

UNCLASSIFIED

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

Exhibit R-2, RDT&E Budget Item Justification								DATE February 2006	
BUDGET ACTIVITY 07 Operational System Development				PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons					
Cost (\$ in Millions)	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
Total Program Element (PE) Cost	311.508	223.252	150.209	51.691	0.000	0.000	0.000	0.000	1,686.630
4495 Avionics Modernization Program	33.327	0.000	0.000	0.000	0.000	0.000	0.000	0.000	392.041
4835 Reliability Enhancement & Reengining Program	278.181	223.252	150.209	51.691	0.000	0.000	0.000	0.000	1,294.589

(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 in August 05, and operational testing is scheduled to complete in May 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. 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.

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, commercially 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 FY05/06/07. RERP's Preliminary Design Review (PDR) completed in Jan 03 and the Air-vehicle Critical Design Review (CDR) completed in Mar 04. Avionics capability required for modernization that is not complete at the end of AMP development will be captured and funded in RERP. The C-5 modernization program was approved in FY04

R-1 Shopping List - Item No. 216-2 of 216-13

Exhibit R-2 (PE 0401119F)

R-1 Shopping List - Item No. 216-2 of 216-13

Exhibit R-2 (PE 0401119F)

Exhibit R-2, RDT&E Budget Item Justification

DATE

February 2006

BUDGET ACTIVITY

07 Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

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. As described above, RERP includes a new start effort for avionics capability required for modernization, but which may not be complete at the end of AMP development.

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

	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
(U) Previous President's Budget	332.982	226.479	150.209
(U) Current PBR/President's Budget	311.508	223.252	150.209
(U) Total Adjustments	-21.474	-3.227	
(U) Congressional Program Reductions		-2.247	
Congressional Rescissions	-3.186	-0.980	
Congressional Increases			
Reprogrammings	-9.299		
SBIR/STTR Transfer	-8.989		

(U) **Significant Program Changes:**

FY07 PB:

FY06 has been reduced by \$3.3M. This funding reduction was made as a result of Congressional actions.

FY07:

FY07 has been increased \$0.6M since the FY06 PB submittal. Increase is a result of changes in inflation factors.

UNCLASSIFIED

Exhibit R-2a, RDT&E Project Justification

DATE

February 2006

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 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
4495 Avionics Modernization Program	33.327	0.000	0.000	0.000	0.000	0.000	0.000	0.000	392.041
Quantity of RDT&E Articles	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. It 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 August 05, and operational testing is scheduled to complete in May 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. 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 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
(U) System Engineering/Program Management	4.547		
(U) AMP Kit Design/Development/Contractor Test	21.787		
(U) Prototype Fabrication/Install	3.797		
(U) Mission Support	0.534		
(U) Government Flight Test Cost	2.662		
(U) Total Cost	33.327	0.000	0.000

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

	<u>FY 2005</u> <u>Actual</u>	<u>FY 2006</u> <u>Estimate</u>	<u>FY 2007</u> <u>Estimate</u>	<u>FY 2008</u> <u>Estimate</u>	<u>FY 2009</u> <u>Estimate</u>	<u>FY 2010</u> <u>Estimate</u>	<u>FY 2011</u> <u>Estimate</u>	<u>Cost to</u> <u>Complete</u>	<u>Total Cost</u>
(U) AF RDT&E									
(U) Other APPN									
(U) Aircraft Procurement, AF, BA-5,	98.907	71.199	50.426	28.188	4.197			412.885	877.300
Project 4495									

R-1 Shopping List - Item No. 216-4 of 216-13

Exhibit R-2a (PE 0401119F)

UNCLASSIFIED

Exhibit R-2a, RDT&E Project Justification

DATE

February 2006

BUDGET ACTIVITY

07 Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE

4495 Avionics Modernization Program

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

C-5 Mods, Avionics

Modernization Program, BP-11

(U) Aircraft Procurement, AF, BA-5,

C-5 Mods, Avionics

Modernization Program, BP-16

(U) Aircraft Procurement, AF, BA-5,

C-5 Mods, Reliability

Enhancement and Re-engining

27.661

143.615

440.378

642.424

778.338

884.283

6,842.840

9,759.539

Program, BP-11 (to include

Advance Procurement)

