

Unmanned Aircraft Systems (UAS) Standardization Coordination Meeting

MEETING SUMMARY

Friday, May 19, 2017

20 F Street, NW Conference Center, Washington, DC

As the national coordinator for the U.S. private-sector system of voluntary standardization, ANSI convened this meeting to discuss the current standards landscape for unmanned aircraft systems (UAS), commonly known as drones. A number of standards developing organizations (SDOs) are currently involved in developing standards for UAS, underscoring the need for coordination to avoid duplication of effort and to achieve a coherent set of standards. The meeting considered work already completed, in progress, and still to be done. It explored how ongoing coordination can be facilitated through an ANSI standardization collaborative to support the broader policy dialogue now taking place around the growing commercial and civil UAS market. Close to 70 representatives from more than 40 organizations participated.

Secretary's Note: Presentations from the meeting are available as a single zip file [here](#). They are also posted individually [here](#). The embedded links below point directly to the individual presentations.

Discussion Topic / Speaker

Welcome and ANSI Opening Remarks

Joe Bhatia, President and CEO, American National Standards Institute (ANSI)

Mr. Bhatia welcomed the participants. He described ANSI's role as administrator and coordinator of the U.S. private sector system of voluntary standardization. ANSI provides a neutral venue for broad, open and consensus-based discussions to address national and global standardization priorities and emerging technology areas like UAS. ANSI has a track record of facilitating such cross-sector dialogue and advancing coordination via the Institute's standardization collaboratives.

Mr. Bhatia commented on the growing market for UAS, noting activity over the last year both on the regulatory front and in the standardization community. He introduced and thanked the public- and private-sector co-chairs for the meeting:

- Earl Lawrence, Director, UAS Integration Office, Federal Aviation Administration (FAA)
- Brian Wynne, President & CEO, Association for Unmanned Vehicle Systems International (AUVSI)

Mr. Bhatia laid out the agenda for the day and encouraged active participation and information sharing among the participants.

FAA Opening Remarks

[Federal Aviation Administration \(FAA\)](#)

- Earl Lawrence, Director, UAS Integration Office
- Arthur Hinaman, Manager, Technical Support Branch, UAS Integration Office

Mr. Lawrence commented that FAA's priority is to safely integrate UAS into the U.S. national airspace system (NAS). UAS is a disruptive technology and there is a great deal of federal agency and international interest. Industry consensus is important in supporting FAA rulemaking. The FAA allows for flexibility in how industry meets FAA requirements. FAA doesn't require specific standards; rather, it requires industry to demonstrate that it can

repeatedly build a safe product. Industry will be the key audience for the work of the ANSI standardization collaborative, not the FAA. The pace and volume of UAS operations is significant. Performance-based regulations, standardization, and collaboration will be key to integration.

Mr. Hinaman remarked that there is plenty of work to do in terms of performance-based standards but we want to avoid duplication. FAA wants to be involved but not driving the activity; that is industry's role. He outlined a number of focus areas including collision avoidance, detect and avoid, command and control, design and construction, operations over people. Future focus areas include human factors, operations, airworthiness, and swarming. Let FAA know of additional research needs.

AUVSI Opening Remarks

Brian Wynne, President and CEO, the Association for Unmanned Vehicle Systems International

Mr. Wynne mentioned that he had testified before Congress in support of appropriations for FAA's work on UAS integration. There is tremendous support on the Hill, so we need to do our job right. AUVSI covers multiple domains: space, air, ground, and maritime. Let's not reinvent the wheel. Industry likes performance-based/risk-based standards. We need to leverage what is already out there and identify new areas of work needed. Success is defined as integrating the airspace successfully. Remote identification is critical and at the top of the priority list. Solutions have to be codified and regulated. While AUVSI is not a standards making body, it understands the importance of standards and likes the idea of an ANSI collaborative.

Federal Agency Perspectives on UAS Priorities

Facilitator: Earl Lawrence

Speakers were invited to give brief overviews of agency priorities highlighting current areas of focus and future work.

Department of Homeland Security (DHS)

- Philip Mattson, DHS Standards Executive

Mr. Mattson explained that the office of standards coordinates standards activity across DHS and works with other federal agencies on standards activities. DHS is involved in many aspects of UAS including research and development (R&D), operational assessment, and field operations. DHS partners with state and local agencies to support their missions and UAS capabilities. A concern is UAS being used for malicious purposes. DHS wants to safely deploy and effectively operate UAS to meet mission requirements. UAS integration issues include safety, flight characteristics, power, command and communications, integration of sensors, visual acuity, airworthiness, terminology, networking, swarming, interoperability, etc. Other factors include security of systems, data transmission security, operator training, proficiency testing, and certification.

