

73rd MORSS CD Cover Page

UNCLASSIFIED DISCLOSURE FORM CD Presentation

712CD

For office use only 41205

21-23 June 2005, at US Military Academy, West Point, NY

Please complete this form 712CD as your cover page to your electronic briefing submission to the MORSS CD. Do not fax to the MORS office.

Author Request (To be completed by applicant) - The following author(s) request authority to disclose the following presentation in the MORSS Final Report, for inclusion on the MORSS CD and/or posting on the MORS web site.

Name of Principal Author and all other author(s): **Andrew D. Jastrzembski**
Raymond W. Staats

Principal Author's Organization and address:

AFIT/ENS
2950 Hobson Way
Wright-Patterson AFB OH 45433

Phone: **DSN 785-3636 x4518**

Fax: **DSN 986-4943**

Email: **andrew.jastrzembski@maxwell.af.mil**
raymond.staats@afit.edu

Original title on 712 A/B: **Inventory Management for Air Force Advanced Academic Degree Officers**

Revised title: **n/a**

Presented in (input and Bold one): (**WG 20**, CG____, Special Session ____, Poster, Demo, or Tutorial):

This presentation is believed to be:
UNCLASSIFIED AND APPROVED FOR PUBLIC RELEASE

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 23 JUN 2005		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Inventory Management for Air Force Advanced Academic Degree Officers				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 2950 Hobson WayWright-Patterson AFB OH 45433				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES See also ADM201946, Military Operations Research Society Symposium (73rd) Held in West Point, NY on 21-23 June 2005. , The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 36	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Inventory Management for Air Force Advanced Academic Degree Officers

**Andrew D. Jastrzembski
Raymond W. Staats**



AIR FORCE INSTITUTE OF TECHNOLOGY
Graduate School of Engineering and Management

23 June 2005



- Introduction
 - GEMS/AADS Background
 - Inventory Modeling Approach
- AADIM-E
 - Education Profiles
 - Quota Recommendations
 - AADIM-E Insights
- AADIM-U
 - Assignment Problem
 - Qualification Matrix
 - AADIM-U Insights
- Conclusions and Future Directions



- Graduate Education Management System (GEMS)
 - Guidance
 - DODD 1322.10, 26 Aug 04
 - Allows each service to manage their own graduate education programs
 - AFI 36-2302 , 11 Jul 01
 - Source document for GEMS
 - Specific unit positions are coded and revalidated at least biannually
 - “Bottom up
 - Projected vacancies are basis for graduate education quotas



- System is well designed to justify education requirements
 - “One billet, one body”
 - Incumbency rates are measurable
 - Service Commitment fulfillment rates are measurable
- System is poorly designed to develop officers
 - Officers move from AAD billet
 - Professional Development
 - Dynamic unit environment
 - AAD billets are not backfilled and commanders will delete AAD coded billets



- “Bottom-Up” approach is problematic
 - Specific billets are coded when actual requirement is for a level of expertise within a unit
 - Not consistent across units, wings, MAJCOMS
 - No grand strategy exists
- Despite design for accountability, GEMS/AADS does not adequately achieve or monitor goals
 - Historical billet incumbency rate: 50-60%
 - Tracking problems, e.g., no credit given for serving in related specialty billets
 - AAD officer payback—most don’t complete the 36-month requirement



Inventory Management

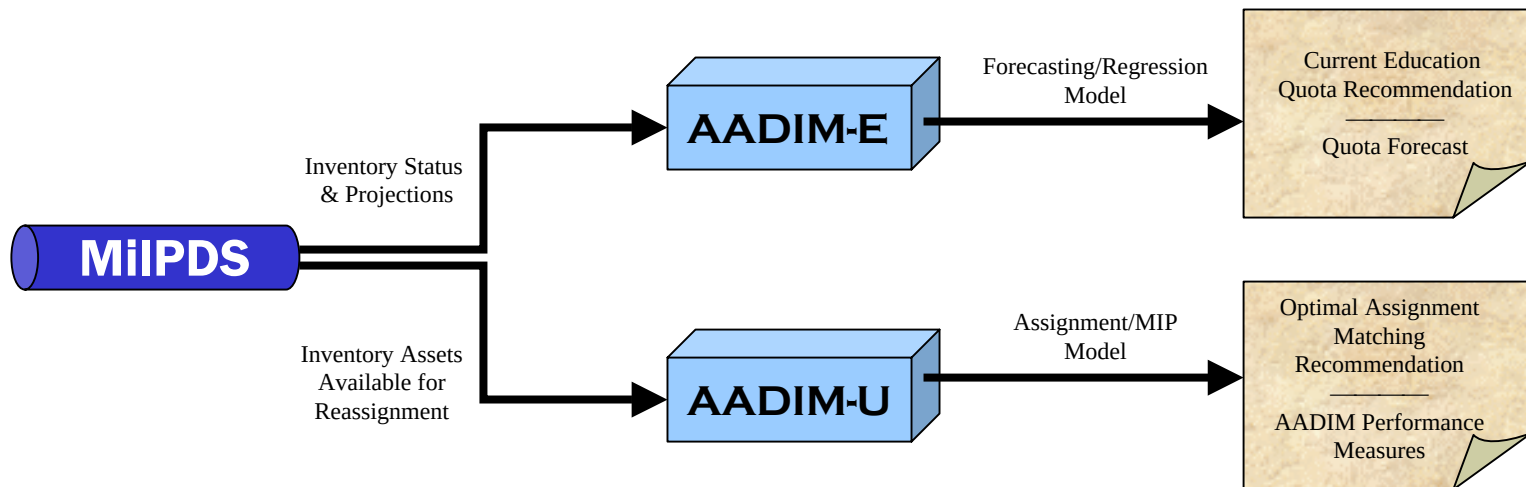
- Development Teams provide an opportunity to develop a grand strategy
 - “Health” of each career field
 - Centralized guidance from Career Field Managers (CFM)
 - Primary advocate for career field specific and officer development
 - Career field representatives from cross-section of the AF
 - Long-term planning approach
- Developmental Education Initiatives
 - Paradigm Change: Officers are educated to enhance overall development, not just to qualify for the next job
 - IDE: no billet system for assigning these AFIT graduates





