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NSF ERC for
Computational Field Simulation at
Mississippi State University
History and Economic Impact

*NSF ERC Annual Meeting
4 December 2009*



MSU NSF ERC PI's & Directors



Dave Whitfield, Joe Thompson, Don Trotter
The Doer



Joe Thompson
1990
Vision



Don Trotter
1995
*Strategic
Planning*



Brad Carter
2001
Graduation



Dave
Marcum
2002



NSF Engineering Research Center for *Computational Field Simulation (1990-2001)*

MISSION: To *reduce the time* and cost of *complex field simulations* for engineering analysis and design.

Cross-Disciplinary Research Team with a Common Focused Mission

Science & Engineering Faculty; ASE, CE, CS, ECE, MA, ME, PH

Mission Related Educational Programs

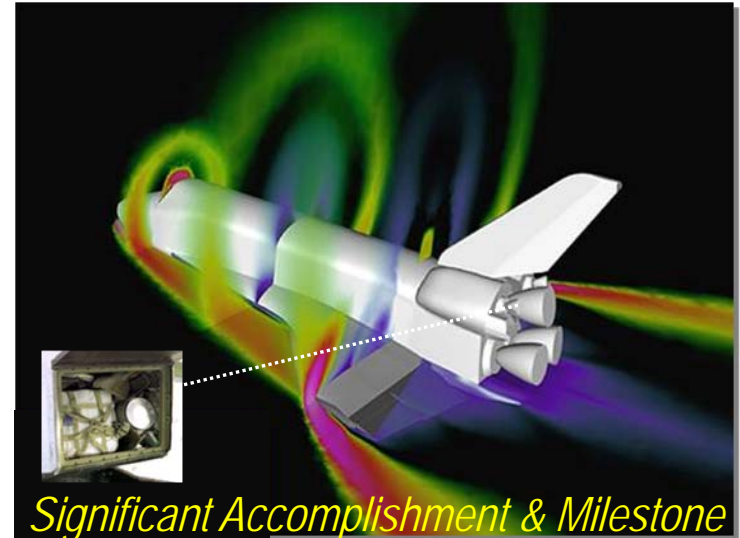
*Computational Engineering MS & PhD Program
Related CME, ASE, CS, ECE, MA, ME courses
Undergraduate Outreach Programs*

Test-bed Integrated Systems

Applied to relevant customer defined problems

Technology Transfer Programs

*Industrial, government, & academic collaborators
Software & technology widely used*



