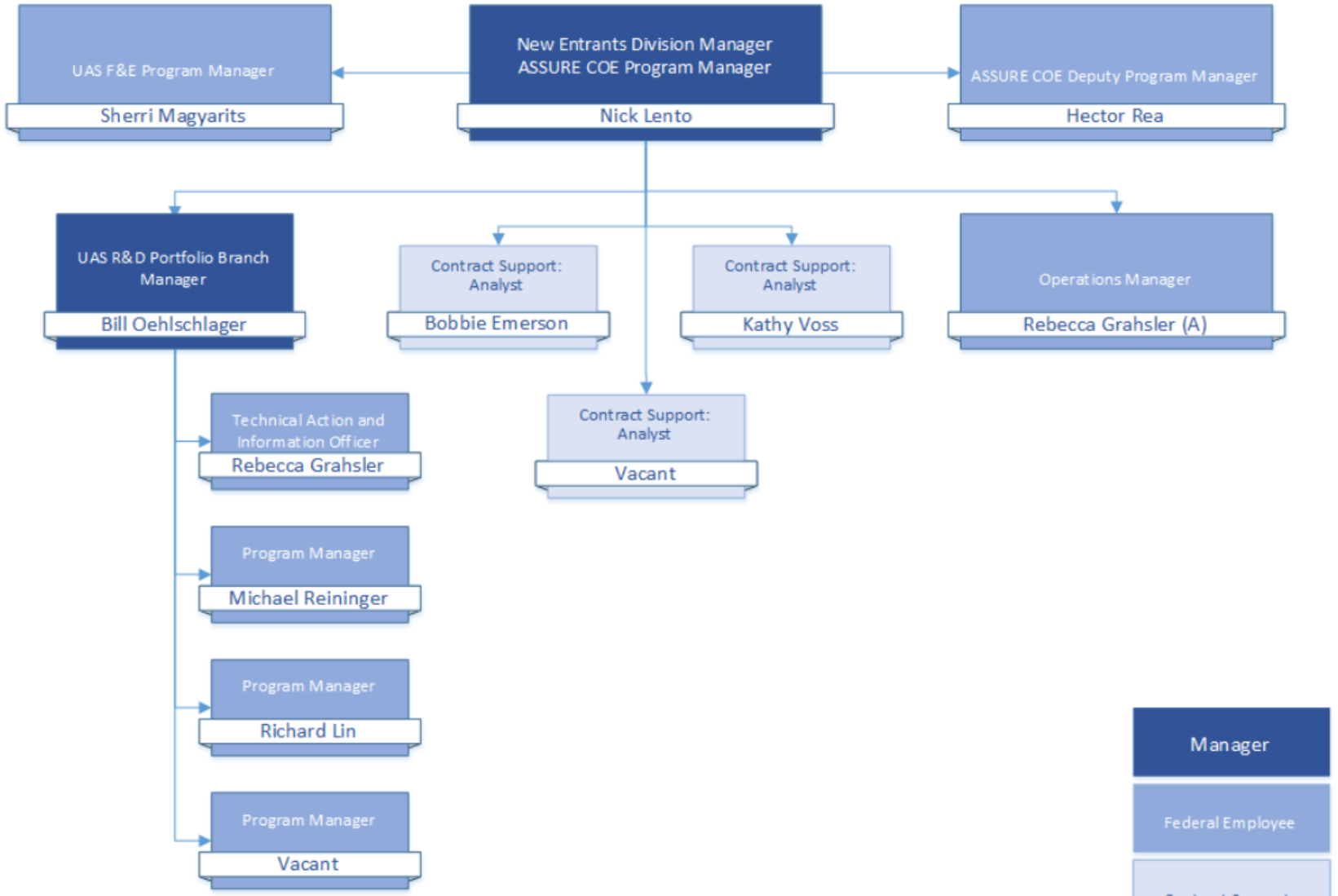
New Entrants Division Overview
July 2020

Presented by Nick Lento, New Entrants Division Manager and Center of Excellence for Unmanned Aircraft Program Manager

Overview

The New Entrants Division supports the evolution of the National Airspace System (NAS) by integrating Research and Development (R&D) to refine NAS operational requirements, influence NAS operational improvements and sustainments, and managing the FAA's Unmanned Aircraft Systems (UAS) R&D portfolios. This includes program management responsibility for the execution of relative R&D to support both Aviation Safety and NextGen requirements for UAS integration into the NAS. Within the scope of its portfolios, this Division manages the FAA's Center of Excellence for UAS and plays a leading role in collaborating with external domestic and international partners, such as the U.S. Department of Defense, NASA, and the European Organization for the Safety of Air Navigation (EUROCONTROL), to leverage relevant R&D to support the FAA's goals.

ANG-C2 Management Team



Current as of: Jun. 4, 2020

The FAA Reauthorization Act of 2018
H.R. 302 Legislation Related to UAS Research

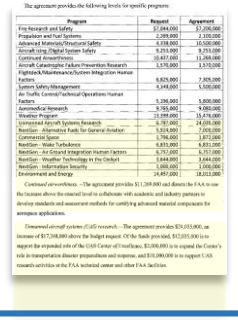
- Sec. 343: UAS Test Sites
  - Requires the FAA to carry out certain activities and programs in support of the FAA UAS Test Sites
  - COE and IPP Participants are partnered with Test Sites for research activities
- Sec. 345: Small Unmanned Aircraft Safety Standards
  - Establish a process to accept risk-based consensus safety standards
  - Research activities inform safety standards and rule making
- Sec. 351: UAS Integration Pilot Program (IPP)
  - Codifies pilot program. Notify Congress before initiating any additional rounds of selections/participation
- Sec. 359: Study on Fire Department and Emergency Service Agency Use of UAS
  - Report to Congress on use of UAS by fire and emergency service agencies
  - Initiating research effort on use of UAS for Disaster Preparedness & Response
- Sec. 364: U.S. Counter-UAS System Review of Inter-Agency Coordination Processes;
  - Review interagency coordination process and standards for operating C-UAS systems
- Sec. 365: Cooperation Related to Certain Counter-UAS Technology
  - Requires the FAA to work with government security partners for counter-UAS coordination & system deployment
  - Research activities will support ASH with counter-UAS responsibilities
- Sec. 376: Plan for Full Operational Capability of UTM
  - Requires the FAA to create a comprehensive plan for the implementation of UTM systems
  - Completion of UTM Pilot Program (UPP) will inform FAA's UTM Comprehensive Plan
- Sec. 383: Airport Safety and Airspace Hazard Mitigation and Enforcement
  - Includes testing and evaluation of detection and mitigation technologies at five airports

3-Year UAS RE&D Appropriations

FY17 Appropriation

Unmanned aircraft systems research.—The agreement provides $20,035,000 for Unmanned Aircraft Systems (UAS) Research, an increase of $2,670,000 above the fiscal year 2016 enacted level, to address the host of research challenges associated with the integration of UAS into the NAS system. Of this amount, $3,650,000 is provided to the NextGen integrated laboratories, in

FY18 Appropriation



Unmanned aircraft systems (UAS) research.—The agreement provides $24,035,000, an increase of $17,248,000 above the budget request. Of the funds provided, $12,035,000 is to support the expanded role of the UAS Center of Excellence, $2,000,000 is to expand the Center's role in transportation disaster preparedness and response, and $10,000,000 is to support UAS research activities at the FAA technical center and other FAA facilities.

FY19 Appropriation

Unmanned aircraft systems (UAS) research.—The conferees provide $24,035,000 for UAS research, including $12,035,000 for the UAS center of excellence in UAS research, $2,000,000 to expand the center's role in transportation disaster preparedness and response, and $10,000,000 to support UAS research activities at the FAA technical center and other FAA facilities.

UAS Stakeholders

- **AFRL**: Air Force Research Lab
- **ANSI**: American National Standards Institute
- **APAC**: ICAO Asia and Pacific Office
- **ASEB**: NAS Aeronautics and Space Engineering Board
- **ASSURE**: Alliance for System Safety of UAS through Research Excellence
- **CANSO**: Civil Air Navigation Services Organization
- **CTA**: Consumer Technology Association
- **REDAC**: Research and Development Advisory Committee
- **EASA**: European Aviation Safety Agency
- **EuroCAE**: European Organisation for Civil Aviation Equipment
- **EXCOM SSG SARP**: Executive Committee – Senior Steering Group – Science And Research Panel
- **FAA CAMI**: Civil Aerospace Medical Institute
- **FAA WJHTC**: William J. Hughes Technical Center
- **ICAO**: International Civil Aviation Organization
- **IEEE**: Institute of Electrical and Electronics Engineers
- **ITU**: International Telecommunications Union
- **JARUS**: Joint Authorities for Rulemaking on Unmanned SAZA Systems
- **MIT/LL:** Massachusetts Institute of Technology Lincoln Laboratory
- **MITRE CAASD**: Center for Advanced Aviation System Development
- **NAS**: National Academy of Sciences
- **NATO**: North Atlantic Treaty Organization
- **NSF**: National Science Foundation
- **NIST:** National Institute of Standards and Technology
- **SAE**: Society of Automotive Engineers
- **TRB**: NAS Transportation Research Board

FAA UAS COE Overview

- Congress mandated under the Consolidated Appropriations Act of 2014
- August 2014, FAA issued a Final Competitive Solicitation for the UAS COE
- May 2015, DOT/FAA selected the Alliance for System Safety of UAS through Research Excellence (ASSURE) led by Mississippi State University as the FAA's first COE for UAS
- The UAS COE was to focus on research, education and training in areas critical to the safe and successful integration of UAS into the nation's airspace
- FAA and other government funding will be matched by the COE one-for-one

UAS COE Period of Performance

- Ten Years
- Two Phases
  - Phase I – May 2015 through May 7, 2020
  - Phase II – May 2020 through May 7, 2025
    - Pending successful evaluation of COE performance (technical, management, and fiscal)
    - One year extension granted April 17, 2020

ASSURE Composition

www.ASSUREuas.org

Core Members (15)

- Mississippi State University - Lead
- Drexel University
- Embry-Riddle Aeronautical Univ.
- Kansas State University
- Montana State University
- New Mexico State University
- North Carolina State University
- Oregon State University
- University of Alabama - Huntsville
- University of Alaska - Fairbanks
- University of Kansas
- University of North Dakota
- Wichita State University
- Ohio State University
- University of California - Davis

Affiliate Members (8)

- Auburn University
- Concordia University – Canada *
- Louisiana Tech University
- Tuskegee University
- Indiana State University
- University of Southampton – UK *
- Sinclair Community College (added September 2015)
- Technion Israel Institute of Technology - Israel * (added August 2016)
- Nanyang Technological University - Singapore * (added April 2020)

* - International Partners

Corporate Partners (114+)

- Visit website for complete list http://www.assureuas.org/partners.php

Unmanned Aircraft Systems (UASs)

Very small UAVs (Micro or Nano UAVs):

- The very small UAV class applies to UAVs with dimensions ranging from the size of a large insect to 30-50 cm long.

