

DEFENSE BASE REALIGNMENT AND CLOSURE COMMISSION
2521 S. CLARK STREET, SUITE 600
ARLINGTON, VIRGINIA 22202
(703) 699-2950

MEMORANDUM OF MEETING

DATE: July 21, 2005

TIME & PLACE: 11:00 am—Longworth Building

MEETING WITH: Rep. Michael R. Turner, Third District of Ohio
Rep. Dave Hobson, Seventh District of Ohio
Michael Wiehe, Senior Legislative Assistant for
Rep. Turner
Kenny Kraft, Legislative Director for Rep. Hobson

OBJECTIVE: To discuss BRAC actions involving Wright-Patterson
Air Force Base. Meeting requested by the
Congressional Representatives

BRAC STAFF: Charles Battaglia, Executive Director
Dave Van Saun, Technical Cross-Service Team Lead
Les Farrington, Senior Analyst, Technical Joint Cross-
Service Group

OTHER COMMISSION PARTICIPANTS:

None

MEETING RESULTS/FOLLOW-UP ACTION:

Congressional representatives voiced concern over planned movement of people out of Wright-Patterson Air Force Base to Hanscom Air Force Base. They focused on Consolidation of Air and Space C4ISR Research, Development and Acquisition, Test and Evaluation (Technical Joint Cross-Service Recommendation TECH-6). The recommendation relocates the Development and Fielding Systems Group from Wright Patterson to Hanscom and involves about 400 people. They have the following concerns:

- Hanscom's \$410M expansion plan is suspect because it was sold to the state on the basis that new technical missions would be directed to Hanscom by DOD.**
- It is questionable whether Hanscom has sufficient land to accommodate all the planned relocations. Forty acres of unconstrained land are needed but only 18 acres are available. However, only 8 acres of unconstrained land is zoned for industrial operations.**
- Consolidation of Information Technology functions at Hanscom is not a good idea and will reduce military value. The Informational Technology function permits remote operations.**
- People are not going to move from Ohio to Massachusetts, a higher cost of living area. Ninety percent of civilians will not move.**
- The cost of the expansion is questionable—MILCON estimates are significantly understated.**
- Current costs need to be considered in BRAC's analysis rather than costs captured in 2003. Also, 715 mission essential contractors to move were not reflected in COBRA which distorts the savings claimed.**

The Congressional representatives also stressed the need for the Air Force Institute of Technology (AFIT) to remain at Wright Patterson because of the excellent synergy that AFIT has with the laboratories, local universities acquisition offices.

At the conclusion of the meeting, the Congressional staffers provided us with recent data generated by the Dayton community for use in our analysis.

Congress of the United States
Washington, DC 20515

July 20, 2005

The Honorable Anthony Principi
Base Realignment and Closure Commission
2521 South Clark Street, Suite 600
Arlington, VA 22202

Dear Mr. Chairman:

We understand that the Air Force, as part of planning for proposed BRAC realignments, is identifying "disconnects and inconsistencies" among data used in putting DOD BRAC recommendations together and actual "as is" data from activities affected by realignments or closures. We are particularly interested in promptly receiving Air Force information concerning disconnects and inconsistency data related to the recommended realignment of the Development and Fielding Systems Group and elements of the Operations Support Systems Wing at Wright-Patterson Air Force Base versus C4ISR RDATE&E Consolidation data used by the DOD Technical Joint Cross-Service Group in recommending this realignment.

We are enclosing preliminary data we received to assist you in telling the Air Force the type of data you are seeking.

Thank you in advance for your consideration.

Sincerely,



DAVID L. HOBSON
Member of Congress



MIKE TURNER
Member of Congress

Enclosure

2005 BRAC Process TECH-0042 Part 7

C4ISR RDAT&E Consolidation

Disconnects & Inconsistencies Topics

Highlight of Findings

- **Bottom Line...Dayton-Springfield MSA Economic Impact/Job Loss Significantly Understated**
- **Increases AF Infrastructure - - Payback Calculation in Error**
 - Cost Understated
 - Savings Overstated
- **TJCSG Military Value (MV) for C4ISR D&A Calculation in Error**
 - WPAFB higher in almost every MV category except D&A for Information Systems
 - Double Counting/Co-mingling of Hanscom and Maxwell Data.
 - Question 04289 : Identifies IMDS and DCAPEs as an Hanscom AFB program; however, both are at Maxwell AFB, AL
- **Analysis provided to Commission different than AF Implementation Plan**
 - Actual Plan Includes Realignment of 3 Additional AF Installations
 - Hill AFB, UT; Tinker AFB, OK; Randolph AFB, TX
 - Actual Plan Does not Have a Supporting COBRA Run
 - Actual Plan Includes Use of Lease Space Until MILCON is ready for occupancy (2008-2010)
 - Actual Plan includes Contracting out of 390 programming jobs currently at Maxwell AFB
 - Same approach may be used for Hill AFB, Tinker AFB, and Randolph AFB
- **TJCSG for C4ISR**
 - Did Not Apply 2025 Force Structure Plan for data and analysis
 - Did Not Apply equal analyses for each site
 - No COBRA runs for realignment of D&A Business Information Systems Workload at
 - Wright-Patterson AFB, OH
 - Maxwell AFB, AL
 - Hill AFB, UT
 - Tinker AFB, OK
 - Lackland AFB, TX
 - Randolph AFB, TX
 - Inclusion of Business Information Systems inconsistent with C4ISR definition and application of Technical Criteria as indicated in BRAC documents.

Military Value (MV) Discussion

- **Military Value is the predominate decision criteria for the movement of the development and acquisition workload for movement to Hanscom AFB**
- **TJCSG Military Value (MV) Score for C4ISR Development & Acquisition Calculation in Error**
 - WPAFB higher in almost every MV category except D&A for Information Systems
 - Double Counting/Co-mingling of Hanscom and Maxwell Data.
 - Question 04289 : Identifies IMDS and DCAPEs as an Hanscom AFB program; however, both are at Maxwell AFB, AL

- **TJCSG "information systems" data qualifier for questions related to D&A workload**
 - Counts all workload at Hanscom AFB which is predominately C2ISR yet,
 - Does not recognize C2ISR Information Systems Workload at ASC and AFRL on Wright-Patterson AFB or
 - Development and Acquisition Workload at ASC and AFRL on Wright-Patterson AFB
 - Predominately, the DFSG acquisition and engineering workforce was recruited from
 - Aeronautical Systems Center, Wright-Patterson AFB
 - HQ AFMC, Wright-Patterson AFB
 - Air Force Research Laboratory, Wright-Patterson AFB
 - DFSG has current MOAs in place for cross-training and utilization of personnel
- **MV of WPAFB is higher than Hanscom AFB**
 - Only two exclusions found: Battlespace and C4ISR D&A
 - MV for C4ISR T&E delta not statistically significant

C4ISR Vs. Business Systems WPAFB Workload Misclassified

C4ISR Joint Technical Architecture Definition, Systems that:

- support properly designated commanders in the exercise of authority and direction over assigned and attached forces across the range of military operations;
 - collect, process, integrate, analyze, evaluate, or interpret available information concerning foreign countries or areas;
 - systematically observe aerospace, surface or subsurface areas, places, persons, or things by visual, aural, electronic, photographic, or other means; and
 - obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy, or secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area.
- **Business Systems: 21 Jun 2004 USD ATL Memo, Transformational Options:**
 - 30. Examine DoD's business management operations to include the complex network of finance, logistics, personnel, acquisition, and other management processes and information systems that are used to gather the financial data needed to support day-to-day management and decision-making.
 - 36. Review the efforts of the Business Management Modernization Program and all other information technology studies being conducted by OSD and the military departments with a goal of determining opportunities for transferring, consolidating, or privatizing all or part of information technology services and systems.
 - Also directs use/look at other AF and OSD studies like MID 905

Analysis Disconnects

- **USD AT&L Memo on 20 Year Force Structure Plan**
 - **TJCSG C4ISR did not use**
 - 20 year force structure plan for 2005 to 2025
 - Probable end-strength levels
 - **IMPACT: Costs and Savings are Incorrectly stated showing a personnel elimination savings of over 200 positions**
 - **Note: As stated in the Jul 05 GAO report. Savings appear to be over stated.**
 - **Wrong Baseline Used**
 - **Planned Personnel Reductions (MID905, Work Force Shaping) included as savings.**
 - **Historically, AFMC funds civilian payroll at approximately 96%**
 - Therefore, all savings with AFMC civilian personnel is overstated by 4%
- **DoD BRAC Technical JCSG Report Misleading**
 - **DoD BRAC Report - - "This recommendation will reduce the number of C4ISR technical facilities from 6 to 2."**
 - Edwards
 - Eglin AFB

- Net Change in Disposable Income – \$22K .
- % Retirement Eligible (Optional+Early) 57.5%
- Local Employment Options: AFRL, ASC, HQ AFMC
- Unemployment Compensation
 - COBRA: \$272 for 16 Weeks
 - State of Ohio: \$425 for 26 to 39 Weeks
- Training for Civilian New Hires at Hanscom (Allowed in Previous BRACs)
 - COBRA \$0
 - SATAF \$3K Per Person

Recurring Costs Understated

Cost of Doing Business

- Embedded Contractors
 - Delta between Contractor cost at WPAFB and Hanscom AFB
 - » \$9.7M annually
 - Direct development contractor cost impact -- TBD
- Customer Interaction due to location changes \$2.6M annually
 - TDY, Air Fare, Care Rental
 - Avg \$3K per trip X 2 trips annually for 50% of workforce
- ESC Assumption 390 Maxwell Positions will be contracted out
 - Conservatively Increase of \$4.7M annually
 - Was not in BRAC original proposal
- 227K square feet of space Identified at WPAFB for deactivation
 - 88th ABW is not going to deactivate the space
 - Therefore Recurring BOS Cost are understated and Savings are overstated
 - BOS Savings Appear to be inconsistent
 - 50% Increase in Hanscom Population only increases BOS 24%
 - 50% Increase in Hanscom Population only increases Sustainment 12%

MILCON Issues

- What is the Beneficial Occupancy Date of the Facility?
 - People are scheduled to move in FY06 – FY08
 - Parking Lot Funded in FY08
 - Hanscom Infrastructure Upgrade Funded in FY08
 - Systems Furniture/Facility Outfitting Funded in FY10
- ESC Plan to Lease Space Until Facility Completed
 - In Direct Conflict of BRAC Goal for reduction in DoD Leased Space
 - Expense not included in the Analysis
- Facility Description Types in Hanscom CE Estimate do not match Types in Final BRAC Provided to the Commission

Economic Impact to Dayton-Springfield MSA

– **BRAC Report:** Job Loss 2,250 Unemployment .44%

– **SATF Analysis:** Job Loss 6,241 Unemployment 1.22%
• Based on WPAFB EIC Multipliers

Current WPAFB Jobs Baseline – 1111 Jobs

- Military – 55
- Civilian – 429
- Support Contractors- 627

Current Indirect Jobs – 1681

- Indirect Jobs from Military - 23
- Indirect Jobs from Civilians - 674
- Indirect Jobs from Support Contractors – 984

Development Contractors (Estimated) – 1342

Indirect Jobs from Development Contractors – 2107

Total Dayton Area Jobs - 6241

Congress of the United States
Washington, DC 20515

May 18, 2005

The Honorable Anthony Principi
Chairman
Base Realignment and Closure Commission
2521 S. Clark Street, Suite 600
Arlington, Virginia 22202

Dear Chairman Principi:

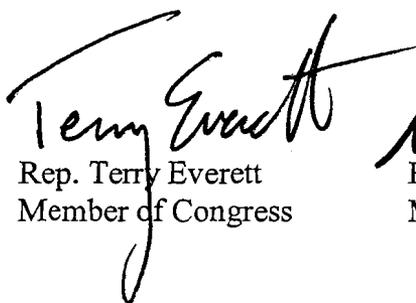
Thank you for your hard work and dedication and for that of the members of the commission and your staff, as you undertake the important process of reviewing our nation's military resources in formulating a BRAC recommendation that will ensure the strengthening of our national security. Now that Secretary Rumsfeld and the Department of Defense have issued their recommendations, pursuant to the BRAC process, I am seeking confirmation of the BRAC commission's application of the BRAC review criteria.

Attached is an October 8, 2004 correspondence from Raymond F. DuBois, Deputy-Under Secretary of Defense, to Congressman Duncan Hunter, Chairman of the House Armed Services Committee, confirming DOD's policy towards community proposals to invest future resources to improve or expand base infrastructure for consideration within the BRAC process. Secretary DuBois confirmed that such proposals do not constitute certified data upon which DOD will rely.

From a policy perspective, it is important that communities hosting military facilities have confidence that the BRAC commission will not consider offers of monetary, or land or facility enhancements in making its final recommendations. Absent such assurances, communities may needlessly spend countless hours garnering resources in anticipation of a specious opportunity to impact the BRAC process.

Again, thank you for your service and I appreciate your consideration of this request.

Sincerely,


Rep. Terry Everett
Member of Congress


Rep. Michael R. Turner
Member of Congress

 -AL
Rep. Mike Rogers
Member of Congress



DEPARTMENT OF THE AIR FORCE
WASHINGTON DC 20330-1000

15 OCT 2004

OFFICE OF THE SECRETARY

SAF/LL
1160 Air Force Pentagon
Washington, DC 20330-1160

The Honorable Michael R. Turner
U.S. House of Representatives
Washington, DC 20515-3503

Dear Mr. Turner

You have expressed concerns regarding press reports that the U.S. Air Force may be considering a proposal to move the Air Force Research Laboratory from Wright-Patterson Air Force Base, Ohio, to Hanscom Air Force Base, Massachusetts. We assure you those press reports are false.

However, no one can predict the results of the upcoming Base Realignment and Closure (BRAC) round. As required by the BRAC statute, we will consider all installations equally using published selection criteria, the force structure plan, and our installation inventory. All BRAC recommendations will be based solely on data certified in accordance with the statute and submitted through formal Air Force and Department of Defense BRAC processes.

We hope this letter has allayed your concerns. Rest assured that senior Air Force leaders are well aware of the incredible work being done by the talented and patriotic workforce at Wright-Patterson. Please do not hesitate to contact us with any questions.

Very respectfully

SCOTT S. CUSTER
Major General, USAF
Director, Legislative Liaison



OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION
TECHNOLOGY
AND LOGISTICS

OCT 8 2004

The Honorable Duncan Hunter
Chairman, Committee on Armed Services
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

This is in response to your request for consideration of proposals to invest future resources to improve or expand base infrastructure and their consideration within the BRAC process.

While the Department welcomes any actions that improve military-community relationships and the quality of life for our nation's armed forces, it will not include such promised considerations within the BRAC process. The statute authorizing the BRAC process requires that the Department review all military installations equally based on approved, published selection criteria and a force structure plan. The statute also requires that military value be the primary consideration in making recommendations for the closure or realignment of military installations using certified data. Proposals from the public do not constitute certified data that our analysis relies upon.

I trust you find this information helpful.

Sincerely,

Raymond F. DuBois
Deputy Under Secretary of Defense
(Installations and Environment)

cc: The Honorable Ike Skelton
Ranking Member





DFSG Orientation

AFMC BRAC Site Survey Team

July 12, 2005

Presented By:
Mrs. Debra Haley
Director
Development and Fielding
Systems Group



Agenda



Proposed realignment of the DFSG

Function of the DFSG

COBRA Disconnects



BRAC Proposed Realignment



- Air & Space Command, Control, Communication, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Information Systems Research, Development, Acquisition, Test & Evaluation (RDAT&E)
 - MSG from Wright-Patterson AFB
 - SSG from Maxwell-Gunter AFB } to Hanscom AFB
- Justification
 - Reduce Technical Facilities
 - Increase likelihood of fielding interoperable systems

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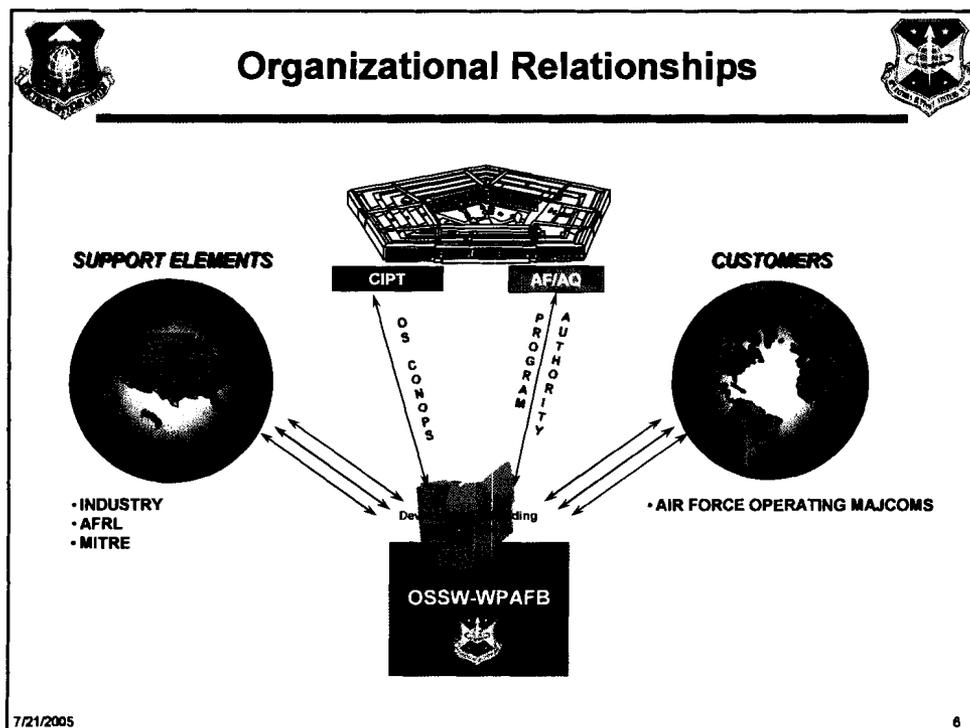
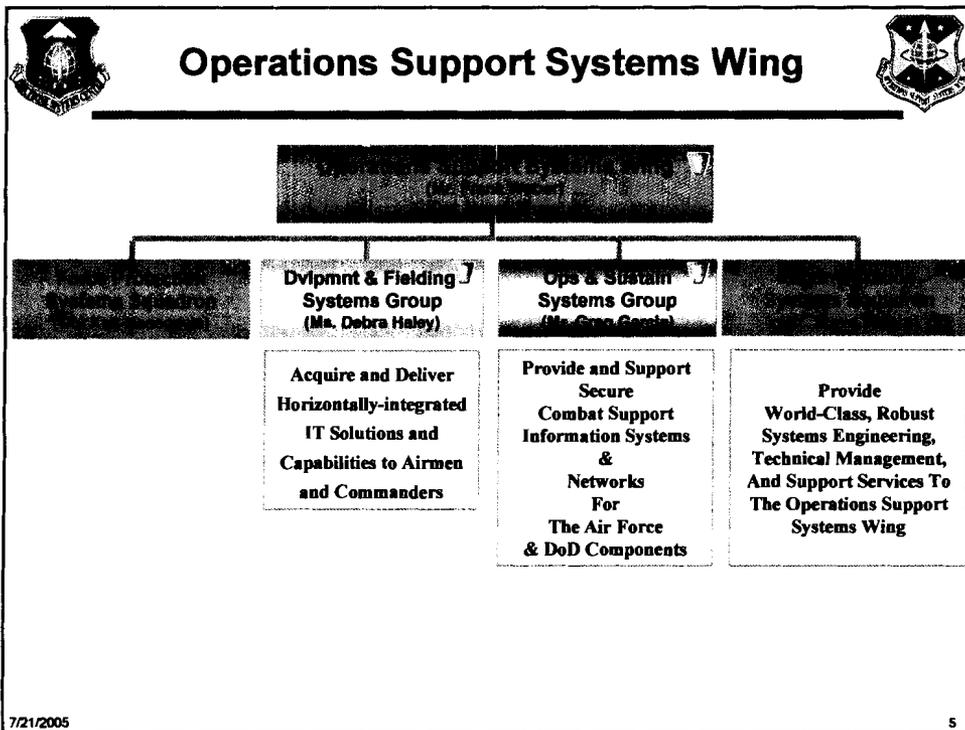
Proposed realignment of the DFSG

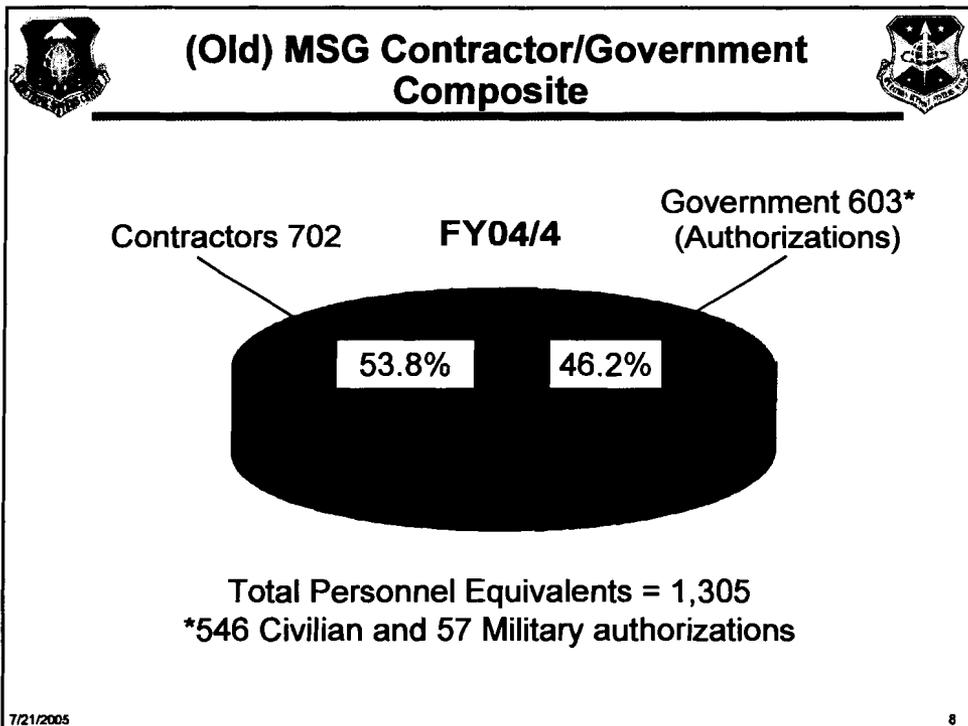
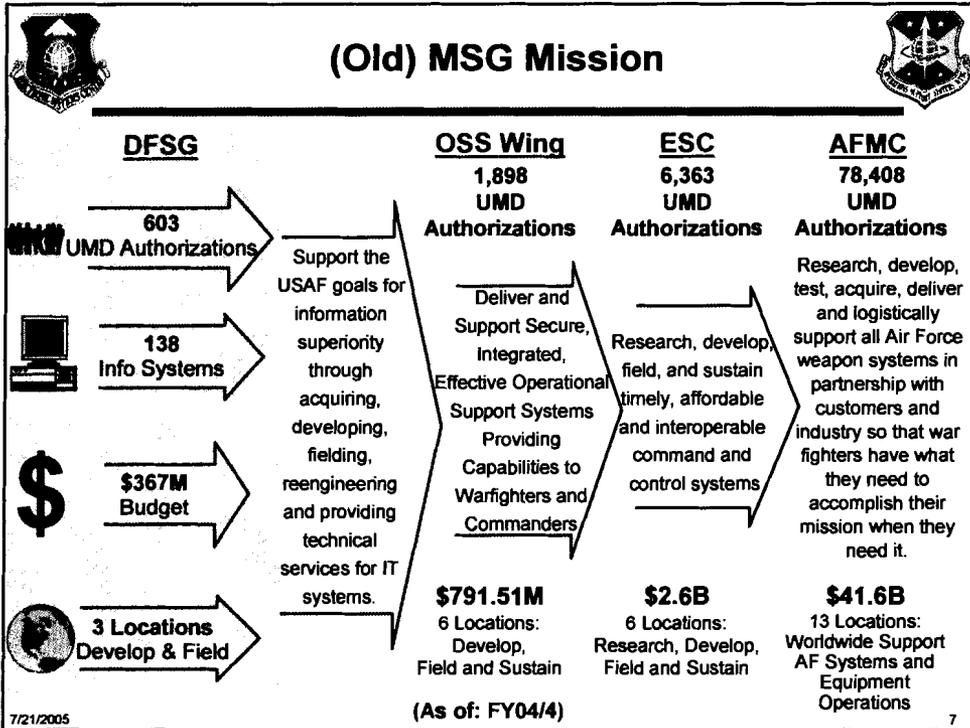
Function of the DFSG

