

Developing the 21st Century Aerospace Workforce

Preliminary Draft of Briefing Materials for

U.S. Commission on the Future of the Aerospace Industry

December 2001

Introduction to Labor Aerospace Research Agenda

- **Sponsor:** USAF ManTech
- **Lead Partners:** IAM and others representing the aerospace workforce
- **Principal investigators and Research Team:**
 - Tom Kochan, Joel Cutcher-Gershenfeld, Betty Barrett, Rob Scott, Takashi Inaba, Eric Partlan, Shannon O'Callighan, Kevin Long, and other team members
- **Links to LAI:**
 - Organizations and People, Knowledge Deployment, Other Research/Product Teams, and Curriculum Development
- **Funding:**
 - ~\$300K/yr
- **Focus:**
 - Impact of instability on employment and workplace innovation in the aerospace industry
 - Social capital and institutional infrastructure
- **Methods**
 - National random sample survey (194 facilities)
 - Individual surveys (400+ surveys)
 - Case studies (6)
 - Collective bargaining contract analysis
 - Archival data analysis

Outline for White Paper (cont.)

➤ 3.0 Selected Innovative Models and Linkages

- 3.1 School-to-work transition programs in selected communities**
- 3.2 Lean/high performance workplace transformation initiatives in selected locations**
- 3.3 Joint training partnerships among major employers and unions**
- 3.4 Industry-level forecasting and training in Canada**
- 3.5 Linking R&D funding to workforce attraction and intellectual capital development**
- 3.6A case example of integrated learning and development**
- 3.7 Construction industry educational partnership**
- 3.8 Core challenge: Moving beyond “islands of success”**

➤ 4.0 Conclusions and Recommendations

- 4.1 Public Policy Priority
Protecting Investment in Intellectual Capital**
- 4.2 Aerospace Capability Network**
- 4.3 National Training and Development Partnership**
- 4.4 Regional and Local Workforce Initiatives**
- 4.5 Innovation by Government as an Employer**
- 4.6 R&D Investment Driving Demand for the 21st Century Workforce**
- 4.7 Implementation Recommendations**

Outline for White Paper

➤ 1.0 Statement of the Problem

1.1 Challenges in Attracting and Retaining a 21st Century Workforce

1.2 Inadequate Infrastructure for Enabling Wise Investment in Human Capital

1.3 Limited Mechanisms for Diffusing Best Practices Across the Aerospace Enterprise

➤ 2.0 Root causes and Research Findings

2.1 The end of the Cold War and the rise of global competition

2.2 Industry “maturity” with reduced opportunities for innovation

2.3 Instability in funding, technology, and organizations

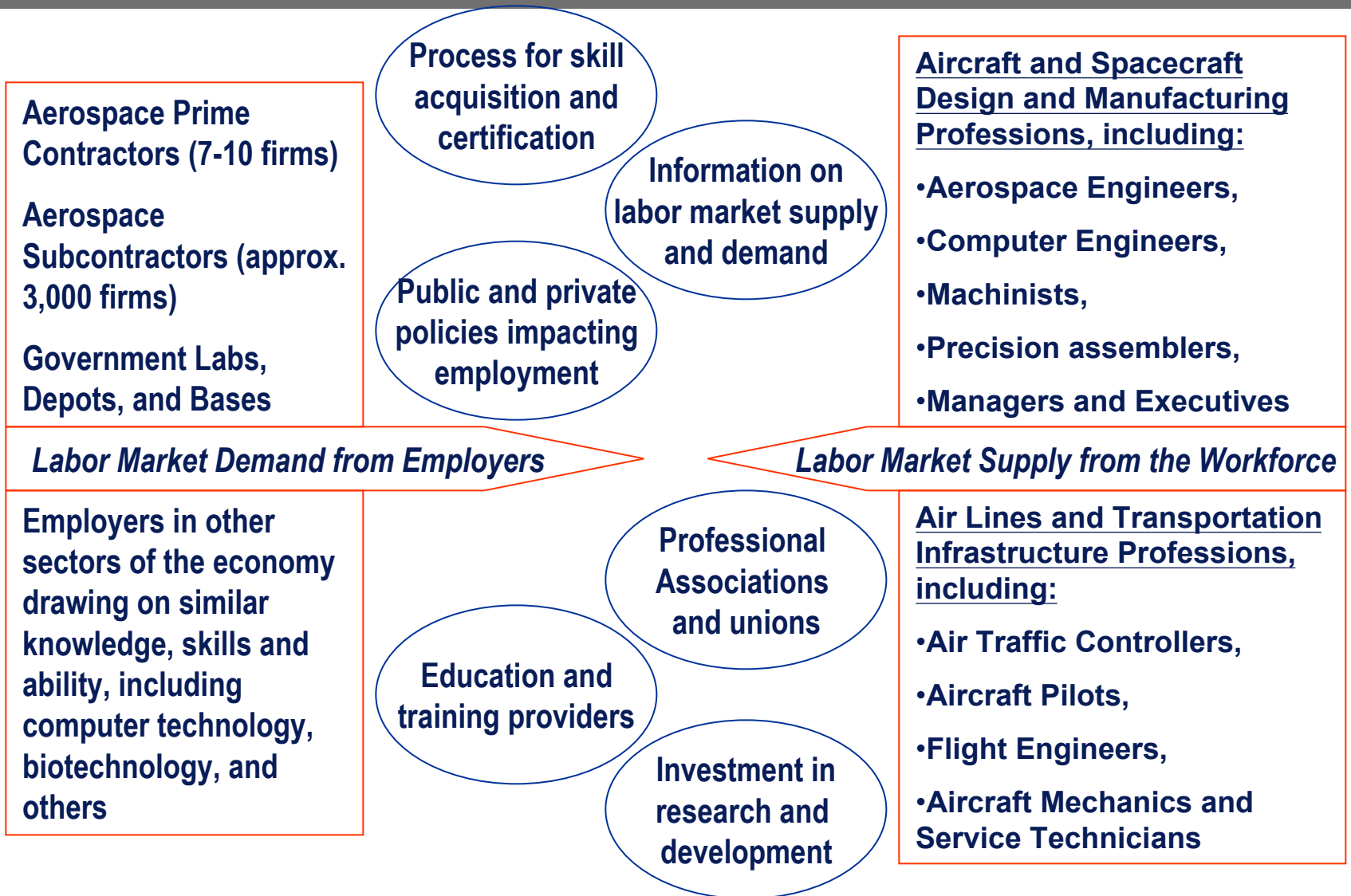
2.4 Gaps in training and development infrastructure

