

# Software Best Practices Clearinghouse

Promoting Adoption and Effective  
Implementation

**Kathleen Dangle**

Fraunhofer Center for Experimental Software Engineering

**Thomas McGibbon**

ITT Industries/Data & Analysis Center for Software (DACs)

**Richard Turner**

The George Washington University

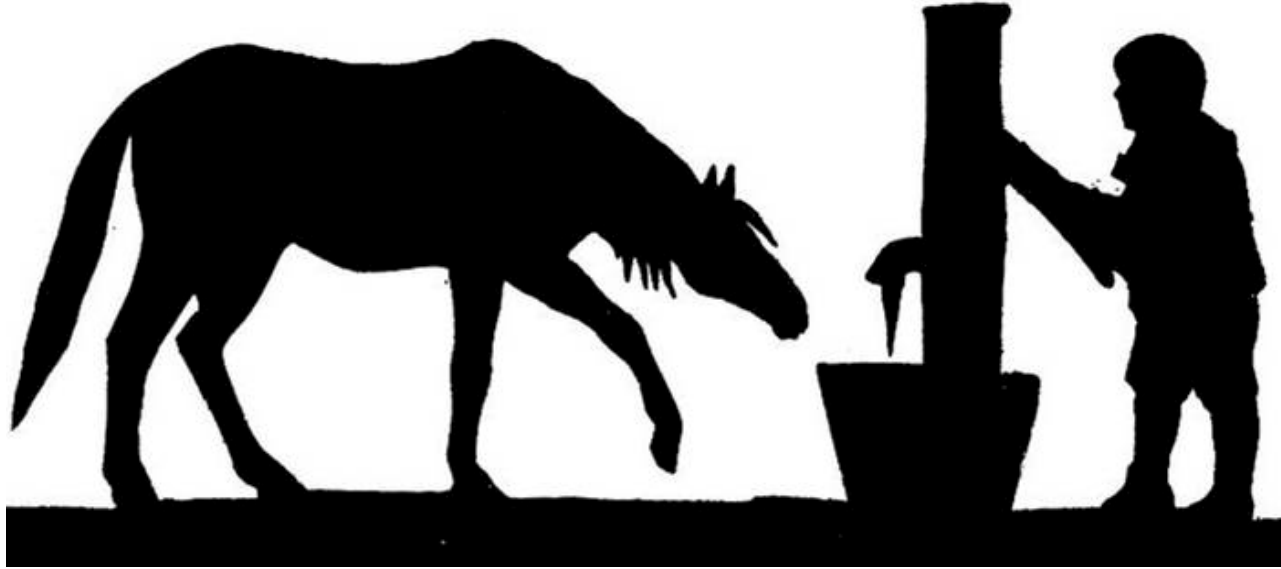
# Presentation Objectives

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- **Share** with you our thinking on why we believe programs face challenges implementing best practices and how we overcome those challenges
- **Inform** you about the Best Practices Clearinghouse Initiative
- **Encourage** you to think about your experiences with considering or implementing best practices
- **Request** your feedback and motivate you to get involved

# How Do We Encourage Broader Use of Best Practices?

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- Through the **Best Practices Clearinghouse**
  - Promote and assist in the adoption and effective utilization of “best practices”
  - Provide central access to validated, actionable practice information
  - Target the needs of the Department of Defense software acquisition and development community

# Implementation Barriers

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- Programs are aware of “best practices,” but they don’t often choose to implement them
  - Too **many lists** to choose from
  - No basis for **selecting** specific practices
  - **Proof** of effectiveness is not generally available
  - Not easy to see **connection** between practices and specific program risks or issues
  - Practice’s **success factors** not well understood
  - Resources are limited and the **return** on practice investment is unknown
  - Implementation **guidance** is inadequate

# Traditional Best Practices

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- Are disciplines rather than specific practices (e.g., Risk Management)
- Have problematic descriptions
  - If descriptions too generic or abstract, hard to apply; if too context specific, don't seem relevant
  - Implementation directions insufficient, ineffective, imprecise
  - Rarely supported by data
- Take energy and resources to implement, but benefits may come (much) later or are hard to quantify
- Implementation does not always work
  - Often depend on other practices
  - Are not implemented as designed
  - Depend on project context (size, complexity, life-cycle phase)