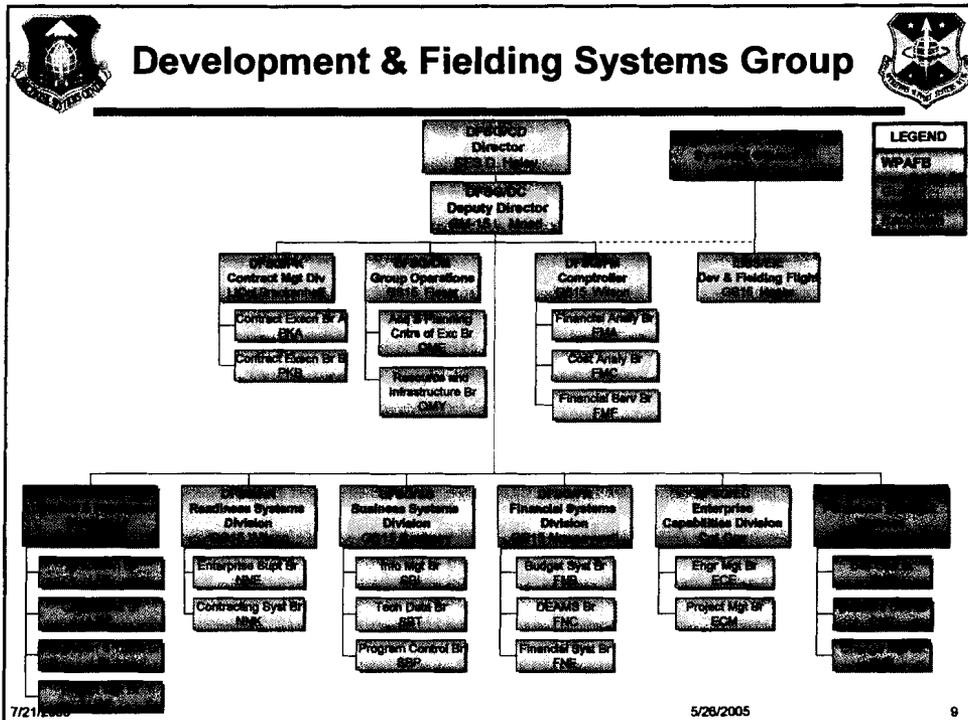
COBRA Disconnects

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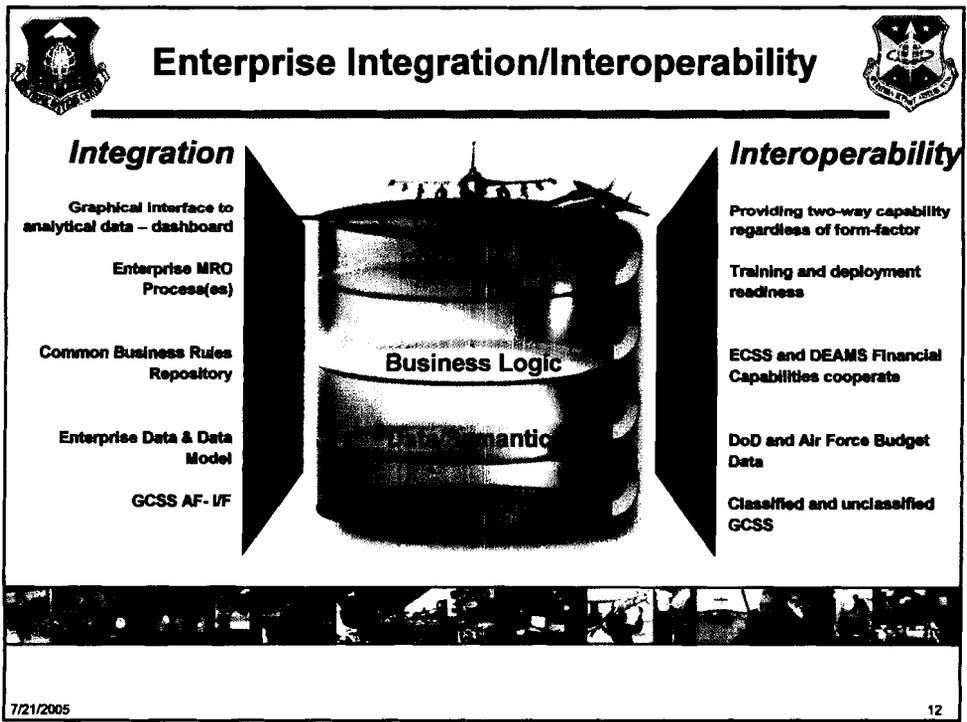
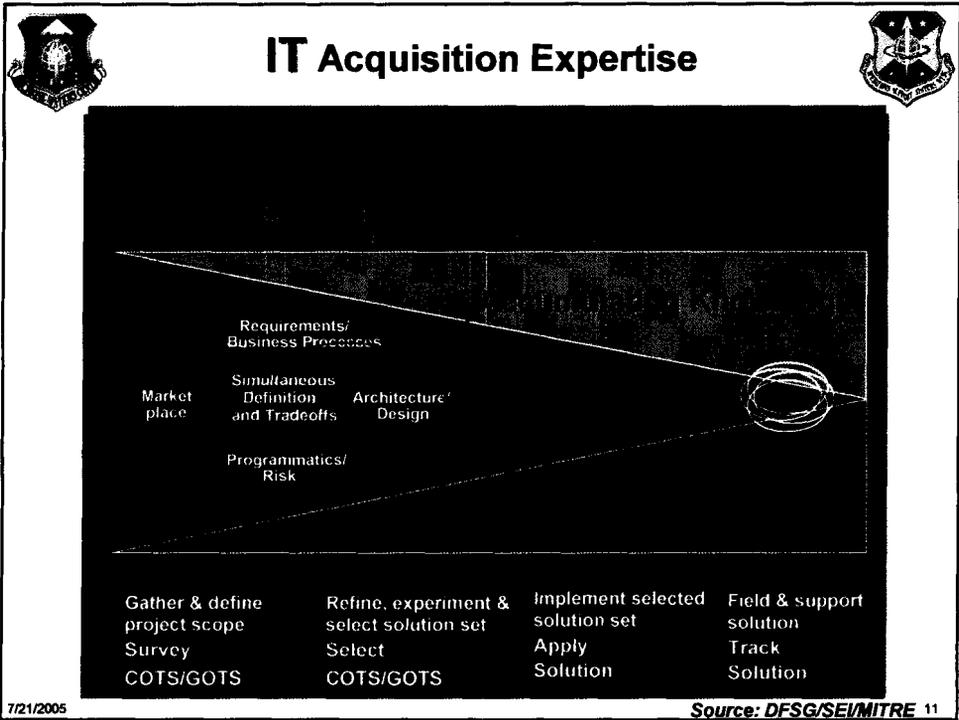
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- ## DFSG Contribution to Operational Support
- IT Acquisition expertise
 - Business process reengineering
 - Change management
 - Acquisition discipline
 - Enterprise integration/interoperability
 - Operational focus
 - Cross domain efficiencies
 - Architectural/domain integration
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Where We Have Been



- 138 systems primarily custom coded
- Source Lines of Code (SLOC) often exceeded several million
- Nearly every system had its own database with little or no horizontal data sharing
 - All data exchanged via point-to-point interfaces
 - Average 25 point-to-point interfaces each (Stock Control: 1,200+)
- Each system had its own HW and SW infrastructure
 - HW: IBM, HP, Sun, Tandem, etc. in multiple versions
 - OS: VM, UNIX, Solaris, HPUX, etc. in multiple versions
- Primary customer – functionals
 - Business processes optimized for functional execution

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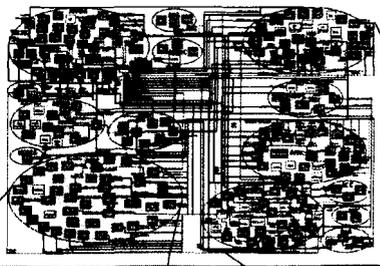
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Where We Have Been



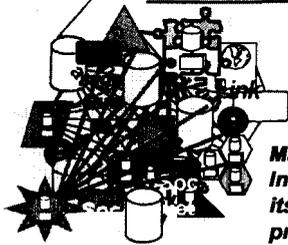
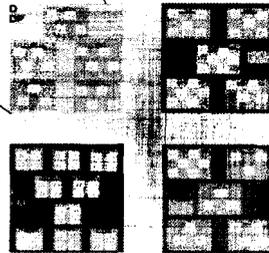
Within a Domain



Our Challenge:
Size & Complexity

- Within a single domain
- Between multiple domains

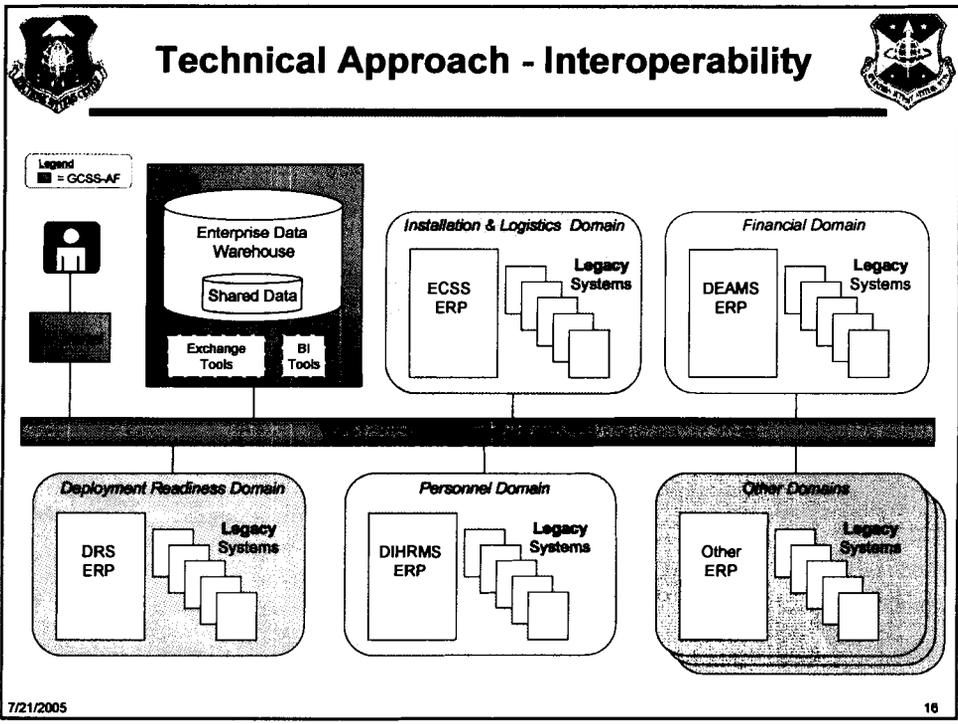
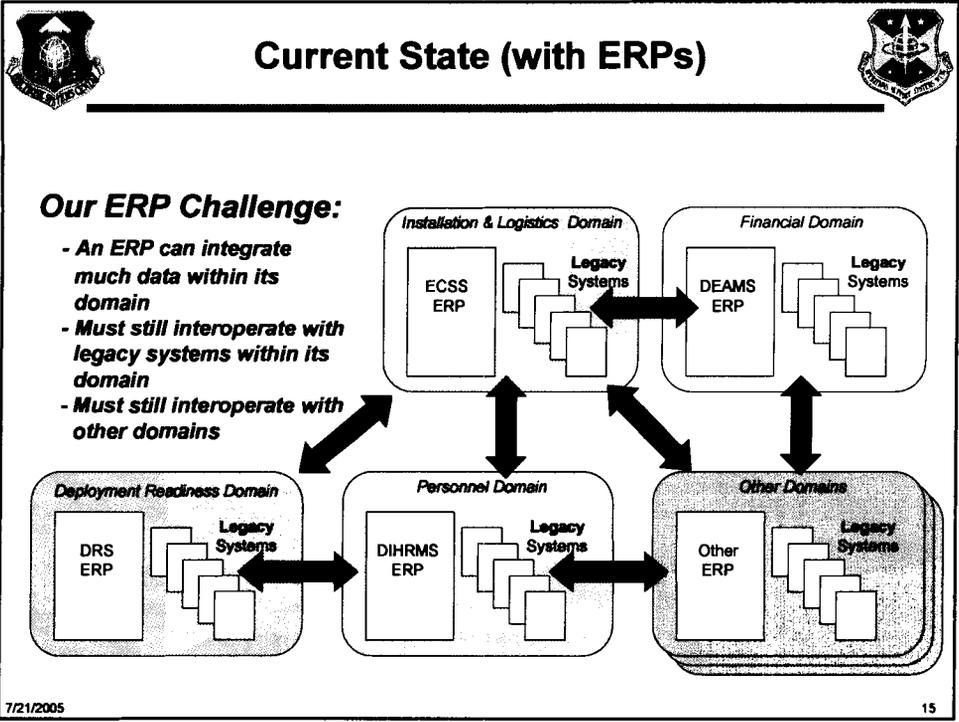
Across Domains



Many point-to-point interfaces, each with its own formats & protocols

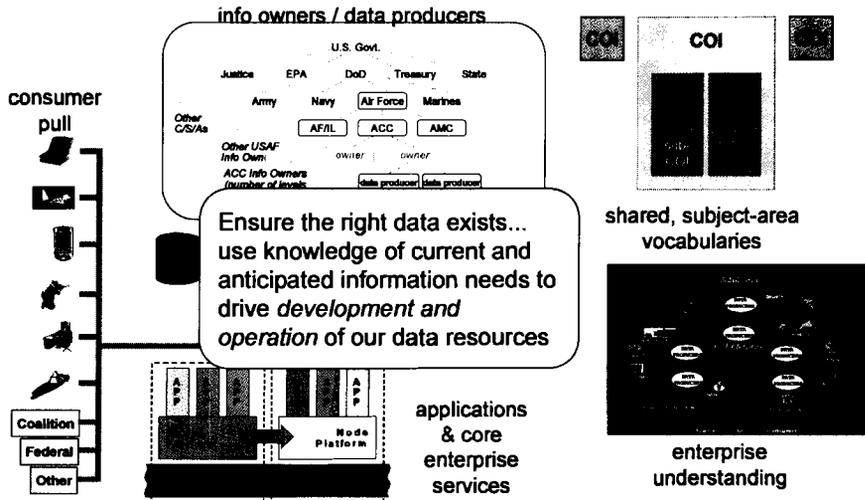
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The Desired End State: Info Management For The Enterprise

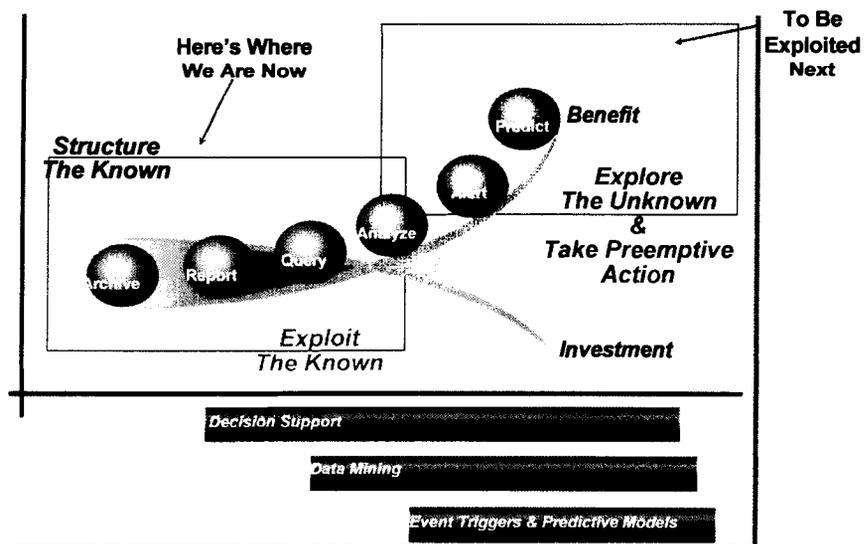


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Use of Capability



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Summary



- DFSG is postured to:
 - Acquire and Deliver Horizontally-integrated IT Solutions and Capabilities to Airmen and Commanders***
 - Enhanced Technical Information Management System (ETIMS) - Total life cycle cost: \$258M through FY19
 - Enterprise Information Management (EIM) - Total life cycle cost: \$45M through FY09
 - Deployment Readiness System (DRS) - Total life cycle cost: \$80M through FY16
 - Expeditionary Combat Support System (ECSS) - Total life cycle cost: \$2.993B in then-year dollars through FY22
 - Defense Enterprise Accounting and Management System (DEAMS) - Total life cycle cost: \$419.9 M through FY18

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Proposed realignment of the DFSG

Function of the DFSG

COBRA Disconnects

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COBRA Disconnects



- 75% of staff assumed to move
- Hanscom time to fill data?
- BOS savings mixed w/efficiencies
 - Unintelligible
 - 2006 for WP -2008 for Maxwell
- WP RIF Costs in 2006 – too Soon
- MILCON costs differ
 - COBRA \$131M
 - AF \$154M
- Hanscom MilVal?
- Netcentric (in or out – Lyles)
- Equipment moving costs

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Impacts To Community



- Economic Impact on Community: Assuming no economic recovery, this recommendation could result in a maximum potential reduction of 2250 jobs (1262 direct jobs and 988 indirect jobs) over the 2006-2011 period in the Dayton, OH Metropolitan Statistical Area, which is 0.44 percent of economic area employment. (source: DoD Documentation to BRAC Commission)
- Disconnects:
 - Includes ~ 100 AF Civilian @ other locations
 - Does not reflect current W-P baseline
 - AF Civilians – 429
 - AF Military – 58
 - Support contractors – 702
 - Does not include other contract activity

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Impact to Community (cont)



Current WPAFB Jobs Baseline	Jobs	Mean Salary Dayton-Springfield	Annual Pay Roll	Mean Salary Boston	Estimated Annual Pay Roll
Military	55	\$68,407	\$3,762,399	\$81,781	\$81,836
Civilian	429	\$71,754	\$30,782,252	\$87,490	\$37,533,330
Support Contractors	702	\$61,360	\$43,074,720	\$76,870	\$53,962,740
Subtotal	1,186		\$77,619,370		\$91,577,906
Indirect Jobs from Military	23	\$36,387	\$820,527	\$48,230	\$1,087,587
Indirect Jobs from Civilians	674	\$36,387	\$24,507,736	\$48,230	\$32,484,352
Indirect Jobs from Support Contrs	1,102	\$36,387	\$40,103,568	\$48,230	\$53,156,212
Total WPAFB Jobs	2,984		\$65,431,831		\$88,728,151
Development Contractors (estimates based on contract awards to community)	1,342	\$90,450	\$121,383,900	\$107,070	\$143,687,940
Indirect Jobs from Dev Contrs	2,107	\$36,387	\$76,665,226	\$48,230	\$101,617,716
Total Dev Contractor Jobs	3,449		\$198,049,126		\$245,305,656
TOTAL	6,433		\$263,480,957		\$332,033,807
References:					
- Wright-Patterson Air Force Base Economic Impact Analysis, 30 Sep 2004					
- More Than Dollars Alone: the Economic and Security Significance of Hanscom Air Force Base and the Natick Soldier Systems Center, Sep 2004, Massachusetts Defense Technology Initiative					
- U. S. Department of Labor, Bureau of Labor Statistics, Occupational Employment Statistics, May 2004 Area Occupational Employment and Wage Estimates					

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Space Requirements



OSSW WP	Groups	PEs	Net Sq Ft	Gross Sq Ft	2003 \$ WP	2006 \$ WP	2006 \$ Hanscom
Bld 286/282	OSSG, DFSG,EISS	1397	226,820	283,525	\$66.7 M	\$62.0 M	\$65M
DISA; AF Owned	OSSG, DFSG	13	2,400	3,000	\$0.6M	\$0.66M	\$0.7M
Area B	DFSG	8	1,850	2,312	\$0.48M	\$0.5M	\$0.53M
KTR sites	OSSG, DFSG		32,000	40,000	\$8.0M	\$8.75M	\$9.2M
Warehouse Bld 280	OSSG, DFSG,EISS	89	18,710	23,388	\$2.3M	\$2.6M	\$2.7M
Total			281,780	352,225	\$68.1M	\$74.5M	\$78.5M

- Items not included in estimates
 - Building furnishings: systems furniture, carpeting, conference room furniture
 - Parking facilities
 - Landscaping
 - Upgrade of base infrastructure: Electrical, Sewer, base maintenance
 - Computer / office space: \$200/SqFt, Warehouse space: \$100/SqFt
 - Eng study required to refine estimate: Exact sizing of Air Handlers, Power Conditioners, UPS, Generator Backup Sys, Fire Suppression Sys, Water Detection Sys
 - Certain IT systems being supported require Classified environment
 - Security; DoD & AFR SCIFF requirements

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Equipment / Systems Relocation



Group / Squadron	SPO	Sys Being Supported	Main Frames	Unix Servers	Windows Servers	Tandem Servers
DFSG	FN	13	1	149	151	0
DFSG	SB					
DFSG	NN	5	0	21	5	0
DFSG	EC	ERP/ECSS	0	0	0	0
OSSG	KS	8	0	0	11	0
OSSG	LR	39	14	50	34	0
EISS	EIE	All - VIC				
EISS	EIE	All - ITAC	0	85	96	0
Total						
EISS	EIE	All - AFKS DISA	40 Teradata nodes	80 Disk Arrays	66	1 Tape Disk

- Equipment relocation risks
 - System users can not accept any down time; Parallel equip will need to be available
 - Warranties may be voided if equipment is shut down transported and stood up
 - Re-certification costs
- Contractor support
 - Support contracts will require modification
 - Relocate GFE presently located at off base contractor facilities

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Networks Infrastructure Specifications



	SIPERNET; 100MG	NIPERNET; 100MG	NIPERNET; 1GB		
Drops	12	1350	140		
	T-1	RAS	DSN	VTC	ISDN
Dedicated Circuits	13			12	40
	Peak	Avg			
Bandwidth	800MG	68MG			
	Phone Drops	Fax Drops	Blackberry		
Telephones	1780	100	40		

- Connectivity to support contractor facilities will need to be re-established: T1 lines to Hanscom
- Firewall issues will need to be re-addressed
- Future growth can be accommodated by OC 192 (10GB/Sec) line located parallel to WP area A that runs from Cincinnati to Dayton to Columbus to New York to DC

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DFSG Jobs (Data From DSFG Briefing July 12, 2005 (With Mathematical Errors Corrected))					
	Jobs	Mean Salary (Dayton- Springfield)	Annual Payroll	Mean Salary (Boston)	Estimated Annual Payroll
Military	55	\$68,407	\$3,762,385	\$81,781	\$4,497,955
Civilian	429	\$71,754	\$30,782,466	\$87,490	\$37,533,210
Support Contractors	702	\$61,360	\$43,074,720	\$76,870	\$53,962,740
Subtotal	1,186		\$77,619,571		\$95,993,905
Indirect Jobs from Military	23	\$36,387	\$836,901	\$48,230	\$1,109,290
Indirect Jobs from Civilians	674	\$36,387	\$24,524,838	\$48,230	\$32,507,020
Indirect Jobs from Support Cont	1,102	\$36,387	\$40,098,474	\$48,230	\$53,149,460
Total WPAFB Jobs	2,985		\$143,079,784		\$182,759,675
Development Contractors	1,342	\$90,450	\$121,383,900	\$107,070	\$143,687,940
Indirect Jobs for Dev. Contrs	2,107	\$36,387	\$76,667,409	\$48,230	\$101,620,610
Total Dev. Contractor Jobs	3,449		\$198,051,309		\$245,308,550
Total	6,434		\$341,131,093		\$428,068,225

DFSG Jobs (Data From DSFG Briefing July 12, 2005) Showing Boston-Dayton Cost Comparison Totals						
	Jobs	Mean Salary (Dayton- Springfield)	Annual Payroll	Mean Salary (Boston)	Estimated Annual Payroll	Difference Between Boston and Dayton- Cost to AF
Military	55	\$68,407	\$3,762,385	\$81,781	\$4,497,955	\$735,570
Civilian	429	\$71,754	\$30,782,466	\$87,490	\$37,533,210	\$6,750,744
Support Contractors	702	\$61,360	\$43,074,720	\$76,870	\$53,962,740	\$10,888,020
Subtotal	1,186		\$77,619,571		\$95,993,905	\$18,374,334
Indirect Jobs from Military	23	\$36,387	\$836,901	\$48,230	\$1,109,290	
Indirect Jobs from Civilians	674	\$36,387	\$24,524,838	\$48,230	\$32,507,020	
Indirect Jobs from Support Cont	1,102	\$36,387	\$40,098,474	\$48,230	\$53,149,460	
Total WPAFB Jobs	2,985		\$143,079,784		\$182,759,675	
Development Contractors	1,342	\$90,450	\$121,383,900	\$107,070	\$143,687,940	\$22,304,040
Indirect Jobs for Dev. Contrs	2,107	\$36,387	\$76,667,409	\$48,230	\$101,620,610	
Total Dev. Contractor Jobs	3,449		\$198,051,309		\$245,308,550	
Total	6,434		\$341,131,093		\$428,068,225	\$40,678,374

DFSG Jobs (Data From DSFG Briefing July 12, 2005 (With 29.6 percent benefit factor))						
	Jobs	Mean Salary (Dayton- Springfield)	Annual Wages and Estimated Compensation	Mean Salary (Boston)	Estimated Annual Wages and Compensation	Difference Between Boston and Dayton
Military	55	\$68,407	\$4,876,051	\$81,781	\$5,829,350	\$953,299
Civilian	429	\$71,754	\$39,894,076	\$87,490	\$48,643,040	\$8,748,964
Support Contractors	702	\$61,360	\$55,824,837	\$76,870	\$69,935,711	\$14,110,874
Subtotal	1,186		\$100,594,964		\$124,408,101	\$23,813,137
Indirect Jobs from Military	23	\$36,387	\$1,084,624	\$48,230	\$1,109,290	
Indirect Jobs from Civilians	674	\$36,387	\$31,784,190	\$48,230	\$32,507,020	
Indirect Jobs from Support Cont	1,102	\$36,387	\$51,967,622	\$48,230	\$53,149,460	
Total WPAFB Jobs	2,985		\$185,431,400		\$211,173,871	
Development Contractors	1,342	\$90,450	\$157,313,534	\$107,070	\$186,219,570	\$28,906,036
Indirect Jobs for Dev. Contrs	2,107	\$36,387	\$99,360,962	\$48,230	\$101,620,610	
Total Dev. Contractor Jobs	3,449		\$256,674,496		\$287,840,180	
Total	6,434		\$442,105,897		\$499,014,051	\$52,719,173

Notes

1. Some of increased costs for federal workers (but not contractors) were taken into consideration for original BRAC estimates.
2. The 29.6 benefit factor comes from the U.S. Department of Labor, Bureau of Labor Statistics, "Employer Costs for Employee Compensation—March 2005." It is a national average and includes non-wage compensation including insurance, leave, retirement, and other benefits.