2.5 Imports, offsets and other global dynamics

2.6 Underlying assumption that responsibility lies at the level of the individual firm/facility



Elements to be Coordinated for the 21st Century Aerospace Workforce



➤ **Human capital issues in context**

- **The “big picture”**
- **The transformation of American industrial relations**

➤ **A call to action**

- **Declining experience levels**
- **Three employment scenarios**
- **Imports and employment**
- **Workforce projections**

➤ **Instability**

- **Industry concentration as a form of instability**
- **Funding instability**
- **Highlights from instability case studies**
- **Facility survey data on types of instability, mitigation and other factors**
- **Looking ahead to the next generation**



The “Big Picture”

	<u>Social</u>	<u>Technical</u>
	<u>Systems</u>	<u>Systems</u>
<u>Craft Production</u>	Decentralized Enterprises Mastery of Craft	Custom Manufacture Specialized Tools
<u>Mass Production</u>	Vertical Hierarchies Scientific management	Assembly Line Interchangeable Parts
<u>Knowledge-Driven Work</u>	Network Alliances Team-Based Work Systems	Flexible Specialization Information Systems

Adapted from: “*Knowledge-Driven Work: Unexpected Lessons from Japanese and United States Work Practices*” (Oxford University Press, 1998)

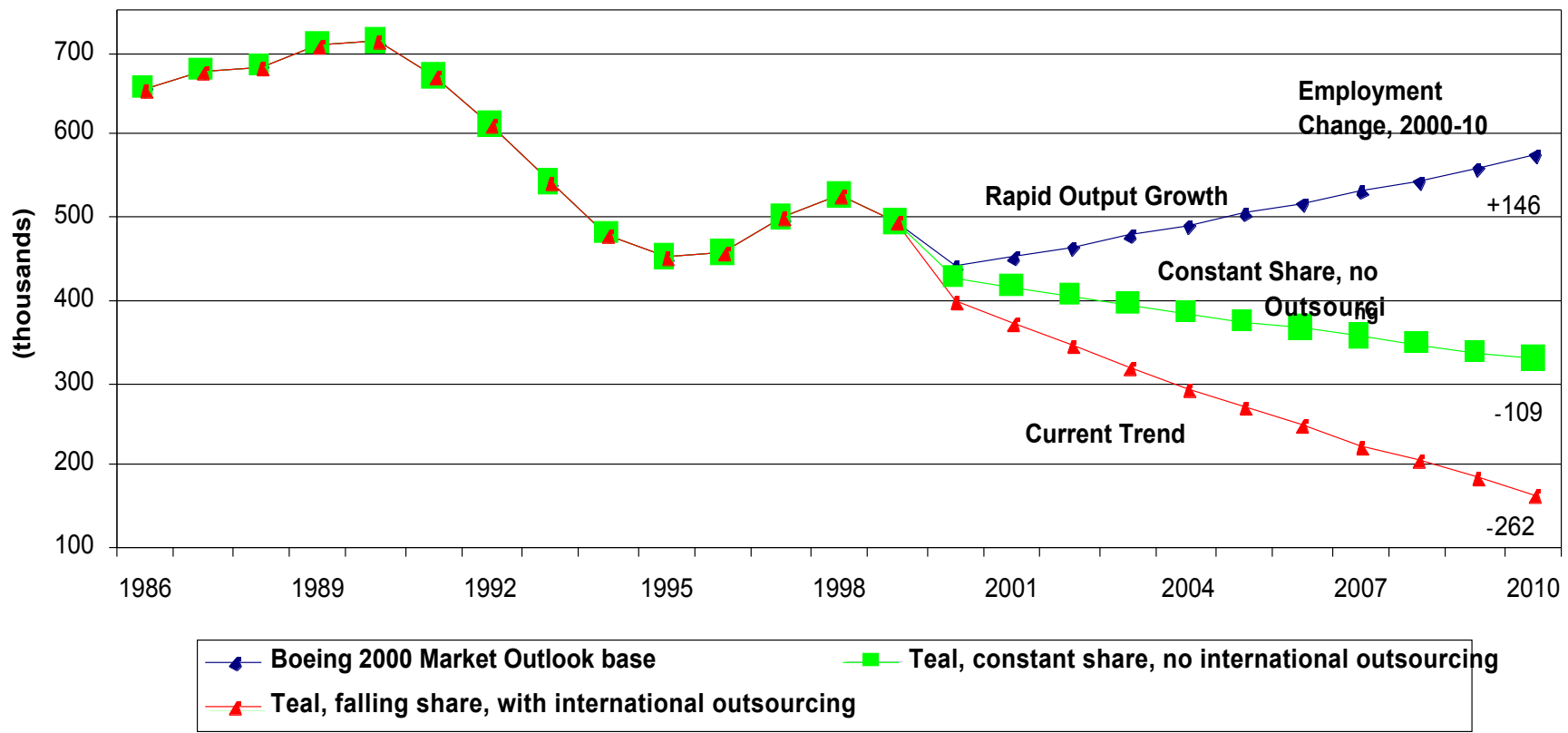
- **Transformation of American Industrial Relations**
 - **Interdependence across three levels**
 - **Workplace**
 - **Collective Bargaining/HR Policy**
 - **Strategic**
 - **Shift in the 1980s from the union to the nonunion sector in setting the “HR” agenda in U.S. industrial relations**
 - **Dunlop Commission – Policy gridlock on employment issues**

Source: *The Transformation of American Industrial Relations* by Thomas Kochan, Harry Katz, and Robert McKersie (New York: Basic Books, 1994)

- **Dimensions of an employment crisis in Aerospace:**
 - **Increasing skill shortages**
 - Changing skill mix in a post-cold war era
 - Reduced investment in training and development
 - **Divisive and immobilizing concerns over job security**
 - Industry has lost over 500,000 jobs since 1990
 - **Demographic “cliff”**
 - Average age of IAM members is 44 in the Commercial Sector and 53 in Defense – with over 20% eligible to retire in next 3 years
 - **Global competitive dynamics**
 - Projected loss of jobs and revenue due to increased global competition
 - Projected increase in foreign content – with complex implications
 - Projected job growth in European Aerospace Industry
 - **Inability to attract and retain a 21st Century workforce**

