Quad Chart Poster

for Senior Design Night

Quad Chart Description: The Quad chart is a traditional one page summary of a project. A Quad chart asks for a brief description of the project, a statement about the potential benefit from the project, and description of the management approach of the project, and a summary of the cost and schedule for the project.

https://www.nasa.gov/pdf/522234main_template_instructions.pdf

Issues: Often ends up being an overly complicated slide.

https://smdepo.org/post/9199

AREN Project -- *(November 14-18 2016)*

Programmatics

PI/Institution: David Bydlowski / Wayne RESA - Wayne, MI PI Email: davidbydlowski@me.com
Total Value: $3,276,147 (Wayne RESA - $1,926,808 Goddard Space Flight Center -- $1,349,339)

Period of Performance: Jan 4, 2016 – Dec 31, 2020

Summary Description: The *AEROKATS and ROVER Education Network (AREN)* introduces NASA technologies and practices in authentic, experiential learning environments. Low-cost instrumented systems for in-situ and remotely sensed Earth observations include kite-based "AEROKATS", and remotely controlled aquatic and land-based "ROVERS".

AREN technologies and lesson development are NGSS aligned and provide necessary science literacy skills. Data capture and visualization tools,designed to integrate with the GLOBE Program, enable the expansion of GLOBE study sites in new dimension with transects and vertical profiles. Engineering Design concepts are embedded in student development of new platforms and instrument systems. Training, safety practices, and STEM challenges are a focus of the AREN Team, concurrently advancing student research projects investigating Earth science related phenomena.

Science Focus: Earth Science **Audience:** Grades 5-12; Formal, Informal and Pre-Service Educators, Citizen Scientists **Region(s) Served:** United States

Current Partnerships

GLOBE

University of Alaska, Fairbanks: Impacts and Feedbacks of a Warming Arctic: Engaging Learners in STEM Using NASA and GLOBE Assets

University of Toledo: Mission Earth: Fusing GLOBE with NASA Assets to Build Systemic Innovation in STEM Education

Southwestern Community College: Eclipse 2017

Gulf of Maine Research Institute: Online Earth Science Course

University of Colorado, Boulder: Eclipse 2017, Videos of ARE

National Solar Observatory/Association of Universities for Research in Astronomy: Eclipse 2017

University of Washington: Winglee/Camera Technology/Operations

Goddard Space Flight Center: Outreach/Education

American Museum of Natural History: OpenSpace/Data Sets

Team Members and Institutions

Anasphere, Inc. -- John Bognar

Chesapeake Bay Environmental Center – Eileen Friedman, Hannah Spongberg, Alissa Quinton, Vicki Paulas, Judy Wink

Montana State University – Suzi Taylor, Kim Obbink, Kelly Boyce

NASA/GSFC– Geoff Bland, Sallie Smith, Patrick Coronado

Public Lab – Mathew Lippincott, Becki Chall, Shannon Dosemagen

University of Maryland Eastern Shore – Abhijit Nagchaudhuri, Chris Hartman, Willie Brown

University of South Florida – Jonathan Gaines

Washington College – Doug Levin, Jemima Clark

Wayne RESA – David Bydlowski, Andy Henry

AREN Project -- *(November 14-18 2016)*

Evaluator(s)

Anil Aranaha, PhD – Evaluation and Assessment
anfaranha@yahoo.com
406-388-4177

Opportunities

- Collaborate with GLOBE to advance multi-dimensional data collection and analysis, and data develop remote sensing protocols at local scale
- Enhance engineering within GLOBE
- Develop new AeroPods and ROVERs for a wider range of phenomena
- Develop lending library for AEROKATS and ROVER hardware
- Collaboration with content projects, audience projects, and infrastructure projects.
- Distribute information via Science "WOW"
- NASA educational resources – NASA Wavelength; science.nasa.gov; PBS Learning Media; NASA eClips; NASA@ My Library;
- Create repository of AREN learning resources

Risks/Areas of Concern

- Continued clarity of focus - trying to accomplish "too much";
- Complexity - clarity of "how" to do the project;
- Clarity of task/jobs of each partner;
- Hardware configuration control and distribution, cost;
- "Unpacking" tasks;
- GLOBE protocol development schedule;
- Funding work assigned to GLOBE – Additional funding to support GLOBE work on protocol development and database management;
- Developing teacher focused materials instead of student focused materials.