DHS is working on response robots and reproducible test methods. DHS has WGs focused on UAS. A robotics subject area WG is being established. Ground based and water borne robotic systems may have application across platforms. DHS endorses the objectives of this collaborative.

International Trade Administration

- Jonathan Alvear, International Trade Specialist, Transportation and Machinery

Mr. Alvear indicated that ITA has roles in both domestic and international development of the UAS market. To begin with, ITA serves as a gateway for industry to interact with relevant U.S. government agencies (such as FAA, Transportation Security Administration (TSA) and the National Aeronautics and Space Administration (NASA) as well as the other parts of the Commerce Department directly involved in the development of UAS policies, procedures, operations, and standards (such as NIST and NTIA).

ITA regularly represents Commerce on the UAS Executive Committee (EXCOM), an interagency body hosted by the

FAA to coordinate UAS policies across the federal government. The UAS EXCOM membership consists of representatives of the FAA, DOD, Commerce, Justice, DHS, Interior, and NASA. The EXCOM oversees rulemaking, addresses specific issues such as Counter-UAS threats and solutions, and identifies research gaps. ITA is working towards introducing industry and/or market development topics into the EXCOM discussions.

Commerce hosted a UAS industry roundtable in November 2016 which included a wide cross-section of the UAS community in order to discuss ongoing activities in the sector and topics the participants wished to highlight that could be relevant to the UAS EXCOM and/or that should be briefed to the incoming administration. The participants widely agreed that the industry remains in a formative stage and the government should continue to emphasize safety while avoiding stifling the industry. UAS covers a wide range of diverse areas (from spectrum to air traffic management (ATM) to regulations/standards to R&D to international engagement) and government needs to lead to ensure U.S. leadership in technology and standards development. The roundtable participants also expressed support for more quantification of economic benefits of the UAS industry.

ITA addresses factors that affect the competitiveness of U.S. products, including export control issues. For instance, the U.S. is a member of the Missile Technology Control Regime (MTCR), which seeks to limit the risks of proliferation of weapons of mass destruction by controlling transfers that could contribute to delivery systems for such weapons (other than manned aircraft). As currently written, MTCR regards larger UAS (with a range exceeding 300km and/or a payload exceeding 500kg) as part of Category I. Category I items face a strong presumption of denial of export to anyone except allies.

According to the Bureau of Industry and Security (BIS), armed UAS will continue to be controlled under MTCR while commercial UAS have the possibility of being reclassified to allow for freer exports. BIS has indicated that the MTCR membership most likely will address lighter-than-air UAS in the near future and that BIS will seek industry input on further parameters for Category I such that more UAS could be exempted.

U.S. export controls reflect the reality of MTCR such that a great number of UAS components and complete systems require licensing in order to export (either the more restrictive International Traffic in Arms Regulations (ITAR) process governed by the State Department or the less onerous process for products on the Commerce Control List or designated as falling under the Export Administration Regulations). Continued movement of UAS-related products from ITAR to the CCL/EAR will be dependent on changes to MTCR that raise the thresholds on distance and payload in order to shift more UAS out of Category I.

National Institute of Standards and Technology (NIST)

- Adam Jacoff, Robotics Research Engineer, Intelligent Systems Division

Mr. Jacoff noted that DHS/Phil Mattson is the largest external sponsor for NIST developing standard test methods for response robots (aerial, ground, aquatic). The work is being done in ASTM E54.09, homeland security applications. The goal is to develop the underlying measurements and standards infrastructure necessary to evaluate robot capabilities and operator proficiency. The approach is to develop the test methods by subsystem not by mission. Outcomes will be test methods, performance metrics, and data collection tools. Statistically significant data helps to compare systems and reliability. It informs procurement decision-making, training, and operational mission deployment.

NIST has been doing this for a long time for ground robots. The focus is now turning to small UAS, vertical take-off and lift (VTOL). The list of test methods is under development. NIST advocates internal, enclosed space testing to start, then moving those tests outdoors, and then embedding them into training scenarios. The idea is get measureable performance out of those scenarios. Impact forces test methods are also being developed. A model for standards collaboration is that ASTM develops the standard test methods to evaluate ground robots and operators, NFPA develops equipment standards for robots in specific missions, and the user community uses the standards for procurement, training, and to assess readiness. Several test method validation sites exist.

