

## **Workshop to Support Implementation of NOAA's Uncrewed Systems (UxS) Strategy**

**Jon White**

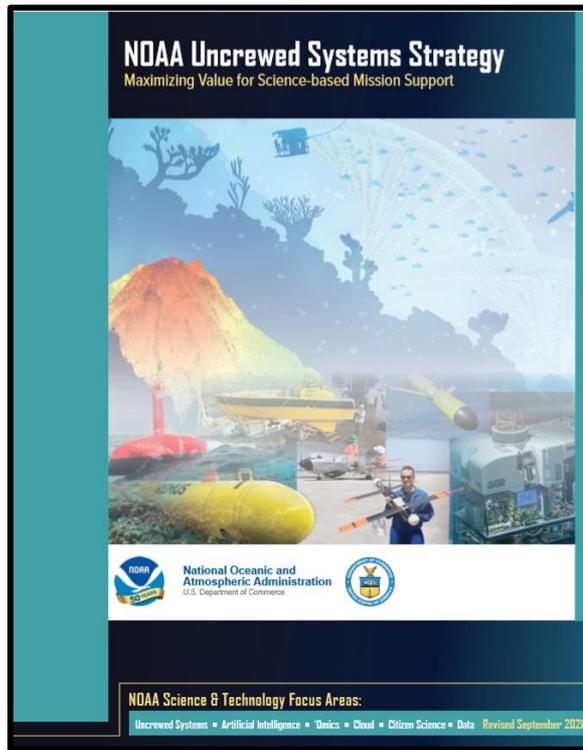
*RADM, U.S. Navy (Ret.)*

*President and CEO Consortium for Ocean Leadership*

**27 October 2020**



# Background



## ***NOAA Uncrewed Systems Strategy***

**Goal 1: Coordinate and Support UxS Operations at an Enterprise Level.**

**Goal 2: Expand UxS Applications Across NOAA's Mission Portfolio.**

**Goal 3: Accelerate Transition of UxS Research to Applications.**

**Goal 4: Strengthen and Expand UxS Partnerships.**

**Goal 5: Promote Workforce Proficiency in UxS Use and Operations.**

- Give community stakeholders an opportunity to provide insight for the implementation of NOAA's UxS Strategy***
- Enhance relationships with the broad science and technology community to assist NOAA in this area, to the benefit of our broader security and prosperity that rely on a healthy and well-understood ocean and atmosphere.***
- Participation by invitation only; attendees selected based on expertise and experience with various uncrewed systems, and to ensure balanced representation across government, nonprofit, industry, and academic organizations.***

# Background

---

- Virtual workshop format
  - August 4-6, 2020
  - >120 participants
  - Structured around five focus areas
    - Requirements Development
    - Research to Operations
    - Partnerships
    - Developing a Proficient Workforce
    - Building a Community of Practice
  - Blend of speakers, panels, and breakout sessions
- 

# Special Thanks

---

- NOAA Leadership
- Workshop Executive Committee
  - Bill Burnett, U.S. Navy
  - Thomas Chance, Retired (formerly ASV, L3Harris)
  - RDML Tim Gallaudet, NOAA
  - Monty Graham, University of Southern Mississippi
  - Parimal (PK) Kopardekar, NASA
  - John Kreider, Kreider Consulting
  - Larry Mayer, University of New Hampshire
  - Phil McGillivray, U.S. Coast Guard
  - Chris Scholin, Monterey Bay Aquarium Research Institute
  - RADM Jon White, COL
  - Craig Woolcott, Dept. of Commerce
- Anthony Weeks, Graphic Illustrator

# Summary Report

---

- Finalized September 2020
- Constitutes community-based input
- Does not reflect consensus statements
- Full report is available here:  
<http://oceanleadership.org/unmanned-systems-workshop/>

# NOAA S&T Strategies



IF YOU MAKE THE DATA SMALL ENOUGH, YOU COULD DO TELEMETRY ANALYSIS...

WHAT ARE THE BANDWIDTH ISSUES? REQUIRES EDGE COMPUTING...

"HOW MUCH ARE YOU PLANNING TO PUT OMICS on the US PLATFORMS?"

MOBILE, AD-HOC DATA... into the cloud?

GETTING REAL-TIME DATA from US to SHIPS, AIR ASSETS, and GROUND ASSETS.

WHAT ARE THE REQUIREMENTS? RISKS? BUSINESS CASES?

CLOUD and DATA STRATEGIES

THE FEDERAL LANDSCAPE IS MOVING toward the CLOUD! How can we GUIDE NOAA'S ADOPTION?



IT'S A MINDSHIFT.

FULL CONTINUUM of CLOUD DEPLOYMENT MODELS:

- PRIVATE
- COMMUNITY
- HYBRID

COMMERCIAL CLOUD-BASED ARCHITECTURE should be the PRESUMPTIVE END STATE

LEVERAGE EXISTING CLOUD INITIATIVES as FORCE MULTIPLIERS

STRATEGY REVIEW

"IT'S AN UMBRELLA TERM!"

OMICS

- METABOLOMICS
- PROTEOMICS
- PHENOMICS
- METAGENOMICS + METATRANSCRIPTOMICS
- GENOMICS

e.g. COLLECTING OMICS DATA to DETECT and SUPPORT ESTIMATES of FISH STOCKS



DATA!

- HOW DO WE MAKE EFFECTIVE USE OF IT?
- HOW DO WE TREAT IT AS A VALUED ASSET?
- HOW DO WE LEVERAGE the FULL RANGE of DATA?

WE ARE RE-EVALUATING DATA FORMATS to SEE WHICH ARE MOST USEFUL!

OPEN... ACCESSIBLE... IN A USEFUL FORMAT...

195 AI PROJECTS!

ENHANCING ABILITIES of UNMANNED SYSTEMS via AI! ... and a COORDINATED APPROACH.

AI STRATEGY

"A WIDE RANGE of DATA TYPES are BEING USED."

