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Advancements in Means of Compliance

An ASTM Aviation Workshop

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ASTM Welcome

Dan Smith
ASTM Vice President of Technical Committee Operations

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Opening Remarks

Di Reimold
FAA Deputy Director, Policy & Innovation Division

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Advancements in Means of Compliance

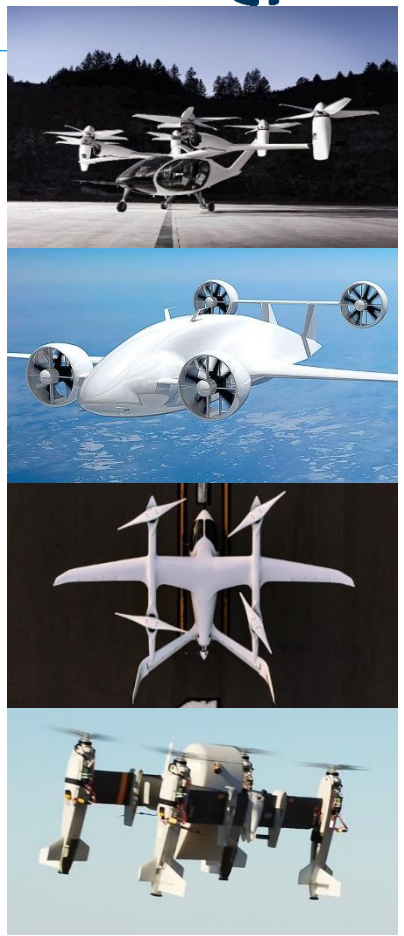
Di Reimold, Deputy Director, Policy & Innovation Division, AVS FAA

Drivers of Change & Opportunities

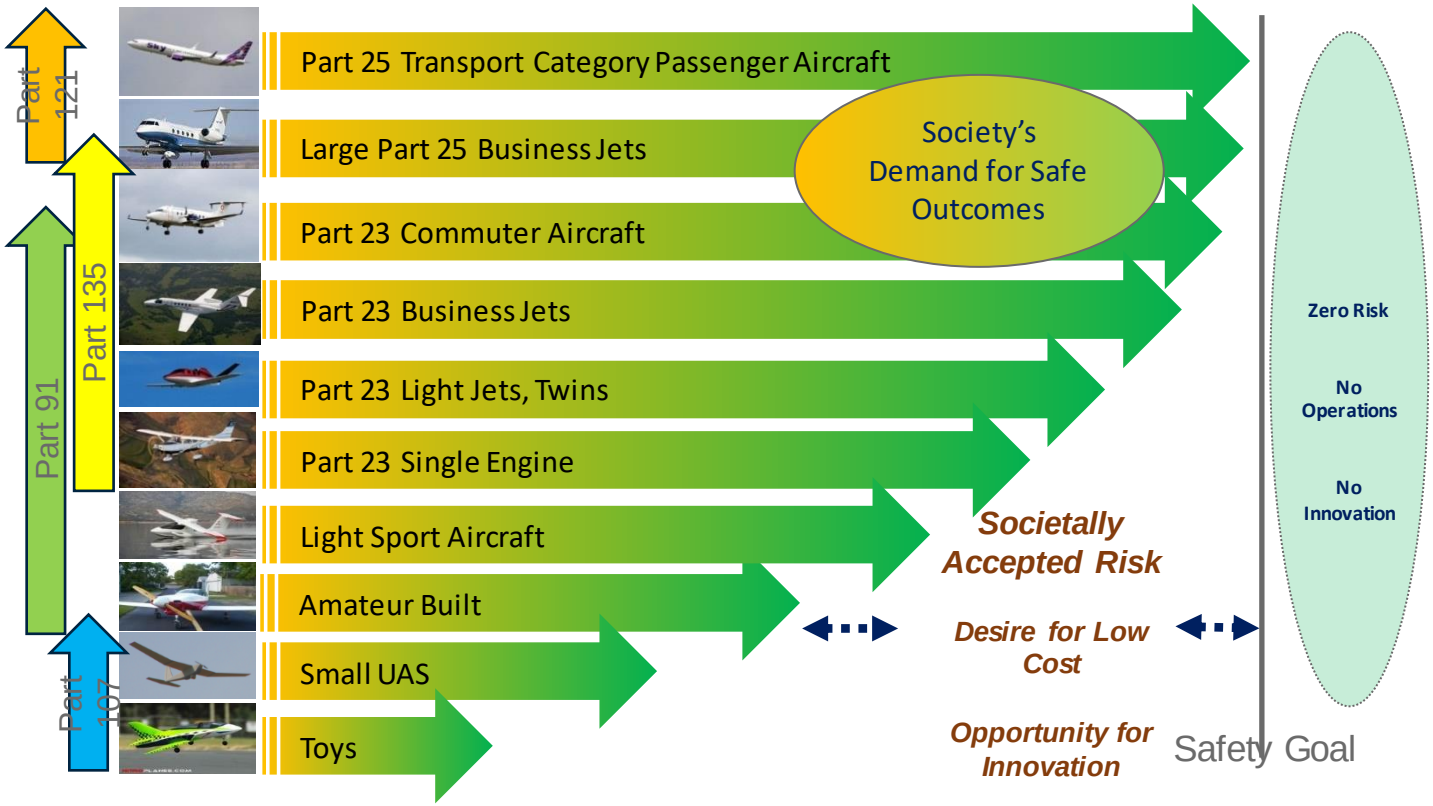
Greater “Personalization” of Aviation Services - Package Delivery & Air Taxi

Emerging Automation Concepts – Trust & Reliance on Automated Systems

Must Consider the Aircraft, Automation, Operation, and Airspace Integration for Future Concepts to be Viable



Risk Based Approach to Innovation & Certification



Rigor of Certification Oversight Follows Risk-Based Structure

Aircraft, and Intended Use Must Be Considered

Performance Based Regulations

Target Safety Outcomes and Enable Innovation

Advancing performance based regulatory environment to

- ❑Achieve safety outcomes
- ❑Enable new technologies
- ❑Promote international harmonization

- **Leveraging the world's experts in the rapid development of voluntary consensus standards as a means of regulatory compliance**

Standards Management

In order to effectively manage the utilization of standards we need to understand where and why we are engaged

- ❑ Data Driven Approach

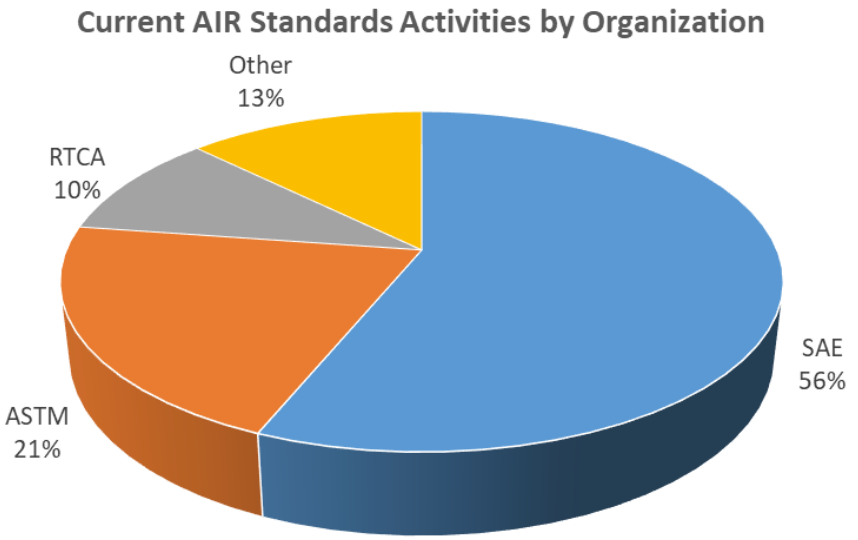
Collection of data to understand the scope of current AIR engagement with ongoing standards development:

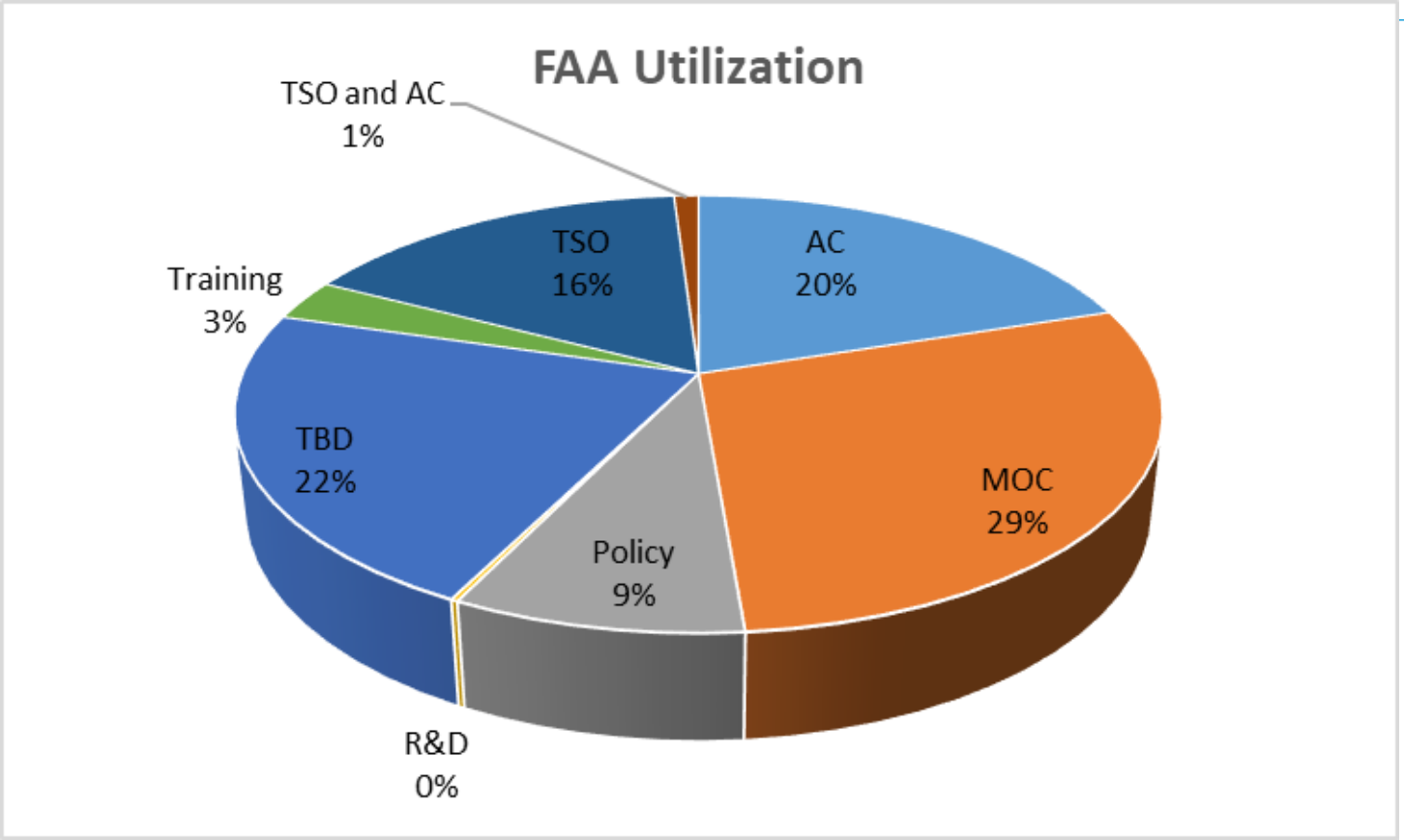
- ❑ Who is involved?
  - ❑ SDOs, FAA reps, CAAs, Industry, Organizations, Academia
- ❑ Why are we involved?
  - ❑ Activity goals/objectives/safety outcome
- ❑ What are the current challenges?

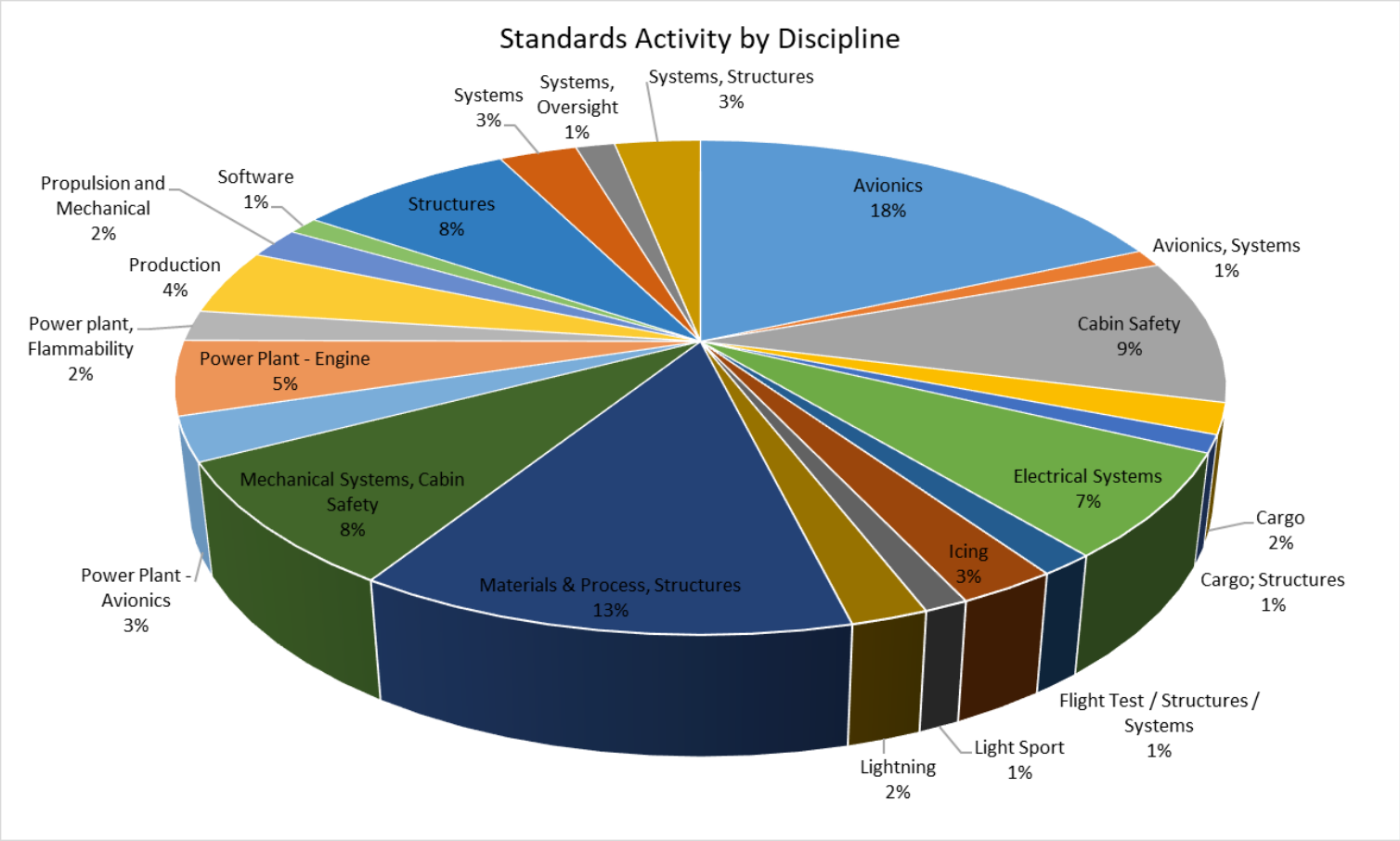
Data used to inform decisions and support periodic program reviews

Current AIR Engagement Data

Over 100 committees
Approximately 500 current standards activities
- Roughly 90% of activities reside with ASTM, RTCA and SAE







Where Will We Be in 10 Years?