# What Do We Mean By 'Supported By Data'?

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- Example: NASA Software Engineering Laboratory Ground Support Systems Software Development
  - Used experiments and data to evaluate, select, implement and track the impact of development practices
  - By feeding back actual performance data into their work, and using only practices their data showed effective, they:

## Decreased Development Defect rates by

**75%** (1987 - 1991)

**37%** (1991 - 1995)

## Reduced Cost by

**55%** (1987 - 1991)

**42%** (1991 - 1995)

## Improved Reuse by

**300%** (1987 - 1991)

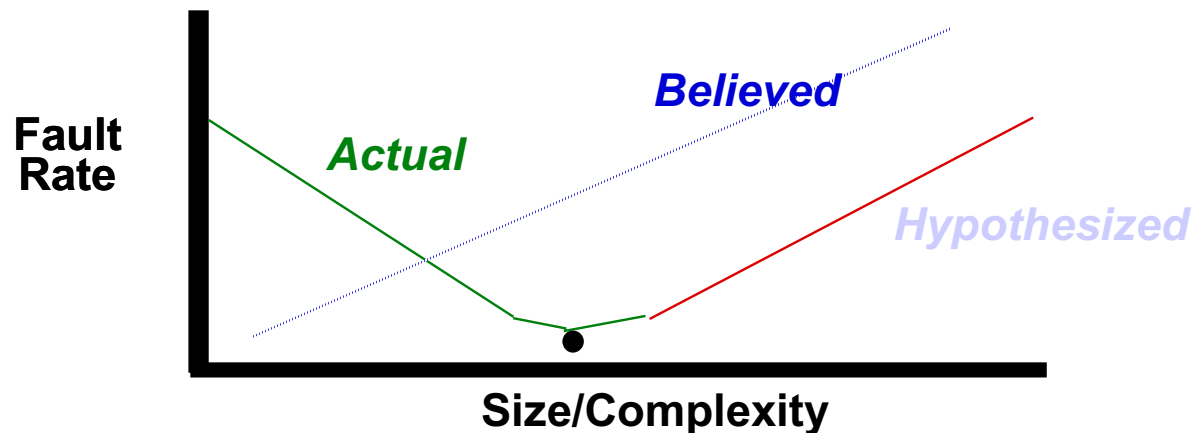
**8%** (1991 - 1995)

**Increased Functionality five-fold** (1976 - 1992)

# Practice Analysis Examples

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- **Best practice: Smaller modules have less defects**
  - Reality: Observation and analysis showed sweet spot



- **Best Practice: Early detection of defects**
  - Initial experience: late detection >100X more expensive
  - New data showed
    - 100X still valid for severe defects
    - However, only 2X more expensive for less severe defects
    - Business model drives acceptance of late costs

# The Clearinghouse **Vision**

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- *The* best practice **resource** for the Department of Defense
- Based on empirical **evidence**
- Validated practice information provides level of **confidence**
- Leverages existing best practices and **centralizes access** to them
- Captures cost, benefits, **context**, latency
- Supports user-driven **selection** of relevant practices
- Provides step-wise implementation **guidance** and expert **assistance**
- Tracks and measures **results**



# Key Strategies to Overcome Challenges

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- **User-focused** access and information infrastructure
- **Empirically based** Information in the repository
- The building block of each practice or set of practices is a **“story”**
- A set of stories are synthesized into a **profile**
- Details of the practice are provided **on demand**
- A type of **color code scheme** provides a quick and easy way of understanding the level at which the practice is well-proven or robust

# Delivery Infrastructure Focused on Users

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- Easy to use, informative **tools** for best practices selection and implementation support
  - Practices suggested by goal, risk, phase, program size
  - Implementation ordering for multiple practices
  - Evolution from basic through advanced practices
  - Flexible search mechanisms
- **Active community involvement and links to expertise**
  - Acquisition Community Connection (nee PM CoP)
- **Dissemination of Clearinghouse latest information through widely-used venues: courses, workshops, articles, conference tutorials**

# Exploiting Sources of Information

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- **Identify and utilize what we already know**
  - Mine best practices and lessons learned repositories (from the Services, Agencies, FFRDCs, DAU, Academic Institutions, DACS Gold Practices, Industry, literature, etc.)
  - Cultivate relationships with practice experts and researchers
  - Gather experiences on specific programs
- **Make it readily accessible**
  - One central entry point to organized information
  - Not re-publish what is already there, but provide links
- **Make it easy to use**
  - Extract key information from more detailed sources
  - Provide visual cues and progressively more detailed information
- **Keep it current**
  - E-workshops support practice identification and validation
  - User feedback
  - Ongoing study, conferences, workshops, symposia

# Best Practices Vetting Process

**A Work In Progress**

Each cycle allows more experience to be gathered and processed, leading to better characterization of the practice, improved recommendations, and more dependable implementation guidance.