Measurable Achievement

Learning Resources – Development and Delivery:
Geospatial tools for data sharing and analysis; New GLOBE protocols and learning activities; STEM instructional units aligned with NGSS; Online Courses; Short programs for informal education; Comprehensive elective courses; STEM challenges; Online Web and Social Media presence

Instrumentation, Protocols, and Operations – Development and Delivery:
Aeropods: Monocams; Profilers; Anasondes; Twincams;Thermocams;
ROVERs: TerraRover; AeroRover; Rover 3-D Printed;
Lending Library

Evaluation for this project is defined as a systematic investigation of the merit, worth or effectiveness of the project or curriculum material on teachers, students and their communities. Evaluation focuses on two main themes:
1) Level of satisfaction of the participants
2) Impact of the project on the targeted audience

AREN Project -- *(November 14-18 2016)*

Dissemination

- GLOBE Training
- General AREN Training
- Pilot program on aerial Imaging and ground level atmosphere data collection with the Rouge Education Project.
- STEM Project Pilots at CBEC on Beach Erosion and Invasive Species
- National Teacher Enhancement Network (NTEN) online courses
- Bulls-EYE summer mentoring program (USF)
- Public Laboratory for Open Technology and Science (hardware distribution, community science events and forums)
- Undergraduate course and student workshop (UMES)
- Conference Presentations – AGU, NSTA, MDSTA, MSTA
- Web, social media, and online webinars

Updates/Changes

During 2016, there was a shift in funding levels between Wayne RESA and GSFC. Incompatibilities became apparent in the contractual language required by three university partners and Wayne RESA with regard to compliance with their respective state laws. This resulted in those institutions applying for individual Cooperative Agreements with NASA SMD. To cover the cost of this, the necessary funding for the contracts and costs for managing these contracts was de-obligated from Wayne RESA and obligated to GSFC. This amounted to a funding transfer of approximately $600,000 over the course of the program

Look Ahead

- AEROKATS and ROVER Development, Testing, and Training
- Pilot Program on Aerial Imaging and Atmospheric Profiling with Rouge Education Project
- Online Presence
- Online geodatabase and mapping tools (go live)
- Partnering with Eclipse 2017
- Performance Improvements for Citizen Science and Research
- Training Workshop at CBEC for area educators
- Undergrad Student Workshop at UMES
- Aerial Operation and Remote Sensing Class at UMES
- New Anasonde Prototypes with data logging and telemetry
- Bulls-EYE summer mentoring and new ROVER 3D Designs
- Online Earth Science Content Course for Educators
- Local Collaborations with Tribal Colleges
- Buoy Deployment and Operation
- Develop ROVER Sensor Calibration Procedures
- Wind Measurements and Lift Estimation

Cross-Collaboration Status

We need to work with GLOBE on two projects – New GLOBE Protocols Development and Develop a Media Plan for upcoming AREN workshops – We need to determine if there are any costs that will be incurred.

We will work with GLOBE on partnering with future measurement campaigns.

We will work with the University of Alaska to do aerial imaging of sea ice

Examples of Engineering Quad Charts

NAVY Transition Assistance Program

NAVAIR Public Release 2013-1078 Approved for public release; distribution is unlimited.

N101-026 - ATA Engineering, Inc

Multi-Axis Vibration Mitigation and Habitability Improvement for Seated Occupants

NEED & CUSTOMER REQUIREMENT

Need: As aircraft capability increased and mission lengths extended, there have been increasing complaints of annoyance, fatigue, and musculoskeletal pain during prolonged exposures to propulsion-generated vibration in propeller-driven aircraft.

Value to the Warfighter: The technology improves blood circulation for the seated occupant and relieves excessive pressure without the occupant having to move. The active cushion allows the operators or pilots to sit for much longer without experiencing numbness, excessive pressure, or muscle ache, thus allowing them to be more alert and focused on their assignment.