- ESTABLISH EFFICIENT ORG STRUCTURES and PROCESSES
- ADVANCE AI RESEARCH and INNOVATION
- ACCELERATE TRANSITION of RESEARCH to APPLICATIONS
- PARTNERSHIPS
- AI PROFICIENCY

37% of NOAA AI PROJECTS are in TRANSITION; 25% are OPERATIONAL



NOAA is a WORLD LEADER on ENVIRONMENTAL DATA! How could AI ENHANCE OUR CAPABILITIES?

4 AUGUST 2020

# NOAA S&T Strategies



IF YOU MAKE THE DATA SMALL ENOUGH, YOU COULD DO TELEMETRY ANALYSIS...

WHAT ARE THE BANDWIDTH ISSUES? REQUIRES EDGE COMPUTING...

"HOW MUCH ARE YOU PLANNING TO PUT OMICS on the US PLATFORMS?"

MOBILE, AD-HOC DATA FEEDS into the CLOUD?

GETTING REAL-TIME DATA from US to SHIPS, AIR ASSETS, and GROUND ASSETS.

WHAT ARE THE REQUIREMENTS? RISKS? BUSINESS CASES?

## CLOUD and DATA STRATEGIES

- FULL CONTINUUM of CLOUD DEPLOYMENT MODELS:
  - PRIVATE
  - COMMUNITY
  - HYBRID
- COMMERCIAL CLOUD-BASED ARCHITECTURE should be the PRESUMPTIVE END STATE
- LEVERAGE EXISTING CLOUD INITIATIVES AS FORCE MULTIPLIERS

THE FEDERAL LANDSCAPE IS MOVING toward the CLOUD! How CAN WE GUIDE NOAA'S ADOPTION?



## STRATEGY REVIEW

"IT'S AN UMBRELLA TERM!"

## OMICS

- METABOLOMICS
- PROTEOMICS
- PHENOMICS
- METAGENOMICS + METATRANSCRIPTOMICS
- GENOMICS

4 AUGUST 2020

195 AI PROJECTS!

ENHANCING ABILITIES of UNMANNED SYSTEMS via AI! ... and a COORDINATED APPROACH.

## AI STRATEGY

"A WIDE RANGE of DATA TYPES are BEING USED."

- ESTABLISH EFFICIENT ORG STRUCTURES and PROCESSES
- ADVANCE AI RESEARCH and INNOVATION
- ACCELERATE TRANSITION of RESEARCH to APPLICATIONS
- PARTNERSHIPS
- AI PROFICIENCY

37% of NOAA AI PROJECTS are in TRANSITION; 25% are OPERATIONAL

e.g. COLLECTING OMICS DATA to DETECT and SUPPORT ESTIMATES of FISH STOCKS



## DATA!

- HOW DO WE MAKE EFFECTIVE USE OF IT?
- HOW DO WE TREAT IT AS A VALUED ASSET?
- HOW DO WE LEVERAGE the FULL RANGE of DATA?

WE ARE RE-EVALUATING DATA FORMATS to SEE WHICH ARE MOST USEFUL!

OPEN... ACCESSIBLE... IN A USEFUL FORMAT...



NOAA is a WORLD LEADER on ENVIRONMENTAL DATA! How could AI ENHANCE OUR CAPABILITIES?

# Panel: Requirements Development (1/2)



## REQUIREMENTS DEVELOPMENT PANEL DISCUSSION

moderated by CHRIS SCHOLIN

IN ORDER TO GET THE REQUIREMENTS RIGHT,  
YOU NEED TO GET THE CONOPS RIGHT...  
... END TO END...

# "HOW?"

HOW DO WE  
START the  
CONVERSATION?

- WHAT CAN WE DO NOW?
- WHAT'S EMERGENT?
- WHITE PAPERS, by region, Co-authored by AGENCY, INDUSTRY, RESEARCH

4 AUGUST 2020

PROMOTE NEXT  
GENERATION  
REGIONAL  
SCALE FIELD  
EXERCISES...

ADOPT a  
"TECHNOLOGY  
PUSH/AGENCY  
PULL" APPROACH.

- DISRUPTIVE TECHNOLOGIES
- are not always ANTICIPATED.
  - DATA-as-SERVICE vs OWNER-OPERATOR?
  - STANDARDS, INTEROPERABILITY, COMMAND/CONTROL ELEMENTS are PARAMOUNT

- REAL-WORLD OPERATIONS
- IDENTIFY INTER-AGENCY OVERLAPS

HOLISTIC APPROACH?

? A CENTRALIZED or DOMAIN-BASED APPROACH?

- UNDER SEA?
- SURFACE?
- AIR?

WITH ANY UNIVERSAL or CENTRALIZED approach, there's a RISK that it WON'T FIT.



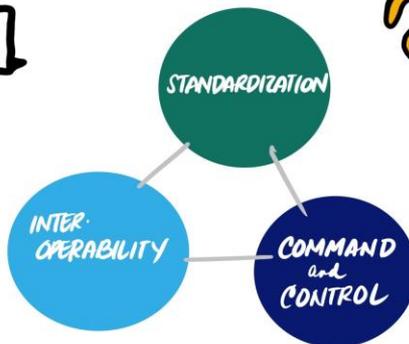
SUBSTITUTE "MISSION" for "DATA": What are you TRYING to DO?

? ARE YOU WRITING REQUIREMENTS for PLATFORMS? DATA?

"IT'S HARD TO WRITE REQUIREMENTS FOR DATA!"

DATA-as-SERVICE or OWNER-OPERATOR?

? HOW will you EXPERIMENT? PROTOTYPE?



### PANELISTS:

LARRY KARL

GUY NOLL

PAUL SIEGRIST

CAPT. PETE SMALL

# Panel: Requirements Development (1/2)



## REQUIREMENTS DEVELOPMENT PANEL DISCUSSION

moderated by CHRIS SCHOLIN

IN ORDER TO GET THE REQUIREMENTS RIGHT,  
YOU NEED TO GET THE CONOPS RIGHT...  
... END TO END...

# "HOW?"

HOW DO WE  
START THE  
CONVERSATION?