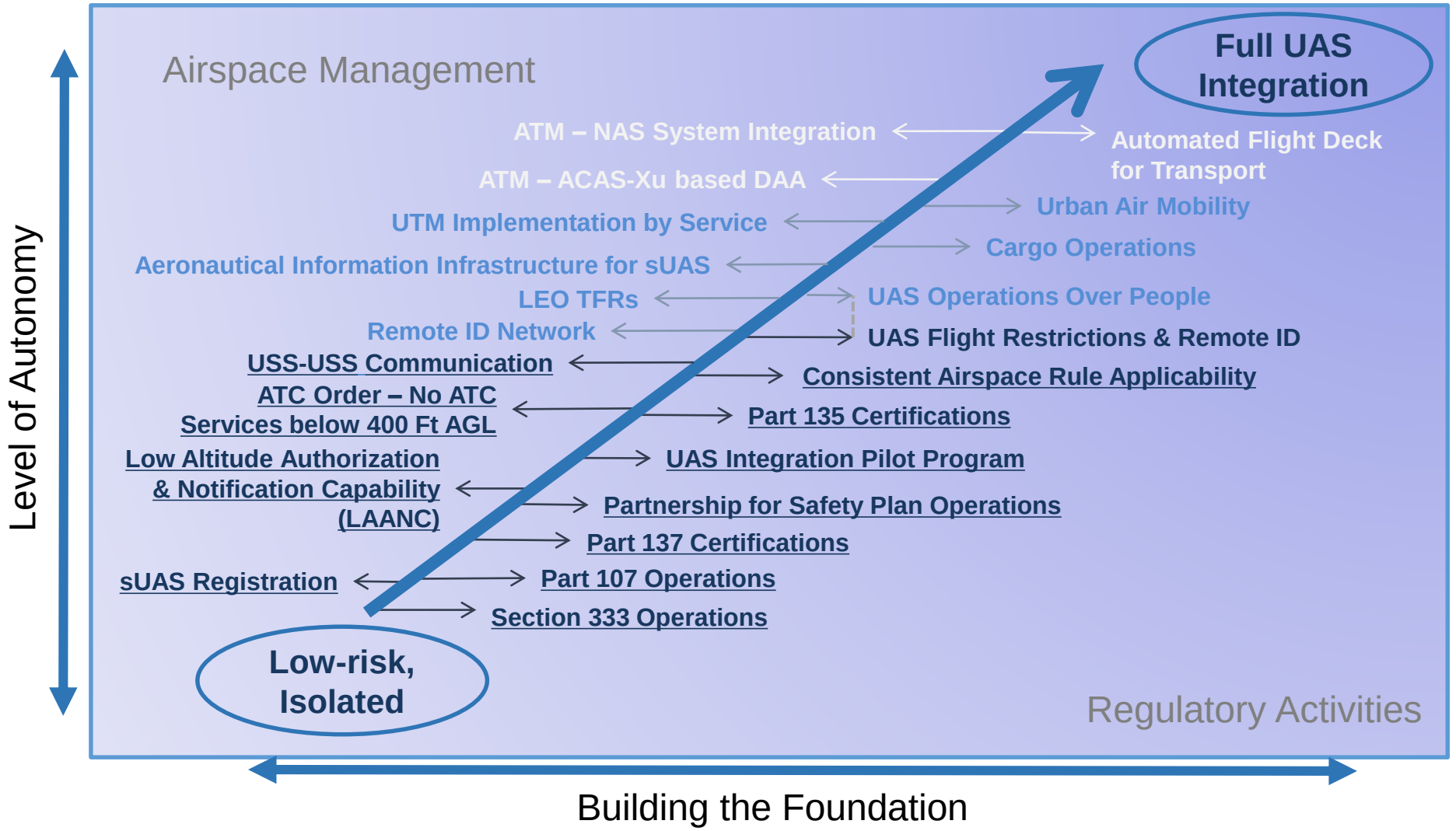
Medium UAVs:

- UAVs that are too heavy to be carried by one person but are still smaller than a light aircraft. They usually have a wingspan of about 5-10 m and can carry payloads of 100 to 200 kg.

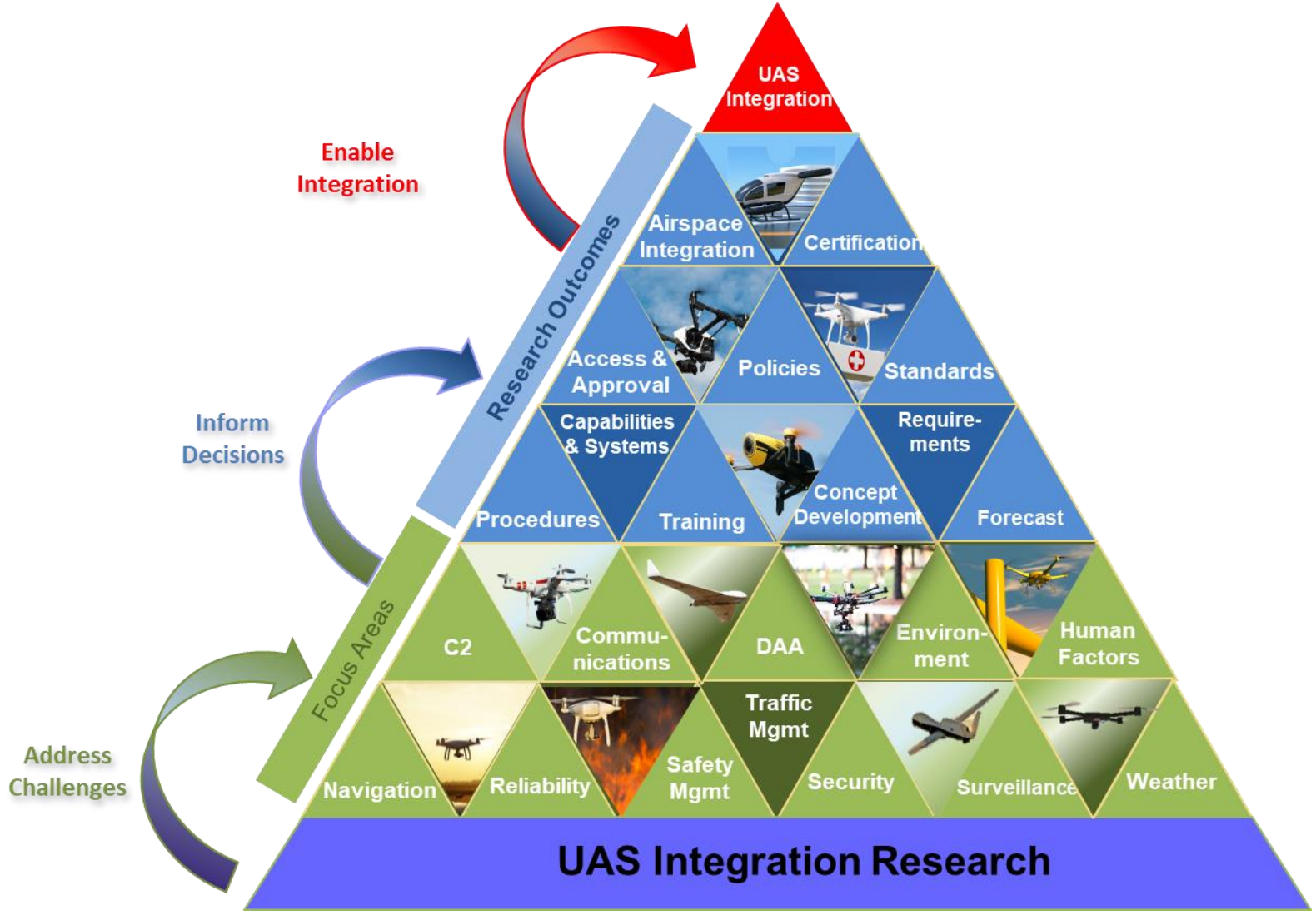
Large UAVs:

- The large UAV class applies to the large UAVs used mainly for combat operations by the military.