Three Scenarios for U.S. Aerospace Employment

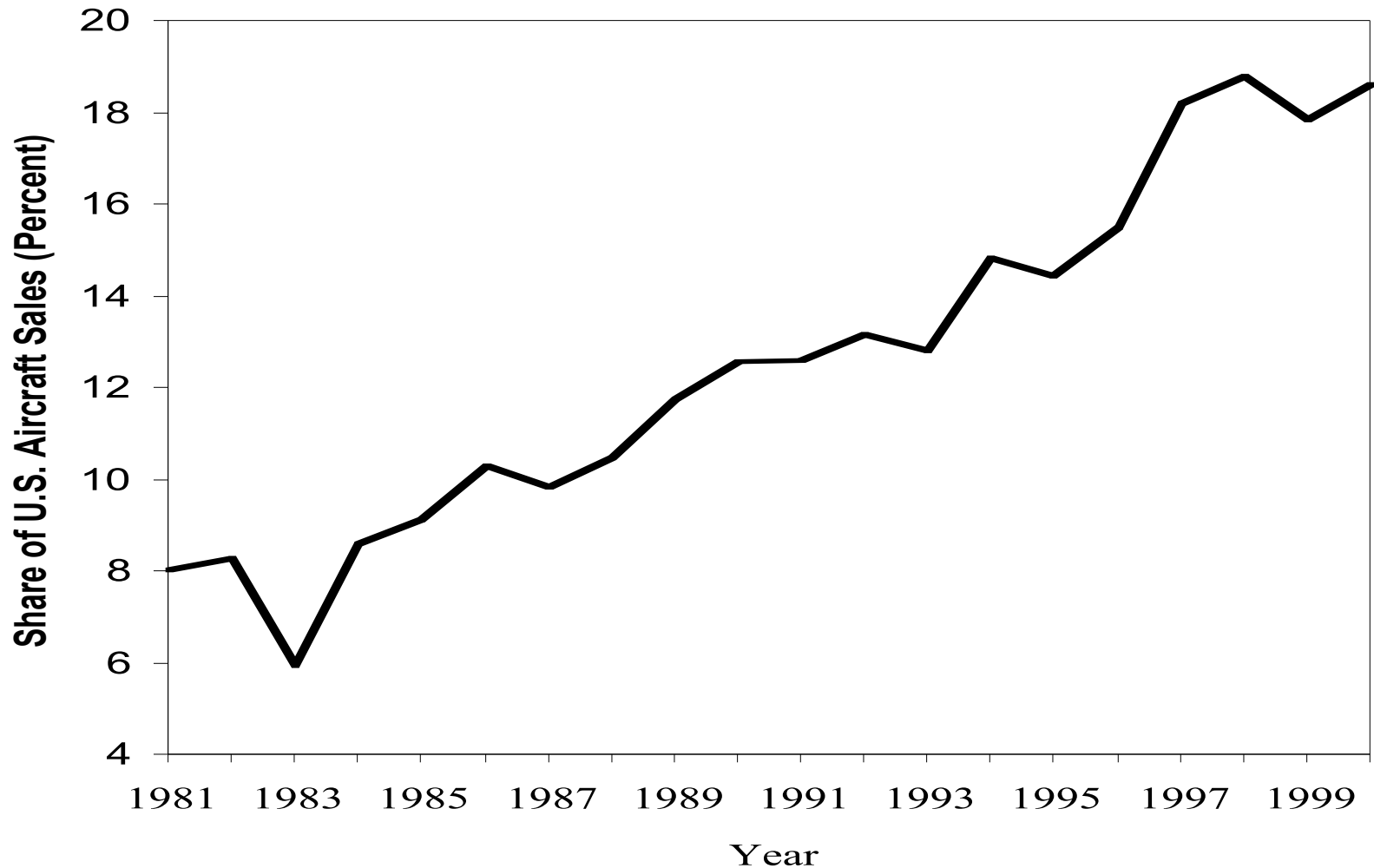
Figure 5
U.S. Aircraft Employment Forecast, 2000-10





Imports and Employment

U.S. engines and parts imports as a share of total aircraft sales, 1981-2000



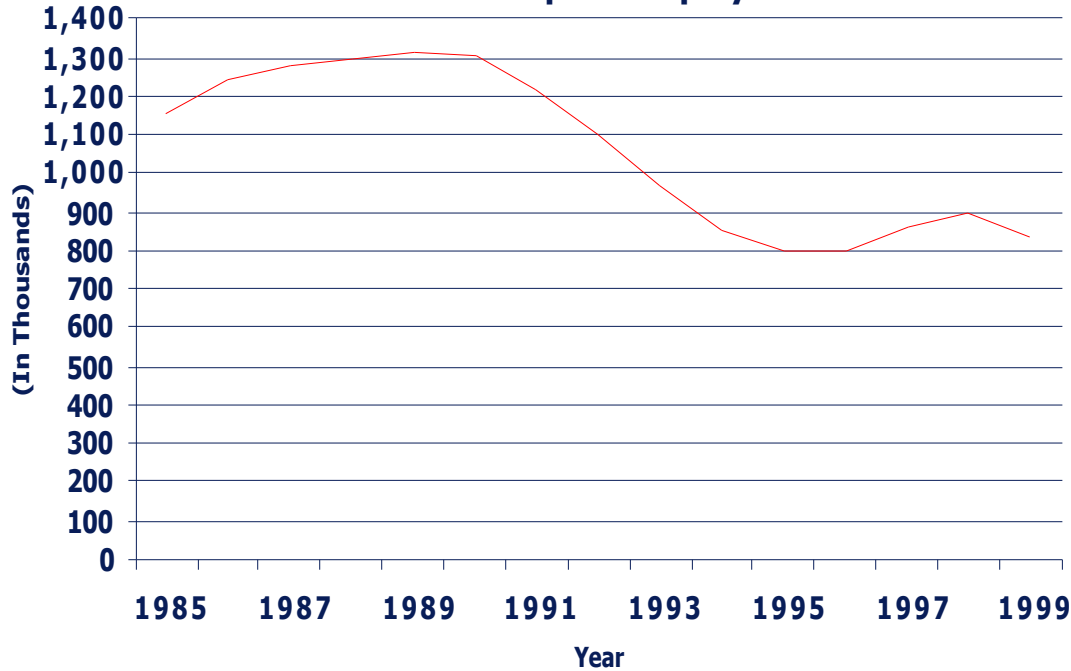
➤ **Consider these projected core competencies for the 21st Century Workforce:**

➤ ***“The ability to read, write, and compute with competence, think analytically, adapt to change, to work in teams and use technology”***

➤ Source: *A Nation of Opportunity*. Report of the 21st Century Workforce Commission, 2000.