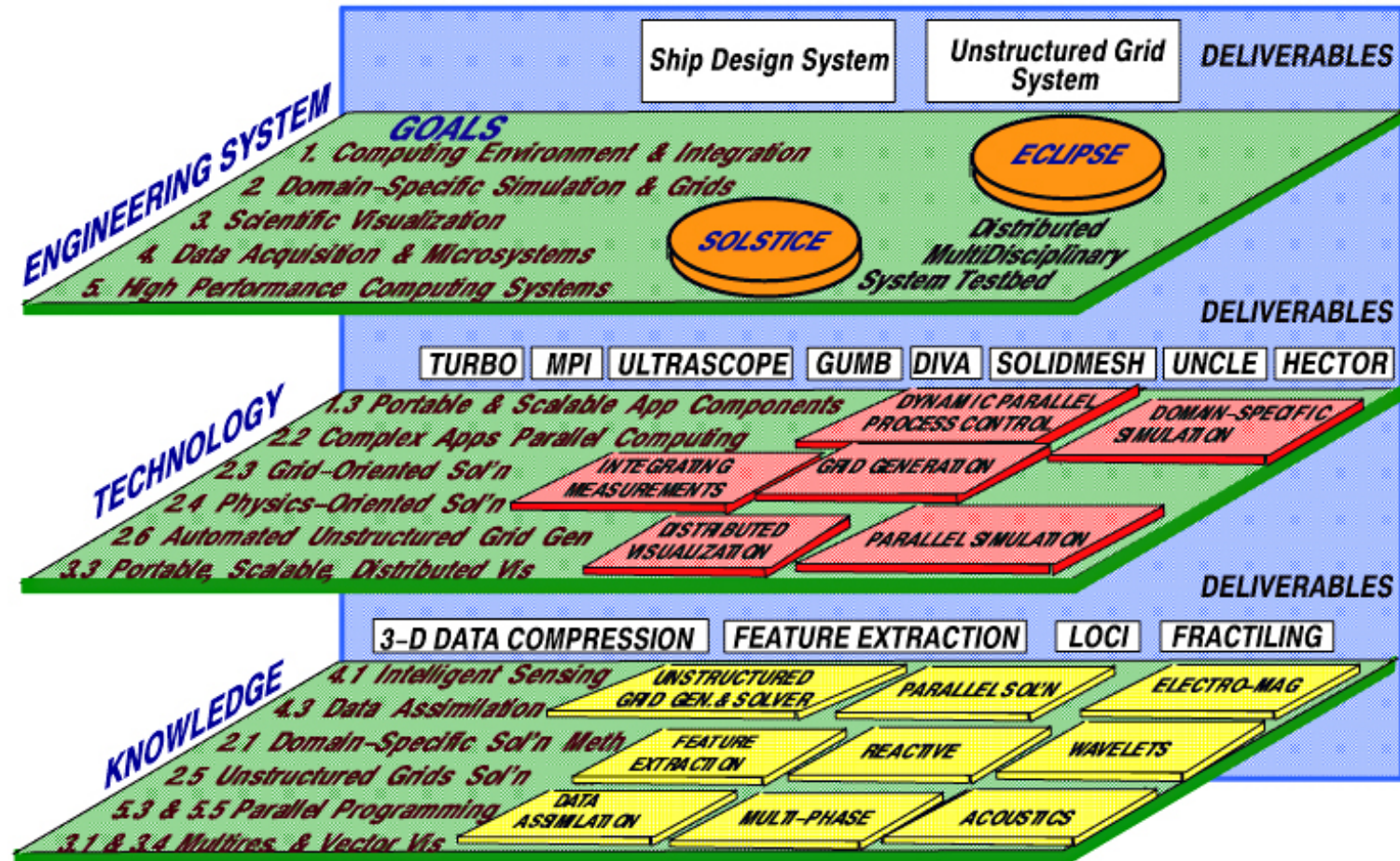
In the 1998 STS-95 (John Glenn) Mission the drag chute door fell off at launch.

A Shuttle simulation was completed by the ERC during the Mission. This demonstrated that the ERC had reduced the CAD to solution time from 2 months to 2 days.

