

# ARES INSTITUTE, INC.

## Florida Aerospace, Science and Technology Education Project

The Aerospace Research & Engineering Systems Institute, Inc. (ARES) is a 501 (c) 3 tax exempt not-for-profit corporation formed in the state of Florida in 2003. ARES is working to develop a series of innovative research programs involving academia, industry and government in order to protect and grow the aerospace workforce in the state. The primary purpose of the Institute is to engage students at all levels of their studies in exciting space-related projects and spur interest in math, science and aerospace careers.

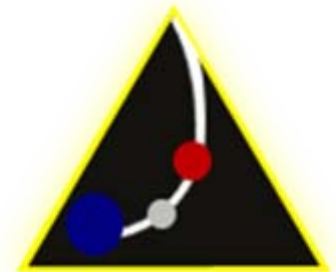


# The Guiding Vision

➤ The fundamental philosophy behind the programs of the Institute is that there is no more effective way to make aerospace careers attractive to students than to engage them in hands-on endeavours and provide the experience and the excitement of accomplishing complex aerospace projects. This is one of the best ways to attract students to aerospace careers and is essential during a time when universities are turning out fewer and fewer engineering graduates and even fewer are taking up careers in the aerospace industry.

➤ The vision of ARES has three primary components:

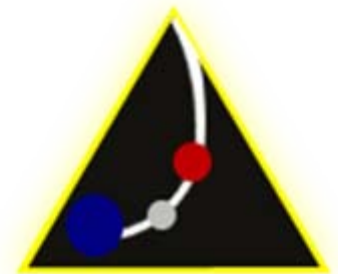
1. Involve students from primary school through graduate studies in a comprehensive program of increasing skill and complexity involving rocket, payload and spacecraft design, fabrication and flight
2. Provide experiential knowledge to secondary and higher level students to supplement classroom learning
3. Provide knowledge and continuing education for aerospace professionals for job retraining and skills retention



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# State of the Education System and Industry

- Many companies have drastically cut back spending on high technology initiatives
- At all levels of government and industry, R&D budgets look to remain stagnant for the near-term
- Investors are still skeptical of new high technology endeavours
- Many public school districts and universities are experiencing a decline in public funding as states struggle to balance or keep balanced their budgets
- A number of new aerospace companies have emerged in recent years and, unlike the past, some seem to be on track to actually succeed in bringing their services to market
- Florida's public education system remains ranked below average nationally in spite of improvements partly due to FCAT

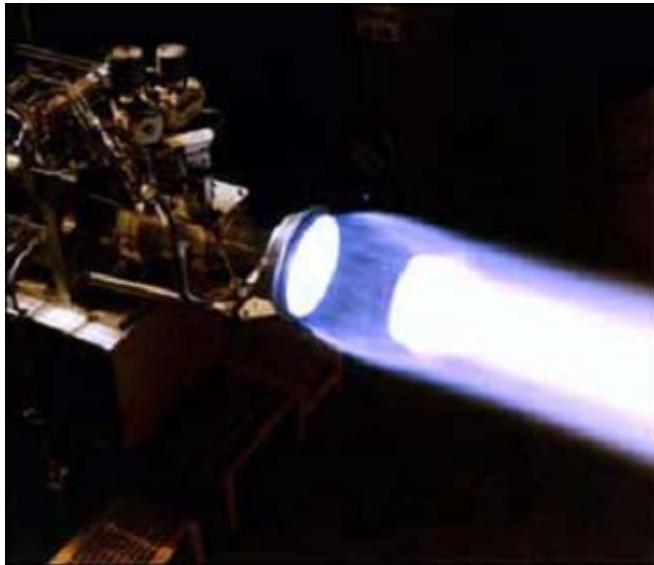


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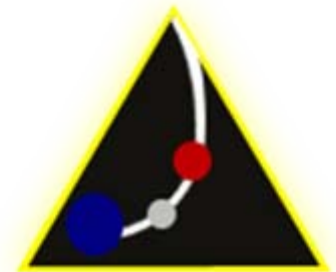
# Industry Faces Several Needs