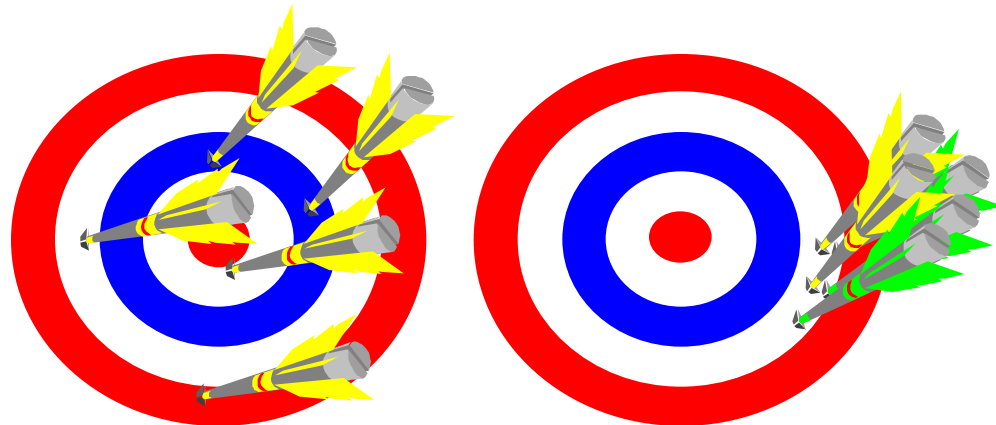
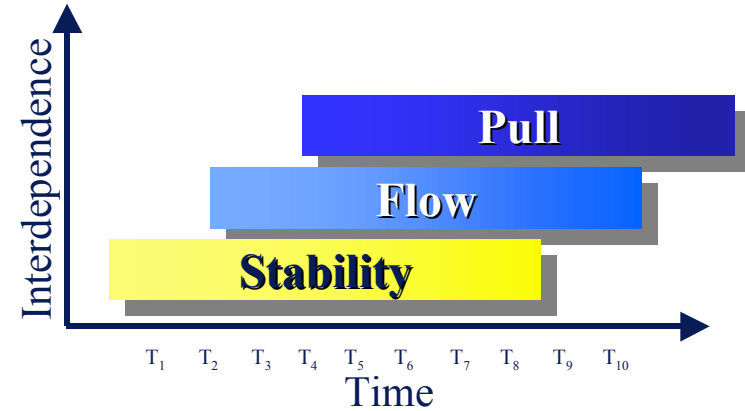
Why Worry About Instability?

Total U.S. Aerospace Employment



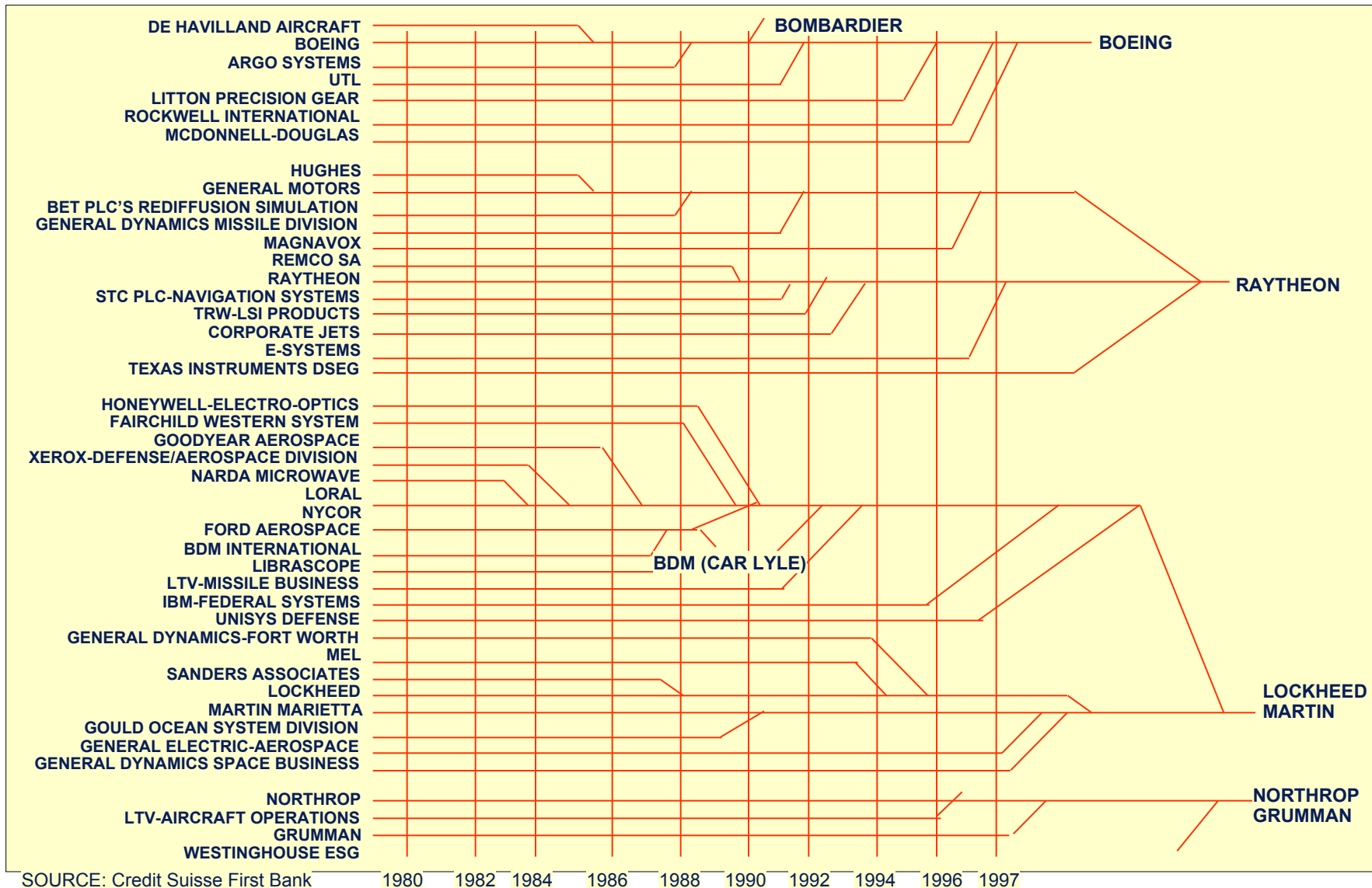
Source: AIA

Prepared by: IAM Strategic Resources Department





Industry Concentration as a Form of Instability



SOURCE: Credit Suisse First Bank

1980 1982 1984 1986 1988 1990 1992 1994 1996 1997

"the money spent on canceled programs in recent years could have bought:

- 1,000 Abrams tanks,
- 100 F-16 Fighters
- 1,000 AMRAAM missiles
- 10 Titan Launch Vehicles
- 20 Joint STARS Aircraft
- 10,000 Javelin missiles
- 70,000 MLRS Rockets, and
- one nuclear attack submarine."

