ANSI Unmanned Aircraft Systems Standardization Collaborative (UASSC)

A Roadmap for Standards

VERSION 2.0 Project Overview

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ASTM F38 Committee Chair

Why a Roadmap? Many Standards Developing Organizations (SDOs) Involved in UAS

ASTM International	International Organization for Standardization	RTCA, Inc.
SAE International	Institute of Electrical and Electronics Engineers	Consumer Technology Association
Open Geospatial Consortium	Underwriters Laboratories Inc.	National Fire Protection Association
American Society of Mechanical Engineers	American Society of Safety Professionals	Telecommunications Industry Assn.

May 19, 2017 ANSI UAS Standardization Coordination Meeting

◆ 42 organizations including industry, trade associations, SDOs, federal agencies, coalitions, academia, et al.

◆ Proposed UASSC mission, objectives, deliverables, current standards, focus
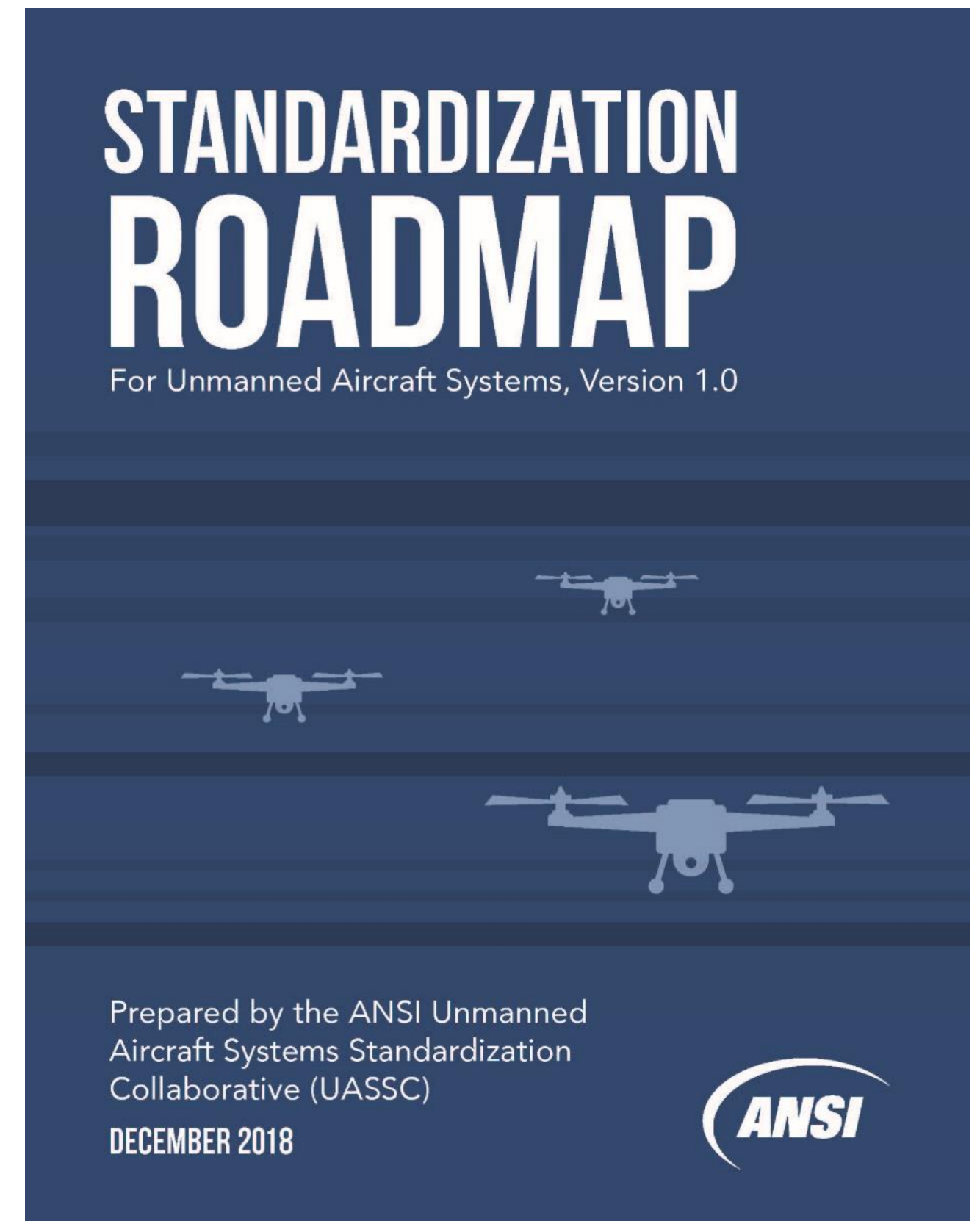
September 28, 2017 UASSC Kick-off Meeting