(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. AMP contract 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.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis

DATE

February 2006

BUDGET ACTIVITY

07 Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE

4495 Avionics Modernization
Program

(U) <u>Cost Categories</u> (Tailor to WBS, or System/Item Requirements) (\$ in Millions)	<u>Contract</u> <u>Method &</u> <u>Type</u>	<u>Performing</u> <u>Activity &</u> <u>Location</u>	<u>Total</u> <u>Prior to FY</u> <u>2005</u> <u>Cost</u>	<u>FY 2005</u> <u>Cost</u>	<u>FY 2005</u> <u>Award</u> <u>Date</u>	<u>FY 2006</u> <u>Cost</u>	<u>FY 2006</u> <u>Award</u> <u>Date</u>	<u>FY 2007</u> <u>Cost</u>	<u>FY 2007</u> <u>Award</u> <u>Date</u>	<u>Cost to</u> <u>Complete</u>	<u>Total Cost</u>	<u>Target Value</u> <u>of Contract</u>
(U) <u>Product Development</u>												
Lockheed Martin Aeronautics Co	CPAF		318.394	30.131	Oct-04	0.000		0.000		0.000	348.525	274.000
N/A											0.000	
Subtotal Product Development			318.394	30.131		0.000		0.000		0.000	348.525	274.000
Remarks:												
(U) <u>Support</u>												
WR-ALC/LT			9.079	0.000							9.079	9.079
C5SG			14.369	0.534							14.903	14.903
N/A											0.000	
Subtotal Support			23.448	0.534		0.000		0.000		0.000	23.982	23.982
Remarks:												
(U) <u>Test & Evaluation</u>												
418 Test Squadron		Edwards AFB	16.872	2.662							19.534	19.534
N/A											0.000	
Subtotal Test & Evaluation			16.872	2.662		0.000		0.000		0.000	19.534	19.534
Remarks:												
(U) <u>Management</u>												
Subtotal Management			0.000	0.000		0.000		0.000		0.000	0.000	0.000
Remarks:												
(U) Total Cost			358.714	33.327		0.000		0.000		0.000	392.041	317.516