- **Impact of “engineering brain drain” as older aerospace workers retire at a faster rate than they are replaced with younger people and loss of experience due to the retirement of the space shuttle**
- **Domestic industry strives to retain a competitive workforce in the face of international competition**
- **The workforce of the future faces the prospect of being inadequately trained**
- **Math and science need to be taught more effectively and with more focus**
- **The Vision for Space Exploration will create a need for an infusion of new talent and retraining the existing aerospace workforce**

# So What Are Our Goals?



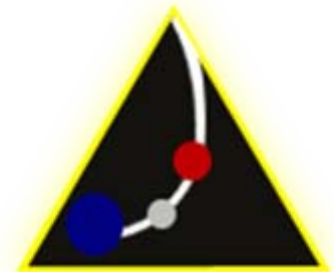
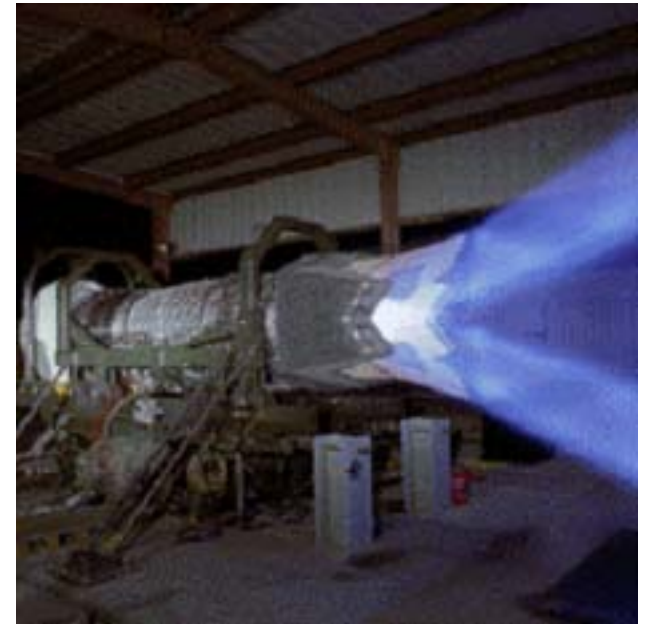
1. To provide inspiration and encouragement to students in math, science and space education
2. To stimulate an increase in the number of graduates choosing careers in the aerospace industry in Florida
3. To stimulate an increase in the number of engineering graduates from Florida universities
4. To retrain and retain aerospace workforce whose skills must be kept relevant
5. To pass on experience and knowledge to the new generation of aerospace professionals
6. To encourage small businesses in Florida and provide an opportunity for growth
7. To embody the motto "Get them when they're young and keep their interest"



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# And Our Objectives?

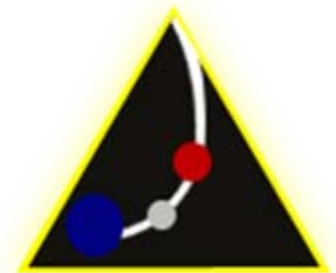
1. To involve students from grade school through graduate studies in a comprehensive program of increasing skill and complexity involving rocket, payload and spacecraft design, fabrication and flight
2. To provide experiential knowledge to secondary and higher level students to supplement classroom learning
3. To provide supplementary knowledge and continuing education for persons in the workforce for job retraining and skills retention
4. To establish and maintain a comprehensive program of research and experimental aerospace related projects



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# There Will Be Numerous Benefits