Practice/packaging maturation cycle

Identification	Characterization	Analysis & Synthesis	Validation	Packaging & Dissemination
<p><b>Inputs:</b> Leads to practices</p> <p><b>Activities:</b></p> <ul style="list-style-type: none"> <li>• Collect</li> <li>• Categorize</li> <li>• Filter</li> <li>• Synthesize</li> <li>• Prioritize</li> </ul> <p><b>Outputs:</b> Candidate set of practices</p>	<p><b>Inputs:</b> Set of candidate practices and rationale for consideration</p> <p><b>Activities:</b></p> <ul style="list-style-type: none"> <li>• Gather/research characteristics about the practice including context (project, etc.), evidence of use, lessons learned</li> <li>• Complete "story" profile</li> </ul> <p><b>Outputs:</b> More detailed set of candidate practices with "stories"</p>	<p><b>Inputs:</b> Detailed set of candidate practices</p> <p><b>Activities:</b></p> <ul style="list-style-type: none"> <li>• Aggregate stories, create profile of practice</li> <li>• Populate the repository</li> <li>• Identify/define Interrelationships</li> </ul> <p><b>Outputs:</b> Single profile for each best practice, associated artifacts, and confidence levels</p>	<p><b>Inputs:</b> Sets of practice data; validation criteria</p> <p><b>Activities:</b></p> <ul style="list-style-type: none"> <li>• Check outputs from previous phases</li> <li>• Color Code practices</li> <li>• Approve practices via panel of experts</li> </ul> <p><b>Outputs:</b> Validated practices</p>	<p><b>Inputs:</b> Sets of practice data; validation criteria</p> <p><b>Activities:</b></p> <ul style="list-style-type: none"> <li>• Packaging</li> <li>• Publishing</li> <li>• Promoting</li> <li>• Providing user help</li> <li>• Discussions</li> </ul> <p><b>Outputs:</b></p> <ul style="list-style-type: none"> <li>• Repository update</li> <li>• Papers &amp; conference presentations</li> <li>• Course materials/updates</li> </ul>

- Proven
- Consistent results
- Initial validation
- Nominated

Possible practice validation coding

# Conceptual BP Information

Characteristic data		Help		D	E	F	G
ID	Code	Description	Text	Acq. Org.	Dev. Org.		
10	9	Indications	Telltails that suggest implementation of this practice would be advantageous.				
14	10	Contraindications	Telltails that suggest against implementing this practice.				
15	11	Appropriate Candidates	Types of programs that would most benefit from implementation.				
16	12	Inappropriate Candidates	Types of programs where this practice would be useless or harmful.				
17	13	Barriers	List barriers to implementation under each category (categories described in instructions).	Infrastructure			
18	14	Enablers	List enablers which could support implementation under each category (categories described in instructions).	Infrastructure			
<b>Quantifiable Characteristics</b>							
Select one answer for each column and indicate your confidence in your answer. Confidence is							
21	15	Maturity	The technical readiness of the practice (Using the NASA Technology Readiness Scale provided in instructions).	Immature (1-3)	Adaptable (4-6)		
22	16	Benefit Latency	The length of time between adoption and when benefits are apparent.	Immediate (within the quarter)	Low (Within the LC Phase)		
23	17	Ease of Implementation	How much of a headache is it to deploy the practice.	Very Easy	Somewhat Easy	Moderate	
24	18	Cost to Apply	The cost of applying the practice (% cost/staff member).				
25	19	Cost to Achieve Readiness	The cost required to establish infrastructure within the acquisition to support the practice.				
26	20	Cost to Maintain Readiness	The cost required to maintain the infrastructure within the acquisition necessary to achieve benefits.				
27	21	Cost Burden	Describes where the major costs are.				
28	22	Benefit to Cost	Average % Cost reduction.				
29	23	Benefit to Schedule	Average % Schedule reduction.				
30	24	Benefit to Quality	Average delivered defect reduction.				
31	25	Size Threshold for Value	The size of the program where implementation results in accruing value. (No. of software related personnel).				
32	26	Duration Threshold for Value	The length of the acquisition program.				
33	27	Criticality Threshold for Value	The criticality of the program where implementation results in accruing value.				

