Requirements-Driven and Partnership-Based

Systems Engineering & Training Education

Jerrell Stracener
Stephen Szygenda
James Rodenkirch

October 24, 2007

Agenda

- Systems Engineering Education

    - SMU (Systems Engineering Program) Overview

    - Program Development

- Systems Engineering Aerospace & Defense Initiative

- Systems Engineering Training

- Summary

Definitions

- Education
  - "can be thought of as the process of acquiring knowledge and information, usually in a formal manner… [including] learning how to think"
  - "typically measured by testing comprehension and knowledge retention"
- Training
  - "the process of gaining proficiency in some skill or skill set"
  - "usually measured by the learner's ability to demonstrate the learned skill by producing desired outcomes"

Definitions from the American Society of Quality, Certified Quality Manager Handbook

Agenda

- Systems Engineering Education

    - SMU (Systems Engineering Program) Overview

    - Program Development

- Systems Engineering Aerospace & Defense Initiative

- Systems Engineering Training

- Summary

Objective (of this section)

To present the highlights of a non-traditional university systems engineering program that was initiated and has been developed

–in response to aerospace & defense needs

–with extensive industry and government participation

–with DoD OSD / DAU / Military Services review & guidance

SMU-EMIS
System Engineering Program

Systems Engineering Program (SEP) Overview

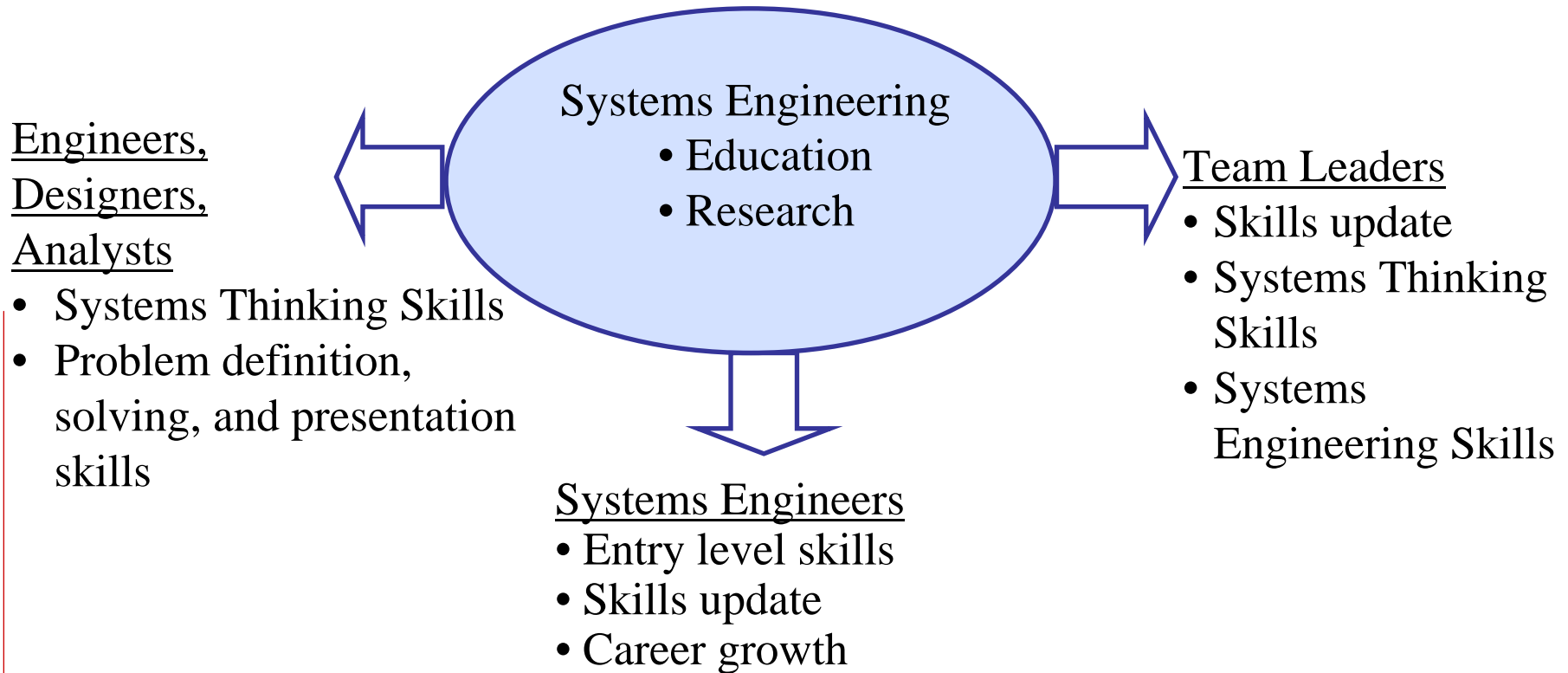**SMU-EMIS**
System Engineering Program

Mission

- Provide education relevant to the engineering of systems

- Foster and conduct research in selected areas of systems engineering

- Maintain a Systems Engineering Program in partnership with industry, government and associations that is responsive to current and emerging needs and requirements

SMU-EMIS
System Engineering Program

Driven by Industry and Government needs

Systems Engineering
- Education
- Research

Engineers, Designers, Analysts
- Systems Thinking Skills
- Problem definition, solving, and presentation skills

Team Leaders
- Skills update
- Systems Thinking Skills
- Systems Engineering Skills

Systems Engineers
- Entry level skills
- Skills update
- Career growth

To help you become a better engineer and manager

SMU-EMIS
System Engineering Program

Current Academic Program

```
┌─────────────────┐
│   Non-Degree    │──┐
│  Studies in SE  │  │              ┌──────────────┐        ┌──────────────┐
└─────────────────┘  │              │              │        │  PhD Applied │
                     ├──────────────│    MS SE     │────────│   Science    │
┌─────────────────┐  │              │              │        │  (SE Major)  │
│   Certificate   │──┘              └──────────────┘        └──────────────┘
│   Series in SE  │
└─────────────────┘
```
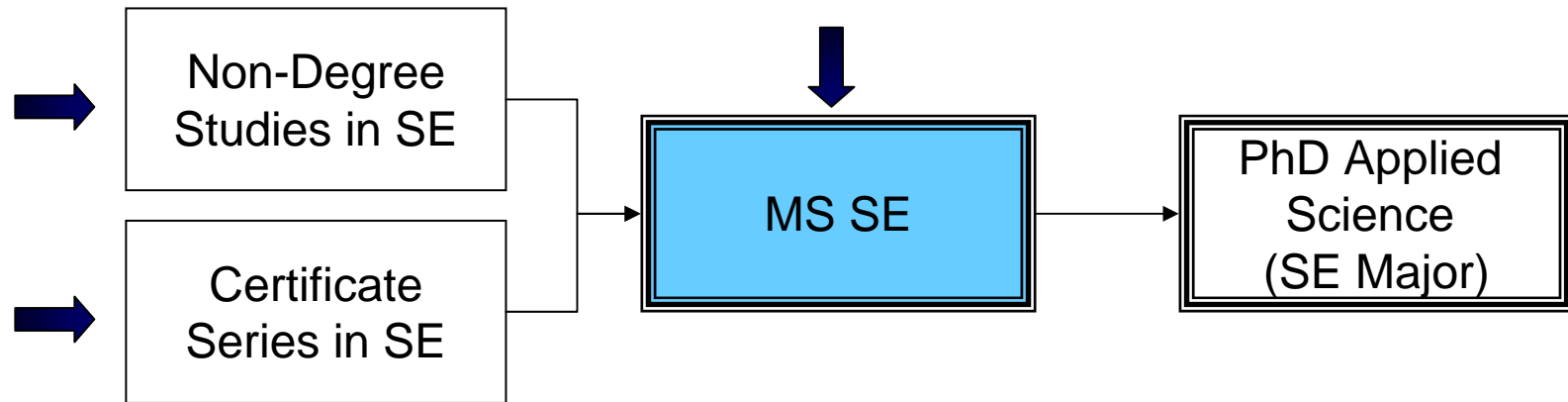
Academic Programs

- On-Campus and Distance Programs
  - MS SE
  - Fast Track Second Masters
  - Certificate Series in SE
  - Non-Degree Studies (for credit) in SE
  - PhD in Applied Science (Major in Systems Engineering)
- On-Site and Virtual On-Site Programs
  - MS SE
  - Fast Track Second Masters Program

SMU-EMIS
System Engineering Program

MS SE Program Options

- "Live" on-campus and Distance Students via DVD
  - Very flexible structure

- On-Site and Virtual On-Site
  - Offered "live" only
  - Very little flexibility

SMU-EMIS
System Engineering Program

MS SE Degree Requirements

- Thirty term-credit hours of graduate courses with a minimum GPA of 3.00 on a 4.00 scale.

- Satisfactory completion of the following five core courses:

EMIS 7300	Systems Analysis Methods
EMIS 7301	Systems Engineering Process
EMIS 7303	Integrated Risk Management
EMIS 7305	Systems Reliability, Supportability & Availability Analysis
EMIS 7307	Systems Integration and Test

MS SE Degree Requirements

- Satisfactory completion of one of the following tracks:
  - Systems Engineering Technology Track
  - Systems Engineering and Design Track
  - Logistics and Supply Chain Management Track
  - Systems Engineering Application Track
  - On-site (Executive Format) Track

SMU-EMIS
System Engineering Program

MS SE Degree Admission Requirements

- MS SE Admission Requirements

  - Bachelor of Science in engineering*, mathematics, or one of the quantitative sciences (*a Bachelor of Science in an appropriate engineering discipline is required for the Systems Engineering and Design track)

  - G.P.A. of at least 3.00 out of 4.00 scale in previous undergraduate and graduate study.