1. Aerospace workforce retention and retraining for future needs
2. Seeding the aerospace workforce of the future with critical skills
3. Creating a more attractive environment to attract new aerospace ventures to Florida
4. Maintaining, increasing and keeping relevant the skillset of the aerospace workforce in the state
5. Reducing the impact of "engineering brain drain" by providing a mechanism for experiential knowledge to be passed from the older generation to younger
6. Help make Florida more competitive in the aerospace and engineering related industries
7. Already scarce funds can be utilized more effectively and efficiently by pooling together the resources of multiple institutions, businesses and governments
8. By focusing on rocket, spacecraft and space engineering initiatives, the multidisciplinary nature of the work will benefit those in all math, science, and engineering related areas
9. While not a primary concern, the social benefits of mentoring and hands-on real-world achievement oriented projects are worthy of note

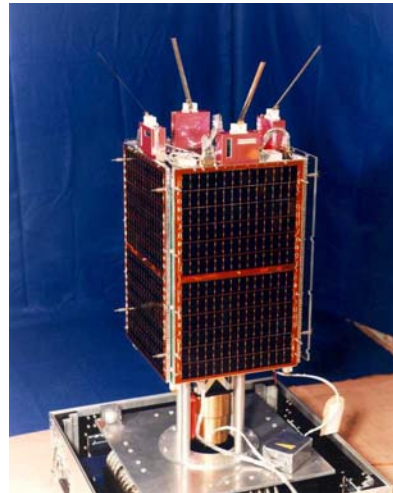


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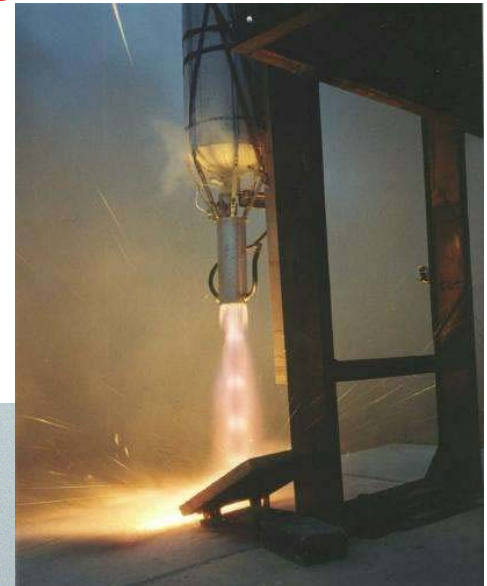
# FASTEP: Florida Aerospace, Science and Technology Education Program

FASTEP is a proposed comprehensive program consisting of 3 individual projects that span elementary through post-graduate level students...

- ✓ Student Rocket Program
- ✓ LASRE
- ✓ Small Satellites



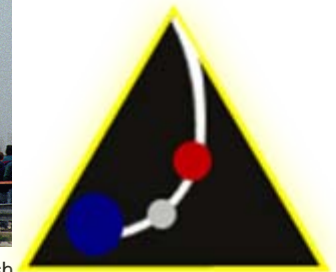
Fasat 55kg microsatellite



LunaRoc engine testing



1999 WI Rockets for Schools Super Loki launch, photo © Ken Walsh



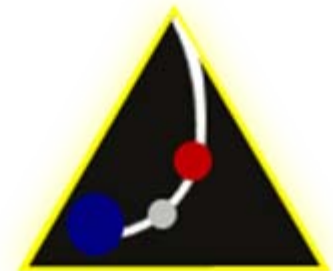
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# Student Rocket Program

The Student Rocket Program project involves primary, secondary and college students and begins with the design, construction and flight of model rockets. Further on, students will be involved in the creation of payloads to fly on actual sounding rockets on scientific missions. This project is being modeled after the successful Rockets For Schools programs that took place in the midwest in the 1990's.

