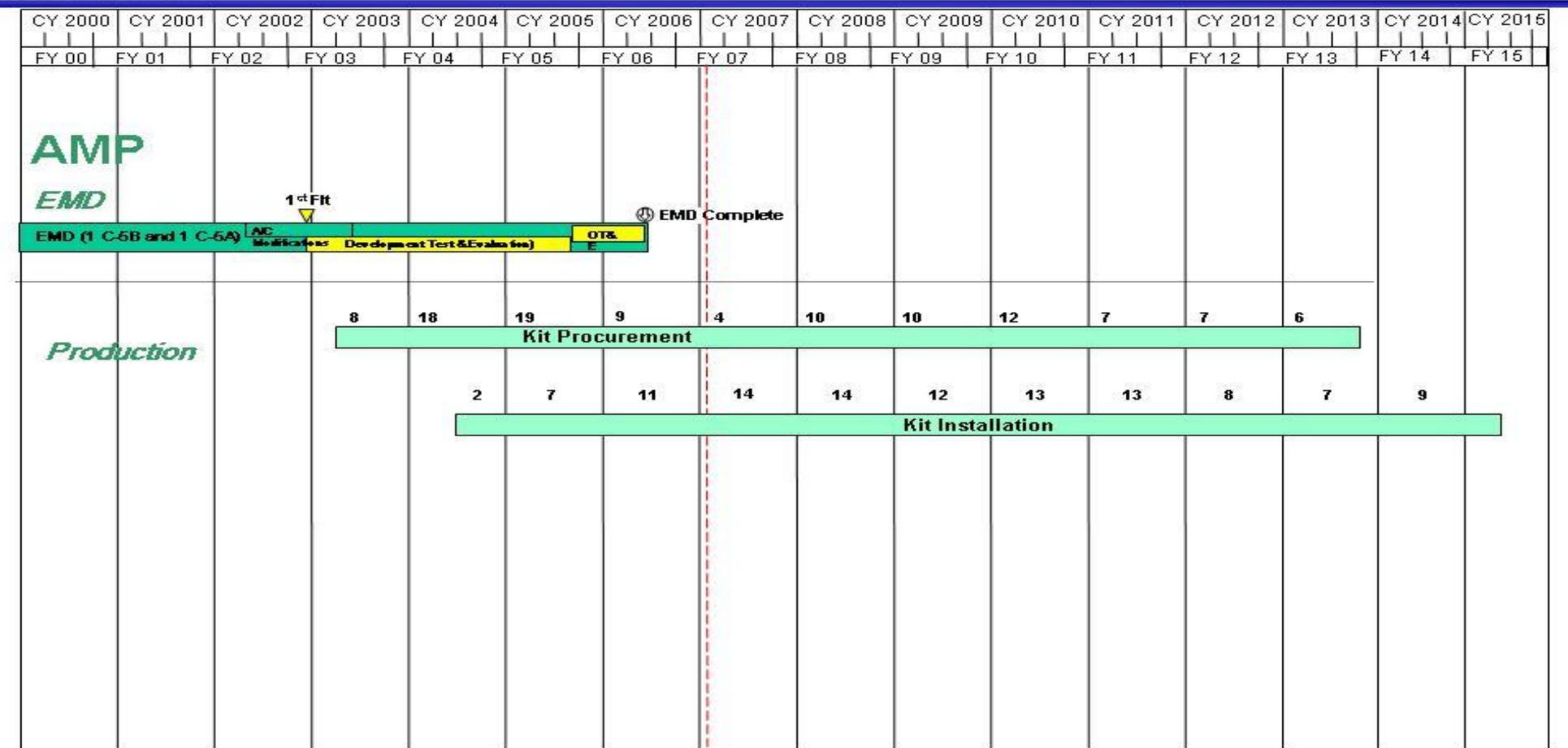


Exhibit R-4a, RDT&E Schedule Detail	DATE February 2007
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BUDGET ACTIVITY 07 Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons	PROJECT NUMBER AND TITLE 4495 Avionics Modernization Program
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(U) <u>Schedule Profile</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) AMP Flight Test Complete (FY06/3)	4Q			