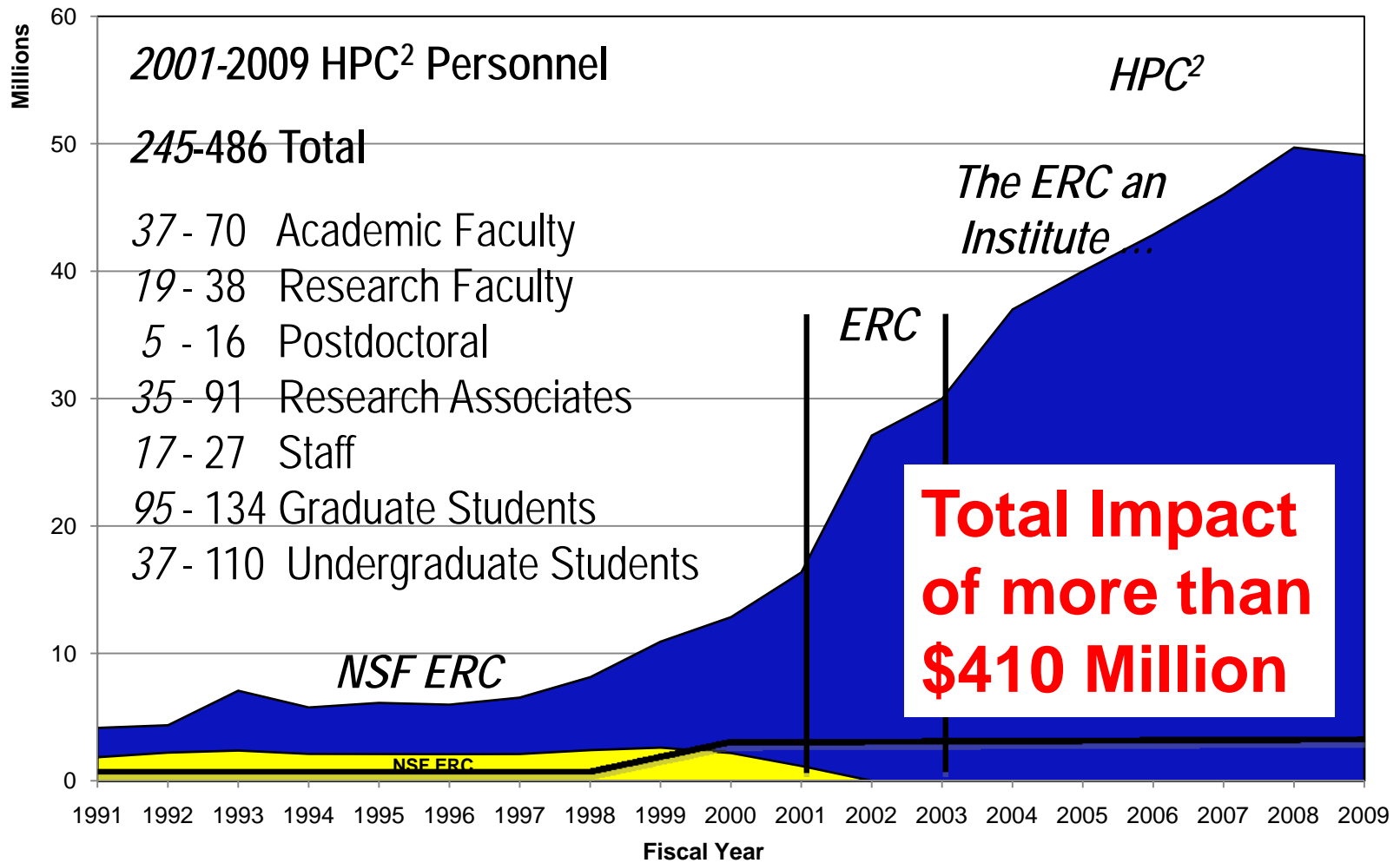


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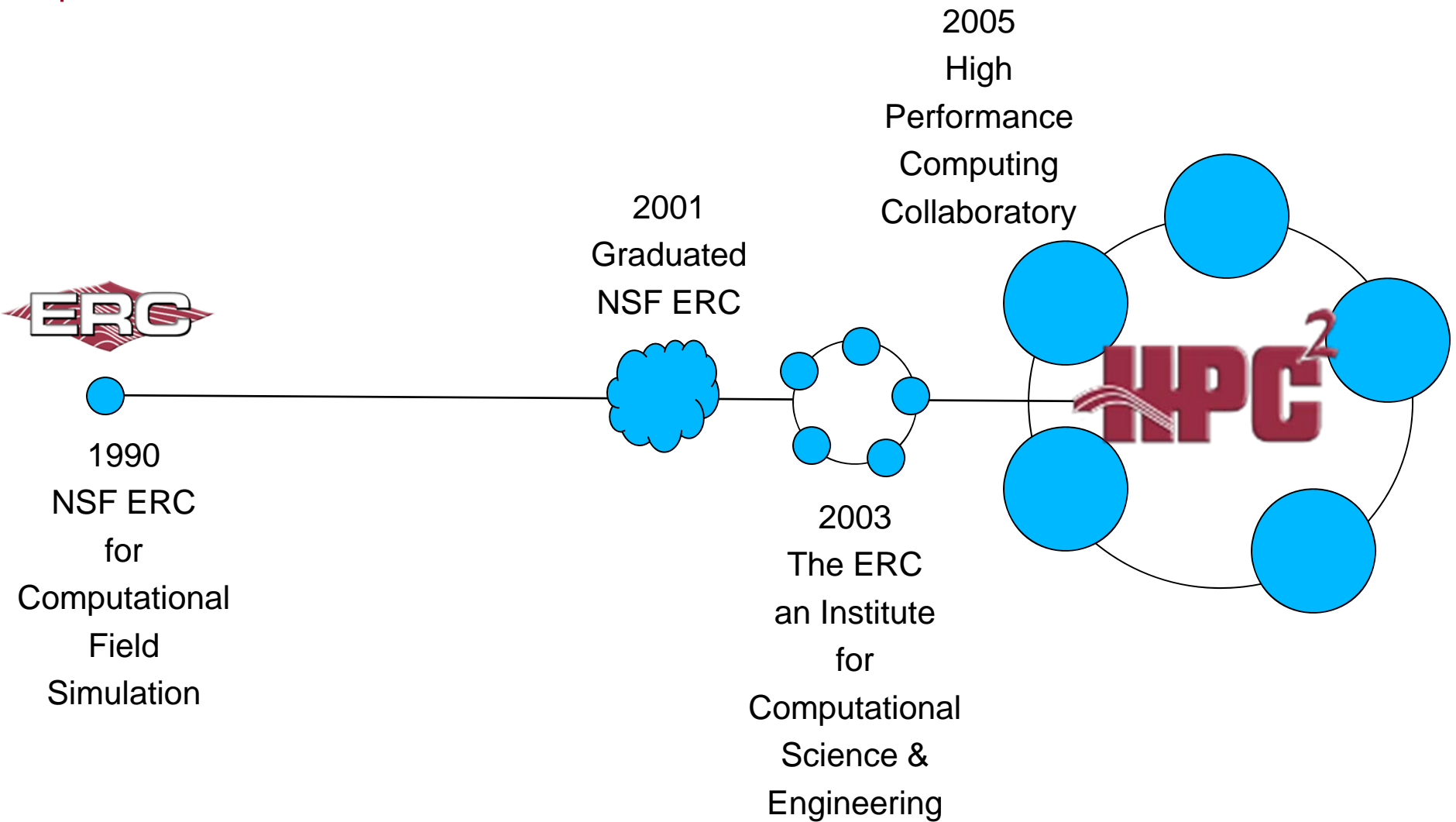
Application-Driven Research Science and Technology Highlights



Personnel & Research Expenditures



Growth and Evolution



Structure



The **High Performance Computing Collaboratory (HPC²)** is a coalition of member centers and groups that share;

a common core objective of advancing the state-of-the-art in **computational science and engineering** using **high performance computing**,

a common approach to research that embraces a **multi-disciplinary, team-oriented** concept,

and a commitment to a full partnership between **education, research, and service.**



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Economic Impact of the ERC & Successors

- ❑ \$410 million in total research expenditures since 1990.
- ❑ Software developed at the NSF ERC is in use throughout government, university and industry.
- ❑ The ERC was instrumental in attracting Nissan to Mississippi.
- ❑ The graduated ERC and now HPC² provides MSU with a showcase for economic development activities that clearly demonstrates a commitment to and success in long term planning and investment.



Proposal to Support Nissan and their Suppliers

- ❑ Proposed directly to Nissan in 2000
 - The vision and plan developed by MSU President Portera along with Don Trotter was based heavily on our experience with the NSF ERC
 - \$15M facilities & \$3.62M recurring (state funds)
- ❑ Create R&D Center for Advanced Vehicular Systems (CAVS)
 - Organize a cross-disciplinary research center targeting project needs modeled after the NSF ERC.
 - Identify and create research and support thrusts for regional industry
 - Leverage and expand existing activities within the ERC and various departments throughout MSU
- ❑ Establish CAVS Engineering Extension Center at Nissan Site (CAVS-E)
 - Build on experience with ERC-Stennis and Cypress Design
- ❑ MS Economic Development Agency lead credited MSU's presentation on the scope and accomplishments of the ERC with significantly influencing Nissan's decision



Economic Development Activities

- The ERC/HPC² is typically showcased during regional recruiting and has helped enable MSU to take a more active role in economic development.

