



# NEEMO 21



## Tools, Techniques, Technologies & Training for Science Exploration EVA

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### OVERVIEW

The 21<sup>st</sup> mission of the NASA Extreme Environment Mission Operations (NEEMO) was a highly integrated operational test and evaluation of tools, techniques, technologies, and training for science driven exploration during Extravehicular Activity (EVA). The 16-day mission was conducted from the Aquarius habitat, an underwater laboratory, off the coast of Key Largo, FL. The unique facility, authentic science objectives, and diverse skill-sets of the crew/team facilitate the planning and design for future space exploration.

### PARTNERSHIPS / COLLABORATIONS

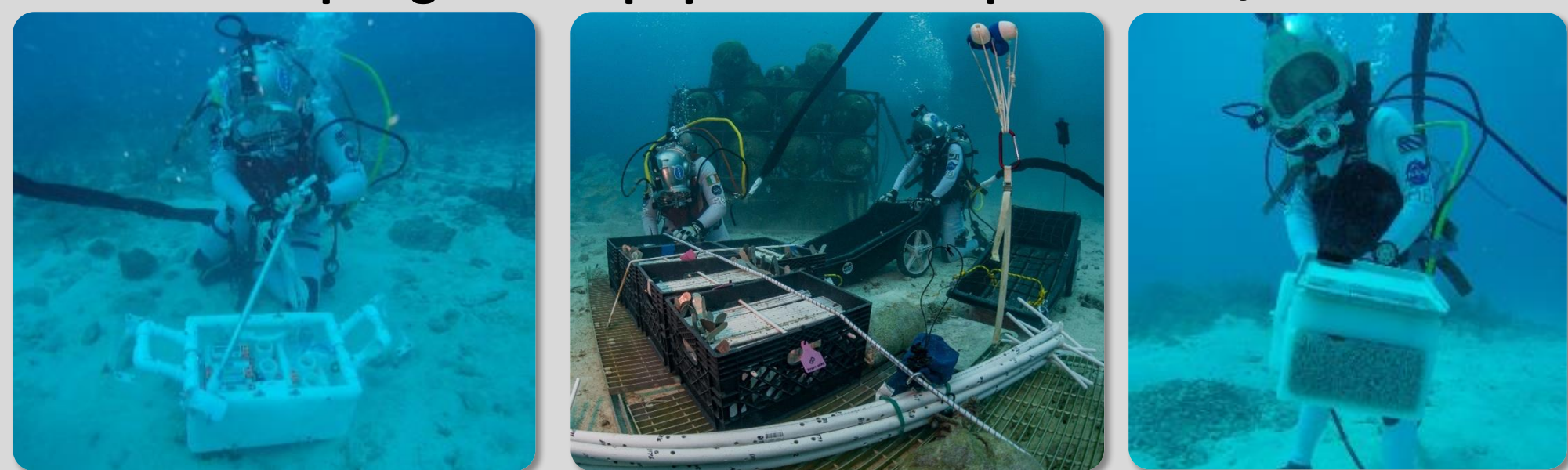
NEEMO continues to provide an excellent opportunity for collaboration and integration within JSC, across NASA centers, along side our international partners, and with academia, industry, institutions and the military.



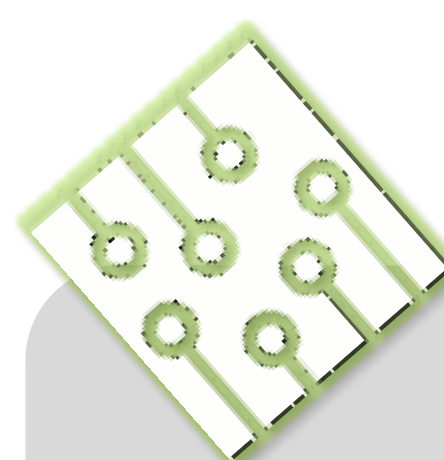
## TOOLS

### Tool and Equipment Maturation

Science Sampling Kit    Equipment Transport    Sample Collection



- Provided unique field environment for testing prototype hardware for design maturation of tools and equipment
- Included equipment, instrumentation, and sampling methodologies similar to science activities intended for planetary surface exploration



