

Michigan Tech Aerospace Engineering Research Center (MARC)

Michigan Technological University

Annual Report FY2020

Director:

Greg Odegard – MEEM

Statement of Purpose

To establish Michigan Tech as a leader in aerospace engineering research and education

Mission Statement

The institute will serve as a focal point at Michigan Tech for activities related to Aerospace Engineering. Specifically, the institute will

- Enable world-class research
- Foster undergraduate and graduate educational programs

Membership

The criteria for membership in MARC is simple: Michigan Tech researchers who either supported the proposal a couple of years ago and/or are actively participating in the center. The current members are:

- Jeff Allen (MEEM)
- Craig Friedrich (MEEM)
- Brad King (MEEM)
- Julie King (Chem Eng)
- Greg Odegard (MEEM)
- Trisha Sain (MEEM)
- Paul van Susante (MEEM)
- Kazuya Tajiri (MEEM)

Moving forward, the members of MARC will be engaged through a regular strategic planning meeting in which we will discuss funding opportunities, resource utilization, IRAD return usage, and research collaboration. The goal of these meetings will be to use our resources in the best manner to facilitate the members' research success and the growth of aerospace engineering research at Michigan Tech.

Major facilities/projects

Planetary Surface Technology Development Lab (PSTDL), aka Huskyworks

- Director: Paul van Susante
- Location: MEEM 701A and Benedict Lab U112
- Website: <http://www.huskyworks.space/>

Carbon Technology Center

- Director: Julie King
- Location: ChemSci building
- Website: <http://www.huskyworks.space/>

Ultra-Strong Composites by Computational Design (US-COMP)

- Director: Greg Odegard

- Website: <http://www.us-comp.com/>

IRAD return usage

In FY 2019 MARC used IRAD return for the following two items:

- Contribution to STEM service contract: **\$12,000**
- Cost share on C2E2 proposal (New Ground Penetrating Radar for Near-Surface Geophysical Survey, Timothy Scarlett and Paul van Susante): **\$5,000**

The STEM service contract needs to be covered to facilitate the aerospace materials-based research that is currently the largest component of MARC. The STEM is a very powerful, state-of-the-art instrument that needs an annual service contract. Michigan Tech has invested a substantial amount resources for the TEM, and MARC’s support was needed in 2019. Having the STEM fully operational continues to be a strength in future proposals that involve materials research. For the C2E2 proposal, the instrumentation will be a benefit to the research of Paul van Susante. This equipment will facilitate future research proposals in space resource utilization.

Strategic planning

MARC has not yet addressed any future strategic planning. One of the goals for FY2021 is to start identifying resource gaps that we have, which prevent us from attracting external aerospace research funding. We plan to address this issue, and to establish means of obtaining these resources.

Total Center Proposals Submitted & Awards Per FY

	FY19	FY20	FY21	FY22	FY23
Number of proposals	11	13			
Number of PI’s who submitted	3	12			
Total requested amount	\$1,354,629	\$4,347,348			
	FY19	FY20	FY21	FY22	FY23
Number of awards	5	7			
Number of PI’s who were awarded	2	2			
Total award amount	\$5,117,712	\$4,165,912			

IRAD Fund Income and Use Per Fiscal Year

	FY19	FY20	FY21	FY22	FY23
Expenditures					
SSW	\$0.00	\$0.00			
Supplies	\$0.00	\$0.00			
Equipment	\$0.00	\$5,000.00			
Travel	\$0.00	\$0.00			
Transfers Out	\$0.00	\$12,000.00			
Designated Fund Fee	\$389.98	\$0.00			
Total Expenditures	\$389.98	\$17,000.00			
Income					
IRAD	\$27,121.10	\$29,128.03			
PI Transfers	\$0.00	\$0.00			
Other	\$0.00	\$0.00			
Total Income	\$27,121.10	\$29,128.03			
Carryforward	\$0.00	\$26,731.12			
End FY Balance	\$26,731.12	\$38,859.15			

Active Contracts FY 20

1608063	9/2/2016	8/31/2019
Odegard, Greg (PI: MEEM)		
Colorado Seminary - University of Denver		
<i>"I/UCRC: Novel High Voltage/Temperature Materials and Structures"</i>		
1607060	6/15/2017	6/14/2022
Odegard, Greg, (PI: MEEM); Pandey, Ravindra, King, Julia, Sain, Trisha		
National Aeronautics & Space Administration		
<i>"Institute for Ultra-Strong Composites by Computational Design (US-COMP)"</i>		
1807023	6/20/2019	12/20/2019
King, Julia (PI: ECM)		
Confidential		
<i>"Confidential"</i>		
1803004	9/25/2019	10/13/2020

van Susante, Paulus (PI: MEEM)
Honeybee Robotics Ltd
"RedWater: Extraction of Water from Mars' Ice Deposits"

1909082	5/1/2019	4/30/2020
---------	----------	-----------

van Susante, Paulus (PI: MEEM)
University of Michigan
"MTU team for NASA Lunabotics Competition"

1811081	10/15/2019	10/14/2024
---------	------------	------------

van Susante, Paulus (PI: MEEM)
University of Central Florida
"Center for Lunar and Asteroid Surface Science (NASA SSERVI CAN)"

2001030	2/14/2020	4/30/2021
---------	-----------	-----------

van Susante, Paulus (PI: MEEM)
National Institute of Aerospace
"T-Rex (Tethered - permanently shade Region EXplorer)"

1905027	9/3/2019	9/2/2021
---------	----------	----------

Odegard, Greg (PI: MEEM)
University of Massachusetts
"Multiscale Modeling of Advanced Fiber-Reinforced Thermoset Composites During Curing"

Pending Proposals at close of FY 20 \$3,028,343

2001022P1 Date submitted: 01/14/2020
University of Colorado
"AI Institute: AI - Driven Discovery of Molecules Nanostructures and Catalysts for Chemical Precision Manufacturing"
09/01/2020 – 08/31/2025 \$999,999 PI: Odegard, Greg

2003066P1 Date submitted: 03/27/2020
National Aeronautics & Space Administration
"NASA GCD: Molten Regolith Electrolysis Technology Maturation"
01/01/2021 - 08/31/2023 \$754,887 PI: van Susante, Paulus

2003067P1 Date submitted: 04/01/2020
National Aeronautics & Space Administration
"NASA GCD: In-situ Construction"
01/01/2022 – 08/31/2023 \$100,023 PI: van Susante, Paulus

2005031P1 Date submitted: 05/12/2020
US Dept of Defense

“A Thermodynamically-consistent Entrop-Based Model for Impact Fatigue Failure of Composites under Moisture Diffusion”

07/01/2020 – 12/13/2020

\$49,742

PI: Sain, Trisha

2005060P1 Date submitted: 05/19/2020

Pacific International Space Center for Exploration Systems Basalt

“Launchpad Additive-manufacturing Sintering Test (BLAST)”

01/01/2021 – 06/30/

\$350,001

PI: van Susante, Paulus

2005067P1 Date submitted: 05/22/2020

University of Massachusetts

“ICME Optimization of Advanced Composite Components of the Aurora D8 Aircraft”

09/01/2020 – 08/31/2023

\$167,995

PI: Odegard, Greg

2006011P1 Date submitted:06/02/2020

University of Massachusetts

“FMRG: Enabling the Manufacturability of the Next Generation of Fully Recyclable Wind Turbine Blades”

09/01/2020 – 08/31/2025

\$605,696

PI: Odegard, Greg