

# Master of Cost Estimating and Analysis Brief

Program Brief, June 2015

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# Agenda

- Background of Program
- Who We Are
- Why is this Program Important?
- What We are Doing: Overview
  - Master's Overview
  - Curriculum Overview/Capstone Projects
  - First Four Cohort Demographics
- Challenges and Issues
- Solicit your Questions and Feedback

## Background

- Jointly developed a Distributed Learning Cost Estimating and Analysis Master's Degree Program between AFIT and NPS
  - Master's Program (16 courses)
  - Certificate (4 courses)
- Open to all personnel
  - DoD Civilians
  - Military (officers and enlisted)
  - Defense Contractors
  - Foreign Officers
  - Civilians from Ministry of Defense

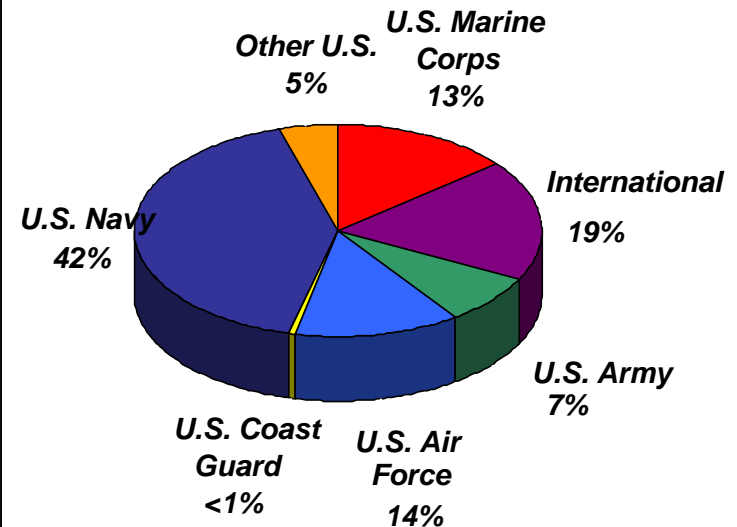
# Background

- Initial Request from NAVSEA in Winter 2010
  - Specific interest in collaboration between AFIT and NPS
- Initial development funding received from NAVSEA and NAVAIR, Summer 2010
- Strong Stated Interest/Support
  - All Services, OSD
  - Service Cost Centers

We have received and incorporated numerous ideas concerning course content

# NPS: 100+ Years of Graduate Military Education

- **Accredited:**
  - WASC, ABET, AACSB, NASPAA
- **Operationally Relevant**
  - Unique advanced education and research programs increasing the combat effectiveness of U.S. and Allied armed forces
- **Accomplishing the Mission**
  - Program of Record-focused graduate schools, institutes, and research centers.
  - Education built on operational experience.
  - An innovative environment: solutions to current, near-term and long-term national security needs.
  - Opportunity to experiment with the latest operational technologies in an academic environment.



- Postgraduate Master's, Engineering and Doctorate Degrees
- Programs renewed every two years based on emerging requirements
- Clear focus on military systems and applications



## **NPS Alumni**

- **43,000 Graduates**
  - Representing all U.S. Military Services and many U.S. Government agencies
  - 4031 international officers from 84 countries
  - 34 Astronauts
  - 25% of U.S. active-duty Flag and General Officers
- **More than 50,000 Nondegree Participants**



ADM Michael Mullen  
Chairman, JCS



General Michael Hagee  
Commandant  
U.S. Marine Corps



King Abdullah of Jordan

## Why is This Program Important?

- Cost Estimating is in the Department of Defense spotlight
  - Weapons System Acquisition Reform Act of 2009
    - Combined OSD PA&E and the Cost Analysis Improvement Group (CAIG) into the Director of Cost Assessment and Program Evaluation (D-CAPE), with two deputy directors:
      - Deputy Director for Cost Assessment.
      - Deputy Director for Program Evaluation
    - The Director [D-CAPE] was a new position (2009), Senate-confirmable, reporting directly to SECDEF, with annual Congressional reporting requirements.

## Why is this program important?

- Large expansion underway in DoD cost estimating cadre.
  
- Target Population:
  - Most new hires will be recent college graduates, untutored in DoD/mostly clueless about cost estimating.
  
  - There are also a number of GS-12s to GS-15s who are already cost estimators, but who lack formal education in the field.