- WHAT CAN WE DO NOW?
- WHAT'S EMERGENT?
- WHITE PAPERS, by region, Co-authored by AGENCY, INDUSTRY, RESEARCH

4 AUGUST 2020

PROMOTE NEXT  
GENERATION  
REGIONAL  
SCALE FIELD  
EXERCISES...

ADOPT a  
"TECHNOLOGY  
PUSH/AGENCY  
PULL" APPROACH.

- DISRUPTIVE TECHNOLOGIES
- are not always ANTICIPATED.
  - DATA-as-SERVICE vs OWNER-OPERATOR?
  - STANDARDS, INTEROPERABILITY, COMMAND/CONTROL ELEMENTS are PARAMOUNT

- REAL-WORLD OPERATIONS
- IDENTIFY INTER-AGENCY OVERLAPS

HOLISTIC APPROACH?

? A CENTRALIZED or DOMAIN-BASED APPROACH?

- UNDER SEA?
- SURFACE?
- AIR?

WITH ANY UNIVERSAL or CENTRALIZED approach, there's a RISK that it WON'T FIT.

PANELISTS:

LARRY KARL

GUY NOLL

PAUL SIEGRIST

CAPT. PETE SMALL

SUBSTITUTE "MISSION" for "DATA": What are you TRYING to DO?

? ARE YOU WRITING REQUIREMENTS for PLATFORMS? DATA?  
"IT'S HARD TO WRITE REQUIREMENTS FOR DATA!"

DATA-as-SERVICE or OWNER-OPERATOR?



? HOW will you EXPERIMENT? PROTOTYPE?

# Panel: Requirements Development (1/2)



## REQUIREMENTS DEVELOPMENT PANEL DISCUSSION

moderated by CHRIS SCHOLIN

IN ORDER TO GET THE REQUIREMENTS RIGHT,  
YOU NEED TO GET THE CONOPS RIGHT...  
... END TO END...

HOW DO WE  
START the  
CONVERSATION?

- WHAT CAN WE DO NOW?
- WHAT'S EMERGENT?
- WHITE PAPERS, by region, Co-authored by AGENCY, INDUSTRY, RESEARCH

"HOW?"

4 AUGUST 2020

PROMOTE NEXT  
GENERATION  
REGIONAL  
SCALE FIELD  
EXERCISES...

ADOPT a  
"TECHNOLOGY  
PUSH/AGENCY  
PULL" APPROACH.

- DISRUPTIVE TECHNOLOGIES
- are not always ANTICIPATED.
  - DATA-as-SERVICE vs OWNER-OPERATOR?
  - STANDARDS, INTEROPERABILITY, COMMAND/CONTROL ELEMENTS are PARAMOUNT

- REAL-WORLD OPERATIONS
- IDENTIFY INTER-AGENCY OVERLAPS

WITH ANY UNIVERSAL  
or CENTRALIZED  
approach, there's a  
RISK that it WON'T  
FIT.



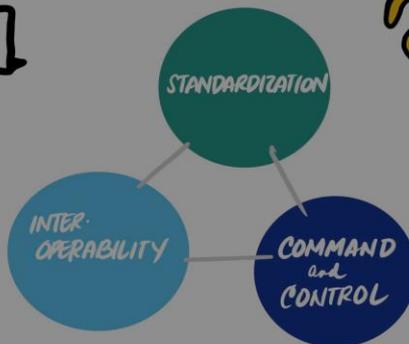
? A CENTRALIZED  
or DOMAIN-BASED  
APPROACH?  
— UNDER SEA?  
— SURFACE?  
— AIR?

? ARE YOU WRITING  
REQUIREMENTS for  
PLATFORMS?  
DATA?  
"IT'S HARD TO WRITE  
REQUIREMENTS FOR DATA!"

SUBSTITUTE  
"MISSION" for  
"DATA": What are  
you TRYING to  
DO?

DATA-as-  
SERVICE or  
OWNER-  
OPERATOR?

? HOW will  
you  
EXPERIMENT?  
PROTOTYPE?



### PANELISTS:

LARRY  
KARL

GUY  
NOLL

PAUL  
SIEGRIST

CAPT.  
PETE SMALL

# Panel: Requirements Development (1/2)



## REQUIREMENTS DEVELOPMENT PANEL DISCUSSION

Moderated by CHRIS SCHOLIN

# "HOW?"

IN ORDER TO GET THE REQUIREMENTS RIGHT,  
YOU NEED TO GET THE CONOPS RIGHT...  
... END TO END...

HOW DO WE  
START THE  
CONVERSATION?

- WHAT CAN WE DO NOW?
- WHAT'S EMERGENT?
- WHITE PAPERS, by region, Co-authored by AGENCY, INDUSTRY, RESEARCH

4 AUGUST 2020

### PANELISTS:

LARRY  
KARL

GUY  
NOLL

PAUL  
SIEGRIST

CAPT.  
PETE SMALL

PROMOTE NEXT  
GENERATION  
REGIONAL  
SCALE FIELD  
EXERCISES...

- REAL-WORLD OPERATIONS
- IDENTIFY INTER-AGENCY OVERLAPS

ADOPT a  
"TECHNOLOGY  
PUSH/AGENCY  
PULL" APPROACH.

- DISRUPTIVE TECHNOLOGIES are not always ANTICIPATED.
- DATA-as-SERVICE vs OWNER-OPERATOR?
- STANDARDS, INTEROPERABILITY, COMMAND/CONTROL ELEMENTS are PARAMOUNT

HOLISTIC APPROACH?

? A CENTRALIZED or DOMAIN-BASED APPROACH?

- UNDER SEA?
- SURFACE?
- AIR?

WITH ANY UNIVERSAL or CENTRALIZED approach, there's a RISK that it WON'T FIT.



SUBSTITUTE "MISSION" for "DATA": What are you TRYING to DO?

? ARE YOU WRITING REQUIREMENTS for PLATFORMS? DATA?

"IT'S HARD TO WRITE REQUIREMENTS FOR DATA!"

DATA-as-SERVICE or OWNER-OPERATOR?