Operational Gap: Legacy seat provides no active occupant relief during extended missions, leading to 78% of pilots and 74% of naval flight officers (NFOs) reporting pain and numbness in the posterior and upper legs.

Customer Specifications: The cushion shall provide a reduction in peak pressure points, have good ventilation, not add more than five pounds to seat weight, not change the position of the seated occupant, comfortably accommodate the 5th-90th percentile male, cushion shall not impede the use of any mission equipment, have a 5 year life minimum, and meet or exceed requirements per FAR 29.853 and MIL-STD-810G.

Technology Description: Unlike other pneumatic seat cushions in the marketplace, the Continuous Wave Cushion (CWC) does not use inflated bladders to support the occupant. Instead, it is made up of a pattern of sealed foam cells that can be individually collapsed by vacuum to relieve local pressure. The cells reinflate on their own as atmospheric pressure is restored. Through gradual collapse and reinflation of a pattern of cells, the occupant support surface is continually varied – allowing circulation to restore periodically over the entire seated area.

SPONSORSHIP of original SBIR/STTR Topic

SYSCOM: NAVAIR

Transition Target: E-2 C/D Hawkeye aircraft

Original Sponsoring Program: PMA 231, E-2 Hawkeye Program Office

TPOC Contact Information: 301-342-8450

TECHNOLOGY DEVELOPMENT MILESTONES (SBIR/STTR)

Milestone	TRL	Risk	Measure of Success	TRL Date
Operational optimization	5	Moderate	Optimal active and passive features selected	Q4 2013
Navy physiological evaluation	6	Moderate	Occupant comfort improvement demonstrated	Q2 2014
Pre-flight design review	7	Moderate	Design passes pre-flight engineering review and test program	Q4 2014
Flight testing	8	Moderate	Seat functionality demonstrated in-flight onboard E-2C or other aircraft	Qt 2015

Open contract: N68335-12-C-0330 ending November 2014

Image Citation: Navy Image: 080304-N-2984R-336 (left) / Copyright 2013, ATA Engineering, Inc (right)

TECHNOLOGY TRANSITION OPPORTUNITIES (PHASE III)

Other Potential Applications: In addition to military endurance aircraft, commercial applications are anticipated in long haul trucking, municipal transit, commercial passenger aircraft, medical, and office furniture industries.

Business Model: Licensing CWC technology components to seat manufacturers.

Objective: Seeking partners to incorporate the CWC technology in military and commercial aircraft and develop solutions for seating systems on-board new aircraft and for retrofitting existing aircraft with "drop-in" replacement cushions.

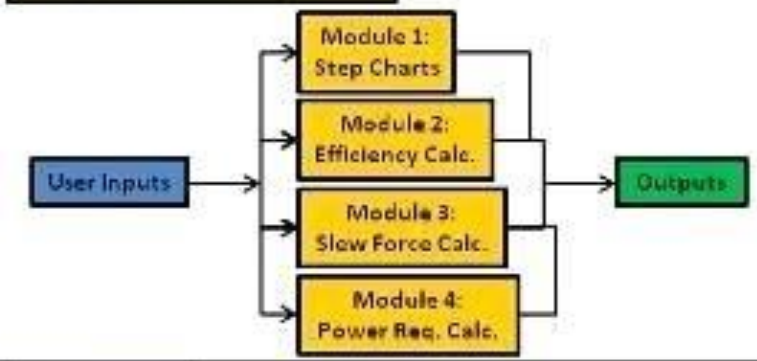
Company: ATA Engineering, Inc **Contact:** Mr. Joshua Davis **Email:** jdavis@ata-e.com **Phone:** 858-480-2028

https://www.slideshare.net/robertemmanuelmayssat/ata-engineeringincquad

UNITED STATES MILITARY ACADEMY
WEST POINT.

