

# Master of Cost Estimating and Analysis Brief



Program Brief, June 2016

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# Agenda

- n Background of Program
- n Who We Are
- n Why is this Program Important?
- n What We are Doing: Overview
  - .. Master's Overview
  - .. Cohort Demographics
  - .. Curriculum Overview
  - .. Capstone Projects
- n MCEA graduation at NPS and the Pentagon
- n Success Stories/Testimonials
- n A new full-time Teaching position (Lecturer/Senior Lecturer) position in Monterey, CA. Teaching single classes available, too
- n Challenges and Issues
- n Questions and Feedback

## Background

- n Developed a Distributed Learning (Non-Resident) Cost Estimating and Analysis Master's Degree Program
  - .. Master's Program (16 courses)
  - .. Certificate Program (4 courses)
- n Open to the following personnel:
  - .. DoD Civilians
  - .. Non-DoD/Government Civilians from agencies such as GAO, Census Bureau, DHS, DOE, etc.
  - .. U.S. Military (officers and enlisted)
  - .. Defense Industry Contractors
  - .. University Affiliated Research Centers (UARCs) that have a Navy sponsor

## 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 received and incorporated numerous ideas concerning course content

# NPS: 100+ Years of Graduate Military Education (Founded:1909)

## n Accredited:

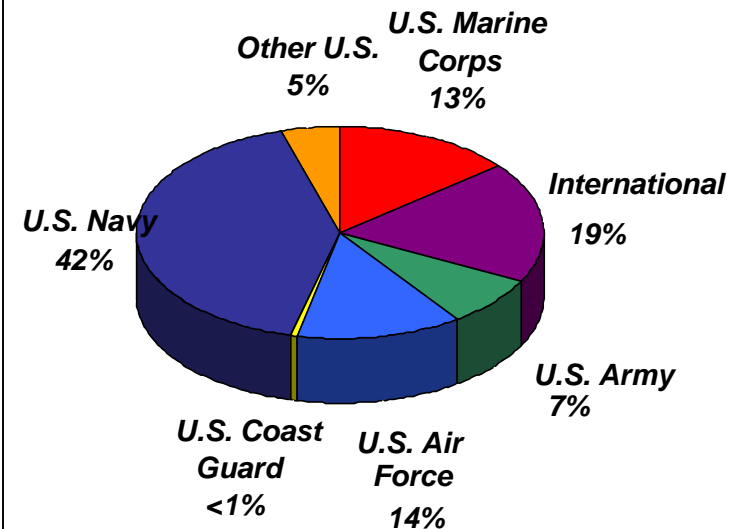
- WASC, ABET, AACSB, NASPAA

## n Operationally Relevant

- Unique advanced education and research programs increasing the combat effectiveness of U.S. and Allied armed forces

## n 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 Graduates/Alumni



## 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?

### n Cost Estimating is in the Department of Defense spotlight

#### • Weapons System Acquisition Reform Act of 2009

- n 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
- n 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?

## • Target Population:

- n Most new hires will be recent college graduates, untutored in DoD/mostly clueless about cost estimating.
- n There are a number of GS-12s to GS-15s who are already cost estimators, but who lack formal education in the field.
- n *Defense Industry Contractors*. This provides a well-rounded education for all students and promotes important interaction between government and industry.



## High Level Visibility

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

Hon. Sean Stackley, ASN(RD&A)

# What We Are Doing: Overview

- n Two year program: 4 cohorts (94 students) have graduated so far!
  - .. 2 classes per quarter
  - .. 4 quarters per year
- n Delivery modes
  - q Asynchronous (computer based; no face-to-face instructional time, one class each quarter)
  - .. Synchronous (class with an instructor: one class each quarter)
    - n VTC / Collaborate / DCO
    - n Fifth cohort: Classes meet Wednesdays, 1400-1700 (EST), same time slot for two years
    - n Sixth cohort: Classes meet Thursdays, 1400-1700 (EST), same time slot for two years
    - n Seventh (next) cohort: Classes will meet Wednesdays, 1400-1700 (EST) for the full two years

# First Six Cohorts: Good Mix of Young and Experienced

Cohort #	Selected	Graduated**
1	32	24
2	33	26
3	26	20
4	25	24
5	29	26 (projected)
6	23	??

\*\*Some move to a later cohort

# Curriculum Overview

## n 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)

## n 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

## n Capstone Project (final two quarters)

## Capstone Projects

- n Final two quarters of program
- n 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.)
- n Either work on part of a larger program, or work on a small program: *“Bite-sized and focused”*
- n Project Deliverables: Research paper, and a ppt presentation to sponsoring command
- n Published?