National Oceanic and Atmospheric Administration (NOAA)

- Phil Kenul, SVP, Aviation and Operations, TriVector Services, and Retired NOAA Corps Rear Admiral

Mr. Kenul explained that NOAA prides itself on being the nation's environmental intelligence agency. Wildlife survey fatalities is a big problem, so the agency wants to take the man out of the airplane. It also wants to work more efficiently, effectively, economically, and environmentally-friendly. Focus areas included high-impact weather, marine monitoring, and polar research. NOAA is using the NASA Global Hawk drone to track hurricanes and improve forecasting resulting in significant savings and reduced carbon footprint. The Grav-D project is redefining vertical datum. The agency wants to be able to fly in dangerous areas and with precise flight lines, and it is safer doing so with an unmanned aircraft. Marine monitoring has included using small UAS to compare the body conditions and health of killer whale populations. Polar research has included ice detection/navigation/mapping, weather forecasting, and oil spill response. The agency is supporting the development of new capabilities through partnerships and cooperative R&D agreements. Essentially, it is using autonomy to reduce costs and increase mission effectiveness.

Oak Ridge National Laboratory (ORNL)

- Richard Lusk, Director, UAS Research Center

Mr. Lusk noted that ORNL is a DOE lab, and he is a federal contractor, not a federal employee. ORNL is the largest R&D facility on the planet with supercomputers, nanotechnology, etc. It works to advance science and technology and does not compete with industry. It has been involved in UAS for a long time. Drivers include power plants, propulsion, command and control, and data analytics. Areas covered by ORNL's UAS Research Center include platforms, sensors, computing, navigation, analytics and operation. Mr. Lusk has written a free book *Early Survey of Best Practices for the Use of Small Unmanned Aerial Systems by the Electric Utility Industry*.

JARUS Perspective on UAS Priorities

Facilitator: Earl Lawrence

Joint Authorities for Rulemaking on Unmanned Systems (JARUS)

- Christopher Swider, International Specialist, UAS Integration Office, Federal Aviation Administration, JARUS Vice Chairman

Mr. Swider explained that JARUS is a forum for cooperation among national aviation authorities. Its membership includes 51 member states and 2 European regional organizations. JARUS recommends technical, safety and operational requirements for the certification and safe integration of UAS into the airspace and at aerodromes. Industry is represented through a stakeholder consultative body. JARUS has seven WGs covering flight crew licensing; operations; airworthiness; detect and avoid; command, control & communications; safety and risk management; and concept of operations (CONOPS). JARUS is not an SDO and it does not write laws or mandatory standards. Its deliverables are recommendations that undergo both internal and external consultation. They are made available to interested parties such as the International Civil Aviation Organization (ICAO) and the national aviation authorities who decide how to use them. Published documents and work in progress are posted on the JARUS website. One of the documents in development deals with Specific Operations Risk Assessment (SORA), a risk assessment methodology to establish a sufficient level of confidence that a specific operation can be conducted safely.

SDO Perspectives on UAS Priorities

Facilitator: Brian Wynne

Speakers were invited to give brief overviews of SDO work programs, highlighting current areas of focus and future work.

ASTM International (ASTM)

- Mary Mikolajewski, Manager, Technical Committee Operations

Ms. Mikolajewski stated that ASTM is a not-for-profit organization that develops consensus standards. It was formed in 1898 and has developed standards for over 90 industry sectors. It is accredited by ANSI and the Standards Council of Canada. It adheres to WTO principles. It provides infrastructure and tools for standards development and brings industry together. Staff does not write standards. Programs and services are industry driven.

ASTM committee F38 on unmanned aircraft systems was formed in 2003 in response to the FAA's need for standards. There are currently 13 approved standards and 12 in development. There are three subcommittees on airworthiness, flight operations, and personnel. Areas covered by standards development include design and construction; design and command, batteries, etc. A specification for operations over people is out for ballot. Recently published standards include F3178, practice for operational risk assessment, and F3196, practice for seeking approval for extended/beyond visual line of sight operations. A revision is underway on F2909, practice for maintenance and continued airworthiness of small UAS.

Ms. Mikolajewski is also staff manager for committee E54 on homeland security applications, also formed in 2003. The relevant subcommittee is E54.09 on response robots. It includes ground robot standards on maneuvering, mobility, manipulation, and sensing. There are twenty plus standards in development on aerial response robots for use in law enforcement. Areas covered include safety, situational awareness, operation, etc.

A few more relevant ASTM committees are: F39 on aircraft systems with standards on wiring; E06 on performance of buildings including a work item on the inspection of building facades using UAS; F32 on search and rescue which has 65 approved work items and 15 in development. There are three F32 UAS standards in development but they cover only wilderness search and rescue, not the urban environment.

There are a number of other ASTM committees that will be getting into the UAS area, such as A01 on steel for railroad inspections and E57 on 3D imaging in the geospatial area.

Consumer Technology Association (CTA)

- Bill Belt, Senior Director, Technology & Standards

Mr. Belt noted that the Consumer Technology Association is the new name for the Consumer Electronics Association. They may be most well-known for holding the largest trade show in the world in January in Las Vegas. They also do market research, releasing 40-50 reports each year, with forecasts in the Fall timeframe. Recent market research estimates that sales of drones this year will exceed 3.4 million units and 1 billion in revenue.