Workshop Agenda

10:30-11:30	**PANEL 1: AUTHORITY ENGAGEMENT AND ACCEPTANCE OF CONSENSUS STANDARDS** ▪ Moderator, Joe Koury, ASTM International *(Manager F37, F39, F44)* ▪ EASA Reorg: Policy, Innovation & Knowledge Branch - Dominique Roland, EASA ▪ FAA Reorg: Consensus Standards Management Branch - Robert Bouza, FAA ▪ FAA Remote ID / OOP Issuances - Ben Walsh, FAA AUS
11:30-11:45	**MODERATED Q&A**
11:45-12:00	**BREAK**
12:00-12:30	**PANEL 2: AVIATION STANDARDS ACTIVITY** ▪ Moderator, Joe Koury, ASTM International *(Manager F37, F39, F44)* ▪ F37 Light Sport Aircraft - Steve Hamblin, Virgin Galactic ▪ F38 Unmanned Aircraft Systems - Ajay Sehgal. Wyle ▪ F39 Aircraft Systems - Ric Peri, Aircraft Electronics Association ▪ F44 General Aviation Aircraft - Christoph Genster, Diamond Aircraft ▪ F46 Aerospace Personnel - Kurt Barnhart, Kansas State University Polytechnic
12:30-13:45	**PANEL 3: ADVANCEMENTS ON MEANS OF COMPLIANCE** ▪ Moderator, Mary Mikolajewski, ASTM International *(Manager F38)* ▪ F37 Light Sport Aircraft - Adam Morrison, Streamline Designs LLC ▪ F38 Unmanned Aircraft Systems - Phil Kenul, Trivector Services ▪ F39 Aircraft Systems - Ric Peri, Aircraft Electronics Association ▪ F44 General Aviation Aircraft - Christine DeJong Bernat, General Aviation Manufacturers Association ▪ F46 Aerospace Personnel - Rich Ochs, Spirits Aeronautics
13:45-14:00	**MODERATED Q&A**
14:00-14:30	**PANEL 4: ADVISORY COMMITTEE PROGRAMS FOR 2021** ▪ Moderator, Kristy Straiton, ASTM International *(Manager F46)* ▪ AC377 Autonomy in Aviation - Stephen Cook, Northrop Grumman ▪ AC433 eVTOL Certification - Tom Gunnarson, Wisk ▪ AC478 BLOS Strategy & Roadmapping - Adam Morrison, Streamline Designs LLC
14:30-14:45	**MODERATED Q&A**
14:45-15:00	**CLOSING REMARKS** ▪ Jeff Grove, ASTM Vice President of Global Policy, Cooperation and Communication

Presentations will be made available post-event by ASTM HQ

Panel 1: Authority Engagement and Acceptance of Consensus Standards

Moderator:

- Joe Koury, ASTM International (Manager F37, F39, F44)

Panelists:

- EASA Policy, Innovation & Knowledge Branch - Dominique Roland, EASA
- FAA Consensus Standards Management Branch - Robert Bouza, FAA
- FAA Remote ID / OOP Issuances - Ben Walsh, FAA AUS

Questions for a Panelist? Please use Webex Chat

EASA
European Union Aviation Safety Agency

Adapting the Certification Directorate to a rapidly changing environment

Dominique Roland
Head of Policy, Innovation & Knowledge Department
Champion for the General Aviation Roadmap

26th January 2021 - ASTM International 1st Annual Advancements in Means of Compliance

Your safety is our mission.

An Agency of the European Union

CT Adjust purpose

Management of Expert resources --> **Achieve** critical size of expert resources per product line

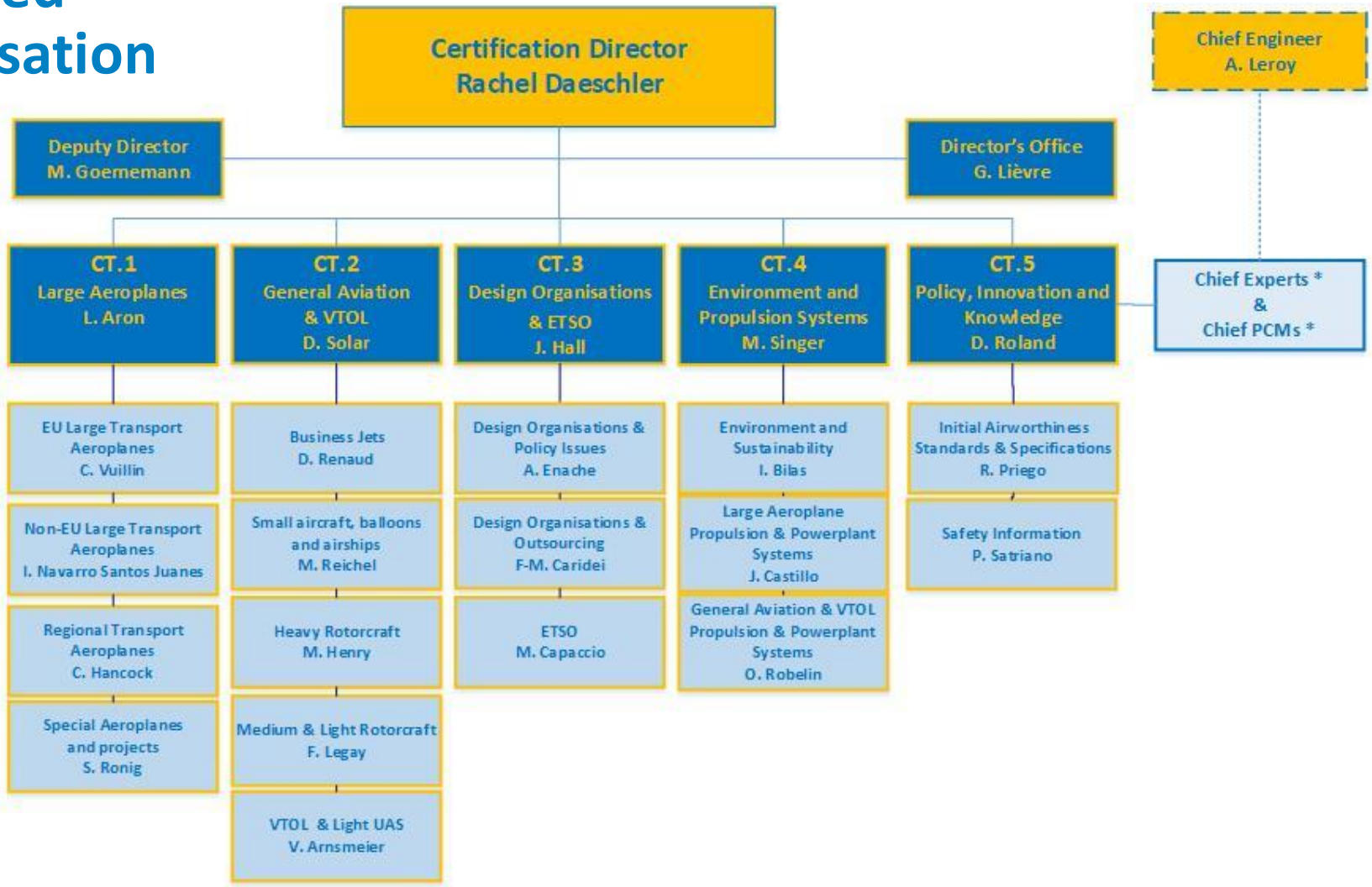
Synergies --> **Expand** synergies between GA and VTOL

Lean organisational structure --> **Reduce** overhead & **Protect** technical resources

Policies --> **Reinforce** the management of policy development

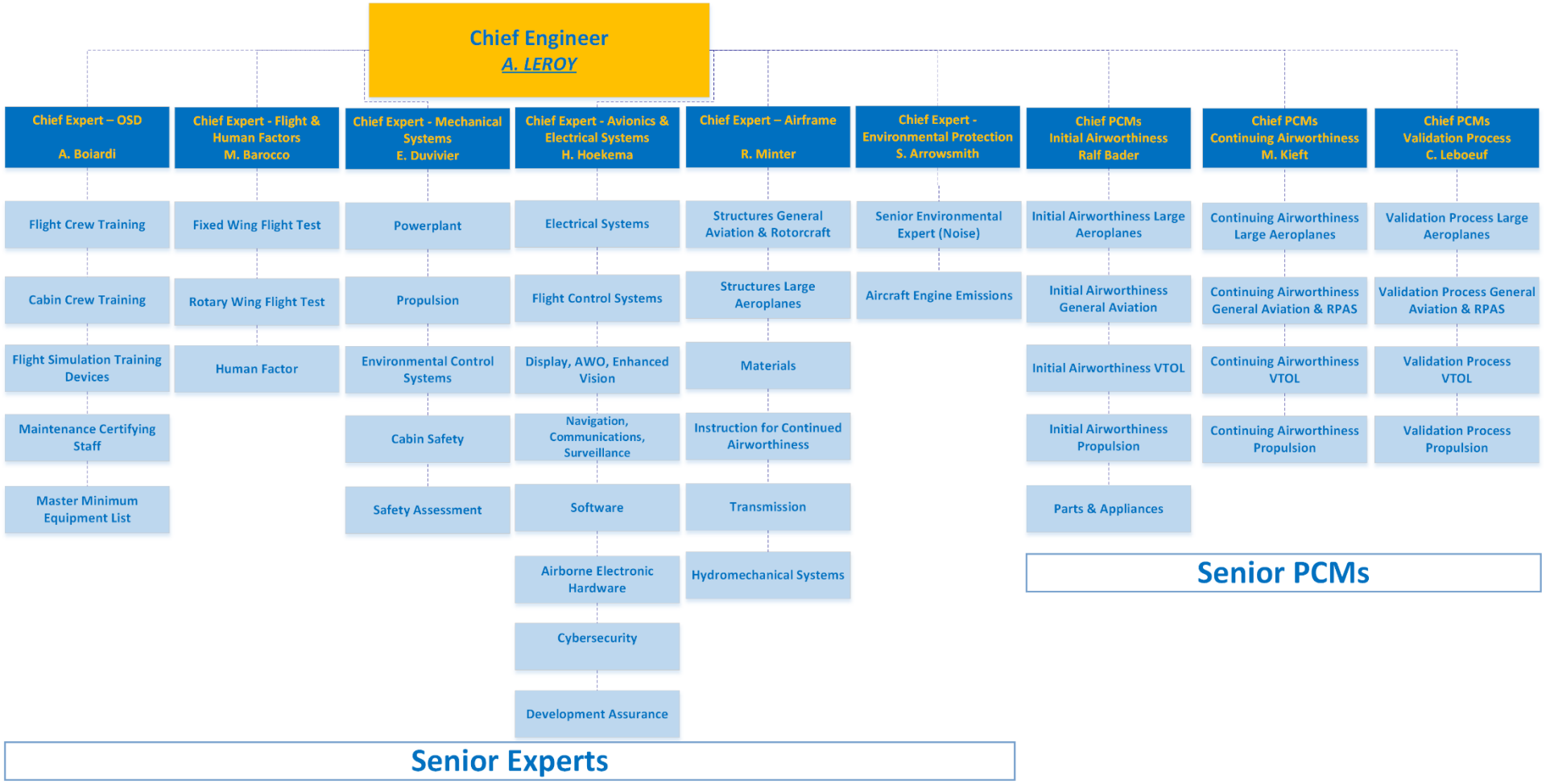
Knowledge Management --> **Develop** knowledge management initiatives

Adjusted organisation



* Technical reporting to the Chief Engineer

Adjusted organisation – Technical line



EASA Internal International Standards Committee (IISC)

Objective

To ensure necessary coordination and the effective use of resources in activities related to the Agency participation in standardisation organisation and professional bodies

Organisation

- ✓ Chaired by SM2.1 (Strategy & Programmes)
- ✓ Co-chaired by Chief Engineer
- ✓ Certification directorate represented by **CT5**

EASA participation & use of ASTM F44 standards

Note: EASA is one of the multiple authorities that are involved in F44

Standard status at EASA

ASTM F44 standards are "draft" means to show compliance to the objective CS-23 technical specifications

EASA involvement

✓ EASA involvement is essential to create standards that:

- Are technically acceptable by EASA
- Are a potential means of compliance to the rule
- Are suitable for use in the certification process

EASA participation & use of ASTM F44 standards

Note: EASA is one of the multiple authorities that are involved in F44

Standard status at EASA

EASA is using ASTM F44 standards, and their revisions as input to the rulemaking process for CS-23 amendments.