  - A minimum of two years of college-level mathematics, including at least one year of calculus.

Current Systems Engineering Courses

Course Number		Title	Date Approved
EMIS	7300	Systems Analysis Methods	April-2000
EMIS	7301	Systems Engineering Process	September-1994
EMIS	7303	Integrated Risk Management	September-1994
EMIS	7305	Systems Reliability, Supportability and Availability Analysis	Sept 1994/Rev Apr 2005
EMIS	7307	Systems Integration and Test	September-1994
EMIS	7310	Systems Engineering Design	April-2000
EMIS	7312	Software Systems Engineering	April-2000
EMIS	7315	Systems Architecture Development	April-2000
EMIS	7320	Systems Engineering Leadership	Apr 2000/Rev Apr 2005
EMIS	7330	Systems Reliability Engineering	April-2000
EMIS	7335	Human-Systems Integration	April-2005
EMIS	7340	Logistics Systems Engineering	April-2000
EMIS	7347	Critical Infrastructure Protection/Security Systems Engineering	April-2005
EMIS	8340	Systems Engineering Software Tools	April-2005
EMIS	8342	Six Sigma Systems Engineering	April-2005
EMIS	8348	Supply Chain Systems Engineering	April-2005

SMU-EMIS
System Engineering Program

Current Systems Engineering Courses

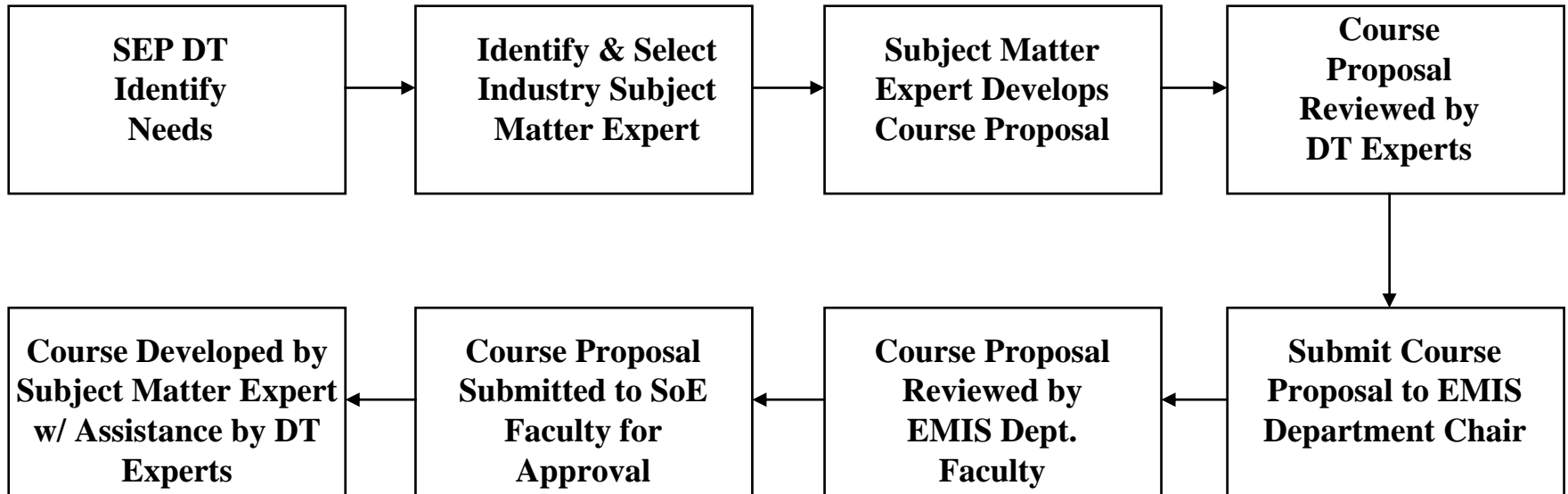| Course Number		Title	Date Approved
EMIS	7318	Systems Engineering Planning and Management	March-2007
EMIS	8305	Systems Life Cost & Affordability Analysis	March-2007
EMIS	8307	Systems Test and Evaluation	March-2007
EMIS	8310	Collective Systems Design	March-2007
EMIS	8315	Innovation Systems Design	March-2007

SMU-EMIS
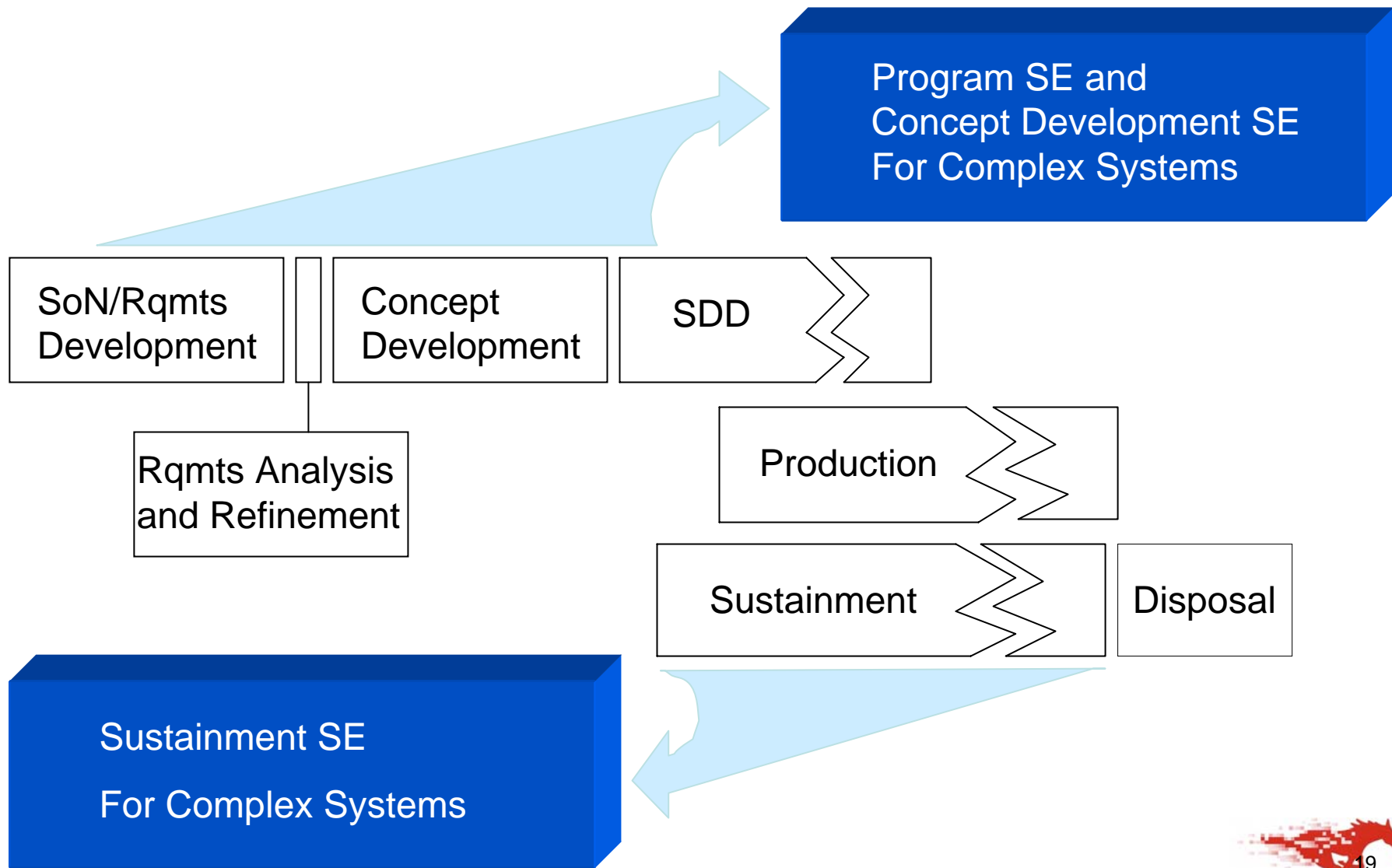**System Engineering Program**

In-Development Courses

•Introduction to Systems Engineering (Undergraduate Course)

•Systems Requirements Engineering

•Acquisition Logistics Systems Engineering

•Sustainment Logistics Systems Engineering

SMU-EMIS
System Engineering Program

Systems Engineering Course Development Process

```
┌──────────────┐     ┌──────────────┐     ┌──────────────┐     ┌──────────────┐
│   SEP DT     │     │ Identify &   │     │ Subject Matter│    │   Course     │
│  Identify    │ ──▶ │ Select       │ ──▶ │ Expert Develops│──▶│  Proposal    │
│   Needs      │     │ Industry     │     │ Course Proposal│   │  Reviewed by │
│              │     │ Subject      │     │              │     │  DT Experts  │
│              │     │ Matter Expert│     │              │     │              │
└──────────────┘     └──────────────┘     └──────────────┘     └──────────────┘
                                                                       │
                                                                       ▼
┌──────────────┐     ┌──────────────┐     ┌──────────────┐     ┌──────────────┐
│ Course       │     │ Course       │     │ Course       │     │ Submit Course│
│ Developed by │ ◀── │ Proposal     │ ◀── │ Proposal     │ ◀── │ Proposal to  │
│ Subject      │     │ Submitted to │     │ Reviewed by  │     │ EMIS         │
│ Matter Expert│     │ SoE Faculty  │     │ EMIS Dept.   │     │ Department   │
│ w/ Assistance│     │ for Approval │     │ Faculty      │     │ Chair        │
│ by DT Experts│     │              │     │              │     │              │
└──────────────┘     └──────────────┘     └──────────────┘     └──────────────┘
```