Vehicle Steer Performance Team

Program Module Flow



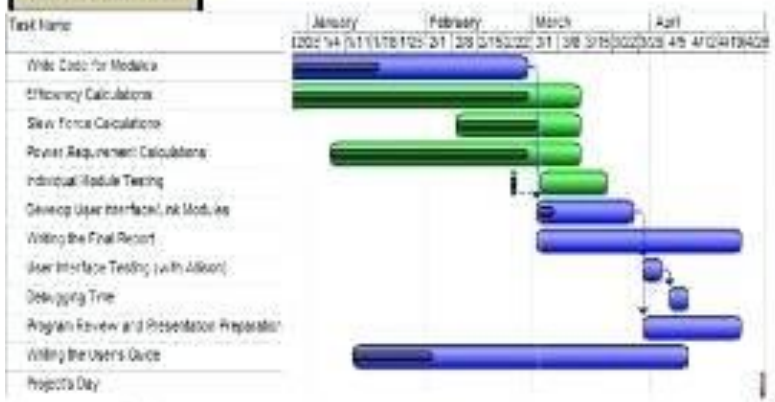
Mission

The Vehicle Steer Performance Team will design, test, and validate a *Transmission-Vehicle Steering Performance Program* for Allison Transmission, Inc. in order to accurately predict the engine power output necessary to achieve given steer commands for various tracked vehicle cross drive transmission combinations.

Challenges/Issues

- Organizing cell references and tracking all equations
- Using linear regression to accurately model efficiency and slew force
- Enabling new data to improve model without requiring redevelopment
- Arranging program in an organized, intuitive manner

Schedule



Deliverables

- *Transmission-Vehicle Steering Performance Program*
  - Platform: Microsoft Excel
  - Projected file size: 3 MB (Max)
- Program User Guide
  - Will enable Allison engineers to effectively employ the program
  - Support future expansion of model capabilities

Long-term Benefits for Allison

- Faster, more powerful simulations
- Intuitive user-interface
- Accept new data for continuity
- Ability to model vehicle-transmission combinations
- Program should remain beneficial for years to come

http://nextbook.co/editor/?

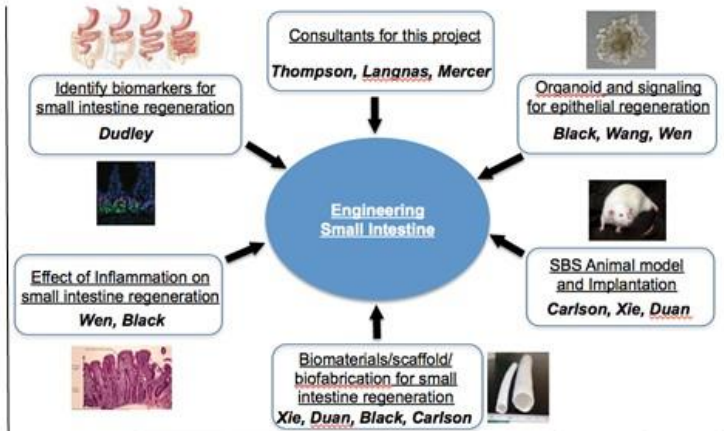
Small Intestine Tissue Engineering

University of Nebraska Medical Center

PIs: Jingwei Xie, Mark Carlson, Bin Duan, Haitao Wen, Andrew Dudley, Jennifer Black, Jenni Wang

Problem, Hypothesis and Relevance

- Short bowel syndrome (SBS) affects neonates and children and has mortality rates up to 10-30%.
- The most promising treatment for SBS remains intestinal transplant , however, overall worldwide survival for isolated small bowel transplantation is around 50% at 5 years.
- There is a critical need for engineering small intestine due to a desperate shortage of donors and donor-to-recipient size mismatch.



Proposed Solution

- The objective of the projects in this proposal is to understand the mechanism of small intestine regeneration and engineer functional small intestine tissues.
- The Specific Aims are to: 1) Identify, validate and characterize biomarkers/signaling pathways for small intestine regeneration; and, 2) To engineer functional small intestine tissues for treatment of SBS in the animal model.
- We anticipate that the identification of biomarkers and mechanisms of small intestine regeneration will lead to more effective ways for engineering functional small intestine tissues for SBS treatment.