Summary of Scenario Environmental Impacts - Criterion 8

Scenario ID#: TECH0042C

<u>General Environmental Impacts</u>	
Environmental Resource Area	Edwards
Air Quality	The base is in non-attainment for ozone (maintenance). An initial conformity analysis indicated that a conformity determination is not required. No air permit revision is necessary. A critical air quality region is located within 100 miles of the installation, but it does not restrict operations.
Cultural/ Archeological/ Tribal Resources	There are 2989 archaeological sites, and there is a native American tribe interested in burial sites on the installation but they do not impact operations. There are also 7 historic properties and 4 historic districts making up 8,461 acres. Additional operations may impact these areas which may impact operations.
Dredging	No impact
Land Use Constraints/ Sensitive Resource Areas	No impact to land use from scenario
Marine Mammals/ Marine Resources/ Marine Sanctuaries	No impact
Noise	No increase in off-base noise is expected
Threatened& Endangered Species/ Critical Habitat	T&E species and critical habitats already restrict operations (use of high explosives on the range) with a Biological Opinion. Additional operations may impact T&E species and/or critical habitats. In addition, the Biological Opinion will need to be evaluated to ensure the scenario conforms to it.
Waste Management	No impact
Water Resources	No impact
Wetlands	Wetlands do not exist. No impact.

<u>Impacts of Costs</u>	
	Edwards
Environmental Restoration	DERA money spent through FY03 (\$K): 277868 Estimated CTC (\$K): 645215 DO NOT ENTER IN COBRA
Waste Management	None
Environmental Compliance	FY07 Air Conformity Analysis: \$50K

<u>General Environmental Impacts</u>	
Environmental Resource Area	Eglin
Air Quality	No impact
Cultural/ Archeological/ Tribal Resources	No impact
Dredging	No impact
Land Use Constraints/ Sensitive Resource Areas	No impact
Marine Mammals/ Marine Resources/ Marine Sanctuaries	No impact
Noise	No impact
Threatened& Endangered Species/ Critical Habitat	No impact
Waste Management	No impact
Water Resources	No impact
Wetlands	No impact

<u>Impacts of Costs</u>	
	Eglin
Environmental Restoration	DERA money spent through FY03 (\$K): 72200 Estimated CTC (\$K): 35142 DO NOT ENTER IN COBRA
Waste Management	No impact
Environmental Compliance	No impact

<u>General Environmental Impacts</u>	
Environmental Resource Area	Hanscom
Air Quality	An initial air conformity analysis indicated that a conformity determination is not needed. Carpooling initiatives are used as an emission reduction technique.
Cultural/ Archeological/ Tribal Resources	One archaeological site is present but does not constrain operations. A native American tribe is in contact, but not formally, with the base regarding cultural land. Additional operations may impact these sites, which may constrain operations.
Dredging	No impact
Land Use Constraints/ Sensitive Resource Areas	The scenario requires roughly 40 acres; Hanscom reported it's largest parcel is 18.27 acres, and only 8.4 unconstrained acres are zoned for industrial ops. This scenario may require building on constrained acreage. Sensitive resource areas exist but do not constrain operations. Additional operations may impact these areas, which may constrain operations.
Marine Mammals/ Marine Resources/ Marine Sanctuaries	No impact
Noise	No impact
Threatened& Endangered Species/ Critical Habitat	No T&E species or critical habitats exist. No impact to T&E species is expected.
Waste Management	The hazardous waste program will need modification.
Water Resources	The state requires a permit for withdrawal of groundwater.
Wetlands	Wetlands restrict 5% of the base. Wetlands do not currently restrict operations. Additional operations may impact wetlands, which may restrict operations.

<u>Impacts of Costs</u>	
	Hanscom
Environmental Restoration	DERA money spent through FY03 (\$K): 41797 Estimated CTC (\$K): 10461 DO NOT ENTER IN COBRA
Waste Management	FY07 Hazardous Waste Program Modification: \$100K
Environmental Compliance	FY06 NEPA cost: \$336K FY07 Air Conformity Analysis \$50K

<u>General Environmental Impacts</u>	
Environmental Resource Area	Lackland
Air Quality	No impact
Cultural/ Archeological/ Tribal Resources	No impact
Dredging	No impact
Land Use Constraints/ Sensitive Resource Areas	No impact
Marine Mammals/ Marine Resources/ Marine Sanctuaries	No impact
Noise	No impact
Threatened& Endangered Species/ Critical Habitat	No impact
Waste Management	No impact
Water Resources	No impact
Wetlands	No impact

<u>Impacts of Costs</u>	
	Lackland
Environmental Restoration	DERA money spent through FY03 (\$K): 50297 Estimated CTC (\$K): 200559 DO NOT ENTER IN COBRA
Waste Management	No impact
Environmental Compliance	No impact

<u>General Environmental Impacts</u>	
Environmental Resource Area	Maxwell
Air Quality	No impact
Cultural/ Archeological/ Tribal Resources	No impact
Dredging	No impact
Land Use Constraints/ Sensitive Resource Areas	No impact
Marine Mammals/ Marine Resources/ Marine Sanctuaries	No impact
Noise	No impact
Threatened& Endangered Species/ Critical Habitat	No impact
Waste Management	No impact
Water Resources	No impact
Wetlands	No impact

<u>Impacts of Costs</u>	
	Maxwell
Environmental Restoration	DERA money spent through FY03 (\$K): 19123 Estimated CTC (\$K): 7713 DO NOT ENTER IN COBRA
Waste Management	No impact
Environmental Compliance	No impact

<u>General Environmental Impacts</u>	
Environmental Resource Area	Wright-Patterson
Air Quality	No impact
Cultural/ Archeological/ Tribal Resources	No impact
Dredging	No impact
Land Use Constraints/ Sensitive Resource Areas	No impact
Marine Mammals/ Marine Resources/ Marine Sanctuaries	No impact
Noise	No impact
Threatened& Endangered Species/ Critical Habitat	No impact
Waste Management	No impact
Water Resources	No impact
Wetlands	No impact

<u>Impacts of Costs</u>	
	Wright-Patterson
Environmental Restoration	DERA money spent through FY03 (\$K): 156972 Estimated CTC (\$K): 34261 DO NOT ENTER IN COBRA
Waste Management	No impact
Environmental Compliance	No impact

Consolidate Air Force Institute of Technology & Naval Postgraduate School
Professional Development Education Functions at Naval Postgraduate
School

BRAC Commission Request

PROFESSIONAL DEVELOPMENT EDUCATION

- Naval Postgraduate School (NPS) Monterey, CA
- Defense Language Institute (DLI) Monterey, CA
- Air Force Institute of Technology (AFIT) Wright-Patterson AFB, OH

ISSUE:

- What consideration was given to the closure or realignment of the Air Force Institute of Technology at Wright-Patterson AFB, OH and the Defense Language Institute at Monterey, CA, with Naval Postgraduate School at Monterey, CA, to create a consolidated professional development education center? (BRAC Commission Letter to DoD, dated 1 July 2005).

DAYTON REGION RECOMMENDATION

Retain the Air Force Institute of Technology at Wright-Patterson Air Force Base

RATIONALE

1. As the facts outlined herein disclose, it is clear that, if any consolidation of Professional Development Education, is directed, the 'best choice' option is to create a Defense Professional Development Education Center at Wright-Patterson Air Force Base, Ohio. Per the *Dayton Daily News* on 7 July, "AFIT's advantage is spelled out in a compelling report by the Government Accountability Office released just days after the BRAC inquiry. It notes that closing AFIT would yield just \$8 million in annual savings – an exceedingly modest sum compared to the \$90 million that would be saved each year by closing the Naval Postgraduate School (Over 20 years, the report puts the savings from closing the Navy's school at \$1.1 billion)." The *Monterey Herald*, July 8, in an article by Staff Writer Julie Reynolds said, "Military advisors said closing the school would save the Navy \$90 million a year and \$2.1 billion over 20 years – the highest potential savings among 10 bases spared at the 11th hour."

2. Professional Development Education (PDE) evaluations were conducted for the 2005 BRAC Commission and DoD by the Education and Training Joint Cross-Service Group (E&T JCSG). Several scenarios were developed and evaluated. Scenario 0022, "Disestablish AFIT graduate education function at Wright-Patterson AFB. Consolidate AFIT graduate education function with Naval Postgraduate School, Monterey, CA." The

E&T JSCG, after reviewing the analysis, disapproved this scenario as a candidate recommendation

3. The recommendation to realign AFIT with NPS at Monterey, California does not adequately address the enormous differences in cost of operations between the Monterey, CA, and Wright-Patterson AFB, OH sites. Additionally, it does not address the positive educational impact of the AFIT students' ability to work directly with the Air Force's best researchers, engineers and acquisition specialists at Wright-Patterson. Compounding the fiscal losses to DOD of this realignment is the unrealistic expectation that all civilians who are not displaced will move. Historically, less than 20% of the people will actually move during realignment, particularly to a 'high cost' area. The Naval Postgraduate School is a 'stand-alone' facility in an extremely high-cost location while the Air Force Institute of Technology's location at Wright-Patterson Air Force Base makes it an affordable, *best value* to everyone concerned.

4. According to the Navy's Special Assistant for BRAC, the Chief of Naval Operations did not want to lose the synergy and interaction between U.S. and foreign students who attended the postgraduate school (Source: GAO Report 05-785, Education and Training joint Cross-Service Group Selection Process and Recommendations.) However, synergy for students at the Air Force Institute of Technology means not just working with foreign students, but working together, on site, with the Aeronautical Systems Center program offices, five directorates of the Air Force Research Laboratory, the Air Force Security Assistance Center, the National Air and Space Intelligence Center, the Major-Shared Resource Center (Super Computer), and the Dayton Area Graduate Studies Institute, to name a few. Additionally, AFIT has research laboratories embedded within the school. Therefore, Wright-Patterson adds *best military value* to the aforementioned economic *best value*.

5. Several other facts illustrate why consolidating AFIT at NPS would not make sense from either business or quality of life perspectives. Medical care is limited with active duty personnel being cared for at the Presidio of Monterey (Defense Language Institute). Sick call is by appointment only and the pharmacy has limited stock. TRICARE facilities in the area are limited. Currently, students and faculty must drive long distances to locate TRICARE (medical) suppliers. Adding significant Air Force student loads and additional faculty will only magnify this already-taxed quality of life issue. Purchasing a home in the Monterey area is nearly impossible for a majority of buyers. According to the Monterey County Association of Realtors (see charts below), the average price of a Carmel home during the January – June 2005 was \$1.930 million. Pebble Beach homes averaged \$2.150 million during the same time period, while homes in Carmel Valley sold for an average price of \$1,235,400. Data indicates prices averaging over \$700,000 (with most higher) for a three bedroom, one bath home (Monterey, \$885,000 median, \$934,910 average; Carmel, \$1.580 million median, \$1.93 million average; Pacific Grove, \$840,000 median, \$949,000 average; Seaside, \$647,000 median, \$668,000 average; Marina, \$650,000 median, \$665,000 average. The *Dayton Daily News*, July 11 (Jill Barton, Associated Press) states that housing in all of California is averaging \$552,000. There are some condos/townhouses available in the \$300 – 500,000 range. Base housing

assignments are determined by military rank, leaving younger students and PCS members to try to survive financially in this extremely high cost environment. Most permanent personnel supporting NPS drive long distances just to find affordable housing. This option not only takes valuable time away from their families, but also is draining personal budgets (with the price of gasoline).

Source: Monterey County Association of Realtors

January - June 2005 Monterey County Single Family

County	Area/ City	Year	Cur Inv	No. of Closed Sales	% P Rec'd	Med. Price	Avg. Price	Total Vol / 1000	Avg DOM	New Listings
MTY	CAR	2005	128	122	93.98	1,580,001	1,930,095	235,472	128	181
MTY	CV	2005	73	75	94.26	1,150,000	1,235,400	92,655	96	123
MTY	DR	2005	9	14	97.78	715,000	727,057	10,179	72	14
MTY	ES	2005	45	95	100.09	485,000	475,497	45,172	36	130
MTY	MA	2005	33	85	99.32	650,000	664,598	43,199	33	92
MTY	MO	2005	54	83	96.90	885,000	934,910	77,598	67	120
MTY	NOM	2005	148	163	99.22	685,000	727,163	118,528	53	284
MTY	NS	2005	190	390	100.10	578,500	595,337	232,181	28	566
MTY	PB	2005	61	80	92.19	1,600,000	2,150,181	129,010	140	93
MTY	PG	2005	53	68	97.82	840,000	948,899	62,627	54	101
MTY	SCT	2005	38	16	93.91	2,300,000	2,674,219	42,788	131	39
MTY	SEA	2005	76	113	98.85	647,500	667,773	75,458	40	190
MTY	SMH	2005	108	108	94.56	915,000	1,267,629	134,369	99	188
MTY	SOM	2005	105	215	97.72	451,000	475,380	102,202	40	325
MTY	SS	2005	108	170	99.02	559,000	576,892	98,072	34	268
MTY	UN	2005	*	*	*	*	*	*	*	*
Totals										
		2005	1227	1,753	96.68	635,000	855,396	1,499,509	56	2,724

* = Not Available

January - June 2005 Monterey County Condos/Townhomes

County	Area/ City	Year	Cur Inv	No. of Closed Sales	% P Rec'd	Med. Price	Avg. Price	Total Vol / 1000	Avg DOM	New Listings
MTY	CAR	2005	8	9	98.53	679,000	701,722	6,316	32	11
MTY	CV	2005	12	29	97.94	610,000	631,957	18,327	78	32
MTY	DR	2005	1	4	99.89	430,000	445,250	1,781	12	7
MTY	ES	2005	8	28	98.55	310,000	321,179	8,993	34	33
MTY	MA	2005	2	16	100.34	409,900	428,113	6,850	12	23
MTY	MO	2005	22	28	98.99	577,000	573,882	16,069	33	51
MTY	NOM	2005	*	4	94.96	1,375,000	1,486,000	5,884	110	1
MTY	NS	2005	18	49	100.21	338,000	338,926	16,656	37	61
MTY	PB	2005	3	13	95.16	780,000	1,333,885	17,341	76	9
MTY	PG	2005	3	8	97.77	635,000	645,250	3,872	30	7
MTY	SEA	2005	4	4	99.58	535,000	587,000	2,348	13	9
MTY	SMH	2005	2	3	99.87	645,000	631,633	1,895	6	5
MTY	SOM	2005	11	16	99.53	305,000	298,806	4,781	27	26
MTY	SS	2005	7	17	101.19	395,000	398,965	6,782	16	24
MTY	UN	2005	*	*	*	*	*	*	*	*
Totals										
		2005	99	226	98.37	409,900	521,563	117,873	39	299

* = Not Available

6. The Air Force Institute of Technology, an integral part of Wright-Patterson Air Force Base, has all the support typical of a large military installation. In addition, the Dayton-Springfield metropolitan area offers everything an individual or family would look for in a supporting community: moderate cost of living, short commuting distances, outstanding health care options, exceptional educational systems, superb child care, recreation to fit everyone's needs, and centrally located and in easy reach of most destinations:

Distance from AFIT (in miles):	
Dayton International Airport, OH	15
Cincinnati International Airport, OH	82
Columbus International Airport, OH	70

7. As the following examples show, AFIT responds to changing Air Force and Defense needs by tailoring resident graduate and continuing education programs to fast-changing requirements and needs, and does so in a much shorter timeframe than possible in civilian universities:

- Intermediate Development Education (IDE) programs developed and delivered within six months of request – graduates available within eighteen months of request.
- Systems Engineering (SE) Program redesigned in less than a year with both graduate degree and certificate programs, resident and by distance learning, available and being awarded.
- During the past four years, five Centers of Excellence have been developed at AFIT, each with a specific defense focus
 - **Measurement and Signature Intelligence (MASINT)** – A growing and increasingly important intelligence area which includes significant classified content (which is not normally available in civilian universities) – this program receives strong support from NGA, NRO, CIA, DIA, and NASIC
 - **Information Security** – Encompasses info security, info operations and info warfare. Many civilian universities are involved in developing the technology to defend computer systems and networks, however none are involved in developing capabilities to disrupt and exploit enemy systems and networks – this program receives strong support from NSA, AFIWC, and 8th AF
 - **Directed Energy** – Focused on the development of high-energy lasers and microwave weapons systems
 - **Systems Engineering** – Focused on systems architecture and capabilities planning – developing an officer corps with the ability to do effects and capabilities based planning
 - **Operational Analysis** – Focused on Modeling and Simulation and the analysis tools to improve operations. A steady stream

of military faculty from this area have deployed in support of OIF to supply analysis support for the current conflict in Iraq

- AFIT is currently performing over four hundred research efforts annually– DOD customer surveys rank 90% as significant or highly significant.

8. AFIT is part of the Dayton Area Graduate Studies Institute (DAGSI), a consortium of graduate engineering schools at the University of Dayton, a private institution; Wright State University, a state-assisted institution; and the Air Force Institute of Technology, a federal institution. DAGSI integrates and leverages the combined resources of the partnership, including faculty, facilities, equipment, and other assets of the institutions. The DAGSI partnership, which includes The Ohio State University and the University of Cincinnati as affiliate members and Miami University as an associate member, effectively expands regional educational and research opportunities at the masters and doctoral levels of engineering and computer science. DAGSI's ultimate objective is to support economic growth and development in Ohio by strengthening the intellectual infrastructure supporting the state's high-tech workforce. This academic partnership is second-to-none in the industry and offers AFIT students another dimension in advanced educational opportunities.

9. AFIT is located in the "Center of Invention and Innovation," the Dayton and Wright-Patterson community. It is a premiere, education and technical research-focused complex offering state-of-the-art facilities with more than 160,000 square feet of academic and research space coupled with 115,000 square feet of administrative support space. Ample land is available for future growth in and around the campus and Wright-Patterson Air Force Base. Correspondingly, Wright-Patterson AFB provides a robust environment for AFIT with support from the Air Force Research Laboratory, Headquarters Air Force Materiel Command, Aeronautical Systems Center, National Air and Space Intelligence Center, Air Force Security Assistance Center, and the Major Shared Resource Center (a DoD supercomputer facility).

Bottom line: The Dayton Region Recommends Retaining the Air Force Institute of Technology at Wright-Patterson Air Force Base (AFB), Ohio; further recommend that the BRAC Commission study the realignment of NPS to AFIT to capture greater savings.

[Final Version]

REPORT

ON

AIR FORCE INSTITUTE OF TECHNOLOGY
(AFIT)

STUDY

FOR

SENATE AND HOUSE ARMED SERVICES
COMMITTEES

DUE: 30 September 2001

[Note: Final Version; Submitted to Congress 25 February 2002 by SAF/LL]

Introduction:

This report was written to meet the requirements of the National Defense Authorization Act (NDAA) of 2001, which tasked the Air Force (AF) with a study of AFIT. The NDAA mandated the following items be included in the report:

- 1) A statement of the institute's roles and missions through 2010 in meeting the critical scientific and educational requirements of the AF
- 2) A statement of the strategic priorities for the institute in meeting long-term core science and technology educational needs of the AF
- 3) A plan for the near-term increase in the production by the institute of master's and doctoral degree graduates

The report also includes recommendations on:

- 1) The grade of the Commandant of AFIT
- 2) The chain of command of the Commandant within the AF
- 3) Employment and compensation for the institute's civilian professors
- 4) The process for identifying AF requirements for personnel with advanced degrees
- 5) The institute's candidate-selection process for annual enrollment
- 6) Post-graduation opportunities within the AF for AFIT graduates
- 7) AFIT admission policies and practices for Army, Navy, Marine Corps, and Coast Guard officers; employees of the Department of the Army; Department of the Navy; Department of Transportation; foreign military personnel; enlisted members of the Armed Forces; and other persons eligible for admission
- 8) Near- and long-term funding of the institute
- 9) Opportunities for cooperation, collaboration, and joint endeavors with other military and civilian scientific and technical educational institutions for the production of qualified personnel to meet Department of Defense scientific and technical requirements

The report consists of an executive summary and 11 chapters addressing the specific issues above.

The lead agency and focal point for the AF for this report is the Office of the Secretary of the AF (HQ USAF/OS): Headquarters Air Force, 1670 Air Force Pentagon; Washington DC 20330-1670. The phone number is (703) 697-7376 or DSN 227-7376. The report has been reviewed and approved by the Commander of the Air Force Materiel Command as required by NDAA 2001.

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EXECUTIVE SUMMARY

This executive summary outlines the chapters found in the Report on Air Force Institute of Technology (AFIT) Study for Senate and House Armed Services Committees. This report was written to meet the requirements of the National Defense Authorization Act (NDAA) of 2001, which tasked the Air Force with a study of AFIT. The objective of the report is to highlight AFIT's roles and missions, strategic priorities, plans to increase production, recommended organizational structure, student selection process, opportunities for graduates, funding issues, opportunities for research, and future challenges. The report contains 11 chapters with each chapter addressing a specific issue or providing a recommendation as requested in the NDAA of 2001. The chapters are titled according to the issue addressed.