SMU-EMIS
System Engineering Program

SMU Systems Engineering Research Focus

Program SE and
Concept Development SE
For Complex Systems

SoN/Rqmts Development	Concept Development	SDD

Rqmts Analysis and Refinement

Production

Sustainment

Disposal

Sustainment SE

For Complex Systems

19

Funded Research

Funded by	Title	Dates	Amount
U.S. DoD DAU / NAVYSPAWAR	System Engineering in Science and Technology	October 1, 2007 – September 31, 2008	$40.000
Lockheed Martin Aeronautics Co.	Development of Response Framework to Regional Systems Engineering Education, Research and Training Needs	August 10, 2007 December 15, 2007	$40,000
U.S. Army- ISEC	Phase I: Re-engineering Not-for-profit Technical Organizations for Transition to Market-Driven Enterprises: Strategies, Models, and Application to the Technical Information Center	September 15, 2005- September 20, 2006	$89,488
Lockheed Martin Missiles & Fire Control	Potential Capability Maturity Model, Integrated^{TM} (CMMI) Generic, Practice (GP) and Specific Practice (SP) Tailoring Approaches	September 15, 2005- May 31, 2006	$50,000
U. S. Navy-SPAWAR	Phase II: CIP Systems Engineering for Critical Infrastructure Protection Center (CIPC)	November 16, 2004-February 28, 2005	$60,000
U. S. Navy-SPAWAR	Phase I: CIP Systems Engineering	April 13, 2004 –September 30, 2004	$60,000

SMU-EMIS
System Engineering Program

PhD AS (SE) Student Focus

- Target Students
  - Primary – Full-time Aerospace/Defense Sector employees; industry and government
  - Secondary – Full-time students funded by government and industry research grants
- Target Students Profile
  - Engineering and other Technical degrees
  - Work experience in Aerospace/Defense sector
  - U.S. Citizens with active DoD Security Clearances

SMU-EMIS
System Engineering Program

Resident SE Faculty

- Jerrell Stracener, Ph.D.   Scholar in Residence & Founding Director
                                       (Vought/Northrop Grumman)

- Steve Szygenda, Ph.D.*   Professor, Cecil H. Green Chair
                                       (AT&T Bell Labs)

- Junfang Yu, Ph.D. *   Assistant Professor
                                       (I2)

- Eli Olinick, Ph.D.*   Associate Professor

- Mitch Thornton, Ph.D.*   Professor
                                       (E-Systems Greenville)

*= Part time SE Program

SE Adjunct Faculty

- Arunski, Karl P.E.   Raytheon Intelligence and Info. Sys.
- Bell, Bob   Lockheed Martin Aeronautics Company
- Bell, Dave , DE   Mitre
- Broihier, Ann   Raytheon Network Centric Systems
- Chollar, Jr. George , PhD   Statistical Design Institute, LLC
- Cluff, Kevin PhD, P.E.   Abbott Laboratories
- Cowin, Howard   Lockheed Martin Missiles & Fire Control
- Daley, Gunter   Siemens Government Services
- Delzer, Dennis, PhD   Raytheon Space and Airborne Systems
- Durchholz, Matt, PhD   Lockheed Martin Missiles & Fire Control
- Hinderer, Jim, PhD   Raytheon Space and Airborne Systems
- Hopper, Mike, DE   L-3 Communications Integrated Systems
- Ibarra, Gerard, PhD   Ibarra & Associates
- Lipp, John, PhD   Lockheed Martin Missiles & Fire Control
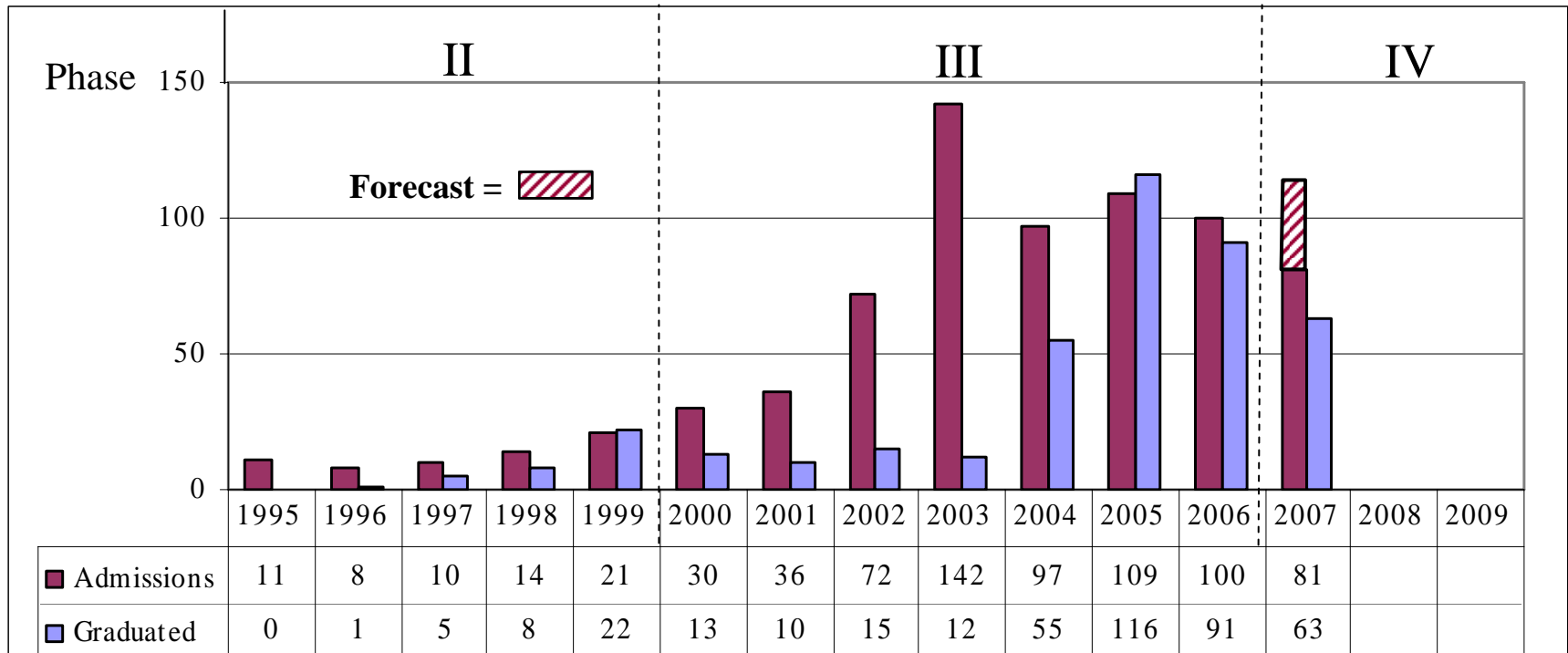
SE Adjunct Faculty continued

- Lyons, Jan, PhD   Lockheed Martin Missiles & Fire Control (Ret.)
- Muto, William, PhD   GE Medical Systems
- Oshana, Rob   Freescale Semi-conductor
- Rynas, Chris   Raytheon Space and Airborne Systems
- Sampson, Mark   Siemens Automation
- Skinner, Steve   Bell Helicopter
- Vacante, Russell   US DoD defense Acquisition University

SMU-EMIS
System Engineering Program

SMU System Engineering Program
MS SE Admissions and Graduates

Phase II / III / IV

Forecast = (hatched)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Admissions	11	8	10	14	21	30	36	72	142	97	109	100	81		
Graduated	0	1	5	8	22	13	10	15	12	55	116	91	63		

Cumulative admitted as of September 14, 2007: 731
Cumulative graduated as of August 15, 2007: 411
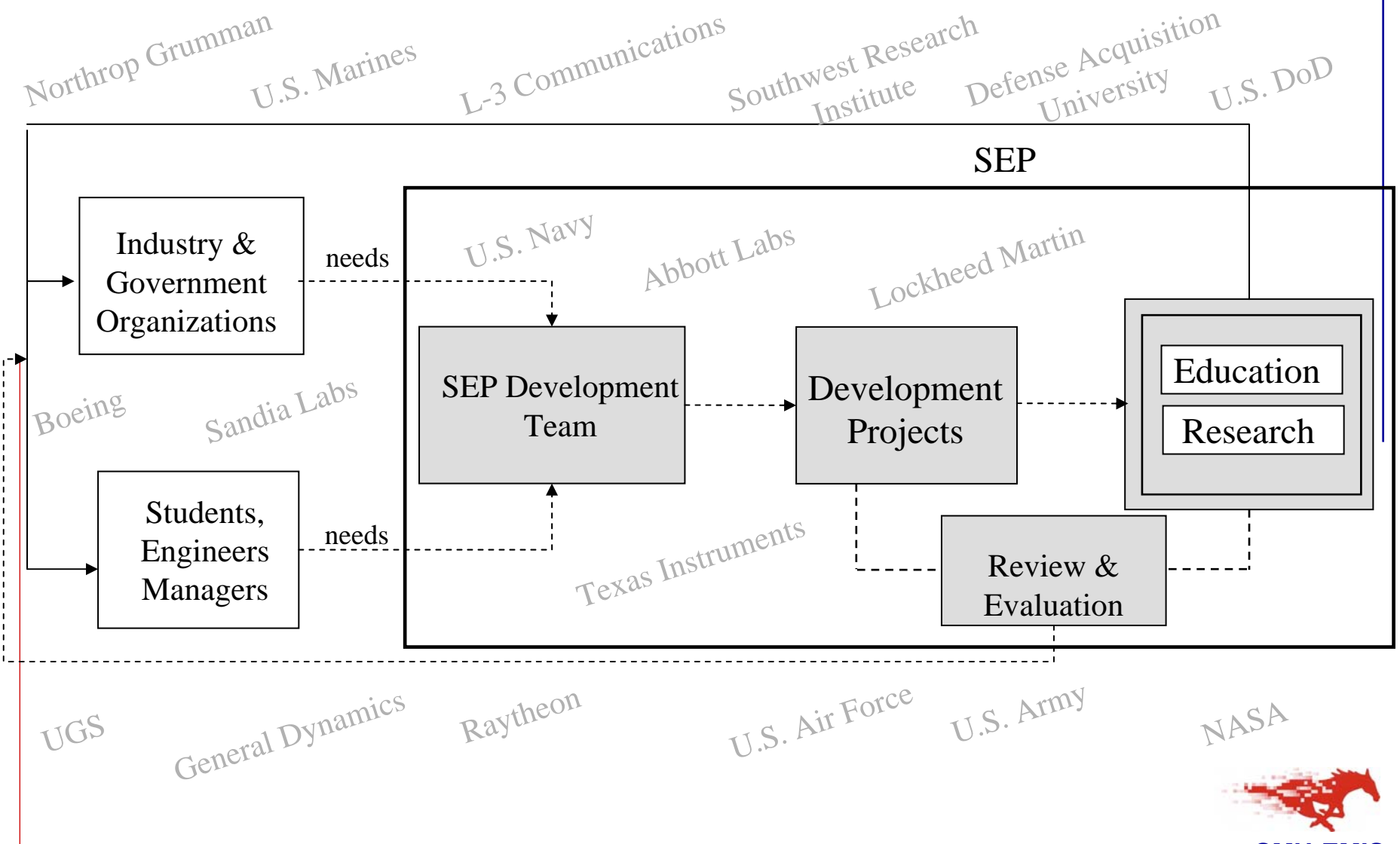Note: Does not include NTU Students