Timeline and Cost

Activities	FY 2016	FY 2017
Identify, validate and characterize biomarkers for small intestine regeneration	→	
Characterize impact of inflammatory on small intestine regeneration	→	
Engineering small intestines and proof of concept for prosthetic implants	→	
Estimated Budget ($K)	$175,000	$175,000

https://www.unmc.edu/regenerativemed/research/collaborations.html

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
MCSC-PRR-1925

Topic # N142-087
Expeditionary Portable Oxygen Generation System
TDA Research, Inc.

WHO

SYSCOM: MARCOR

Sponsoring Program:

Transition Target: Forward Resuscitative Surgical System

TPOC:
sbir.admin@usmc.mil

Other transition opportunities:
U.S. Army Medical Units
The expeditionary portable oxygen generation system can be used in medical facilities of various sizes, emergency management agencies, disaster aid and humanitarian aid agencies, and municipal fire and rescue squads.

Photo provided courtesy USMC, VIRIN: 160801-M-QM580-126

Notes:
LPM: Liters Per Minute
PSIG: Pounds Per Square Inch Gauge
FRSS: Forward Resuscitative Surgical System
EPOGS: Expeditionary Portable Oxygen Generating System
SWaP: Size, Weight and Power

WHAT

Operational Need and Improvement:
The objective is to develop a portable oxygen generation system that consumes less electrical power, and has a compact cube/size and reduced weight. This objective is in support of the expeditionary medical requirements of the USMC.

Specifications Required:
- Smaller, lighter, man-portable (2-4 personnel)
- More energy efficient (requiring less electrical and mechanical power)
- Produces medical-grade oxygen (United States Pharmacopeia (USP) 93% oxygen)
- Flow rate greater than 15 Liters Per Minute, produce 2200 PSIG
- Total weight does not exceed 250 pounds, volume does not exceed 20 cubic feet
- Maximum power should not exceed 1200 Watts
- Ability to be transported in all tactical/medical vehicles including helicopters
- Operate in all climates with no degradation at temperatures between -40 deg F and 125 deg F

Technology Developed:
The size and power reduction of the EPOGS are made possible through the incorporation of a more selective oxygen/nitrogen separation sorbent and by the implementation of innovative adsorption/regeneration cycling schemes.

Warfighter Value:
SWaP improved thereby reducing logistical burden
- Reduced power requirements by 33% (from 1800 Watts to 1200 Watts)
- Decreased size by 40% (from 34.5 cubic feet to 20 cubic feet)
- Decreased weight by 61% (Goal from 644 lbs. to 250 lbs.)

WHEN

Contract Number: M67854-16-C-6504 **Ending on:** August 8, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Breadboard testing complete	Low	Meets flow/purity/power requirements	4	3rd QTR FY17
Design Review of Prototype	Low	Design meets flow/purity/power requirements and MIL-STD	4	1st QTR FY18
Develop laboratory prototype	Low	Meet flow/purity/power requirements and MIL-STD-810G requirements	5	3rd QTR FY18
Production-type prototype completed and tested	Med	Meet flow/purity/power requirements and successful testing against MIL-STD-810G	6	4th QTR FY18

HOW

Projected Business Model:
TDA will contract a third party medical device manufacturer to produce the EPOGS which will be sold directly to the USMC.

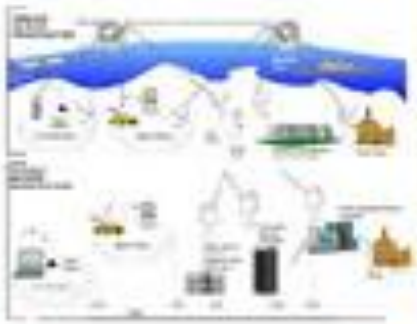
Company Objectives:
TDA Research, Inc. is a technology developer that uses various pathways to commercialization. Depending on the technology and manufacturing process, we will manufacture products in-house and sell directly to customers or we will license the technology to a third party.

Potential Commercial Applications:
The potential for commercial application and dual use is high. The proposed system would be easily portable and well suited in areas where limited power is available. The expeditionary portable oxygen generation system can be used in medical facilities of various sizes, emergency management agencies, disaster aid and humanitarian aid agencies, and municipal fire and rescue squads.