STANDARDIZATION

INTER-OPERABILITY

COMMAND and CONTROL

? HOW will you EXPERIMENT? PROTOTYPE?



# Panel: Requirements Development (2/2)



4 AUGUST 2020

**WE NEED COLLABORATION** around **REQUIREMENTS** and **COST.**

... as well as **INCLUSION** and **INTEGRATION...**

**QUESTIONS...**

**WHAT'S the ROI?**  
**WHAT'S the BUSINESS CASE?**



"WE DON'T HAVE THE MONEY TO BUY THE PLATFORM..."

THE PROCESS IS NOT DESIGNED FOR DATA. as a SERVICE, but for PLATFORM S.

"WE NEED PLATFORMS IN ORDER TO PROVE OUT THE CONOPS... BUT THERE'S A BARRIER TO ENTRY."

IS IT OPEN?  
IS IT TESTED with FORENSIC ANALYSIS?

**Data!**

WHAT are the REQUIREMENTS for DATA QUALITY?

— GRANULARITY  
— ACCURACY  
— "THEY'RE EVOLUTIONARY."

Is the DATA FIT for PURPOSE?

- Platform-centric?
- Deliver back to a repository so others can use it?

— Do you HAVE REQUIREMENTS around DATA ARCHIVING?  
— AUTHORITY DATA VS. OPPORTUNISTIC DATA.

THIS INFORMS HOW TO WRITE a REQUIREMENT for DATA as SERVICE!

WE ARE GETTING SMARTER ABOUT THE DATA! WHERE WILL IT GO? WHO WILL USE IT?

**ARE WE WRITING REQUIREMENTS THAT ARE IMPOSSIBLE?**

**WHO ARE THE WRITERS? THE USERS?**

# Panel: Requirements Development (2/2)



4 AUGUST 2020

**WE NEED COLLABORATION** around **REQUIREMENTS** and **COST**.  
... as well as **INCLUSION** and **INTEGRATION**...

**QUESTIONS...**



→ **WHAT'S the ROI?**  
→ **WHAT'S the BUSINESS CASE?**



"WE DON'T HAVE THE MONEY TO BUY THE PLATFORM..."

THE PROCESS IS NOT DESIGNED FOR DATA as a SERVICE, but for PLATFORMS.

"WE NEED PLATFORMS IN ORDER TO PROVE OUT THE CONOPS... BUT THERE'S A BARRIER TO ENTRY."

IS IT OPEN?  
IS IT TESTED with FORENSIC ANALYSIS?

**Data!**

WHAT are the REQUIREMENTS for DATA QUALITY?  
- GRANULARITY  
- ACCURACY  
- "THEY'RE EVOLUTIONARY."

Is the DATA FIT for PURPOSE?

- Platform-centric?
- Deliver back to a repository so others can use it?

Do you HAVE REQUIREMENTS around DATA ARCHIVING?  
- AUTHORITY DATA VS. OPPORTUNISTIC DATA.

THIS INFORMS HOW to WRITE a REQUIREMENT for DATA as SERVICE!

WE ARE GETTING SMARTER ABOUT THE DATA / WHERE WILL IT GO? WHO WILL USE IT?

**ARE WE WRITING REQUIREMENTS THAT ARE IMPOSSIBLE?**

**WHO ARE THE WRITERS? THE USERS?**

# Panel: Requirements Development (2/2)



4 AUGUST 2020

WE NEED COLLABORATION *around* REQUIREMENTS and COST.

... as well as INCLUSION and INTEGRATION...

QUESTIONS...

WHAT'S the ROI?  
WHAT'S the BUSINESS CASE?



"WE DON'T HAVE THE MONEY TO BUY THE PLATFORM..."

THE PROCESS IS NOT DESIGNED FOR DATA. as a SERVICE, but for PLATFORM S.

"WE NEED PLATFORMS IN ORDER TO PROVE OUT THE CONOPS... BUT THERE'S A BARRIER TO ENTRY."

IS IT OPEN?  
IS IT TESTED with FORENSIC ANALYSIS?

Data!

WHAT are the REQUIREMENTS for DATA QUALITY?  
- GRANULARITY  
- ACCURACY  
- "THEY'RE EVOLUTIONARY."

Is the DATA FIT for PURPOSE?

Do you HAVE REQUIREMENTS around DATA ARCHIVING?  
- AUTHORITATIVE DATA VS. OPPORTUNISTIC DATA.

- Platform-centric?
- Deliver back to a repository so others can use it?

WE ARE GETTING SMARTER ABOUT THE DATA / WHERE WILL IT GO? WHO WILL USE IT?

THIS INFORMS HOW to WRITE a REQUIREMENT for DATA as SERVICE!

ARE WE WRITING REQUIREMENTS THAT ARE IMPOSSIBLE?

WHO ARE THE WRITERS? THE USERS?

# Panel: Requirements Development (2/2)



4 AUGUST 2020

WE NEED COLLABORATION *around* REQUIREMENTS and COST.

... as well as INCLUSION and INTEGRATION...

QUESTIONS...



WHAT'S the ROI?  
WHAT'S the BUSINESS CASE?



"WE DON'T HAVE THE MONEY TO BUY THE PLATFORM..."

THE PROCESS IS NOT DESIGNED FOR DATA as a SERVICE, but for PLATFORMS.

"WE NEED PLATFORMS IN ORDER TO PROVE OUT THE CONOPS... BUT THERE'S A BARRIER TO ENTRY."

IS IT OPEN?  
IS IT TESTED with FORENSIC ANALYSIS?

Data!

WHAT are the REQUIREMENTS for DATA QUALITY?  
- GRANULARITY  
- ACCURACY  
- "THEY'RE EVOLUTIONARY."

Is the DATA FIT for PURPOSE?

Do you HAVE REQUIREMENTS around DATA ARCHIVING?  
- AUTHORITATIVE DATA VS. OPPORTUNISTIC DATA.

- Platform-centric?
- Deliver back to a repository so others can use it?

THIS INFORMS HOW to WRITE a REQUIREMENT for DATA as SERVICE!