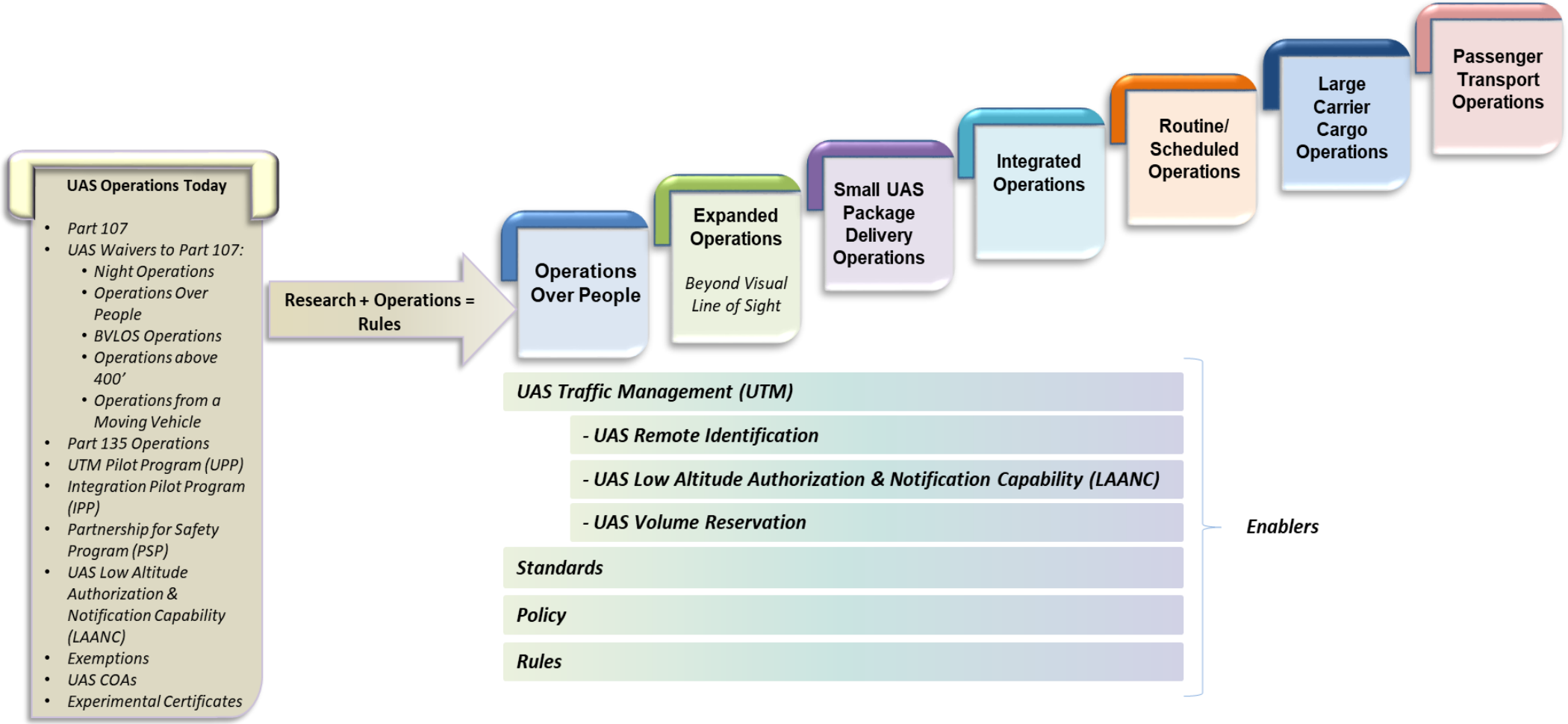
UAS Integration Strategy – 2019



FAA UAS Integration Research Functional Framework



UAS Integration Operational Capabilities



UAS Integration Operational Capabilities

Operations Over People	Expanded Operations	sUAS Package Delivery Operations	Integrated Operations	Routine/ Scheduled Operations	Large Carrier Cargo Operations	Passenger Transport Operations
A11L.UAS.7_A34	A11L.UAS.22_A18	A11L.UAS.52_A22	A11L.UAS.2	A11L.UAS.43_A20	A11L.UAS.44	A11L.UAS.61
				A11L.UAS.43_A49		*A11L.UAS.76_A36*
	A11L.UAS.53_A29	*A11L.UAS.77_A37*	A11L.UAS.31			*A11L.UAS.78_A38*
	A11L.UAS.55_A40	*A11L.UAS.89_A47*	A11L.UAS.47			
	A11L.UAS.56		A11L.UAS.50_A19			
	A11L.UAS.69_A21		A11L.UAS.50_A24			
	A11L.UAS.71_A27		*A11L.UAS.55_A23*			
	A11L.UAS.73_A25		A11L.UAS.58_A17			
	A11L.UAS.87_A45		A11L.UAS.60_A16			
	A11L.UAS.88_A46		A11L.UAS.68_A28			
			A11L.UAS.70_A33			
			A11L.UAS.72_A31			
			A11L.UAS.75_A35			
			A11L.UAS.79			
			A11L.UAS.83_A41			
			A11L.UAS.84_A42			
			A11L.UAS.85_A43			
			A11L.UAS.86_A44		*Legend*	
			A11L.UAS.90_A48		Active Projects	
			UAS.ATO_A30		*Projects In Coordination*	

ANG-C21 Research Projects (Active)

Project Identification	Research Title	Operational Capability	Performers
A11L.UAS.2	Multi-Sensor Data Fusion Strategies	Integrated Operations	FAA WJHTC
A11L.UAS.7_A34	Operations Over People	Operations Over People	ASSURE COE
A11L.UAS.22_A18	BVLOS – Separation Requirements and Testing	Expanded Operations	ASSURE COE
		Integrated Operations	
A11L.UAS.31	High Visual Contrast	Integrated Operations	CAMI
A11L.UAS.38	UAS Fuel Cells	Expanded Operations	FAA WJHTC
A11L.UAS.39	UAS Lithium Batteries	Operations Over People	FAA WJHTC
A11L.UAS.43_A20	ASIAS	Routine/ Scheduled Operations	ASSURE COE
A11L.UAS.44	UAS Air Carrier Ops	Large Carrier Cargo Operations	CAMI
A11L.UAS.47	Flight Path Display	Integrated Operations	CAMI
A11L.UAS.50_A19	Flight Test Data Collection	Integrated Operations	ASSURE COE
A11L.UAS.50_A24	Safety Case Development	Integrated Operations	ASSURE COE
A11L.UAS.52_A22	eCommerce	sUAS Package Delivery Operations	ASSURE COE
A11L.UAS.53_A29	STEM III	Expanded Operations	ASSURE COE

Operations Over People	Expanded Operations	sUAS Package Delivery Operations	Integrated Operations	Routine/ Scheduled Operations	Large Carrier Cargo Operations	Passenger Transport Operations

ANG-C21 Research Projects (Active)

Project Identification	Research Title	Operational Capability	Performers
A11L.UAS.56	SARP Well Clear Research	Expanded Operations	MIT/LL
		Integrated Operations	
A11L.UAS.60_A16	Airborne Collision: Structural Impact	Integrated Operations	ASSURE COE
A11L.UAS.61	Automation and Autonomy	Passenger Transport Operations	FAA, NASA
A11L.UAS.68_A28	Disaster Prep	Integrated Operations	FAA WJHTC, ASSURE COE
A11L.UAS.69_A21	Expanded and Non-Segregated Ops	Expanded Operations	ASSURE COE
A11L.UAS.71_A27	Risk-Based Thresholds	Expanded Operations	ASSURE COE
A11L.UAS.73_A25	Waiver Case Study Review	Expanded Operations	ASSURE COE
A11L.UAS.74_A26	Pilot Proficiency Requirements	sUAS Package Delivery Operations	ASSURE COE
A11L.UAS.79	Section 383 UAS Detection at Airports	Integrated Operations	FAA WJHTC
UAS.ATO_A30	ATO Large UAS Collision	Integrated Operations	ASSURE COE

Operations Over People	Expanded Operations	sUAS Package Delivery Operations	Integrated Operations	Routine/ Scheduled Operations	Large Carrier Cargo Operations	Passenger Transport Operations

ANG-C21 Research In Coordination

Project Identification	Research Title	Operational Capability	Performers
A11L.UAS.43_A49	UAS Flight Data Research in Support of ASIAS	Routine/ Scheduled Operations	ASSURE COE
A11L.UAS.55_A23	Validation of Low-Altitude Detect and Avoid Standards - Safety Research Center	Integrated Operations	ASSURE COE
A11L.UAS.55_A40	Validation of American Society for Testing and Materials (ASTM) Remote ID Standards - Safety Research Center	Expanded Operations	ASSURE COE
A11L.UAS.70_A33	Science and Research Panel (SARP) Support	Integrated Operations	ASSURE COE
A11L.UAS.72_A31	Safety Risks and Mitigations for UAS Operations On and Around Airports	Integrated Operations	ASSURE COE
A11L.UAS.75_A35	Identify Wake Turbulence and Flutter Testing Requirements for UAS	Integrated Operations	ASSURE COE
A11L.UAS.76_A36	Urban Air Mobility (UAM): Safety Standards, Aircraft Certification and Impact on Market Feasibility and Growth Potentials	Passenger Transport Operations	ASSURE COE
A11L.UAS.77_A37	UAS Standards Tracking, Mapping, and Analysis	sUAS Package Delivery Operations	ASSURE COE
A11L.UAS.78_A38	CyberSecurity and Safety Literature Review	Passenger Transport Operations	ASSURE COE

Operations Over People	Expanded Operations	sUAS Package Delivery Operations	Integrated Operations	Routine/ Scheduled Operations	Large Carrier Cargo Operations	Passenger Transport Operations

