

# Synthetic Biological Membrane (SBM) Project

Game Changing Development Program | Space Technology Mission Directorate (STMD)



## ANTICIPATED BENEFITS

### To NASA funded missions:

The Space Synthetic Biology (SSB) project can improve the reliability and reduce the mass, power, and volume of NASA's next generation life support systems, particularly on ISS, based on lessons learned showing that "reliability" is the major limitation of ISS technology. SSB objective is to improve subsystem reliability by integrating biological and mechanical systems to create a new type of biomechanical subsystem. Improved reliability leads to a reduction in the amount of material, or mass, that would otherwise be required to be launched, leading to increase efficiency, in both time and cost.

### To NASA unfunded & planned missions:

The product of this development project will be relevant to the NASA Advanced Exploration System (AES) Life Support System Program (LSS) that may be deployed in exploration mission scenarios.

## DETAILED DESCRIPTION

The ultimate goal of the Synthetic Biological Membrane project is to develop a new type of membrane that will enable the wastewater treatment system required on exploration missions to operate for extended periods while requiring no maintenance, and using only available resources. Because current water treatment systems have a lifetime of less than 1 year, extending membrane life will benefit exploration missions by reducing upmass and crew time requirements associated with maintenance and resupply/replacement of membranes. The project will use synthetic biology to engineer organisms that create and replenish the membrane, and this new technology can be easily adapted for use in terrestrial waste water treatment plants.

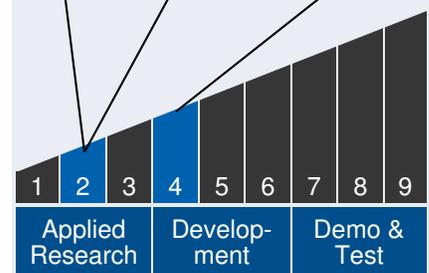


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### Technology Maturity

Start: 2 | Current: 2 | Estimated End: 4



### Management Team

#### Program Executive:

- Lanetra Tate

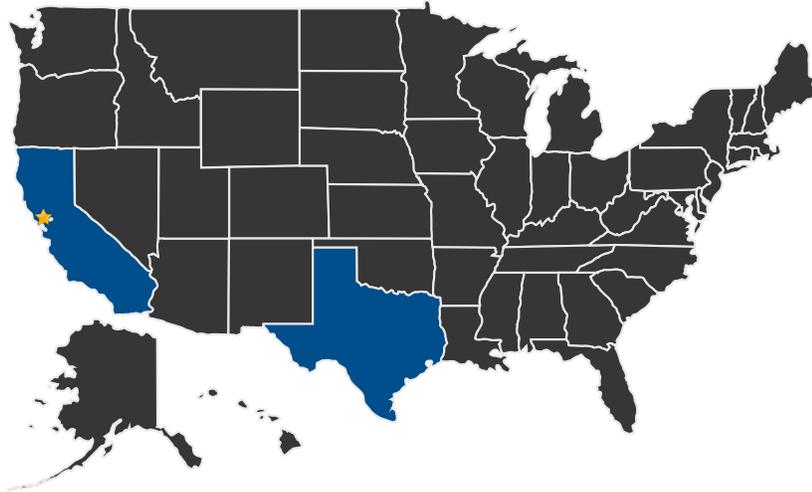
#### Program Manager:

- Mary Wusk

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## U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States  
With Work

★ **Lead Center:**  
Ames Research Center

### Other Organizations Performing Work:

- Human Exploration and Operations Mission Directorate
- Massachusetts Institute of Technology
- Nanocomp

### Management Team (cont.)

#### Project Manager:

- Michael Flynn

#### Principal Investigators:

- Michael Flynn
- Masood Hadi

### Technology Areas

#### Primary Technology Area:

Human Health, Life Support, and Habitation Systems (TA 6)

- └ Environmental Control and Life Support Systems and Habitation Systems (TA 6.1)
  - └ Water Recovery and Management (TA 6.1.2)

#### Secondary Technology Area:

Human Health, Life Support, and Habitation Systems (TA 6)

- └ Human Health and Performance (TA 6.3)
- └ Materials, Structures, Mechanical Systems and Manufacturing (TA 12)
  - └ Materials (TA 12.1)
    - └ Materials for Extreme Environments (TA 12.1.4)

## DETAILS FOR TECHNOLOGY 1

### Technology Title

Synthetic Biological Membrane

### Technology Description

This technology is categorized as a material for other applications

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membrane that will enable the wastewater treatment system required on exploration missions to operate for extended periods while requiring no maintenance, and using only available resources. Because current water treatment systems have a lifetime of less than 1 year, extending membrane life will benefit exploration missions by reducing upmass and crew time requirements associated with maintenance and resupply/replacement of membranes. The project will use synthetic biology to engineer organisms that protect and replenish the membrane, and this new technology can be easily adapted for use in terrestrial waste water treatment plants.

### Capabilities Provided

This project provides a new type of membrane with extended performance life based on the regenerative capability of living systems.

### Potential Applications

The product of this development project will be relevant to the NASA Advanced Exploration System (AES) Life Support System Program (LSS).

### Performance Metrics

Metric	Unit	Quantity
membrane life	years	1
Water recovery ration	%	87