◆ 83 attendees from 58 organizations including industry, trade associations, SDOs, government and others

◆ Approved UASSC mission, objectives and deliverables

Mission and Deliverable

◆ **Mission:** To coordinate and accelerate the development of the standards and conformity assessment programs needed to facilitate the safe integration of unmanned aircraft systems (UAS) into the national airspace system (NAS) of the United States, with international coordination and adaptability

◆ **Deliverable:** A comprehensive roadmap published in December 2018 describing the current and desired standardization landscape for UAS

– Available as a free download at www.ansi.org/uassc

STANDARDIZATION ROADMAP
For Unmanned Aircraft Systems, Version 1.0

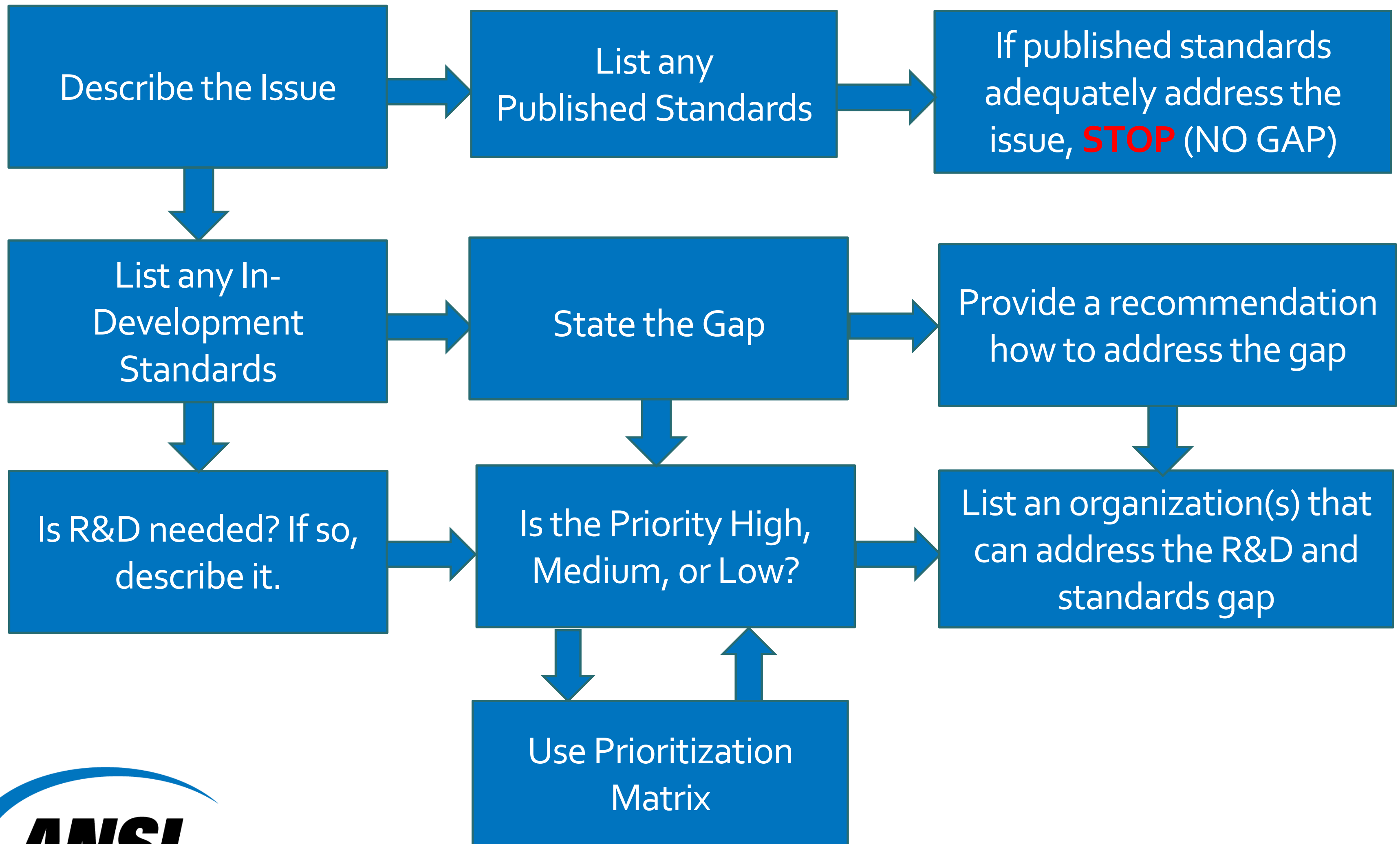Prepared by the ANSI Unmanned Aircraft Systems Standardization Collaborative (UASSC)