## High Level Visibility

*“ I don’t need more cost estimators; I need better cost estimators...”*

[Hon. Sean Stackley, ASN(RD&A)]

## Benefits

- All graduates will earn a Master of Cost Estimating and Analysis Degree upon completion.
- Intent is for Master's Program to Fulfill the Educational Requirements for DAWIA Level I, II, and III Certification (BUS-CE) for all services. Seven years of experience still needed for completion.
  - Air Force has granted its approval for all cohorts
  - Army has granted its approval for all cohorts
  - Navy approval for first two cohorts. NAVSEA heading working group to resolve

# What We Are Doing: Overview

- Two year program: 3 cohorts (70 students) have graduated so far!
  - 2 classes per quarter
  - 4 quarters per year
- Delivery modes
  - Asynchronous (computer based; no face-to-face instructional time, one class each quarter)
  - Synchronous (class with an instructor: one class each quarter)
    - VTE / VTC / DCO
    - Fourth cohort: Classes meet Thursdays, 1400-1700 (EST), same time slot for two years
    - Fifth cohort: Classes meet Wednesdays, 1400-1700 (EST), same time slot for two years
    - Sixth (next) cohort: Classes will meet Thursdays, 1400-1700 (EST), same time slot for two years

# Curriculum Overview

## ■ Foundational courses

- Probability and Statistics (2 Courses)
- Operations Research for Cost Analysts
- Acquisition of Defense Systems
- Defense Financial Management and Budgeting (2 Courses)  
(one on policy, one on practice)
- Systems Engineering (2 Courses)

## ■ Cost Estimating courses

- Cost Estimating I, II, and III: Methods and Techniques, Advanced Concepts, Risk and Uncertainty
- Cost Estimating IV: Applied Cost Analysis
- Cost Estimating V: Cost/Engineering Economics, Case Studies
- Cost Estimating VI: Decision Analysis

## ■ Capstone Project (final two quarters)

## Capstone Projects

- Final two quarters of program
- Students will work in groups of three and will be assigned real projects provided by the cost organizations (OSD-CAPE, NAVSEA, NAVAIR, AFCAA, DASA-CE, NCCA, MDA, TACOM, etc.)
- Either work on part of a larger program, or work on a small program: *“Bite-sized and focused”*
- Project Deliverables: Research paper, and a ppt presentation to sponsoring command
- Published?

# Sample Capstone Projects

- *“Simple Software Cost Estimation Model Without Adaptation Adjustment Factor:”* Sponsor: AFCAA
- *“Profit:”* Develop a CER that relates fee/profit to an economic indicator by phase of acquisition. Sponsor: NCCA
- *“Analyze/Update SE/PM Analysis:”* Sponsor: NAVAIR
- *“Investigating Learning and Rate in Vehicle Production:”* Sponsor: MDA

## Sample Capstone Projects (cont)

- *“Analysis of Contractor Cost Structures and Rates:”* Evaluate impacts of factors such as business base changes, evolution away from defense work to commercial, and pension impacts. Sponsor: NAVAIR
- *“Future Exchange Rates Predictor:”* Researching the best predictors. Sponsor: AFCAA
- *“Analysis of O&S Costs for the Littoral Combat Ship Compared to Other Ship Types.”* Sponsor: NCCA
- *“Characterization, Comparison, and Replication of Common Software Estimation Tools.”* Sponsor: MDA

## Timetable

- Cohort #1: Graduated March 2013
- Cohort #2: Graduated March 2014
- Cohort #3: Graduated March 2015
  - “Feedback Forum” in Monterey for all three
- Cohort #4: Commenced Spring Quarter 2014
- Cohort #5: Commenced Spring Quarter 2015
- Cohort #6: Will commence Spring 2016

### Our Focus:

- One cohort per year, 25 – 30 students per cohort



# Demographics of First Cohort

- Applicants: 74, Selected: 32 Graduated: 24
  
- Mostly Navy and Air Force represented, plus a few contractors:
  - NAVSEA: 5
  - NAVAIR: 5
  - NUWC-Newport: 4
  - NSWCDD Dahlgren: 3
  - Pentagon: NCCA, OSD (CAPE), AFCAA: 4
  - AF Space and Missile Center, Los Angeles: 5
  - NGIA, AFMC: 2 (DC and Hanscom, MA)
  - Contractors: 4

# Demographics of First Cohort

- All applicants were working in the cost estimation field at their respective commands

## Rank/Grade Breakdown:

- GS 7 – GS 15
- One Active Duty Navy O-6
- One Active Duty Air Force O-2
- Four contractors (Boeing, Cask Technologies, EM Solutions, Wyle Aerospace)

## Demographics of Other Cohorts

### Cohort #2:

- 33 Students Selected, 26 graduated.
- Navy, Air Force, Army, JHU/APL, and contractor involvement this cohort

### Cohort #3:

- Commenced with 26 students, graduated 20 (a few moved to a later cohort): Air Force, Army, Navy and Marine Corps involvement, TSA and Defense Security Service, MITRE Corporation, plus one contractor.

## Demographics of Other Cohorts

### Cohort #4:

- Commenced with 25 students, presently at 24. Continued support from all services. In addition: GAO, NELO, MARCORSSCOM

### Cohort #5:

- Recently commenced with 30 students. Continued support from all services:
  - US Army: 8
  - USAF: 7
  - USMC: 5 (including 3 active duty)
  - USN: 8
  - OSD: 1
  - GAO: 1

## Certificate Program Available, as well

- A four course sequence leading to a Certificate in Cost Estimating and Analysis.
- You will take one class per quarter for four consecutive quarters.
- Next Class commences early July 2015.