## Experience data

**Case Study # 24**

**Best practice** Formal inspections

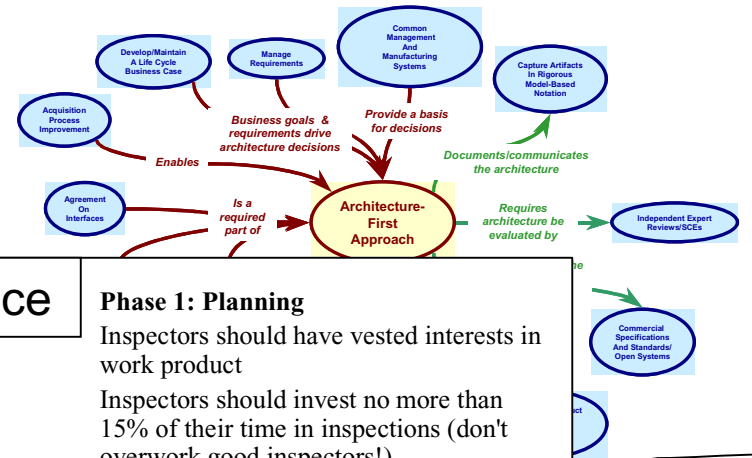
**Source** "Report on the Loss of the Mars Climate Orbiter Mission", [JPL D-18441, JPL Special Review Board, Nov. 11, 1999]

**Theory/Expectation** The use of software inspections will ensure a high level of system quality.

**Lesson Learned** Attention must be paid that inspections are practiced correctly with appropriate formality, to ensure

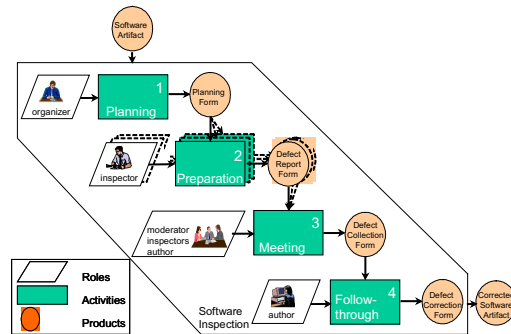
Breakdown in the use of inspections - Contrary to typical practice navigation (end-user) represents walkthroughs or the acceptance - The Sm\_forces software project was critical, which reduced the number of inspections compared to mission critical

## BP Interrelationships



## Implementation data/ guidance

### Inspection process overview



### Phase 1: Planning

Inspectors should have vested interests in work product

Inspectors should invest no more than 15% of their time in inspections (don't overwork good inspectors!)