CTA is also an SDO. They have 11 major committees. Committee R06, *Portable Handheld and In-Vehicle Electronics Committee* has a Working Group 23, *Unmanned Aerial Systems*. The group has been meeting for about a year. They have one published standard related to physical and electronic serial numbers for drones. It is ANSI/CTA-2063, *Small Unmanned Aerial Systems*, published last month.

They also have a project ANSI/CTA-2067, *Small Unmanned Aerial Systems – Remote Identification*. It kicked off two months ago and step one is identifying use cases. They have identified six so far. The next step will be to prioritize them and then start drafting the standard. While it's hard to predict how long it will take, they hope to wrap up the project by the end of this year. Anyone with a material interest may participate—you don't have to be a CTA member.

ISO/TC 20/SC 16, Unmanned Aircraft Systems

- Cortney Robinson, Director, Civil Aviation Infrastructure, Aerospace Industries Association (AIA), and Secretary of ISO/TC 20/SC 16 on UAS

Mr. Robinson indicated that there are few uniform communications, navigation and surveillance (CNS) / ATM standards, rules and regulations. Physical and cyber security concerns are also an issue. A lot of international

activity takes place at ICAO and the standards roundtable.

ISO/TC 20/SC 16 was proposed by Russia and established in 2014 to develop international standards in the field of UAS “including, but not limited to classification, design, manufacture, operation (including maintenance) and safety management of UAS operations.” The U.S. holds the international secretariat. The SC first met in 2015 and now meets once or twice a year. There are three WGs that meet monthly by phone dealing with general specifications; product manufacturing and maintenance; and operations and procedures. There are 40 SC members and more than 80 WG members. SC members include Northrop Grumman and DJI.

There are four approved work items (corresponding WGs are noted):

ISO 21384-1 - *General requirements for UAS for civil and commercial applications, UAS terminology and classification (WG1)*

ISO 21384-2 - *Requirements for ensuring the safety and quality of the design and manufacture of UAS (WG2)*

ISO 21384-3 - *Requirements for safe civil RPAS/UAS operations and applies to all types, categories, classes, sizes and modes of operation of UAS (WG3)*

ISO 21895 - *Requirements for the categorization and classification of civil UAS (WG1)*

A call for experts to participate in ISO/TC 20/SC 16 has been issued. The SC is particularly seeking individuals with expertise in UAS categorization/classification; autonomy; quality and safety programs for components essential to UAS design and manufacture; and legal and insurance aspects of UAS manufacture and operation. Persons interested in joining the U.S. technical advisory group (TAG) can speak with Hillary Woehrle, American Institute of Aeronautics and Astronautics (AIAA), the U.S. TAG Administrator, or Doug Davis, Northrop Grumman, the U.S. TAG chair.

In response to a question, Mr. Robinson indicated that ICAO will hold the Drone Enable conference in September and may assume a more visible role in international standards development.

Mr. Lawrence commented that one of the reasons we’re here today is because we don’t know the extent of overlap. We need to have a strategy internationally.

Mr. Robinson noted that China is the largest producer of UAS in the world and they want to use the ISO standardization process to advance their interests.

Mr. Bhatia noted that we need to develop a roadmap to see who is doing what and also identify where there are gaps. We have the opportunity to advance our own preferences and standards for international adoption. ANSI has permanent seats on the ISO Council and Technical Management Board. We need to participate and have the right volunteers involved in the discussions.

National Fire Protection Association (NFPA)

- Michael Wixted, Emergency Services Specialist

Mr. Wixted stated that NFPA is a global nonprofit organization established in 1896 devoted to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards. NFPA is an ANSI accredited SDO with over 300 ANSI approved standards. Codes and standards is part of the organization’s broader focus on information and knowledge including research and data analysis.

NFPA has started its first standards development project for small UAS (sUAS), i.e., less than 55 pounds, used for public safety operations (NFPA 2400). The three areas of focus are organizational deployment, professional qualifications, and selection care and maintenance. The standards will apply to all public safety departments with sUAS including fire service, law enforcement, and emergency medical services. The document information page where all drafts will be posted is www.nfpa.org/2400. The project was launched in August, 2016; a first in-person meeting was held in January, 2017; a second meeting was held in May, 2017. A draft has been developed and it will go out for public review by December. The hope is to have it approved as an ANSI standard within two years.

What will be in the standard? It will include policies and procedures, operational protocols, personnel qualifications and training, safety requirements, and maintenance provisions. Remote pilot in command with a visual observer will be the starting point.

Open Geospatial Consortium (OGC)

- George Percivall, CTO, Chief Engineer

Mr. Percivall explained that OGC is a not-for-profit standards consortium focused on consensus standards and innovation related to the exchange of geospatial information including imaging and geographic information system (GIS), light detection and ranging (LIDAR), aviation maps, etc.