Modeling Overview

- Model is partitioned into two sub-models
 - AADIM Entry (AADIM-E)
 - Requirements Definition (aggregate educational profiles)
 - Quota generation for new AAD inventory entries
 - AADIM Utilization (AADIM-U)
 - Assign AAD officers to maintain optimal unit profiles





AADIM-E: “Ideal” Educational Profiles

- Baseline for examination of the current and forecasted AAD inventories
- Two types of educational profiles
 - Career-field critical education
 - Officers obtaining these AADs are inventoried
 - Career-field enhancement education
 - Officers obtaining these AADs are not inventoried





AADIM-E: “Ideal” Educational Profiles

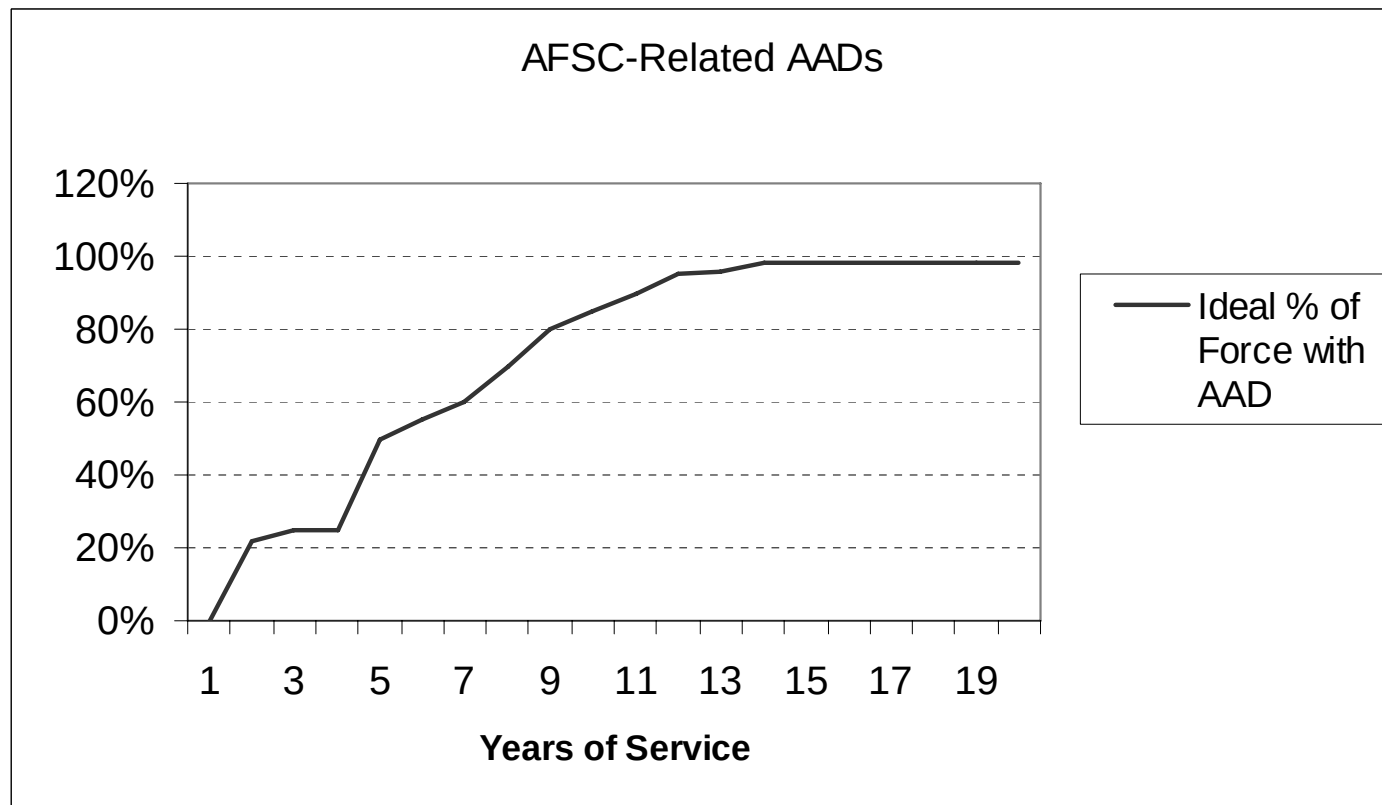
- Two Approaches
 - Senior Rater: “At least x% of my 13S officers should have an advanced degree in a discipline that satisfies an appropriate subset of educational competencies.”
 - CFM: “An educationally healthy 13S career field should have y% of its officers with an advanced degree that satisfies an appropriate subset of educational competencies.”
- Complimentary approaches yield aggregate profile for each career field
 - Former approach reflects unit requirements, e.g., an ops wing has different needs than a MAJCOM staff
 - Latter approach reflects aggregate time-phased (by CYOS) career field needs





AADIM-E: “Ideal” Educational Profiles

- Example “Idealized Career Field Profile”
 - Each career field is unique, but will have similar functional form