ANG-C21 Research In Coordination

Project Identification	Research Title	Operational Capability	Performers
A11L.UAS.83_A41	Investigate and Identify the Key Differences Between Commercial Air Carrier Operations and Unmanned Transport Operations	Integrated Operations	ASSURE COE
A11L.UAS.84_A42	From Manned Cargo to UAS Cargo Operations: Future Trends, Performance, Reliability, and Safety Characteristics Towards Integration into the NAS	Integrated Operations	ASSURE COE
A11L.UAS.85_A43	High-Bypass UAS Engine Ingestion Test	Integrated Operations	ASSURE COE
A11L.UAS.86_A44	Mitigating GPS and ADS-B risks for UAS	Integrated Operations	ASSURE COE
A11L.UAS.87_A45	Shielded UAS Operations - Shielded UAS Operations (DAA)	Expanded Operations	ASSURE COE
A11L.UAS.88_A46	Validation of Visual Operation Standards for Small UAS (sUAS)	Expanded Operations	ASSURE COE
A11L.UAS.89_A47	sUAS Mid-Air Collision (MAC) Likelihood	sUAS Package Delivery Operations	ASSURE COE
A11L.UAS.90_A48	Evaluation of Unmanned Aircraft System(s) (UAS) Detection and Counter-UAS (C-UAS) Technologies & Enforcement Actions in the National Airspace System (NAS) Program	Integrated Operations	ASSURE COE

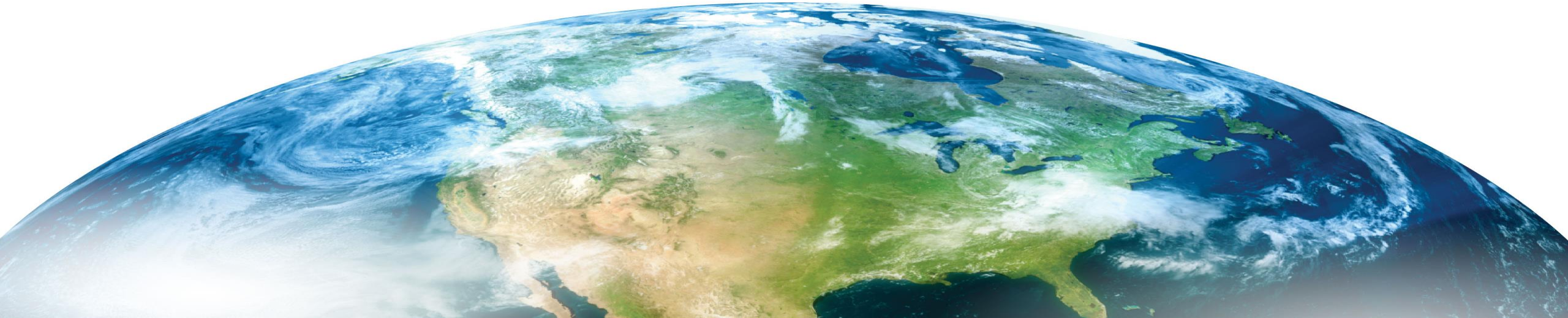
Operations Over People	Expanded Operations	sUAS Package Delivery Operations	Integrated Operations	Routine/ Scheduled Operations	Large Carrier Cargo Operations	Passenger Transport Operations

Back Up

NextGEN

Operations Over People

Lithium Batteries for UAV Systems and Aerospace Applications (A11L.UAS.39)



Lithium Batteries and Battery Systems for UAV
A11L.UAS.39

Overview

Need - UAS Li Battery requirement is addressing a broad range of safety issues, but will focus on a more detailed investigation of thermal runaway in efforts of developing consistent testing approaches leading to increased safety for aerospace vehicles.

Approach - The program will have commercial involvement and oversight from a Commercial Advisory Board (CAB) comprising General Atomics and Boeing Phantom Works.

Legislative Direction – N/A.

Major Activities

Activity	Status
Final Draft report	Complete
Report in Editing for publication	On going

Period of Performance
FY2016 – FY2020

Program Manager	Operational Capability

Sponsor	Partners
-	
-	

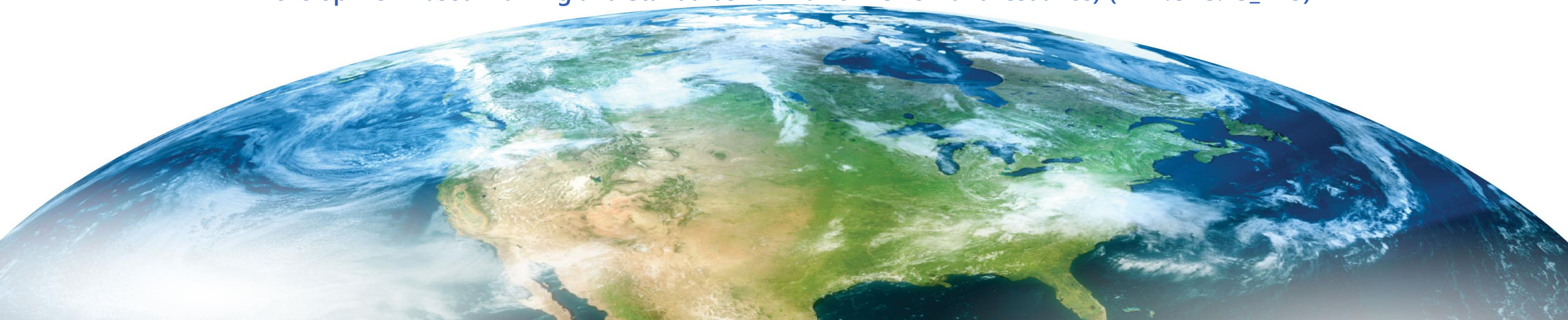
Research Performers
WJHTC – Mike Walz, ANG-E232

Issues & Risks

- COVID-19 has caused delays in the research team meeting to finish the editing of the report.

Expanded Operations

sUAS Detect and Avoid Beyond Visual Line of Sight (BVLOS) (A11L.UAS.22_A18)
Fuel Cell Energy Supply Systems for UAV Systems and Aerospace Applications (A11L.UAS.38)
Minority Outreach -- UAS as a STEM Minority Outreach Learning Platform for K-12 (A11L.UAS.53_A29)
sUAS Well Clear Definition in "under flight" conditions in Class B/C/D airspace (A11L.UAS.56)
Integrating Expanded & Non-Segregated UAS Operations into the NAS: Impact on Traffic Trends and Safety (A11L.UAS.69_A21)
Establish Risk-based Thresholds for Approvals Needed to Certify UAS for Safe Operation) (A11L.UAS.71_A27)
Develop Risk-Based Training and Standards for Waiver Review and Issuance) (A11L.UAS.73_A25)



sUAS Detect and Avoid Beyond Visual Line of Sight (BVLOS)
A11L.UAS.22

Overview

Need - To expand access for sUAS in limited portions of the NAS and still achieve a level of safety equivalent to manned aircraft operating in a similar manner.

Approach – Define an operational framework and conduct a comparison of approaches that support development of standards for sUAS DAA systems and development of proposed operating rules, limitations, and guidelines for sUAS BVLOS operations.

Legislative Direction – Supports H.R. 302 – The FAA Reauthorization Act of 2018, Section 345: Small Unmanned Aircraft Safety Standards

Major Activities

Activity	Status
Task 4: Development of the Separation Framework	Complete – 2/20/2020
Task 5: Development of a Testing Plan	Delayed – August 2020
Task 6: Testing of a) recommended DAA test plan, b) candidate DAA systems	Delayed – 9/21-25/2020
Task 7: Final Report	Delayed – May 2021

Period of Performance
FY2016- FY2021

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
ASSURE Lead – Mark Askelson, UND
UND, MSU, KSU, NMSU, OSU, UAF

Issues & Risks

- COVID-19 delayed testing due to social distancing requirements and travel restrictions due to limit the size of large gatherings.
  - Some travel restrictions for the participating schools have been eased.
  - Team planning for remote observation for FAA
  - Flight testing resumes Sept. 21-25, 2020 in Grand Forks, ND.

Fuel Cell Energy Supply Systems for UAV Systems and Aerospace Applications
A11L.UAS.38

Overview

Need - This research will search, test, and develop data and recommendations for FAA and global partners to create appropriate standards, regulations, and means of demonstrating safe compliance of UAS fuel cells.

Approach - Leverage the work in the Electrical System TCRG and target UAV system applications of fuel cell systems.

Legislative Direction – N/A

Major Activities

Activity	Status

Period of Performance
FY2016 – FY2019

Program Manager
Mike Reininger, ANG-C21

Operational Capability
Expanded Operations

Sponsor
Stephen Slotte, ANM-11
Wes Ryan, ACE-113

Partners
S&T Electrical and Wiring Systems Interagency Group
Energy Supply Device Aviation Rulemaking Committee
SAE AE7 Fuel

Research Performers
WJHTC – Mike Walz, ANG-E232

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Minority Outreach -- UAS as a STEM Minority Outreach Learning Platform for K-12
A11L.UAS.53

Overview

Need – This is the third phase of the FAA's program to provide Science, Technology, Engineering, and Math (STEM) minority outreach, using Unmanned Aircraft Systems (UAS) as the central learning platform

Approach – Research for the STEM III effort will be conducted in five key categories:1. Educator based STEM outreach programs 2. Rural community education and outreach 3. UAS-centered summer camps 4. After-school programs 5. In school immersion programs

Legislative Direction – Supports: H.R. 302 – The FAA Reauthorization Act of 2018, Section 350: The Use of UAS at Institutions of Higher Education
'Consolidated Appropriation Act of 2014 directs COEs to conduct STEM Outreach'

Period of Performance
FY2017 – FY2022

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
ASSURE – Henry Cathey, NMSU
NMSU, OSU, UAH, UAF, UCD, Sinclair

Major Activities

Activity	Status
University of Alabama Huntsville Space Camp for Educators	Postponed – 7/2019
New Mexico State University STEM Summer Camps	Postponed – 7/2019
University of Alaska Fairbanks UAS Roadshows	Postponed – 7/2019
Ohio State University TEK8 Engineering Design Challenge	Postponed – 7/2019
	Postponed – 7/2019

Issues & Risks

- **Issue** COVID-19 has caused events to be postponed or canceled.
  - Schools are looking to reschedule or change to online formats.

sUAS Well Clear Definition in "under flight" conditions in Class B/C/D airspace
A11L.UAS.56

Overview

Need – Provide research focused on gaps supporting the Science and Research Panel (SARP) including collision avoidance thresholds for UAS-to-UAS coordination.