"Acquisition Reform Dream or Mirage?" Norm Augustine. Army RD&A, September/October 1996.

➤ **Types of instability:**

➤ **Funding/orders**

- **Shift from R&D to production funds**
- **Fluctuations in demand for primary product in facility**

➤ **Technology**

- **Changes in customer requirements**
- **Shifts in materials**
- **Rapid pace of change in computer capabilities)**
- **Environmental constraints**

➤ **Organizational**

- **Acquisition/layoffs**
- **Mergers/restructuring**
- **Relocation of products among facilities**
- **Two-tier relationship between sister facilities**
- **Demographics -- retirements/gaps in past hiring, skill shortages**
- **Turnover -- management, engineering, and hourly**

- **Observed mitigation strategies:**
 - ***Business Strategy***
 - Increase proportion of commercial business sought
 - Shift in product mix to increase focus on space
 - ***Human Resource Management/Industrial Relations***
 - Cross-training/flexible utilization/teams
 - Informal no-layoff practice
 - Labor-management partnership
 - Employee involvement
 - Intensified training of hourly and salaried employees
 - Co-location of engineers, teams
 - Two-tier wage system
 - Multi-facility transfer agreements

Facility Survey: Survey Response Rate, Facility and Respondent Profile

➤ Population and Sample

- Estimated Population: approx. 5,000
- Sample Size: two mailings to 2,123, with 2 follow-up card mailings and over 900 follow-up calls – many bad addresses, many no longer in industry
- Valid Responses: 198

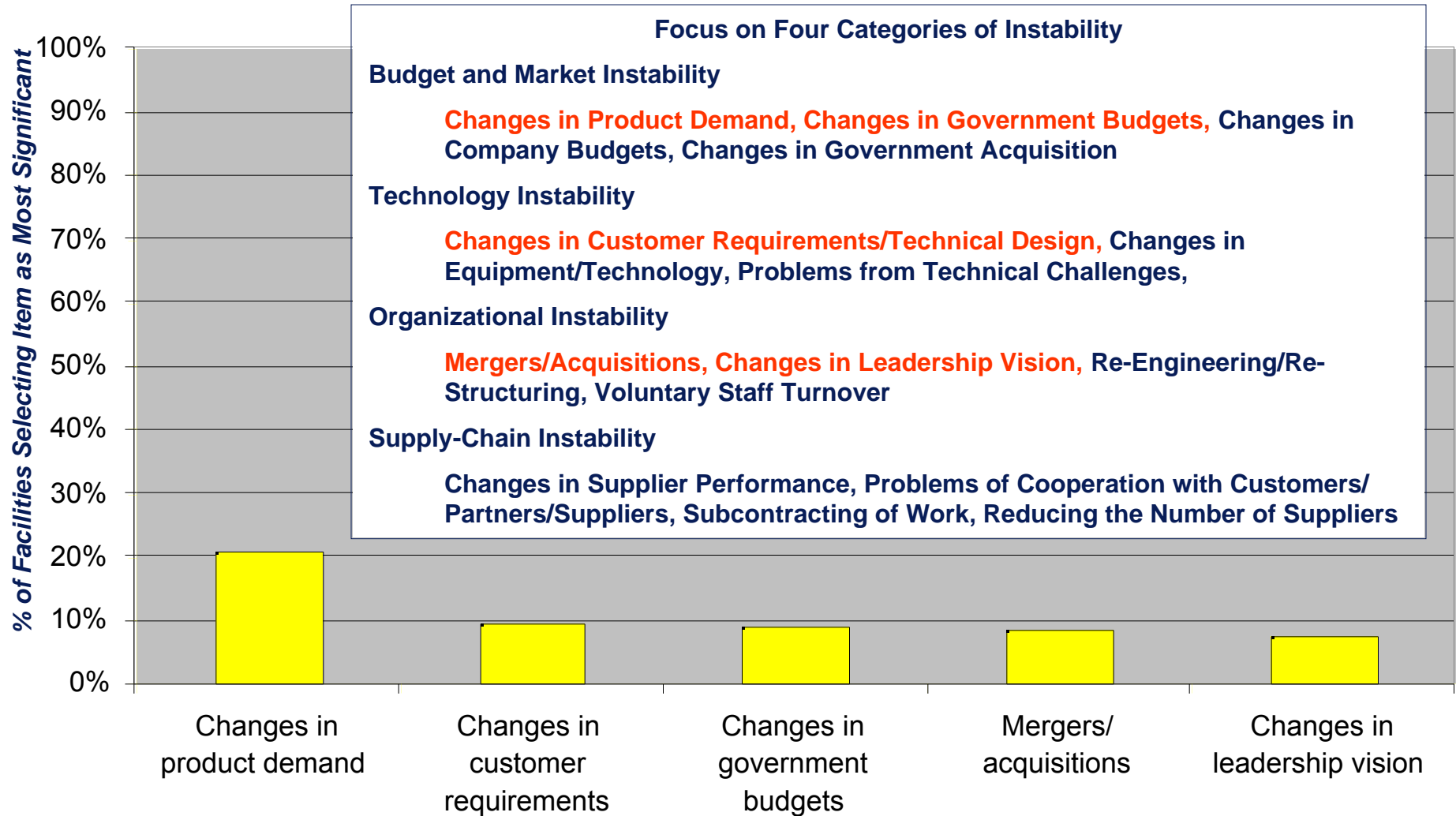
➤ Facility Profile	Distribution	Size	Year
➤ Airframes and Mechanical Systems (n=54)	27.4%	1,051	1971
➤ Engines and Propulsion (n=19)	9.6%	880	1969
➤ Space and Missiles (n=8)*	4%	1,738	1971
➤ Avionics and Electronic Systems (n=40)	30.3%	318	1977
➤ Second/Third Tier Suppliers and Others (n=76)	38.6%	262	1976