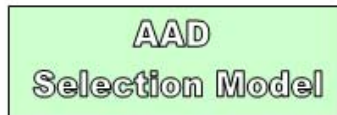


AADIM-E: “Ideal” Educational Profiles

- Assignment sequence of ops/staff tours through CGO years
 - Each time officers are available for assignment a fixed percentage is sent to graduate school
 - Preliminary model assumes a constant “selection rule”
 - Different rules can be utilized for each assignment timing
- Two-directional model
 - “Assignment Rule” yields Notional Profile
 - Desired Notional Profile yields “Assignment Rule”
- Inventory Factor (IF): Percentage of officers holding a career field related AAD for a given CYOS
- Aggregate Idealized Educational Profile ($\overline{IF}$)

$$\overline{IF} = \frac{\sum_{i=1}^n IF (CYOS = i)}{n}$$





CYOS = 3

$x = 12\%$

$$xy(1-x)$$

X

12.0%

Enter AAD Inventory
at YQS=2

52 Enter AAD Inve

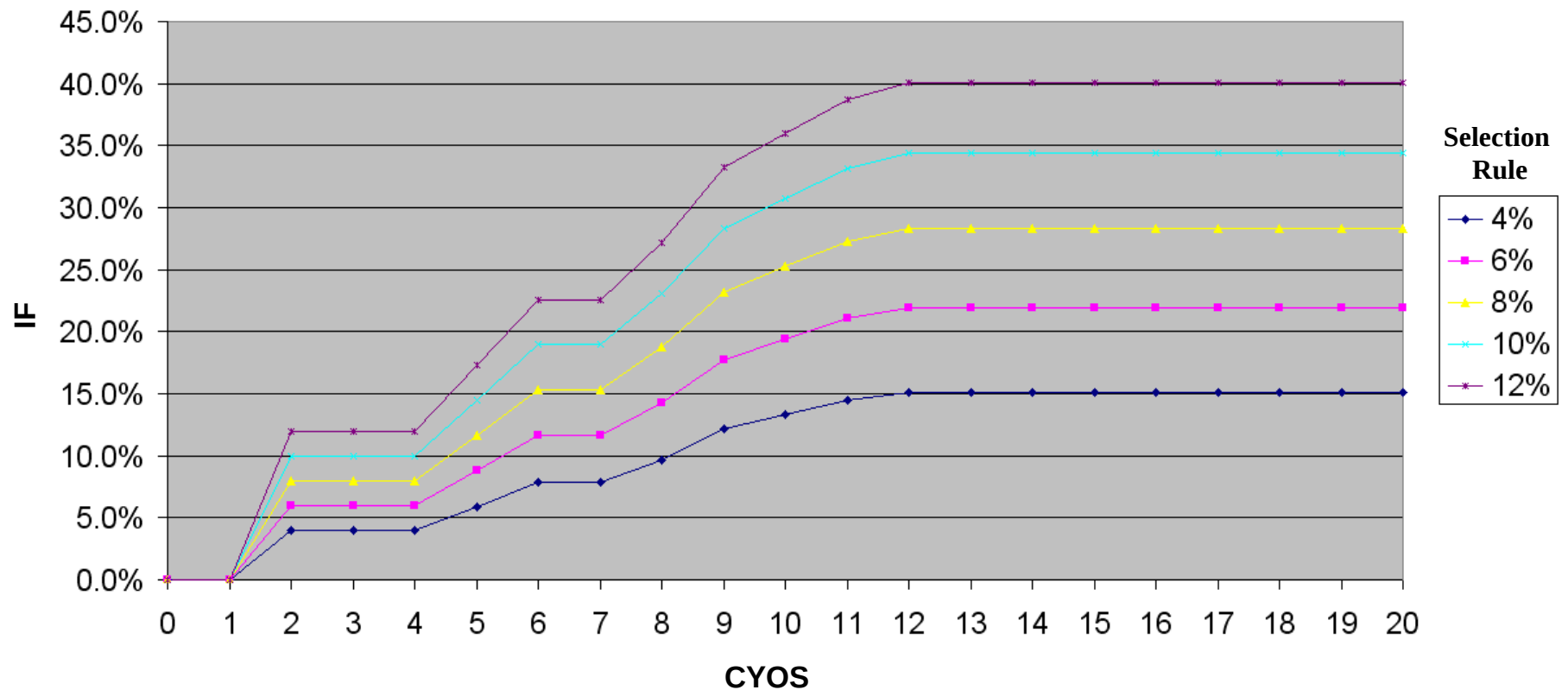
Enter AAD Inventory
at YQS=6

13



AADIM-E: “Ideal” Educational Profiles

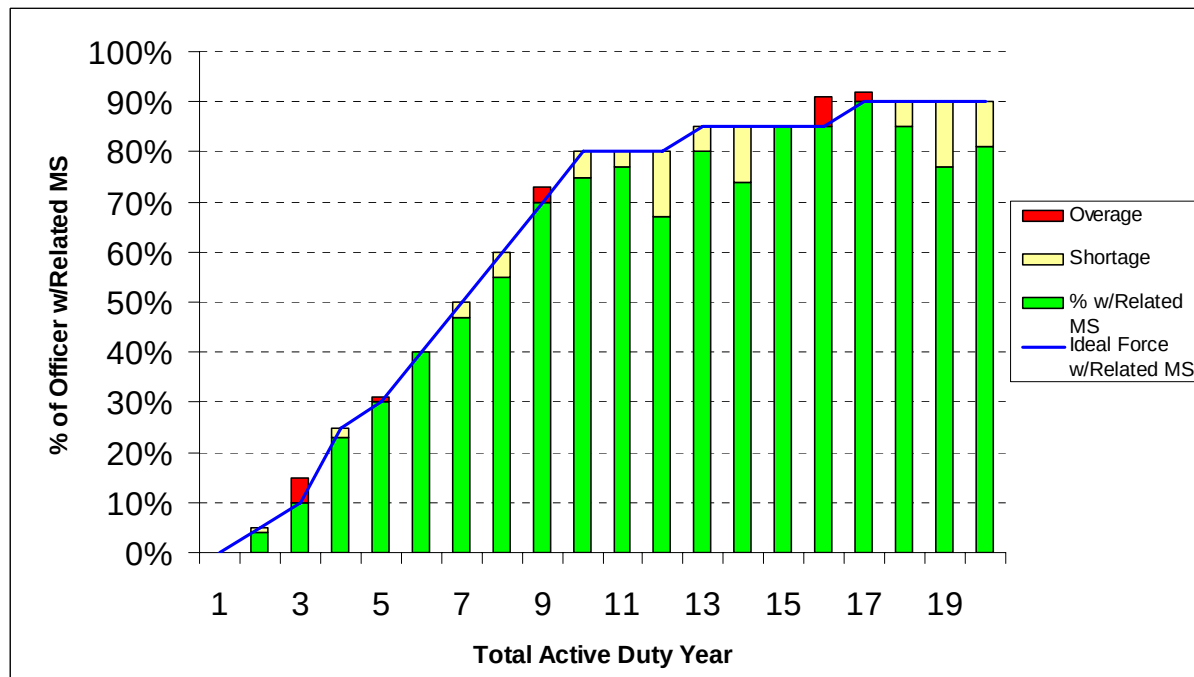
