

# ***Air Force Institute of Technology***

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*Integrity - Service - Excellence*

## ***The Air Force Center for Systems Engineering***

*Lt Col Brian G. Hermann  
brian.hermann@afit.edu*



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**[www.afit.edu/cse](http://www.afit.edu/cse)**



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# *Outline*

- **Mission**
- **Organization**
- **Practitioner Support**
- **SE Education**
- **Research Projects**
- **Case Studies**



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# ***Mission & Services***

- **Mission**
  - Influence and Institutionalize Systems Engineering
  - Educate the workforce
  
- **Services**
  - Vectors to the latest Systems Engineering Policy and Guidance
  - Seminars, workshops, remote and local SE continuing education and graduate education (Masters and Certificate programs)
  - Provide hands-on experience to government and industry engineers via the Rotational Systems Engineering Development program
  - Advocate the best SE practices to the AF, DoD and industry counterparts
  - Collaborate with leading SE minds to help further develop SE policy and guidance
  - Provide SE consultation services






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# Policy and Consulting

- Advice and consulting
  - Links to current policy
  - Plan reviews
  
- Policy advocacy and formulation
  - Implementation assistance
  - Guidance and policy creation
    - Guide for use of Robust Engineering in AF Acq Programs
    - AFMC SE Guide
    - SEP creation guide

**SYSTEMS ENGINEERING PLAN (SEP) GUIDE**  
*"The plan is nothing, planning is everything." - Gen. Dwight D. Eisenhower*



10 JANUARY 2005

**Guidance for the Use of Systems Engineering in AF Acq Programs**

**Introduction**

The intent of this document is to provide preliminary guidance for addressing SE in solicitations, proposals, contractual documents, and the management and control of programs.

**Systems Engineering**

As the Air Force develops and modifies systems and capabilities for the warfighter, it is critically important to consistently and effectively employ disciplined SE processes, focused explicitly on delivering the desired end state. A disciplined SE process, being the technical integration and technical management processes/subprocesses, is critical to successfully manage products and systems that exhibit the high levels of mission performance, reliability, maintainability, supportability (RMAAS) and other characteristics demanded by our warfighters. In addressing the rigorous application of the SE processes, one enables the program to deliver products on time and schedule. The intent of this document is to provide preliminary guidance for addressing SE in solicitations, proposals, contractual documents, and the management and control of programs.

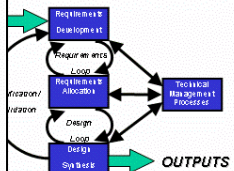
The objectives of the references on SE are to:

- Establish an environment founded on SE principles that delivers products that exhibit attributes of robustness:
  - Deliver promised capabilities within budget and schedule
  - Are easily scalable/expansible to meet future capability needs
  - Are demonstrated to expected contributors in manufacturing and use
- Reproduce and elevate key elements of SE as principal considerations in solicitation, award and execution processes.
- Provide simple leading indicators for proactive SE data:
  - Are measurable
  - Map to incentive strategies
  - Maximize support

1  
18/2004

**TO THE SYSTEMS ENGINEERING PROCESS**

Figure 2-1. Systems Engineering "Engine" Model



The SE process begins with a statement of the customer's capabilities and limitations, customer needs, objectives, and program constraints. Program constraints can be budget, schedule, risk, and other technical or programmatic constraints. These constraints are then used to develop a system architecture, which is then used to develop a system architecture. The SE process then develops a system architecture, which is then used to develop a system architecture. The SE process then develops a system architecture, which is then used to develop a system architecture.



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# ***Rotational Engineer Program***

- **Tailorable immersion experience**
  - **Case study development**
  - **SE Education**
  - **Refinement of tools, processes, practices**
  - **Systems engineering projects in program offices**
  - **Mentorship by experienced systems engineers**
  
- **Open to engineers and other functional professionals**
- **Available to government, academia, and industry personnel**