WE ARE GETTING SMARTER ABOUT THE DATA / WHERE WILL IT GO? WHO WILL USE IT?

ARE WE WRITING REQUIREMENTS THAT ARE IMPOSSIBLE?

WHO ARE THE WRITERS? THE USERS?

# Panel: Research to Operations



LOOK FOR and UTILIZE MULTI-AWARD CONTRACTS!

BRIAN McKEON

BEYOND the SHIPYARD:  
Technical Solutions Division

YOUR SMALL SIZE CAN WORK FOR YOU!

LESS OVER-SIGHT can also BENEFIT YOU.

OPERATORS NEED to BE PART of DEMONSTRATIONS.

## DEMONSTRATIONS:

- CAPTURE FEEDBACK along the way.
- "WHAT'S the BENEFIT for the ORGANIZATION?" — THE CARROT —

## SET-BASED DESIGN:

- EXPLORE LARGE SETS of ALTERNATIVES
- THINK about MVPs / Minimum Viable Products

MVP

- REQUIREMENTS should be at the MISSION LEVEL.

- DON'T OVERLOOK MODELING and SIMULATION early on.

- TEST and EVALUATION: Create models EARLY in your SELECTION PROCESS.

DRIVE COLLABORATION! Industry and Government want to HELP YOU!

ERIC LINDSTROM

"THE OCEAN IS UNDERSAMPLED!"

THE MOTION OF THE OCEAN! RESOLUTION IS KEY... BUT A CHALLENGE

"YOU CAN ONLY SUSTAIN ONE SYSTEM TO SERVE EVERYTHING?"

ONGOING RESEARCH → REGULAR TECHNOLOGY INFUSIONS

PUBLIC PRIVATE PARTNERSHIPS are KEY to SCALING UP UxS.

"I BELIEVE IN R and O!"



POTENTIAL for LOW-HANGING FRUIT?

- DON'T WAIT FOR SCIENCE BREAKTHROUGHS to LAUNCH PILOTS at SCALE
- FUND MORE RESEARCH TO SERVICE LONG-TERM PARTNERSHIPS
- CONSTANT NEED for UPGRADING OPERATIONS MODELS

# Panel: Research to Operations



LOOK FOR and UTILIZE MULTI-AWARD CONTRACTS!

BRIAN McKEON

BEYOND the SHIPYARD:  
Technical Solutions  
Division

YOUR SMALL SIZE CAN WORK FOR YOU!

LESS OVER-SIGHT can also BENEFIT YOU.

OPERATORS NEED to BE PART of DEMONSTRATIONS.

## DEMONSTRATIONS:

- CAPTURE FEEDBACK along the way.
- "WHAT'S the BENEFIT for the ORGANIZATION?" — THE CARROT —

○ DON'T OVERLOOK MODELING and SIMULATION early on.

○ TEST and EVALUATION: Create models EARLY in your SELECTION PROCESS.

○ REQUIREMENTS should be at the MISSION LEVEL.

DRIVE COLLABORATION! Industry and Government want to HELP YOU!

## SET-BASED DESIGN:

- EXPLORE LARGE SETS of ALTERNATIVES
- THINK about MVPs / Minimum Viable Products

MVP

• "THE OCEAN IS UNDERSAMPLED!"

• THE MOTION OF THE OCEAN: RESOLUTION IS KEY... BUT A CHALLENGE

• "YOU CAN ONLY SUSTAIN ONE SYSTEM TO SERVE EVERYTHING?"

• ONGOING RESEARCH → REGULAR TECHNOLOGY INFUSIONS

• PUBLIC PRIVATE PARTNERSHIPS are KEY to SCALING UP UxS.

○ DON'T WAIT FOR SCIENCE BREAKTHROUGHS to LAUNCH PILOTS at SCALE

○ FUND MORE RESEARCH TO SERVICE LONG-TERM PARTNERSHIPS

○ CONSTANT NEED for UPGRADING OPERATIONS MODELS

ERIC LINDSTROM

"I BELIEVE IN R and O!"

YOU NEED IMPORTS...

...OPENNESS

Noaa

BEWARE "ISLAND CULTURE..."

POTENTIAL for LOW-HANGING FRUIT?

# Panel: Research to Operations



LOOK FOR and UTILIZE MULTI-AWARD CONTRACTS!

BRIAN McKEON

BEYOND the SHIPYARD:  
Technical Solutions Division

YOUR SMALL SIZE CAN WORK FOR YOU!

LESS OVER-SIGHT can also BENEFIT YOU.

OPERATORS NEED to BE PART of DEMONSTRATIONS.

## DEMONSTRATIONS:

- CAPTURE FEEDBACK along the way.
- "WHAT'S the BENEFIT for the ORGANIZATION?" — THE CARROT —

○ DON'T OVERLOOK MODELING and SIMULATION early on.

○ TEST and EVALUATION: Create models EARLY in your SELECTION PROCESS.

○ REQUIREMENTS should be at the MISSION LEVEL.

DRIVE COLLABORATION! Industry and Government want to HELP YOU!

## SET-BASED DESIGN:

- EXPLORE LARGE SETS of ALTERNATIVES
- THINK about MVPs / Minimum Viable Products

MVP

• "THE OCEAN IS UNDERSAMPLED!"

• THE MOTION OF THE OCEAN: RESOLUTION IS KEY... BUT A CHALLENGE

• "YOU CAN ONLY SUSTAIN ONE SYSTEM TO SERVE EVERYTHING?"

• ONGOING RESEARCH → REGULAR TECHNOLOGY INFUSIONS

• PUBLIC PRIVATE PARTNERSHIPS are KEY to SCALING UP UxS.

○ DON'T WAIT FOR SCIENCE BREAKTHROUGHS to LAUNCH PILOTS at SCALE

○ FUND MORE RESEARCH TO SERVICE LONG-TERM PARTNERSHIPS

○ CONSTANT NEED for UPGRADING OPERATIONS MODELS

ERIC LINDSTROM

"I BELIEVE IN R and O!"

YOU NEED IMPORTS...

...OPENNESS

Noaa

BEWARE "ISLAND CULTURE..."