Approach – The SSG has prioritized UAS research gaps including: Government, industry, and academic research on small-UAS-to-small-UAS coordination is evolving in multiple directions with different assumptions and technologies.

Legislative Direction – Supports: H.R. 302 – The FAA Reauthorization Act of 2018, Section 345: Small Unmanned Aircraft Safety Standards

Period of Performance
FY2018 – FY2020

Program Manager	Operational Capability
Richard Lin, ANG-C21	Expanded Operations

Sponsor	Partners
Sabrina Saunders-Hodge, AUS-300	N/A

MIT/LL – Rodney Cole

Major Activities

Activity	Status
Task 1: TIM examining Use Cases	Completed - 7/2019
Task 2: sUAS Encounters transition path	Completed – 7/2019
Task 3: V2V Communication Report	Completed – 8/2019
Task 4: Transition to Support Industry Report	Completed – 12/2019
Task 5: Report detailing simplified CA threshold	Completed – 3/2020
Task 6: Report detailing NMAC recommendation	Completed – 4/2020
Task 7: Report detailing V2V link performance for CA	On Track 9/2020

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Integrating Expanded and Non-Segregated UAS Operations into the NAS: Impact on Traffic Trends and Safety

A11L.UAS.69

Overview

Need – Provide further insight into the safe integration of UAS through forecasting of expanded and non-segregated UAS operations and subsequently collecting data to inform FAA's risk-based approach to safety rules, regulations and revising SMS based on forecasted UAS operational needs and characteristics.

Approach – Using a wide range of data, the research will (1) evaluate of data and establish quantitative impacts of expanded operations, (2) forecast and establish scope of non-segregated operations, and (3) formulate a risk management strategy for non-segregated operations

Legislative Direction – Supports: H.R. 302 – The FAA Reauthorization Act of 2018, Section 345: Small Unmanned Aircraft Safety Standards

Period of Performance
FY2019 – FY2021

Program Manager	Operational Capability
Phil Maloney, ANG-C35	Expanded Operations

Sponsor	Partners
Mike Lukacs, APO-100	N/A

Research Performers
ASSURE Lead–Philip Smith, OSU
DU, ERAU, KSU, NMSU, OSU, UAH, UAF, UND

Major Activities

Activity	Status
Phase 1 Technical Report	Ongoing, Interim Deliverables Submitted
Phase 2 Data Catalogue Report & Materials	Ongoing, On Track
Phase 2 Whitepaper on Forecasted UAS Operations	Ongoing, On Track
Phase 3 Technical Report on Automation & Incidents	Not Started
Phase 3 Technical Report on 'De Minimis' Risk	Not Started
Phase 3 Technical Report on SMS recommendations	Not Started

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Establish Risk-based Thresholds for Approvals Needed to Certify UAS for Safe Operation A11L.UAS.71

Overview

Need – The certification test case will validate sUAS industry standards and certification strategies for their safe integration into the NAS

Approach – Through a case study, establish a framework for a performance based airworthiness criteria to achieve a consistent means of compliance for waiver exemptions under 14 CFR Part 107

Legislative Direction –N/A

Major Activities

Activity	Status
Task 1 Literature Review	Completed -1/2020
Task 2 Durability and Reliable Type Certification	In Progress -11/2020
Task 3 UAS Pilot Operational Training Requirements	In Progress -4/2021
Task 4 Waiver Applications and Submissions	In Coordination
Task 5 Final Report	In Coordination

Period of Performance
FY2019 – FY2021

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
ASSURE Lead– Tom Haritos, KSU
KSU, UND, Sinclair

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Develop Risk-Based Training and Standards for Waiver Review and Issuance
A11L.UAS.73

Overview

Need – Validate sUAS industry standards and support standards development and waiver strategies for sUAS, necessary for their safe integration in the NAS

Approach – Provide a standardized risk-based process for assessing operational risk when reviewing and approving 14 CFR Part 107 waiver applications.

Legislative Direction – N/A

Major Activities

Activity	Status
Task 1: Literature Review and Framework Development	4/2021
Task 2: Write and Submit Part 107 Waivers	8/2021
Task 3: Reporting. Write the final report that captures the findings of this research.	12/2021
Task 4: Peer Review	1/2022
Task 5: Program Management and Completed Final Report	2/2022

Period of Performance
FY2020 – FY2022

Program Manager	Operational Capability

Sponsor	Partners

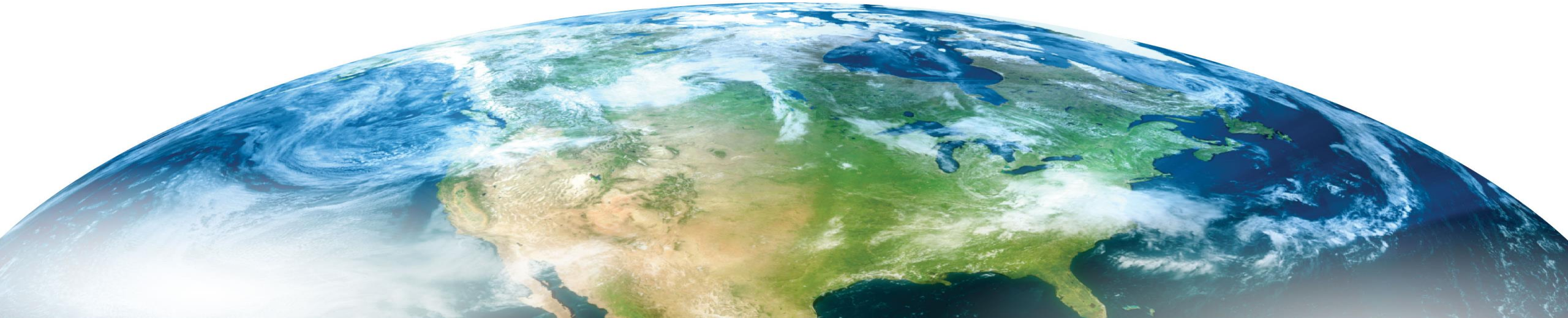
Research Performers
ASSURE Lead – Tom Haritos, KSU
KSU, UAF, UND

Issues & Risks

- **Issue** None
- **Risk** Sponsor wants to refocus the work after the literature review had already taken place and added a small subtask. Delayed the Scoping Peer Review by a couple of months.
  - Closely monitor the scoping changes and ensure it is well documented so questions don't arise at the end.

sUAS Package Delivery Operations

eCommerce, Emerging UAS Network and Implications on NAS Integration (A11L.UAS.52_A74)
Establish Pilot Proficiency Requirements (A11L.UAS.74_A26)



eCommerce, Emerging UAS Network and Implications on NAS Integration
A11L.UAS.52

Overview

Need – Gather and survey market and business intelligence, existing data and sources for UAS commercial delivery operations to support risk and hazard analysis for safety goals.

Approach – Analyze and compile data on sUAS use of terminal areas and populated areas in their use of delivery mode so that the implications of integration can be better understood, regulated, and designed.

Legislative Direction – N/A

Major Activities

Activity	Status
Phase 1 Data Examination & Evaluation	In Progress – 9/2020
Phase 2 Network and Safety Analysis	In Progress – 10/2020
Phase 3 Emerging Network and NASA's UTM	In Progress – 4/2021
Phase 4 Emerging Network and Environment footprints	In Progress – 7/2021
Phase 5 Emerging Network and Regulatory Framework	In Progress - 7/2021

Period of Performance
FY2019 – FY2021

Program Manager	Operational Capability
Richard Lin, ANG-C21	sUAS Package Delivery Operations

Sponsor	Partners
Mike Lukacs, APO-100	N/A

ASSURE – Dallas Brooks, MSU

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Establish Pilot Proficiency Requirements
A11L.UAS.74

Overview

Need – Address human factors safety concerns that are unique to UAS and perform research that supports development of standards, regulations, and guidance for civil UAS.

Approach – Identify knowledge gaps that are currently a barrier to the safe, efficient, and timely integration of systems composed of multiple unmanned aircraft (UAS) into the NAS.