OGC recently completed an incident management information sharing (IMIS) Internet of Things (IoT) Pilot for DHS. OGC sensor web enablement standards have been used in various emergency response applications including forest fires, Fukushima, and police surveillance. The OGC standards include the Sensor Model Language (SensorML) and Sensor Planning Service (SPS). Another is the OGC Wide Area Motion Imagery (WAMI) specification. SensorML helps to manage UAS complexity and the proliferation of sensors on unmanned aerial vehicle (UAV) platforms. There are some technical challenges that need to be addressed. OGC is looking at UAV technology use cases including data quality, data management, mission planning, etc.

OGC has established an unmanned systems (UxS) domain working group. The initial focus is on aerial but it also includes ground and marine. The group is surveying existing relevant standards and identifying needed standards.

OGC recognizes the strength of collaboration and appreciates ANSI organizing this meeting. OGC works closely with other standards bodies including ISO/TC 211 on geographic information, ISO/TC 20/SC 16, the International Hydrographic Organization (IHO), ASTM, RTCA, Inc., the European Organization for Civil Aviation Equipment (EUROCAE), and the American Society for Photogrammetry and Remote Sensing (ASPRS).

SAE International (SAE)

- Mark DeAngelo, Aerospace Standards Engineer

Mr. DeAngelo noted that many SAE technical committees (TCs) are involved or making provision for UAS. Two that specifically deal with UAS are: AS-4, unmanned systems steering committee (with two subcommittees thereunder, AS-4JAUS, on joint architecture for unmanned systems, and AS-4UCS, on unmanned systems control segment architecture), and E-39, unmanned aircraft propulsion committee. Published SAE UAS standards address many topics including wiring, flight control design, actuators, pilot training, etc. SAE also has a number of works in progress in these and other committees addressing topics such as lighting applications for UAS (A-20B); remote identification and interrogation of unmanned aerial systems; data dictionary for quantities used in unmanned systems (both AS-4UCS); and position, navigation and timing (AS-5).

Documents in development include the SAE Aerospace Information Report AIR6388 on remote identification and interrogation of unmanned aerial systems. This project is currently being scoped but deals with remotely identifying sUAS including requirements, methods and technologies.

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In response to an invitation for other SDOs to make any comments, Mike Palm of Underwriters Laboratories, Inc. noted they have some UAS/UAV related documents on electrical wiring and cybersecurity of robots/robotics.

Industry Perspectives on UAS Priorities

Facilitator: Brian Wynne

Speakers were invited to give brief overviews of industry priorities highlighting current areas of focus and future

work.

[Aerospace Industries Association \(AIA\)](#)

- Doug Davis, Director, Airworthiness, Northrop Grumman, Chair AIA UAS Committee

Mr. Davis reported on the activities of the AIA UAS Committee. This includes obtaining funding for the FAA's UAS Integration Office, providing a list of research areas to legislators, facilitating global harmonization of standards, and inter-agency coordination related to software and Federal Communications Commission (FCC) rulemaking on spectrum allocation. The MTCR and ITAR export issues mentioned by Mr. Alvear are also of concern.

[AT&T](#)

- Peter Musgrove, Principal Member of Technical Staff

Mr. Musgrove provided the perspective of a cellular operator. Key UAS standardization areas of concern are: network optimizations (long term evolution (LTE) enhancements, 5G); communications for command and control (authorization to fly, location), and identification of drones (on cellular network, and for remote identification). In terms of standards groups, they are interested in the Third Generation Partnership Project (3GPP) that does cellular communications specifications. A 3GPP Radio Access Network (RAN) study item on LTE optimizations for drones should be completed by the end of the year. Drone speeds and video streaming from different altitudes is also being looked at. ATIS has a UAV program. The GSMA association of mobile operators has an IoT program with a drone interest group. Network performance, command and control are topics. There is also the National Public Safety Telecommunications Council (NPSTC) which has a UAS and Robotics working group looking at use cases and requirements on First Responder Network Authority (FirstNet) applications. CTA has a standard on identification of drones. We need to address high priority use cases (e.g., Fukushima).

[Alliance for Telecommunications Industry Solutions \(ATIS\)](#)

- Jim McEachern, Technical Lead, Unmanned Aerial Vehicles

Mr. McEachern reported that ATIS's initial focus is on low altitude sUAS. There will be competitive differentiation and innovation but we hope to build on a common understanding of requirements and services. Command and control, and payload, are two main areas of focus. Cellular support for UAV control and location services needs requirements. A network can provide a recording of where a drone went and there can be an audit trail. ATIS's effort has strong participation from service providers and vendors.