CS23 amendments:

- **Issue 1** AMC & GM to CS-23:
  29 new ASTM standards (2017)
- **Issue 2** AMC & GM to CS-23:
  2 new, 13 revised ASTM standards (2019)
- **Issue 3** AMC & GM to CS-23:
  1 new GM (Not an ASTM standard) (2020)
- **Issue 4** AMC & GM to CS-23:
  8 new, 21 revised ASTM standards (Planned 2021)

EASA
European Union Aviation Safety Agency

Thank you for your attention

easa.europa.eu/connect

Your safety is our mission.

An Agency of the European Union

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FAA Consensus Standards Management Branch

26 January 2021
Robert Bouza, FAA

www.astm.org

Federal Aviation Administration

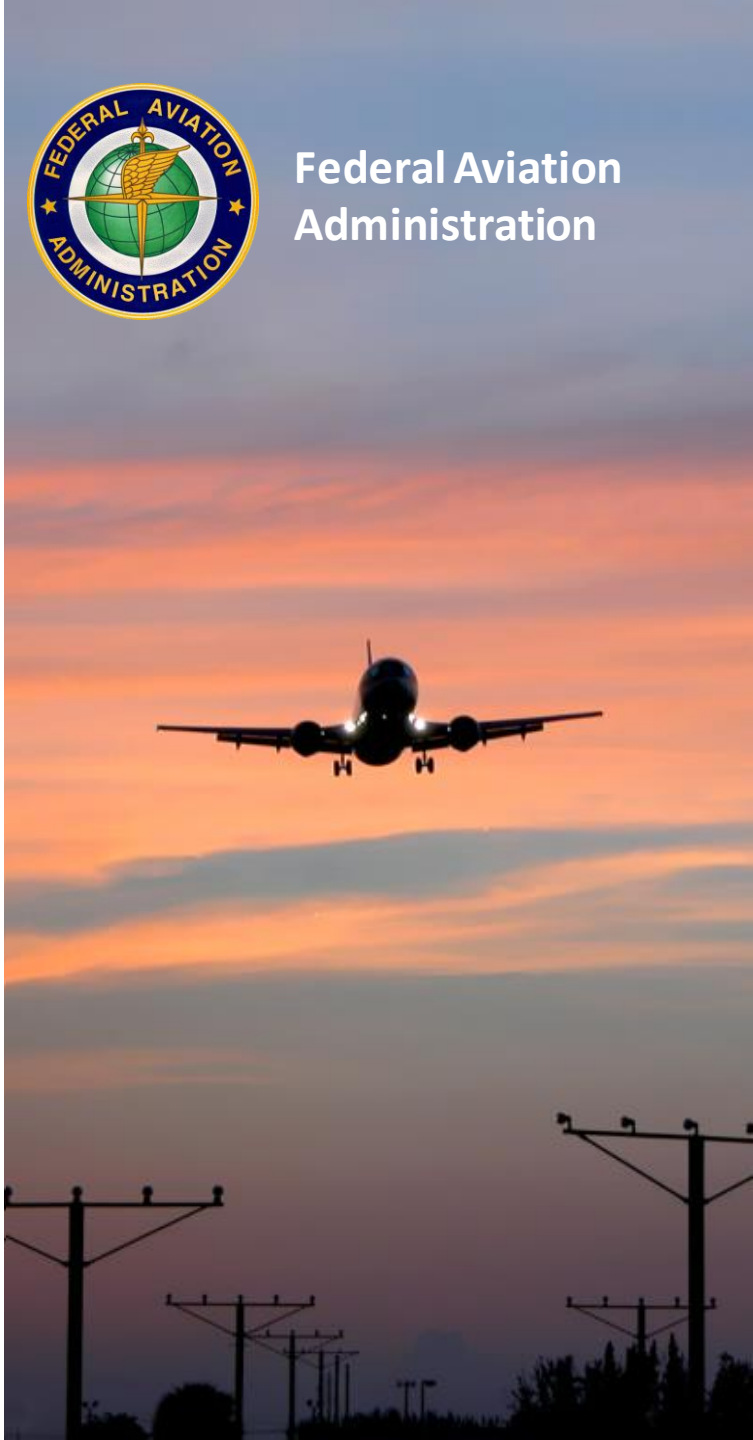
Refinement

Policy & Innovation Division, AIR-600

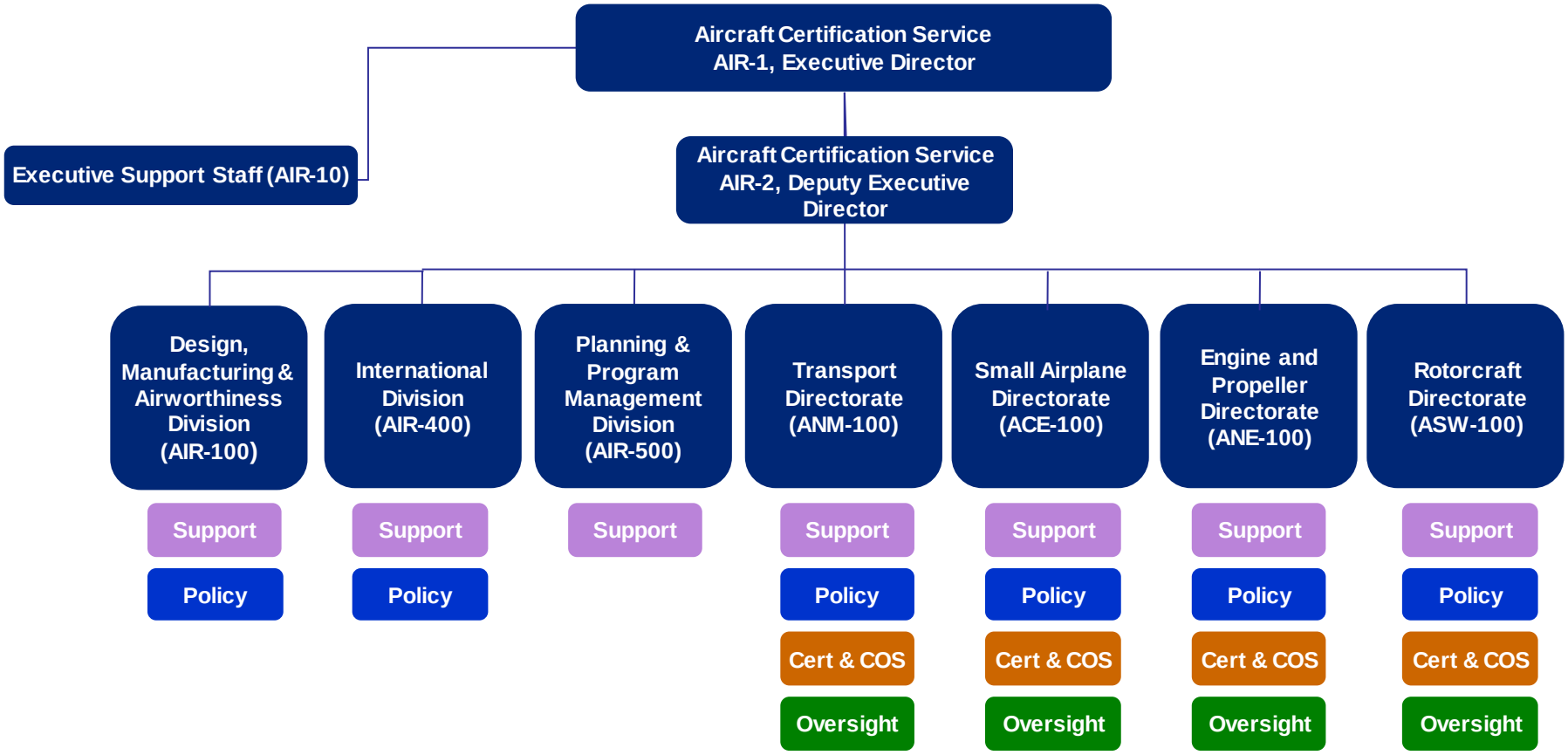
ASTM Aviation Advancements in Means of Compliance Workshop