Legislative Direction –

H.R. 302 – The FAA Reauthorization Act of 2018, Section 343: UAS Test Sites

H.R. 302 – The FAA Reauthorization Act of 2018, Section 345: Small Unmanned Aircraft Safety Standards

Period of Performance
FY2020 – FY2022

Program Manager	Operational Capability
Zac King, ANG-C21	sUAS Package Delivery Operations

Sponsor	Partners
Sabrina Saunders-Hodge, AUS-300	N/A

ASSURE Lead– Julie Adams, OrSU
DU, KSU, OrSU

Major Activities

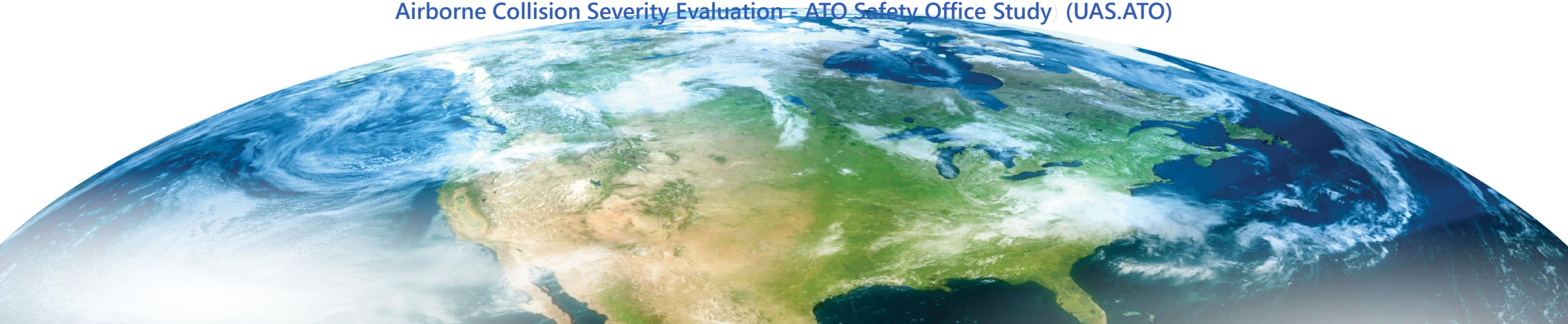
Activity	Status
Task 1: Literature Review	10/2020
Task 2: Other potential Multi-UAS research areas	11/2020
Task 3: Determine and assess the human factors limitations to monitoring multiple UAS.	8/2021
Task 4: Determine and assess the human factors limitations to monitoring multiple UAS.	8/2021
Task 5: Conduct a HITL simulation exploring human factor considerations of one pilot to many vehicles.	5/2022
Task 6: Final Report	7/2022

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Integrated Operations

Detect and Avoid (DAA) Multi-Sensor Surveillance Data Fusion Strategies (A11L.UAS.2)
UAS Command and Control Link Compatibility Testing (A11L.UAS.23)
High Visual Contrast for UAS (A11L.UAS.31)
Minimum Detect and Avoid (DAA) Display and Flight Path Information (A11L.UAS.47)
UAS Safety Case Development, Process Improvement, and Data Collection (A11L.UAS.50_A19_A24)
Airborne Collision Severity Evaluation-Engine Ingestion) (A11L.UAS.58_A17)
UAS Airborne Collision Hazard Severity Evaluation- Structural Impact) (A11L.UAS.60_A16)
Disaster Preparedness and Response) (A11L.UAS.68_A28)
Section 383 Detection at Airports) (A11L.UAS.79)
Airborne Collision Severity Evaluation - ATO Safety Office Study) (UAS.ATO)



Detect and Avoid (DAA) Multi-Sensor Data Fusion Strategies
A11L.UAS.2

Overview

Need – To comply with 14CFR Part 91.113 and 91.111, an UAS DAA system must provide UAS pilot the ability to detect and avoid collisions with other aircraft. This research supports the development of surveillance performance requirements and then develops **ALL** software models and trackers required to provide a track to the DAA algorithm to make the required decision.

Approach - SMEs of research task participate in SC-228 DAA WG1 and SC-147 Committees to provide insight as well as gather insight and feedback from members in order to develop all products. Important deliverables are included as Appendix to MOPS documents.

Legislative Direction – N/A

–

Program Manager	Operational Capability
Deepak Chauhan, ANG-C35	Integrated Operations

Sponsor	Partners
Sheila Mariano, AIR-6B4	NASA and RTCA Committee Members

Research Performers
WJHTC

Major Activities

Final version of surveillance sensor models, trackers and test vectors developed in support of SC-228 DAA WG1 and SC-147 ACAS Xu MOPS	
Further enhancement of UAS terminal encounter model and research into viability of utilizing an Omni antenna for small UAS (55lbs and up).	

Issues & Risks

- Research task is conducted in sync with RTCA Committee schedule and deliverables. A slide/delay in their schedule can affect the research task.
- Due to COVID 19 situation, all efforts are ongoing to keep deliverables on schedule. However, since we rely on other entities to provide input, there is a possibility of delay.
- Contractual: No issues at the moment. However delays in administering support contracts and/or continuation can cause drop in support of research.

UAS Command and Control Link Compatibility Testing
A11L.UAS.23

Overview

Need – To complement the current validation efforts for Control and Non Payload Communications (CNPC) standards by evaluating the operating compatibility with other L-band and C-Band avionics equipment. Further research to support needs for SC-228.

Approach – Construct a hardware-in-the-loop laboratory environment and conduct laboratory testing using selected equipment of interests (i.e. TACAN, UAT, etc.).

Legislative Direction – Supports H.R. 302 – The FAA Reauthorization Act of 2018, Section 345: Small Unmanned Aircraft Safety Standards

Major Activities

Activity	Status

Period of Performance
FY2016 – FY2018

Program Manager
Melanie Flavin, ANG-C35

Operational Capability
Expanded Operations

Sponsor
Steve VanTrees, AIR-130 (RTCA SC-228, WG2-C2 Co-chair

Partners
TBD

Research Performers
WJHTC & Various

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

High Visual Contrast for UAS
A11L.UAS.31

Overview

Need – This research determines possible methods to increase visual conspicuity sUAS to visual observers on the ground and to pilots of manned aircraft.

Approach – Due to COVID-19, Research Performers will be using a computer based study to investigate the following variables of interest:

- Day Night
- Light Intensity
- Light Flash Rate

Legislative Direction – N/A.

Major Activities

Activity	Status
Computer Based Study	In process

Period of Performance
FY2019 – FY2021

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
Civil Aerospace Medical Institute (CAMI)

Issues & Risks

- **Issue** Due to COVID-19 participants are not permitted to travel and participate in in-person study.
  - Mitigation: Study will be performed using computer based study.
- **Risk** Limited screen size and un-calibrated monitors can result in errors
  - Mitigation: Data collection with CAMI participants on calibrated machines to establish a performance baseline for comparison.

Minimum Detect and Avoid (DAA) Display and Flight Path Information
A11L.UAS.47

Overview

Need – This research supports the development of minimum requirements for Detect and Avoid (DAA) display and flight path guidance information required for UAS pilots to avoid collisions, remain well clear from other aircraft, and comply with right-of-way rules.

Approach – Design and conduct experiment and analysis of human factors considerations of DAA alerting guidance used to maintain well clear during heading command changes and reversals.

Legislative Direction – N/A

Major Activities

Activity	Status

Period of Performance
FY2019 – FY2020

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
Civil Aerospace Medical Institute (CAMI)

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

UAS Safety Case Development, Process Improvement, and Data Collection
A11L.UAS.50

Overview

Need – Development of the technical data requirements, risk management processes, data collection, and admin processes used to inform safety cases in support of UAS Integration.

Approach – Develop a safety case framework for data collection with accompanying data schema. Have the FAA review the proposed framework and revise accordingly.

Legislative Direction – 2016 FAA Extension, Section 2211, 2018 Reauthorization Legislation, specifically Section 343 (UAS Test Sites), Section 345 (Small Unmanned Aircraft Safety Standards), and Section 351 (UAS Integration Pilot Program)

Major Activities

Activity	Status

Period of Performance
FY2020 – FY2022

Program Manager	Operational Capability
Mike Reininger, ANG-C21	Integrated Operations

Sponsor	Partners
Sabrina Saunders-Hodge, AUS-300	N/A

Research Performers
ASSURE Lead– Mark Askelson, UND
UND, MSU, NMSU, UAF, KSU, OSU

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Airborne Collision Severity Evaluation-Engine Ingestion
A11L.UAS.58

Overview

Need – Study the interaction of a representative high bypass ratio fan and UAV during an engine ingestion scenario to define best practices and fan models for further studies.

Approach – Create a verifiable and measurable risk assessment of a UAS ingestion. This is a repeatable and reliable model of a UAS ingestion into an operating large bypass turbine engine

Legislative Direction – H.R. 636 - The FAA Extension, Safety, and Security Act of 2016, Section 2212, Unmanned Aircraft Systems-Manned Aircraft Collision Research

Major Activities

Activity	Status
Experimental Validation of Component & Full Quadcopter Model	In Process/Oct 2020
Report of Findings and Release Results of study publicly	Jan 2021

Period of Performance
FY2018 – FY2021

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
ASSURE Lead– Kiran D'Souza, OSU
OSU, UAH, WSU

Issues & Risks

- **Issue** COVID-19 delays testing process-SME not available to travel to UAH
  - Mitigation: UAH has been able to provide manpower and expertise and provide work arounds.
- **Risk** COVID-19 continuing and impacting personnel availability..

UAS Airborne Collision Hazard Severity Evaluation- Structural Impact
A11L.UAS.60

Overview

Need – Analyze the characteristics of small UAS that contribute to damage of the airframe of manned aircraft as a resulting from an airborne collision.

Approach – Develop high-fidelity computer models supported by component level tests to evaluate the severity of sUAS collisions with manned aircraft.

