

Leveraging the NASA T2U Program for Integrating Entrepreneurship Within Capstone Design

Matthew J. Swenson, Michael R. Maughan, Vibhav Durgesh, George Tanner

Objective

Integrate the NASA Technology Transfer University (T2U) program into capstone design, creating opportunities for students to engage in entrepreneurial activities.

Introduction & Background

Capstone Design:

- Interdisciplinary program; two semester sequence
- Predominantly industry-sponsored projects, with little opportunity for entrepreneurship-related learning
- Need a project model to enable capstone students to innovate while developing an “entrepreneurial mind set”

NASA Technology Transfer University (T2U) program:

- Hundreds of unused, patented technologies with potential for high societal impact and commercialization
- Goal: enable universities to develop products and explore commercialization with these technologies.
- No cost research licenses granted for student projects.



Set Up

1. Capstone Instructors → Selected 2 technologies from the NASA catalog of available patents. Note: *Picked technologies that align with research expertise of faculty. These faculty serve as the “clients” for the projects.*
2. Apply for a no-cost research license via NASA. *Begin ~6 months in advance.*
3. Funding for projects provided via \$25k grant from the NASA Idaho Space Grant Consortium (ISGC).
4. Enabled four total projects over 2 years



Print-assisted Photovoltaic Assembly

Objective: Design and demonstrate a repeatable and automated assembly process for compiling thin-film cells into larger photovoltaic arrays. (from US patent 10,930,812)

Functions:

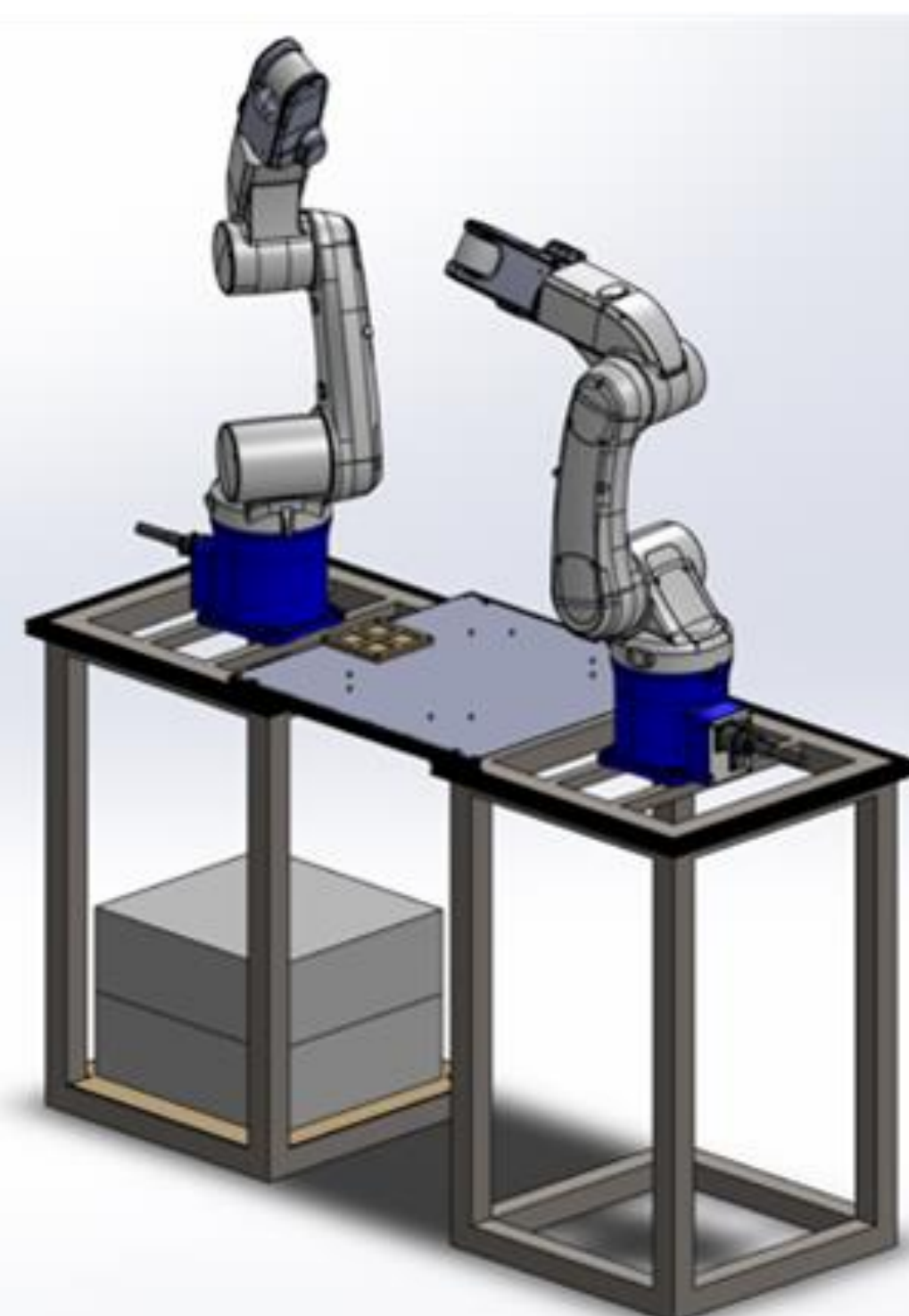
- 1) applying adhesive, 2) placing cells,
- 3) printing electrical circuit, and
- 4) applying a protective cover