# Sample Capstone Projects

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

## Sample Capstone Projects (cont.)

- n *“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
  
- n *“Analysis of O&S Costs for the Littoral Combat Ship Compared to Other Ship Types.”* Sponsor: NCCA
  
- n *“Characterization, Comparison, and Replication of Common Software Estimation Tools.”* Sponsor: MDA

## Sample Capstone Projects (cont.) \*\*

- n *“ESLOC Software Sizing Analysis.”* Sponsor: MDA (Karem)
  
- n *“Characterization, Comparison and Replication of Common Software Estimation Tools.”* Sponsor: MDA (Karen)
  
- n *“DoD Acquisition Streamlining: Could an Optimized Approach Determine that a Significantly Reduced Number of Documents are Sufficient to Support a Milestone B Decision?”* Sponsor: GAO (Cari)

(\*\* All three in attendance)



## Benefits

- n All graduates will earn a Master of Cost Estimating and Analysis Degree upon completion.
- n 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
  - Working with Navy to grant approval for all cohorts

## Timetable

- n Cohort #1: Graduated March 2013
- n Cohort #2: Graduated March 2014
- n Cohort #3: Graduated March 2015
- n Cohort #4: Graduated March 2016
  - .. “Feedback Forum” in Monterey for all four
- n Cohort #5: Commenced March 2015
- n Cohort #6: Commenced March 2016
- n Cohort #7: Will Commence late March 2017
  
- n Our Focus:
  - .. One cohort per year, 25 – 30 students per cohort

## Certificate Program Available, as well

- n A four course sequence leading to a Certificate in Cost Estimating and Analysis.
- n You will take one class per quarter for four consecutive quarters.
- n Next Class commences early July 2016.

### *The Four Courses Include:*

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

# Some Braggin' Rights....

# Cohort 4 Graduation: in Monterey March 2016



# Cohort 4 Graduation: Pentagon: April 2016



# DoD Cost Community Leaders @ MCEA Graduation



# Distinguished Guests at Graduation: Cohort #3





# Some Braggin' Rights....Success Stories from Graduates: Cohort 1

- n I received the FY13 Acquisition Excellence Award as part of a team. We were able to establish a better Learning Curve and Rate Curve based on knowledge gained in that area. The Statistics classes helped to better prepare me to challenge the logic used on a contract, resulting in a lower overall "Should Cost."
- n I was hired by the Center for Naval Analysis (CNA) as a Senior Research Scientist. They hired me specifically because they had no certified cost analysts on staff and felt strongly that they needed one since they do a lot of cost analysis.
- n Within 3 months of graduating, I went from EVM analyst at Pax River to Division Head, Program Oversight and Training at the Center for Earned Value Management in the Pentagon. A good promotion!
- n I was moved from Pax River to Crystal City to become "Director of F-35 for Cost and EVM."

# Some Braggin' Rights....Success Stories from Graduates: Cohort 2

n I was selected as the winner of the following awards:

- AFLCMC Cost Estimator of the Year for 2014
- AFMC(FM) Civilian (GS-09 and above) of the Year for 2014; and
- SAF/FM(FM) Civilian (GS-09 and above) of the Year for 2014.
- I was promoted to GS-15, and to Chief of the AFCAA Hanscom Operating Location in Nov 2014.
- Selected as the SAF/FM Senior Leader of Q3 in 2015, and
- I won the Eagle Comptroller Award in 2015.

# Some Braggin' Rights....Success Stories from Graduates: Cohort 3

- n I was promoted to CFO of a small aero-defense contractor at the start of 2016 now that I have the MCEA credentials!
- n I received a promotion that was directly related to having my MCEA degree. I now work as a cost analyst in the cost division at Air Force Materiel Command HQ -- the largest acquisition Major Command in the AF. I get to work on specialized projects and advise the commander on decision support items.
- n My company gave me a \$2500 bonus upon graduation.

# Some Braggin' Rights....Success Stories from Graduates: Cohort 3

- n Thanks to my MCEA degree, I have been fortunate to have been nominated for four awards and won one in the past year. I was also recently promoted to a GS-13 position here on the Cost Staff at the AFMC's Life Cycle Management Center's Cost and Economics Division in the Financial Management Directorate. The awards I was nominated for were:
  - AFLCMC Mid-level Cost Estimator of the Year, Civilian Category III award, FY15
  - AFMC Financial Management Quarterly Award, Civilian Category III award, 4<sup>th</sup> Quarter FY15
  - ICEAA National Junior Technical Award nomination, FY16.
  - *ICEAA Greater Dayton Chapter Junior Technical Award winner, FY16*
  
- n I have worked on numerous projects over the past two years which I can proudly say I would not have been able to successfully complete without my MCEA degree. **Enrolling in NPS's MCEA program was the best decision I have made for my career! (Karem)**

## Some Braggin' Rights....Success Stories from Graduates: Cohort 4

- n I was requested to apply for a GS-15 position after graduation that I would not have been asked to without the degree, so "Doors are Opening!" I am also part of the Acquisition Corps which will allow access to other opportunities for me, like upcoming positions and programs such as the student loan repayment program (which will be helpful in repaying loans I have from previous degrees).
  
- n I was asked to give a presentation to the Collaborative Cost Review Group meeting on 11 May in Crystal City on our capstone project. Topic: "Consumable & Reparable Cost Factor Based on Vehicle Age."