SMU-EMIS
System Engineering Program

SEP Development

SMU-EMIS
System Engineering Program

Development Model
Industry- Government - Student Partnership

Northrop Grumman   U.S. Marines   L-3 Communications   Southwest Research Institute   Defense Acquisition University   U.S. DoD

SEP

| Industry & Government Organizations | needs |

U.S. Navy   Abbott Labs   Lockheed Martin

SEP Development Team

Development Projects

Education

Research

Boeing   Sandia Labs

| Students, Engineers Managers | needs |

Texas Instruments

Review & Evaluation

UGS   General Dynamics   Raytheon   U.S. Air Force   U.S. Army   NASA

SMU-EMIS
System Engineering Program

Development Highlights

- Initiated Feasibility Study……………………...September 1991
- Established ad hoc SE Advisory Council…….……January 1992
- Initiated Proposal………………………………...February 1992
- Investigated Launching SEP at…………………..April 1993
  - UT Arlington
  - UT Dallas
  - SMU

(estimated 400 to 500 admissions in first 10 years)

- Selected SMU……………………………………...June 1993
- Delivered Proposal to SMU SoE……………………...July 1993
- SMU Board of Trustees Approved Proposal…...December 1994
- MS SE Degree Program Launched …………………...Jan. 1995

ad hoc Systems Engineering Advisory Council 1991-1995

Name	Organization	Location
Arunski, Karl, P.E.**	Texas Instruments, Inc.	Dallas, TX
Coyne, Bill	American Airlines	Fort Worth, TX
Davis, Joe, P.E.	Loral Vought Systems	Grand Prairie, TX
Dean, Joe, Ph.D.	Lockheed Martin Tactical Aircraft Systems	Fort Worth, TX
Halligan, Charles	General Electric Transportation Systems	Erie, PA
Hanson, Harold	EDS	Plano, TX
Harris, Doug, DE	Southern Methodist University	Dallas, TX
Jain, Anant, Ph.D.	Rockwell International	Richardson, TX
Kolson, Joanna	Federal Reserve Bank	Dallas, TX
Luhks, Ronald, Ph.D.	Loral Aerospace	Houston, TX
Martin, Kim	Abbott Labs	Irving, TX
Pearse, Derek	Hughes Training, Inc.	Arlington, TX
Ransom, C. J. , Ph.D.	Bell Helicopter Textron	Arlington, TX
Stracener, Jerrell, Ph.D.*	Vought/Northrop Grumman Corp.	Grand Prairie, TX
Shaw, Terry, Ph.D.	E-Systems	Greenville, TX
Steinheimer, Steven L.	E-Systems	Garland, TX
Tucker, Scott	Hughes Training, Inc.	Arlington, TX
Vacante, Russell, Ph.D.	Army Management Staff College	Fort Belvoir, VA
Zsak, Mike	U.S. DoD OSD	Washington, DC

*=Chairman

**=Vice Chairman

SMU – **EMIS**
System Engineering Program

SEP Business Structure

- Multidisciplinary Program – Department Independent

- Build on Aerospace & Defense (A&D) Base & Needs

- Focus on part-time students employed full-time by the A&D sector – Industry & Government

- Utilize SE subject matter experts employed by A&D for Adjunct Faculty for teaching most courses - Scalable

- Grow number of resident faculty to develop SE research & PhD SE programs and teach specialized advanced SE courses

ad hoc SE Council recommendations

Development Highlights

- Phase I - Concept Exploration & Proposal (Sept 1991 – Dec 1994)

- Phase II - Start-Up and Development (Jan 1995 – Dec 1999)

- Phase III - Rqmts. Driven Development (Jan 2000 – Dec 2006)

- Phase IV - Focused Development (Jan 2007 – Dec 2011)

SMU – **EMIS**
System Engineering Program

Executive Reviews

- U.S. DoD Defense Acquisition University
  - Dr. Russell Vacante, Director

- Lockheed Martin Aeronautics
  - Tom Blakely, VP Engineering
  - Bob Manny, VP Enterprise Integration
  - Jim Engelland, VP Systems Engineering & Chief Engineer F-35
  - Frank Cappuccio, VP Advanced Development Programs
  - Bill Anderson, VP Engineering

- Lockheed Martin Missles & Fire Control
  - Glenn Miller, VP Technical Operations
  - Bill Cannon, VP Engineering

- Raytheon Information and Intellegence Systems
  - John Grimm, VP Engineering

SMU – **EMIS**
System Engineering Program

Executive Reviews

- U.S. DoD OSD
  - Bob Skalamera, Deputy Director, Systems and Software Engineering
  - Mark Schaeffer, Deputy Director, Defense Systems, and Director, Systems Engineering, OUSD (AT&L)
  - Dr. James Roche, Secretary of the Air Force
  - Mike Zsak, Director, Systems Engineering
  - Mike McGrath, Director CALS

- Raytheon Space & Airborne Systems
  - Bob Kern, VP Engineering
  - Janne Ackerman, Director North Texas Engineering
  - Bob Rassa, Director Systems Supportability

- Vought Aircraft Company
  - Eric Smith, Senior VP Programs
  - Joe Ayers, VP Engineering

- L-3 Communications Integrated Systems
  - Dr. Val Gavito, VP Engineering & Strategic Initiatives

SMU – **EMIS**
System Engineering Program

DAU – SMU SEP Partnerships

- U.S. DoD Defense Acquisition University (DAU) and SMU Systems Engineering Program (SEP) MoU

    1. Provide members of U.S. DoD Acquisition, Technology, and Logistics (AT&L) workforce the opportunity to apply courses provided by DAU towards a SMU graduate degree in systems engineering.
    2. Provide SMU SEP students access to DAU courses, and
    3. Collaboratively develop research topics and projects in systems engineering.

- U.S. Navy SPAWAR Charleston and SMU SEP Cooperative Research and Development Agreement (CRADA) in work