[Commercial Drone Alliance](#)

- Patrick Rizzi, Counsel, Hogan Lovells

Mr. Rizzi explained that the Commercial Drone Alliance is an industry-led, non-profit association dedicated to supporting the growth of the commercial drone industry. It also works to enhance value for commercial enterprise drone end users and to reduce barriers to entry for this technology. Recent activities have included providing policy statements and personnel recommendations to the new administration, including a framework for the FAA draft Operations Over People rule. They have also been a policy advocate on Capitol Hill. They will be hosting a Domestic Drone Security Summit on June 28 and working with FAA on solutions to issues such as beyond visual line of sight (BVLOS). They will also be educating end users at events and in publications on benefits of the technology and use cases. In addition, they will be working with the NASA/FAA unmanned traffic management (UTM) program and FAA's Unmanned Aircraft Safety Team (UAST), and in other relevant committees and activities. Finally, they are working with Congress to protect drone industry priorities in the FAA Reauthorization Bill and Infrastructure Bill, and on the "2-for-1" regulatory executive order. This is an industry that needs some enabling regulations that should be considered "deregulatory actions."

Small UAV Coalition

- Gregory Walden, Aviation Counsel, Akin Gump Strauss Hauer & Feld, LLP

Mr. Walden explained that the Small UAV Coalition started in 2014, noting its members. It supports risk based, performance based standards. This meeting is a first good step toward addressing overlap and duplication. The hope is that the standards groups will work with FAA to shape rulemaking initiatives. We have the data, research, technologies to facilitate beyond visual line of site and autonomous operations.

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(Secretary's Note: Regrettably, Earl Lawrence had to leave the meeting after lunch owing to a U.S. Court of Appeals for the District of Columbia decision striking down the FAA's drone registration rule to the extent it pertains to model aircraft.)

Overview of ANSI Standardization Collaboratives

Jim McCabe, Senior Director, Standards Facilitation, ANSI

Mr. McCabe provided background on ANSI, the benefits of standardization, and an overview of ANSI standardization collaboratives. These are a mechanism to advance cross-sector coordination in the development and compatibility of standards and conformance programs needed to support emerging technologies and national / global priorities. ANSI has worked with federal agencies and private sector partners to define standards needs in areas as diverse as homeland security, nanotechnology, electric vehicles, and energy efficiency in the built environment. Most recently, ANSI partnered with America Makes, the National Additive Manufacturing Innovation Institute, to develop a roadmap of standards needed to foster the growth of the additive manufacturing industry, also known as 3D printing.

Mr. McCabe described two different models for how an ANSI collaborative operates: the workshop format and the roadmap format. The workshop format (e.g., ANSI's Homeland Defense and Security Standardization Collaborative) typically involves a series of topical workshops held over the course of a year. A written report following each workshop describes what was discussed and any recommendations. The roadmap format (e.g., America Makes & ANSI Additive Manufacturing Standardization Collaborative; ANSI Energy Efficiency Standardization Coordination Collaborative; ANSI Electric Vehicles Standards Panel) involves the development of a comprehensive roadmap over the course of a year describing the current and desired standards landscape. It identifies existing standards and standards in development, assesses gaps, makes recommendations to fill gaps, establishes priorities for action, and suggests organizations to do the work. This format makes sense when there is a more urgent need for coordination and a comprehensive gap analysis, and issues need to be addressed simultaneously. A hybrid approach incorporating elements of these two formats is also possible. Activity may continue into subsequent years as needed if it continues to deliver value to stakeholders.

Mr. McCabe described the typical organizational structure of a collaborative, the ingredients for success, and different models used to fund the activity. He provided additional detail about the recent additive manufacturing collaborative as an example of how ANSI can help facilitate identifying standardization needs in an emerging area of technology. That activity is now entering a second phase to track SDO action on the roadmap recommendations, bring in other industry sectors and experts, and further develop the document.

During the ensuing discussion, standards for test methods were called out as an area that will need attention. It was noted that ANSI uses the term standardization to include not only standards but also the means of demonstrating conformity or compliance with standards.

It was noted that an ANSI collaborative would be consistent with the aims of the National Technology Transfer and Advancement Act which mandates that federal government agencies participate in and use voluntary consensus standards for regulatory and other purposes wherever possible.

ANSI UAS Standardization Collaborative (UASSC) – Mission, Objectives, and Deliverable

Facilitator: Brian Wynne

This was an open discussion of the draft UASSC mission, objectives and deliverable as set forth on the agenda. Selected comments from the discussion are noted.

Mission

- To coordinate and accelerate the development of the standards and conformity assessment programs needed to facilitate the safe, mass integration of unmanned aircraft systems (UAS) into the national airspace system (NAS), and thereby foster the growth of the UAS market

Questions for Discussion

1. Is there consensus that there is a need for the ANSI UASSC?

Yes, alignment is needed and this is a good way of doing it.