# Some Braggin' Rights....Success Stories from Graduates: Cohort 4

- n I received a promotion from GS-13 to GS-14 one year into the NPS program. I went from being a “branch cost lead” managing the estimates for 3 ACAT III programs and 3 analysts to a “division cost chief” with 13 programs (3 ACAT I, 10 ACAT III) and a team of 10 analysts. No way I get that promotion if I hadn't been enrolled in the NPS program. The promotion was competitive, so I had to interview and go through the whole process, and being enrolled in the MCEA program was a huge part in being considered for the interview and position.

## We have been so successful, that....

- n A new Lecturer/Senior Lecturer position is being advertised on the Operations Research Department website at the Naval Postgraduate School.
- n The successful candidate is expected to teach approximately six quarter-length courses each year, and has an opportunity to also advise thesis students and conduct research. The pressing need for us is in the areas of statistics, cost estimation, and test and evaluation.
- n Applications close around 20 June but is slightly flexible. The job would require a hardship move to Monterey, CA!
- n The link is now available on our website:
  - <http://my.nps.edu/web/or/faculty>

## ...And Another Teaching Opportunity.....

- n We are also in need of an instructor for our Cost II class in the Winter Quarter, Jan-March 2017.
- n Syllabus generated (but modifications acceptable)
- n Does not require a move!
- n Please contact us for more details
  
- n MCEA graduates already teaching:
  - Dane Cooper, Cohort 1, taught Cost 2
  - Karen Richey, Jennifer Echard will teach Cost 6 this Winter.



# ...And We Even Arrange Marriages!

Two members of Cohort 1 who took the MCEA program together got married a year after graduation!

(Who needs Match.com when you have MCEA?!)

J



## Challenges and Issues

- n Tuition MUST be paid for by student's command or organization, with Command Endorsement a requirement. GI Bill and personal funds cannot be used for tuition.
  
- n VTC Limitations: NPS IT can handle a maximum of 20 VTC sites dialing in for one class. On average 10-15 sites are needed.
  
- n But the best news –
  - You will have no student loan debt from this program!!

## Advertising

n Tri-folds available

n Website URL

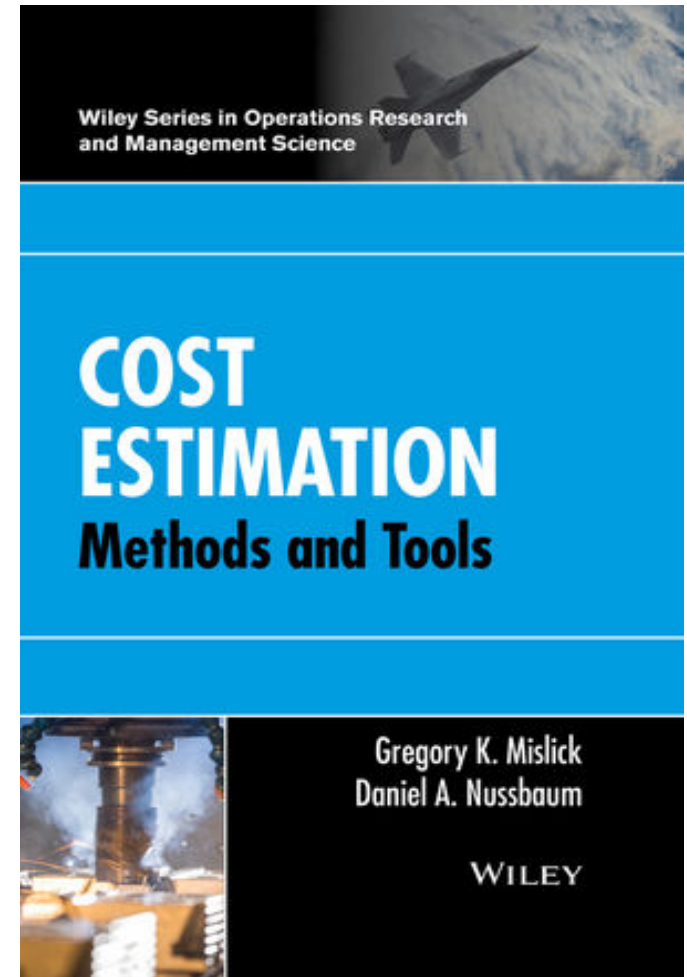
[http://www.nps.edu/Academics/DL/DLPrograms/Programs/degProgs\\_MCEA.html](http://www.nps.edu/Academics/DL/DLPrograms/Programs/degProgs_MCEA.html)

n MCEA Video on website

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

# We Would be Remiss if We Did Not Mention....

- n **“Cost Estimation: Methods and Tools”**
- n Gregory K. Mislick, Daniel A. Nussbaum
- n ISBN: 978-1-118-53613-1



## Points of Contact:

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# BACK UP SLIDES

Detailed Information on the Syllabus of  
each Cost Course



## Cost Estimation I: Subject Areas

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



## Cost Estimation I: Subject Areas (cont)

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

## Cost Estimation II: Subject Areas

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

## Cost Estimation III: Subject Areas

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

## Cost Estimation IV: Subject Areas

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

## Cost Estimation IV: Subject Areas (cont)

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

# Cost Estimation V: Subject Areas

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

## Cost Estimation VI: Decision Analysis

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

# Cost Estimation VI: Decision Analysis

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