DECEMBER 2018

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Structure and Participation

◆ Steering Committee

◆ WG1 – Airworthiness

◆ WG2 – Flight Operations and Personnel Qualifications

◆ WG3 – Infrastructure Inspections and Commercial Services Operations

◆ WG4 – Public Safety Operations

◆ Participation open to UAS stakeholders that have U.S. operations

– ANSI membership not a prerequisite

– Participants come from industry, government agencies, standards developing organizations (SDOs), and other interested stakeholders

– **Over 300 individuals from some 175 public- and private-sector organizations** supported the roadmap's development

WGs' Approach to Gap Analysis

```
┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────────┐
│ Describe the Issue  │ ───> │ List any            │ ───> │ If published standards  │
│                     │      │ Published Standards │      │ adequately address the  │
│                     │      │                     │      │ issue, STOP (NO GAP)    │
└─────────────────────┘      └─────────────────────┘      └─────────────────────────┘
         │
         v
┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────────┐
│ List any In-        │ ───> │ State the Gap       │ ───> │ Provide a recommendation│
│ Development         │      │                     │      │ how to address the gap  │
│ Standards           │      │                     │      │                         │
└─────────────────────┘      └─────────────────────┘      └─────────────────────────┘
         │                            │                              │
         v                            v                              v
┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────────┐
│ Is R&D needed? If so,│ ──> │ Is the Priority High,│ ──> │ List an organization(s) │
│ describe it.        │      │ Medium, or Low?     │      │ that can address the    │
│                     │      │                     │      │ R&D and standards gap   │
└─────────────────────┘      └─────────────────────┘      └─────────────────────────┘
                                   │        ^
                                   v        │
                              ┌─────────────────────┐
                              │ Use Prioritization  │
                              │ Matrix              │
                              └─────────────────────┘
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Sample Gap Statement

- **Gap: Crane Inspection Using UAS**. Standards are needed to cover requirements for the use of UAS in the inspection, testing, maintenance and operation of cranes and other material handling equipment covered within the scope of ASME's B30 volumes.

- **R&D Needed:** No

- **Recommendation:** Complete work on ASME B30.32 to address crane inspections using UAS.

- **Priority:** Medium*

- **(NEW) Status of Progress:** Options: Closed (completed), Green (moving forward), Yellow (delayed), Red (at a standstill), Not Started, Withdrawn, or Unknown

- **(NEW) Update:** Narrative statement summarizing any significant changes from version 1

- **Organization:** ASME

* For any NEW gaps refer to prioritization matrix on next two slides

Prioritization Matrix: Making the CASE for the Gap Priority Level

Criteria

- **Criticality (Safety/Quality Implications)** How important is the project? How urgently is a standard or guidance needed? What would be the consequences if the project were not completed or undertaken? A high score means the project is more critical.

- **Achievability (Time to Complete)** - Does it make sense to do this project now, especially when considered in relation to other projects? Is the project already underway or is it a new project? A high score means there's a good probability of completing the project soon.

Scoring Values

- 3 - critical