- ❑ First Rockets For Schools was in 1996 in Sheboygan, Wisconsin. Since then, schools in WI, IL, MI, IA have participated.
- ❑ Model rockets for younger students, secondary level students participate in building model rockets and a sounding rocket mission, university level students and professionals from industry create a payload for a sounding rocket and conduct the mission
- ❑ Industry and government collaboration is key
- ❑ Three main purposes:
  - To stimulate interest in science, math and technology in students in grades 6 through 16 and make it more exciting
  - Encourage students and the public in future aerospace pursuits
  - Promote and teach cooperative learning, teamwork, leadership and problem-solving skills
- ❑ Model rocketry can be engaged with a minimal expenditure of money, a few hundred dollars per school. Other components of the Student Rocket Project would require grants, donations and government support

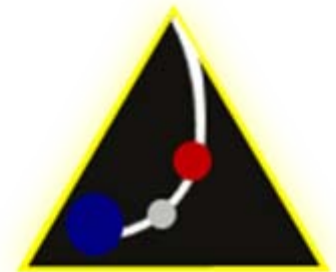


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# LASRE: Launch Systems & Rocketry Education

Taking a systems engineering approach is vital for engineering, math and science students. Traditional curricula don't provide enough exposure to full life-cycle development of aerospace products and only limited hands-on experience. This program will develop hands-on skills for engineering students and provide them with experience in all aspects of product development, from requirements definition to the actual test of an aerospace product.

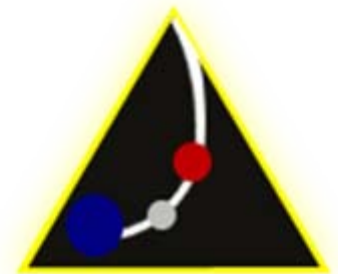
- ❑ Program patterned after the successful CALVEIN (California Launch Vehicle Education Initiative) program at California State U. at Long Beach
- ❑ Provide students with hands-on experience designing, developing and testing a rocket propulsion system
- ❑ Involves university undergraduates and graduate students partnered with industry professionals
- ❑ Multi-year program: basics and beginning design work in the first year, development the next year followed by fabrication and testing
- ❑ Using CSULB's CALVEIN as an example, total program cost for each iteration (each rocket system) should be less than \$200,000 over the span of a few years, from a variety of public and private sources



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# Small Satellites (Smallsat)

- What is a smallsat?
  - Small spacecraft weighing < 100lb.
  - Typically used to demonstrate new technologies, techniques, or for communication or earth/space observation
- Purpose - to provide hands-on experience in a multidisciplinary team-oriented space-related project including mission operations
- Program brings together university upperclassmen and graduate students in multi-university teams
- Typical lifecycle would be approximately 3 years from requirements specification to completion of spacecraft fabrication and testing (i.e. ready to launch)
- This program could be engaged for between \$50,000 and \$75,000 per year, on average

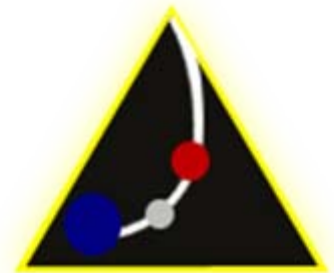


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# Seminars and Conferences



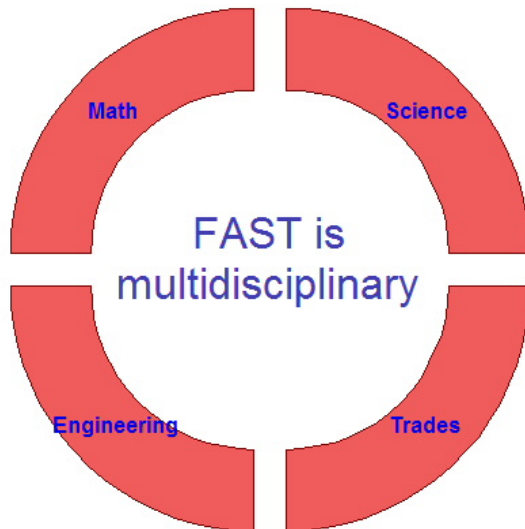
**An annual conference will bring together participants throughout the state to share knowledge and experience. Activities would include presentations by various teams and individuals along with learning sessions to supplement the classroom and project experience. The sharing of knowledge among teams and individuals would broaden the individual's learning experience. Additionally, participants with exceptional performance would be given an opportunity to gain formal recognition (i.e. achievement awards).**