Chapter 1 examines AFIT's roles and missions through 2010, focusing primarily on meeting the United States Air Force (USAF) and Department of Defense (DoD) critical scientific and education requirements. The overall mission of AFIT is to provide responsive, defense-focused graduate and professional continuing education; mission-focused research and worldwide problem solving for the USAF and DoD; and technical consultation to improve USAF and joint operations capability. AFIT's mission includes ensuring that the AF is able to maintain its scientific and technological dominance. AFIT has derived its direction from a wide variety of AF and joint publications in order to develop educational and research programs. This has allowed AFIT the flexibility to adapt scientific and technical research and tailor its education programs in response to a rapidly changing world. In the future, AFIT will work to establish a relationship with the Naval Postgraduate School to capitalize on the strengths of both programs to jointly improve graduate education opportunities for both Services.

Chapter 2 delineates the strategic priorities of AFIT. AFIT's strategic priorities reflect its mission: to provide responsive, defense-focused graduate and professional continuing education to meet the needs of the USAF, DoD and the Nation; conduct mission-focused research and worldwide problem solving for the USAF and DoD; and provide technical consultation to improve AF and joint operational capability.

Chapter 3 identifies USAF initiatives to increase enrollment in the graduate degree programs at AFIT and summarizes the difficulties AFIT has encountered in filling scientific and engineering student requirements. Initiatives include: utilizing direct accessions from the officer commissioning sources to fill seats; allowing military personnel and federal civilians in the Wright-Patterson Air Force Base area to enroll; and identifying and recruiting international officers to fill remaining available seats. . These actions have raised the core engineering and science student fill-rate to over 80 percent, up from below 50 percent. It has also resulted in the first AFIT resident enrollment increase since 1995 when the demand for scientists and engineers was not as high. The failure to meet a 100-percent fill-rate appears to be one consequence of current personnel shortages in the science and engineering career fields throughout the USAF. Current manning in scientific fields is 80 percent and 68 percent within the developmental engineering career field. Meeting a 100 percent student fill-rate in the engineering and science field of study would negatively impact present AF missions including operations tempo. Efforts to publicize opportunities to attend AFIT to encourage additional volunteers have been marginally successful. In addition, some personnel appear to be reluctant to commit to additional active duty service in a full-employment economy with better salaries outside the Air Force.

Chapter 4 addresses the recommended grade of the AFIT Commandant. The methodology used is the Position Description (PD). The rank of the AFIT Commandant is therefore based upon the level and scope of responsibilities, the experience and skills required to do the job, and the level of official contacts with whom the commandant interacts. Using this methodology, the grade of the AFIT Commandant grades out at the level of brigadier general. The PD supports this by outlining the required specific duties and skills of the commandant. The current incumbent is a colonel and that has been the grade of the AFIT Commandant since 1991.

Chapter 5 depicts AFIT's current chain of command, which consists of four levels. Presently, AFIT reports to the Air University (AU) Commander who subsequently reports to Air Education and Training Command (AETC). The AETC Commander reports directly to Headquarters Air Force. The study supports the current command arrangement.

Chapter 6 focuses on AFIT's civilian faculty employment, civilian faculty pay and associated problems. The chapter discusses AFIT's quest to remain competitive with other public and federal institutions in terms of faculty pay. During the threatened closure actions in the mid-1990s, AFIT lost 20 of the graduate school's 51 civilian faculty members to retirement or other civilian job opportunities. Ten of these vacancies remain unfilled. In filling its vacancies, AFIT is statutorily restricted to hiring only US citizens. This limits their pool of eligible applicants and affects AFIT's ability to hire qualified faculty. It is estimated that 45 to 60 percent of doctorates earned in engineering and the physical sciences in the past decade were awarded to non-US citizens. AFIT must try to hire from a pool of less than 50 percent of those earning doctorates. Another problem that AFIT continues to confront is the perception that the school may close in the future despite assurances from both senior Air Force leadership and Congress that AFIT's future is secure.

Chapter 7 explains the process for identifying USAF requirements for personnel with advanced academic degrees and the identification and selection of candidates for annual enrollment at AFIT. USAF career functional managers identify requirements for specific duty positions, which require an Advanced Academic Degree (AAD). AAD positions are the basis of the USAF-funded graduate education program. An AAD-validated position indicates the incumbent cannot optimally perform the job without the specific advanced degree. The basis for USAF AAD-funded quota requirements is projected vacancies due to personnel rotations or new degree requirements. If the USAF cannot fill the mission critical positions with the current officer inventory, then a limited number of officers are selected to receive graduate education through in-resident attendance at AFIT or a civilian institution. Current USAF policy requires the student attend AFIT if the field of study is available in residence. Graduates of the funded graduate education program normally serve in a coded AAD position immediately following graduation to ensure optimal payback to the Air Force. However, by regulation they must serve in an AAD position no later than the second tour following completion of the funded education. Due to funding constraints, the requirements for graduate education always exceed the number of available slots. The Air Force Education Requirements Board (AFERB) Working Group, a panel of career field functional experts, prioritizes the USAF graduate education requirements to determine which slots are funded with the limited resources. The AFERB Executive Committee reviews the working group's findings and validates or modifies the results as necessary. The AFERB normally meets each October one and a half years prior to execution year for graduate education requirements, allowing time for candidate selection and preparation for the following

summer move cycle. The Air Force Personnel Center (AFPC) selects the most qualified candidates available for the graduate degree training. Time-on-station requirements should be met to ensure personnel are not moved too often and to ensure the Air Force gets adequate payback for the previous move. Additionally, USAF mission requirements take priority further reducing the pool of eligible candidates. Also, some members might be reluctant to accept the active duty service commitment associated with the training in light of the competitive civilian job market. In summary, the USAF has a formal system in place to ensure limited graduate education resources are used to the maximum benefit of the USAF, DoD and the Nation. The AF selection process in determining AAD positions and filling AADs prevents repetition of effort in meeting AF needs.

Chapter 8 discusses the post graduation opportunities (within the USAF) for AFIT graduates. These opportunities are in areas related to the graduate's degree and involve jobs requiring an advanced degree in which the officer is a specialist. Sanctioned by the CSAF and SECAF, the S&E Summit is working to define better career opportunities for the science and engineering career fields to enhance recruitment and retention of scientists and engineers. The S&E Summit is examining the officer scientist and engineer career path where these officers could remain on a technical career path and be competitive for promotion to higher grades.

Chapter 9 illustrates the policies and practices of admitting Army, Navy, Marine Corps, and Coast Guard officers, Department of the Army, Navy, and Transportation employees, military personnel from foreign countries, enlisted members and other persons eligible for admission to AFIT. AFIT follows the same policies and practices for applicants from other sources as it does for USAF officers. However, AFIT only enrolls non-USAF students on a space-available basis, since AFIT's priority is to educate AF quota students. These exceptions are beyond AFIT's control and while they do not affect admission criteria, they do affect the space available for these students. Students from non-USAF sources such as sister services and foreign military personnel have been used to fill vacant seats at AFIT and ensure the institute is operating efficiently. Students from outside sources currently make up almost a third of AFIT's total student in-resident population. In the past, this has not been a problem since the USAF was unable to fill the quotas; however, if the USAF reaches a point where it can fill all the student slots, additional funding will be required to accommodate non-AF students. AFIT prefers to admit a number of sister service and foreign military officers to promote jointness, develop better relationships with international partners, and ensure continued interest in the programs. This chapter discusses a complication encountered when admitting civilians. Funds paid by civilians taking AFIT courses are deposited directly in the US Treasury and AFIT receives no direct reimbursement. Dayton Area Graduate Studies Institute (DAGSI) students who participate in a Cooperative Research and Development Agreement (CRDA) are an exception. DAGSI is a consortium of universities in the Dayton, OH area that allow the transfer of credits between the participating universities. This program allows payment to DAGSI, which deducts an administration fee and forwards the balance of the money to the providing institute. The chapter concludes by noting there is no reason why academically qualified enlisted personnel could not attend AFIT as full-time students.

Chapter 10 addresses the near- and long-term funding of AFIT. AFIT's funding has remained constant over recent years while overall requirements and costs continue to increase. Over the last 5 years, requirements have exceeded funding from \$4M to \$8M annually. This trend in funding is

typical of the budget shortfalls each service has experienced. The long-term funding shortfalls from FY 03-09 are estimated to be between \$11M and \$20M.

Chapter 11 examines opportunities for joint research and collaborative endeavors with other military and civilian scientific and technical institutions in order to produce qualified personnel to meet DoD scientific and technical requirements. In the past, AFIT has successfully identified and benefited from joint research efforts with other USAF agencies. From FYs 97-00, the AF Research Laboratory (AFRL) and the AF Office of Scientific Research (AFOSR) provided over 70 percent of the funding for joint research and collaborative endeavors with AFIT, an amount ranging from \$3.1M to \$4.5M. Other USAF agencies contributed over \$750,000 annually during this time. AFIT has supported other DoD units, but not to the same extent as the joint research provided to USAF units. Other DoD-sponsored research has averaged almost \$250,000 each year. Other federal agencies outside of DoD, such as the Department of Energy and the National Security Agency have provided over \$300,000 in research funds. Until recently, opportunities for joint research outside of the federal government have been limited. The advent of DAGSI and the associated CRDA has allowed joint research outside of the government. Civilian institute-sponsored research has climbed from less than \$100,000 each year in FYs 97-99 to \$255,291 last year and is expected to exceed \$1M in FY 01. Building on the success with DAGSI, AFIT is now working to develop similar arrangements with educational institutions located throughout the country. One remaining barrier to collaborative efforts is the fact that AFIT is not statutorily authorized to receive grants and must negotiate other funding transfer mechanisms with sponsors. This statutory restriction was eliminated for the military academies through the Strom Thurmond National Defense Act of FY 99 and the removal of this restriction would benefit AFIT if similar legislation were enacted.

CHAPTER ONE

Statement of the Institute's Roles and Missions Through 2010 in Meeting the Critical Scientific and Educational Requirements of the Air Force

The institute's mission is "to provide responsive, defense-focused graduate and continuing education, mission-focused research and worldwide problem solving, and technical consultation to improve AF and joint operational capability."¹ Within AFIT, the Graduate School of Engineering and Management has the primary responsibility for meeting the USAF's requirements in scientific and engineering education. The graduate school's mission is "to produce graduates and research that enable the AF to maintain its defense-related scientific and technological dominance."² Supporting both the AF and DoD organizations with operationally focused research and consultation on scientific and technical problems is integral to the graduate school's mission.

AFIT has developed its requirements from its own educational and research programs and a wide variety of official sources including:

- The Chairman, Joint Chiefs of Staff's strategic vision statements, including *Joint Vision 2020*, and its predecessors;
- The AF's strategic vision statements including *Vision 2020: America's Air Force* and its predecessors;
- Other AF-level planning documents including "1998 Air Force Long-Range Strategic Plan";
- Official advisory panel studies including the Air Force Scientific Advisory Board's 15-volume, "*New World Vistas: Air and Space Power for the 21st Century*";
- AFIT faculty members' participation in Air University alternative future operational environment studies including "Spacecast 2020" (SECAF study completed in the early 1990s) and "Air Force 2025" (Chief of Staff follow-on study conducted in the mid-1990s);
- AF major commands' (MAJCOM) strategic plans;
- Air Force Research Laboratory technology area plans;
- Current joint and AF doctrine publications; and
- AFIT contacts with AF and other DoD organizations, especially concerning long-range education and research priorities.

These sources provide AFIT with an informed view of the potential environments for future AF operations and the technology necessary for successful military operations. In keeping with its mission, AFIT focuses its research and education programs to support both current and future AF and other DoD technology needs. AFIT's strategic focus extrapolates and supports concepts developed from the previously identified source document mission statements. These mission statements allow Air Education and Training Command (AETC), Headquarters Air University (HQ AU), and AFIT the flexibility to adapt to a rapidly changing technological environment.

¹ Source: AFIT's current organizational mission statement.

² Source: The graduate school's current organizational mission statement.

AFIT will continue to identify future AF and DoD needs in curricula development, research and consultation efforts. For instance, AFIT's research efforts have kept pace with emerging scientific and technological trends. AFIT has also built appropriate support curricula in state-of-the-art fields including information operations and space operations.

The Air Force envisions joint cooperation and collaboration with the Navy in the rationalization of AFIT and Naval Postgraduate School (NPS) programs. Both schools will look at the programs to capitalize on the strengths of each, eliminate unnecessary redundancy, and develop a collaborative effort to provide enhanced educational opportunities to members of all services. We anticipate this effort will result in centers of excellence being identified and capitalized on to improve the graduate education systems of both Services.

CHAPTER TWO

Statement of Strategic Priorities for the Institute in Meeting Long-Term Core Science and Technology Educational Needs of the Air Force

AFIT's strategic priorities reflect the institute's mission identified in Chapter 1. The strategic priorities are to:

1. Provide responsive, defense-focused graduate and continuing education to meet the needs of the AF, DoD and the Nation;
2. Conduct mission-focused research and provide worldwide scientific and technical problem solving for the AF and DoD;
- 3. Provide technical consultation to improve AF and joint operational capability.

AFIT takes every opportunity to validate, affirm, and revise their curricula to meet AF long-term science and technology educational requirements. Through collaborative efforts with the Navy and NPS, AFIT plans to optimize educational opportunities.

CHAPTER THREE

Plan for Near-Term Increase in the Production by the Institute of Master's and Doctoral Degree Graduates

Over the last year the USAF has worked to increase the number of AFIT resident students for the academic school year beginning in August 2001. In July 2000, then SECAF, Honorable F. Whitten Peters, sent a letter to members of the Ohio Congressional delegation, Senators Dewine and Voinovich and Congressmen Hall and Hobson, stating the AF's commitment to working a short-term initiative to boost enrollment at AFIT. The SECAF and CSAF, General Michael Ryan, subsequently approved sending direct accessions to AFIT for critical scientific and engineering requirements. Direct accessions are those AF officers newly commissioned through Air Force Reserve Officer Training Corps (AFROTC), the United States Air Force Academy (USAFA), and Officer Training School (OTS). The SECAF did this as part of a broader effort to address the current AF science and engineering shortfall and to make better use of AFIT assets.

As a result of the commitment to fill available AFIT seats, additional quotas were allotted to AFIT for direct accessions during the February 2001 AF graduate education quota reallocation process. The AFIT Registrar identified 29 direct accessions for in-resident attendance of the graduate school in the critical engineering and scientific programs.

The Air Force Personnel Center (AFPC) centrally manages new officer accessions and their assignments are coordinated with individual Career Field Functional managers to meet Force Planning Objectives. The Developmental Engineering (AF Specialty Code 62E) Officer Assignments section at AFPC filled initial Air Staff-approved AFIT slots as top priority. However, these additional quotas given to AFIT for direct accessions exacerbate the engineering manning problem in the field since these individuals will no longer be available for operational assignments while completing their degree requirements. With this shortfall in company grade officers, the number of direct accessions sent to AFIT had to be limited. The original direct accessions goal was 50 officers. The final number of 29 was a necessary compromise between the mission needs in the field and the need to fill AFIT seats.

AFIT is filling its logistics and acquisitions seats. Since 1995, AFIT's logistics and acquisition capacity has been exceeded by an average of 10-40 percent. It is in the hard-core sciences that the seats have been difficult to fill. For example, the aeronautical and electrical engineering seat fill-rate has been less than 50 percent (25 of 52 seats filled); the physics seat fill-rate has been 30 percent (4 of 14 seats filled). The USAF is focusing its efforts in these difficult-to-fill specialties to increase AFIT's enrollment up to capacity (230 masters and 35 doctorates). The minimum efficient load has been identified as 165 masters and 22 doctorate degrees.

To fill the "hard-to-fill" degree areas, AFIT has opened their doors to all military world wide and those federal civilians stationed at Wright-Patterson Air Force Base. These students attend on a part-time basis. This has resulted in an additional ten aeronautical engineers and seven electrical engineers, as well as increases in the computer sciences, materials sciences, space engineering, and space operations programs. Over the past year, a total of 40 employees took advantage of this program.

Most of the employees are from the research labs at Wright-Patterson Air Force Base, attending AFIT as their work schedule allows. Seat fill-rates are improving – from under 50 percent to over 80 percent for FY 01. This is due to the direct accessions, Wright-Patterson part-time programs, and close oversight ensuring students attended AFIT in residence when training was available at AFIT. In addition, AFIT has been added to the list of schools that civilians can choose from under the Civilian Competitive Development Program to encourage full time participation by civilians.

To ensure that AFIT faculty is productively employed and the institute remains viable, AFIT has identified and recruited international officers. The total number of international officers in this year's 2001 graduating class and the 2002 class is 63.

In the past year, the number of in-residence students has risen 50 percent from 143 to 210 master's candidates. This represents the first AFIT in-resident enrollment increase since 1995 when scientists and engineers were not in such short supply. Other recruitment efforts, including advertising campaigns highlighting AFIT research opportunities and the specific degree programs available, have been publicized throughout the AF, but with marginal success. A primary reason cited is a reluctance to accept the additional active duty service commitment in a full-employment economy and better salaries outside the Air Force. In the coming year, the AF will continue to optimize the student fill-rate while balancing known operational requirements.

In addition, AFIT plans to work with the Navy and NPS to identify more opportunities for cross flow education between the institutions as well as additional opportunities for Naval officers and AF officers to attend sister service's programs.

CHAPTER FOUR

Recommended Grade of the Commandant of AFIT

The required grade of the commandant was determined based on the level of supervision, the scope of responsibilities, the nature of official contacts the commandant is required to make, and the experience required for the job. The Air University Manpower Division (HQ AU/XPM) developed the resultant position description (PD) for the AFIT Commandant. The PD grades out at the level of brigadier general.

AIR FORCE INSTITUTE OF TECHNOLOGY (AFIT)

COMMANDER MILITARY GRADE REQUIREMENT

POSITION DESCRIPTION

REQUIRED GRADE: Brigadier General

CURRENT AUTHORIZED AND ASSIGNED GRADE: Colonel

For 41 of 51 years, a general officer has commanded the institute. A history summary of the institute's grade assignments follows:

Major General	from April 1950	to January 1951
Brigadier General	from January 1951	to October 1951
Major General	from October 1951	to August 1957
Brigadier General	from August 1957	to September 1961
Major General	from September 1961	to June 1983
Brigadier General	from June 1983	to July 1985
Major General	from July 1985	to August 1986
Brigadier General	from August 1986	to May 1991
Colonel	from May 1991	to present

POSITION DESCRIPTION:

I. OVERVIEW:

1. **POSITION TITLE:** Commandant, AFIT
2. **RATER POSITION AND GRADE:** Commander, Air University; Lieutenant General
3. **ADDITIONAL RATER POSITION AND GRADE:** Not Applicable
4. **PRINCIPAL SUBORDINATES:** Grades, position titles, and locations of principal subordinates.
 - A. AD-28, Dean of Academic Affairs

- B. AD-27, Dean, Graduate School of Engineering and Management
- C. Colonel, Vice Commandant
- D. Colonel, Dean, Civilian Institute Programs
- E. Colonel, Dean, School of Systems and Logistics
- F. Colonel, Dean, Civil Engineer and Services School
- G. Four additional colonels and over 20 AD-25/AD-24 (GM-15 equivalent) faculty

5. REQUIRED CONTACTS:

- A. Office of Secretary of Defense
- B. Defense Acquisition University
 - 1) Commander
 - 2) Vice Commander
 - 3) Directors and Staffs
- C. United States Air Force
 - 1) Office of Secretary of the Air Force
 - 2) Chief of Staff
 - 3) Deputy Chiefs of Staff
 - 4) Directors and Staffs
- D. Air Education and Training Command
 - 1) Commander
 - 2) Vice Commander
 - 3) Directors and Staffs
- E. Air University
 - 1) Commander
 - 2) Vice Commander
 - 3) Directors and Staffs
- F. Air Force Personnel Center
 - 1) Commander
 - 2) Vice Commander
 - 3) Directors and Staffs
- G. Air Force Materiel Command
 - 1) Commander
 - 2) Vice Commander
 - 3) Directors and Staffs
- H-1. Aeronautical Systems Center
 - 1) Commander
 - 2) Vice Commander
 - 3) Directors and Staffs
- H-2. Air Force Research Laboratory
 - 1) Commander
 - 2) Vice Commander
 - 3) Directors and Staffs
- I. 88th Air Base Wing (Host Wing)
 - 1) Commander
 - 2) Vice Commander

- J. Other Services
 - 1) Secretaries and Staff
 - 2) Chiefs of Staff
 - 3) Directors and Staffs
- K. Local Congressional Leaders and Offices
- L. Corporate/Corporate Division/Educational Institution Presidents and Officers
- M. Members of National and Professional Accreditation Boards (North Central Association of Colleges and Schools and Accreditation Board for Engineering and Technology (ABET))
- N. AFIT Board of Visitors
- O. Civic Leaders

6. LATERAL POINTS OF COORDINATION (staff, joint, international)

- A. Other Senior Service Schools
- B. Naval Postgraduate School
- C. Joint Chiefs of Staff and Joint Staff
- D. Office of the Secretary of the Air Force – Undersecretaries
- E. Air Force Reserve Chief
- F. Air National Guard Director
- G. Department of Defense – Undersecretaries
- H. US Government Agencies
 - 1) State Department
 - 2) Defense Intelligence Agency
 - 3) Central Intelligence Agency
 - 4) National Security Agency
- I. International Liaison Officers and Organizations
- J. Congressional Representatives
- K. ASC Commander and Vice Commander
- L. AFRL Director and Deputy Director

7. RESPONSIBILITY, AUTHORITY, AND ACCOUNTABILITY:

The commandant is responsible for leadership, discipline, morale, welfare, health, and training of assigned personnel. Manages resources to meet mission requirements. Interprets directives, orders, and regulations. Formulates plans and interfaces with other agencies as required. Maintains and enforces standards.

Responsible for planning, developing, conducting, and administering the Air Force' advanced degree-granting and professional continuing education programs in technology and acquisition to approximately 18,500 military and federal civilian employees for the United States, Department of Defense, and allied governments (includes approximately 15,800 in short professional continuing education courses). Provides the Air Force a capability for technical education, research, and consultation in the advancement of aerospace power for national security.

8. RESOURCES:

The current AFIT Commandant commands 434 members of the faculty and staff (146 officers, 63 enlisted, and 225 civilians) as well as 400 resident graduate students, and over 2,300 students at 450 civilian universities and industrial locations. Responsible for fiscal resources exceeding \$80M annually and for the institute's campus facilities value estimated at \$29.9M, replaceable at a cost of \$114.5M.

9. MOST DIFFICULT TYPE PROBLEMS:

Personnel management issues which include academic and faculty boards, selection and subsequent placement of faculty and staff, coordination of staff and mission elements. Determining budget and fiscal priorities, including user agency (Major Air Command and Department of Defense agency) requirements. Resolving issues arising from reports of inspection and review teams, the inspector general complaint system, and the civilian performance and appraisal system. Long-term planning with Air University, Headquarters Air Education & Training Command, and Headquarters United States Air Force to match resources with education requirements.

10. SUPPLEMENTAL INFORMATION:

Effectiveness depends on ability to gain cooperation of entire AFIT faculty and staff and ability to coordinate and manage sensitive, complex issues with Headquarters United States Air Force, Headquarters Air Education & Training Command and Air University.

II. JOB REQUIREMENTS:

1. SPECIAL TRAINING AND WORK EXPERIENCE:

Rated (desired) experience beneficial to integrate operational and academic requirements into increasing interdisciplinary programs. Command and/or extensive staff experience. Knowledge and experience in Department of Defense Program Operating Memorandum (POM) process. Doctorate degree in engineering, science, or management is highly desirable. Previous AFIT-sponsored program participation desired.

2. COMMUNICATIONS SKILLS:

Approves or prepares written correspondence for Air University, Headquarters Air Education & Training Command, HQ United States Air Force, and Department of Defense addresses; must be sensitive to nuances of purpose and style and responsive to Air Force, Department of Defense, congressional, and civilian inquiries and statements. Briefs distinguished visitors to include congressional leaders and their staffs; general and flag officers, secretary-level civilians, senior-level educators, school, and staff agencies.

3. JUDGMENT AND DECISION MAKING:

Evaluates Air Force education needs, available resources to accomplish AFIT's mission and the mismatch of requirements and resources available; then determines the best short-term and long-term courses of action for most cost-effective benefit. Determines internal operating policies and procedures; evaluates and selects proposed programs and actions based on justifications, requirements, and alternatives; directs activities based on long-range plans and foreseeable objectives.