Legislative Direction – H.R. 636 - The FAA Extension, Safety, and Security Act of 2016, Section 2212, Unmanned Aircraft Systems-Manned Aircraft Collision Research

Major Activities

Activity	Status
Public Release of Final Report	Jan 2021

Period of Performance
FY2018 – FY2021

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
ASSURE Lead – Gerardo Olivares, WSU
ERAU, UAH, MtSU, WSU

Issues & Risks

- **Issue** COVID-19 delays testing process-SME not available to travel to UAH
  - Mitigation: UAH has been able to provide manpower and expertise and provide work arounds.
- **Risk** Description COVID-19 continuing and impacting personnel availability

Disaster Preparedness and Response
A11L.UAS.68

Overview

Need – This research will investigate the roles of UAS aiding in disaster response operations.

Approach – Survey experts across state, local, and federal agencies for disaster response use case development. Develop CONOPS and ORAs by disaster. Determine coordination levels amongst federal agencies.

Legislative Direction – Directly fulfills direction in 2018 Omnibus Appropriation. Supports H.R. 302 – The FAA Reauthorization Act of 2018, Section 359: Study on Fire Department and Emergency Service Agency Use of UAS

Major Activities

Activity	Status
COE Tasks 1&2: Government Surveys	Upcoming – Jan. 2021
COE Task 3: Development of the CONOPS and ORAs by Disaster	Upcoming – July 2021
COE Task 4: Determine common risks and mitigations from Task 3	Upcoming – Sept. 2021
COE Task 5: Determine coordination level to conduct disaster response	Upcoming – Nov. 2021
COE Task 6: Study Fire Department and Emergency Service Agency Use of UAS	Upcoming – Apr. 2021

Period of Performance
FY2020 – FY2022

Program Manager	Operational Capability
Mike Reininger, ANG-C21	Integrated Operations

Sponsor	Partners
Sabrina Saunders-Hodge, AUS-300	N/A

ASSURE Lead – Jerry Hendrix, UAH
MSU, NMSU, NCSU, OrSU, UAH, UAF, ERAU

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Section 383 Detection at Airports
A11L.UAS.79

Overview

Need – Ensure that counter UAS (cUAS) technologies do not adversely impact or interfere with safe airport operations, air navigation, air traffic services, or the safe and efficient operation of the NAS. Identify standards necessary for the safe use of cUAS technologies in the NAS.

Approach – Develop a plan for certifying, permitting, authorizing, or allowing the deployment of cUAS technologies or systems, and testing UAS detection and mitigation systems at five airports, including an airport that ranks in the top 10 of the FAA's most recent Passenger Boarding Data.

Legislative Direction – Supports H.R. 302 FAA Reauthorization Act SEC. 383. airport safety and airspace hazard mitigation and enforcement

Major Activities

Activity	Status
Draft Advisory Circular Framework	In Progress - 9/2020
Technical Screen	In Progress - 9/2020
Vendor Equipment Lease for ACY	In Progress - 1/2021
ACY Site Preparation	In Progress - 3/2021
UAS Pilot Services	In Progress - 3/2021
Equipment Lease for field sites	In Progress - 3/2021

Period of Performance
FY2020 – FY2021

Program Manager	Operational Capability
Richard Lin, ANG-C21	Integrated Operations

Sponsor	Partners
John Dermody, AAS	N/A

Research Performers
WJHTC – Jim Patterson, ANG-E26

Issues & Risks

- **Risk** COVID-19 may delay ability to install necessary infrastructure at ACY
  - Closely monitoring COVID protocol

Airborne Collision Severity Evaluation - ATO Safety Office Study

Overview

Need – Determine the potential severity of sUAS mid-air collisions with aircraft in order to define an Equivalent Level of Safety to manned aviation.

Approach – Use computer modeling and simulation to evaluate the damage done from various weights of fixed wing and quadcopter UAS colliding with aircraft mid-air.

Legislative Direction – Directly Fulfills: H.R. 636 - The FAA Extension, Safety, and Security Act of 2016, Section 2212

Supports: H.R. 302 – The FAA Reauthorization Act of 2018, Section 345: Small Unmanned Aircraft Safety Standards

Major Activities

Activity	Status
10 lbs UAS Analysis	Completed 5/2020
25 lbs UAS Analysis	Completed 6/2020
55 lbs UAS Analysis	In Progress 8/2020

Period of Performance
FY2019 – FY2020

Program Manager	Operational Capability
Richard Lin, ANG-C21	Integrated Operations

Sponsor	Partners
Pradip Som, AJI-331	N/A

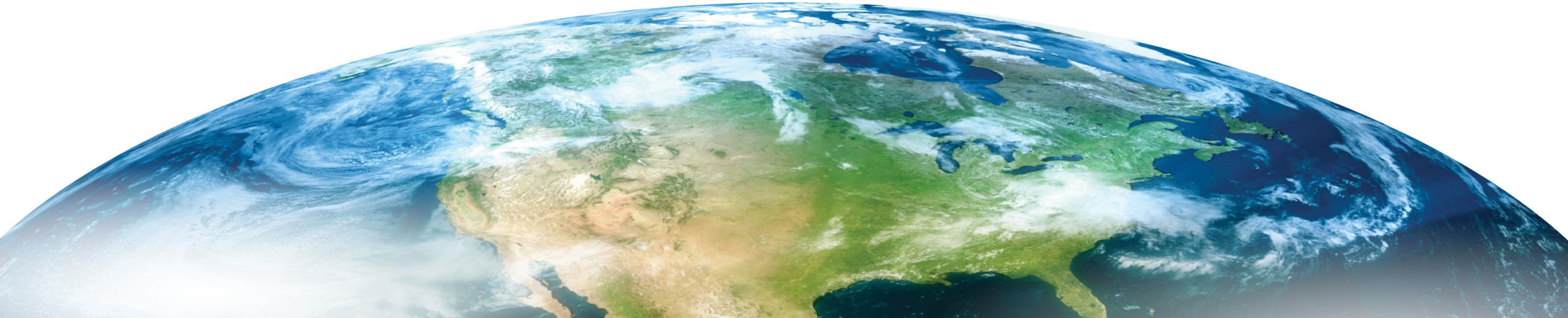
Research Performers
ASSURE – Gerardo Olivares, WSU

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Routine/Scheduled Operations

UAS Parameters, Exceedances, Recording Rates for ASIAS (A11L.UAS.43_A20)



UAS Parameters, Exceedances, Recording Rates for ASIAS
A11L.UAS.43

Overview

Need – Support aggregation of UAS flight data with commercial, general aviation and surveillance data, to develop enhanced safety analyses for NAS stakeholders.

Approach – The researcher will review current state-of-the-art Unmanned Flight Data Monitoring, identify benefits of UFDM, begin development of a UAS FDM data standard, identify data types unique to UAS, and map them to events to determine causal factors.

Legislative Direction – N/A

Major Activities

Activity	Status
Task 1: UFDM State of the Art Report	Completed - 3/2019
Task 2: UFDM Safety, Productivity, and Economic analysis report	Completed - 9/2019
Task 3: Unmanned Aircraft FDM report which lists the parameters, exceedances, and recording rates for ASIAS.	Completed - 6/2019
Task 4: Report detailing the common data types across commercial, GA, and unmanned aircraft.	Completed - 12/2019
Task 5: Final Report which maps types of events and causal factors. Include algorithms, source code, tests, and validation.	Complete – June 2020

Period of Performance
FY2018 – FY2020

Program Manager	Operational Capability
Mike Reininger, ANG-C21	Routine/Scheduled Operations

Sponsor	Partners
Tim Evans, AVP-220	N/A

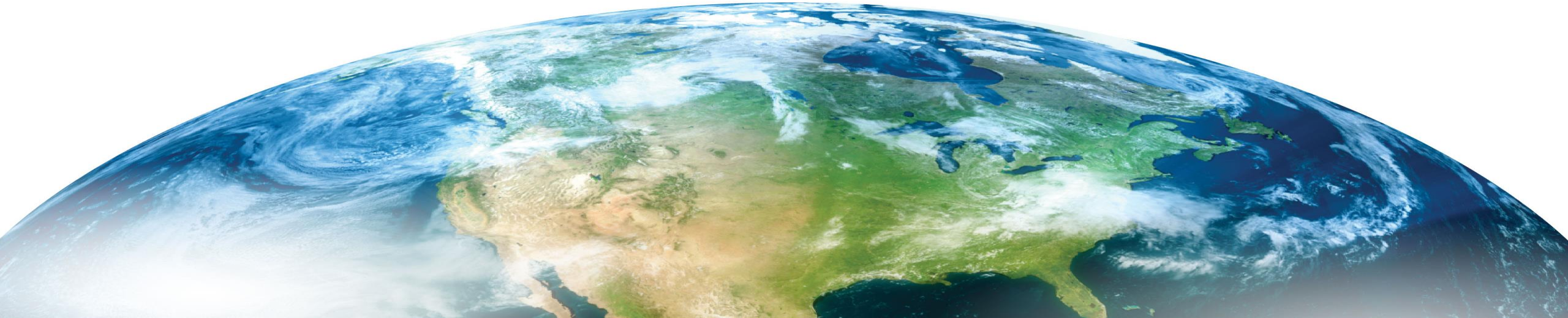
Research Performers
ASSURE Leads - Phase 1 – Jim Higgins, UND; Phase 2 - Ryan Guthridge, UND
UND, ERAU, MSU

Issues & Risks

- **No Issues or Risks** impacting programmatic progress at this time

Large Carrier Cargo Operations

Air Carrier Operational Considerations for Unmanned Aircraft Systems (A11L.UAS.44)



Air Carrier Operational Considerations for Unmanned Aircraft Systems
A11L.UAS.44

Overview

Need – This research addresses safety concerns specific to Air Carrier Operations for UAS including air carrier staffing, training, testing, duty, and rest requirements.