Robert Bouza, Manager, Consensus Standards Management Branch

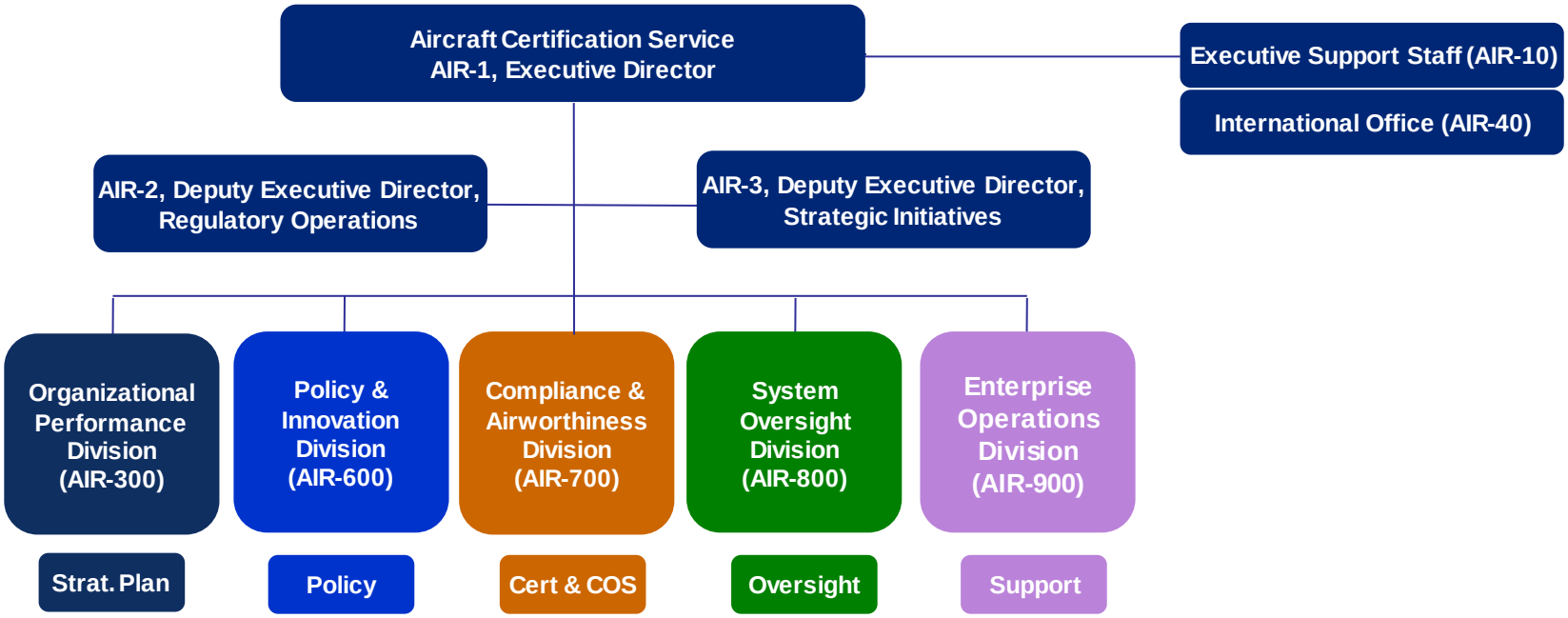
1/26/2021



AIR's Organization ~ Prior to 2017



AIR's Realignment ~ Post 2017



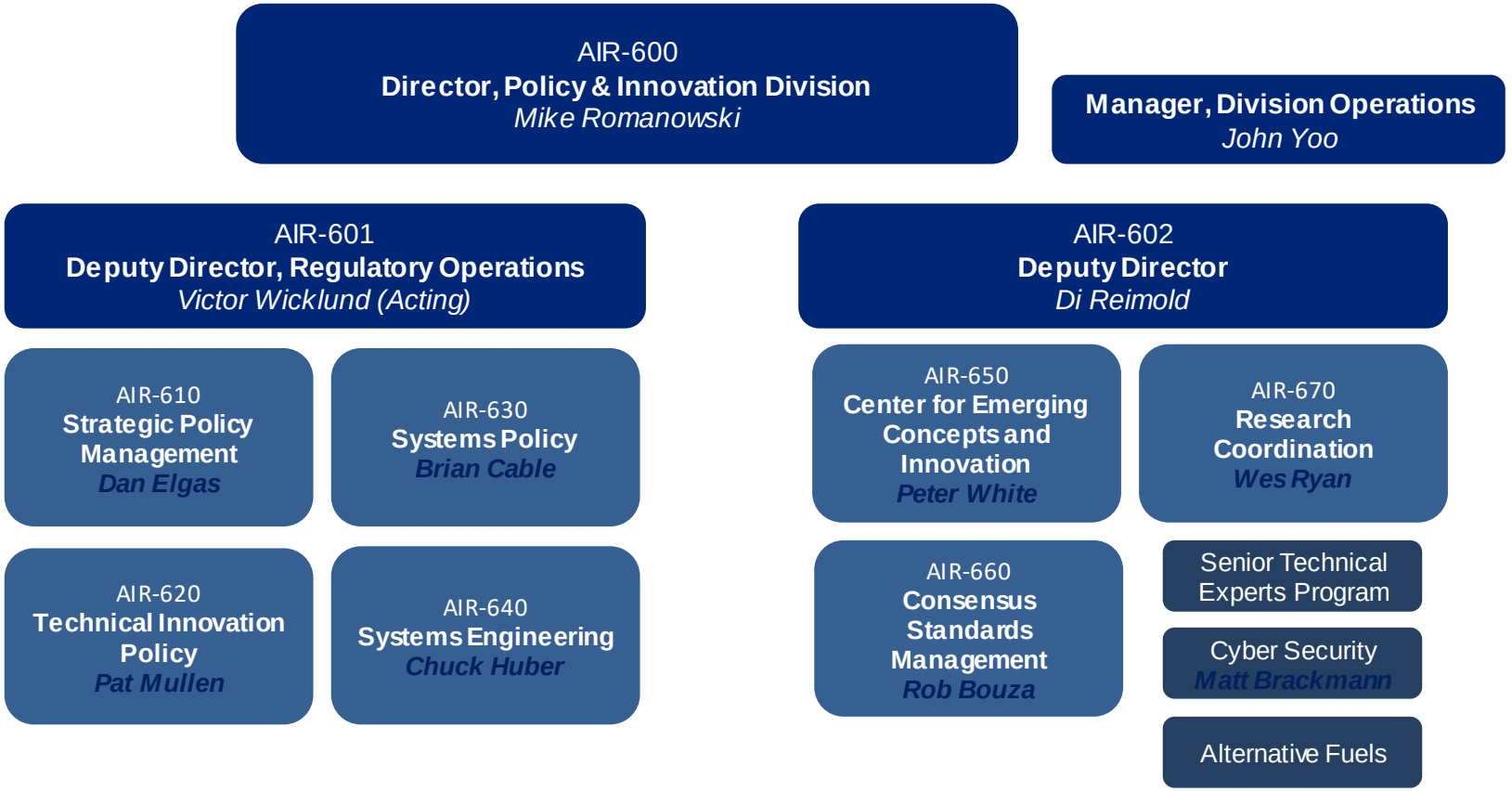
AIR-600 Refinement (and beyond) Goals

- **Provide staff and managers needed clarity and certainty**: *Stabilize the organization*
- **Integrate six unique locations and cultures** into a *cohesive* and *mutually supportive* organization
  - ✓ Improve collaboration and consistency across partner organizations
  - ✓ *One Division, within one AIR, within one AVS, within one FAA!*
- **Position the organization to meet the safety demands for today and the future**
  - ✓ Strengthen technical expertise while enabling systems oversight concepts
  - ✓ Grow organization's technical capability in light of current and emerging trends
    - ➢ Address the full array of current and emerging products and technologies
  - ✓ Align strategic outcomes and priorities; fully embrace risk-based performance outcomes and fully leverage and align voluntary consensus standards activities
  - ✓ Strengthen educational outreach & engagement
- **Align the AVS Senior Technical Experts Program (STEP)** contributions to support key agency goals and strategies

New Roles and Groups within the Policy & Innovation Division Include:

- Strategic Policy Management/Strategic Policy Managers
- Strengthened Program Management
- Systems Engineering
- Consensus Standards Program Management
- Research Coordination
- Cyber Security
- Center for Emerging Concepts & Innovation (set up previously)

Policy & Innovation Organization Structure



Drill-into P&I Organization Structure

AIR-601
Deputy Director, Regulatory Operations

AIR-610 Strategic Policy Management Branch *Dan Elgas*

Key Activities

Defines strategic priorities and plans for regulatory and policy development and consensus standards engagement

- Manages rulemaking projects and processes
- Overall coordination with international authorities on regulations and policy
- Assesses existing regulatory and policy effectiveness
- Tech writing support
- Coordinates certification program support

AIR-620 Technical Innovation Policy Branch *Pat Mullen*

Key Activities

Provides subject matter expertise in specific technical fields to support –

- Consensus standards development
- Rulemaking
- Guidance development
- Certification and innovation programs
- Educational outreach on specific technical matters
- Identifies regulatory/policy gaps and issues

AIR-630 Systems Policy Branch *Brian Cable*

Key Activities

Provides subject matter expertise in compliance and oversight systems to support –

- Consensus standards development
- Rulemaking
- Guidance development
- Certification and innovation programs
- Educational outreach on specific systems standards matters
- Identifies regulatory/policy gaps and issues

AIR-640 Systems Engineering Branch *Chuck Huber*

Key Activities

Supports strategy development (in support of Strategic Policy Management Branch) –

- Assists in identifying and extracting strategic issues (e.g., from Innovation Programs)
- Facilitates broader use of systems engineering processes and tools
- Roadmap development
- Staged review process for innovation projects
- Identifies regulatory/policy gaps and issues

Strategic Policy Management Branch

AIR-610
Strategic Policy Management
Dan Elgas

AIR-611
Policy Program Management Section
Mallory Naill

Key Activities

Coordinates and tracks division regulatory & policy activities, and associated performance

Rulemaking and policy program management and policy performance

- Rulemaking project management
- Program management of policy strategic plans
- Support international harmonization
- NTSB/FAA Safety Recommendations
- Directive Feedback

AIR-612
Technical Writing Section
BID (non-technical)
Dan Elgas (Day 1)

Key Activities

Supports division activities by providing technical writing and editing of technical documents

- Special Conditions
- Exemptions
- Rulemaking
- Advisory Circulars
- Orders
- Directives Management Officer

AIR-613
Policy Implementation Section
Karen Grant

Key Activities

Supports ACOs & validation office as the focal point for project specific policy (i.e., "Project Officer" function)

Coordinates cross-FAA educational outreach on new regulatory & policy

- Supports certification project in establishing certification basis (special conditions, ELOSs, exemptions, new MOCs)
- Manages product (or technical) issues list
- Manages bilateral issues list
- Implementation of new rules

AIR-614
Strategic Policy Transport
Suzanne Masterson

AIR-615
Strategic Policy Small Airplanes
Bill Schinstock

AIR-616
Strategic Policy Rotorcraft
Jorge Castillo

AIR-617
Strategic Policy Propulsion
Bob Ganley

AIR-618
Strategic Policy Emerging Aircraft
James Foltz

AIR-619
Strategic Policy Systems Standards
Steve Thompson

Strategic Policy Coordinator for Airspace Integration
Vacant

Strategic Policy Managers

Key Activities

Develop regulatory - policy strategy for specific product and systems. Set priorities for:

- ✓ Rulemaking
- ✓ Policy development
- ✓ Consensus standards
- Engage outside organizations on policy direction
- Align strategies with international partners

Technical Innovation Policy Branch

AIR-620
Technical Innovation Policy Branch
Pat Mullen

AIR-621
Materials and Structural Properties
Jackie Jambor

Key Activities

Technical & policy experts in materials processes, structural properties and structural integrity

- Materials and processes
- Fatigue and damage tolerance
- System and structures
- Crashworthiness of structures

AIR-622
Aircraft Information Systems
Paul Siegmund
Gregg Nesemeier
Barbara Clark (A)

Key Activities

Technical & policy experts in aircraft information systems for crew and NAS interface

- Communication
- Navigation
- Surveillance
- Flight management systems
- Flight guidance & auto-flight systems
- Software & complex electronic hardware
- Artificial intelligence
- Cockpit displays
- Vision systems
- Detect and avoid systems

AIR-623
Aircraft Systems BID/
Bill Schinstock
(Day 1)

Key Activities

Technical & policy experts in aircraft systems

- Electrical power generation & distribution systems
- Batteries and battery installation
- Fuel cells
- EWIS
- Mechanical systems
- Landing gear systems
- Pneumatic and hydraulic systems
- Pressurization
- Cargo fire protection
- Interior flammability
- Water and waste systems
- O2 systems
- Environmental control systems
- Ditching and emergency landing systems (e.g. floats)
- Hoists for cargo and human external loads
- Control actuators

AIR-624
Propulsion and Energy
Diane Cook

Key Activities

Technical & policy experts in propulsion and high energy storage and delivery systems

- Engine (turbine, recips, electric)
- Hybrid-electric propulsion systems
- Propulsion installation
- Fuel systems
- Engine fire protection
- Propellers
- APU
- ETOPS

AIR-625
Performance and Environment
Chris Parker

Key Activities

Technical & policy experts in aircraft performance and environmental impact

- Aircraft performance
- Aerodynamics
- Flight manuals
- Icing performance
- Noise, emissions
- Handling qualities

AIR-626
Human/Machine Interface
Mary Schooley

Key Activities

Technical & policy experts in human-machine interface

- Flight crew interface/human factors
- Physiological human factors
- Cabin safety/injury prevention
- Evacuation

AIR-627
Dynamic Systems
Tom Groves

Key Activities

Technical & policy experts in dynamic systems, including those for stability and control

- Dynamics
- Loads
- Aeroelasticity/ aeroservoelasticity
- Flight control laws
- Engine control systems
- Drivetrain
- Gear boxes

Systems Policy Branch

AIR-630
Systems Policy Branch
Brian Cable

AIR-631
Design and Maintenance Systems
Erik Brown
Victor Powell (A)

Key Activities

Technical & policy experts in design certification systems

- Type certification (TC)
- Supplemental TC
- Instructions for Continued Airworthiness
- Interface with repair and alterations

AIR-632
Production and Airworthiness Systems
BID
Mallory Naill (Day 1)

Key Activities

Technical & policy experts in production and airworthiness certification systems

- Production systems
- Standard airworthiness certification
- Special airworthiness certification

AIR-633
Safety Risk Management
James Wilborn
Dave Showers

Key Activities

Technical & policy experts in safety risk management and mitigation

- Safety risk management
- Policy for mandatory and voluntary actions
- Aviation data management
- Policy for product risk determination
- Policy for fleet risk
- System safety assessment
- Safety performance for special aircraft (e.g. gliders, balloons)
- Assessing safety effectiveness of regulations

AIR-634
Compliance Systems
Scott Geddie

Key Activities

Technical & policy experts in systems to ensure compliance and oversight

- Delegation of individuals
- Designation of organizations
- Oversight of designees and organizations
- Safety management systems
- Design compliance assurance

Drill-into P&I Organization Structure

AIR-602
Deputy Director

Cyber Security
Matt Brackmann

Key Activities

Facilitate integration of cyber issues and activities into AIR regulatory – policy framework

Alternative GA Fuels

Key Activities

Ongoing initiatives related to alternative fuels

Senior Technical Experts Program

Key Activities

Serves as AVS corporate technical expertise for issue resolution and influences priorities for research and regulatory focus

- Early innovation engagement
- Focal points for issue resolution process
- Engagement with industry to determine trends
- Coordination with technical policy, management, and innovation initiatives
- Promote USG safety policies abroad

AIR-650
Center for Emerging Concepts & Innovation
Peter White

Key Activities

Management of early engagement efforts (innovation projects)

- Outreach
- Portfolio Tracking
- Educational Outreach

AIR-660
Consensus Standards Management
Rob Bouza

Key Activities

Acts as the primary engagement point with standards development organizations (SDOs) and coordination between other FAA LOBs

- Manages FAA engagement with SDOs and other industry
- Aligns to priorities and goals for industry standards development and implementation
- Manages relationship between FAA, SDOs, and other aviation stakeholders
- Coordinates specific training and credentialing
- Conformity to OMB Circular A-119
- Tracks data to enable FAA resource management

AIR-670
Research Coordination
Wes Ryan

Key Activities

Develops and manages AIR R&D priorities and plans

- Aligns AIR R&D program to AIR, AVS, and FAA strategies and priorities
- Focal for engagement in AVS R&D process
- Engagement with NASA, USAF and other agencies
- Influences FAA R&D priorities through technical experts, engagement with industry, and needs from emerging concepts & technology, regulatory safety gaps and standards development

Consensus Standards Management – Deeper Look

- **Supports development of performance based regulations and guidance through focused strategic approach**
- **Consensus standards play a critical role as methods of compliance recognized by the FAA**
- **In implementing its Key Activities, Consensus Standards Management Branch will –**
  - ✓ Facilitate governance between FAA and SDOs
  - ✓ Develop and maintain procedures and directives for standards development and acceptance
  - ✓ Manage promotion of new standards to SDOs and other industry standards interests
  - ✓ Facilitate development of data and metrics to enable effective standards utilization
  - ✓ Manage FAA engagement in SDO activities through data driven decisions
  - ✓ Work with organizational leadership to ensure that FAA resources:
    - Are able to fully support committee leadership and membership roles
    - Have clarity on goals and objectives of their specific initiatives
    - Have mechanisms to identify and manage issues

ASTM INTERNATIONAL
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FAA Remote ID and Operations Over People

26 January 2021

Ben Walsh, FAA

www.astm.org

Federal Aviation Administration

REMOTE IDENTIFICATION OF UNMANNED AIRCRAFT

Ben Walsh, FAA

Jan 26, 2021

Changes from the NPRM to the Final Rule

Remote Identification (ID) Overview

- Final rule published in Federal Register on Jan 15, 2021
- Remote identification is a "digital license plate" technology for unmanned aircraft (UA) where information is broadcast directly from the UA to nearby receivers
- The new rule (Part 89) has specific subparts addressing:
  - Operating requirements (Subpart B)
  - Remote ID minimum performance requirements (Subpart D)
  - Means of Compliance (Subpart E)
  - Declarations of Compliance (Subpart F)