➤ Respondent experience in Aerospace **20.5 years**

** Note that 33 facilities listed space or missiles as a secondary sector, but not as primary sector*

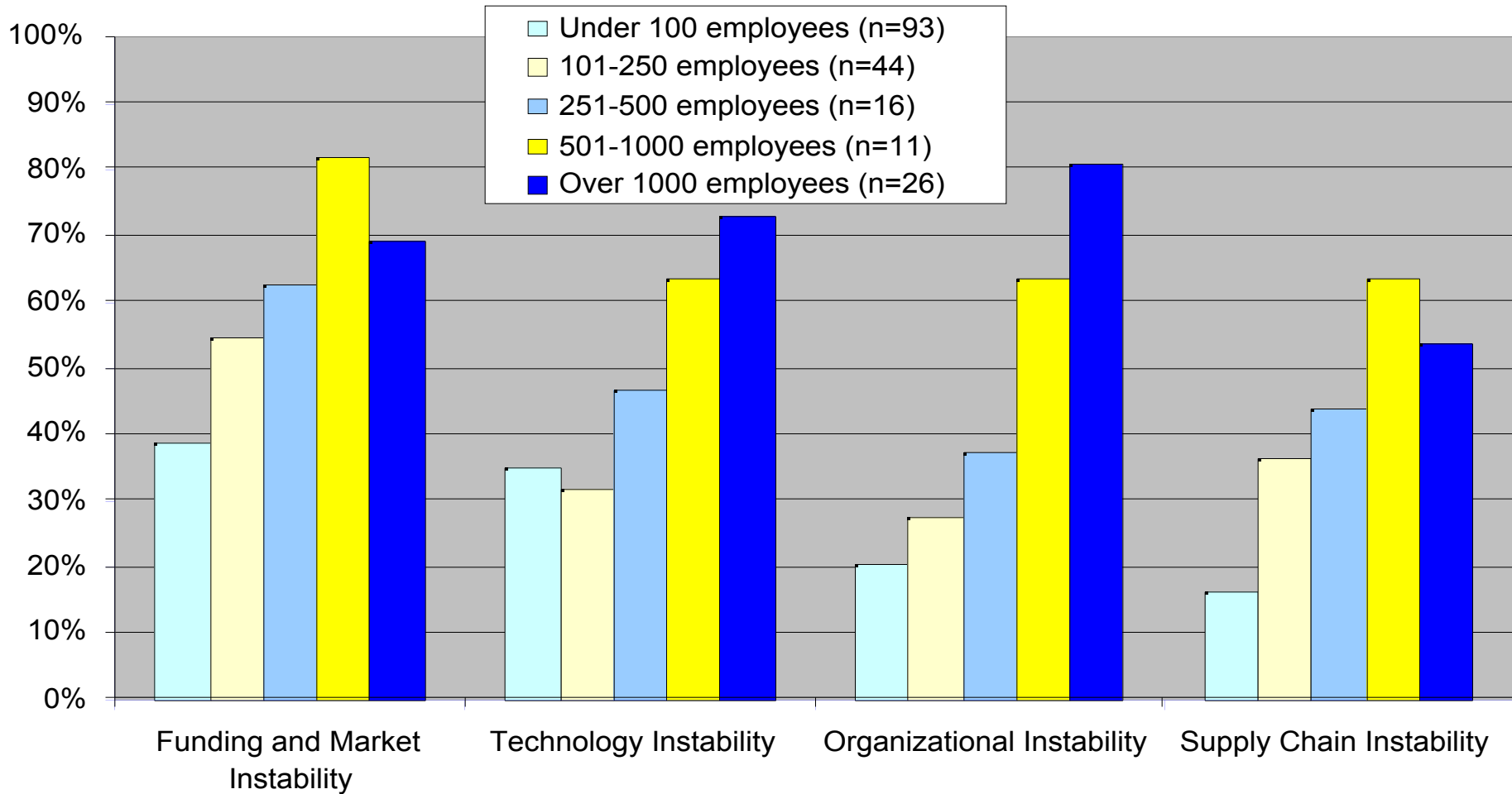


Facility Survey: Sources of Instability





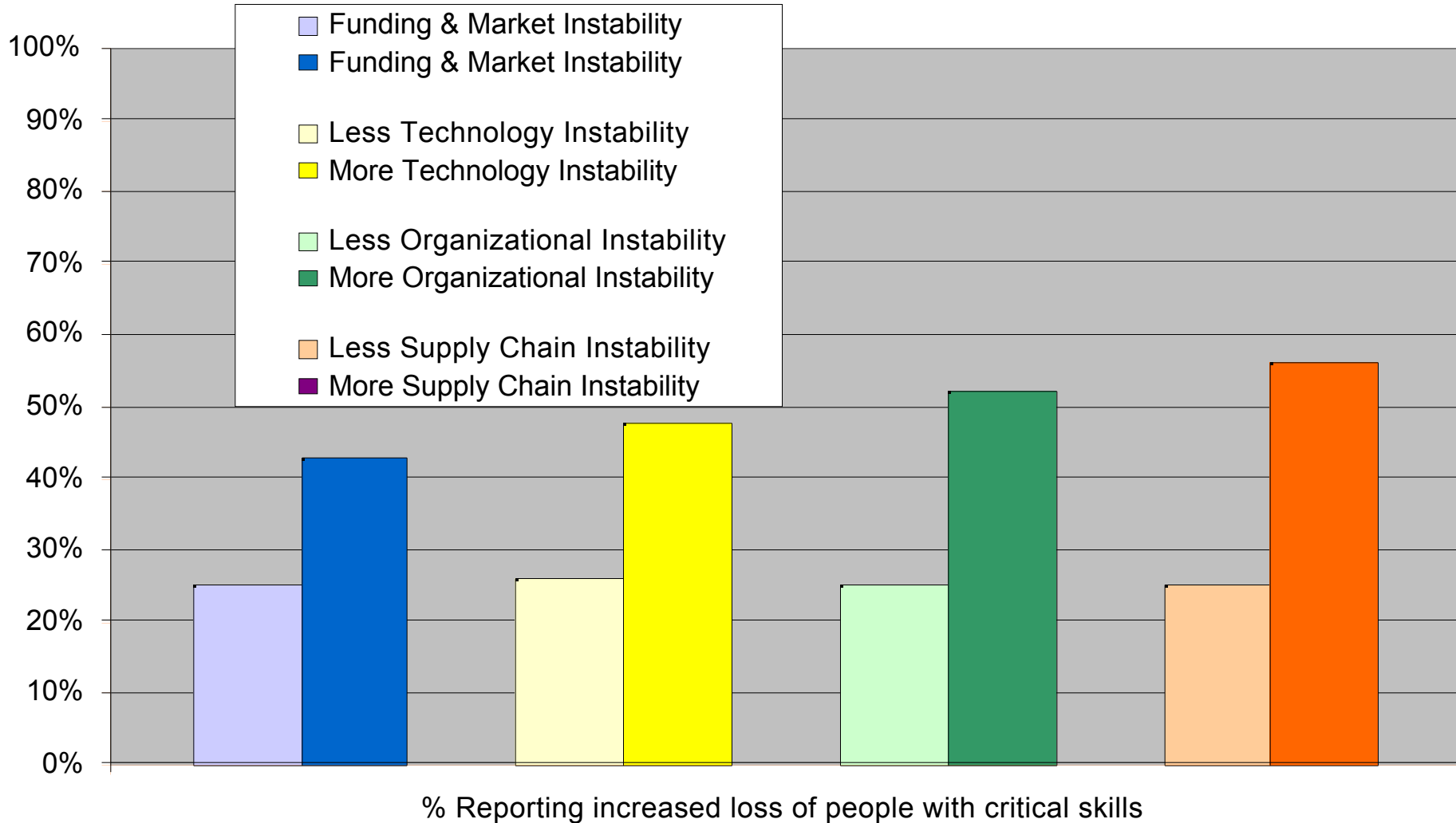
High Levels of Instability and Facility Size