Exhibit R-4, RDT&E Schedule Profile

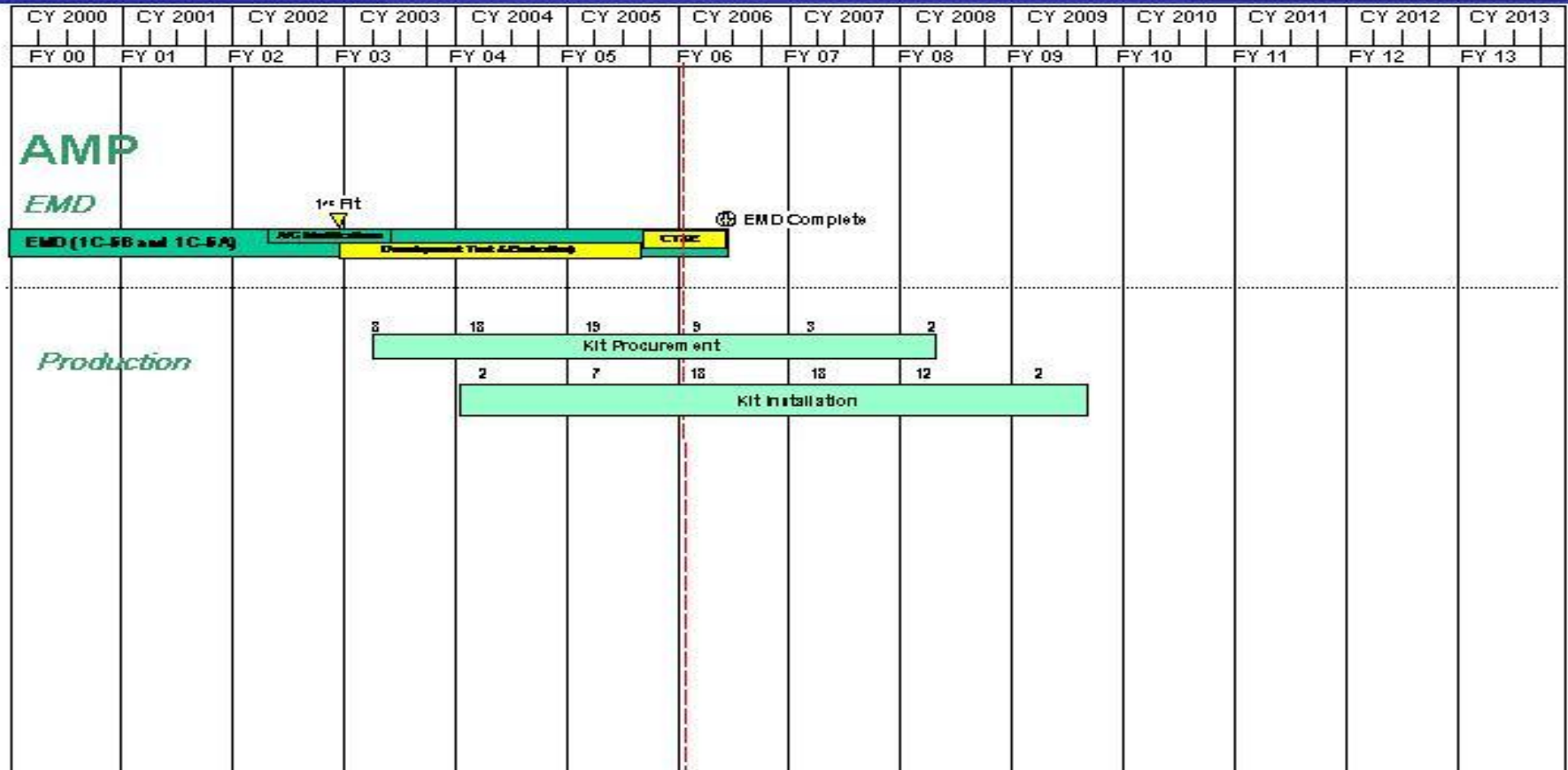
DATE

February 2006

BUDGET ACTIVITY
07 Operational System DevelopmentPE NUMBER AND TITLE
0401119F C-5 Airlift SquadronsPROJECT NUMBER AND TITLE
4495 Avionics Modernization Program

C-5 Summary Schedule Avionics Modernization Program (AMP)

U.S. AIR FORCE



UNCLASSIFIED

Exhibit R-4a, RDT&E Schedule Detail

DATE

February 2006

BUDGET ACTIVITY

07 Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE

4495 Avionics Modernization
Program(U) Schedule ProfileFY 2005FY 2006FY 2007

(U) AMP Flight Test Start (FY05/4)

4Q

(U) AMP Flight Test Complete (FY06/3)

3Q

UNCLASSIFIED

Exhibit R-2a, RDT&E Project Justification

DATE

February 2006

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 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
4835 Reliability Enhancement & Reengining Program	278.181	223.252	150.209	51.691	0.000	0.000	0.000	0.000	1,294.589
Quantity of RDT&E Articles	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. It improves 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, commercially 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 Global Air Traffic Management (GATM) 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 FY05/06/07. RERP's Preliminary Design Review (PDR) completed in Jan 03 and the Air-vehicle Critical Design Review (CDR) completed in Mar 04. Avionics capability required for modernization that is not complete at the end of AMP development will be captured and funded in RERP. 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. As described above, RERP includes a new start effort for avionics capability required for modernization, but which may not be complete at the end of AMP development.