POTENTIAL for LOW-HANGING FRUIT?

# Breakout: Partnerships



**BREAKOUT GROUP #2**  
5 AUGUST 2020

SMALL BUSINESS WILL LIKELY DRIVE INNOVATION. What do we INVEST? How will we BENEFIT?  
CREATE SHORT-TERM WINS...

THERE IS PRIVATE CAPITAL waiting for NOAA!

WHAT'S IN IT for ME?

VALUE PROPOSITION NEEDS TO BE AN "AND", not an "OR."

RUN EXPERIMENTS with a LARGE NUMBER of PARTNERS. ... and OPERATIONALIZE your EXPERIMENTS.

"PUT IT IN THE WATER!"

WHERE DO PARTNERS FIND THEIR OWN SELF-INTEREST IN THE COLLABORATION?

... with FORMAL AGREEMENTS.

HOW DOES THE PARTNERSHIP SERVE ALL OF THE PARTNERS?

WHO WILL BE DOING THIS WORK anyway? WHERE IS THE COMMUNITY?

e.g. MULTIPLE AGENCIES working on UNCREWED SYSTEMS

WHAT DOES "SKIN IN THE GAME" LOOK LIKE?

WHAT are BEST PRACTICES?

WHAT CAUSES PARTNERSHIPS to FAIL?

IS EVERYONE ON THE SAME PAGE?

IS THE AMOUNT OF MONEY THAT PARTNERS HAVE TO INVEST IN THE EFFORT COMPELLING ENOUGH TO ATTRACT QUALITY PARTNERS?

"WE MAY NOT HAVE THE MONEY, but WE HAVE the GEAR!"

... and EXPERTISE and STANDARDS-DRIVEN SCIENCE!

WHAT MIGHT WORK for NOAA?

FUNDING OPPORTUNITIES, by NOAA, for ADVANCED TECHNOLOGY DEVELOPMENT, e.g. SENSORS

THINK CREATIVELY about BUSINESS MODELS for PARTNERSHIP!

COULD NOAA LEAD through "SERVICE"?



Partnerships!  
"PEOPLE MAKE THE PARTNERSHIP."

REQUIREMENTS NEED TO BE AT THE MISSION LEVEL.

PARTNER at the POLICY and SOLUTIONS LEVELS...

BE INVOLVED IN THE BLUE ECONOMY!

WILL NOAA'S BUDGET LOOK THE SAME FOR THE FORESEEABLE FUTURE?

# Breakout: Partnerships



**BREAKOUT GROUP #2**  
5 AUGUST 2020

SMALL BUSINESS WILL LIKELY DRIVE INNOVATION. What do we INVEST? How will we BENEFIT?  
CREATE SHORT-TERM WINS...

THERE IS PRIVATE CAPITAL waiting for NOAA!

WHAT'S IN IT FOR ME?  
VALUE PROPOSITION NEEDS TO BE AN "AND", not an "OR."  
RUN EXPERIMENTS with a LARGE NUMBER of PARTNERS. ... and OPERATIONALIZE your EXPERIMENTS.  
"PUT IT IN THE WATER!"  
WHERE DO PARTNERS FIND THEIR OWN SELF-INTEREST IN THE COLLABORATION?

THINK CREATIVELY about BUSINESS MODELS for PARTNERSHIP!  
COULD NOAA LEAD through "SERVICE"?



WHAT are BEST PRACTICES?

HOW DOES THE PARTNERSHIP SERVE ALL OF THE PARTNERS?

WHO WILL BE DOING THIS WORK anyway? WHERE IS THE COMMUNITY?  
e.g. MULTIPLE AGENCIES working on UNCREWED SYSTEMS

...with FORMAL AGREEMENTS.

WHAT DOES "SKIN IN THE GAME" LOOK LIKE?

WHAT CAUSES PARTNERSHIPS to FAIL?

IS EVERYONE ON THE SAME PAGE?

IS THE AMOUNT OF MONEY THAT PARTNERS HAVE TO INVEST IN THE EFFORT COMPELLING ENOUGH TO ATTRACT QUALITY PARTNERS?

"WE MAY NOT HAVE THE MONEY, but WE HAVE the GEAR!"

... and EXPERTISE and STANDARDS-DRIVEN SCIENCE!

REQUIREMENTS NEED TO BE AT THE MISSION LEVEL.

WHAT MIGHT WORK for NOAA?

FUNDING OPPORTUNITIES, by NOAA, for ADVANCED TECHNOLOGY DEVELOPMENT, e.g. SENSORS

PARTNER at the POLICY and SOLUTIONS LEVELS...

BE INVOLVED IN THE BLUE ECONOMY!

WILL NOAA'S BUDGET LOOK THE SAME FOR THE FORESEEABLE FUTURE?

# Breakout: Partnerships



**BREAKOUT GROUP #2**  
5 AUGUST 2020

SMALL BUSINESS WILL LIKELY DRIVE INNOVATION. What do we INVEST? How will we BENEFIT?  
CREATE SHORT-TERM WINS...

THERE IS PRIVATE CAPITAL waiting for NOAA!

VALUE PROPOSITION NEEDS TO BE AN "AND", not an "OR."

"PUT IT IN THE WATER!"

RUN EXPERIMENTS with a LARGE NUMBER of PARTNERS. ... and OPERATIONALIZE your EXPERIMENTS.

WHAT'S IN IT for ME?



WHERE DO PARTNERS FIND THEIR OWN SELF-INTEREST IN THE COLLABORATION?

HOW DOES THE PARTNERSHIP SERVE ALL OF THE PARTNERS?

WHO WILL BE DOING THIS WORK anyway? WHERE IS THE COMMUNITY?

e.g. MULTIPLE AGENCIES working on UNCREWED SYSTEMS

...with FORMAL AGREEMENTS.

WHAT DOES "SKIN IN THE GAME" LOOK LIKE?

WHAT are BEST PRACTICES?

WHAT CAUSES PARTNERSHIPS to FAIL?

IS EVERYONE ON THE SAME PAGE?