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BUDGET ACTIVITY 07 Operational System Development				PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons				PROJECT NUMBER AND TITLE 4835 Reliability Enhancement & Reengining Program			
Cost (\$ in Millions)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total	
4835 Reliability Enhancement & Reengining Program	222.730	150.638	190.970	26.431	28.405	20.259	10.103	0.000	0.000	1,518.948	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0			

(U) A. Mission Description and Budget Item Justification

674835: Reliability Enhancement and Re-engining Program (RERP): Phase II of an Air Force planned two-phase modernization effort for the C-5 (Phase I is the Avionics Modernization Program (AMP)). RERP is a comprehensive modernization effort to improve aircraft reliability, maintainability and availability. RERP will enable the C-5 to achieve wartime mission requirements by increasing fleet availability (mission capable rate, departure reliability) while reducing Total Ownership Costs (TOC). This effort centers around replacing TF39 engines with a more reliable, Commercial Off-the-Shelf (COTS) turbofan engine with increased takeoff thrust and stage three noise compliance. These new engines (along with new pylons, wing attach fittings and upgrades, and thrust reversers) increase payload capability and access to Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) airspace. The modification also decreases aircraft time to climb, increases engine-out climb gradient for takeoff, improves transportation system throughput, and decreases engine removals. Additionally, numerous other system modifications will be performed (e.g., auxiliary power units, electrics, hydraulics, fuel system, fire suppression system, pressurization/air conditioning system, landing gear, and airframe) to increase fleet availability and reduce TOC. Three RDT&E test articles were funded in FY04 for installation and flight test in FY05-09. RERP's Preliminary Design Review (PDR) completed in Jan 03 and the Air Vehicle Critical Design Review (CDR) completed in Mar 04. First Flight of the first test article occurred in Jun 06. Avionics capability required for modernization that is not complete at the end of AMP development will be captured and funded in RERP, or in a follow-on software block upgrade program. The C-5 modernization program was approved in FY04 to use the Contractor Supported Weapon System (CSWS) support concept. Initial spares in support of CSWS will be purchased with 3010, BP11 funds instead of 3010, BP16 funds. This project is comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development.

(U) B. Accomplishments/Planned Program (\$ in Millions)

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) Systems Engineering/Program Management	15.220	9.777	12.100	0.803
(U) RERP Design/Development/Contractor Test	118.720	76.264	94.384	5.894
(U) Prototype Fabrication/Install	69.000	44.324	54.856	3.734
(U) Mission Support	14.196	11.353	8.900	0.500
(U) Government Test Support	5.594	8.920	8.730	0.500
(U) Aircrew & Maintenance Trainer	0.000	0.000	12.000	15.000
(U) Total Cost	222.730	150.638	190.970	26.431

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

	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Complete</u>							
(U) AF RDT&E										
(U) Other APPN										
(U) Aircraft Procurement, AF, BA-5, C-5 Mods, Reliability Enhancement and Re-engining Program, BP-11 (to include Advance Procurement)	30.585	143.372	253.262	540.784	845.259	963.558	935.319	940.416	5,166.286	9,818.841
(U) Aircraft Procurement, AF, BA-5, C-5 Mods, Avionics Modernization Program, BP-11	77.820	54.836	94.679	96.166	79.539	75.966	78.155	75.984	21.851	963.366
(U) Aircraft Procurement, AF, BA-5, C-5 Mods, Avionics Modernization Program, BP-19			23.744	7.503	5.019	1.525				37.791