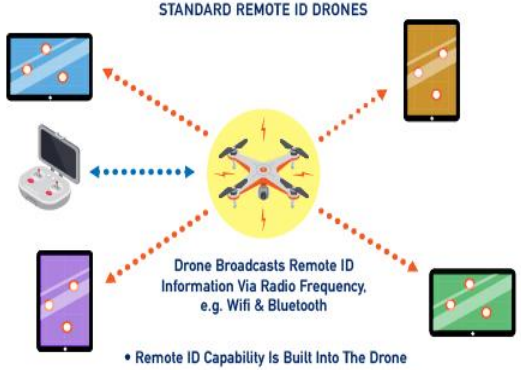
REMOTEID

Three Ways to Comply

3 WAYS DRONE PILOTS CAN MEET REMOTE ID RULE

DRONE REMOTE IDENTIFICATION

STANDARD REMOTE ID DRONES

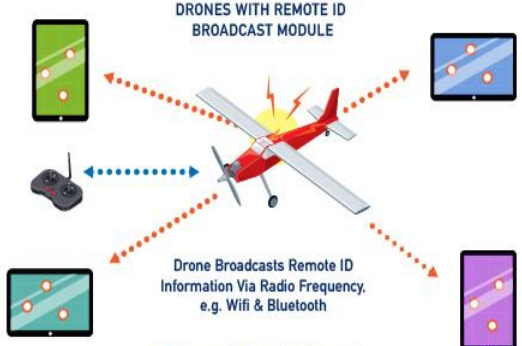


Drone Broadcasts Remote ID Information Via Radio Frequency, e.g. Wifi & Bluetooth

- Remote ID Capability Is Built Into The Drone
- From Takeoff To Shutdown, Drone Broadcasts:
  - Drone ID
  - Drone Location and Altitude
  - Drone Velocity
  - Control Station Location and Elevation
  - Time Mark
  - Emergency Status

DRONE REMOTE IDENTIFICATION

DRONES WITH REMOTE ID BROADCAST MODULE



Drone Broadcasts Remote ID Information Via Radio Frequency, e.g. Wifi & Bluetooth

- Remote ID Capability Through Module Attached To Drone
- Limited To Visual Line Of Sight Operations
- From Takeoff To Shutdown, Drone Broadcasts:
  - Drone ID
  - Drone Location and Altitude
  - Drone Velocity
  - Takeoff Location and Elevation
  - Time Mark

FAA-RECOGNIZED IDENTIFICATION AREA [FRIA]

DRONES WITHOUT REMOTE ID

- Drones Without Remote ID Can Operate Without Broadcasting
- Drones Without Remote ID Must Operate Within Visual Line Of Sight and Within the FRIA
- Anyone Can Fly There, but FRIAs Can Only be Requested by Community-Based Organizations and Educational Institutions

Federal Aviation Administration

Notice of Proposed Rulemaking

Means of Compliance Policy – Remote ID

- All standard Remote ID UA and broadcast modules must be produced in accordance with an FAA-accepted means of compliance
- Means of compliance must address the minimum performance requirements in Part 89, Subpart D
- A means of compliance must be accepted by the FAA before manufacturers can begin producing standard Remote ID UA or broadcast modules
- FAA estimated approximately 6 months for a means of compliance to be developed and submitted for acceptance
  - 18 month production compliance date (Sep 2022)

Changes from the NPRM to the Final Rule

Operations Over People Overview

Ops Over People

- Final rule published in Federal Register on Jan 15, 2021
- Provides a regulatory pathway for routine operations over people and at night without the need for a Part 107 waiver
- Creates a new Part 107, Subpart D, that includes:
  - Operating requirements
  - Means of Compliance requirements
  - Declaration of Compliance requirements



REMOTE ID

Ops Over People

Notice of Proposed Rulemaking

4 Categories of Operations Over People:

Category 1: UA weighs 0.55 pounds or less, no rotating parts that can cause lacerations

- No manufacturer Declaration of Compliance or Means of Compliance

Category 2: 11 ft-lbs kinetic energy transfer threshold, no rotating parts that can cause lacerations

- Must meet an FAA-accepted means of compliance
- No operating limitations

Category 3: 25 ft-lbs kinetic energy transfer threshold, no rotating parts that can cause lacerations

- Must meet an FAA-accepted means of compliance
- No operations over open-air-assemblies of people, limited to closed-sites or no sustained flight

Category 4: UA has an airworthiness certificate that doesn't prohibit ops over people

- No manufacturer Declaration of Compliance or Means of Compliance



REMOTEID

Ops Over People

Notice of Proposed Rulemaking

Means of Compliance Policy - OOP

- Category 2 and 3 operations over people require that the unmanned aircraft comply with an FAA-accepted means of compliance
- For a means of compliance to be acceptable, it must show that UA meet the kinetic energy and exposed rotating parts requirements
- FAA expects OOP means of compliance to be test methods, analytical requirements, inspection methods, and/or design requirements
- A means of compliance must be accepted by the FAA before manufacturers can begin producing Category 2 or 3 OOP UA

Notice of Proposed Rulemaking

Ops Over People

Additional Information/Questions?

- https://www.faa.gov/uas
- https://www.faa.gov/uas/getting_started/remote_id/
- https://www.faa.gov/uas/commercial_operators/operations_over_people/
- https://www.faa.gov/uas/getting_started/remote_id/fria/
- For additional questions contact the UAS Support Desk:
  - UAShelp@faa.gov
  - 1-844-FLYMYUA

Federal Aviation Administration

Panel 1: Moderated Q&A

Moderator:

- Joe Koury, ASTM International (Manager F37, F39, F44)

Panelists:

- EASA Policy, Innovation & Knowledge Branch - Dominique Roland, EASA
- FAA Consensus Standards Management Branch - Robert Bouza, FAA
- FAA Remote ID / OOP Issuances - Ben Walsh, FAA AUS

Questions for a Panelist?

Please use Webex Chat

Break

Session Resumes in

15 minutes

~

12:00 EST

Panel 2: Aviation Standards Activity

Questions for a Panelist? Please use Webex Chat

Moderator:

- Joe Koury, ASTM International (Manager F37, F39, F44)

Panelists:

- F37 Light Sport Aircraft - Steve Hamblin, Virgin Galactic
- F38 Unmanned Aircraft Systems - Ajay Sehgal. Wyle
- F39 Aircraft Systems - Ric Peri, Aircraft Electronics Association
- F44 General Aviation Aircraft - Christoph Genster, Diamond Aircraft
- F46 Aerospace Personnel - Kurt Barnhart, Kansas State University Polytechnic

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Committee F37 on Light Sport Aircraft

Panel 2: Aviation Standards Activity

26 January 2021

Steve Hamblin
1st Vice-Chair

www.astm.org

F37 Quick Facts

- Established 2002
- Number of Members: 200+
- Number of Standards: 35+
- Global Participation: 19 Countries represented
- F37 Standards available in Volume 15.09 in the ASTM Annual Book
- Meetings F37 meets every 8 months, typically coordinate with F44

F37 Officers

- Chair: Adam J. Morrison
- Vice-chair: Steve Hamblin
- Recording Secretary: David J. Oord
- Membership Secretary: Tom Gunnarson

F37 Technical Subcommittees

- F37.10 Glider
- F37.20 Airplane
- F37.30 Power Parachute
- F37.40 Weight Shift
- F37.50 Gyroplane
- F37.60 Lighter than Air
- F37.70 Cross Cutting
- F37.90 Executive
- F37.91 Terminology

F37 Scope

International consensus standard with specific focuses under this scope may include, but are not limited to the development of technical publications for Light Sport Aircraft (LSA), including:

- Minimum design, safety, and performance criteria
- Quality assurance - inspection procedures, parts, materials and assemblies, and manufacturing controls that will assure aircraft conform to design criteria.
- Production acceptance tests and procedures- assuring completed aircraft meet reported criteria. This includes limits such as: empty weight, center of gravity, performance specifications, controllability and maneuverability, stability, stall speed and handling characteristics, engine cooling and operating characteristics, propeller limits, systems functions, and control systems.
- A baseline plan for continued airworthiness systems, including methods for monitoring and maintaining continued operational safety, and processes for identifying, reporting and remedying safety-of-flight issues.
- Required information to be provided with LSA- Maintenance Manuals, Pilot's Operating Handbooks, etc.

The work of this Committee will be coordinated with other ASTM committees and other organizations having mutual interest.

F37 Key Specifications & Practices

- F2245 Standard Specification for Design and Performance of a Light Sport Airplane
- F2339 Standard Practice for Design and Manufacture of Reciprocating Spark Ignition Engines for Light Sport Aircraft
- F2972 Standard Specification for Light Sport Aircraft Manufacturer's Quality Assurance System
- F2483 Standard Practice for Maintenance and the Development of Maintenance Manuals for Light Sport Aircraft

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Committee F38 on Unmanned Aircraft Systems

Panel 2: Aviation Standards Activity

26 January 2021

Ajay Sehgal
Vice Chair

www.astm.org

F38 UAS Technical Committee
AGENDA

- What is F38 Committee?
  - Scope
  - Organization

- F38 Standards Roadmap
  - Approach / Criteria
  - Current Status

Aerospace Sector – Comprehensive Standards Development

Standards Developing Committees

F37 Light Sport Aircraft
- Standards: 35 approved; 4 in development
- FAA NOA's

F38 Unmanned Aircraft Systems
- Standards: 25 approved; 20+ in development
- New rule recently published; FAA acceptance via AC's

F39 Aircraft Systems
- Standards: 6 approved; 9 in development
- FAA Notices

F44 General Aviation Aircraft
- Standards: 29 approved; 10 in development
- New rule recently published; FAA acceptance via AC's

F46 Aerospace Personnel
- Standards: 1 approved, 7 in development
- Formed December 2014, not for regulatory means

F47 Commercial Spaceflight
- Officially formed October 2016
- Approved by Board December 2016
- Supports COMSTAC recommendations
- Following LSA model
- Standards: 12 in development

Training and Certification

NCATT Testing & Certification
- Aircraft Electronics Technicians (AET)
- AeroIT
- Foreign Object Debris
- many more…

LSA Personnel Certificate Program
- Training for compliance personnel

- B07 on Light Metals and Alloys
- D02 on Petroleum Products, Liquid Fuels and Lubricants
- D30.09 on Sandwich Constructions
- E07 on Nondestructive Testing
- E17 on Vehicle-Pavement Systems
- F07 on Aerospace and Aircraft
- F34.06 on Aerospace

What is ASTM F38?

Unmanned Aircraft System Technical Committee

- Formed in ***2003***
- ***3*** Sub-committees
- ***45+*** Standards (Approved and/or in-work)
- ***560+*** members including International Members from ***26*** Countries and ***30*** Regulators
- Process complies with WTO principles: Annex 4 of WTO/TBT Agreement

Industry comes Together

- Experts, individuals, organizations, academia, regulators, trade associations, consultants and consumers
  - Exchange expertise and knowledge
  - Participating in a transparent process – open to anyone, anywhere

Technical Committee SCOPE

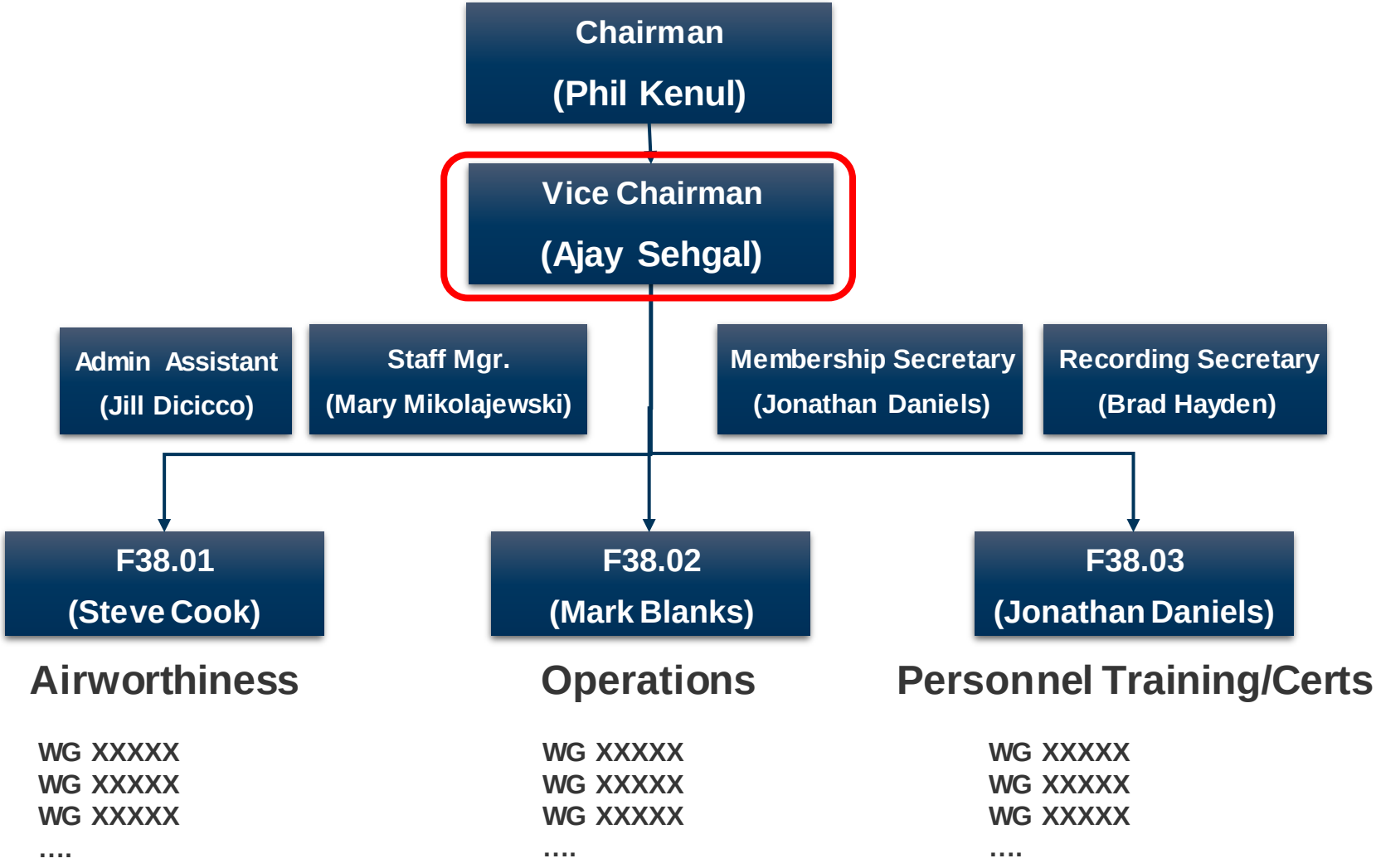
Develop Standards and Guidance Materials for