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

	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
(U) Systems Engineering/Program Management	18.541	15.263	10.086
(U) RERP Design/Development/Contractor Test	145.676	116.797	77.181
(U) Prototype Fabrication/Install	100.649	67.025	44.292
(U) Mission Support	8.103	14.067	11.450
(U) Government Test Support	5.212	5.600	7.200
(U) Aircrew & Maintenance Trainer	0.000	4.500	0.000
(U) Total Cost	278.181	223.252	150.209

UNCLASSIFIED

Exhibit R-2a, RDT&E Project Justification

DATE

February 2006

BUDGET ACTIVITY

07 Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE

4835 Reliability Enhancement &
Reengining Program(U) **C. Other Program Funding Summary (\$ in Millions)**

	<u>FY 2005</u>	<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>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</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)		27.661	143.615	440.378	642.424	778.338	884.283	6,842.840	2,922.699
(U) Aircraft Procurement, AF, BA-5, C-5 Mods, Avionics Modernization Program, BP-11	98.907	71.199	50.426	28.188	4.197			412.885	877.300

(U) **D. Acquisition Strategy**

Reliability Enhancement and Re-engining Program (RERP): The approved FY02 acquisition strategy called for the modification of the entire C-5 aircraft fleet starting with the 50 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. In FY05, the acquisition strategy was modified, moving Milestone C to Dec 06, and inserting an Air Force Review Board in Dec 07. Milestone C will provide approval to procure Lot 1 material and hardware, and the Air Force Review Board will provide approval to install Lot 1 material and hardware.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis

DATE

February 2006

BUDGET ACTIVITY

07 Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE

4835 Reliability Enhancement &
Reengining Program

(U) <u>Cost Categories</u> (Tailor to WBS, or System/Item Requirements) (\$ in Millions)	<u>Contract</u> <u>Method &</u> <u>Type</u>	<u>Performing</u> <u>Activity &</u> <u>Location</u>	<u>Total</u> <u>Prior to FY</u> <u>2005</u> <u>Cost</u>	<u>FY 2005</u> <u>Cost</u>	<u>FY 2005</u> <u>Award</u> <u>Date</u>	<u>FY 2006</u> <u>Cost</u>	<u>FY 2006</u> <u>Award</u> <u>Date</u>	<u>FY 2007</u> <u>Cost</u>	<u>FY 2007</u> <u>Award</u> <u>Date</u>	<u>Cost to</u> <u>Complete</u>	<u>Total Cost</u>	<u>Target Value</u> <u>of Contract</u>
(U) <u>Product Development</u>												
Lockheed Martin Aeronautics Co (Pre-EMD)	FFP		46.738							0.000	46.738	46.738
Lockheed Martin Aeronautics Co (SDD)	CPAF		514.596	264.866	Oct-04	199.085	Oct-05	131.559	Oct-06	29.541	1,139.647	1,139.647
											0.000	
Subtotal Product Development			561.334	264.866		199.085		131.559		29.541	1,186.385	1,186.385
Remarks:												
(U) <u>Support</u>												
330 SASG/LT			6.770	3.023		5.442		4.705		1.125	21.065	21.065
C5SG			11.722	5.080		8.625		6.745		2.125	34.297	34.297
N/A											0.000	
Subtotal Support			18.492	8.103		14.067		11.450		3.250	55.362	55.362
Remarks:												
(U) <u>Test & Evaluation</u>												
418 Test Squadron (Edwards AFB)			11.430	5.212		5.600		7.200		3.500	32.942	32.942
N/A											0.000	
Subtotal Test & Evaluation			11.430	5.212		5.600		7.200		3.500	32.942	32.942
Remarks:												
(U) <u>Management</u>												
Subtotal Management			0.000	0.000		0.000		0.000		0.000	0.000	0.000
Remarks:												
(U) <u>Aircrew & Maintenance Trainer</u>												
Subtotal Aircrew & Maintenance Trainer			0.000	0.000		4.500		0.000		15.400	19.900	19.900
Remarks:												
(U) Total Cost			591.256	278.181		223.252		150.209		51.692	1,294.589	1,294.589