4. PLANNING:

Manages programming in response to changing Air Force and Department of Defense educational objectives, requirements and directions. Must be aware of changing technology and force structure to integrate AFIT's educational mission into the needs of the educational requirements plan, AFIT long-range master plan, and each AFIT school and directorate long-range plan.

5. MANAGEMENT:

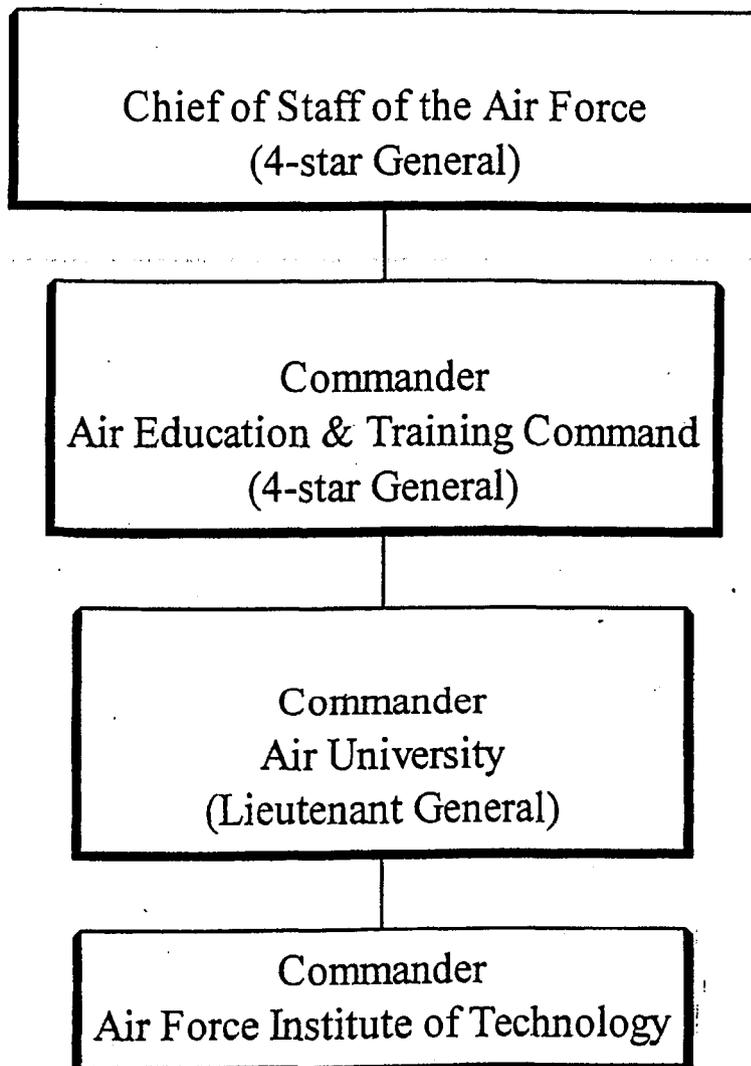
Organizes and coordinates inputs from the school deans, staff directorates, and other organization elements. Sets priorities to accomplish programs and actions; selects key staff members; guides responses to and interprets directions from higher headquarters and implements resultant policies and procedures. Responsible for signing the replies and requests for assistance to Air University, Headquarters Air Education & Training Command, Headquarters United States Air Force, and other government and civilian institutions.

CHAPTER FIVE

The Chain of Command of the Commandant within the Air Force

The existing chain of command chart is shown below:

AFIT CHAIN OF COMMAND



The six mission areas of Air University are:

1. Professional Military Education.
2. Degree-Granting Education.
3. Citizenship Education.
4. Accessions Education.
5. Professional Continuing Education.
6. Research and Consultation.

AFIT's missions consist of:

- 1. Graduate Education (captured under degree-granting education).
- 2. Professional Continuing Education (under AU).
- 3. Mission-Focused Research and Worldwide Problem Solving and/or Consultation.

AFIT's mission is captured under Air University's missions. In addition, the rank structure on the previous page supports AFIT reporting to the Air University Commander.

Recommendation: AFIT retain its current command arrangement reporting to Air University.

CHAPTER SIX

The Employment and Compensation of Civilian Professors at the Institute

Title 10, United States Code, Section 9314 authorizes the employment and compensation of civilian professors at AFIT. Air Force Policy Directive (AFPD) 36-8, *Employee Benefits and Entitlements*, is implemented through Air Force Instruction (AFI) 36-804; *Civilian Faculty Pay Plan for Air University and the USAF Academy* (29 April 1994)³ and Air University (AU) Supplement 1 to AFI 36-804 (10 July 2000) governs the implementation of the faculty pay at both AFIT at Wright-Patterson AFB OH and the AU schools at Maxwell AFB AL. These instructions establish the requirements for appointment, reappointment, academic rank, tenure (if applicable), salary step adjustments, and merit awards for civilian faculty.

The Secretary of the Air Force has delegated to the Director of Personnel Force Management the authority to prescribe basic pay rates for faculty. The Faculty Pay Plan (FPP) sets pay for faculty positions based on academic rank (instructor, assistant, associate and full professor and deans or senior managers) with minimum and maximum step levels within each rank. The maximum payable rate is limited to the rate for Level III of the Executive Schedule (5 U.S.C. 5304 (g) (2)), currently capped at \$133,700. This cap was not affected by the actions referenced in this report.

Due to AFIT's drawdown in the mid- to late-1990s, 20 of the graduate school's 51 civilian faculty members either retired or left to take other positions. The Department of Electrical and Computer Engineering currently has five vacancies; the Department of Aeronautics and Astronautics has three vacancies; the Department of Operational Sciences has two vacancies. The institute has had difficulty filling these positions. A competitive FPP is a crucial ingredient in the process of attracting and retaining quality faculty members.

Another difficulty that AFIT has encountered in hiring faculty is the statutory requirement that Federal degree-granting institutions hire only US citizens. Neither private graduate schools nor other public education institutions face such a restriction. As a result, AFIT and the other Federal degree-granting schools have a smaller pool of eligible applicants, particularly for faculty in the sciences, engineering, and some management disciplines. Although the data is not readily available regarding the citizenship of faculty members at non-Federal institutions, the US Department of Education and the AAUP do report the percentage of doctorates earned by US and non-US citizens each year. These are classified into broad disciplinary groups, including engineering and the physical sciences. According to data published annually by the AAUP, the percentage of doctorates awarded to non-US citizens each year in engineering and the physical sciences has been 45-60 percent for the last decade.⁴

Recommendation: Continue efforts to reduce faculty hiring shortfall.

³ AFI 36-804 superseded Air Force Regulation (AFR) 40-533 (23 March 1990).

⁴ Source: Annual reports on numbers of earned doctorates in the "Facts and Figures" section of the *Chronicle of Higher Education* home page, <http://chronicle.com>.

CHAPTER SEVEN

The Processes for the Identification of Requirements for Personnel with Advanced Degrees within the Air Force and Identification and Selection of Candidates for Annual Enrollment at the Institute

Air Force Instruction (AFI) 36-2302, *Professional Development*; Chapter 1, Graduate Education identifies the process to fill advanced degree requirements.

Graduate education programs are designed to manage limited resources and support National, Military, and Air Force strategic objectives in an increasingly complex international environment experiencing rapid changes in science and technology. Graduate education requirements are identified by specific position and Advanced Academic Degree (AAD) requirements to meet the overall Air Force mission. It applies to Air Force active duty line officers in the grade of lieutenant colonel and below. It does not directly apply to US Air Force Reserve and Air National Guard members.

AAD positions are the basis of the AF-funded graduate education program. A validated AAD position means the incumbent cannot optimally perform the job without the specified advanced degree. Projected vacancies due to personnel rotations or new degree requirements are the basis for AF AAD-funded quota requirements. If the AF cannot fill the mission critical positions with the current officer inventory, then a limited number of officers are selected to receive graduate education through AFIT, either by in-resident attendance at AFIT or a civilian institution. Current Air Force policy requires students to attend AFIT in-residence if the specific degree program is offered at AFIT. If the degree program is not available at AFIT, then the student will attend a civilian institution. Graduates of the program normally serve in a coded AAD position immediately following graduation to ensure optimal payback to the Air Force. However, they must serve in an AAD position no later than the second tour following completion of the funded education.

Title 10, USC Section 2005 and DoDD 1322.10, *Policy on Graduate Education for Military Officers*, permits the USAF to provide graduate education for selected positions. The Graduate Education Management System (GEMS) is the process USAF uses to fill positions which require an advanced degree. The GEMS process prioritized requirements flow from commanders through major commands (MAJCOMs), Direct Reporting Units (DRUs) or Field Operating Agencies (FOAs) to Air Staff representatives who ensure an equitable selection opportunity for all functional areas.

Annual quotas are determined by available student man-years (SMYs). SMYs are based on a manpower formula that factors the number of courses, course length and the number of student entries each year. The available annual SMYs for the period 1998-2008 are 822, down from 860 in 1997. The reduction is a direct result of the overall manpower drawdown and budget cuts over the past decade.

The total AAD authorizations across all Air Force specialties is 4,290 coded positions ranging from the grade of first lieutenant to general officers. Since 1998, annual AF Education Requirements Board (AFERB) requests have been greater than the 822 SMY quotas available. Requests typically are for

over 1,200 SMYs. Academic Specialty Monitors (ASMs), the proponents for requirements within their areas of expertise, only submit their highest priorities because of the cap on SMYs. The panel of functional experts must prioritize requirements in order to stay within the SMYs' cap. A second board meets during the year to redistribute unused quotas allocated during the initial AFERB.

AFIT administers the graduate programs and acts as the AF Registrar for all officers enrolled in advanced degree programs, including those at civilian institutions. Officers earn their degrees through resident study at AFIT, or through one of over 400 civilian institutions. PhD candidates complete their programs in an average of 4.5 years (includes time for thesis), while master's programs range from 15 to 18 months.

Each year the Deputy Chief of Staff/Personnel (AF/DP) requests that MAJCOM/DRU/FOA/DPs review all coded AAD positions. The Air Staff provides both detailed guidance and criteria to the field, as well as reviews positions through command hierarchies in close collaboration with ASMs.

Filling AFIT in-residence seats appears to be a simple process on the surface but there are numerous factors that affect the resident fill rates. These include: a "volunteer only" fill system; a shortage of academically qualified, eligible candidates in certain AFSCs (especially Science and Engineering); mission requirements, which compete for limited number of S&E officers available; lack of accessions in specific, technically orientated disciplines to send to AFIT; and limited ability of AFPC to release certain candidates to school for an extended period of time due to utilization and professional development issues. Further explanations of the identified problems are provided below:

A volunteer-only fill system: A lack of volunteers for graduate education in technical career fields is a persistent problem. Possible causes might include a combination of incurring an active duty service commitment for advanced education and lucrative job opportunities in the civilian sector for technical professionals. AFPC and AFIT continue to solicit volunteers with strong support from the Secretary of the Air Force (SECAF) and Chief of Staff of the Air Force (CSAF).

A shortage of eligible candidates in certain specialties: This is due in part to operational commitments and commanders' reluctance to release candidates to school for an extended period of time when their units are faced with critical manning shortages in that specialty. Hard-to-fill science and engineering specialties suffer from a robust economy and a more competitive civilian job market. The Dec 00 S&E Summit addressed this issue as a nationwide problem. The Office of the Under Secretary of the AF Acquisition (SAF/AQ) is currently developing the AF's S&E requirements. A follow-on summit, S&E Summit II, is scheduled for Dec 01 to discuss findings from the S&E requirements review.

Lack of academically qualified candidates: Operations tempo and reduced manning since the drawdown continue to affect the AAD program. Better advertising by AFIT to the field on timing of an application, better preparation for GRE and GMAT examinations, and preparatory courses for those requiring remedial study to better prepare for GMAT/GRE testing can help increase the qualified pool.

Mission requirements taking priority: Air Force mission requirements take priority over graduate education requirements. Limited manning dictates that operational commitments are filled first, especially in science and engineering mission areas.

Lack of officer accessions with specific degrees to send to school: This is a direct reflection of the shortage of engineers not only within the military and federal government but also in the nation as a whole.

Limited ability of AFPC to release certain candidates to school for an extended period of time due to utilization and professional development issues: AFPC, which approves an officer's release for developmental opportunity, is constrained from releasing officers for an extended period to attend graduate school because of competing requirements to support professional military education (1-yr), support professional continuing education such as Operational Space and Missile Test course, and the need to fill critical mission requirements. Until S&E manning is at required levels, we see no solution to this problem.

For FY 01, AF/DPDE has coordinated the fill process for in-resident AFIT seats closely with AFPC, AFIT, USAFA, and AU. As a result of careful monitoring and aggressive policy implementation, the FY01 incoming AFIT resident class is projected to be 210 students, including 80 logistics and acquisition students, and 130 science and engineering students. Air Staff has implemented a number of initiatives to improve and streamline the GEMS process. In addition, the S&E Summit is reviewing the student selection process.

NOTE: The Air Force Medical Service (AFMS) is not considered part of the AAD program. AFMS receives separate funding for their education and training activities. The AFMS education is not part of the in-residence graduate education program at AFIT.

In summary, the Air Force has a formal system in place to ensure limited graduate education resources provide the maximum benefit to the Air Force, Department of Defense, and the nation. The Air Force selection process to determine and fill AADs is independent of the other services and government agencies.

Recommendation: Continue to use present system to maximize opportunities at AFIT as mission requirements allow.

CHAPTER EIGHT

Post-Graduation Opportunities within the Air Force for Graduates of the Institute

As noted in Chapter 7, there are 4,290 AAD-coded positions in the Air Force. Many are filled from the existing inventory without any need for additional graduate education. However, at times the Air Force must send officers to degree programs to prepare them for AAD-required positions. This is the case for AFIT graduates. AFIT provides in-residence graduate degrees in a number of specialties. The major areas that AFIT offers in-residence degrees in are aeronautical and astronautical engineering, computer sciences, electrical and software engineering, environmental engineering, mechanical engineering, nuclear engineering, operations research, mathematics, physics, meteorology, logistics management, cost analysis, acquisition logistics management, transportation management, and contracting management.

With 4,290 AAD required coded positions, there are a number of opportunities for each graduate in the different specialties relating to their degree. The positions are generally in research and development, academic instructor duties at AFIT or the USAF Academy, or in analysis positions within the degree specialty. They are typically not in management positions. The S&E Summit is examining a scientist and engineer career path that would allow these officers to take a technical career path and be competitive for promotion to higher grades. The S&E Summit is committed to defining a better career path that will enhance recruitment and retention of scientists and engineers.

Each AAD graduate has a number of opportunities to use their graduate degree in the AF. The S&E Summit is exploring not only how to make these opportunities more appealing, but also how to enhance the entire S&E career field for better retention and recruitment of scientists and engineers. S&E Summit findings when published will provide the most up-to-date information on this subject.

Furthermore, a joint review by AFIT and NPS may result in additional opportunities for AFIT and NPS through added joint duty and cross flow assignments. It is envisioned that the alliance will enhance understanding between the institutes as to the value of each other's programs and result in additional opportunities for the graduates.

Recommendation: Review and evaluate S&E Summit findings when published.

CHAPTER NINE

The Policies and Practices Regarding the Admission to the Institute of Officers of the Army, Navy, Marine Corps, and Coast Guard; Employees of the Department of the Army, Department of the Navy, and Department of Transportation; Personnel of the Military Forces of Foreign Countries; Enlisted Members of the Armed Forces; and Other Persons Eligible for Admission

All United States Army, Navy, Marine, and Coast Guard officers are eligible to attend AFIT, as are all DoD and Department of Transportation civilian personnel and military officers from foreign countries. AFIT's mission is to educate students to develop skills needed for their future jobs.

AFIT follows largely the same admission policies and practices, including academic eligibility criteria, for applicants from sources other than the USAF. AFIT can enroll non-USAF students on a space-available basis only. Based on the AF's annual requirements for officers with advanced degrees, the AF funding for graduate education sets limits on the total number of man-years allocated for graduate degree programs. This limits the number of seats available for other students who wish to attend AFIT. AFIT leadership asserts they can efficiently produce 230 MS and 35 PhD students per year. Once the AFERB determines the number of student quotas for AFIT in each academic specialty, the Air Force Personnel Center, in conjunction with AFIT, attempts to fill quotas from the pool of applicants whom AFIT has identified as academically qualified and whose functional career fields will release them for the assignment.

The total number of these filled quotas determines the budget, personnel, and other resources the AF allocates to AFIT. As a result, the number of students AFIT can enroll each year from non-AF sources, including those from sister services, is limited by the number of vacant quota slots. Each year AFIT estimates, based on past experience, how many non-AF students it can admit the following academic year. This can lead to significant variations in the number of non-AF students AFIT can admit from year to year. In recent years, space has been available for almost all qualified applicants. This was not the case in the 1980s and early 1990s.

The AF funds AFIT based only on the number of AF quota students authorized. AFIT could accommodate additional non-USAF students if the institute received additional funding to offset the additional costs incurred.

Civilian personnel from any Federal government agency are eligible to attend AFIT either both part- or full-time--and a small number do so. AFIT is permitted to charge tuition to cover the expense of their education, but by law AFIT can retain these funds to defray its operating costs only under very specific circumstances described below. Otherwise, the AF normally transfers these funds to the general US Treasury and receives no direct benefit. There is no specific authority allowing personal checks to be deposited in an AF appropriation as payment for tuition. Without this authority, personal checks must be deposited in the Treasury (Miscellaneous Receipts Account).

AFIT may use a student's tuition to defray its operating expenses only if the student attends the institute under the provisions of the Cooperative Research and Development Agreement (CRDA) between AFIT and the Dayton Area Graduate Studies Institute (DAGSI). DAGSI is a consortium formed by Wright State University, the University of Dayton, and AFIT in 1995 to coordinate, integrate, and leverage the resources of the three schools to improve and expand graduate-level educational opportunities in engineering.⁵ Through DAGSI, graduate engineering students can take scientific and technical courses at any of the member schools. The Ohio Board of Regents, the educational governing board for the State of Ohio, funds the consortium to provide scholarships for graduate engineering students at the DAGSI schools, and AFIT students are eligible for these scholarships. Under the provisions of the CRDA, non-quota AFIT students attending classes through DAGSI pay tuition to the consortium instead of directly to AFIT or to the other schools. DAGSI then reimburses the school for all courses provided. DAGSI deducts a minor administrative fee for this service. Last year DAGSI had 251 total students enrolled with 42 at AFIT and provided over \$2.2M in scholarships and stipends worth over \$335K.

Prior to the advent of the DAGSI, AF policy did not permit non-Federal government personnel to attend AFIT. The USAF Deputy Chief of Staff for Personnel authorized AFIT to begin accepting these students through DAGSI in 1995. Although eligibility is limited to US citizens, this program allows AFIT to recruit outstanding students to help support AF research as part of their education program. AFIT can frequently provide these students part-time employment as research assistants using specific research-support funds provided by other AF and DoD agencies.

Finally, AFIT is allowing civilians and military located in the Wright-Patterson AFB area to attend part-time as stated in Chapter 3. Approximately 40 such students have taken advantage of this program over the past year. Many of these students have obtained tuition scholarships through funding provided by the State of Ohio.

Although no USAF policy explicitly prohibits enlisted personnel from enrolling in an AFIT program in the Graduate School of Engineering and Management, all references to eligibility for Air Force-sponsored quota slots in the graduate school refer to officers only. The AF sends students to AFIT for an AAD to obtain the education for a position the graduate would fill after graduation. Because the USAF does not have enlisted positions requiring an AAD, enlisted students could not be assigned against quota slots in the graduate school. However, there is no reason why academically qualified enlisted personnel could not attend AFIT as full-time students.

As mentioned in Chapter One, the Air Force envisions a joint effort with the Navy in identifying centers of excellence between AFIT and NPS. Through these collaborative efforts to identify and develop centers of excellence, AFIT and NPS may develop common application procedures and combined curricula and graduation opportunities that will eliminate unnecessary redundancy.

Recommendation: Work student fill rates commensurate with AFIT's funding.

⁵ The Ohio State University and the University of Cincinnati have since joined the consortium as affiliate members.

CHAPTER TEN

The Near- and Long-Term Funding of the Institute

Near-Term Funding (through 2002).

During recent years, funding has remained nearly constant at AFIT, while overall requirements have increased. Mission efficiencies have helped AFIT continue its mission with minimal impact. For instance, two schools, the Graduate School of Acquisition and Systems Logistics and the Graduate School of Engineering and Management, merged to become the Graduate School of Engineering and Management. This allowed sharing of resources and reduced repetitive processes, but no future mission efficiencies are expected. AFIT is expected to run a budget shortfall in the next few years. Since 1996, overall funding has remained nearly steady while AFIT has identified additional requirements totaling \$4M-8M annually. The funding from FY96 through FY01 is listed below. Approximately \$30M is for military and civilian pay and over \$38M is fenced for programs such as medical and environmental education. Approximately \$12M is discretionary operations and maintenance (O&M) funding:

<u>YEAR</u>	<u>AMOUNT (\$000)</u>
96	80,739
97	79,222
98	81,716
99	80,417
00	81,999
01	(Estimated) 79,900

This trend is typical of the budget cuts the services have endured. Assuming a 3-4 percent inflation rate, AFIT's budget has shrunk 4-5 percent a year.

In FY 01, AFIT has \$2.77M in mission critical unfunded requirements and another \$630K of mission essential and mission enhancement requirements. Mission critical is defined as "cannot start new programs or must stop current operations." Mission essential is defined as "not broken but not optimal delivery." Mission enhancement is defined as "improves quality of life; the need exists; however, there is little impact on mission accomplishment." The critical shortfalls in funding are:

<u>ITEM</u>	<u>AMOUNT(\$000)</u>
Critical lab equipment and supplies	1,652.7
Replacement of outdated computer systems	1,122.0

The lab equipment and supplies cited above are underfunded because the AFIT lab equipment budget was zeroed out in the early 1990s. The computer upgrades are required to support education and research activities. At the time this report was compiled these items still required funding.

The mission essential items consist of \$355.1K in lab equipment and supplies, and \$75.0K in audio/visual upgrades. The mission enhancement is \$200.0K for modular furniture and carpet required to accommodate the Air Force Research Library merger with AFIT's Library.

At the time of this report, AFIT was seeking funding for the above items. To procure mission critical items in FY00, AFIT deferred some requirements to FY01 including computer buys, library documents and resources, and equipment replacements. AU provided \$1M out of its budget to fund lab equipment in support of AFIT's accreditation review by the North Central Association of Colleges and Schools (NCA).

In FY 02, discretionary O&M funding is expected to be around \$14M, while AFIT has identified over \$18M in requirements, of which approximately \$12M is committed to "must pay" items. AFIT prioritized over \$6M in unfunded requirements to determine what would be funded. AFIT plans to fund the following items in priority order as referenced below:

<u>ITEM</u>	<u>AMOUNT(\$000)</u>
Lab equipment	1,250.0
Automated data processing equipment contract increases	353.0
Custodial contract increases	72.5
Copier maintenance contract	12.0
Copiers	20.0
Official Trips for Commandant to Support Official Travel	20.0
Virtual School House Contract (web-based instruction for logistics)	109.0
International Flight Safety Officer course (zeroed out of AF budget)	<u>72.0</u>
TOTAL	1,908.5

AFIT continues to work around these shortfalls and is functioning adequately as an institute of higher learning as evidenced by its recent NCA reaccreditation, but is constrained by budget limitations.

Long-term Funding (FY 03-09).

This section outlines the long-term operational funding required by the institute from FY 03-09 as projected in the POM cycle requirements. It is based on AFIT's anticipated budget being \$80M with 3-4 percent annual increases for inflation. AFIT has identified the following deficiencies in funding from FY 03-09:

<u>FY</u>	<u>AMOUNT(\$000)</u>
03	11.6
04	19.9
05	13.8
06	14.1
07	14.9
08	15.4
09	15.5

Recommendation: Continue to work shortfalls in funding.