- Unmanned Aircraft Systems (UAS)
- Optionally Piloted Aircraft (OPA) Systems*

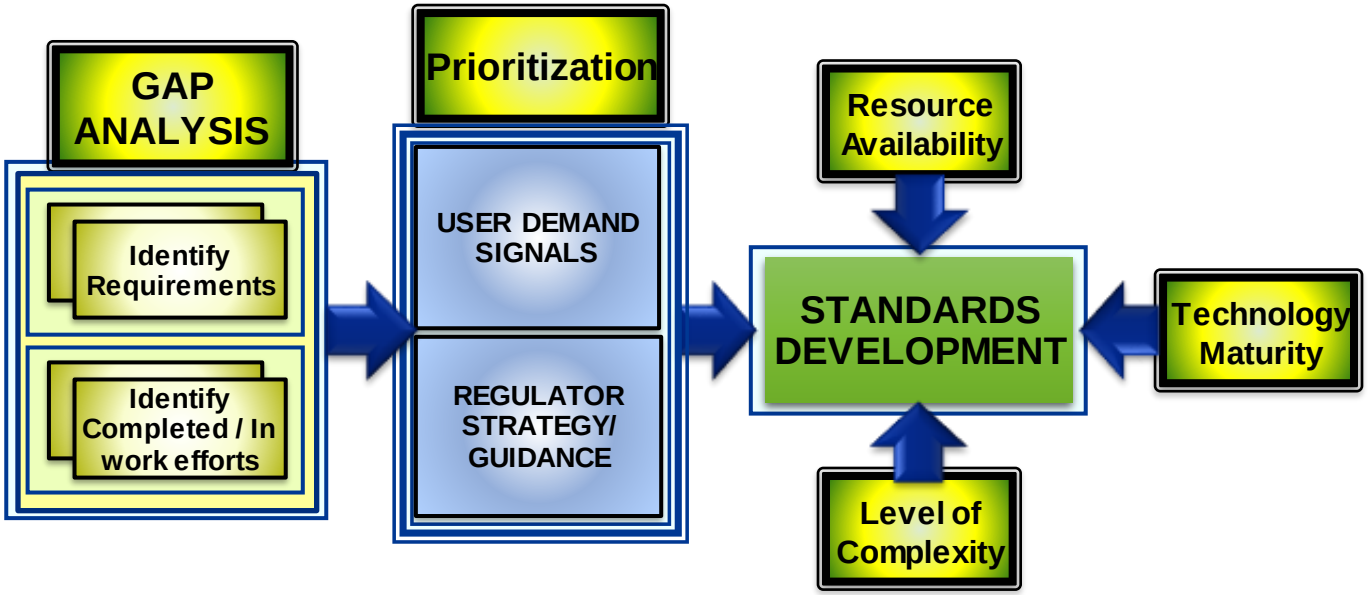
*F38 Bylaws are in revision to include Optionally Piloted Aircraft (OPA)

F38 Unmanned Aircraft Systems

Technical Committee Organization



F38 UAS Standards Roadmap Development
Process



Standards Priority is based on the Regulatory Framework/User Demand Signals

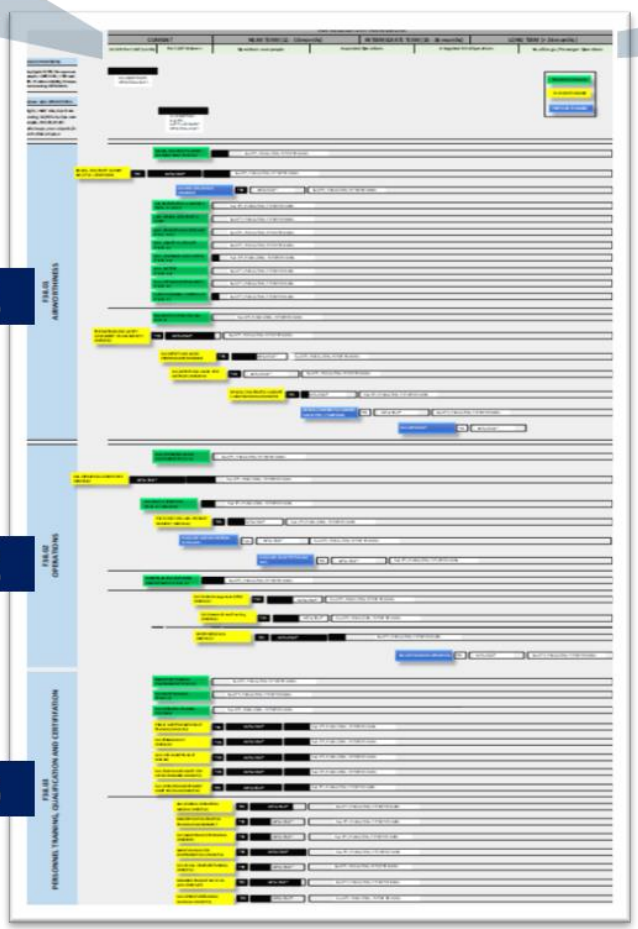
F38 Goal: Industry Standards Achieving Safe & Reliable UAS Operations

FAA REGULATORY FRAMEWORK					
CURRENT		NEAR TERM (12 - 18 months)	INTERMEDIATE TERM (18 - 36 months)		LONG TERM (> 36 months)
14 CFR Part 107 (sUAS)	Part 107 Waivers	Operations over people	Expanded Operations	Integrated NAS Operations	Small Cargo / Passenger Operations

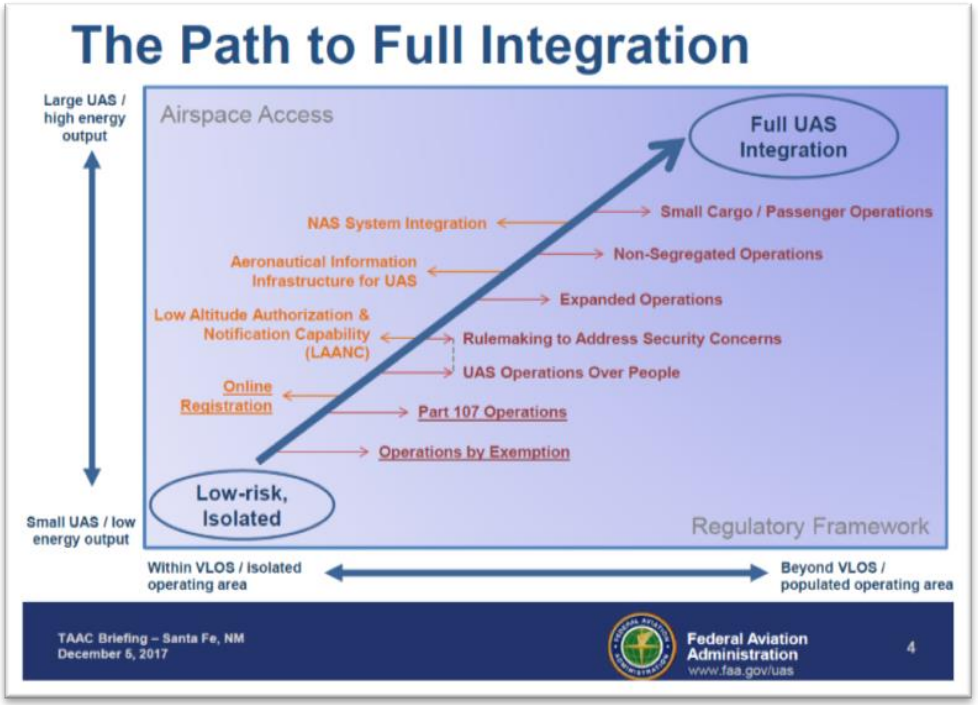
F38.01

F38.02

F38.03



Courtesy: FAA



F38 UAS Technical Committee

Contact Information

- **Committee Operations Questions**

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  Vice Chair
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- **Membership Questions**

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Committee F39 on Aircraft Systems

Panel 2: Aviation Standards Activity

26 January 2021

Ric Peri
Vice-Chair

www.astm.org

ASTM F39 - History

Milestones

– Established 2004

- First Standard June 2005

Key Standards:

– Standard Practice for Design, Alteration, and Certification of Aircraft Electrical Wiring Systems

– Standard Specification for Performance of Angle of Attach Systems

– Standard Specification for Verification of Avionics Systems

– Standard Specification for Design of Electric Propulsion Units for General Aviation Aircraft

ASTM F39 – Key Facts

Committee Structure

- 5 Technical Subcommittees
  - F39.01 Design, Alteration, and Certification of Electrical Systems
  - F39.02 Inspection, Alteration, Maintenance, and Repair
  - F39.03 Design of Avionics Systems
  - F39.04 Aircraft Systems
  - F39.05 Design, Alteration, and Certification of Electric Propulsion Systems

- 10 Active standards, one draft standard, five ongoing revisions
- 100+ members
  - representing more than 200 interested parties incl. more than 100 producers
  - from more than 16 countries on all continents
  - From longstanding companies to start-ups

Member Engagement

Industry Members

- Fixed-wing and VTOL Aircraft Manufacturers
- Propulsion Manufacturers
- Systems Suppliers
- Maintenance (MROs)
- Infrastructure
- Academia
- Independent Experts / Consultants

Authority Engagement

- ANAC
- EASA
- FAA
- TCCA

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Committee F44 on General Aviation Aircraft

Panel 2: Aviation Standards Activity

26 January 2021
Christoph Genster
1st Vice-Chair

www.astm.org

ASTM F44 - History

Milestones

- Certification Process Study of 2009
- Aviation Rule making Committee of 2011

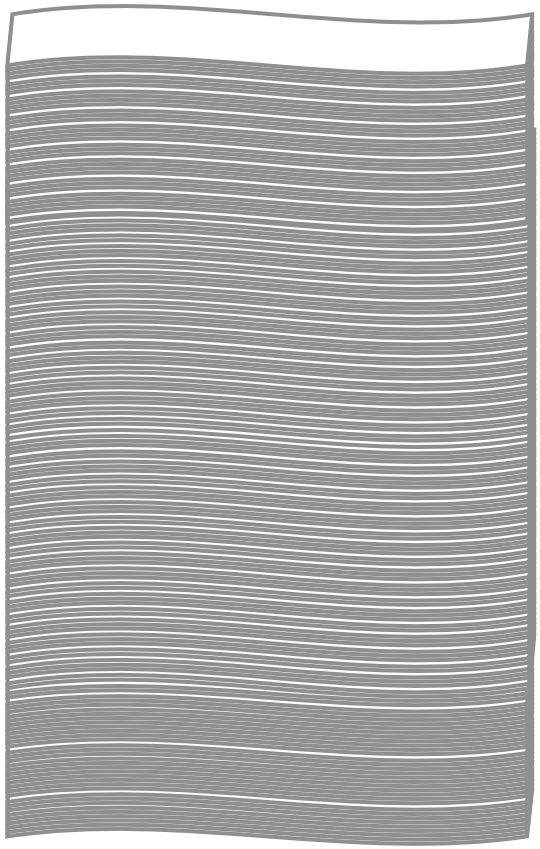
- Established October 2012
  - Charged to provide consensus standards as Means of Compliance for new performance-based rules

- 1st complete set of standards in 2015

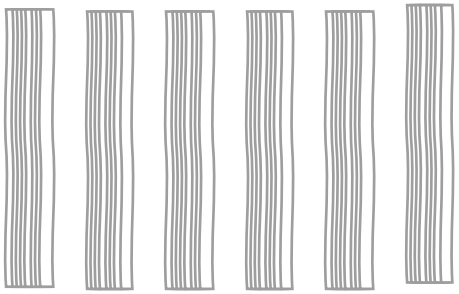
- Performance based rules entered into force in August 2017

- 1st products certified with performance-based rules in 2020

The Reorganization of CS/Part 23



Consensus Stds.

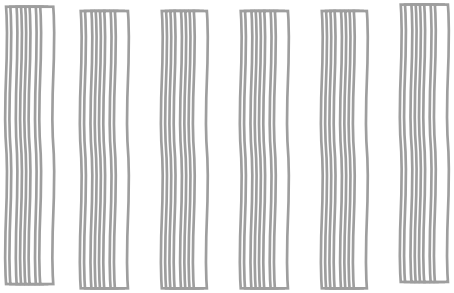


Load Alleviation Systems

Low Fuel Condition

Loss of Control

Hybrid & Electric Propulsion

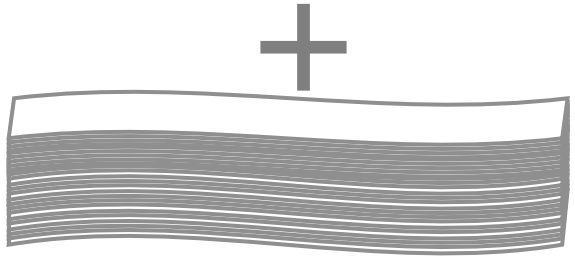


Aeroelasticity

Crashworthiness

Indirect Flight Controls

eVTOL MoC



Prior Rules (~375 Regs)

New Rules (~70 Regs)

ASTM F44 – Key Facts

Committee Structure

- 5 Technical Subcommittees
  - F44.10 General
  - F44.20 Flight
  - F44.30 Structures
  - F44.40 Powerplant
  - F44.50 Systems and Equipment
- 3 Coordination Subcommittees
  - F44.91 Terminology
  - F44.92 Regulatory Liaison
  - F44.93 Industry Liaison

- 40 standards published, 22 draft standards, several ongoing revisions
- 420+ members
  - representing more than 200 interested parties incl. more than 100 producers
  - from 27 countries on all continents
  - From longstanding companies to start-ups

Member Engagement

Industry Members

- Fixed-wing and VTOL Aircraft Manufacturers
- Propulsion Manufacturers
- Systems Suppliers
- Maintenance (MROs)
- Infrastructure
- Academia
- Independent Experts / Consultants

Authority Engagement

- ANAC
- CAAC
- EASA
- FAA
- TCCA
- CAA
  - Philippines
  - Vietnam

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Committee F46 on Aerospace Personnel

Panel 2: Aviation Standards Activity

26 January 2021
Kurt Burnhart

www.astm.org

Committee Scope

- The scope of the committee shall be the development and maintenance of internationally accepted standards and guidance materials for aerospace personnel education, qualification, testing, certification requirements, and continued education concurrent with technological advancement. The work of this committee will include but is not limited to aircraft engineering and maintenance personnel qualifications. The work of this committee will be coordinated with other ASTM committees and organizations having common interest.