- 2 - somewhat critical
- 1 - not critical

- 3 - project near completion
- 2 - project underway
- 1 - new project

Prioritization Matrix (contd.)

Criteria

- **<u>S</u>cope (Investment of Resources)** - Will the project require a significant investment of time/work/money? Can it be completed with the information/tools/resources currently available? Is pre-standardization research required? A high score means the project can be completed without a significant additional investment of resources.

- **<u>E</u>ffect (Return on Investment)** - What impact will the completed project have on the industry? A high score means there are significant gains for the industry by completing the project.

Scoring Values

- 3 - low resource requirement
- 2 - medium resource requirement
- 1 - resource intensive

- 3 - high return
- 2 - medium return
- 1 - low return

Score Rankings

- High Priority (a score of 10-12)
- Medium Priority (a score of 7-9)
- Low Priority (a score of 4-6)

Roadmap Gaps Breakdown

Section	High (0-2 years)	Medium (2-5 years)	Low (5+ years)	Total
WG1 Airworthiness	16	2	1	19
WG2 Flight Operations	8	2	1	11
WG3 Infrastructure Inspections/ Commercial Svcs	4	7	1	12
WG4 Public Safety Operations	4	5	0	9
WG2 Personnel Qualifications	8	1	0	9
Total	40	17	3	60

36 gaps need Research & Development

Goals for Version 2

◆ Expand topics covered

   – spectrum, urban air mobility, and recreational operations

◆ Bring in subject matter experts not previously involved

◆ Identify potentially overlooked issues and gaps

◆ Track progress to address the roadmap recommendations, including new or completed work

◆ Review priorities, noting steering committee rankings of high priority gaps

◆ Incorporate participant feedback and update the document as appropriate

◆ Publish roadmap version 2.0 end of June 2020

VERSION 2 : Breakout Groups - Questions

Questions Related to the Roadmap and Roadmap Update

- What are the top UAS issues of concern for your organization?

- What issues, activities, or initiatives are missing from the roadmap or not adequately covered in your view?

- Please provide any comments that you have on the roadmap's organization.

- Who is not here today who should be involved in this effort?

Questions Related to UAS Standardization

- What topics are not being adequately addressed in UAS standardization?

- What overlap or duplication exists in UAS standardization?

TIME-LINE VERSION 2 KICK-OFF SEPTEMBER 13 WASHINGTON DC

◆ Steering Committee Call (Sep 19 from 3-4pm)

◆ Resume twice monthly WG calls (Oct 2019 – Mar 2020)

　– Provide updates on gaps and to text

　– Discuss new areas and draft text as needed

◆ Public review of roadmap draft version 2.0 (Apr 2020)

◆ Reconvene WGs to dispose of comments (May 2020)

◆ Final copy edit / Publish roadmap version 2.0 (June 2020)

◆ Promote roadmap thereafter

◆ More Info at www.ansi.org/uassc

For More Information

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BACK UP SLIDES

Working Group 1 – Airworthiness (Roadmap Chapter 6)

- Design and Construction

- Safety

- Quality Assurance/Quality Control

- Avionics and Subsystems

- Command and Control Link

- Navigational Systems

- Detect and Avoid Systems

- Software Dependability and Approval

- Crash Protected Airborne Recorder Systems

- Cybersecurity

- Electrical Systems

- Power Sources and Propulsion Systems

- Noise, Emissions, and Fuel Venting

- Mitigation Systems for Various Hazards

- Parachutes for sUAS

- Maintenance and Inspection

- Enterprise Operations: Level of Automation/Autonomy/ Artificial Intelligence (AI)

- **Spectrum (new)**

Working Group 2 – Flight Operations: General Concerns and Personnel Qualifications (Roadmap Chapters 7 & 10)

- Privacy
- Operational Risk Assessment
- Beyond Visual Line of Sight
- Operations Over People
- Weather