(U) D. Acquisition Strategy

Reliability Enhancement and Re-engining Program (RERP): The approved FY02 and the updated FY06 acquisition strategy called for the modification of the entire C-5 aircraft fleet starting with the 49 B-models first. System Development & Demonstration (SDD) includes 1 C-5A and 2 C-5Bs. The program acquisition strategy is to consider every opportunity to use commercially available components and processes to modernize C-5 products and processes to meet or exceed required system performance and support, so as to renew the weapon system until 2040. The program acquisition strategy also seeks to construct a government/industry partnership to identify solutions, assign responsibility, and execute to achieve AMC requirements. Fleet availability, ownership cost, and system performance will be used to balance solutions against program cost. Lockheed Martin Aeronautics Co has been selected as the prime contractor through a sole source arrangement. Lockheed has selected General Electric (Powerplant), Goodrich (Pylon), and Honeywell (Avionics) as the major subcontractors.

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Exhibit R-3, RDT&E Project Cost Analysis

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BUDGET ACTIVITY				PE NUMBER AND TITLE								PROJECT NUMBER AND TITLE		
07 Operational System Development				0401119F C-5 Airlift Squadrons								4835 Reliability Enhancement & Reengining Program		
(U) Cost Categories (Tailor to WBS, or System/Item Requirements) (\$ in Millions)	<u>Contract Method & Type</u>	<u>Performing Activity & Location</u>	<u>Total Prior to FY 2006 Cost</u>	<u>FY 2006 Cost</u>	<u>FY 2006 Award Date</u>	<u>FY 2007 Cost</u>	<u>FY 2007 Award Date</u>	<u>FY 2008 Cost</u>	<u>FY 2008 Award Date</u>	<u>FY 2009 Cost</u>	<u>FY 2009 Award Date</u>	<u>Cost to Complete</u>	<u>Total Cost</u>	<u>Target Value of Contract</u>
(U) Product Development														
Lockheed Martin Aeronautics Co (Pre-EMD)	FFP		46.738									0.000	46.738	46.738
Lockheed Martin Aeronautics Co (SDD)	CPAF		773.929	202.940	Oct-05	130.365	Oct-06	161.340	Oct-07	10.431	Oct-08	8.767	1,287.772	1,287.772
													0.000	
Subtotal Product Development			820.667	202.940		130.365		161.340		10.431		8.767	1,334.510	TBD
Remarks:														
(U) Support														
730.ACSG, Robins AFB, GA			12.588	3.457		2.673						0.000	18.718	18.718
716 AESG, Wright-Patterson AFB, OH			19.578	10.739		8.680		8.900		0.500		0.000	48.397	48.397
N/A													0.000	
Subtotal Support			32.166	14.196		11.353		8.900		0.500		0.000	67.115	67.115
Remarks:														
(U) Test & Evaluation														
418 Test Squadron (Edwards AFB)			16.579	5.594		8.920		8.730		0.500			40.323	40.323
N/A													0.000	
Subtotal Test & Evaluation			16.579	5.594		8.920		8.730		0.500		0.000	40.323	40.323
Remarks:														
(U) Management														
Subtotal Management			0.000	0.000		0.000		0.000		0.000		0.000	0.000	0.000
Remarks:														
(U) Aircrew & Maintenance Trainer														
Subtotal Aircrew & Maintenance Trainer			0.000	0.000		0.000		12.000		15.000		50.000	77.000	77.000
Remarks:								12.000		15.000		50.000	77.000	77.000
(U) Total Cost			869.412	222.730		150.638		190.970		26.431		58.767	1,518.948	TBD

Exhibit R-4, RDT&E Schedule Profile

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BUDGET ACTIVITY
07 Operational System Development