# Education and Training Division

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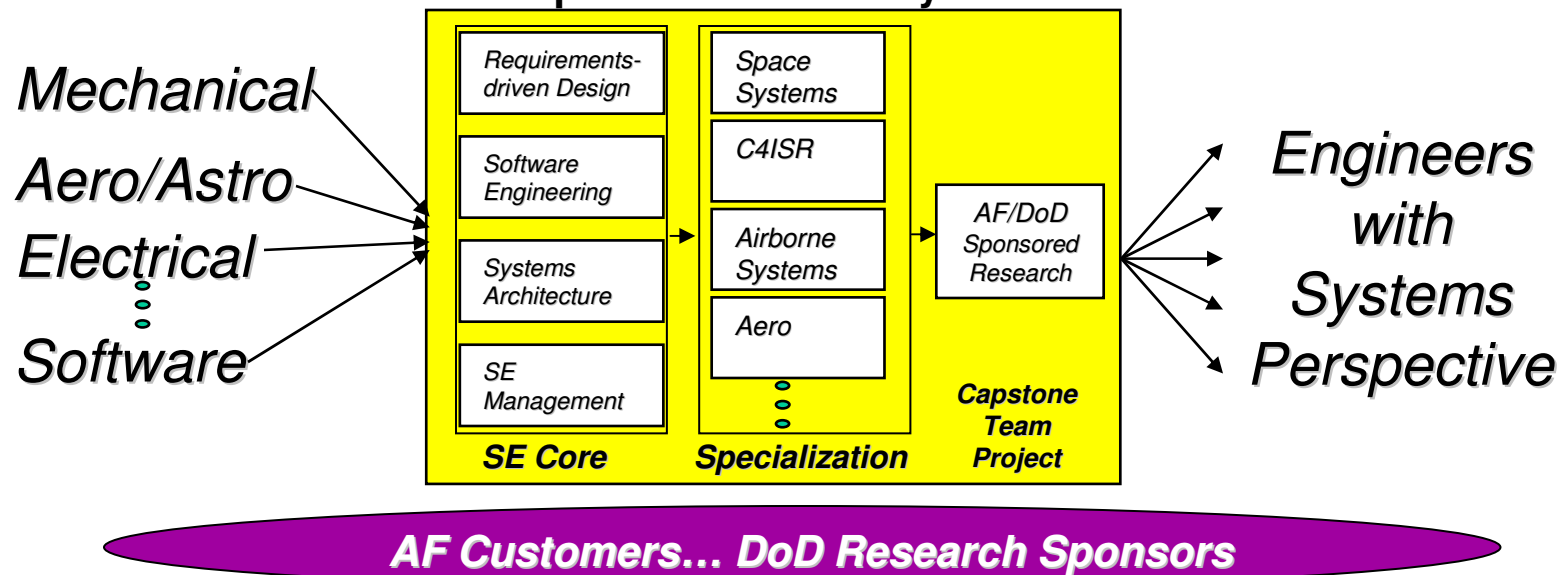
## ■ Graduate Program

### ■ Masters and Doctoral Degrees (Resident)

- Targeted toward junior officers and civilians in acquisition & engineering – 18 months

### ■ IDE Masters

- Broader in scope to include many career fields – 12 months



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# *Graduate Certificate Program*

- **Target Audience**
  - Individuals with an MS degree in any science and engineering field or unable to commit to full MS timeline
- **Curriculum**
  - Four core courses & capstone project – part-time 12-15 months
  - Currently available
    - Distance Learning at Kirtland, LA, Peterson AFBs
    - Resident/DL at Wright Patterson AFB
  - Expanding
    - Hill AFB and Tinker AFB – Fall 2006
    - Vision – anywhere
  - Awarding 20-25 certificates/year
- **Collaborative Education Agreements**
  - Apply certificate courses towards local Masters degree
  - University of New Mexico @ Kirtland AFB
  - Loyola Marymount University @ Los Angeles AFB



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# ***SE Continuing Education***

## **■ Established Courses**

- Systems Architecture (SYS183/283)**
- Systems Engineering (SYS 182/282)**
- Air Worthiness Certification (SYS 116)**
- Operational Safety, Suitability and Effectiveness (OSS&E) (SYS 155)**
- Software Professional Development Program**

## **■ Custom Developed Courses**

- NRO – Capability Development Course (SE 602)**
- SAF/XC – Capability Based Systems Development (SENG 540-NC/SENG 539-NC)**
- Focus Week Topics**



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# *Research*

- **AF and DoD-Sponsored Group Projects and Theses**
  - Relevant -- constantly soliciting topics
  - Inexpensive and responsive
  
- **Examples**
  - **Process Application**
    - Implementing Capability-Based Development
      - C4ISR (JBMC2) - JFCOM
      - Weapon Data Link – Eglin AAC, AFRL/MN
  - **SE Process Management**
    - Historical Analysis of Fighter Aircraft Development - AFMC
    - Case Study of Avionics Modernization Program - ASC
  
- **Improved Methods for Analysis and Design of Complex System of System level Concepts**
  - Role of architectures in concept analysis
  - Appropriate metrics and models
  - Example Applications
    - Net Centric Operations – SAF/XC, SOCOM
    - Cooperative Behavior and Control – AFRL/MN