Design Challenges:

- Robot coordination (see Figure)
- End effectors for 4 unique functions
- Stock feeding of substrate and cells
- Consistency in results

Product Ideas:

- Solar sails
- Power generation on the Moon or Mars (for long-term exploration)



Prandtl-D Flying Wing

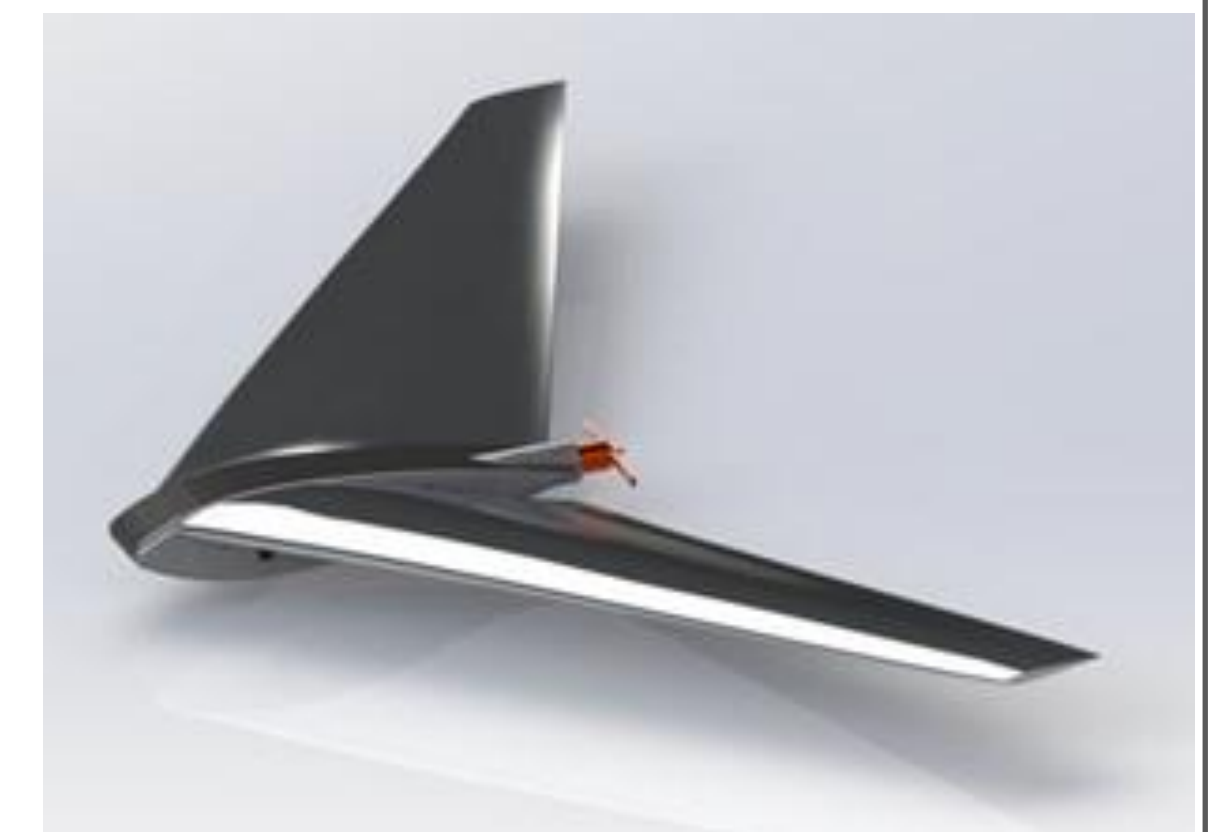
Objective: Evaluate the improvement in aerodynamic performance of an unmanned aerial vehicle (UAV) with a Prandtl-D wing design. (from US patent 9,382,000)

Context:

The wing has a proverse yaw via induced thrust near the wingtips. Improves energy efficiency and enables a more simplified aircraft due to its tailless design.

Design:

- A fully flyable proof-of-concept UAV with a 12-foot wingspan, the largest built to date (Figure).



Product Ideas:

- Agricultural surveying
- Wildfire detection

Entrepreneurship Integration

- Collaboration with parallel teams of entrepreneurship students (in the 2nd Semester)

- Learning Outcomes:

- Identify a potential product via customer discovery
- Develop a value proposition for pitch competitions

Students	Technology Project		Totals
	1) Solar Cell Robotics	2) Prandtl-D Wing	
UG Engr. (Capstone)	6	5	11
UG Engr. (2nd Capst.)	5	6	11
Graduate Stud. (TA)	1	1	2
UG Entrepren. (Yr. 1)	3	4	7
UG Entrepren. (Yr. 2)	3	4	7
Totals	18	20	38

- Formal instruction provided for creating value proposition

Reflection

- Identifying product ideas was challenging for the teams
Faculty need to assist with product ideation
- Business students were challenged with understanding the novelty and applicability of the technology.
- Participation in Pitch Competitions solidifies the need for clear value proposition and customer “beachhead”

Future Opportunities



- Capstone engineering students need more targeted coaching and training on customer discovery; similar to **NSF I-CORPS™** program, which can help with:

- Clear identification of customer “beachhead”
- Focusing the product development efforts
- Stronger collaboration with entrepreneurship students

Participants will be highly competitive for programs such as:

- **NSF I-CORPS™** Regional and National programs
- **NASA I-CORPS™** program

Potential for **\$3k - \$50k** in additional seed funding

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