### *The Four Courses Include:*

- Operations Research Methods for Cost Analysts
- Cost I: Methods and Techniques
- Cost II: Advanced Concepts in Cost Estimating
- Cost III: Risk and Uncertainty Analysis

## Challenges and Issues

- Tuition MUST be paid for by student's command, with Command Endorsement a requirement. GI Bill and personal funds cannot be used for tuition. Funding programs available include 852 funds and Tuition Assistance – availability varies by service.
- As of Cohort #4, the program is being taught entirely by NPS instructors.
- VTC Limitations: NPS IT can handle a maximum of 20 VTC sites dialing in for one class. On average 10-15 sites are needed.

# Advertising

- Tri-folds available

- Website URL

[http://www.nps.edu/Academics/DL/DLPrograms/Programs/degProgs\\_MCEA.html](http://www.nps.edu/Academics/DL/DLPrograms/Programs/degProgs_MCEA.html)

- MCEA Video on website

<http://www.nps.edu/video/portal/Video.aspx?enc=JkJoOpnrBNc8itOw2LqZ4p8wswvm0Vlv>

## Points of Contact:

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# BACK UP SLIDES

Detailed Information on the Syllabus of  
each Cost Course



## Cost Estimation I: Subject Areas

- Introduction to Cost Estimating
- Cost Processes
- Data Collection and Sources  
(CSDR/CPR/SAR/SRDR, .....)
- Data Bases Used (VAMOSC, DCARC, DAMIR, etc.....)
- Introduction to Earned Value Management
- Data Normalization
- Statistics for Cost Estimators
- Methodologies (Analogy, Parametric, .....)

## Cost Estimation I: Subject Areas (cont)

- Regression Analysis
- Learning Curves (Unit Theory, Cum Average Theory, Production Breaks, Step Down Functions, Production Rates)
- Cost Factors
- Wrap Rates
- Analogy Technique
- Introduction to Software Cost Estimating
- Introduction to Risk and Uncertainty Analysis

## Cost Estimation II: Subject Areas

- Cost Estimate Documentation
- WBS, Data Requirements
- Labor and Overhead Rates
- Direct Materials and other Support Costs
- Operating and Support Costs
  - PBL, CLS, Organic
  - Total Ownership Cost
  - Cost per Flying Hour
- Earned Value Management Systems
  - Estimates at Completion
  - Cost and Schedule Overruns
- Two Major Cost Estimating Projects

## Cost Estimation III: Subject Areas

- *Introduction to Cost and Schedule Risk and Uncertainty*
- Review of Probability for Cost Analysts
- Monte Carlo Simulation with @Risk
- Understanding the Nature of CER and Cost Driver Uncertainty
- The Impact of Correlation
- Schedule Risk Analysis
- Phasing the Cost Estimate
- Putting It All Together: Project Preparation: Examining the technical and programmatic description of an acquisition program, then develop appropriate WBS's for cost estimating
- Course Project

## Cost Estimation IV: Subject Areas

- Cost Estimating in the “Post-WSARA” Era
- Considerations in Early Phases of Major Acquisition Programs
  - Requirements Formation
  - Materiel Development Decision (MDD)
  - Analyses of Alternatives (AoAs)
- Case Studies for Milestone A, B and C Defense Acquisition Board (DAB) reviews of programs
- Full-Rate Production (FRP) decisions
- Post-IOC Analyses
- Considerations prior to release of Requests for Proposals (RFPs)

## Cost Estimation IV: Subject Areas (cont)

- Savings Achieved through Multi-Year Procurement Contracts
- Joint Urgent Operational Needs (JUONs) and Rapid Acquisition Requirements Outside the Normal DoD process.
- “Rescuing a Program in Trouble,” or “Supporting a Decision to Terminate a Program.”

# Cost Estimation V: Subject Areas

- Engineering Economics
  - Time Value of Money
  - Equivalence of Cash Flows
- Analyzing a Project
  - Present Worth
  - Equivalent Annual Worth
  - Return on Investment (ROI)
- Comparing Alternatives and Projects
  - Mutually Exclusive Investments
  - Replacement Analysis
- Case Studies



# Cost Estimation VI: Decision Analysis

- Decision Making under Certainty
- Decision Making under Uncertainty
- Decision Making under Risk
- Means Objectives
- Fundamental Objectives/Hierarchies
- Mean-Objectives Networks
- Influence Diagrams
- Decision Trees/Decision Matrix
- Expected Monetary Value (EMV)
- Expected Value of Perfect Information

# Cost Estimation VI: Decision Analysis

- Risk Curves
- Risk Measure
- Utility Functions
- Bayes' Theorem
- Two-way Sensitivity Graphs
- Probability Distributions
- Risk Tolerance Measures