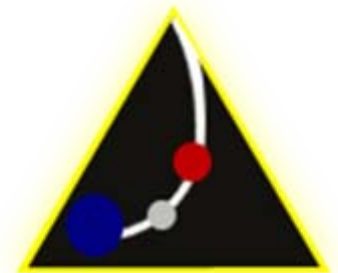
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# Multidisciplinary Aspects

The FASTEP program is multidisciplinary in nature. Knowledge and experience spans a broad range of skills.



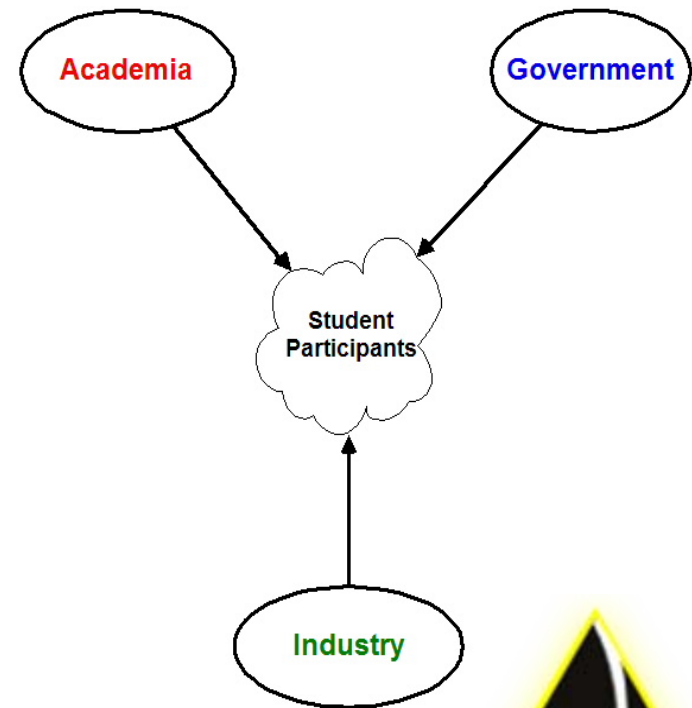
- ✓ Math
- ✓ Science
- ✓ Space
- ✓ Civil engineering
- ✓ Mechanical engineering
- ✓ Aerodynamics
- ✓ Photography
- ✓ Communications
- ✓ Other skills



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# Broad Scope of Partners

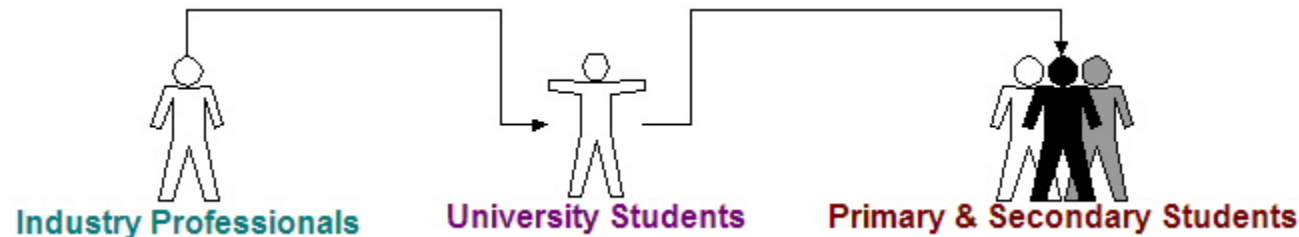
- FASTEP will bring together participants from academia, industry, and government
- The benefits from this include:
  - Increasing the skill level of graduates entering the workforce and enhancing Florida's economic competitiveness
  - Increasing the number of engineering and aerospace graduates
  - Students are more likely to work for an aerospace company in the state if they have worked with the company while still in school
  - Small business in Florida find a source of skilled labor and capital which they might not otherwise have access to
  - Industry and academia partners working with government can more effectively and efficiently engage in leading edge R & D projects in an environment of scarce funding