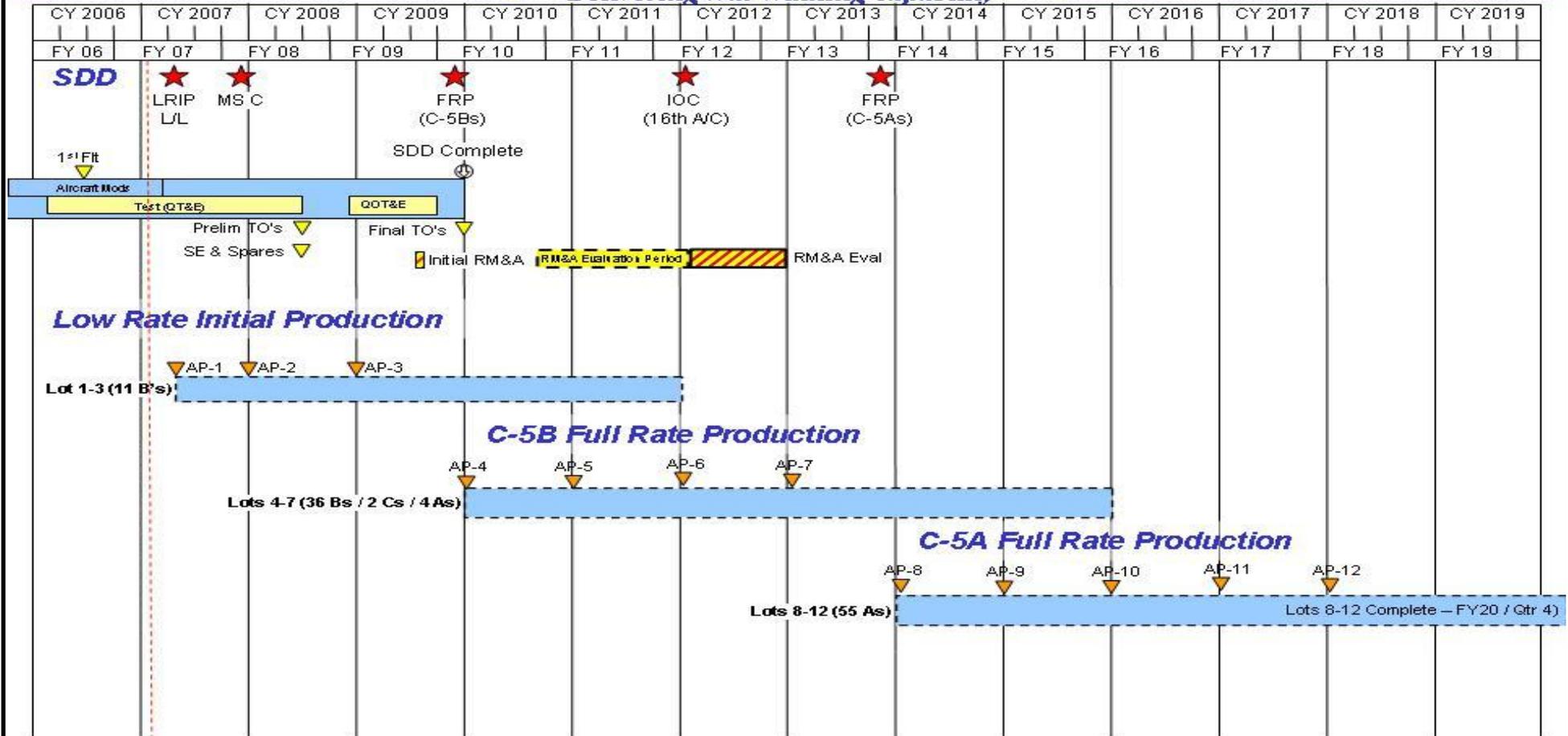
PE NUMBER AND TITLE
0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE
4835 Reliability Enhancement & Reengining Program



C-5 Summary Schedule Reliability Enhancement & Reengining (RERP)

Delivering war-winning capability



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Exhibit R-4a, RDT&E Schedule Detail	DATE February 2007
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	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) Schedule Profile				
(U) First Prototype Flight (FY06/3)	3Q			
(U) Milestone C (FY08/1)			1Q	