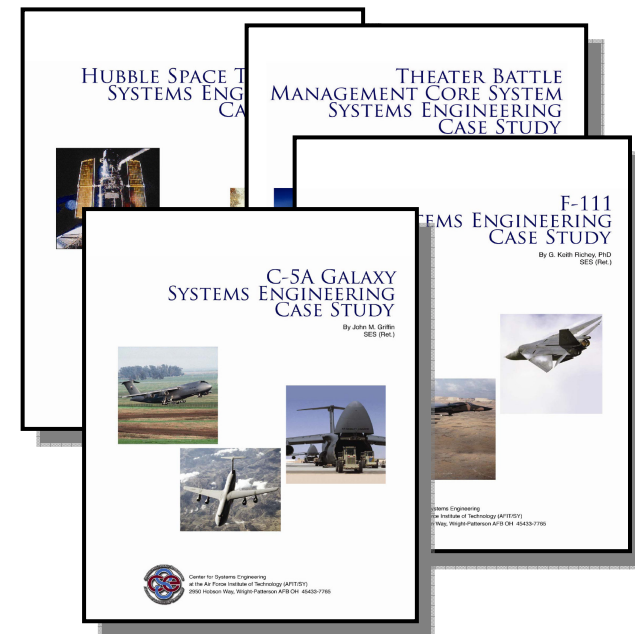




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# SE Case Study Development

- **Purpose: Support the teaching of SE principles**
  - **Consequences of SE & programmatic decisions on cost, schedule & effectiveness**
  - **Discussion of both successful and unsuccessful methods, processes, principles, tools and decision material**
  - **Highlight the importance of skills from multiple engineering disciplines**
- **Cover all portfolio domains – airborne, space, munitions, C2 and MIS**
- **Open to suggestions for future studies**







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# Sample Case Study Learning Principles

**C-5A Galaxy Systems Engineering Case Study**




By  
*John M. Griffin, SES (Ret.)*



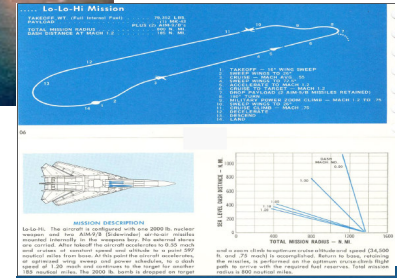
Center for System Engineering  
at the Air Force Institute of Technology (AFIT/SY)  
2950 Hobson Way, Wright Patterson AFB OH 45433-7765

**F-111 Systems Engineering Case Study**

By  
*G. Keith Richey, PhD SES (Ret.)*

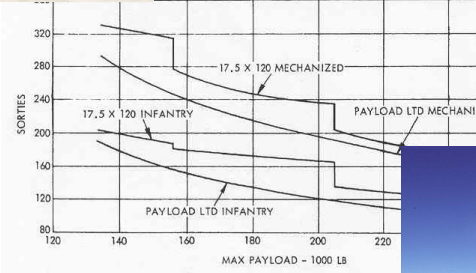


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**Direct Program Support**

OVERSIZE VEHICLES + JEEPS	
MECH DIV W/O TROOPS	38.9 X 10 <sup>6</sup> LB
INF DIV W/O TROOPS	24.8 X 10 <sup>6</sup> LB



- Requirements Feasibility (F-111) > JSF
- Aircraft Weight Growth (C-5) > F/A-22, JSF
- Concurrent Development (F-111) > Global Hawk
- Total Pkg Procure Concept (C-5) > Life Cycle Cost Mgmt



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# Coming Soon @ the AF CSE

- **Late Spring 2006**
  - **B-2 Case Study (in final editing)**
  
- **Summer 2006**
  - **JASSM Case Study (external coordination)**
  
- **Fall 2006**
  - **New cohort for SE Graduate Certificate Program**
  - **SE Masters degree by distance learning (in as little as 21 months)**
  
- **Spring 2007**
  - **Global Positioning System (GPS) and A-10 Case Studies**






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# CSE Website [www.afit.edu/cse](http://www.afit.edu/cse)

**SEARCH**    
...our site

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WHAT WE DO

WHAT WE CAN DO FOR YOU

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[SE Guidance](#)
[SE Resources](#)
[Case Studies](#)

[GSE Programs](#) | [Continuing Education](#) | [Academic Outreach Activities](#) | [Orientation Activities](#) | [Key Courses](#) | [MORE >>](#)

**UPCOMING EVENTS**  
...More Events

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**INCOSE 2006, the 16th International Symposium**  
7/9/06 at 12:00 PM ...[\[read more\]](#)

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**9th Annual NDIA Systems Engineering Conference**  
10/23/06 at 12:00 PM ...[\[read more\]](#)

**WELCOME!**

...To The Future of Systems Engineering

**NOTICE: Our site address has changed. Please update your bookmarks**

Welcome to the Air Force Center for Systems Engineering (CSE) web Site.


Our Center was created in Feb 2003 and we have been growing ever since. We are located

**LOGIN**  
...for Federal Affiliates

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Eligibility?



**EARLYBIRD**  
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# Summary

- AF Center for Systems Engineering is **YOUR** resource for
  - Workforce education
  - Consulting
  - Policy advice
  - Research
  - Case studies



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# *Questions*



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