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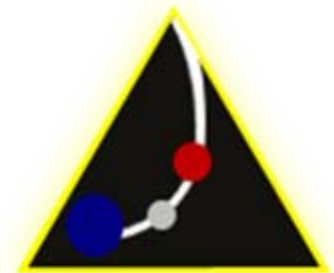
# Leveraging Existing Talent

FASTEP is designed to leverage existing talent and knowledge of professionals in the aerospace industry by giving professionals the opportunity to work with students. Additionally, older students work with younger students and pass on their knowledge. Multi-tiered mentoring is an effective way to spread experiential knowledge, increases the likelihood for project success and promotes teamwork and leadership.



# Bringing It All Together

FASTEP is composed of three connected phases. A student's involvement in the Student Rocket Program will lead to taking part in LASRE which in turn will lead to participation in smallsat projects. Key here is continuity in learning (from one phase to the next) and the comprehensive nature of the program. Of significant note is that, fully implemented, FASTEP projects would span the greater portion of an individual's educational career, from approx. grade 6 through graduate studies.

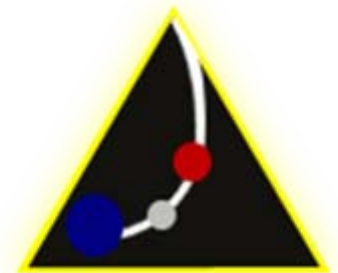


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# Timetable

- The desired implementation schedule for each phase is:
  - Student Rocket Program: beginning in Spring 2010
  - LASRE: beginning in Fall 2010 with the first rocket engine tested at the end of Spring 2011
  - Microsatellite: beginning in Fall 2010 with the first spacecraft ready to launch at the end of Spring 2012



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# Funding and Budget Targets

- Approximate projected budget requirements:
- Student Rocket Program:  
\$10,000/yr. at a ratio of 2:2:1 split between government, academia, and ARES, respectively (4k:4k:2k)
- LASRE:  
\$75,000/yr. at a ratio of 8:5:3 split between govt., academia, and ARES (45k:25k:15k)
- Microsatellite:  
\$75,000/yr. at a ratio of 1:1:1 split between govt., academia and ARES (25k:25k:25k)

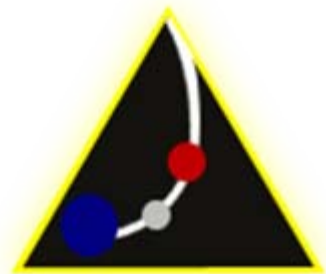
No bucks, no Buck Rogers!



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# Concluding Comments

The Aerospace Research and Engineering Systems Institute was formed with the purpose of creating hands-on space-related projects that bring together academia, industry and government participants. The objectives are to increase the skill level of engineering graduates, to increase the number of engineering graduates, and to increase the number of students entering the aerospace industry in Florida. Additionally, ARES seeks to reduce the impact of so-called “engineering brain drain” by providing means for the older generation of aerospace professionals to pass on their experience, knowledge and skills to the younger generation of students. The Vision for Space Exploration seeks to return humans to the Moon and establish a permanent lunar outpost as a stepping-stone on the path to future manned flights to Mars. ARES Institute supports the Vision and designs its programs with the goal of inspiring students to seek careers in aerospace and take an active role in fulfilling the Vision.



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# How To Reach Us

**Aerospace Research and Engineering Systems Institute, Inc.**

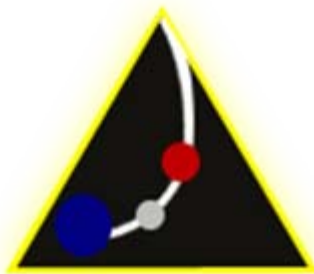
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