Notional AAD Profiles





AADIM-E: Quota Recommendation

- Compare “Ideal” with actual MilPDS data
 - Delta between ideal and current profiles indicates educational needs
 - Provides the basis for a quota recommendation





AADIM-E: Quota Recommendation

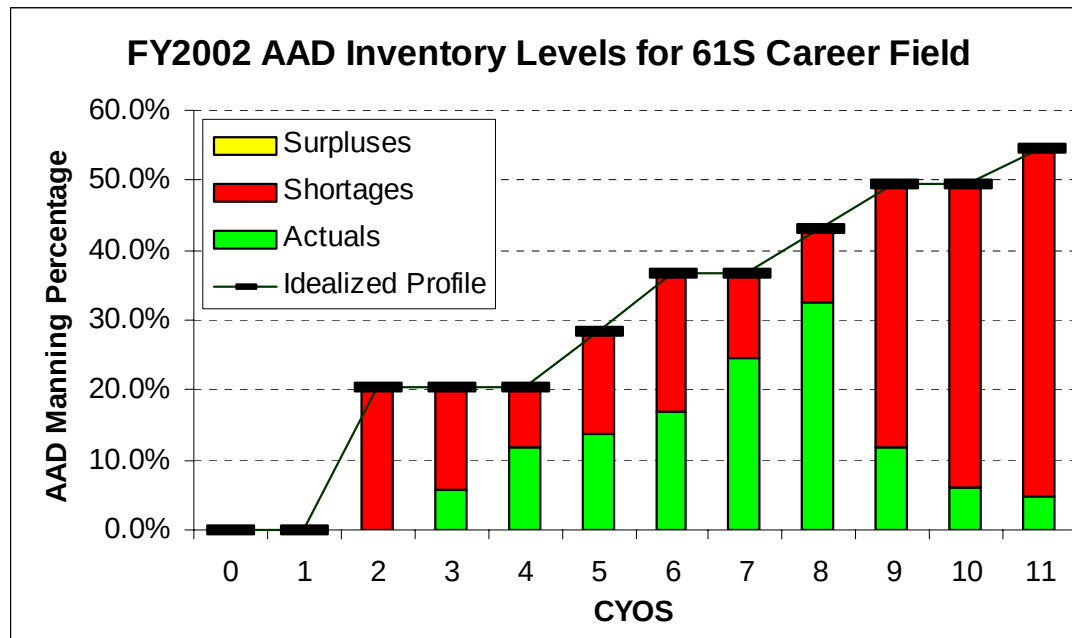
- Educational assignment alternatives for Inventory Entry
 - Career Field specific needs
 - Officer career timing for entry to AAD inventory
 - Officer preferences (T-OPD)
- Multiple year output—current FY plus projected
 - Requirements visibility facilitates long-term DT, AFPC and AFIT planning, as well as “advertising” to interested officers





Idealized Educational Profile and Actual AAD Inventory for 61S Career Field

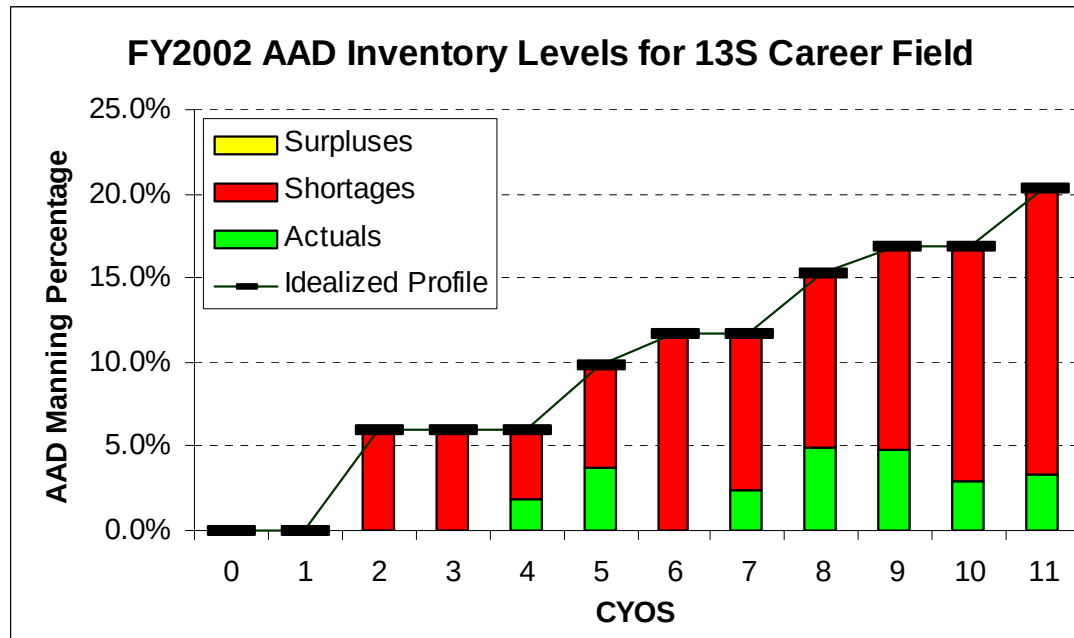
- Percentage selected to attend graduate education each cycle = 20%
- Percentage with initial 3 year assignment = 50%
- $\bar{IF} = 30\%$
- Actual Aggregate AAD Inventory Percentage for FY02 = 10.6%