Contact: Gokhan Alptekin , Principal Investigator
galptekin@tda.com (303)940-2349

What could be done better here?

Adaptive Hierarchical Network Modeling and Simulation



NEW IDEAS/METHODS

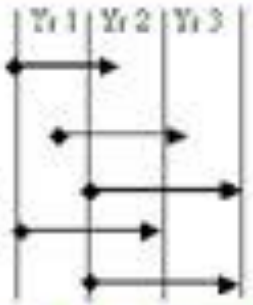
- Robust multi-scale traffic models and model complexity vs performance tradeoff
- Hierarchical loss network models and progressive estimates and control
- Self-configurable adaptive hierarchical traffic models linked to network management and control functions

IMPACT

- New network laws for new traffic types (fractal)
- Two to three orders of magnitude faster performance evaluation of large networks
- Enabler of intelligent network management via models
- Accurate network planning and dimensioning

SCHEDULE

Self-similar traffic models and wavelets
Multi-fractal traffic models and wavelets
Queuing theory/control
Aggregation hierarchies
Network design and control on hierarchies



University of Maryland College Park: J.S. Baras, A. Makowski, P. Narayan

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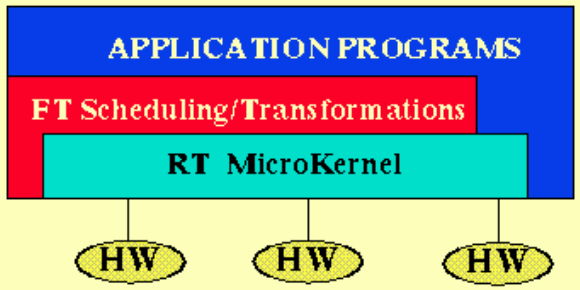
http://www.hynet.umd.edu/research/darpa/darpa-modeling/overview.html

FORTS: Fault tOlerance in Real-Time systems through Scheduling

Phase 1



Phase 2

RTMach

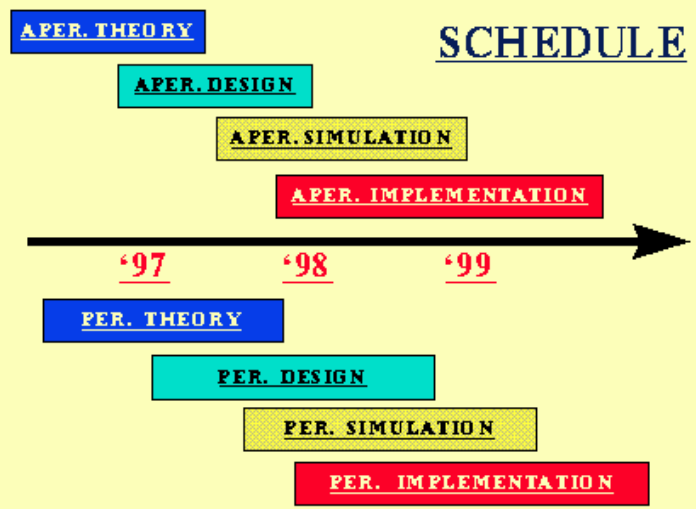
NEW IDEAS

- Derivation of new bounds for FT, rate-based scheduling
- Overloading: analytically determine best number of tasks that can use the same backup
- Dynamic resource reclamation of unused backups
- FT admission control added to COTS
- Middleware for FT scheduling in distributed RTSs
- User-specified level of Fault Tolerance
- FAULT DETECTION at different levels:
  application (user), system (kernel), hardware (devices)

IMPACT

- Highly efficient use of resources with FAULT TOLERANCE CAPABILITIES
- TRUE Academic-Industry (HTC) collaboration will speed up Technology Transfer Path
- Allows periodic and aperiodic applications running on the same hardware platform
- Improves performance and supports constraints of time and environment (weight, size, heating/cooling, power, fault requirements, etc)

SCHEDULE



Melhem/Mosse (Univ of Pittsburgh), Suri (NJIT)

http://cs.pitt.edu/FORTS/quad.html

This is the title of my wonderful project

Project Description

System Overview

Methods/Implementation

Results/Conclusion