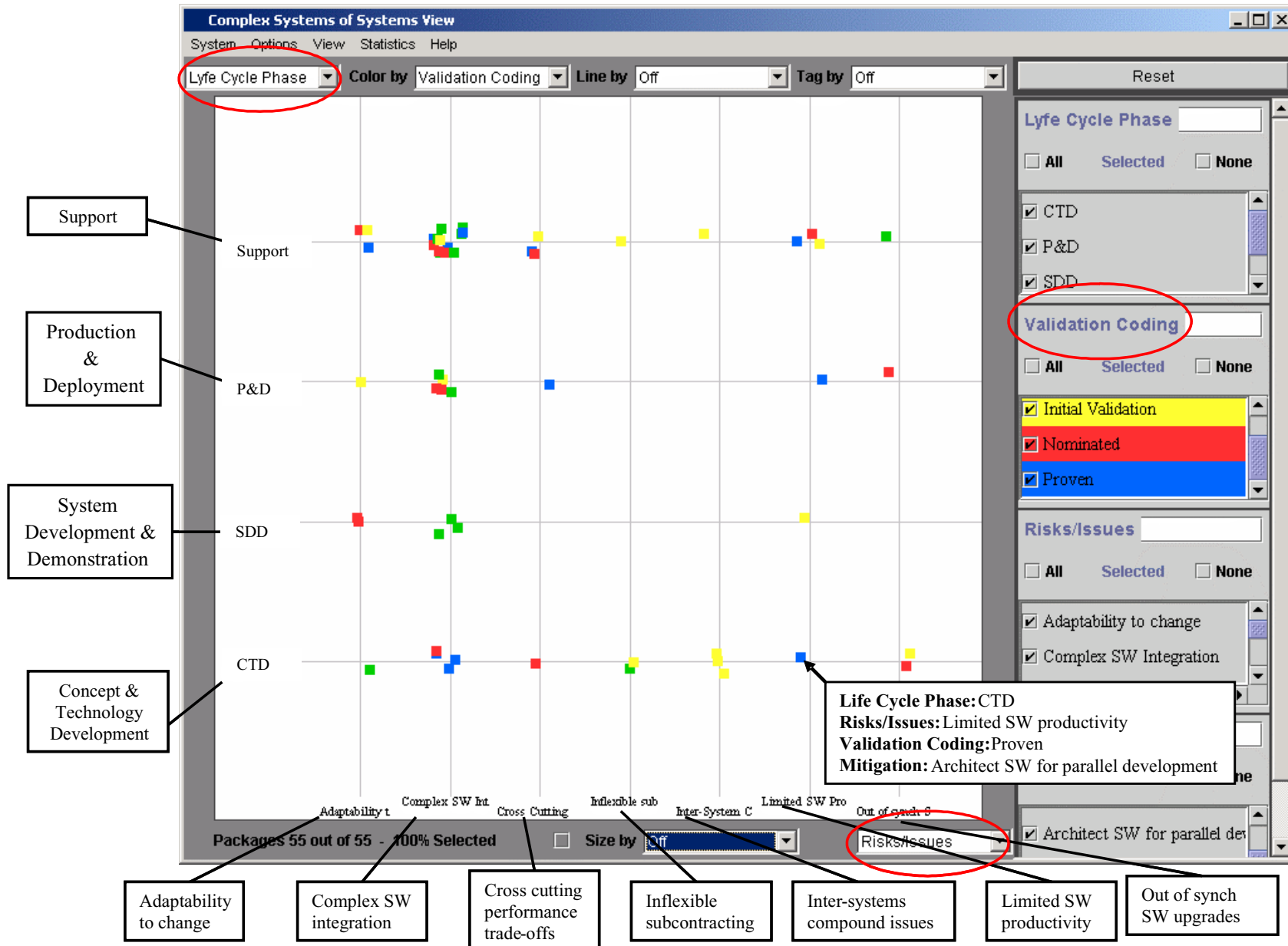
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### Phase 2: Preparation

Inspectors should spend at least as much time in preparing as is required for the inspection meeting.

Provide adequate lead time for inspectors to perform preparation (3 - 5 work days)

# Example Tool for Practice Selection & Investigation



# DACS Gold Practices

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- Initiative began in early-2002, extending previous best practice research
- Objectives:
  - Disseminate consistent, easy-to-understand, value-added best practice information
  - Gather user experience on best practice information
- 35 practices identified; 4 currently described
- Relationship to Clearinghouse
  - Initial information source for Clearinghouse
  - Clearinghouse activities will inform and improve Gold Practice products

# How Can You Get Involved?

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- Let us know your needs by
  - Identifying your best practices **lists** and **sources** of guidance for their use
  - Sharing your **experiences** & lessons learned in implementing best practices
  - Volunteering to help us **define** the services and capabilities of the Clearinghouse
  - Participating in surveys, e-workshops and other events - See <http://iac.dtic.mil/dacs> for more information
- Participate in the next session, “Software Acquisition Best Practices Workshop”



# The Best Practices Clearinghouse – In Summary

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- Centralized resource
- Lessons learned in application of practices
- Empirically based, Experiences provided
- Acquisition and development practices
- Repository of vetted practices
- Important insight
- Not just another list; Not just a website
- Guidance on selection
- Help provided through multiple services
- Outreach to user community
- Useful information
- Search capabilities
- Easy to use & informative tools

# Contact Information

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## **Kathleen Dangle**

Fraunhofer Center for Experimental Software Engineering  
kdangle@fc-md.umd.edu  
301-403-8973

## **Thomas McGibbon**

ITT Industries/Data & Analysis Center for Software (DACs)  
Tom.McGibbon@itt.com  
315-334-4933

## **Richard Turner**

The George Washington University  
Rich.Turner.CTR@osd.mil  
703-602-0851 x124