CHAPTER ELEVEN

Opportunities for Cooperation, Collaboration, and Joint Endeavors With Other Military and Civilian Scientific and Technical Educational Institutions for the Production of Qualified Personnel To Meet Department of Defense Scientific and Technical Requirements

AFIT research interests and faculty expertise cover a broad spectrum of technical areas to attack current problems and explore future systems for USAF and DoD organizations. Evidence of this focus is that 87 percent of all theses and dissertations were externally sponsored by AF, DoD, and associated government agencies. The other 13 percent were sponsored by allied armed services or concerned technology transfer ventures. AFIT has taken advantage of numerous joint and cooperative research efforts. In FYs 97-00, outside sponsorship and funding for research efforts have ranged from \$3.1M to nearly \$4.5M annually. DoD regulations limit AFIT's ability to charge DoD organizations. Accounting for these non-chargeable items, the cost of AFIT's research program at a comparable civilian university would have been from \$8M to \$9M a year. Over this time, funded research projects have exceeded 100 projects a year with over 160 master's theses and 8 doctoral dissertations produced each year.

AFIT's number one avenue for joint research is the Air Force Research Laboratory (AFRL) and the Air Force Office of Scientific Research (AFOSR), which is part of AFRL. Over the past few years, these two organizations have provided over 70 percent of the funding for joint research by AFIT as well as a number of projects. Since 1997, these two units have sponsored over \$10M in joint research. The combination of location at Wright-Patterson AFB and common research focus make AFRL and AFOSR ideal research partners.

In addition to AFRL and AFOSR, other AFMC units have sponsored over \$250,000 in research funding annually since FY 97. This research has been for the Aeronautical Systems Center, Air Force Flight Test Center, Space and Missile Systems Center, and miscellaneous operational units. Combining these figures with the previous paragraph, nearly 80 percent of joint research has been in cooperation with AFMC. To further future efforts, AFIT and AFMC are creating a joint advisory board to pursue opportunities.

AFIT has proactively searched for joint research opportunities throughout the AF. AFMC is not the only AF activity that AFIT has supported in research. From FYs 97-00, other AF agencies have contributed a yearly average in excess of \$500,000. Agencies supported include the Space Warfare Center, Air Mobility Warfare Center, AF Civil Engineer Support Agency, AF Studies and Analyses Agency, AF Technical Applications Center, AF weather units, and the AF Communication Agency.

In addition to opportunities with the AF, AFIT has supported other DoD units but not to the extent of the joint research provided to AF units as would be expected. Other DoD-sponsored research has averaged almost \$250,000 the last 4 years with typically 8 projects each year. Examples of units supported are the Defense Advanced Research Projects Agency, Defense Intelligence Agency, Defense Threat Reduction Agency, Office of the Secretary of Defense, and US Strategic Command.

AFIT has received over \$300,000 for joint research in the last 4 years from government agencies outside the DoD. Agencies supported include the Department of Energy and the National Security Agency. Opportunities outside of the DoD, but within the federal government have been limited since AFIT's research, by design, is primarily defense and aerospace-focused.

Within its operating constraints, AFIT aggressively seeks opportunities for cooperation, collaboration, and joint endeavors with other military and civilian scientific and technical educational institutions. However, until just recently opportunities outside of the government were considered limited. As an example, research sponsored from outside of the government was less than \$100,000 annually from FYs 97 through 99 but rose to \$336,772 in FY 00 of which DAGSI contributed \$255,291. With the creation of DAGSI and its cooperative agreements, AFIT anticipates over \$1M in FY01 for 31 projects with AFIT as the lead agency on 10 of the projects. As Chapter 9 of this report described, DAGSI is a prime example of AFIT's collaboration with other engineering schools in Ohio on both educational programs and research.

Building upon its success with DAGSI, AFIT is now working to develop similar articulation arrangements with educational institutions located throughout the country. The long-term objective is to develop stronger research and programmatic ties with institutions in other states in order to increase educational opportunities for Air Force officers and civilians in a variety of locations. Although an agreement is not yet in place, planning with the University of Tennessee Space Institute, adjacent to the US Air Force Arnold Engineering Development Center, is well underway. In addition, AFIT is partnering with 11 universities on joint endeavors. These institutes are Cal Tech, Johns Hopkins, Notre Dame, UC-Irvine, UC-Santa Barbara, U of Colorado, U of New Mexico, U of Rhode Island, VA Tech, and Youngstown State University.

These collaborative efforts, while in their infancy, are expected to grow further since AFIT and other federal institutions of higher education will now be allowed to compete for funding under the FY 02 and future DoD University Research Initiative (URI) programs. These programs include the Defense University Research Instrumentation Program (DURIP) and the Multidisciplinary University Research Initiative (MURI). This change in policy removes a substantial barrier to research activity at AFIT, and hopefully will establish a clear precedent for AFIT's eligibility to compete for other federal research funding.

One remaining difficulty is that AFIT is not presently authorized to receive grants, and therefore must negotiate other funding transfer mechanisms with sponsors. The Strom Thurmond National Defense Authorization Act for FY 99 amended Title 10 (Secs. 4358, 6977, and 9357) allows the United States Military Academy, United States Naval Academy, and United States Air Force Academy to receive grants. Similar legislation for AFIT would facilitate additional collaborative research activity especially if additional language is included to authorize AFIT to execute sole-source sub-contracts to partner universities for competitively awarded team projects (e.g., MURIs).

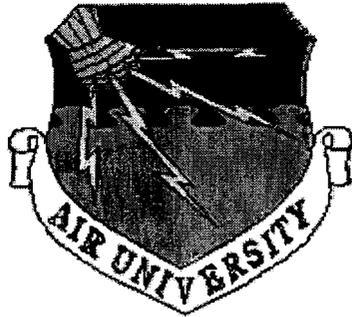
In short, AFIT has been heavily involved in cooperative research endeavors with other AF agencies and even with other DoD agencies but only recently have they been able to pursue opportunities outside of the federal government. The opportunities appear to be available but they must be developed. Only through a combination of joint research between agencies within the government and

in the private sector can the institute be expected to develop all of the qualified personnel who are needed to meet DoD scientific and technical requirements.

Recommendation: Work to resolve statutory restriction on receipt of grants.

Air Force Institute of Technology

**Graduate Education Program
Cost/Benefit Analysis**



**Prepared for:
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EXECUTIVE SUMMARY

At the request of the Air University commander, Booz·Allen & Hamilton assessed the costs and relative benefits of three select alternatives for providing a focused Graduate Education Program (GEP) for the United States Air Force (USAF). The size of the GEP for purposes of this study was assumed to be 230 M.S. degrees and 35 Ph.D. degrees awarded annually for Fiscal Years (FYs)99, 00 and 01 (AFIT/CC, 1998). The three alternatives studied are:

- A restructured Air Force Institute of Technology (AFIT).
- A multisource alternative.
- A single-source alternative.

The current in-residence AFIT faculty has been reduced by 30 professors over the past two years. Programmed reductions of 43 additional staff positions are planned by FY00. This restructured AFIT is represented in the first alternative. The multisource alternative would transfer production in the GEP to high-quality Civilian Institutions (CIs). Maintaining only a small oversight and administrative staff, AFIT would manage conduct of the GEP at CIs. The single-source alternative reflects an offer from the Miami Valley Economic Development Coalition to combine the resources of four Ohio universities to provide GEP to the Air Force.

Each alternative meets the following five objectives (Multiple Sources, 1998) of a GEP to some extent.

- Fill advanced degree quotas established by the Air Force Education Requirements Board (AFERB).
- Provide research and consulting services to the USAF and the Department of Defense (DOD) on unique technology focused subject matter.
- Focus and respond to the changing technological direction of the USAF and DOD.
- Promote a sense of USAF organizational culture and professionalism among graduates.
- Provide specified advanced education and training to foreign students.

A. Study Methodology

1. Costs. Costs for purposes of this study were gathered from the extensive cost analysis that has been completed on various alternatives to date. AFIT costs are provided from the AFIT Resources and Programs Director (AFIT/RP), a 1995 "Outsourcing Feasibility Study" conducted by the Air Force Management Effectiveness Agency, and internal AFIT cost studies. Costs for

the multisource alternative were obtained directly from the 13 institutions that AFIT faculty and senior leadership studied in mid-1997. Costs for the single-source alternative were provided in two unsolicited proposals submitted to AFIT/CC in 1997 and 1998 (Miami Valley Economic

Development Council, 1998). Traditional cost accounting methodologies use Net Present Value (NPV) as a standard. NPV considers the opportunity cost of performing the alternative. Costs in this study are represented in terms of NPV.

2. Benefits. In order to assess the relative benefit of the GEP, a series of benefits and subbenefits are derived from the five GEP objectives. Thus, accomplishing the GEP objectives will contribute some measurable benefit to the USAF. The analysis assigns relative weights to the objectives, benefits, and subbenefits by means of pairwise comparisons. Pairwise comparison means to weigh each against the other, in pairs. A decisionmaking analysis tool is used to score each alternative on the extent to which the alternative satisfies the benefit or subbenefit, then aggregates those scores to arrive at a composite benefit score for each alternative.

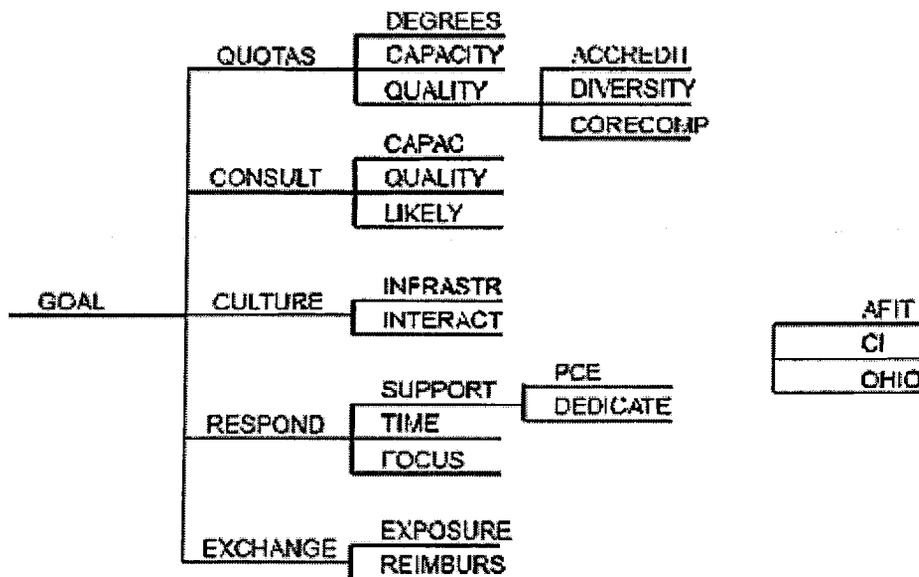


Figure 1.—Benefits Tree

3. Cost/Benefit Ratio. Combining costs and benefits determines the true value of each alternative. The cost/benefit ratio represents the dollar cost (in NPV terms) per unit of benefit. Thus, a lower cost/benefit ratio is preferred. Figure 2 shows cost/benefit ratios.

Alternative	Costs (NPV) (\$K)	Benefits	Cost/Benefit Ratio	Ranking
Restructured AFIT	74,606	639	116.7	1
Multisource	55,006	111	495.5	3
Single-source	38,019	250	152.1	2

Figure 2.—Cost, Benefits, and Cost/Benefit Ratios

The restructured AFIT alternative is the most cost-effective. It provides the most benefit for the money, while the multisource alternative is the least cost-effective.

B. Risk Assessment/Sensitivity Analysis

The study explored four excursions from the baseline assessment. They assessed the impact on costs and benefits if major assumptions in the baseline analysis were inaccurate. The four excursions were based on the following scenarios:

- USAF advanced academic degree quotas are increased by one-third.
- Lower tier schools are selected for the multisource alternative.
- Requirements for research and consulting are deleted from the USAF GEP objectives.
- Restructured AFIT costs are increased to equate its cost-effectiveness to that of the next most cost-effective alternative (the single-source alternative).

These excursions revealed interesting insight as to the strength of continuing with a restructured AFIT over the multisource or single-source alternatives. For instance, increasing the number of degrees produced at AFIT annually still does not make either of the other alternatives more cost-effective. Similarly, reducing the costs of the multisource alternative by trading quality for cost still would not make that alternative more cost-effective.

The third excursion shows that if we eliminate research and consulting for the USAF and DOD at AFIT—thus making the AFIT “product” essentially advanced degrees only—AFIT is only slightly less cost-effective than the single-source alternative.

Finally, in the fourth excursion, raising AFIT costs to make its cost/benefit ratio the same as the next closest alternative (multisource alternative), the study reveals that AFIT costs would have to rise by over \$22M, a 30% increase.

C. Conclusions and Recommendations

This study defines a set of benefits to the USAF and DOD by investing in AFIT. They attempt to describe the contributions to USAF’s mission in unique areas. Those areas are the unique technologies and the focus on the direction of future technologies that will or likely will impact the future of warfare as conducted by the USAF. Assigning numerical values to the measurable aspects of these benefits and objectives allows us to develop a cost/benefit ratio for each of the three alternatives requested in the study.

The restructured AFIT alternative is clearly the highest cost alternative, yet it yields an even higher relative benefit value. It costs 36% more than the next most expensive alternative, yet it provides 156% more benefit than any other alternative. The primary contributor to AFIT’s extreme benefit is its ability to focus on unique technologies that are key to the evolution of the

USAF’s warfighting capability. In analyzing the benefits of a program such as the GEP, the multisource or single-source alternatives cannot provide the unique benefits to the extent that a restructured AFIT can.

The USAF should maintain the restructured AFIT as the institution to satisfy its GEP objectives. Of the alternatives evaluated, a restructured AFIT provides the most cost-effective solution. The USAF should continue to restructure AFIT as defined in this alternative to meet the objectives of a USAF graduate education program.

SECTION I REQUIREMENT

A. Introduction

USAF's mission is to defend the United States through control and exploitation of air and space. In order to perform this mission, the Air Force organizes, trains, and equips its forces to conduct assigned military missions. Not every military mission can or should be performed by one Service. However, the USAF is particularly suited to provide certain services to military commanders around the world. The USAF develops, trains, sustains, and integrates the elements of aerospace power to produce core competencies (Booz-Allen & Hamilton, 1998): air and space superiority, global attack, rapid global mobility, precision engagement, information superiority, and agile combat support.

AFIT's mission is to support the Air Force and national defense through responsive graduate and Professional Continuing Education (PCE), research, and consultation (AU Catalog, AFIT, March 1997). The specific requirement for the GEP includes graduate-level programs with degree-granting accreditation, consultation services, and research on topics of particular interest to the USAF and DOD. This analysis focuses on the graduate degree-granting education, research, and consultation requirements currently satisfied by AFIT residence and CI programs.

AFIT contributes to the development of the Air Force core competencies by leading the direction of critical technologies for the future. These unique core focus areas—air vehicles, special weapons, information warfare, environmental management, meteorology, logistics and acquisition, and sensing—form the central thrust areas of its curriculum and research efforts. AFIT's course offerings are designed to ensure that the graduates and the research contributions of the institute provide sufficient resources for application and consultation on unique technologies that contribute directly to the Air Force's seven core competencies, and to the exploitation of air and space power.

B. Graduate Programs

Air Force personnel carry out the core competencies of the Service. Similarly, AFIT has identified primary education areas it considers its core competencies. These competencies can be identified as “an education and research thrust which supports both current and future Air Force/DOD research and educational requirements” (AFIT/EN, 1998). Graduate curriculums are derived by identifying the academic programs and research necessary for producing the education core competencies.

Figure 3 illustrates AFIT's education core competencies and the degree programs designed to support them. Each AFIT degree program supports at least one education core requirement.

USAF Core Competencies	Acquisition Logistics Management	Logistics Management	Supply Management	Transportation Management	Air Mobility Operations	Contracting Management	Cost Analysis	Systems Management	Software Systems Management	Information Resource/Systems Management	Aerodynamics and Propulsion	Aerospace Systems Engineering	Applied Physics/Optics	Communications/Signal Processing	Computer Systems	Dynamics, Guidance, and Control	Electronics/EE/CE	Electro-Optics	Engineering Management	Environmental Engineering	EM/ Low Observables	Mathematics	Mechanics	Nuclear Engineering	Operations Science	Space Environment	Structures and Materials
Acquisition Management																											
Aerospace Materials																											
Autonomous Weapons Systems																											
Directed Energy Weapons																											
Environmental & Engineering Management																											
Information Warfare																											
Information Resources Management																											
Logistics Management																											
Military Technology																											
Modeling, Simulation & Analysis																											
Nuclear Weapons Engineering																											
Remote Sensing/Target Recognition & Tracking																											
Space Operations																											
Sensor Technology/Electronic Warfare																											
Sustainable Guidance/Control/Navigation																											
Weapon System Life Cycle Design																											
Project Management																											
Defense Contract Management																											
Defense Financial Management																											
Transportation/Mobility																											
Fuel/Log Management																											
Life Cycle Logistics Support																											
Information Management																											

Figure 3.—USAF Technology Focus Areas and Required Graduate Programs To Sustain Those Focus Areas (Source: Air Force Graduate Education Core Competency Needs briefing, AFIT/EN, 1998)

The specific requirement for the number of graduates to fill designated Advanced Academic Degree (AAD) is defined by the Air Force Education Requirements Board (AFERB) and illustrated by the following quotas. (Note: While the academic degree requirement to fill some of these quotas can be provided by a CI, the following quotas are earmarked for graduates from the in-residence AFIT program.)

FY98 Quotas	Masters of Science	Duration (mos)	Ph.D.	Duration (mos)
Program				

Computer Systems	15	18		
Computer Systems/EDP Systems	1	18		
Data Processing	4	18		
Computer Systems/Software Engr.	11	18		
Business Mgmt./Accounting	1	18		
Numerical Methods in EDP		18	1	36
Operations Research/Command & Control	1	18		
Ops Research	23	18	2	36
Space Ops	3	18		
Operational Analysis	12	18	1	36
Engineering and Environmental Mgmt.	18	18		
Contracting Mgmt.	7	15		
Acquisition Logistics Mgmt.	1	15		
Supply Mgmt.	3	15		
Logistics Mgmt.	10	15		
Cost Analysis	9	15		
Software Systems Mgmt.	1	18		
Transportation Mgmt/Air Mobility	12	12		
Transportation Mgmt.	7	15		
Info Resources Mgmt.	11	18		
Aeronautical Engr./Aerodynamics	1	18	2	36
Aeronautical Engr./Stability & Control	2	18		
Aeronautical Engr. Structures	2	18	2	36
Aeronautical Engineering	6	18	2	36
Astronautical Engineering	4	18		
Matl Science & Engr/Structural Materials	2	18		
Matl Science & Engr/Elec & Opt Mtls.	2	18		
Matl Science & Engr/General	1	18	2	36
Electrical Engr/waves	2	18		
Electrical Engr/Electrical circuits & devices	1	18		
Software Engr.	1	18		
Electrical Engr./Digital	1	18		
Electrical Engr./Info Systems/Comm	1	18		
Electrical Engr./Info Systems/Sat Comm	1	18		
Electrical Engr./Communications/RADA	6	18		
Electrical Engr./Guidance & Nav Ctl Syst.	1	18		
Electrical Engr./Guidance & Control	2	18		
Electrical Engr./Electro-Optics	5	18		
Electrical Engr./Observables reduction	5	18		
Electrical Engineering	12	18	2	36
Mechanical Engineering	2	18		
Nuclear Engr./nuclear rad effects		18	1	36
Nuclear Engineering	1	18		
Systems Engr/Ops Research	2	18		
Computer Engr/AI	1	18		
Computer Engineering	2	18		
Meteor/Atmospheric Dynamics	2	18		
Meteor/Special areas	3	18		
Meteor/Analysis & Forecasting	2	18		
Meteor/Radiative Transfer	1	18		
Meteor (physical Met)	2	18		
Meteorology/Interact grap	3	18		
Meteorology	5	18		
Physics/nuclear physics	1	18		
Physics/Optic lasers		18	1	36
Physics/optics	1	18		
Physics	1	18		
Total quota/average duration	237	17.58	16	36

Figure 4.—Quotas for In-Residence AAD billets, FY98 (Source: AFIT/RPB)

C. Research and Consultation Services

The unique application of technology to defense creates an entire field of research and information requirements. As illustrated in figure 4, the list of highly specialized technological areas of study and research, and their applications to the business of defense is a long one.

An Air Force GEP must provide research and consultation services on a broad range of unique USAF and DOD topics of interest. While the amount of research and consultation provided by the GEP is not defined as a requirement, it is generally agreed that the GEP should provide USAF and DOD agencies ready access to high-quality research and consulting on unique topics. Research support is typically provided by students and faculty under USAF or DOD sponsorship. At AFIT, this research generally supports a master's thesis or doctoral dissertation.

D. Study Focus

This study evaluates the relative cost-effectiveness of three alternatives for providing the objectives of a USAF GEP for the requirements of FY99, 00, and 01. It will use as its basis for study, an evaluation of five overall objectives for the GEP.

E. Objectives of the Graduate Education Program

To satisfy the requirements outlined in section I, the GEP must meet certain objectives. The main objectives are to fill the advanced academic degree quotas identified by the AFERB, and to provide focused intellectual capital in the form of consultation and research services to USAF and DOD agencies. Additional objectives include:

1. • Focusing and responding to the changing technological direction of the USAF and DOD.
2. • Promoting a sense of USAF organizational culture and professionalism.
3. • Providing specified advanced education and training to foreign students as required.

SECTION II

ANALYTICAL FRAMEWORK, GROUND RULES, AND ASSUMPTIONS

The structure of this analysis closely adheres to that recommended by the USAF and DOD. The following guidance has helped establish a framework for this analysis.

4. • Department of Defense Instruction (DODI) 7041.3, Economic Analysis for Decisionmaking.
5. • Air Force Instruction (AFI) 65-501, Economic Analysis.
6. • Air Force Manual 65-506, Economic Analysis.

This framework allows for comparing costs and benefits for competing organizational alternatives to satisfy the GEP objectives. Every effort has been made to objectively identify reasonable organizational alternatives, estimate their costs, and value their benefits. The analysis is designed to obtain agreement as to the scope of the objective, the definition of alternatives, and the rationale for defining and valuing benefits. These are the three areas where the most subjectivity is typically found. Costs are relatively objective, and have been captured here through data collection and analysis from several earlier studies.

A. Study Period

The period over which costs and benefits will be evaluated is five years (FY97–01). This period includes costs for providing 230 M.S. graduates and 35 Ph.D. graduates to meet FY99, 00, and 01 quotas (AFIT/CC, 1998), and to support research and consulting demands.

B. References

Raw cost data will be provided from three previous studies:

7. • AFIT Horizons Briefing (December 1994).
8. • AFIT Graduate Education Restructuring Study (September 1995).
9. • AFMEA Study (July 1995).
- 10.

C. Sources of Identification and Valuation

Sources for the identification and valuation of benefits include literature (periodicals, point papers) and interviews with USAF and DOD personnel.

D. Degree Quotas

Quotas for in-residence and CI slots, and the degreed programs in which students are required to be placed, are identified by the AFERB and the registrar's office at AFIT (AFIT/RR, 1998). To provide a common student load to be evaluated for each alternative, this study assumes that 230 M.S. degrees and 35 doctorates will be awarded each year for FYs 99, 00, and 01 (AFIT/CC, 1998).

For purposes of this analysis, graduating the requisite number of students to satisfy the indicated AAD quotas will be considered a key element of "meeting the objective of the graduate program."

E. Degree Requirements

The unique expertise necessary to sustain advancement in specific areas of military applications of technology for the Air Force generates requirements for M.S. and Ph.D. degrees. Courses that satisfy those requirements are described in the AFIT briefing "Air Force Graduate Education Core Competency Needs," AFIT/EN, 1998, and the AFIT Catalog, September 1996.

F. Benefits of Each Alternative

We will provide quantitative assessments of the benefits of alternatives to the maximum extent possible. The assessments are made using an analytical hierarchy process that compares the benefits' importance to the GEP objectives. Then, the extent to which each alternative provides that benefit is determined. These assessments determine the importance of the benefit and the effectiveness of the alternative in meeting the benefit. Thus, a quantified measure of benefits is derived.

G. Deliverables

For purposes of this analysis, the product of research is defined as a document, or "deliverable." This is distinguished from consulting services, which are defined as "hours of focused time." The value of research can be quantified in dollars using feedback from AFIT thesis sponsors and the data gathered from civilian institutions. Methodologies employed in the "AFIT Research, Cost and Benefit" factbook (October 1997) will be used to identify the hours and cost required to duplicate the in-residence thesis and dissertation research at a typical CI. The value of consulting services is assumed to be identical across alternatives; costs differ, however.