SMU-EMIS
System Engineering Program

National Defense Industrial Association
SYSTEMS ENGINEERING DIVISION

STEERING COMMITTEE
Carlos Galvan - SPC
Dr. Ronald Johnson - Boeing
Pat Bevins - GD, Electric Boat
Hank Eyster - Harris Corp
Bill Chen - United Defense
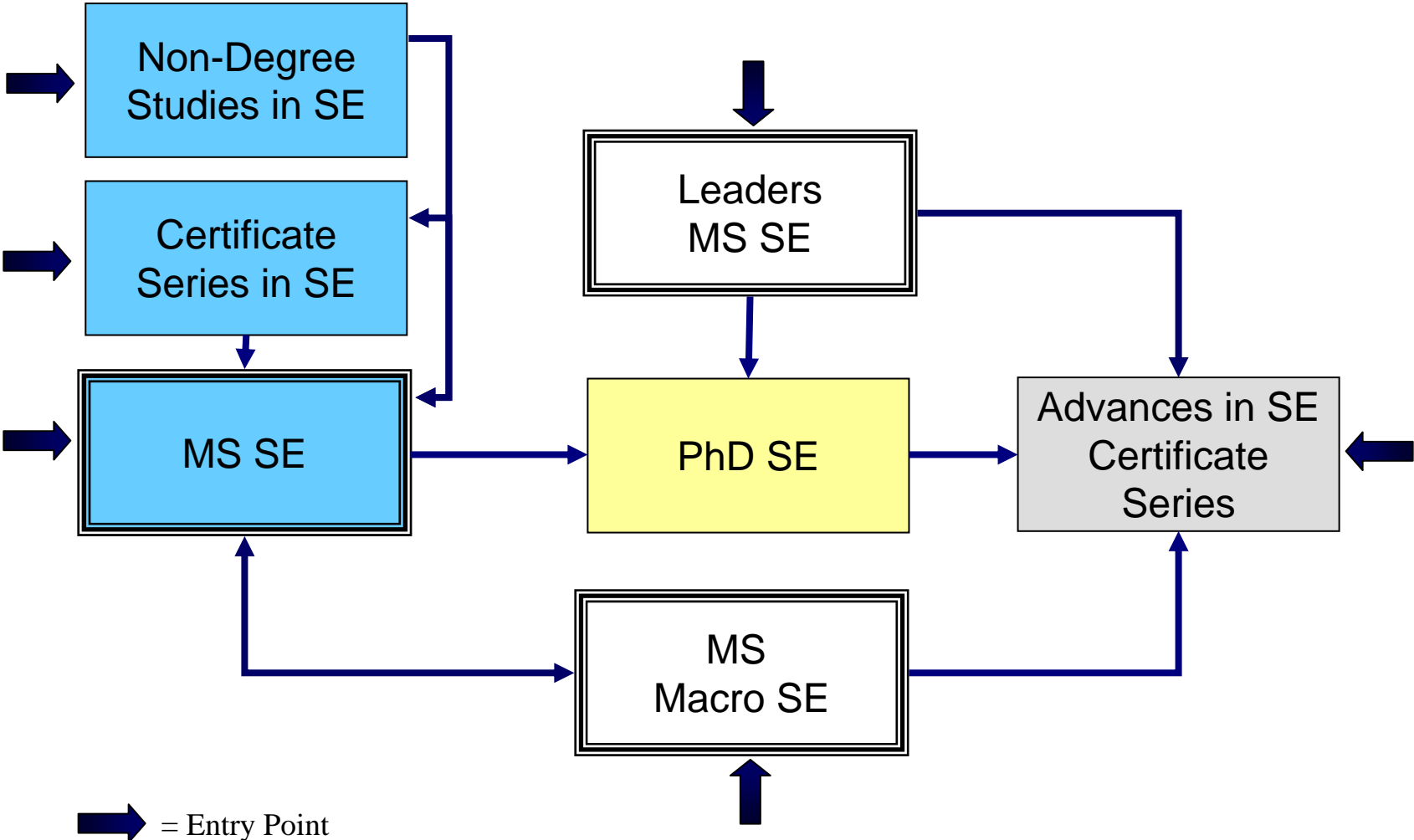Nick Fritz - Burdeshaw Associates
Jeff Dutton - Sverdrup
Dr. Rob't. Lentz - General Dynamics
Jim Sturges - Lockheed Martin
open- ManTech Int'l
Richard Rothman - SA IC
Brooks Nolan - L3 COM
Aaron Fuller - CSC

Affiliations & Liaisons
Stan Siegel & Ed Viau- AIA
Ken Ptack - INCOSE
Jerrell Stracener - SMU
Steve Kuehl - AIAA
Paul Croll - IEEE Computer Soc.
Mike Cardinale - IEEE AESS
Rene Smith - SOLE
Les Orlidge - IEEE SCC20
Elliot Axelband - RAND Corp
Greg DiBenedetto - GEIA
Open - Mitre
Brian Gallagher - SEI

CHAIR
Bob Rassa
Raytheon
(IEEE)

VICE-CHAIR
Hal Wilson
Northrop Grumman

(EIA)

GOV'T Steering Group
Mark Schaeffer - OSD (Chair)
Dr. V. Garber - OSD(AT&L)DS
RADM Kate Paige - MDA
Mark Wilson - USAF
Jesse McCurdy - USN
Lou Kratz - OSD
Robert W. Schmitt- DCMA
Art Pyster - FAA
Open - NASA
Bob Skalamera - OSD(AT&L)
John Osterholz - OSD(C3I)
RADM Mike Mathis - USN/JS
Open - Army

**NDIA
COMMITTEE EXECUTIVE**
Sam Campagna

**CMMI Project
Co-Chairs**
Mike Nicol, USAF
Bob Rassa, Raytheon

**Interoperability
Committee**
Tom Croak,CSC
Jack Zavin, OASD(NII)

**Automatic Test
Committee**
DaveWallhermfechtel,Boeing
Les Orlidge, AAI Corp
Joe O'Connell, Boeing

Systems Engineering Effectiveness Committee	Education & Training Committee	Open Systems Committee	Modeling & Simulation Committee	Integrated Diagnostics Committee	The Software Committee	Quality Assurance Committee	Life Cycle Support Committee
Gordon F. Neary Boeing Mr. Mark Wilson USAF	Elliot Axelband Rand Corp John Snoderly Defense Acquisition University	Lt Col Ken Flowers USA (OSJTF) Hal Wilson Northrop Grumman	Jim Hollenbach Simulation Strategies Mike Johnson Boeing (Seattle)	Howard Savage SCI Dennis Hecht Boeing (St Louis)	Was Disbanded Dec 7, 2003	Cyndi Reichardt DCMA - HQ PaulThornberry NSWC - Corona Industry-open	Joel Moorvitch Raytheon Jerry Beck DUSD(AT&L)LP&P

SMU-EMIS
System Engineering Program

Plans

SMU-EMIS
System Engineering Program

Baseline Academic Programs

Non-Degree Studies in SE

Certificate Series in SE

MS SE

Leaders MS SE

PhD SE

Advances in SE Certificate Series

MS Macro SE

= Entry Point

Systems Engineering Education is a Journey – Not a Destination

SMU-EMIS
System Engineering Program

Summary

Summary

- A SE Education & Research program with focus on:
  - aerospace & defense
  - development of complex Systems (as opposed to acquisition)
- Track record of success in responding to Customer needs
  - SEP Established in 1994
  - Growing Enrollment and expanding scope
  - Extensive & growing industry and government network
- SE is currently a HOT topic (but lacks branding)
  - Emphasis on SE by U.S. DoD and defense contractors
  - High and increasing Student interest in SE (not in becoming a SE, but rather in utilizing SE education to become a "letter" engineer or for career advancement)
  - Increasing number of University SE Programs (but many are commingled with other programs)
- The SEP is severally resource constrained for PhD SE generation and research

SMU – **EMIS**
System Engineering Program

Agenda

- Systems Engineering Education

    - SMU (Systems Engineering Program) Overview

    - Program Development

- Systems Engineering Aerospace & Defense Initiative

- Systems Engineering Training

- Summary

Description

- Research based exploration and definition of a framework for effective response to regional industry and government systems engineering-education,-research and-training & consulting needs.

- Initial focus on the aerospace/ defense/security sectors.

- Expansion to other sectors will be guided by regional needs.

ad hoc
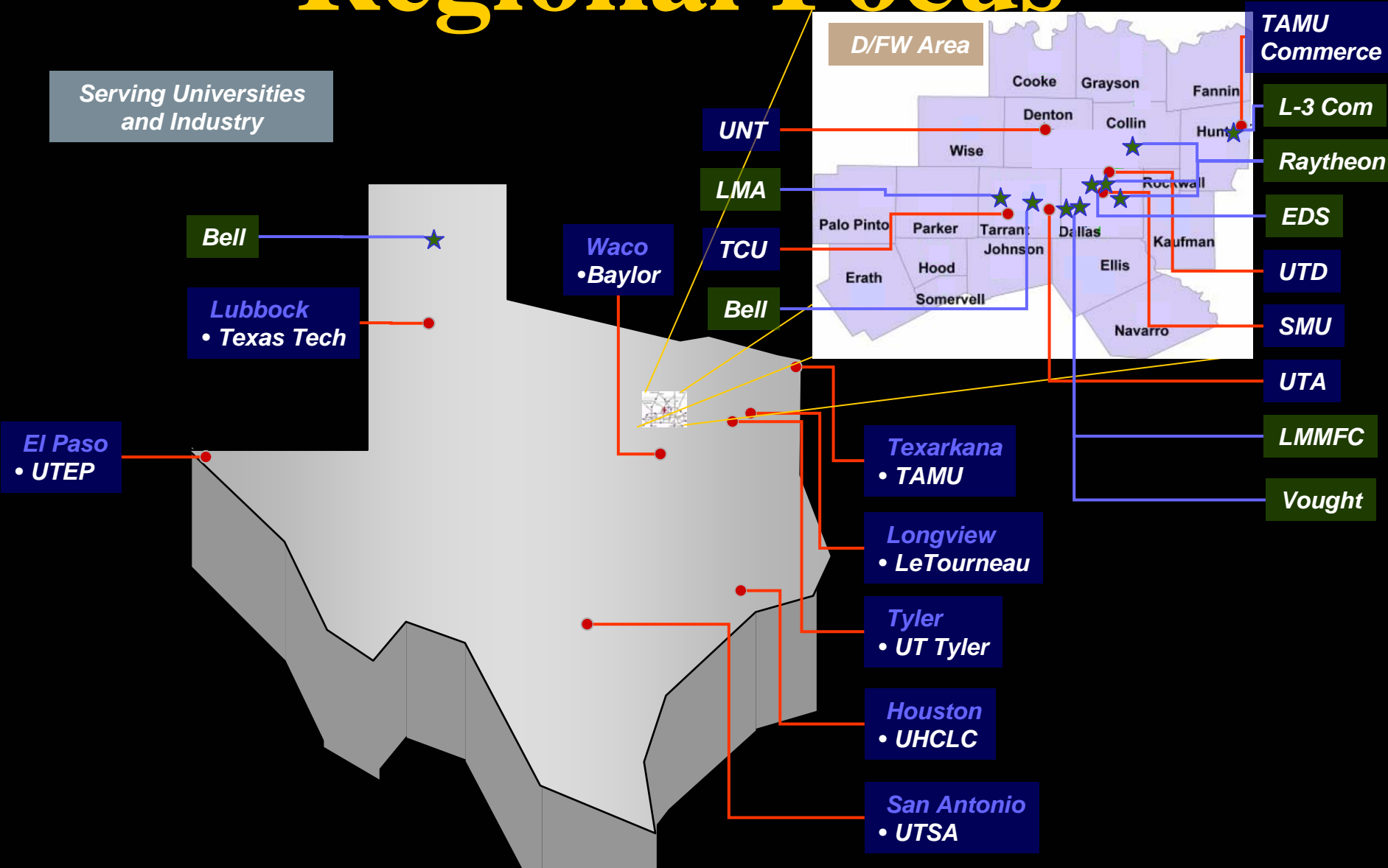Systems Engineering
TIGER TEAM

Statement of Work

- Specific tasks necessary to evolve the preferred response framework include the following:
  - Industry and government needs captured and assessed
  - Identification and analysis of regional capabilities and resources, both current and planned
  - Analysis to determine gaps and overlaps with respect to needs
  - Explore and define alternatives for responding to needs, including benchmarking the nations best.
  - Evaluate and refine alternates to evolve the preferred concept, a regional framework.
  - Strawman regional framework development plan