Exhibit R-4, RDT&E Schedule Profile

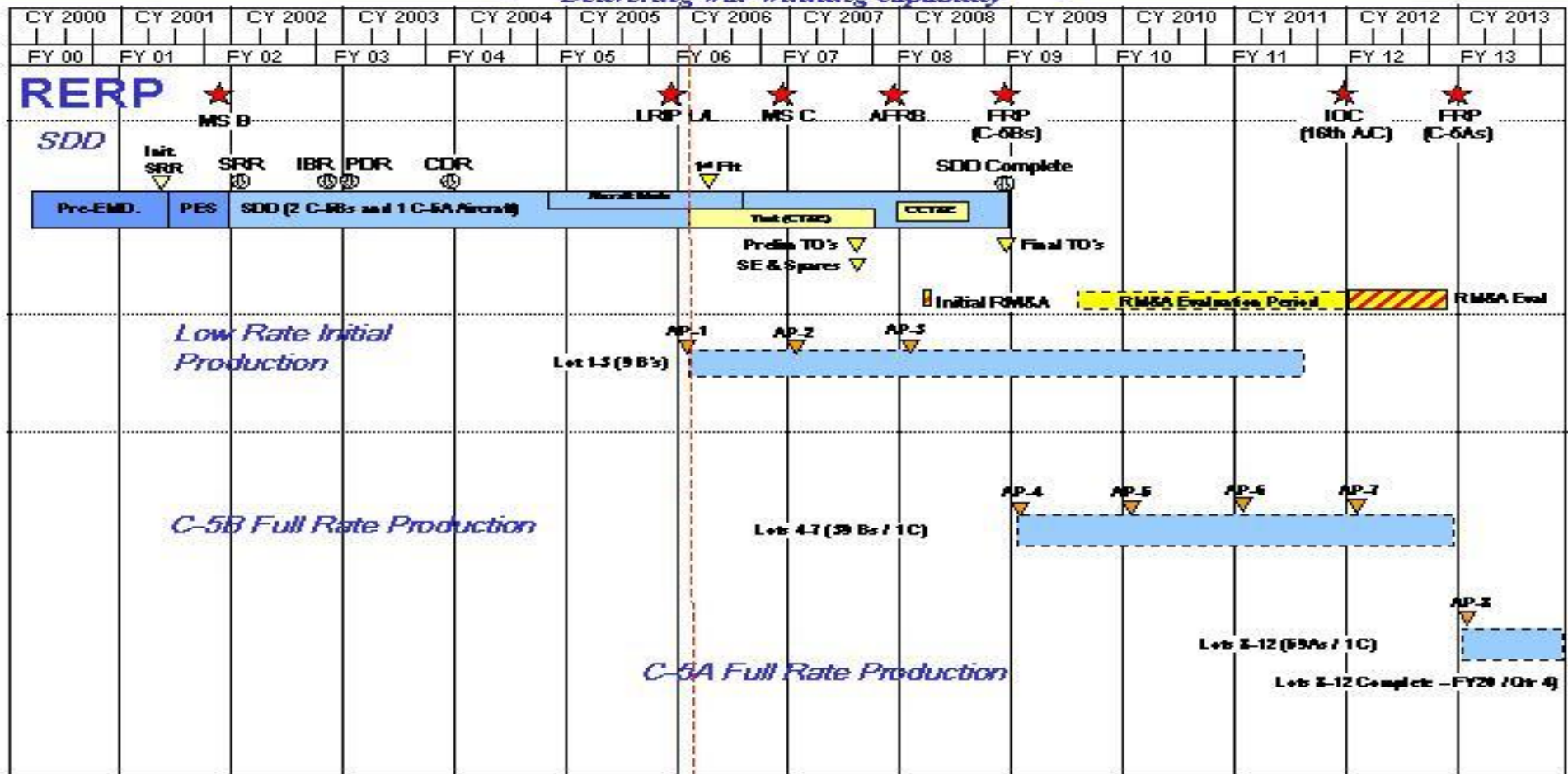
DATE

February 2006

BUDGET ACTIVITY
07 Operational System DevelopmentPE NUMBER AND TITLE
0401119F C-5 Airlift SquadronsPROJECT NUMBER AND TITLE
4835 Reliability Enhancement & Reengining Program

U.S. AIR FORCE

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

Delivering war-winning capability

UNCLASSIFIED

Exhibit R-4a, RDT&E Schedule Detail

DATE

February 2006

BUDGET ACTIVITY

07 Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

PROJECT NUMBER AND TITLE

4835 Reliability Enhancement &
Reengining Program(U) Schedule ProfileFY 2005FY 2006FY 2007

(U) First Prototype Flight (FY06/3)

3Q

(U) Milestone C (FY07/1)

1Q