- Data Handling & Processing
- UAS Traffic Management
- Remote ID & Tracking
- Geo-fencing

- Terminology
- Manuals
- UAS Flight Crew
- Additional Crew Members
- Maintenance Technicians
- Compliance/Audit Programs
- Human Factors in UAS Operations

Working Group 3 – Infrastructure Inspections and Commercial Services Operations (Roadmap Chapter 8)

- Vertical Infrastructure Inspections
  - Boilers & Pressure Vessels
  - Cranes
  - Building Facades
  - Low-Rise Residential and Commercial Buildings
  - Communications Towers
- Linear Infrastructure Inspections
  - Bridges
  - Railroads
  - Power Transmission Lines

- Wide Area Environment Infrastructure Inspections/Precision Agriculture
  - Environmental Monitoring
  - Pesticide Application
  - Livestock Monitoring and Pasture Management
- Commercial Package Delivery
- Occupational Safety Requirements for UAS Operated in Workplace
- **Urban Air Mobility (new)**

Working Group 4 – Public Safety Operations (Roadmap Chapter 9)

- sUAS for Public Safety Operations

- Hazardous Materials Incident Response and Transport

- Transport and Post-Crash Procedures Involving Biohazards

- Forensic Investigations Photogrammetry

- Payload Interface and Control for Public Safety Operations

- Search and Rescue
    - sUAS FLIR Cameral Sensor Capabilities
    - sUAS Automated Waypoint Missions

- Response Robots

- Law Enforcement Tactical Operations

- Counter UAS

- **Recreational Operations (new)**

Steering Committee Survey to Rank 40 High Priority Gaps Tier 1 – Most Critical (14)

- Gap A1: UAS Design and Construction (D&C) Standards

- Gap A5: Command and Control (C2)/Command, Control and Communications (C3) Link Performance Requirements

- Gap A7: UAS Navigational Systems

- Gap A8: Protection from Global Navigation Satellite Signals (GNSS) Interference Including Spoofing and Jamming

- Gap A9: Detect and Avoid (DAA) Systems

- Gap A10: Software Dependability and Approval

- Gap A12: UAS Cybersecurity

- Gap O2: Operational Risk Assessment and Risk Mitigation

- Gap O3: Beyond Visual Line of Sight (BVLOS)

- Gap O4: UAS Operations Over People (OOP)

- Gap O8: Remote ID and Tracking: Direct Broadcast

- Gap O9: Remote ID and Tracking: Network Publishing

- Gap S9: Counter-UAS/Drone (C-UAS) Operations

- Gap P8: Flight Control Automation and System Failures

Survey to Rank High Priority Gaps (contd.) Tier 2 – Critical (14)

- Gap A4: Avionics and Subsystems

- Gap A6: Technical support for C2/C3 link performance requirements in telecommunications standards

- Gap A16: Mitigation Systems for Various Hazards

- Gap A18: Maintenance and Inspection (M&I) of UAS

- Gap A19: Enterprise Operations: Levels of Automation/ Autonomy/ Artificial Intelligence (AI)

- Gap O5: UAS Operations and Weather

- Gap O7: UTM Service Performance Standards

- Gap O10: Geo-fence Exchange

- Gap I12: Occupational Safety Requirements for UAS Operated in Workplaces

- Gap S1: Use of sUAS for Public Safety Operations

- Gap P2: Manuals (tie tier 2/3)

- Gap P3: Instructors and Functional Area Qualification

- Gap P5: UAS Maintenance Technicians

- Gap P9: Crew-Composition, Selection, and Training (tie tier 2/3)

Survey to Rank High Priority Gaps (contd.)
Tier 3 – Least Critical (12)

- Gap A13: Electrical Systems

- Gap A14: Power Sources and Propulsion Systems

- Gap A15: Noise, Emissions, and Fuel Venting

- Gap A17: Parachute or Drag Chute as a Hazard Mitigation System in UAS Operations over People (OOP)

- Gap I9: Inspection of Power Transmission Lines Using UAS

- Gap I10: Pesticide Application Using UAS

- Gap I11: Commercial Package Delivery

- Gap S3: Transport and Post-Crash Procedures Involving Biohazards

- Gap S5: Payload Interface and Control for Public Safety Operations

- Gap P1: Terminology

- Gap P6: Compliance and Audit Programs

- Gap P7: Displays and Controls