- To ensure a structured technical approach and balanced solution, the systems engineering process will be utilized in the planning and conduct of this research project.
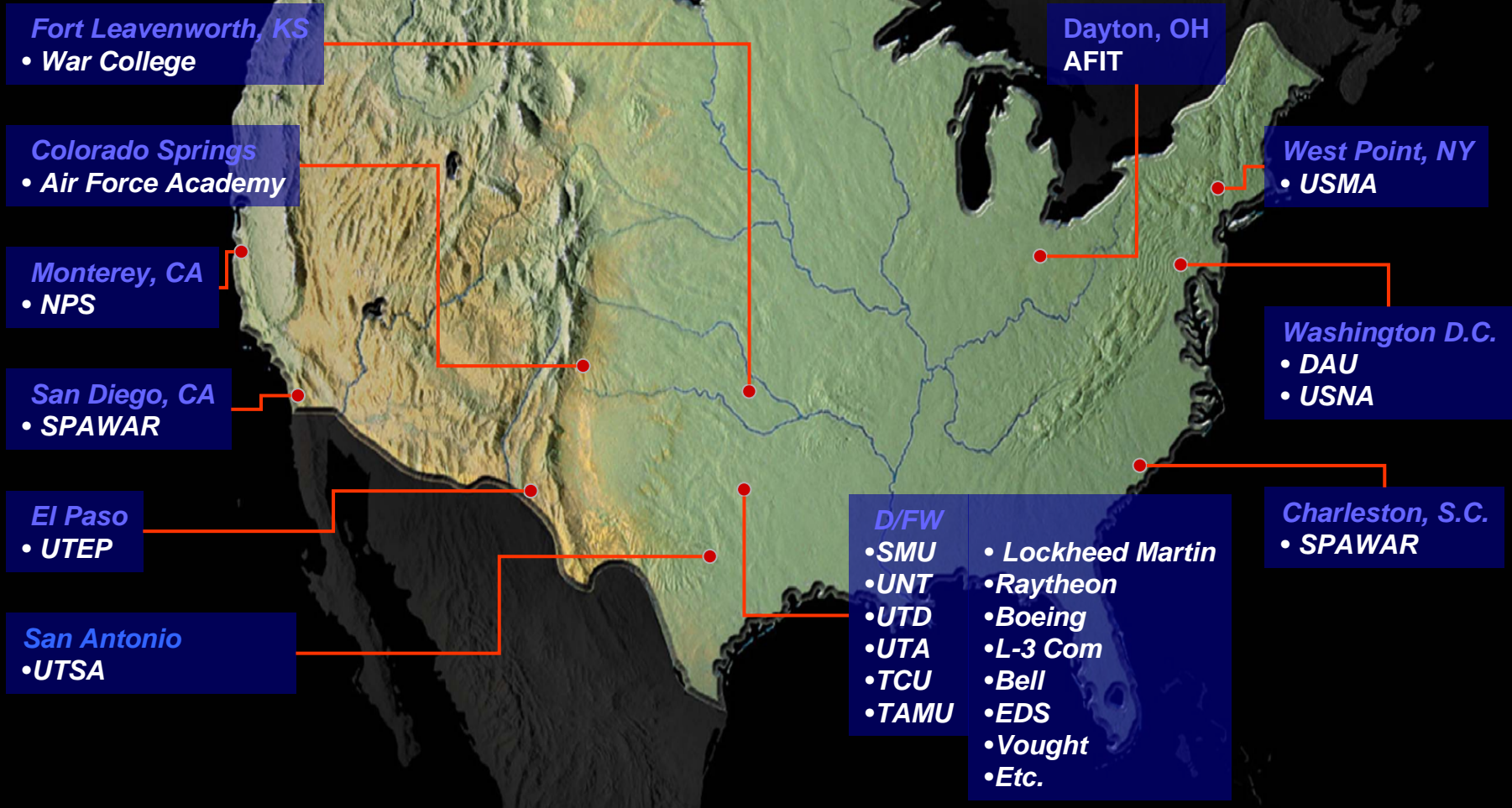
ad hoc
Systems Engineering
TIGER TEAM

Regional Focus

D/FW Area

Serving Universities and Industry

- TAMU Commerce
- L-3 Com
- Raytheon
- EDS
- UTD
- SMU
- UTA
- LMMFC
- Vought

UNT
LMA
TCU
Bell

Bell

Lubbock
• Texas Tech

El Paso
• UTEP

Waco
•Baylor

Texarkana
• TAMU

Longview
• LeTourneau

Tyler
• UT Tyler

Houston
• UHCLC

San Antonio
• UTSA

Leveraging Regional Capabilities to Meet Regional Needs

National Connectivity

Fort Leavenworth, KS
• *War College*

Colorado Springs
• *Air Force Academy*

Monterey, CA
• *NPS*

San Diego, CA
• *SPAWAR*

El Paso
• *UTEP*

San Antonio
• *UTSA*

Dayton, OH
AFIT

West Point, NY
• *USMA*

Washington D.C.
• *DAU*
• *USNA*

Charleston, S.C.
• *SPAWAR*

D/FW
• *SMU*
• *UNT*
• *UTD*
• *UTA*
• *TCU*
• *TAMU*

• *Lockheed Martin*
• *Raytheon*
• *Boeing*
• *L-3 Com*
• *Bell*
• *EDS*
• *Vought*
• *Etc.*

Regional Center with National Ties

Mobilize Resources and Build on Experience
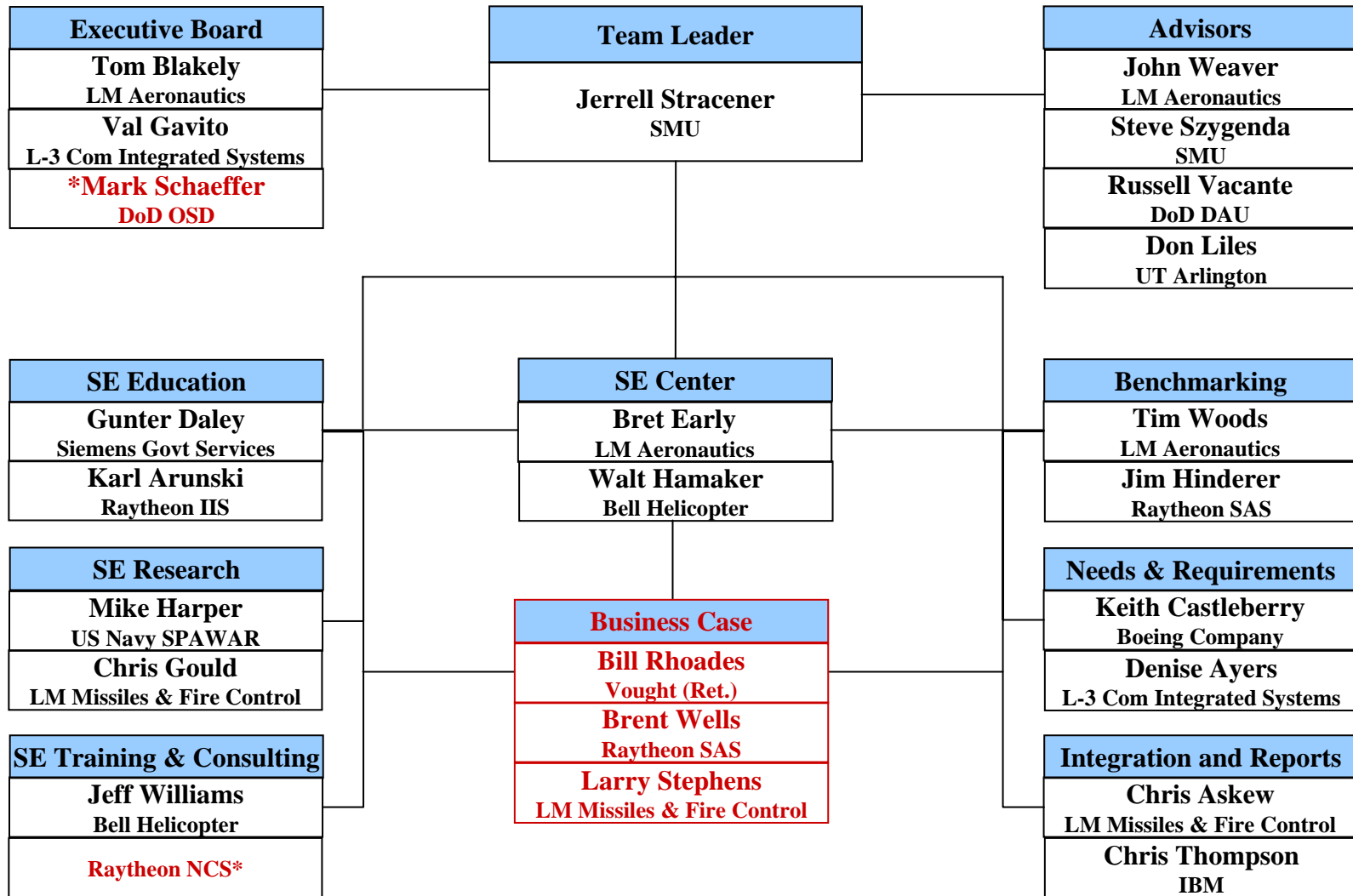
- Initiate SE Tiger Team of members Industry, Government and University Affiliations