ASTM maintains a spreadsheet of its relevant activities and has provided it to ANSI. ASTM and NFPA are working on emergency responder standards for UAS. NFPA through its research foundation is also looking at white papers on drone applications for public safety officials and emergency responders.

DoD has been using drones for some time. UAS is a poster child for needing a standards roadmap. How many of us have the resources to send people to multiple committees developing standards for the same thing? This is a perfect opportunity to make information available to avoid duplication and to fill gaps.

There's huge interest in using this technology in agriculture. We need common capabilities to apply pesticides. There does appear to be duplication which makes it hard to tell my constituents which group has the standards to use.

Almost all credible SDOs are members of ANSI and they work with each other. ANSI has a project initiation notification system (PINS) where SDOs announce the scope of projects. ANSI tries to resolve in a friendly way issues of duplication and overlap on contentious issues. More often than not, it works. The bigger challenge is when standards development is happening outside of our boundaries. We can advance or react to proposals. Flexibility is a key part. The marketplace often decides which standard to use.

2. Is the proposed mission statement acceptable?

Mission statement is similar to the FAA Drone Advisory Committee (DAC). That was intentional. The DAC is advising the FAA administrator on priorities. An ANSI activity would be identifying needs from an industry perspective and capture standards activity that supports the DAC. FAA can help define what those standards should be. All agree there is a need for performance based standards. Earl Lawrence was very supportive of having the ANSI group formed.

Conformity assessment needs to be part of it. Does the equipment meet the identified standards? New York State is financing a national unmanned aerial system standardized testing and rating facility (NUSTAR). It will provide testing, certification and performance benchmarking of drones.

Many attributes of drones will be outside the regulatory space and in the user space. We also need data standards.

The focus appears to be commercial applications but government agencies such as DHS have operational requirements that need to be addressed.

UAS integration is the primary goal.

The mission statement is focused on the U.S. What about international coordination? As a practical matter, roadmap development is usually done on a national basis. ANSI looks at both domestic and international issues. There are strategic reasons to focus on the U.S. first to support the FAA and DAC. Flexibility is needed. U.S. solutions can hopefully become international solutions down the road. Many people are engaged internationally. Trying to bring the whole world to the table is not something we've done before. What we have done in other

cases are follow up workshops and meetings with Europe, Germany, and China, as examples.

European is organizing its own standards coordination group to do a similar exercise. EUROCAE is spearheading it. Several SDOs here will be participating in it. We will need to coordinate with that group.

There is what we must do, meaning what is required by law, what we should do in terms of harmonization in the U.S. to avoid duplication, and what we could do with respect to international harmonization.

Is this activity dealing with the recreational space? Our company mostly deals with consumer products.

Objectives

- To foster coordination and collaboration among industry, standards developing organizations, regulatory authorities, and others on UAS standardization issues
- To clarify the current UAS standardization landscape and enable stakeholders to better focus standards participation resources
- To provide a basis for coherent and coordinated U.S. policy and technical input to regional and international audiences on UAS standardization

Questions for Discussion

3. Are the stated objectives of the ANSI UASSC acceptable?

- Informing pre-standardization R&D could also be an objective.
- Provision of data to support regulatory approvals is also needed.

Deliverable

- A series of topical workshops on UAS standardization held over the course of a year each of which will include a written report describing what was discussed and any recommendations (Workshop Format) OR
- A comprehensive roadmap developed over the course of a year describing the current and desired standardization landscape for UAS (Roadmap Format)

Questions for Discussion

4. Does the group prefer the workshop format or the roadmap format? A roadmap is needed.

UASSC Focus Areas

Facilitator: Jim McCabe

This was an open discussion of the potential UASSC focus areas.

Questions for Discussion

5. What are the most pressing issues that need to be addressed from the standardization perspective?

- Remote identification and tracking is the highest priority. FAA is setting up an aviation rulemaking committee to look at this.
- BVLOS and operations over people
- Pilot qualifications
- UAS design and construction standards. ASTM F38 has made a lot of progress over the last year.
- CTA will be looking at stuff coming out of NUSTAR program for drop tests.
- SAE is pursuing propulsion standards through committee E39
- Detect and avoid
- Operations at night

6. Can these issues be categorized as falling into particular "buckets"?

Perhaps look at the life cycle of an aircraft from the hangar to the field. Standards are needed for design and construction, operators, air traffic controllers, communications, i.e., to design, build and fly the drones. Aircraft

recovery and maintenance also are part of it.

Another idea might be to do a matrix segmenting product types based on weight and capabilities. There will be very different requirements for a toy, versus a drone used for home inspection, versus one that will deploy weapons.

7. Are there any issues that should be addressed first?

See Q5 above.

Each organization may have its own list of priorities.