- **What is it?**

  Aerospace Industry Workforce Development!

- **Why is it important?**

  Civil Aviation Authorities struggle to maintain professional credentialing of Aviation industry experts such as Engineers and Technicians on pace with technological changes. The development of industry driven, consensus-based standards are becoming more acceptable (preferable) to CAA's as timely and well-developed resources for technical standards and personnel qualification requirements.

Subcommittee Scopes

F46.01 Aerospace Engineers and Technicians
Scope: The development and maintenance of international standards and guidance for base-level requirements for the education, training and certification of **Aerospace Engineers and Technicians.**

F46.02 Avionics and Information Technology Endorsements
Scope: The development and maintenance of international standards and guidance for endorsement level requirements for the education, training and certification of aerospace personnel working in **Avionics and Information Technology**.

F46.03 Airframe and Systems Endorsements
Scope: The development and maintenance of international standards and guidance for endorsement level requirements for the education, training and certification of aerospace personnel working in **Airframes and systems**.

F46.04 Powerplant Endorsements
Scope: The development and maintenance of international standards and guidance for endorsement level requirements for the education, training and certification of aerospace personnel working in **Powerplants**.

Subcommittee Scopes

F46.05 Equipment and Furnishings Endorsements
Scope: The development and maintenance of international standards and guidance for endorsement level requirements for the education, training and certification of aerospace personnel working on aircraft **Cabin Equipment and Furnishings**.

F46.06 Autonomous and Electric Aircraft Maintenance Personnel Certification
Scope: The development and maintenance of international standards and guidance for endorsement level requirements for the education, training and certification of aerospace personnel working in **electric powered and electric propulsion aircraft (eVTOL).**

F46.07 Cabin Crew Personnel Subcommittee
Scope: The development and maintenance of international standards and guidance for endorsement level requirements for the education, training and certification of aerospace personnel **working as Cabin Crew members**.

F46.90 Executive Subcommittee
Scope: To give the F 46 committee executive direction.

Panel 3: Advancements on Means of Compliance

Questions for a Panelist? Please use Webex Chat

Moderator:

- Mary Mikolajewski, ASTM International (Manager F38)

Panelists:

- F37 Light Sport Aircraft - Adam Morrison, Streamline Designs LLC
- F38 Unmanned Aircraft Systems - Phil Kenul, Trivector Services
- F39 Aircraft Systems - Ric Peri, Aircraft Electronics Association
- F44 General Aviation Aircraft - Christine DeJong Bernat, General Aviation Manufacturers Association
- F46 Aerospace Personnel - Rich Ochs, Spirits Aeronautics

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Committee F37 on Light Sport Aircraft

Panel 3: Advancements on Means of Compliance

26 January 2021
Adam Morrison
Chair

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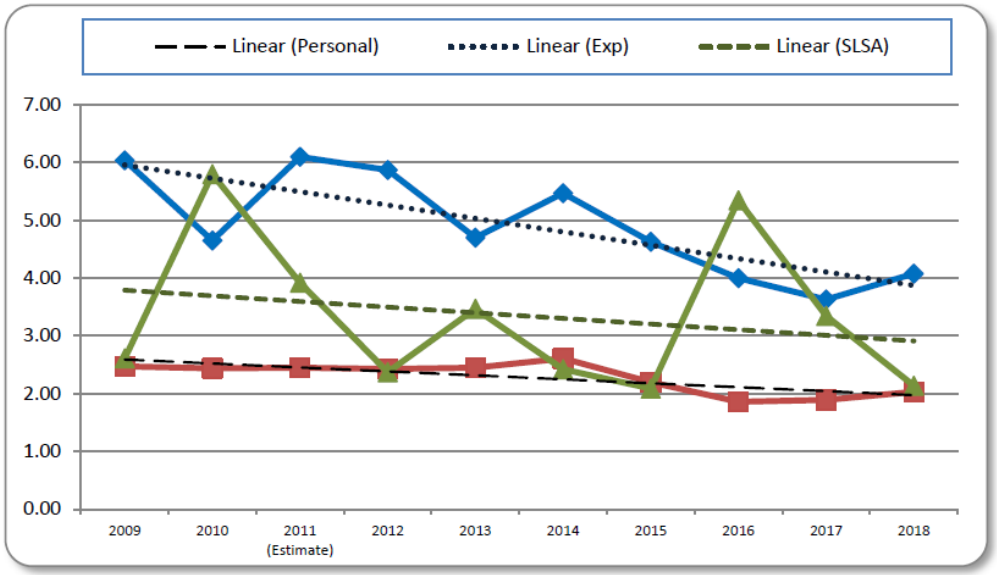
LSA Industry Update

- 2019 COS Report (Issued March 2020)
  - Everyone in the industry should review this report
  - Overall safety record continues to improve
  - 2020 report should publish in February
- MOSAIC Rulemaking
  - Modernization Of Special Alrworthiness Certification
  - Expanding (hopefully) the LSA category (and much more)
  - Rule expected to go live at the end of 2023.
  - NPRM roughly in early to mid FY2022.
  - Initial draft of NPRM due August 2020. (completed)

Fatal Accidents per 100K Hours of Operation with Linear Trend Lines



F37 Overall Status and Updates

F37 Exec Committee

- Chair—Adam Morrison, Streamline Designs
- Vice-Chair—Steve Hamblin, The Spaceship Company
- Recording Secretary—David Oord, Lilium
- Membership Secretary—Tom Gunnarson, Wisk
- Others: Anna Dietrich, Oliver Reinhardt, Roy Beisswenger, John Craparo, John Stoll (FAA), Neil Bungard, Jim Rogina, Stefan Ronig, Dan Johnson, Rian Johnson

F37 Overall Status and Updates

F37 Recent Development & Accomplishments

- Weight-Shift aircraft work
  - Challenges with high-speed wings
  - Improving accident record
- Revised engine standard F2339-19a—published March 2020
  - More options relating to design assurance and validation of electronic engine controls
  - Looking to consolidate engine standards like we have done with other standards

F37 Overall Status and Updates

F37 Recent Development & Accomplishments

- New standard F3409-19—published March 2020
  - Standards Practice for Simplified Aircraft Loads Determination
  - Effort started in May 2014!
  - Joint effort with Committee F44 on General Aviation
  - Further changes forthcoming for cross-committee harmonization
- Approved changes to airplane design and performance standard (F2245) related to fuel vapor lock concerns.
  - Early implementers have been showing compliance and providing excellent feedback for future revisions of this language.

F37 Overall Status and Updates

F37 Recent Development & Accomplishments

- Sponsorship & participation in AC377 reports on automation in aviation
  - ASTM technical report *Autonomy Design and Operations in Aviation* published in 2019
  - ASTM technical report *Developmental Pillars of Increased Autonomy for Aircraft Systems* published in 2020
  - Subgroup on “regulatory barriers to autonomy” focusing on regulatory challenges to implementing autonomous systems. Technical report likely in mid-2021.
  - Important reports when considering automation needs coming with MOSAIC.

Current Ballot & Active Task Group Activity

- Aircraft wiring effort to permit limited usage of automotive-grade wiring
- Splitting maintenance standard into two standards:
  - 1) maintenance program
  - 2) maintenance manuals
- Further Continued Operational Safety standard improvements
- Weight Shift Control high speed wings and possible tie to accident record
- MOSAIC standards readiness
  - Need basic readiness by the middle of 2023 (2.5 years from now!)
  - Major expansion of aircraft definitions and types, including electric power and eVTOL
  - Introduction of Light Personal Aircraft (LPA)
- Merging two existing engine standards into a single, common standard.
- Shared, cross-committee standards
  - F38 on UAS actively considering implementation of LSA quality standard. F37 is removing LSA specifics from QA standard to accommodate broader use.
  - Simplified structural loads
  - Water loads
  - Electric propulsion and eVTOL

Aviation Committee Liaison Work

- Administrative Committees
  - Supporting, non-standards efforts that develop strategy and other technical input into the broader standards development process.
  - AC377 on Autonomy in Aviation (Steve Cook)
  - AC433 on eVTOL Means of Compliance (Tom Gunnarson/Anna Dietrich)
  - AC478 on Beyond Line of Sight Strategy (Adam Morrison)

Regulator Acceptance of Standards

- FAA has issued 15 notices of availability. The first was March 2005 and the most recent was October 2018. Another expected in the spring of 2021.
  - Overall, this has worked really well and has generally kept up with the standards development process.
- EASA references standards within CS-LSA (with some modifications).
  - This has *not* worked very well as it has not been kept up-to-date even as the standards have implemented recommendations from EASA and gone beyond in several areas.
- Other countries have a mix of self-declarative systems and type certification using standards as the agreed means of compliance.
- The lack of TC issuance in some countries (including the USA) does cause some issues with import/export of the products.
- Self-declarative compliance creates immense flexibility for manufacturers to innovate with means of compliance and affordably bring safe aircraft to the market.
- Over 200 new aircraft designs brought to market in 16 years—one new make/model every month for 16 years straight.

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Thank you!

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Committee F38 on Unmanned Aircraft Systems

Panel 3: Advancements on Means of Compliance

26 January 2021

Phil Kenul
Chair

www.astm.org

ASTM F38 2020 Highlights

F3411-20 UAS Remote ID and Tracking – published Jan 2020: Revisions based on Part 89 Final Rule and follow up items underway

1. **Acceptance of F3411**: Crosswalk F3411 to Rule to ensure it meets all the requirements of the final ruling.
2. **Test methods required**
3. **Product Certification**: A means required for certifying if a vehicle is compatible with CAA regulatory requirements.
4. **Receiver options:** The existing link contemplated a handheld cell phone on the ground and discussion of receiving broadcasts in other places, and by other devices (cell towers, handheld directional antennas, or on manned aircraft). Further work to quantify the improvements available using various types of receivers and antennas.
5. Anticipate FAA MOC / ASD-STAN Adopts F3411 as the basis for open category in. Europe
6. FAA DAC Task #9 review of RID as safety mitigation for low altitude manned aircraft.
7. Future Networked Remote ID as UTM building block
8. UAM/AAM applications

FAA DURABILITY & RELIABILITY-BASED TYPE CERTIFICATION PROCESS FOR LOW-RISK SMALLER UNMANNED AIRCRAFT SYSTEMS - MEANS OF COMPLIANCE.

D&R MoC invokes industry consensus standards, including ASTM

F2908-18-Standard Specification for Unmanned Aircraft Flight Manual (UFM) for an Unmanned Aircraft System (UAS)

F3153-15-Standard Specification for Verification of Avionics Systems

F3322-18-Standard Specification for Small Unmanned Aircraft System (sUAS) Parachutes

D&R MoC specifies specific test objectives, required criteria, and evaluation criteria must be met

To meet requirements, applicants must develop own test plans and test cards

F3478-20 Standard Practice for Development of a Durability and Reliability Flight Demonstration Program for Low-Risk Unmanned Aircraft Systems (UAS) under FAA Oversight

The FAA has asked ASTM to provide industry best practices for conducting flight demonstrations and providing evidence to satisfy this means of compliance.

This process requires an applicant to show compliance in three areas:

1. air system durability and reliability flight demonstrations,
2. likely failure and specific demonstration tests, and
3. a design requirements checklist.

F3389/F3389M – 20
Standard Test Method for Assessing the Safety of Small Unmanned Aircraft Impacts

Describes three methods for assessment of the safety of an sUA to assess injury potential associated with an impact.

Revisions to be discussed with FAA to sync up and tailor new methodology to be used as an MOC under recently released OOP Rule.

TCCA AC 922-001
ASTM Standards Accepted by Canada

APPENDIX A – RECOGNIZED INDUSTRY CONSENSUS STANDARDS

ASTM F2908-18 Standard Specification for Unmanned Aircraft Flight Manual (UFM) for an Unmanned Aircraft System (UAS)
ASTM F2909-14 Standard Practice for Maintenance and Continued Airworthiness of Small Unmanned Aircraft Systems (sUAS)
ASTM F2911-14e1 Practice for Production Acceptance of a Small Unmanned Aircraft System (sUAS)
ASTM F3003-14 Specification for Quality Assurance of a Small Unmanned Aircraft System (sUAS)

Electrical Systems
ASTM F2639-15 Standard Practice for Design, Alteration, and Certification of Aircraft Electrical Wiring Systems
ASTM F2490-05(2013) Standard Guide for Aircraft Electrical Load and Power Source Capacity

Equipment
ASTM F3322-18 - Parachutes
ASTM F3002-14a Standard Specification for Design of the Command and Control System for Small Unmanned Aircraft Systems (sUAS)
ASTM F3005-14a Standard Specification for Batteries for Use in Small Unmanned Aircraft Systems (UAS)

Software
ASTM F3201-16 Standard Practice for Ensuring Dependability of Software Used in Unmanned **Aircraft Systems (UAS)**
ASTM F3269-17 Standard Practice for Methods to Safely Bound Flight Behavior of Unmanned Aircraft Systems Containing Complex Functions

ASTM F38 Future Standards Under Development

WK59317 Vertiport Design –adjudicating comments

- intended to service any vertical-takeoff and landing (VTOL) aircraft to include, but not limited to, standard category aircraft (7000lbs and 9 passengers), optionally piloted aircraft and unmanned aircraft. Adjudicating comments

WK69335 Framework for Using ASTM International Standards for Unmanned Aircraft Systems (UAS) A cross-walk to CAA regulatory requirements

WK63418 Service provided under UAS Traffic Management (UTM) – expect ballot Summer 2021

WK69335 Framework for Using ASTM International Standards for Unmanned Aircraft Systems (UAS)

Align standards with CAA requirements to facilitate acceptance

✓Matrix correlated to F3178, SORA, EASA, Transport Canada Part 9, and the FAA 107

✓ Serves as a roadmap for use by proponents to use the standards

✓Offers granularity and guidance

✓For the regulator to better digest the envisioned applicability of those standards.