Approach – Perform literature reviews and surveys examining currently in use crew and staffing practices, duty and rest requirements, and knowledge, skills, and tests for operating UAS in various operations.

Legislative Direction – Supports H.R. 302 FAA Reauthorization Act SEC. 341, 44802. Integration of civil unmanned aircraft systems into national airspace system.

Period of Performance
FY2019 – FY2020

Program Manager	Operational Capability

Sponsor	Partners

Research Performers
Civil Aerospace Medical Institute (CAMI) – Kevin Williams, Tom Nesthus

Major Activities

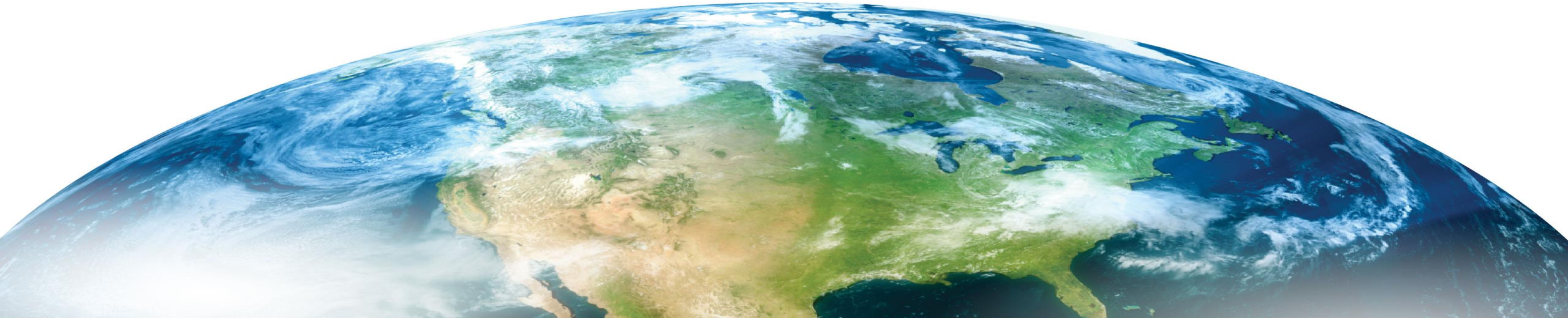
Activity	Status
Task 1: Market Survey/Literature Review on current crew and staffing practices	Completed – 5/2020
Task 2: Literature Review on required knowledge, skills, and tests for operating UAS	Completed – 5/2020
Task 3: Survey/Literature Review of duty and rest requirements	Delayed – 9/2020

Issues & Risks

- **Issue** Paperwork Reduction Act (PRA) is causing major delays in the administration of a survey.
  - Closely examining alternatives while also continuing through with the PRA process.

Passenger Transport Operations

UAS Automation and Intelligent Systems (A11L.UAS.61)



UAS Automation and Intelligent Systems
A11L.UAS.61

Overview

Need – This Research Requirement documents the need for research on automation and intelligent systems. The work will address systems certification criteria and preliminary human factors considerations together. This research will contribute to a long-term automation strategy for approval and certification of intelligent systems.

Approach – Phased approach beginning with UAS and moving toward cargo and passenger carrying aircraft while addressing both systems certification criteria and human factors considerations in coordination

Legislative Direction – N/A.

Major Activities

Activity	Status
Development & Integration of new Cockpit Interface in a Simulator	Complete
Develop Test Scenarios for New Aircraft & Automation Tech	Complete
Conduct Study 1 on Test Scenarios	Delayed
Draft Report on Study 1	Delayed
Refine Test Scenarios for New Aircraft & Automation Tech	TBD
Conduct Study 2 on Refined Test Scenarios	TBD
Final Report on recommended automation policy and human factors considerations on automation & intelligent systems	TBD

Period of Performance
FY2019 – FY2023

Program Manager	Operational Capability
Phil Maloney, ANG-C35	Passenger Transport Operations

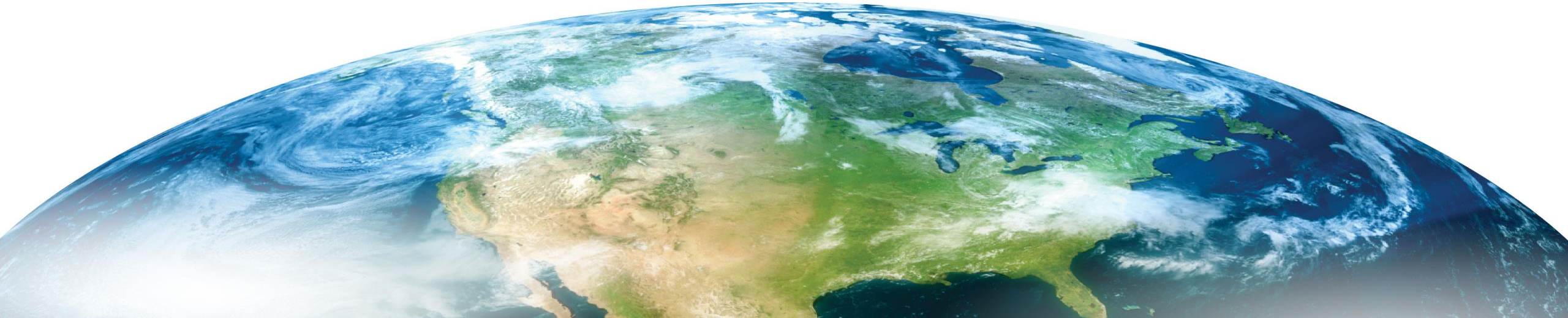
Sponsor	Partners
David Sizoo, AIR	NASA

NASA

Issues & Risks

- **Issue** Covid-19 is preventing researches from conducting formal testing in NASA laboratories; project schedule delays expected.
  - NASA is evaluating when they can get back into the laboratory; their plan is to begin work on other deliverables in the meantime (e.g. Study 1 Report) Mitigation

Past Research



Past Research Activities

- UAS SAA System Certification Obstacles (UAS.1)
  - Objective: Determine certification criteria associated with operational and airworthiness approval that a SAA system will be required to address, and provide a means of compliance to 14 Code of Federal Regulation (CFR) Part 91
- Ground-to-Ground Communication Architecture Assessment (UAS.5)
  - Objective: Analyze architectural alternatives for Ground-to-Ground communication between a Pilot-in-Command at a UAS Control Station (CS) and Air Traffic Control (ATC)
- UAS Test Site Data Collection (UAS.6)
  - Objective: Collect and analyze data from UAS test site operations to determine technical and operational trends
- UAS System Safety Criteria (UAS.7)
  - Objective: Recommend safety thresholds for characteristics such as kinetic energy, structure, shape, or other safety features that can be utilized to identify threshold levels
    - Included Ground Collision Research and Airborne Collision Research with a Commercial Airliner and Business Jet
- Simulating UAS in NAS Operation (UAS.8)
  - Objective: Develop capability for FAA ATO to collect and analyze UAS safety data from COA and other sources to support safety oversight responsibilities for UAS
- Surveillance Criticality (UAS.9)
  - Objective: Determine the sufficiency of exisiting airborne surveillance equipment to provide separation for UAS.

Past Research Activities, cont'd

- Integration of Collision Avoidance System (CAS) into Detect and Avoid (DAA) for Unmanned Aircraft Systems (UAS): (UAS.10)
  - Objective: Determine how a UAS DAA system might use CAS as part of its functionality in various classes of airspace
- Certification Test Case to Validate Industry Consensus Standards (UAS.11)
  - Objective: Utilize Industry Consensus Standards and try to go through a mock certification to identify gaps.
- UAS Maintenance, Modification, Repair, Inspection, Training and Certification Considerations (UAS.15)
  - Objective: Explore the maintenance, repair, modification, and inspection criteria, programs, procedures, and processes utilized by all sizes/types of UAS.
- UAS Human Factors Control Station Design Standards (UAS.24)
  - Objective: Provide input to recommended minimum standards and design guidelines for UAS control stations.
- Human Factors Considerations of UAS Procedures and Control Stations (UAS.30)
  - Objective: Develop recommendations for minimum UAS control station standards and guidelines.
- UAS Well Clear Definition (UAS.34)
  - Objective: Recommend a well clear definition for sUAS to remain well clear of manned aircraft at low altitudes.

Past Research Activities, cont'd

- Secure C2 with Interference Mitigation (UAS.35)
  - Objective: Identify Interference cancellation and mitigation techniques to establish secure C2 between UAS and control station
- Airport Detection (UAS.36)
  - Objective: Assessment of newly emerging UAS detection system technologies in a variety of airport environments
- sUAS Part 107 Electronic Accident Reporting Portal (UAS.37)
  - Objective: Develop a viable tool that will comply with Part 107.9 UAS Accident Reporting.
- sUAS Part 107 Electronic Waiver Processing Development (UAS.40)
  - Objective: Develop a vialble tool that will comply with Part 107.200&205 UAS Waiver Requests.
- Part 107 Waiver Request (UAS.41)
  - Objective: Attempt an operations over people waiver to identify gaps in applicant understanding
- sUAS In and Around Busy Commercial Airspace (UAS.42)
  - Objective: Three primary purposes: (a) understand/integrate data across numerous uses/users; (b) understand and forecast UAS activities and operational implications of NAS integration; and (c) formulation of a quantitative framework to formulate/evaluate regulations.
- Assessing the Risk of UAS Integration (UAS.49)
  - Objective: This study will inform current and future rulemaking and the work of the new UAS Safety Team by focusing on methodologies to characterize the risk of UAS and manned aircraft interactions. The study also supports Section 2210 of the 2016 FAA Reauthorization.