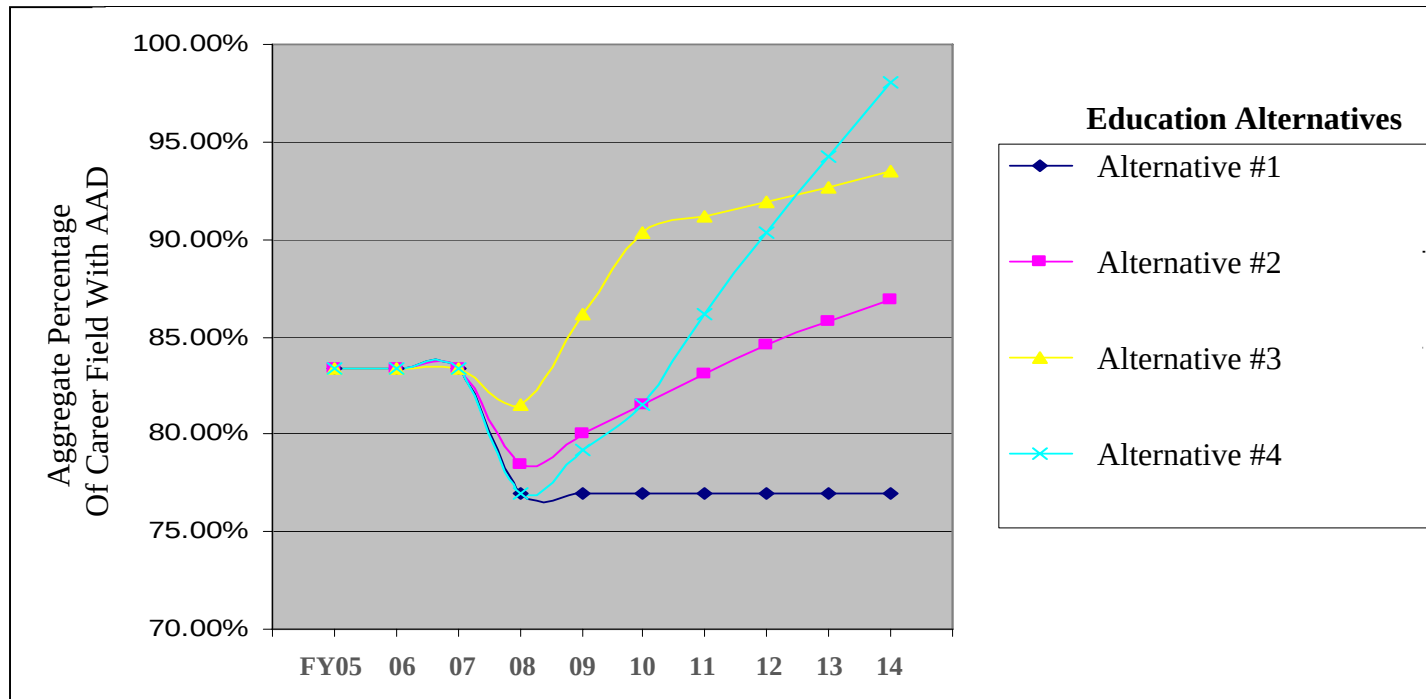
Idealized Educational Profile and Actual AAD Inventory for 13S Career Field

- Percentage selected to attend graduate education each cycle = 6%
- Percentage with initial 3 year assignment = 67%
- $\bar{IF} = 10\%$
- Actual Aggregate AAD Inventory Percentage for FY02 = 1.7%