Industry wants full situational awareness – what the SDOs are doing and what is most important from FAA’s perspective as presented this morning. What do we need to get these things certified? Beyond that we are interested in new markets and applications.

UAS Standards Landscape

Facilitator: Jim McCabe

Comments were invited on an initial version of a spreadsheet listing known published and in development UAS standards, other deliverables, and SDO activities.

Questions for Discussion

8. Are there any comments on the standards landscape spreadsheet?

9. Elaboration on work underway?

10. Anything relevant that is missing?

11. Are the activities underway responsive to the focus areas that have been identified?

- SAE, ASTM et al. already have submitted updates to ANSI that will be incorporated in the next iteration. Others are invited to do so. The standards landscape is a good first step to help identify gaps.
- There are so many buckets in the spreadsheet. Perhaps break it down into system, materials/components, communications, and operations, with subtopics thereunder (e.g., design/production, command control, etc.)

Next Steps

Questions for Discussion

12. Who is not here today who should be involved?

We need to bring the community of experts to the table to assist with the gap analysis.

13. What is a reasonable timeline for our next meeting? TBD

14. What needs to happen between now and then?

Action (All): Share with us your thoughts on priorities. Send us updates for the standards landscape.

Action (Staff): Circulate presentations, announce the initiative, convene a small group to brainstorm how we will organize ourselves

Closing Remarks

Joe Bhatia

Mr. Bhatia thanked the co-chairs, speakers, and participants for their contributions to this constructive dialogue. It is clear that many SDOs are addressing various aspects of UAS standardization but more needs to be done. Key areas of concern include: airworthiness; command and control systems; flight operations; licensing, training, certification and conformity assessment aspects; regulatory and legal issues; sense and avoid systems; and, safety

and risk management. There is agreement that the community of stakeholders could benefit from the information sharing and facilitation offered by an ANSI standardization collaborative. Mr. Bhatia noted that he looks forward to continuing this dialogue. Coordination and collaboration will be key to achieving the overarching objective of making UAS integration safe and ubiquitous.

In Person Attendees		
First Name	Last Name	Organization
Paul	Albuquerque	FAA
Jonathan	Alvear	ITA
Amanda	Armistead	Small UAV Coalition
Justin	Barkowski	AOPA
Bill	Belt	CTA
Joe	Bhatia	ANSI
Tim	Butters	NCPSU
Chris	Carnahan	AIA
Sean	Cassidy	Amazon Prime Air
Scott	Cedarquist	ASABE
Kelley	Cox	ANSI
Doug	Davis	Northrop Grumman
Mark	DeAngelo	SAE
Christine	DeJong	ASTM
Deirdre	Gallop-Anderson	DHS
Gordon	Gillerman	NIST
Mark	Greene	DOJ
George	Gulla	ANSI
Arthur	Hinaman	FAA
Laura	Hitchcock	Boeing
Adam	Jacoff	NIST
Philip	Kenul (RDML)	TriVector Services, Inc. / NOAA
Tim	Klein	DOT
Earl	Lawrence	FAA
Joan	Lawrence	The Toy Association
Rick	Lusk	ORNL
Lisa	Malloy	Intel
Philip	Mattson	DHS
Jim	McCabe	ANSI
Jim	McEachern	ATIS
Brian	Meincke	ASTM
Mary	Mikolajewski	ASTM
Mike	Miles	GSA
Peter	Musgrove	AT&T
Travis	Norton	Bureau Veritas

Aivelis	Opicka	ASIS
Michael	O'Shea	DOJ
Mike	Palm	UL
George	Percivall	OGC
Claire	Ramspeck	ASME
Judith	Ritchie	SAE
Pat	Rizzi	Commercial Drone Alliance
Cortney	Robinson	AIA
Don	Roby	ALEA
Julia	Samojeden	ASME
Mary	Saunders	ANSI
Greg	Saunders	DoD
Rick	Saunders	DHS
Sabrina	Saunders-Hodge	FAA
Fran	Schrotter	ANSI
Al	Secen	RTCA, Inc.
Chief Donald	Shinnamon, Sr. (Ret.)	PSAAC
Mike	Smitsky	AUVSI
Bobby	Sturgell	Rockwell Collins
Christopher	Swider	JARUS
Robert	True	Intel
Gregory	Walden	Small UAV Coalition
Kenneth	Witcher	ERAU
Michael	Wixted	NFPA
Hillary	Woehrle	AIAA
Brian	Wynne	AUVSI
Ray	Young	NUAIR Alliance

Remote Participants		
First Name	Last Name	Organization
Mark	Blanks	Virginia Tech
Mary Lou	Bosco	AIM
Matthew	Ceglia	IEEE
Carole	Franklin	RIA
Mike	Klemmensen	Caterpillar
Brian	Siems	Caterpillar