Table 2. Mississippi State University Engagement in Industrial Recruitment 2000-2008

Year Recruited	Company	Investment	# Jobs	Pay Rates	Product
2000	Nissan	\$1,400,000,000	5,000	NA	Cars, Trucks, and SUVs
2003	American Eurocopter	\$14,000,000	125	\$18-\$20/Hr	Helicopters
2004	American Eurocopter Expansion				
2006	Clear Orbit	NA	11	\$45,000/Yr	Application Software
2006	International Truck/Navistar	TBD	500	\$10 -\$15/Hr	Armored Vehicles
2006	Aurora Flight Sciences Aurora Expansion	\$25,000,000	300	\$17-\$40/Hr	Unmanned Aircrafts (UAVs)
2007	Harbinger/ACIOMM**	NA	10	NA	Software Engineering
2007	PACCAR	\$500,000,000	500*	\$40,000/Yr	Power Trains for Heavy Trucks
2008	Stark Aerospace	\$30,000,000	100	\$50,000/Yr	World Class Aerospace Company Part of IAI
2008	GE Aviation	\$90,000,000	50	NA	Composite Engine Components
2008	Ultralife Batteries	NA	7	NA	Batteries/Fuel Cells
Grand Total Since 2000		\$2,059,000,000	7,503		



Economic Impact of Extension Activities

- Extension efforts have been revitalized by success in economic development activities and are tied to our research through CAVS-E.



Table 1. Mississippi State University Economic Impact and Existing Industries 2005-2008

Performance Measures	CAVS Extension	Industrial Outreach Service	Technology Resource Institute	Center for Safety and Health	Franklin Furniture Institute	Total
Projects Completed	41	84	223	920	100	1368
Companies Visited	39	66	187	665	90	1047
Average # of Counties Impacted	7	12	20	39	10	88
Employees Impacted	20,000	11,575		70,316	32,384	134,275
Impact in Dollars	\$3. Billion	\$19.57 Million	\$2.95 Million	NA	\$6.7 Million	\$3.09 Billion

*TRI impact measured via client surveys.

*CAVSE and IOS economic impacts as reported by clients and verified through a third-party independent assessment conducted by NIST-MEP



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Keys to Longevity and Increasing Potential for Economic Development Impact

- ❑ University stakeholders at all levels engaged, committed, and strategically aligned with the ERC.
- ❑ Synergistic, multi-disciplinary team environment based on mutual benefits and needs of applications.
- ❑ Don't underestimate the impact of collocation on establishing teams and enabling synergetic activities.
- ❑ Leaders that are willing to accept accountability and let their success be based on that of the overall ERC.
- ❑ Undergraduates involved in research activities and large-scale multi-disciplinary team projects.
 - Most students yearn for hands-on activities
 - MSU CAVS team won Challenge X



Keys to Longevity and Increasing Potential for Economic Development Impact (2)

- ❑ Engage industry early on to help define needs while preserving long-term goals of the ERC.
- ❑ Continue projects until viability for industry use is clear.
- ❑ Strategic planning and investments are critical for long-term survivability.
 - Computational Geospatial Technology effort was created within our ERC around 1998 in coordination with investments at the same time by the University and State in Remote Sensing activities. Those efforts merged into GRI and became part of the ERC/HPC² in 2003.



Keys to Longevity and Increasing Potential for Economic Development Impact (3)

- ❑ Do active PR and brand development for the future.
- ❑ Branding combined with collocation (preferably in a separate facility) provides a showcase for economic development activities that clearly demonstrate a commitment to and success in long term planning and investment whether or not your capabilities match company needs.