- Utilize Previous Start-Ups as Guides
  - SAE RMSL Division (G-11): 1985 - 2000
  - CALS Connectivity Center (CCC) / UTA ARRI: 1989 - 1999
  - SMU Systems Engineering Program: 1991 - Present

ad hoc
Systems Engineering
**TIGER TEAM**

Organization

Executive Board	
Tom Blakely	LM Aeronautics
Val Gavito	L-3 Com Integrated Systems
*Mark Schaeffer	DoD OSD

Team Leader
Jerrell Stracener
SMU

Advisors	
John Weaver	LM Aeronautics
Steve Szygenda	SMU
Russell Vacante	DoD DAU
Don Liles	UT Arlington

SE Education	
Gunter Daley	Siemens Govt Services
Karl Arunski	Raytheon IIS

SE Center	
Bret Early	LM Aeronautics
Walt Hamaker	Bell Helicopter

Benchmarking	
Tim Woods	LM Aeronautics
Jim Hinderer	Raytheon SAS

SE Research	
Mike Harper	US Navy SPAWAR
Chris Gould	LM Missiles & Fire Control

Business Case	
Bill Rhoades	Vought (Ret.)
Brent Wells	Raytheon SAS
Larry Stephens	LM Missiles & Fire Control

Needs & Requirements	
Keith Castleberry	Boeing Company
Denise Ayers	L-3 Com Integrated Systems

SE Training & Consulting	
Jeff Williams	Bell Helicopter
Raytheon NCS*	

Integration and Reports	
Chris Askew	LM Missiles & Fire Control
Chris Thompson	IBM

*= to be invited

organizational affiliation – not representation

Research Process

Requirements, Boundaries & Constraints

- Goal
- Objectives
- Vision
- Plan

Regional SE Center
Concept Exploration
& Definition using
the SE Process
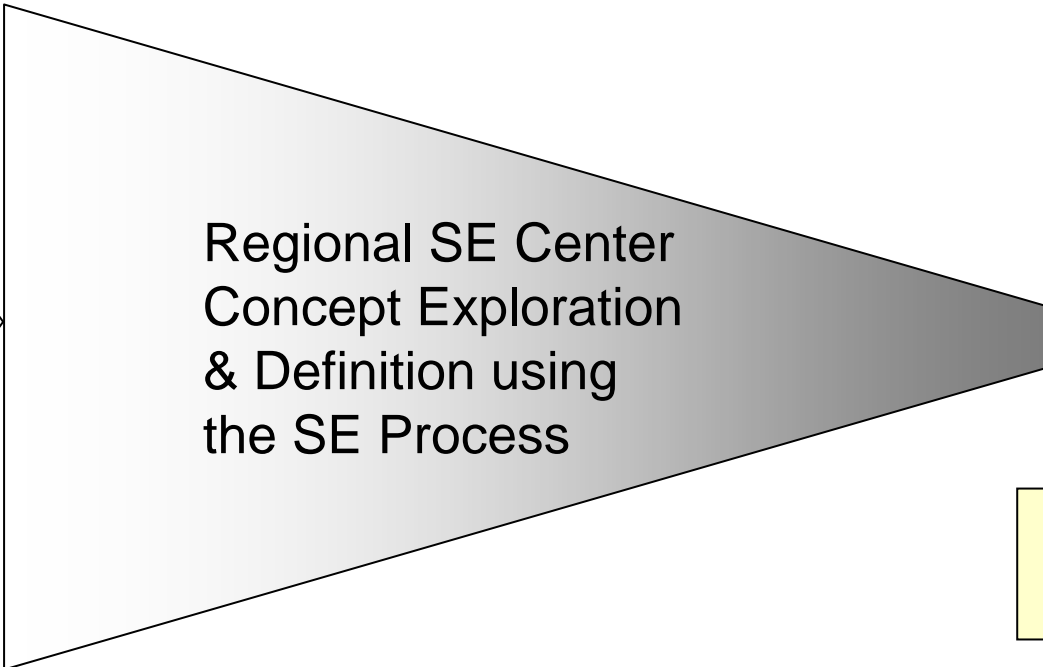
Requirements-Driven Solution

Report

Proposal

Ground rules and Assumptions

August 10, 2007

December 7, 2007
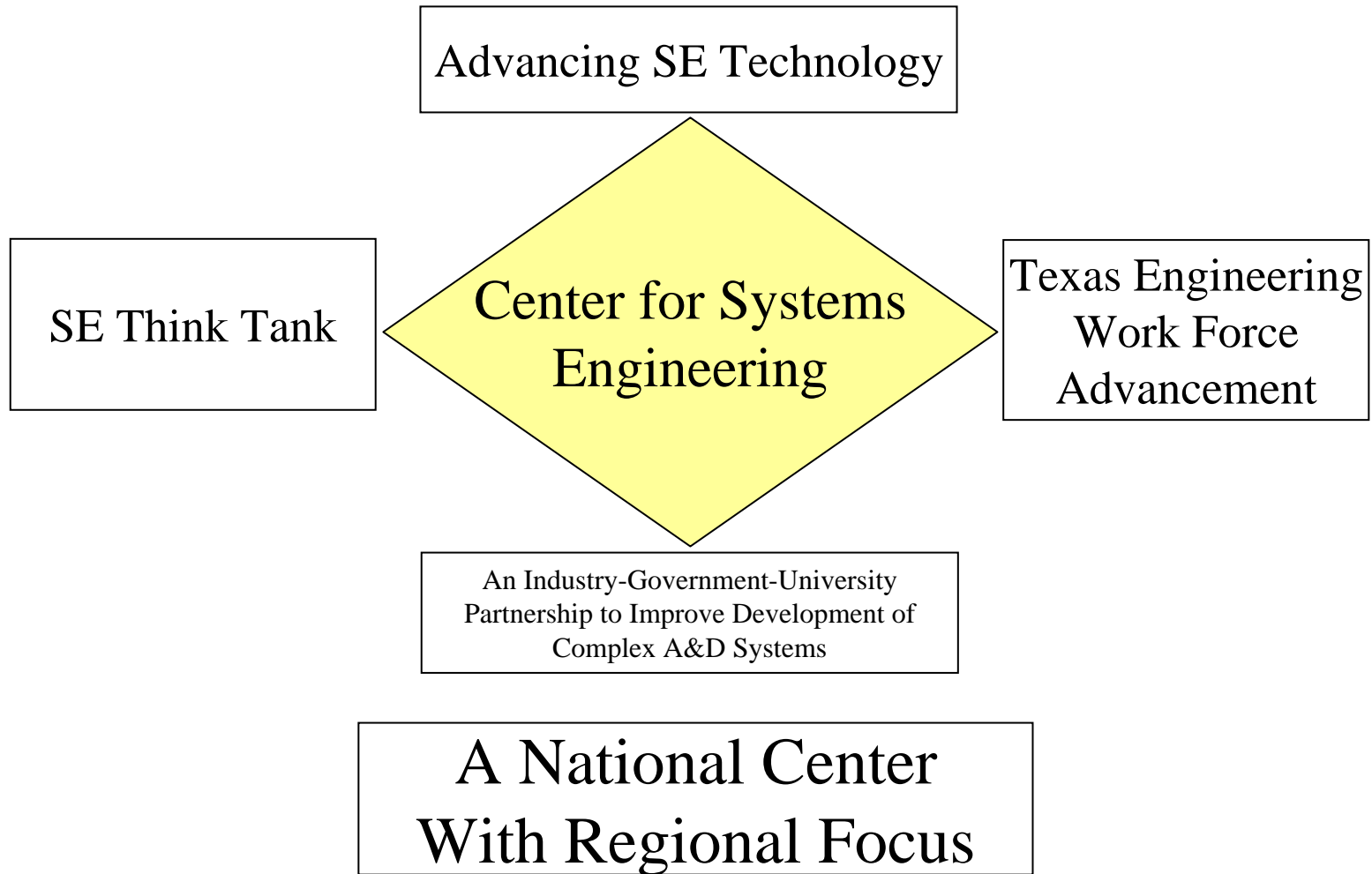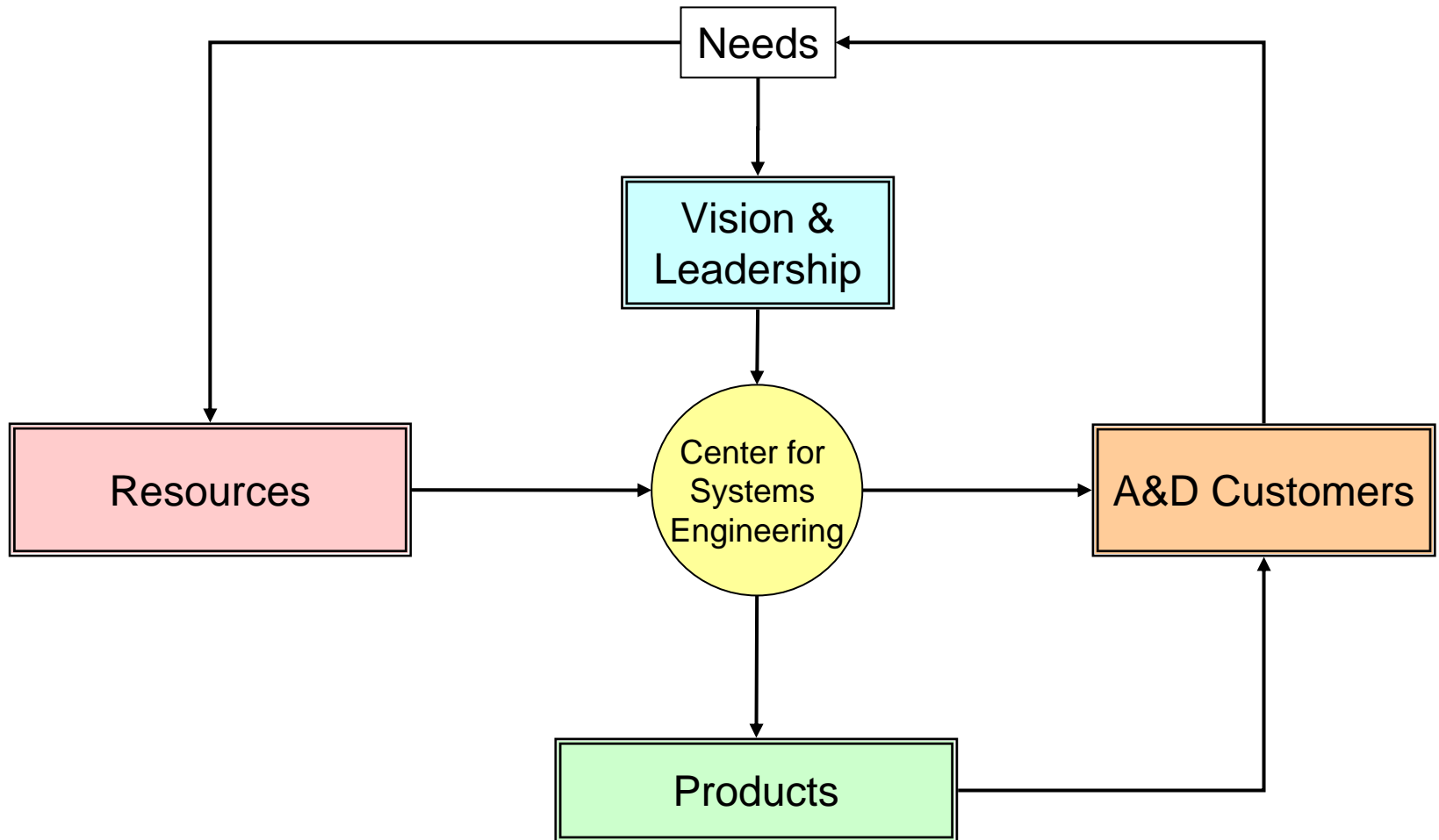
ad hoc
Systems Engineering
TIGER TEAM