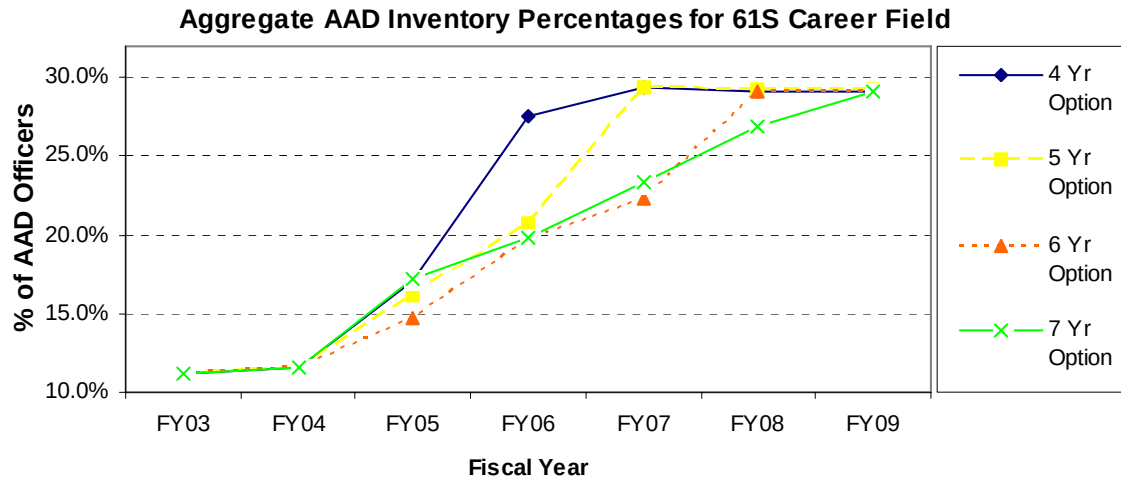
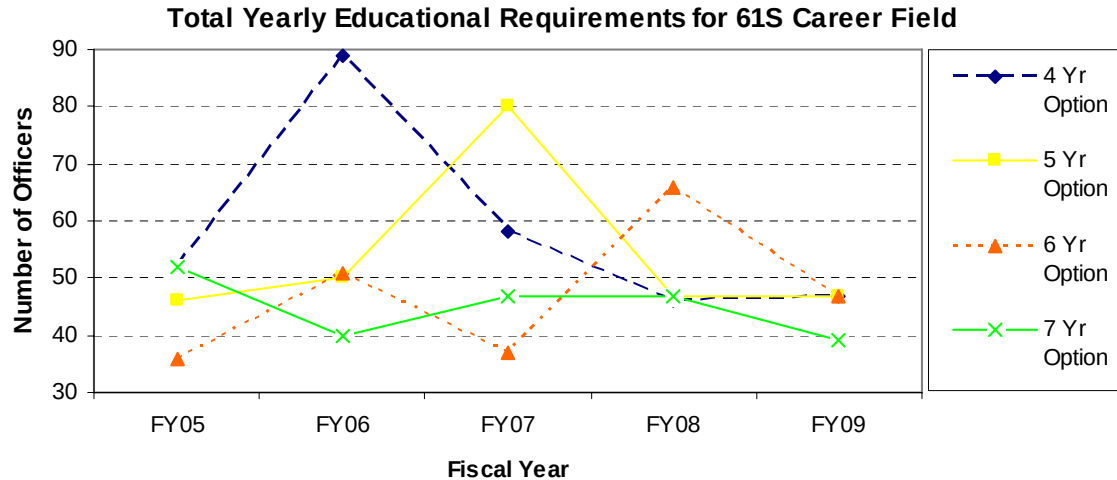


- Graphical Analysis of Alternatives



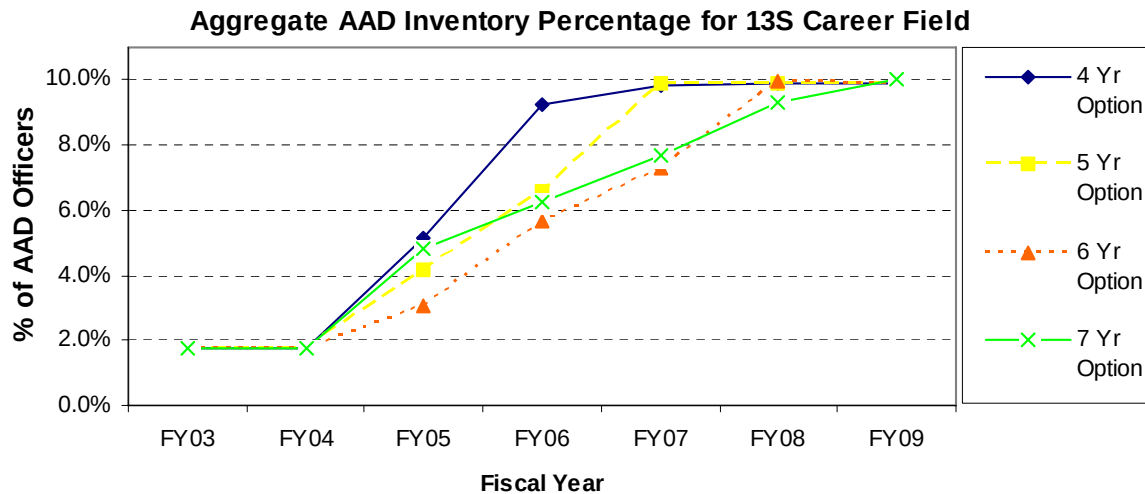
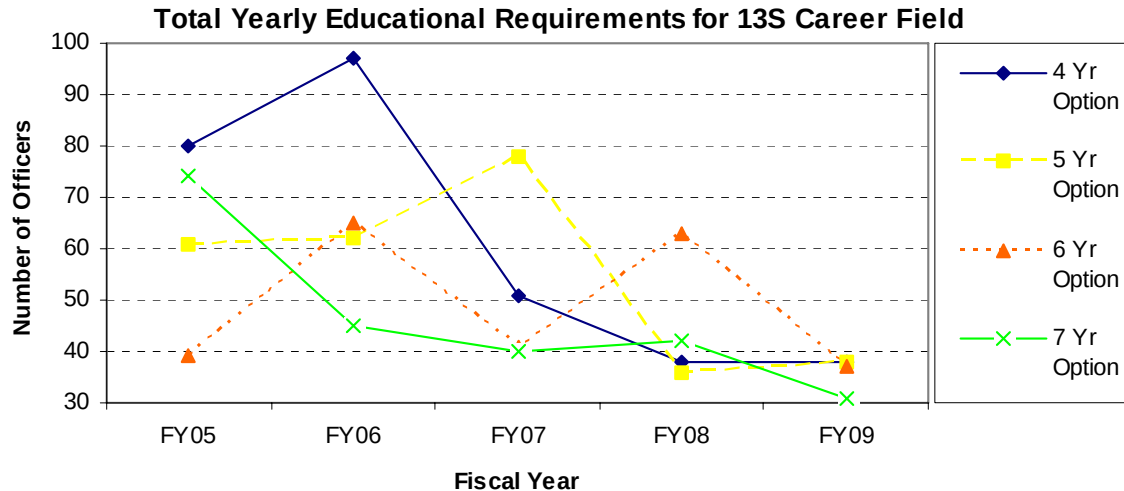