## TECHNOLOGIES

### Technology Innovation Incubator

Navigation    IV Workstation    Informatics

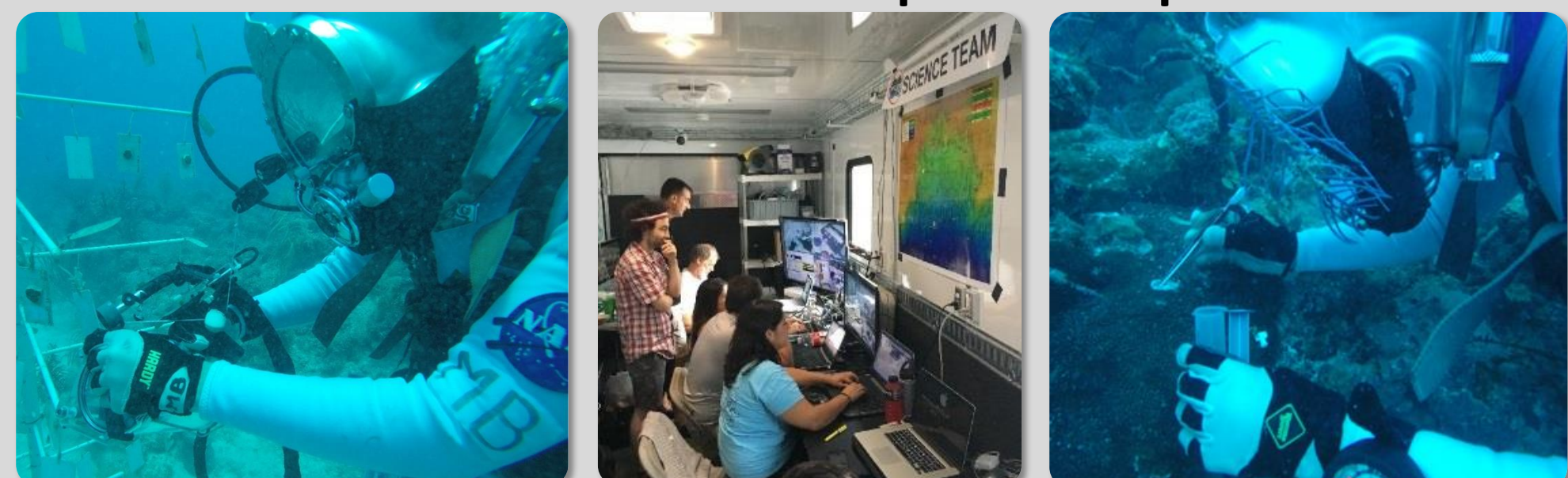


- Assessed technology needs (hardware and software) for navigation, communication, and operations to support accomplishment of science objectives
- Developed unique technology solutions that will feed into other innovation opportunities and projects

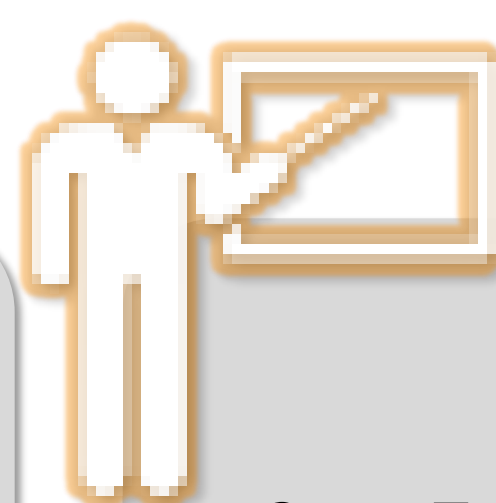
## TECHNIQUES

### Concepts of Operations Testing

Data Collection    Science Ops    Sample Preservation



- Evaluated concepts of operations mapped to specific EVA needs and knowledge gaps
- Integrated authentic science objectives allowed for credible analysis of end-to-end testing of concepts of operations required for exploration driven EVAs



## TRAINING

### Unique Training Opportunities

Crew Training    Skill-Set Integration    Team Training



- Facilitated integration, coordination, and education from multiple disciplines and organizations
- Provided for unique crew training and leadership opportunities lauded by the astronaut office
- Enabled integration across diverse skill sets and teams