IS THE AMOUNT OF MONEY THAT PARTNERS HAVE TO INVEST IN THE EFFORT COMPELLING ENOUGH TO ATTRACT QUALITY PARTNERS?

"WE MAY NOT HAVE THE MONEY, but WE HAVE the GEAR!"

... and EXPERTISE and STANDARDS-DRIVEN SCIENCE!

WHAT MIGHT WORK for NOAA?

FUNDING OPPORTUNITIES, by NOAA, for ADVANCED TECHNOLOGY DEVELOPMENT, e.g. SENSORS

THINK CREATIVELY about BUSINESS MODELS for PARTNERSHIP!

COULD NOAA LEAD through "SERVICE"?



Partnerships!  
"PEOPLE MAKE THE PARTNERSHIP."

REQUIREMENTS NEED TO BE AT THE MISSION LEVEL.

PARTNER at the POLICY and SOLUTIONS LEVELS...

BE INVOLVED IN THE BLUE ECONOMY!

WILL NOAA'S BUDGET LOOK THE SAME FOR THE FORESEEABLE FUTURE?

# Breakout: Developing a Proficient Workforce



WHERE DOES NOAA PLAN TO "SPEND THEIR CHIPS"?

**WORKFORCE**  
**BREAKOUT GROUP #2**  
 DAY 3: Facilitated by  
 MONTY GRAHAM and KATIE  
 FILLINGHAM

6 AUGUST 2020

**WORKFORCE DEVELOPMENT**

LEADERSHIP DEVELOPMENT PROGRAMS

ACADEMIC PARTNERSHIPS

MENTORING

INTERNSHIPS

PARTNERSHIPS BETWEEN INDUSTRY, ACADEMIA, and GOVERNMENT

DO WE CREATE/LOOK FOR OPPORTUNITIES for PEOPLE to DRAW UPON THEIR FULL SUITE of EXPERTISE?

- SCIENTIFIC-TECHNICAL SKILLS
- COMMUNICATION SKILLS
- TECHNOLOGY SKILLS
- TEAM-BUILDING SKILLS
- ENTREPRENEURIAL SKILLS

**EDUCATION and TRAINING**

IS IT A PIPELINE?...

...or a FREEWAY?

"THERE'S A TERRIBLE LACK of BUSINESS KNOWLEDGE!"  
 YOU NEED BUSINESS and TECHNICAL KNOWLEDGE...

? WHAT ARE THE MULTIPLE PATHWAYS TO GETTING ENTREPRENEURIAL KNOWLEDGE?

TRY EVERYTHING!

... BEGINNING WITH AWARENESS...

**DIVERSITY, EQUITY, and INCLUSION**

WHO SEES THEMSELVES REPRESENTED?

WHAT IS REQUIRED to DO THE JOB?

**CERTIFICATION**

WHAT DOES CERTIFICATION ALLOW YOU TO DO?

"SOME TRAINING IS SPONSORED and LED by the VENDORS and TAILORED to the SPECIFIC PRODUCT..."



WHO are we HIRING?

... HOW DO WE RETAIN THEM and DEVELOP THEM?

COMPETENCIES and SPECTRUM: REDUCE the ON-THE-JOB LEARNING TIME.

"THE ENVIRONMENT has a lot to do with OPERATIONS, whether MANNED or UNMANNED..."

WHAT'S TRANSLATABLE BETWEEN AERIAL and MARITIME?

"ONE SIZE DOES NOT FIT ALL!"

# Breakout: Developing a Proficient Workforce



WHERE DOES NOAA PLAN TO "SPEND THEIR CHIPS"?

## WORKFORCE BREAKOUT GROUP #2

DAY 3: Facilitated by  
MONTY GRAHAM and KATIE  
FILLINGHAM

6 AUGUST 2020

- SCIENTIFIC-TECHNICAL SKILLS
- COMMUNICATION SKILLS
- TECHNOLOGY SKILLS
- TEAM-BUILDING SKILLS
- ENTREPRENEURIAL SKILLS

### EDUCATION and TRAINING

IS IT A PIPELINE?...

...or a FREEWAY?

WHAT IS REQUIRED TO DO THE JOB?

### CERTIFICATION

WHAT'S TRANSLATABLE BETWEEN AERIAL and MARITIME?

"THE ENVIRONMENT has a lot to do with OPERATIONS, whether MANNED or UNMANNED..."

"THERE'S A TERRIBLE LACK OF BUSINESS KNOWLEDGE!"

YOU NEED BUSINESS and TECHNICAL KNOWLEDGE...

WHAT DOES CERTIFICATION ALLOW YOU TO DO?

"SOME TRAINING IS SPONSORED and LED by the VENDORS and TAILORED to the SPECIFIC PRODUCT..."

"ONE SIZE DOES NOT FIT ALL!"

### WORKFORCE DEVELOPMENT

LEADERSHIP DEVELOPMENT PROGRAMS

PARTNERSHIPS BETWEEN INDUSTRY, ACADEMIA, and GOVERNMENT

ACADEMIC PARTNERSHIPS

MENTORING

INTERNSHIPS

DO WE CREATE/LOOK FOR OPPORTUNITIES for PEOPLE to DRAW UPON THEIR FULL SUITE of EXPERTISE?

? WHAT ARE THE MULTIPLE PATHWAYS TO GETTING ENTREPRENEURIAL KNOWLEDGE?

TRY EVERYTHING!

... BEGINNING WITH AWARENESS...

DIVERSITY, EQUITY, and INCLUSION

WHO SEES THEMSELVES REPRESENTED?

WHO are we HIRING?

... HOW DO WE RETAIN THEM and DEVELOP THEM?



# Breakout: Developing a Proficient Workforce



WHERE DOES NOAA PLAN TO "SPEND THEIR CHIPS"?

**WORKFORCE**  
**BREAKOUT GROUP #2**  
 DAY 3: Facilitated by  
 MONTY GRAHAM and KATIE  
 FILLINGHAM

6 AUGUST 2020



DO WE CREATE/LOOK FOR OPPORTUNITIES for PEOPLE TO DRAW UPON THEIR FULL SUITE of EXPERTISE?