Forecasted Educational Requirements: 61S



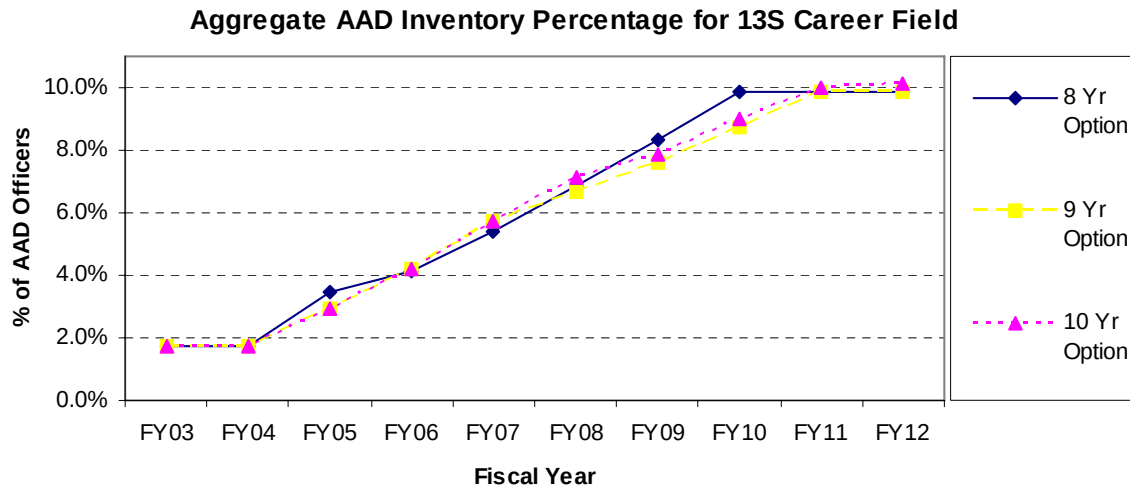
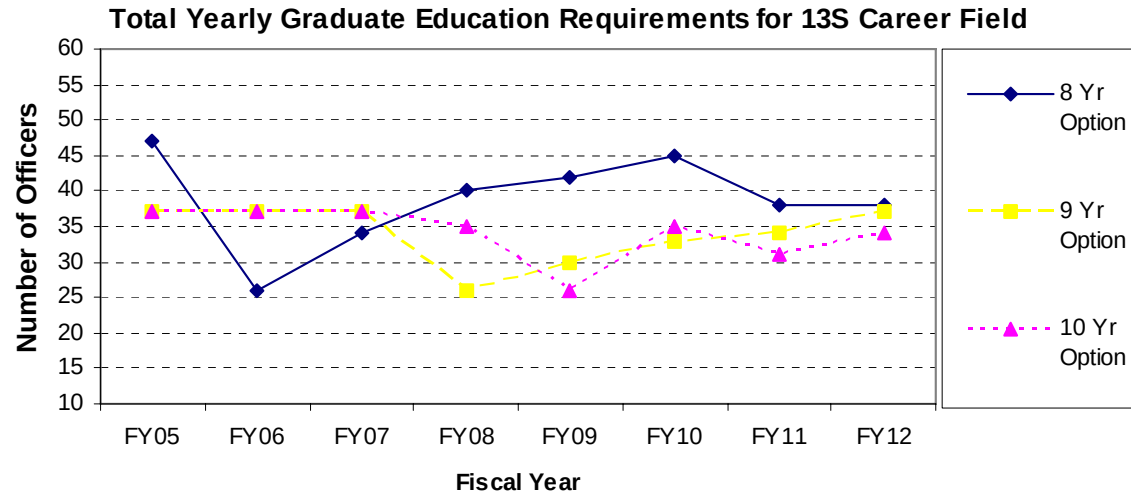


Forecasted Educational Requirements: 13S





Forecasted Educational Requirements: 13S





- Data Collection
 - Generate report with current profile status
 - Identify assignment availability of AAD inventory officers
 - Officers identify assignment preferences
- AAD Inventory Management
 - Match AAD officers to potential assignments
 - AAD-Only Assignments: e.g. AFIT Faculty
 - AAD-Profile Assignments: Satisfy unit profile requirements



- Model should include Measures of Merit to indicate current health of AADIM process
 - % Weighted Average Incumbency of AAD-only assignments
 - % Weighted Average Incumbency of AAD-profile assignments
 - Overall measures and sub-measures by aggregation level and career field
- Model output: “Optimal” assignment recommendations
 - Sensitivity Analysis to show robustness of decision
 - Available “what if” analysis of assignment swaps



AADIM-U Model Development

- Partition assignment characteristics into two categories
 - Required
 - Absolute must-haves
 - Prescreening
 - Grade
 - Security Clearance
 - Desired
 - “Goodness of fit” between an officer and an assignment
 - Desirable Attributes
 - Grade
 - Academic Specialty Code (ASC)
 - Security Clearance
 - Experience Level
 - Training Level
 - DT Vector
 - Officer Preferences





Modified Assignment problem

$$\text{maximize } \sum_{i=1}^m \sum_{j=1}^n p_j a_{ij} x_{ij}$$

$$\text{subject to } \sum_{j=1}^n x_{ij} \leq 1 \quad \forall i$$

$$\sum_{i=1}^m x_{ij} \leq 1 \quad \forall j$$

$$x_{ij} = \begin{cases} 1 & \text{if officer } i \text{ is assigned to assignment } j \\ 0 & \text{otherwise} \end{cases}$$

p_j = relative assignment priority for assignment j

$a_{i,j}$ = qualification score for officer i with respect to assignment j



Qualification Matrix, A

- Multi-attribute Additive Value Function

$$a_{ij} = V \{x_{ij}^1, x_{ij}^2, \dots, x_{ij}^7\} = \sum_{a=1}^7 k^a v^a(x_{ij}^a), \quad \forall(i, j)$$