The research and consulting services valuation assumes that civilian institutions have the inclination and capacity to perform the research for the USAF or DOD. A separate qualitative benefit assesses the likelihood of this assumption.

As AFIT is currently structured, consultation services are provided as inherent parts of AFIT's mission at no additional charge (Cost and Value, Tab C, p. 23). No additional manpower

is required for the research or consulting services that AFIT provides. The average number of hours of consulting services provided by the AFIT/LA faculty for FYs 96 and 97 was 2,638 hours per year (source: AFIT/LA). The EN school provided 3,580 hours of consulting service in FY97. For comparative purposes, the costs and benefits of providing 6,218 hours will be examined for each alternative in this study.

Programmed downsizing through FY00 will not impact AFIT's ability to satisfy objectives related to research and consulting services (6,218 hours of consulting annually, support of 230 theses and 35 dissertations for FYs 99, 00, and 01). For purposes of this study, a restructured AFIT would maintain that capability to support research and consulting services.

H. Current Year Discount Rates

Current-year discount rates and base-year 1997 inflation indices are obtained from SAF/FMC (February 1998).

SECTION III ALTERNATIVES

Three alternatives will be compared for this study. All provide a program that meets each of the GEP objectives to some degree.

A. Alternative 1—A Restructured AFIT

AFIT recognizes that it cannot continue to operate “business as usual” in the face of increasing budget cuts and overall DOD downsizing. This alternative recognizes the programmed downsizing of 31 staff members (30 faculty, 1 admin) since FY96, and the phasing out of 43 additional staff by FY00. School enrollment and subsequent faculty and administrative staff size are based on projected graduate degree quotas, which are in turn based on academic specialties required to produce education core competencies. Restructure includes the merging of the School of Logistics and Acquisition Management (LA) and the School of Engineering (EN) by the beginning of FY00, which results in one consolidated graduate school. This restructure decreases personnel only (i.e., no change in equipment, facility, or overhead allocation rate costs).

When calculating costs for this alternative, we included only those costs that would be eliminated should AFIT/LA and EN be closed (the marginal costs for running an in-residence program). They are faculty and administrative staff, facilities, utilities, and equipment, as well as allocated overhead elements such as support directorates’ personnel, equipment, and facilities. Sponsored research grants will not be saved by closing AFIT; they will simply be redirected (probably to CIs).

Note: Since thesis and dissertation support is such a key element of the in-residence AFIT experience, we consider the costs for providing such support and define them as being “in addition to” those for simply providing classroom instruction. Since costs for faculty salaries are included in the PE84752 line, only costs for student salaries are added costs for research. Those costs as well as costs for travel, materials, and equipment are considered to be constant across all alternatives. Approximately one-third of a faculty member’s time is consumed with thesis and dissertation research. AFIT faculty and student salaries pay for all labor costs associated with this research. Therefore, no additional explicit costs for research are included in the restructured AFIT alternative.

B. Alternative 2—Obtain Degreed Graduates and Research and Consulting Services from Civilian Institutions (CIs) (The Multisource Alternative)

Continue operating the CI directorate at AFIT. Unique courses tailored to the USAF requirements may be provided if they do not already exist. Eliminate the AFIT/LA and EN schools (faculty, facilities, equipment, allocated overhead). Receive all research and consulting

services from a CI. Augment the CI directorate at AFIT with six personnel responsible for proper student placement and degree focus, and coordination of the research and consulting

efforts with the appropriate agencies. Institutions evaluated as candidates for this alternative rank among the top in the U.S.

Members of the AFIT faculty visited a number of universities in mid-1997 to assess the institutions' ability to provide the curriculums required to satisfy graduate education core requirements. A total of 14 were determined as able to furnish sufficient courses and programs of the quality required to satisfy the USAF GEP requirements. Several universities were determined to be able to provide the engineering curriculums. They were: Naval Postgraduate School, Massachusetts Institute of Technology (MIT), Syracuse University, Carnegie-Mellon University, George Washington University, University of Maryland, George Mason University, Georgia Institute of Technology, University of Florida, Oklahoma State University, Texas A&M University, University of Texas at Austin, University of New Mexico, and Stanford University. Only one institution, the Naval Postgraduate Institute, was determined to have sufficient capability to provide the logistics and acquisition management curriculums.

C. Alternative 3—Obtain Degreed Graduates and Research and Consulting Services from Those Institutions Offered in the Ohio Proposal (The Single-Source Alternative)

Replace AFIT instructors with faculty from an Ohio state schools consortium (Miami Valley Economic Development Council, 1998). Retain the AFIT/LA and EN schools (in terms of curriculums). Courses would be conducted at one or more sites off base. A six-member USAF administrative/liason staff would be located at AFIT (Wright-Patterson Air Force Base (WPAFB)) to provide guidance and focus the curriculums and research and consulting efforts to ensure that USAF requirements are satisfied. The USAF will provide a \$7M research grant annually. Consulting services will be acquired on a fee for service basis. Students will be expected to use USAF labs to conduct research. Student and faculty travel between a central campus and the campuses of the four participating universities (Ohio State University, University of Dayton, University of Cincinnati, and Wright State University) would be minimized.

SECTION IV COSTS

A. Tuition Rates

Tuition rates at CIs, for the purpose of this study, are projected to increase at the rate of 7.1% annually (National Center for Education Statistics, 1998). Annual tuition rates for the single-source alternative, although not explicitly stated in that proposal, are assumed to increase at the USAF Operations and Maintenance (O&M) composite inflation index provided by SAF/FMC.

B. Cost Calculation

This section includes costs for satisfying three years' worth of USAF GEP graduate requirements (FY99–01). Figure 5 shows where cost elements associated with each degree program and research and consulting are incurred. For example, the FY99 Ph.D. graduates create costs for each alternative over FY97, 98 and 99. Thus GEP program costs for the period of this study are incurred over five years, FY97–01.

	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
FY99 Requirement					
Degree Program					
M.S.		x	x		
Ph.D.	x	x	x		
Research and Consulting			x		
FY00 Requirement					
Degree Program					
M.S.			x	x	
Ph.D.		x	x	x	
Research and Consulting				x	
FY01 Requirement					
Degree Program					
M.S.				x	x
Ph.D.			x	x	x
Research and Consulting					x

Figure 5.—Cost Elements and Fiscal Year Phasing

Annual research and consulting services costs for the three years (FYs 99–01) are included in those fiscal years.

C. Cost Summary

Total costs are summarized in figure 6 below. Costs represent those incurred to satisfy the FY99–01 requirements for satisfying quotas and providing research and consulting services. Costs are represented in terms of Net Present Values (NPV). NPV considers the opportunity costs of performing the alternative. In this case, the no-risk alternative to paying these costs is to invest them in treasury bills (thus, the discount factor applied to cost streams is based on the interest rates for Treasury notes with five-year maturities as contained in Appendix C of OMB Circular A-94).

<u>Alternative</u>	<u>BY97 (\$ thousands)</u>					<u>TOTAL</u>	<u>NPV</u>
	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>		
Restructured AFIT	\$1,929	\$16,420	\$31,180	\$23,375	\$9,777	\$82,681	\$74,606
Multisource	\$1,063	\$5,437	\$20,218	\$19,899	\$15,304	\$61,921	\$55,006
Single-Source	\$891	\$5,394	\$15,676	\$15,357	\$10,761	\$48,080	\$42,832

Figure 6.—Cost Summary

D. Cost Elements

This section defines costs for the three alternatives. Detail on the costs can be found in Appendix A—Detailed Costs. As described in section III, a good deal of analysis has been performed on the costs of AFIT. This study uses these cost analyses as modified by AFIT/RP.

1. Alternative 1—Restructured AFIT

Figure 7 summarizes the costs of this alternative.

<u>AFIT Costs (\$K)</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>	<u>TOTAL</u>
PE84752 (TY\$)	\$1,561	\$13,592	\$24,106	\$17,787	\$6,156	\$63,201
Assigned BOS costs (TY\$)	\$158	\$1,479	\$2,544	\$2,159	\$761	\$7,100
A-76 Inflators (TY\$)	\$290	\$2,524	\$4,477	\$3,303	\$1,143	\$11,737
SUBTOTAL (TY\$)	\$2,008	\$17,595	\$31,126	\$23,249	\$8,060	\$82,038
SUBTOTAL (BY97\$)	\$2,008	\$17,124	\$29,591	\$21,604	\$7,323	\$77,650
FMS Offset	\$79	\$704	\$1,211	\$1,028	\$346	\$3,368
RESEARCH	\$0	\$0	\$2,800	\$2,800	\$2,800	\$8,400
TOTALS (BY97\$)	\$1,929	\$16,420	\$31,180	\$23,375	\$9,777	\$82,681
NPV	\$1,894	\$15,527	\$28,405	\$20,514	\$8,266	\$74,606

Figure 7.—Restructured AFIT Alternative Costs

a. PE84752 Costs. These costs pay military and civilian faculty salaries, and cover administrative operations to support AFIT in residence. Costs were determined through an activity-based costing exercise performed by AFIT/RP (AFIT/RP, 2 April 1998).

b. Assigned Base Operating Support (BOS) Costs. These costs pay utilities, maintenance, and other common support efforts such as police, fire, security, and services. BOS costs are documented in “AFIT Outsource Feasibility Assessment,” AFMEA, July 1995, and provided by AFIT/RP, 2 April 1998.

c. A-76 Inflaters. These costs are typically included in cost competition analyses and are intended to present a more “activity-based” cost. The A-76 factors used to arrive at costs are documented in “AFIT Outsource Feasibility Assessment,” AFMEA, July 1995, and provided by AFIT/RP, 2 April 1998.

d. FMS Offset. These costs are provided by foreign governments as “tuition” for their students. Costs are provided by AFIT/RP, and act as an offset (negative cost) of the alternative.

e. Research.

- Costs represent those for equipment, travel, and other direct activity associated with AFIT research. The figure of \$2.8M represents direct costs associated with research and is included across all alternatives.
- Labor in the form of student salaries is equal across all alternatives, so it is not included in this study. Labor in the form of faculty salaries is included in the PE84752 costs documented above. These costs were reimbursed from other USAF and DOD sponsoring agencies to support master’s thesis and dissertation efforts in FY97, and are assumed to remain constant across the three years of this analysis.
- The typical “level of effort” of research per thesis is six months; the effort for each dissertation is two years (AFIT, 1998). For ease of analysis and comparability, research costs for three years are assumed to represent the requirement for FY99–01.

2. Alternative 2—Multisource Alternative

Figure 8 summarizes the costs of this alternative.

Multisource Alternative Costs (\$K)	FY97	FY98	FY99	FY00	FY01	TOTAL
USAF Support Staff	\$510	\$510	\$510	\$510	\$510	\$2,549
Tuition	\$514	\$4,594	\$7,180	\$6,900	\$2,599	\$21,787
Academic Ops Cost	\$39	\$333	\$500	\$461	\$167	\$1,499
RESEARCH	\$0	\$0	\$11,500	\$11,500	\$11,500	\$34,500
CONSULTING	\$0	\$0	\$529	\$529	\$529	\$1,586
TOTALS (BY97\$)	\$1,063	\$5,437	\$20,218	\$19,899	\$15,304	\$61,921
NPV	\$1,043	\$5,141	\$18,419	\$17,463	\$12,939	\$55,006

Figure 8.—Multisource Alternative Costs

a. Increased USAF staff support. Dispersing the student population and course load to CIs creates an oversight and administrative support requirement. Increased curriculum oversight to ensure focus on the unique requirements of the USAF will be mandatory. Administrative support to students will be required as well. The USAF will provide two officers and four civil service employees who will be assigned to HQ/AFIT at WPAFB. Costs include direct costs for salaries and benefits, and indirect allocated BOS costs.

b. Tuition. Tuition costs were obtained from the target institutions visited in mid-1997 (AFIT/CC, 1998). Based on these assessments, an average student year of tuition costs \$15,313 (BY98\$). The FY99 requirement for 230 18-month M.S. degrees and 35 three-year doctorates results in costs spread across five fiscal years. For ease of analysis, M.S. students are assumed to begin their program 18 months prior to the final day of the fiscal year of the requirement. For example, students satisfying the FY99 requirement begin their program in mid-FY98. Ph.D. students are assumed to begin their program three years prior to graduation.

c. Academic Operations. Academic operations include administrative support such as faculty textbooks, supplies, leases and licenses, and other incidentals. These costs amount to \$1,100 annually (AFIT/RP).

d. Research. Research costs were provided by the institutions during the mid-97 visits. Costs are assumed to include the \$2.8M annual requirement for equipment, travel, and other direct costs described in the restructured AFIT alternative.

e. Consulting. The total number of hours of consulting services provided by AFIT last year was 6,218. While this support was “funded” with faculty salaries, consulting services in the other two alternatives are costs above and beyond those for tuition. Costs assume an average of \$85/hour.

3. Alternative 3—Single-Source Alternative

Figure 9 summarizes the costs of this alternative. Note that these cost elements are identical to those for the multisource alternative.

Single-Source Alternative Costs (\$K)	FY97	FY98	FY99	FY00	FY01	TOTAL
USAF Support Staff	\$468	\$468	\$468	\$468	\$468	\$2,338
Tuition	\$385	\$3,439	\$5,375	\$5,164	\$1,945	\$16,308
Academic Ops Cost	\$39	\$333	\$500	\$461	\$167	\$1,499
RESEARCH	\$0	\$0	\$7,000	\$7,000	\$7,000	\$21,000
CONSULTING	\$0	\$0	\$529	\$529	\$529	\$1,586
TOTALS (BY97\$)	\$891	\$4,239	\$13,870	\$13,621	\$10,108	\$42,730
NPV	\$875	\$4,009	\$12,636	\$11,954	\$8,546	\$38,019

Figure 9.—Single-Source Alternative Costs

a. Increased USAF staff support. The requirement for management and administrative support is considered to be the same as the multisource alternative. That support is two officers and four civil service employees. This analysis assumes that these personnel are provided offices at the new school facility at no additional cost to the USAF. Costs for the support staff include direct costs for salaries and benefits.

b. Tuition. Tuition costs were obtained from an unsolicited proposal provided to AFIT/CC in early 1998. That proposal includes annual tuition costs per student of \$11,000 (BY98\$). The FY99 requirement for 230 18-month M.S. degrees and 35 three-year doctorates results in costs spread across five fiscal years. For ease of analysis, M.S. students are assumed to begin their program 18 months prior to the final day of the fiscal year of the requirement. (Note

that the average duration for an AFIT MS program is 17.58 months). For example, students satisfying the FY99 requirement begin their program in mid-FY98. Ph.D. students are assumed to begin their program three years prior to graduation.

c. Academic Operations. Academic operations include administrative support such as faculty textbooks, supplies, leases and licenses, and other incidentals. These costs amount to \$1,100 annually (AFIT/RP).

d. Research. Research costs were provided by the institutions during the mid-97 visits. Costs are assumed to include the \$2.8M annual requirement for equipment, travel, and Other Direct Costs (ODCs) described in the restructured AFIT alternative.

e. Consulting. The total number of hours of consulting services provided by AFIT last year was 6,218. While this support was “funded” with faculty salaries, consulting services in the other two alternatives are costs above and beyond those for tuition. Using an industry average of \$85/hour, annual consulting costs are estimated as a separate element of cost for this alternative.

SECTION V BENEFITS

Benefits represent the value that is derived from the alternative. While they can be qualitative or quantitative in nature, each benefit listed here is measured using a relative weighting scheme.

This section is divided into two parts. The first defines the benefit—what is being measured and how it is being measured. The second part illustrates the ratings (the extent to which each alternative satisfies each benefit) as well as their justification.

Figure 10 illustrates the benefits that are assessed in this analysis by means of a hierarchical tree. Note that the very basic node of the tree, the “goal,” is defined in section I as: to provide an Air Force GEP meeting specific USAF technology requirements.

Under this goal are five objectives. Each is defined in section II.

- Objective 1: The primary objective of the GEP is to fill the quotas identified by AFERB.
- Objective 2: Provide focused intellectual capital in the form of consulting and research services to USAF and DOD agencies.
- Objective 3: Focus and respond to the changing technological direction of the USAF and DOD.
- Objective 4: Promote a sense of USAF organizational culture and professionalism among graduates of the GEP.
- Objective 5: Provide specified advanced education and training to foreign students as required.

Under each objective are several benefits that are designed to measure the extent to which the objective is attained. Those benefits may in turn be broken down into still more benefits (referred to here as subbenefits). Finally, once the lowest level of benefit or subbenefit is identified, each of the three alternatives is weighed against to the other two in a series of pairwise comparisons to determine the extent to which the alternative provides the benefit.

For example, the extent to which alternatives satisfy the quotas specified by AFERB (Objective 1) is measured by the benefits indicated by DEGREES, CAPACITY, and QUALITY. In a similar manner, the extent to which alternatives satisfy the “Quality of Education” (QUALITY) benefit is measured by the subbenefits ACCREDIT, DIVERSITY, and CORECOMP. The subbenefit ACCREDIT, speaks to the number of years the institution is

accredited. That is, the number of years for which the institutions are accredited is a measure of the quality of an educational institution, which is in turn a measure of the extent to which that institution can be expected to satisfy AFERB quotas for graduates.

A. Benefit Scores

The relative importance and value ratings described in the following sections yield the following benefit scores for each alternative:

- Restructured AFIT: 639
- Multisource Alternative: 111
- Single-Source Alternative: 250

Benefit values are relative; that is, they only have meaning in relation to each other. In this analysis, the restructured AFIT alternative was found to be more than twice as beneficial as the single-source alternative (639 to 250) and almost six times more beneficial than the multisource alternative. Detailed weightings and values are described in appendix B.

B. Definition of Benefits

Figure 10 illustrates a “benefits tree” that includes benefits and subbenefits derived from the five basic objectives. A total of 16 benefits and subbenefits are illustrated here and defined below.

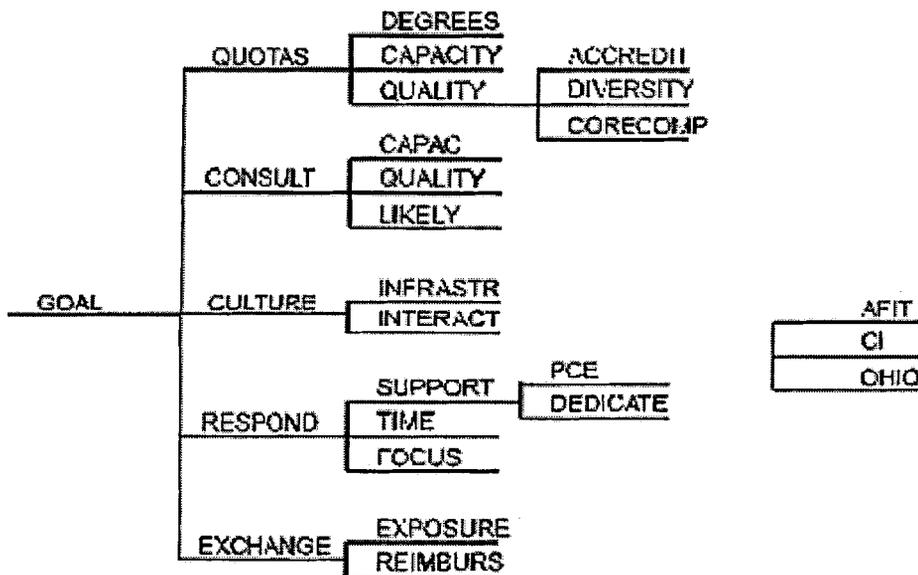


Figure 10.—Benefits Tree

This section defines the benefits against which the three alternatives will be compared. As described above, benefits are grouped under the objectives they support. The abbreviations for the objectives, benefits, and subbenefits are included in parentheses in the following paragraphs.

1. Objective 1—Fill the quotas identified by AFERB (QUOTAS). This is the primary objective of the USAF in-residence graduate education program. Quotas are filled with graduates in the disciplines dictated by annual releases from AFERB and AFIT/RP.

- **Benefit 1A—Specific technology focused degrees and courses offered (DEGREES).** This benefit measures the extent to which each alternative offers the full range of graduate programs and courses required to meet USAF quotas.
- **Benefit 1B—Capacity to fill all quotas (CAPACITY).** This benefit measures the extent to which each alternative offers adequate capacity (student slots) in the appropriate degree programs to meet USAF quotas.
- **Benefit 1C—Quality of academic education (QUALITY).** This benefit measures the quality of the education received by students. It is further broken down to three subbenefits, which are more measurable.
 - **Subbenefit 1C1—Duration for which master’s degree is accredited (ACCREDIT).** This benefit measures the period of time for which the master’s degree program is accredited. A long duration is considered to be indicative of a solid and established institution with a quality master’s program.
 - **Subbenefit 1C2—Diversity of student population and academic professors (DIVERSITY).** This benefit measures the likelihood that the alternative offers a diverse student and faculty population. A diverse faculty would hold degrees from several different universities; a diverse student population would come from different cultural and socioeconomic backgrounds. Diversity is considered a good feature. It brings fresh ideas and approaches into the learning environment.
 - **Subbenefit 1C3—Portion of student population and academic faculty focusing on USAF and DOD core competencies as a primary pursuit (CORECOMP).** This benefit measures the extent to which USAF and DOD technology focus areas are shared by the alternative’s institution(s). It considers the primary areas of academic and research study of the majority of students and faculty, and measures those against USAF technology focus requirements. A high score indicates consistency with pursuits that interest the USAF and DOD.

2. Objective 2—Provide consultation and research services to USAF and DOD agencies (CONSULT). The USAF GEP should be recognized as the source of focused research and consulting services for unique USAF and DOD interests. Benefits associated with this

objective measure the ease, interest, and focus with which the USAF and DOD interests are served by the alternative.

- **Benefit 2A—Capacity of alternative to provide focused research and consultation services (CAPAC).** This benefit measures the alternative’s ability to provide the amount of research and consulting demanded by USAF and DOD customers. It considers availability of key research and consulting personnel, and access to labs and equipment.
- **Benefit 2B—Likelihood of alternative to provide focused research and consultation services (LIKELY).** This benefit measures the likelihood that the institution will be willing and able to provide the research and consulting demanded in a timely manner. Benefits are measured in relative terms. It considers the relative importance of USAF/DOD research to the university’s overall research and consulting focus. This benefit acknowledges that universities focus on different areas of research for different reasons.
- **Benefit 2C – Quality of focused research for USAF/DOD (QUALITY).** This benefit measures the extent to which the research performed satisfies the USAF or DOD customer. Quality is measured by the past performance of the institution with respect to research, and is largely a function of past accomplishments of the faculty, the college entrance scores of the students, and the supporting research facilities (labs, etc.) close to the school.

3. Objective 3—Focus and respond to the changing technological direction of the USAF and DOD (RESPOND).

- **Benefit 3A—Support of existing USAF/DOD technology requirements (SUPPORT).** The following subbenefits measure the extent to which each alternative provides the courses and programs that in turn furnish the skills and expertise to satisfy key areas of focus/for the USAF/DOD.
 - **Subbenefit 3A1—Portion of instructors contributing to AFIT continuing education (PCE).** This benefit measures the portion of the faculty contributing to course content, or actually teaching, for the USAF Professional Continuing Education (PCE) Program. An exchange of ideas and experience between the PCE and graduate education programs is beneficial for both programs.
 - **Subbenefit 3A2 – Number of faculty exclusively dedicated to USAF GEP (DEDICATE).** This benefit measures the number of faculty members assigned exclusively as instructors in the USAF GEP. Faculty exclusively assigned tend to take a more focused approach to teaching, with the ability and desire to interject practical, real-world applications.

- **Benefit 3B—Time required to establish courses providing focused curriculums to satisfy USAF and DOD requirements (TIME).** This benefit measures the extent to which the institutions represented in the alternative can respond to rapidly evolving requirements by establishing new courses for USAF students. A high score here represents flexibility in the ability to create new, focused courses quickly to meet demands. Because no “industry average” is available, benefits are measured in relative terms.
- **Benefit 3C—Ability to quickly determine USAF and DOD areas of focus (FOCUS).** This benefit measures the ability of the school to recognize emerging technological and management developments and their specific relevance to USAF and DOD core competencies. It also determines the extent to which those schools react with senior USAF and DOD leadership to quickly interpret those emerging relevant developments.