Remedies to Instability Have to Be Sensitive to Facility Size

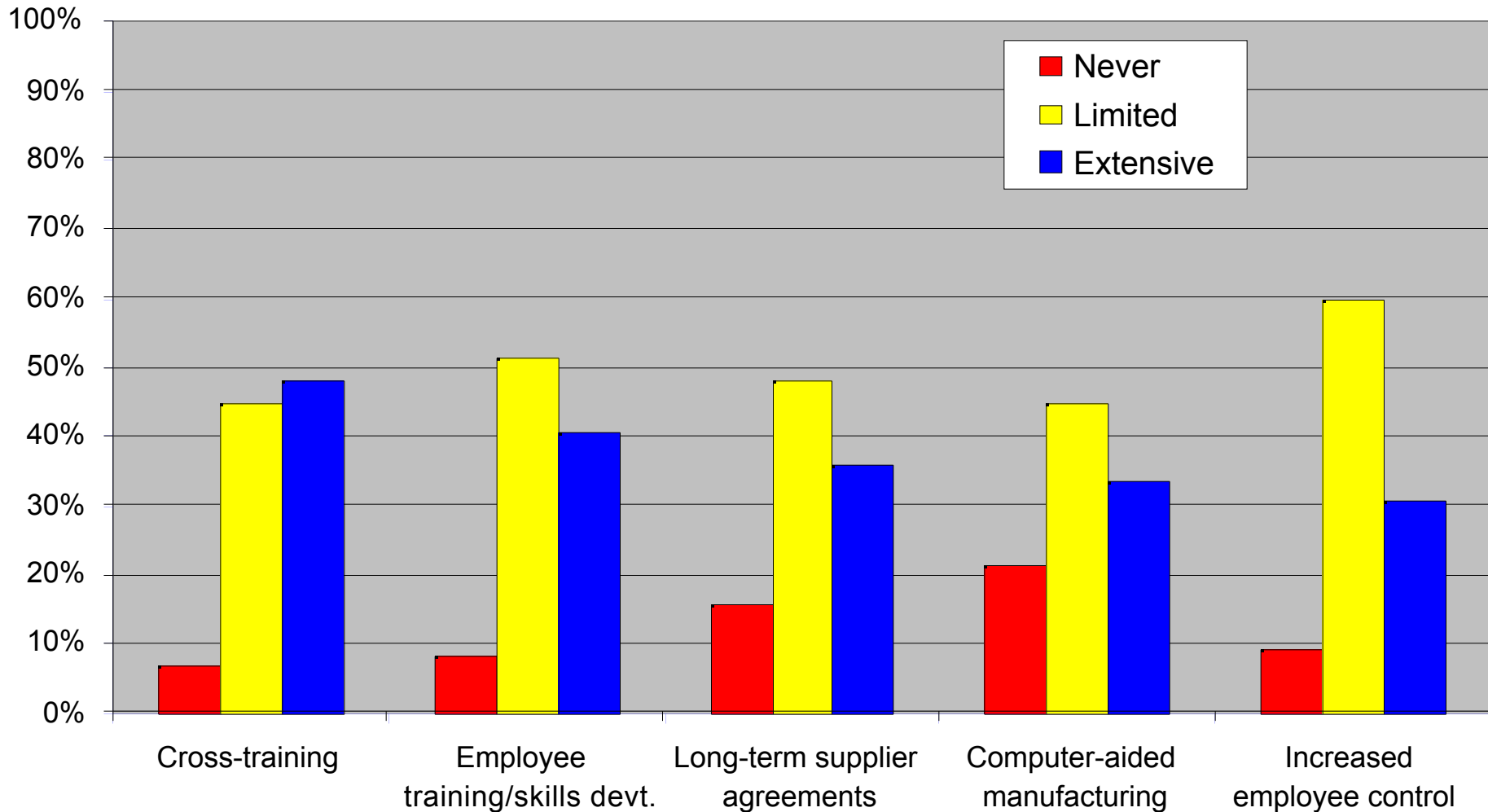


Impact of Instability on Retention of Critical Skills



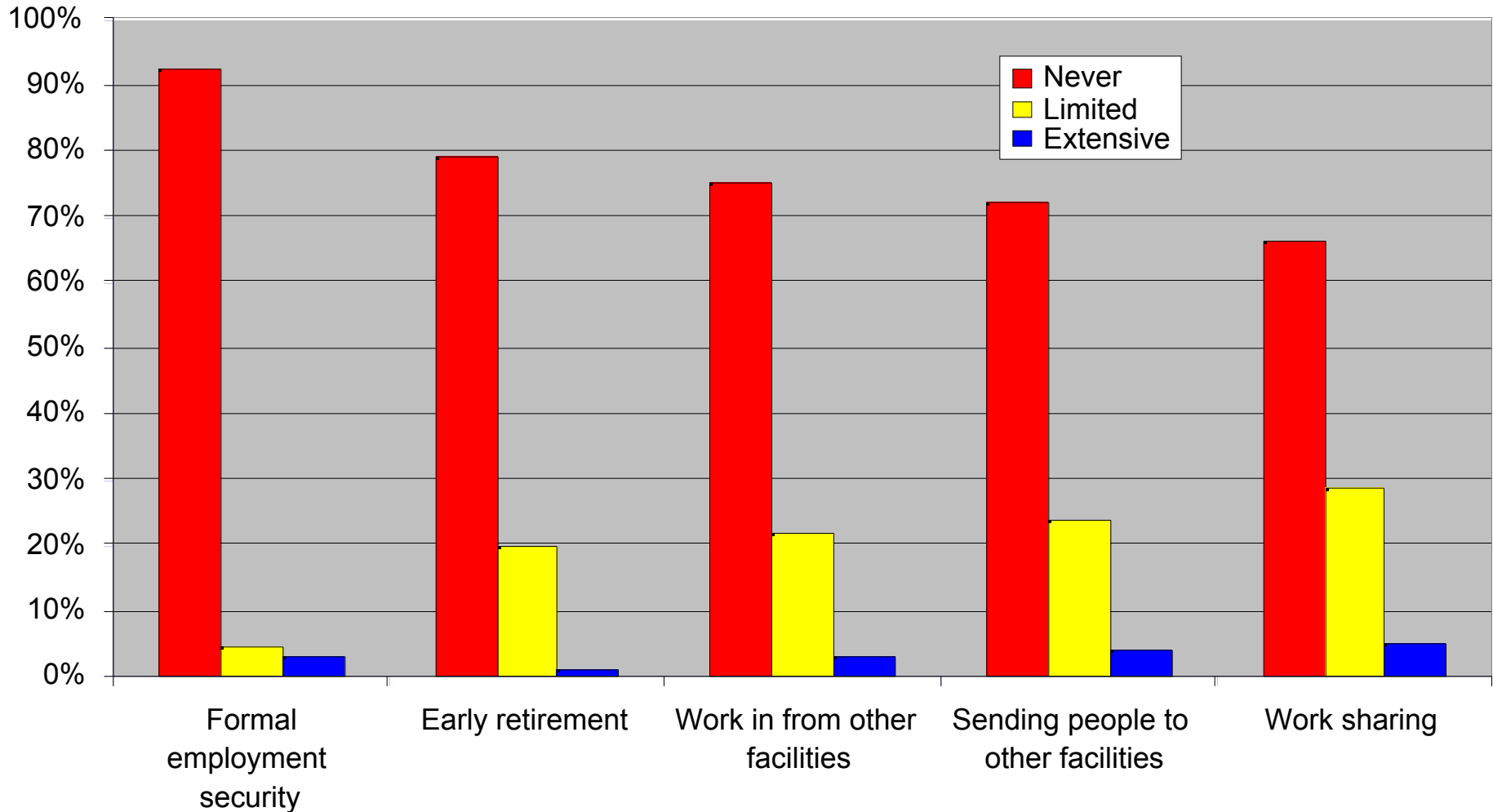


Facility Survey: Reported Use of Mitigation Practices – Five Most Extensively Used Practices (past 3 yrs)

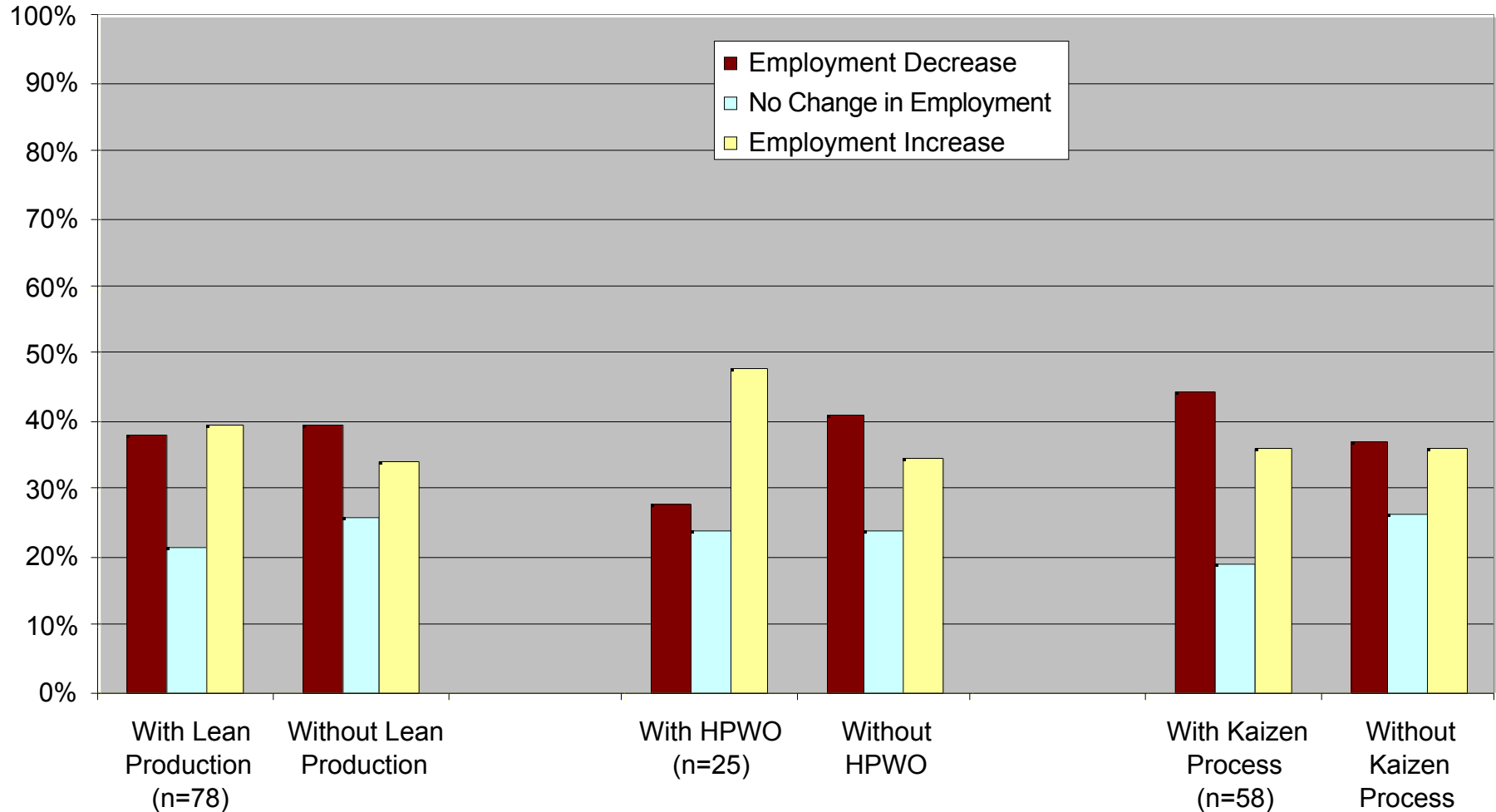




Facility Survey: Reported Use of Mitigation Practices – Five Least Extensively Used Practices (past 3 yrs)



Facility Survey: Selected Innovations and Employment Change



Future Prospects for the U.S. Aerospace Enterprise

***“I would highly recommend that my children work in this industry”
(Agree or Strongly Agree, n=482)***