$a_{i,j}$ = qualification score for officer i with respect to assignment j

k^a = relative weighting constant for attribute a

- Modeling Assumptions
 - Preferential independence between attributes holds
 - Each attribute has two levels
 - Meet the qualification, $v^a(x^a) = 1$
 - Does not meet the qualification, $v^a(x^a) = 0$
 - The weighting constants sum to 1 (Additive Independence)





AADIM-U : Weighting Constants

- Conducted interviews with 61 DT members to examine two sets of weighting constants for the four attribute case
- Performed notional assignment matching experiments

Decision Maker 1

Attribute	Order	k^a
Experience and Training Level	1	0.444
DT Vector	2	0.222
Officer Preferences	2	0.222
Academic Specialty Code (ASC)	3	0.112

Decision Maker 2

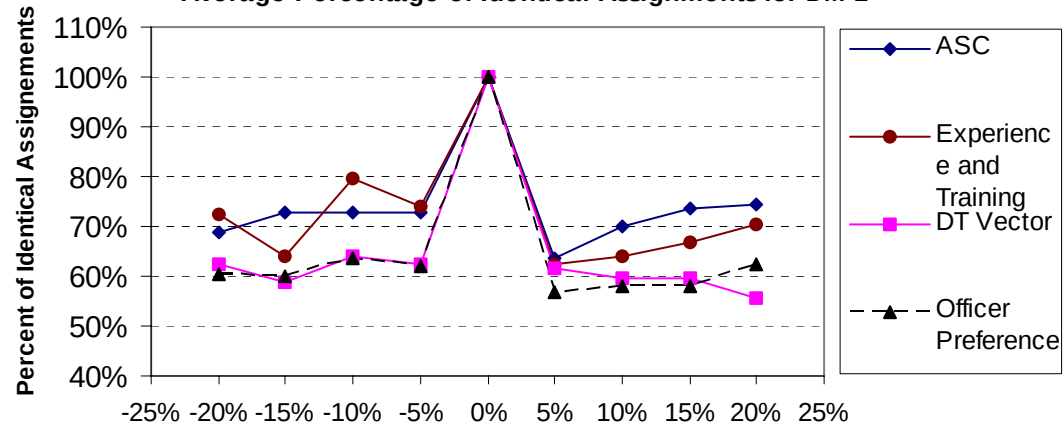
Attribute	Order	k^a
Experience and Training Level	1	0.533
Academic Specialty Code (ASC)	2	0.267
DT Vector	3	0.133
Officer Preferences	4	0.067



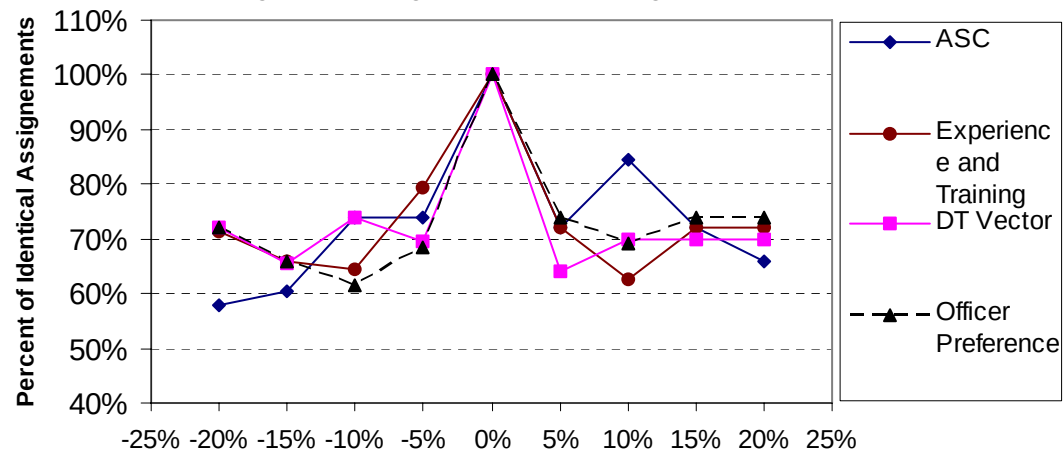


AADIM-U Sensitivity Analysis

Average Percentage of Identical Assignments for DM 1



Average Percentage of Identical Assignments for DM 2





Conclusion

- AADIM-E
 - Capable of predicting long term education requirements
 - Useful to investigate different educational policies
 - Increasing the AAD inventory is a long term initiative
- AADIM-U
 - Provides a tool that matches AAD officers in AAD positions given a qualification score
 - The assignment matching is highly sensitive to the weighting constants
 - Flexible





Further Research

- Manpower forecasting that does not rely on past policies
- More dynamic options for specifying graduate education policies
- Refinement of Job Qualification scoring tool
- Refinement of Multi-Attribute Value Function Weighting Constants
- Validation using data from actual assignment cycle



AADIM Model Summary

- Aggregation level for educational profiles--recommend Senior Rater ID
 - Senior Rater span of control is similar across AF
- Eliminates management of individual AAD billets
 - Key shortfall of current system
 - Compliance Issues with DODD 1322.10 and AFI36-2302
- Flexibility to assign new AAD inventory officers





AADIM Model Summary

- Flexibility for internal reassignments
 - Adaptability to rapidly changing unit requirements and missions
 - Supports officer development (e.g., progression from entry-level to supervisory positions)





Where To Next?

- Conceptual Approval
- Data Requirements
 - Preliminary 13S educational profiles
 - Current 13S-related AAD billets
 - 13S CFM & Development Team inputs
 - Current 13S AAD personnel assignments
 - By grade, YOS, and time-on-station (TOS)
- Model Development
 - AADIM-E
 - AADIM-M





Where To Next?

- Comparison with 15W (Weather) Career Field
 - Education Goals are satisfied using current GEMS
- Career Field Guides
 - Add “technical & educational competencies”
 - Set expectation for officers to pursue advanced education





Questions?