4. Objective 4—Promote a sense of USAF organizational culture and professionalism among GEP students (CULTURE).

- **Benefit 4A—Amount of time spent interacting with USAF and DOD superiors, subordinates, and peers (INTERACT).** This benefit measures the amount of time students spend interacting with other USAF and DOD personnel. It includes social as well as professional interaction.
- **Benefit 4B—USAF and DOD infrastructure support provided to students (INFRASTR).** This benefit measures the amount of administrative, supervisory, and career progression support provided to students. It is considered key to providing an environment that fosters organizational identity and professional focus.

5. Objective 5—Provide Specified Advanced Education and Training to Foreign Students as Required (EXCHANGE).

- **Benefit 5A—Foreign students’ exposure to USAF and DOD culture (EXPOSURE).** A major focus of this objective is to expose foreign students to the practices, attitudes, and underlying organizational culture of the U.S. military. This benefit measures the extent to which foreign students are provided that exposure.
- **Benefit 5B—Monetary Reimbursement (REIMBURS).** This benefit measures the likelihood of any financial reimbursement provided to the U.S. for permitting foreign officers and government workers to attend the USAF GEP. Note that the reimbursement must be made to the U.S. Government and not to an educational institution.

This section describes the weights and values placed on the benefits defined in the previous section. Each of the five objectives is valued with respect to its contribution to achieving the overall goal of the USAF residence graduate education requirement. Then, for each of the five objectives, some benefits are defined; each benefit is valued with respect to its importance in measuring the objective. Finally, there is, in some cases, a set of subbenefits. These subbenefits are measured with respect to their importance in measuring the benefit. Under the lowest level of benefit or subbenefit, each of the three alternatives (restructured AFIT, multisource, and single-source) is scored to determine the extent to which that alternative satisfies the benefit or subbenefit.

Figure 11 illustrates the hierarchy of the overall goal, the five objectives to attain it, and the benefits under those objectives. The decimal values in the boxes are the relative ratings of the objectives, contribution toward meeting the GEP goal. Note that the total contribution of the five objectives equals 100%.

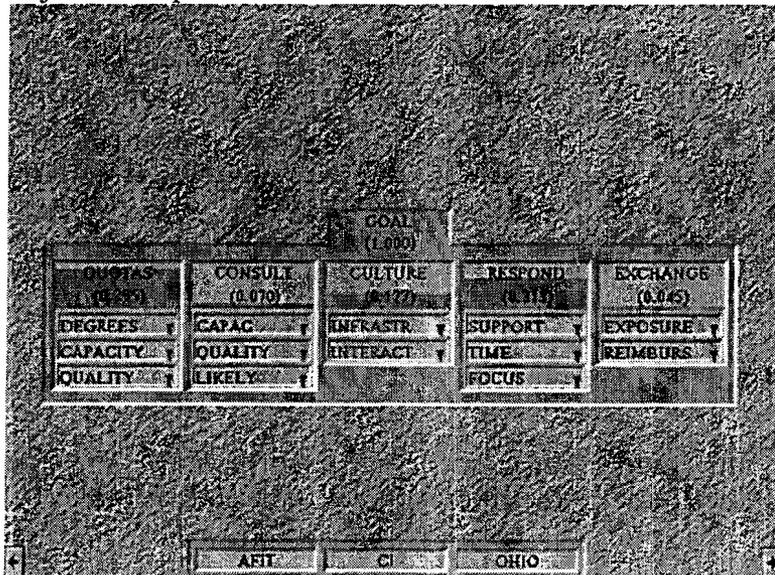


Figure 11.—Goals, Objectives, and Benefits

It is important to note that these “relative importance” values are derived from pairwise comparisons between alternatives for each of the benefits described in the previous section. *Detail of all pairwise comparisons is included in appendix B.* Figure 2 in appendix B illustrates the pairwise comparisons that result in the percentages listed in figure 11.

1. Objective 1—Fill the quotas identified by AFERB. The three measurable benefits that support this objective include:

- Specific technology focused degrees and courses offered.

- Capacity to fill all quotas.
- Quality of academic education.

The ability of the institution to furnish specific courses that lead toward a specific USAF technology-focused degree contributes a lopsided 65.5% of importance. The quality of the education provided at the institution contributes 25%, while the capacity of the institution (ability to handle USAF-specified student loads) is not as important, contributing 9.5%.

- **Benefit 1A—Specific technology focused degrees and courses offered (DEGREES).** The restructured AFIT alternative offers all degrees and courses required of the USAF graduate education program. It satisfies the specified benefit moderately more than the single-source alternative; and much more than the multisource alternative. The following ratings result from the pairwise comparisons documented in appendix B. **Relative benefit scores: AFIT (69.6%); Ohio (Single-Source) (22.9%); CI (Multisource) (7.5%).**
- **Benefit 1B – Capacity to fill all quotas (CAPACITY).** The three alternatives provide this benefit equally well. That is, each alternative provides an institution that is large enough to provide the requisite number of graduates to satisfy quotas. Note that only faculty and classroom size are measured. The following ratings result from the pairwise comparisons documented in appendix B. **Relative benefit scores: AFIT (33.3%); Ohio (33.3%); CI (33.3%).**
- **Benefit 1C – Quality of academic education (QUALITY).** This benefit measures the quality of the education received by students. It is further broken down to three subbenefits, which are more measurable.

The relative importance of the following three subbenefits describes the overall benefit of “Quality of Education.”

- Duration for which master’s degree is accredited.
- Diversity of student population and academic faculty.
- Portion of student population and academic faculty focusing on USAF and DOD technology focus as a primary pursuit.

The portion of the student and faculty body working on or supporting a degree in an area related to a specific USAF technology focus is considered a much stronger contributor to satisfying this benefit than the other two subbenefits. It contributed 69.1% of total importance, while the other two subbenefits are about equally important (16% and 14.9%).

- **Subbenefit 1C1—Duration for which master’s degree is accredited (ACCREDIT).** Both the restructured AFIT and multisource alternatives would

be conducted at institutions with superior academic accreditation credentials. AFIT is currently accredited for a maximum duration. The institutions in the CI alternative are all top-rate universities presumed to have the maximum accreditation duration. The single-source alternative has not applied for accreditation. It is reasonable to presume that it would receive accreditation, but possibly for less than the maximum duration. It is also reasonable to expect student reluctance in enrolling at an unaccredited institution. The following ratings result from the pairwise comparisons documented in appendix B.

Relative subbenefit scores: AFIT (45.5%); Ohio (9.1%); CI (45.5%).

- **Subbenefit 1C2 – Diversity of student population and academic professors (DIVERSITY).** The multisource alternative would clearly offer the most diversity with regard to student body and faculty. Both the restructured AFIT and single-source alternatives would offer the same level of diversity. While the current AFIT faculty is somewhat diverse in that very few instructors have received doctorates from the same universities, the students clearly have common backgrounds and goals. The single-source alternative and AFIT are likely to seek faculty from the same sources. Students may be exposed to a more diverse population if they travel to other Ohio campuses for instruction or research and consulting work. The following ratings result from the pairwise comparisons documented in appendix B.

Relative subbenefit scores: AFIT (11.7%); Ohio (20%); CI (68.3%).

- **Subbenefit 1C3 – Portion of student population and academic faculty focusing on USAF and DOD core competencies as a primary pursuit (CORECOMP).** The restructured AFIT alternative would provide students and faculty more dedicated to pursuing degrees and research in areas directly related to USAF technology focus requirements. In a similar manner, those in the single-source alternative would be focused on USAF technology focuses, but a guarantee of \$7M of research funding each year without specific USAF and DOD sponsors, coupled with a presumably inherent lack of long-term commitment to research and curriculum development in the USAF and DOD's underlying core competencies would tend to lower this alternative's score. Multiple degree programs in the multisource alternative preclude extensive USAF/DOD focus. The following ratings result from the pairwise comparisons documented in appendix B.

Relative subbenefit scores: AFIT (50%); Ohio (41.5%); CI (8.6%).

2. Objective 2—Provide consultation and research services to USAF and DOD agencies. Three measurable benefits that support this objective include:

- Capacity of alternative to provide focused research and consultation services.
- Likelihood of alternative to provide focused research and consultation services.

- Quality of focused research for USAF/DOD.

The likelihood of the institution (represented in the alternative) to provide focused research and consulting contributes 53.7% of total importance to the objective. The quality of that research represents 36.4%. The capacity of the institution to provide the appropriate research and consulting accounts for 9.9%.

- **Benefit 2A—Capacity of alternative to provide focused research and consultation services (CAPAC).** The multisource alternative would allow a virtually unlimited capacity, constrained only by cost (which is not assessed here). A large university has many ways to provide research and consulting services for a fee, and could be expected to obtain the required talent to provide services better than the other alternatives. The Restructured AFIT alternative allows for shared resources among AFIT, the USAF and DOD labs, and the USAF product centers to provide focused research and consulting; capacity is very great. The single-source alternative would have similar capacity to the restructured AFIT, but may be constrained by a lack of familiarity with the USAF and DOD infrastructure from which this surge capacity could be required. The following ratings result from the pairwise comparisons documented in appendix B.
Relative benefit scores: AFIT (29.3%); Ohio (22.3%); CI (48.4%).
- **Benefit 2B—Likelihood of alternative to provide focused research and consultation services (LIKELY).** Since AFIT exists to enhance the USAF and DOD's core competencies, the restructured AFIT alternative best satisfies this benefit. Both the multisource and single-source alternatives involve universities whose primary focus is research, but research in areas of interest and import to that particular institution. It is unlikely that either would be able to provide the focused consulting demanded of AFIT faculty. The single-source alternative, with an annual USAF research grant of \$7M, is more likely to focus in the areas of the USAF's core competencies than the CI alternative. Universities in the CI alternative are more likely to focus on research for which they can obtain notoriety, larger research grants, and individual professor tenure and distinction. The following ratings result from the pairwise comparisons documented in appendix B.
Relative benefit scores: AFIT (64.9%); Ohio (27.9%); CI (7.2%).
- **Benefit 2C—Quality of focused research for USAF/DOD (QUALITY).** It is reasonable to presume that research and consulting at a top university would be high quality. It is likely to be performed by distinguished faculty and/or very academically gifted students. In a similar manner, AFIT research and consulting projects have been very well received, as stated by the numerous letters of appreciation received over the years (AFIT, 1998). AFIT's facilities and proximity to Wright Labs and the Aeronautical Systems Center (ASC) provide it unique opportunities to repeatedly satisfy research and consulting customers. This study did not pursue evidence of

focused research and consulting by schools in the single-source alternatives. However, such research is unlikely to be as focused as that in the other two alternatives. The following ratings result from the pairwise comparisons documented in appendix B.

Relative benefit scores: AFIT (38.7%); Ohio (10%); CI (51.4%).

3. Objective 3—Focus and respond to the changing technological direction of the USAF and DOD. Three measurable benefits that support this objective include:

- Support of existing USAF/DOD technology focused requirements.
- Time required to establish courses providing focused curriculums to satisfy USAF and DOD core competency quotas.
- Ability to quickly determine USAF and DOD areas of focus.

The benefit measuring the extent to which an alternative's curriculums and research is targeted towards USAF core competencies is clearly the most important, providing 59.8% of total importance. The amount of time required to develop a new course or program contributes 22.4% of importance. The ability of an institution to recognize relevant emerging technological and management developments contributes 17.7%.

- **Benefit 3A—Support of existing USAF/DOD technology focus requirements (SUPPORT).** This benefit measures the extent to which each alternative provides the courses and programs that in turn furnish the skills and expertise to satisfy key technology requirements.

Two subbenefits provide a measurable indication of an alternative's relative contribution to the overall SUPPORT benefit:

- Portion of instructors contributing to AFIT continuing education.
- Number of faculty exclusively dedicated to USAF GEP.

The number of faculty exclusively dedicated to the USAF graduate education program is the most important contributor to satisfying this benefit. It receives 60.5% of total importance. The portion of faculty contributing to continuing education contributes 39.4%.

- **Subbenefit 3A1 – Portion of instructors contributing to AFIT continuing education (PCE).** This benefit measures the portion of the faculty contributing to course content, or actually teaching, for the USAF PCE Program. At least 25% of AFIT/LA faculty currently contribute to the continuing education program via direct instruction or curriculum development. The portion is smaller out of the AFIT/EN school, primarily because it does not offer as many continuing

education courses. However, this figure represents considerably more instructors than would be contributing in either of the other two alternatives (single or multisource). Continuing education courses are very focused on unique USAF requirements; there would be no reason why CI instructors would want to contribute to such programs. It is more likely, however, that an instructor at the single-source institution would have the right experience and inclination to be a valuable contributor to a continuing education program than a CI instructor. The following ratings result from the pairwise comparisons documented in appendix B.

Relative subbenefit scores: AFIT (74.2%); Ohio (18.3%); CI (7.5%).

- **Subbenefit 3A2—Number of faculty exclusively dedicated to USAF GEP (DEDICATE).** This benefit measures the number of faculty members assigned exclusively as instructors in the USAF GEP. All faculty in the AFIT alternative contribute to the GEP; after all, it's the reason for AFIT's existence. Conversely, a relatively small percentage of faculty in the other two alternatives would be solely dedicated to the USAF GEP. The multisource alternative would be the lower of the two. Faculty in the single-source alternative would be exclusively dedicated to the USAF GEP during the two- or three-year period that they would be assigned to the program; however, the USAF GEP is not likely to be viewed as a career for these instructors. The following ratings result from the pairwise comparisons documented in appendix B.

Relative subbenefit scores: AFIT (69.6%); Ohio (22.9%); CI (7.5%).

- **Benefit 3B—Time required to establish courses providing focused curriculums to satisfy USAF and DOD core competency quotas.** This benefit measures the extent to which the institutions represented in the alternative can respond to rapidly evolving requirements by establishing new courses for USAF students. AFIT can cite several examples of rapid development of new courses and programs. The masters in air mobility degree program was in place six months after being requested from Headquarters, Air Mobility Command (HQ AMC). Five months elapsed from the time that Wright Laboratory's Materials Directorate identified a requirement for a program in materials science and engineering. While neither the multisource or single-source alternative can be expected to respond quickly, it is likely that the single-source alternative would be more responsive. The following ratings result from the pairwise comparisons documented in appendix B.

Relative benefit scores: AFIT (69.9%); Ohio (23.7%); CI (6.4%).

- **Benefit 3C – Ability to quickly determine USAF and DOD areas of focus.** The benefit measures the ability of the school to recognize emerging technological and management developments and their specific relevance to USAF and DOD requirements. While close collaboration between AFIT faculty and USAF senior leadership has always been common, that relationship will take some time to develop in the other two alternatives. It is more likely to develop in a more focused program

like the single-source alternative where significant portions of the faculty will probably have either taught at AFIT previously or be retired USAF officers. The following ratings result from the pairwise comparisons documented in appendix B.

Relative benefit scores: AFIT (66.1%); Ohio (27.2%); CI (6.7%).

4. Objective 4—Promote a sense of USAF organizational culture and professionalism.

Two measurable benefits that support this objective include:

- Amount of time spent interacting with USAF and DOD superiors, subordinates, and peers.
- USAF and DOD infrastructure support provided to students.

Each benefit is considered of equal importance in contributing to the overall objective of promoting a sense of organizational culture and professionalism.

- **Benefit 4A—Amount of time spent interacting with USAF and DOD superiors, subordinates, and peers (INTERACT).** This benefit measures the amount of time students spend interacting with other USAF and DOD personnel. At AFIT, students continually interact with officers from the USAF, Army, Navy, and foreign countries. Research is primarily conducted at USAF facilities and organizations. Frequent interaction with the “field” to assess the latest emphasis is common. This common interaction cannot be expected in the single-source or multisource alternative. The single-source alternative does insist on students performing research at USAF labs, thus promoting this interaction. The following ratings result from the pairwise comparisons documented in appendix B.

Relative benefit scores: AFIT (64.9%); Ohio (27.9%); CI (7.2%).

- **Benefit 4B—USAF and DOD infrastructure support provided to students (INFRASTR).** This benefit measures the amount of administrative, supervisory, and career progression support provided to students. Once again, the restructured AFIT alternative best provides this benefit because of its organic nature; administrative staff are collocated with students at the school, and USAF faculty are made up of officers who generally have their own experiences and insight into the USAF system. Students have many sources from which to gather information and support. The single-source alternative is likely to provide good support as well, because six USAF officers will be collocated with students to provide “liaison” between the school and the USAF. The multisource alternative is not likely to support unique USAF infrastructure requirements. The following ratings result from the pairwise comparisons documented in appendix B.

Relative benefit scores: AFIT (64.9%); Ohio (27.9%); CI (7.2%).

5. Objective 5—Educate some number of foreign exchange students every year.

Two measurable benefits that support this objective include:

- Foreign students’ exposure to USAF and DOD culture.

- Monetary reimbursement.

The relative importance of these two benefits in contributing to satisfaction of the objective.

- **Benefit 5A—Foreign students' exposure to USAF and DOD culture (EXPOSURE).** This benefit measures the extent to which foreign students are exposed to the practices, attitudes, and underlying organizational culture of the U.S. military. The restructured AFIT alternative provides an environment in which the majority of students and faculty are military—and its campus is on an Air Force installation. This is clearly the preferred alternative for experiencing U.S. military culture. The single-source alternative would include a student body made up primarily of USAF officers. Faculty in this alternative are likely to be retired USAF, or have some experience dealing in the USAF or DOD culture. USAF presence in the multisource alternative would be very small—a foreign student is much less likely to be exposed to USAF or DOD culture under this alternative. The following ratings result from the pairwise comparisons documented in appendix B.
Relative benefit scores: AFIT (73.1%); Ohio (18.8%); CI (8.1%).
- **Benefit 5B—Monetary Reimbursement (REIMBURSE).** This benefit measures the likelihood that any financial reimbursement will be provided to the U.S. for permitting foreign officers and government workers to attend the USAF GEP. In FY97, foreign governments reimbursed the USAF approximately \$987,000 (AFIT/RP, 1998), which equates to about \$22,000 per student. Reimbursements are on an annual basis through the Foreign Military Sales (FMS) programs. An average annual tuition for a student in the single-source alternative would be \$11,000 (see Section IV Costs). The average multisource cost per student year is \$15,313 (AFIT, 1998). Of these tuitions, none goes toward the value added to the GEP from having the USAF administrative presence or populating the programs with primarily USAF officers. The reimbursement to the U.S. Government under the AFIT alternative can be thought of as defraying the *fixed* cost of running AFIT—*marginal* costs to admit foreign students are nominal. The following ratings result from the pairwise comparisons documented in appendix B.
Relative benefit scores: AFIT (100%); Ohio (0%); CI (0%).

SECTION VI

RISK ASSESSMENT/SENSITIVITY ANALYSIS

Sensitivity analysis illustrates how changes in assumptions, and the subsequent impact on the values and ratings of the costs and benefits, change the results of the analysis. Baseline assumptions result in costs, benefits, and cost-effectiveness figures (cost/benefit ratio) for each of the three alternatives.

Excursions from the baseline assumptions in this study were made to determine their impact on the results. These excursions are only a few of the hundreds that could have been evaluated, but they are the most likely to be of interest to reviewers of this analysis.

A. Excursion A—Increase the Student Quotas by One-Third for FY99–01

If quotas are increased, both costs and benefit scores will be impacted. Assuming that the restructured AFIT alternative would be required to increase staff by about one-sixth (half of the quota increase) to accommodate the extra 88 students annually, costs for the PE84752 increase. In the other two alternatives, tuitions increase proportionately. In addition, costs for research increase proportionately for all three alternatives. (This assumption has a particularly large impact for the multisource alternative, which already has a large cost for research). Presuming that CIs are more able to accommodate surges in student population, the relative benefits to the multisource and single-source alternatives are greater than for the restructured AFIT alternative.

Adjusting costs and benefits for the assumptions for this excursion does not yield any change in the ranking of alternatives. The restructured AFIT alternative is still clearly the most cost-effective alternative. Resulting cost-benefit ratios are:

- Restructured AFIT: 139
- Multisource Alternative: 587
- Single-Source Alternative: 198

B. Excursion B—Evaluate the Multisource Alternative Assuming Second- and Third-Tier Schools.

If the USAF was willing to settle for universities outside the top 25, it could save on tuition costs. However, the quality of education would suffer. Benefits provided by the multisource alternative would be impacted such that the quality of both education and consulting services would decline to a level commensurate with the single-source alternative's. The restructured AFIT alternative would become more attractive from a benefits perspective. Since second-tier universities were not approached with requests for cost estimates, the tuition and

Adjusting costs and benefits for the assumptions for this excursion does not yield any change in the ranking of alternatives. The restructured AFIT alternative is still clearly the most cost-effective. Resulting cost-benefit ratios are:

- Restructured AFIT: 115
- Multisource Alternative: 500
- Single-Source Alternative: 150

C. Excursion C—Delete Requirements for Research and Consulting From the USAF GEP Objectives

If the costs and benefits of consulting and research are eliminated from the analysis, the single-source alternative becomes slightly more cost-effective than the restructured AFIT alternative. That's because of the huge cost savings the USAF would realize if it does not have to fund \$7M of research annually. In addition, research and consulting contribute a relatively small amount of value to the overall USAF GEP requirement. Eliminating that contribution has a much greater impact on lowering costs than it does on lowering benefits. The multisource alternative also becomes more competitive. Resulting cost-benefit ratios are:

- Restructured AFIT: 87
- Multisource Alternative: 233
- Single-Source Alternative: 71

Note: This excursion assumes that universities represented in the single- and multisource alternatives would still be willing to provide a USAF GEP. This is highly unlikely, based upon inputs from the Miami Valley Economic Development Coalition (single-source alternative). Furthermore, by eliminating costs and benefits of research, it is implied that AFIT's thesis and doctoral dissertation requirements would be eliminated—also not very likely.

D. Excursion D—Increase Restructured AFIT Costs To Equate Its Cost-Effectiveness to That of the Next Most Cost-Effective Alternative (The Single-Source Alternative)

In order for the single-source alternative to become as cost-effective as the restructured AFIT alternative, cost-benefit ratios must be equal. In order for this to occur, the NPV of costs for the restructured AFIT alternative would have to increase by \$22,986,000 to \$97,191,000, a 30% increase; or costs for the single-source alternative would have to decrease by \$8,844,000 to \$29,175,000, a 223% decrease.

Benefit scores could also increase or decrease by similar percentages to equate cost-benefit ratios.

SECTION VII CONCLUSIONS AND RECOMMENDATIONS

This study defines a set of benefits to the USAF and DOD by investing in AFIT. They attempt to describe the contributions to USAF's mission in unique areas. Those areas are the unique technologies and the focus on the direction of future technologies that will or likely will impact the future of warfare as conducted by the USAF. Assigning numerical values to the measurable aspects of these benefits and objectives allows us to develop a cost/benefit ratio for each of the three alternatives requested in the study.

The restructured AFIT alternative is clearly the highest cost alternative, yet it yields an even higher relative benefit value. It costs 36% more than the next most expensive alternative, yet it provides 156% more benefit than any other alternative. The primary contributor to AFIT's extreme benefit is its ability to focus on unique technologies that are key to the evolution of the USAF's warfighting capability. In analyzing the benefits of a program such as the GEP, the multisource or single-source alternatives cannot provide the unique benefits to the extent that a restructured AFIT can.

The USAF should maintain the restructured AFIT as the institution to satisfy its GEP objectives. Of the alternatives evaluated, a restructured AFIT provides the most cost-effective solution. The USAF should continue to restructure AFIT as defined in this alternative to meet the objectives of a USAF graduate education program.

APPENDIX A—COST WORKSHEETS

APPENDIX A—COST WORKSHEETS

The following worksheets detail the derivation of the costs for the restructured AFIT, multisource, and single-source alternatives. In general, the sources of these costs are:

- Restructured AFIT Alternative—AFMEA Study, July 1995, and AFIT/RP Activity-Based cost analyses.
- Multisource Alternative—Major universities visited in mid-1997.
- Single-Source Alternative—Unsolicited proposal and subsequent response to follow-up questions from AFIT/CC, April 1998.

APPENDIX B—PAIRWISE COMPARISON OF ALTERNATIVES

APPENDIX C—WORKS CITED

WORKS CITED

AFIT (1998), *Level of Effort for Research*, unpublished document, Wright-Patterson AFB, OH.

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