- SCIENTIFIC-TECHNICAL SKILLS
- COMMUNICATION SKILLS
- TECHNOLOGY SKILLS
- TEAM-BUILDING SKILLS
- ENTREPRENEURIAL SKILLS

**EDUCATION and TRAINING**

IS IT A PIPELINE?...

...or a FREEWAY?

"THERE'S A TERRIBLE LACK of BUSINESS KNOWLEDGE!"  
 YOU NEED BUSINESS and TECHNICAL KNOWLEDGE...

? WHAT ARE THE MULTIPLE PATHWAYS TO GETTING ENTREPRENEURIAL KNOWLEDGE?

TRY EVERYTHING!

... BEGINNING WITH AWARENESS...

**DIVERSITY, EQUITY, and INCLUSION**

WHO SEES THEMSELVES REPRESENTED?

WHAT IS REQUIRED to DO THE JOB?

WHAT DOES CERTIFICATION ALLOW YOU TO DO?

**CERTIFICATION**

"SOME TRAINING IS SPONSORED and LED by the VENDORS and TAILORED to the SPECIFIC PRODUCT..."

WHO are we HIRING?



... HOW DO WE RETAIN THEM and DEVELOP THEM?

COMPETENCIES and SPECTRUM: REDUCE the ON-THE-JOB LEARNING TIME.

"THE ENVIRONMENT has a lot to do with OPERATIONS, whether MANNED or UNMANNED..."

WHAT'S TRANSLATABLE BETWEEN AERIAL and MARITIME?

"ONE SIZE DOES NOT FIT ALL!"

# Panel: Building a Community of Practice



HOW DO WE INCLUDE MORE PEOPLE ...

...IN OUR EXPERIENCE?

**BUILDING a COMMUNITY of PRACTICE**

BILL BURNETT  
FRANCISCO CHAVEZ  
CHELLE GENTEMANN  
JOHN KREIDER  
JYOTIKA VIRMANI

6 AUGUST 2020

**FOCUSED TEAMS...  
A COMMUNITY of PRACTICE...**

- ADAPTIVE...
- RESILIENT...
- CONTINUOUS LEARNING...

ALIGNMENT with CULTURE

EXCHANGE PROGRAMS

MEASURE VALUE!

NON-GENDERED LANGUAGE

AVOID CONFUSION.

"MANNED/UNMANNED VEHICLES"

↳ "UN-CREWED"

OPEN SCIENCE

? **WHAT CAN NOAA LEARN from OTHER COMMUNITIES?**

OPEN, SHAREABLE DATA

REGIONAL VS. ENTERPRISE SOLUTIONS?

LEVERAGE OTHER AGENCY or PRIVATE SECTOR MODELS and FRAMEWORKS

e.g. DECADAL SURVEY

USEFUL DATA FORMATS: BRING THEM INTO THE PRACTICE

KNOW WHERE THE DATA IS!

LEARN from HISTORY...

DEVELOP/ACQUIRE TOOLS for DISTRIBUTED R+D/OPERATIONS.

THE MORE EYES ON THE DATA, THE HIGHER THE QUALITY.

MODELERS... ADAPTIVE SAMPLING... AI COMMUNITY...

DEVELOP a CLOSE WORKING RELATIONSHIP between R+D and OPERATIONS.

ACCESS to DATA is KEY to the UTILITY of that DATA!



# Panel: Building a Community of Practice



HOW DO WE INCLUDE MORE PEOPLE ...

...IN OUR EXPERIENCE?

**BUILDING a COMMUNITY of PRACTICE**

BILL BURNETT  
FRANCISCO CHAVEZ  
CHELLE GENTEMANN  
JOHN KREIDER  
JYOTIKA VIRMANI

6 AUGUST 2020

**FOCUSED TEAMS... A COMMUNITY of PRACTICE...**

- ADAPTIVE...
- RESILIENT...
- CONTINUOUS LEARNING...

ALIGNMENT with CULTURE      EXCHANGE PROGRAMS      MEASURE VALUE!

NON-GENDERED LANGUAGE      AVOID CONFUSION.

"MANNED/UNMANNED VEHICLES"      ↳ "UN-CREWED"

OPEN SCIENCE

**? WHAT CAN NOAA LEARN from OTHER COMMUNITIES?**

OPEN, SHAREABLE DATA

REGIONAL VS. ENTERPRISE SOLUTIONS?

LEVERAGE OTHER AGENCY or PRIVATE SECTOR MODELS and FRAMEWORKS

e.g. DECADAL SURVEY

USEFUL DATA FORMATS: BRING THEM INTO THE PRACTICE

KNOW WHERE THE DATA IS!

LEARN from HISTORY...

DEVELOP/ACQUIRE TOOLS for DISTRIBUTED R+D/ OPERATIONS.

THE MORE EYES ON THE DATA, THE HIGHER THE QUALITY.

MODELERS... ADAPTIVE SAMPLING... AI COMMUNITY...

DEVELOP a CLOSE WORKING RELATIONSHIP between R+D and OPERATIONS.

ACCESS to DATA is KEY to the UTILITY of that DATA!



# Summary

---

- UxS will only become more important...
- Integration across strategies
- Partnerships
  - Partner agencies
  - PPPs are essential
- Continuing/consistent external engagement is critical
  - Community input
  - Shared ownership
  - Community advocacy for NOAA

# Summary (continued)

---

- Balance - own to operate *and* data as service
  - “Mission” margins as well as profit margins
- Developing a Community of Practice *and* a Proficient Workforce
  - Standardization in training
  - Don’t reinvent best practices
  - DE&I (Language matters: “Uncrewed” vs. “Unmanned”)

# COL as a Partner

---

- Broad membership and reach; represent the oceanographic research and tech community
- Trusted and honest broker
- Working in education (NOSB) and DE&I
- Ties to ocean exploration and ocean observation
- Ensuring relationships are maintained
- Maintain strain
- Bridging transitions
- *An amazing staff!*



[jwhite@oceanleadership.org](mailto:jwhite@oceanleadership.org)