Vision

Advancing SE Technology

SE Think Tank

Center for Systems Engineering

Texas Engineering Work Force Advancement

An Industry-Government-University Partnership to Improve Development of Complex A&D Systems

A National Center With Regional Focus

ad hoc
Systems Engineering
TIGER TEAM

Needs

Vision & Leadership

Resources

Center for Systems Engineering

A&D Customers

Products

ad hoc
Systems Engineering
TIGER TEAM

Agenda

- Systems Engineering Education

    - SMU (Systems Engineering Program) Overview

    - Program Development

- Systems Engineering Aerospace & Defense Initiative

- Systems Engineering Training

- Summary

Training Goal

to provide System Engineering training that is

- Tailored to customer needs and work place

- Delivered by industry, government and academia subject matter experts

- Relevant

- Conducted in an interactive workshop format

Training Objective

- to increase Systems Engineering awareness
- to increase organizations Systems Engineering capability
- to increase individual engineers SE expertise

Training Scope & Delivery

System Engineering training Scope

- Integrated program

- Stand-alone modules

- Special aligned systems engineering topics

- Delivery

- JGR Systems Engineering, LLC

Systems Engineering, LLC

Leveraged and Work-Place Relevant Training

Linkage to SE Graduate Courses

Systems Engineering Training

Linkage to SE Research

Linkage to SEP DT for Requirements Capture
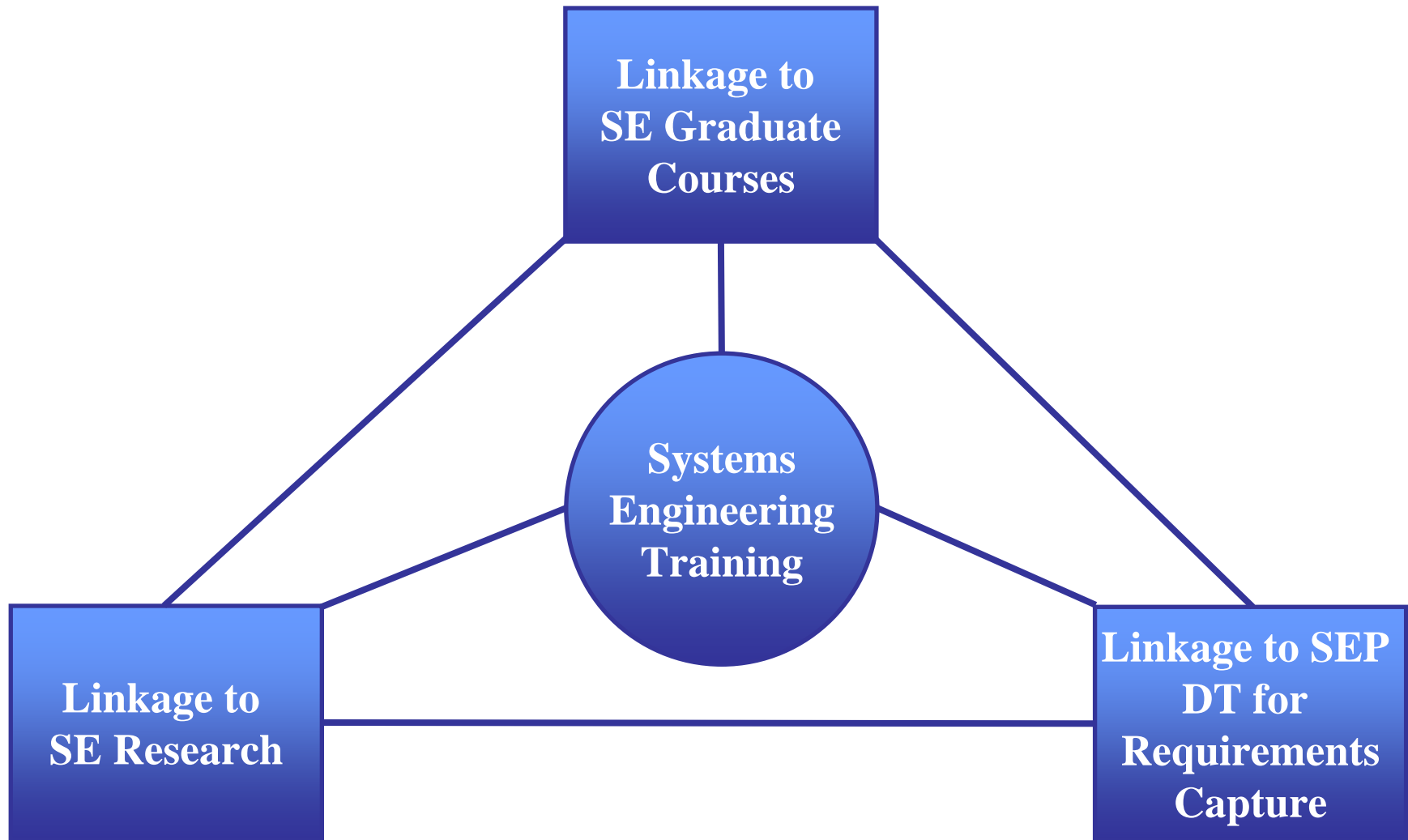
Organizational Level, Training "Depth" and Value

Division or Department level

- Strategic or tactical business importance
- Overall value to a group, division, or department.

@ the Immediate Supervisor, Branch head or Project Lead level

- Impact on projects/programs
- Impact on employee competence

@ the individual engineer's level

- Impact on the individual's specific competency; e.g., ability, capabilities, skills
- Value of those competencies to the company

Systems Engineering Courses

Customer Tailored training from 1 – 5 days, in increments of one day

- Systems Analysis Methods

- Systems Engineering Process

- Integrated Risk Management

- Systems Reliability, Supportability and Availability Analysis

- Systems Integration and Test

- Systems Engineering Design

- Software Systems Engineering

- Systems Architecture Development

- Systems Engineering Leadership

- Systems Reliability Engineering

- Human-Systems Integration

- Logistics Systems Engineering

Systems Engineering, LLC

Systems Engineering Courses

- Critical Infrastructure Protection/Security Systems Engineering

- Systems Engineering Software Tools

- Six Sigma Systems Engineering

- Supply Chain Systems Engineering

- Systems Test and Evaluation

- Systems Engineering Planning and Management

- Systems Cost Engineering

- Systems Life Cycle Logistics

- Innovative Systems Design

- Systems Modeling and Simulation

- Systems Prognostic and Health Management

- Systems Development Program Engineering and Management

Systems Engineering, LLC

Summary

- Work-place Relevant Systems Engineering Training
  - By Subject Matter Practioners
  - Tailored to Customer Needs
- Linkage to Graduate Systems Engineering Courses
- Aerospace & Defense focused

Systems Engineering, LLC

Agenda

• Systems Engineering Education

  - SMU (Systems Engineering Program) Overview

  - Program Development

• Systems Engineering Aerospace & Defense Initiative

• Systems Engineering Training

• Summary