✓Appendix 2. FRAMEWORK FOR USING ASTM STANDARDS FOR JOINT AUTHORITIES FOR RULEMAKING ON UNMANNED SYSTEMS (JARUS) SPECIFIC OPERATIONS RISK ASSESSMENT (SORA) Cross-walking to OSOs.

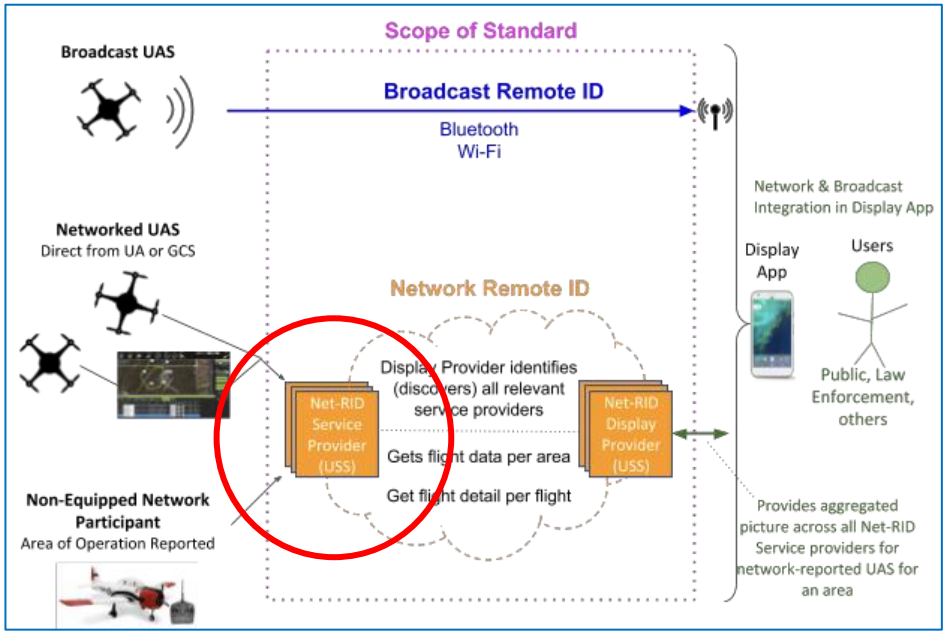
WK63418 Service provided under UAS Traffic Management (UTM) – expect ballot Summer 2021

- Focus on information exchanges and operations between service providers (USS) and any regulatory entities participating in the system
- Describes both a technical interoperability specification for data elements, message formats and communications parameters
- Compatible with and generally used in conjunction with Remote Identification standard
- Identifies required performance specifications for the implementation
- For BVLOS or where significant volumes of sUAS traffic and/or manned aviation traffic
- Primarily but not restricted below 400ft AGL*; however:*
  - *TOR revision by the UTM workgroup to add mixed use airspace to accommodate UAM/AAM and Upper Altitude Airspace.*

R-ID/UTM Space and Progress Today

Collaboration / Federation is key for progress

- Network Remote ID is really the first 'UTM'/USS provider service to be deployed and operated under the federated design that is being proposed within the CONOPS that have been shared to date (FAA/CORUS)
- Key focus within work on standards is driving toward performance-based definitions with specific protocols defined where necessary for shared capabilities in the system



Future Version Scope (not in Version 1)

V2 (Draft Fall 2021):

- Priority operation preemption
- Pre-flight and in-flight negotiations
  - Yes/no response only
  - Including proposed airspace “swap”
- Consider intersecting BVLOS Operational Volumes
- Evaluation of NASA message signing approach
- External endpoint API for auditing data collection from USSs
- Functional response to USS errors
- Limited airspace fairness rules and/or enforcement
- Extended uses for operational constraints beyond whitelists. Possible different types or attributes.
- USS/DSS Outages and Hygiene
  - Operational cleanup enforcement
  - DSS making changes to airspace representation
  - Misbehaving USS
- Limited manned aircraft operation integration (e.g. intent)

V3+:

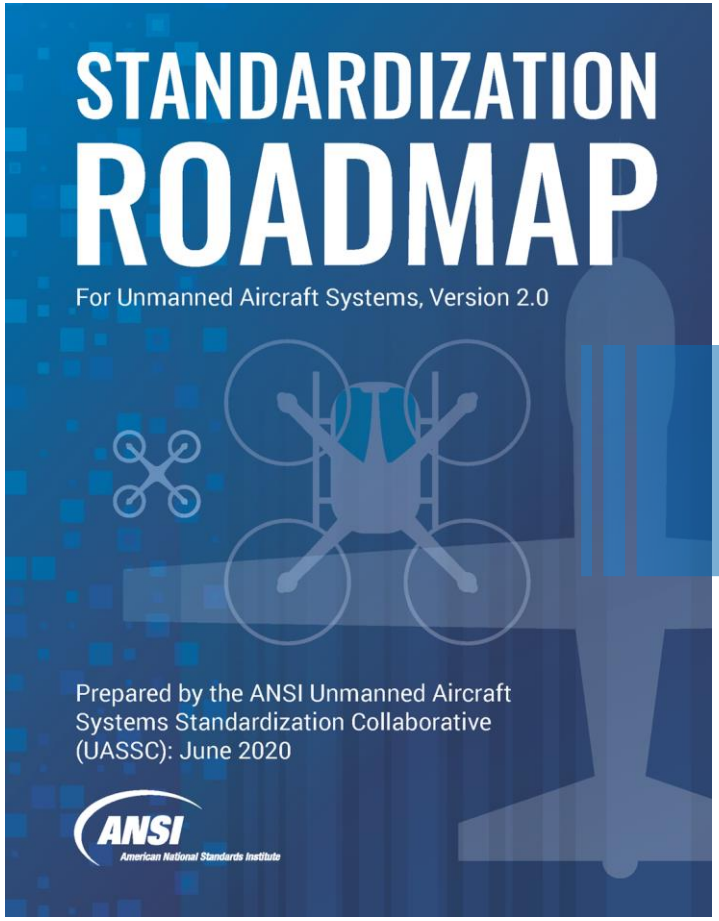
- Advanced negotiations
  - Beyond yes/no
  - Multiple intersections
  - Shared airspace
- Advanced airspace fairness rules
- Swarms

F38 UAS Standards Roadmap
AGENDA

- 2020 & Beyond Roadmap
  - ANSI (2020) Roadmap Gap Analysis
  - Optionally Piloted Aircraft
  - ASTM Administrative Collaborations (AC377, AC433, AC478)
  - Other New Topics?
  - Priorities?
  - Common standards with other ASTM aviation committees?

F38 UAS Standards Roadmap

ANSI (2020) Gap Analysis

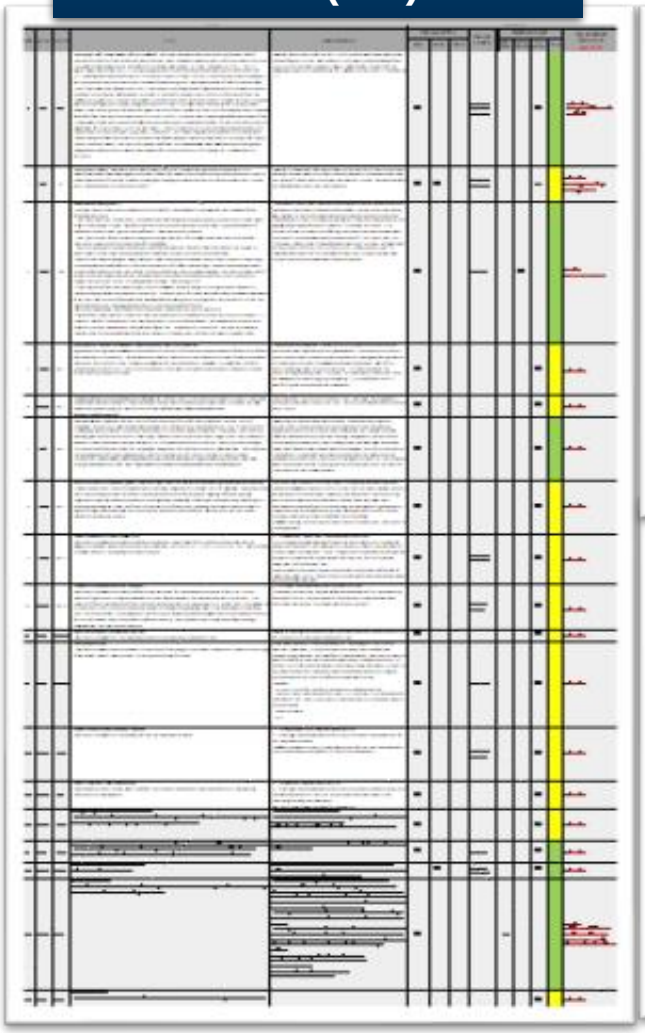


- Version 2.0 published in June 2020
- Identified *71* Total Gaps
  (Gap means No Published Standard)
- F38 identified, prioritized, and made recommendations for a total of *71* gaps, in the topical areas of:
  - Airworthiness (19) (section 6)
  - Flight operations (45) (sections 7-9)
  - Personnel training, qual. and cert. (7) (section 10)

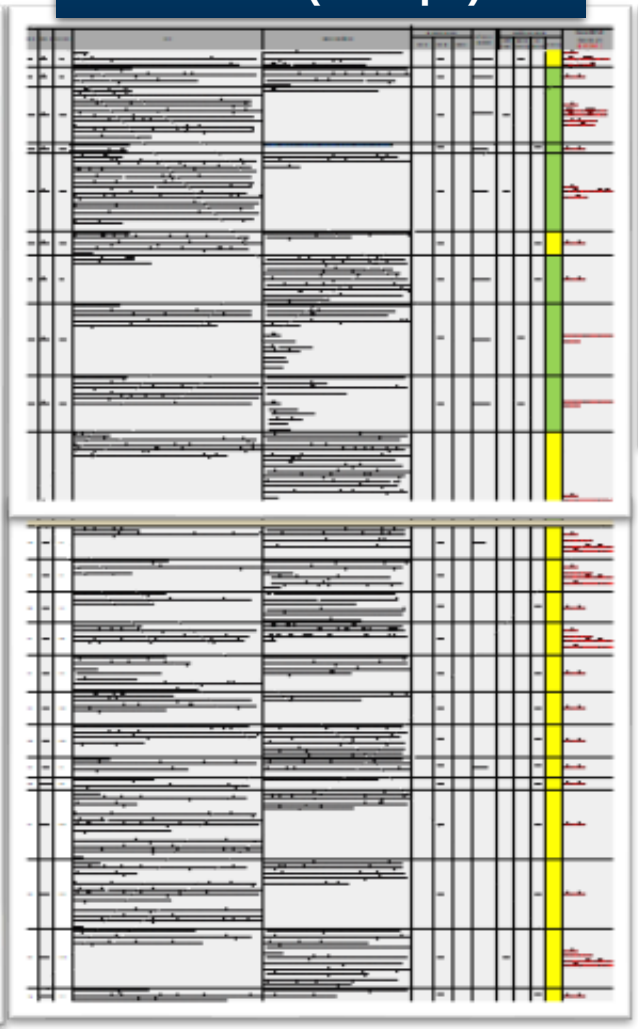
F38 UAS Standards Roadmap

ANSI (2020) Gap Analysis - Summary

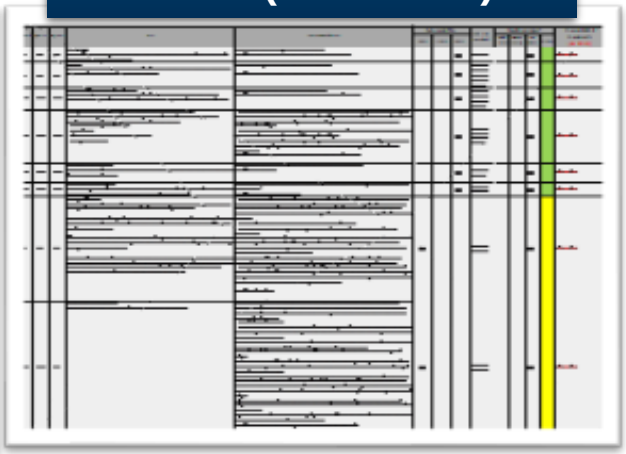
CH 6 (AW)



CH 7-9 (Flt Ops)



CH 10 (Personnel)



F38 UAS Standards Roadmap

ANSI (2020) Gap Analysis - Summary

Chapter	Subject	Total Gaps Reviewed	F38 Sub-committee			F38 Recommended Action			
			F38.01	F38.02	F38.03	In Work or on F38 Roadmap	Add to F38 Roadmap		NO ACTION
							Collaborate with Other Committee(s) / Orgs.	New Standards	
6	Airworthiness	19	X			5	1	1	12
7	Flight Operations	13		X		5	-	3	5
8	Infrastructure Inspections / Commercial Services	19		X		-	-	2	17
9	Public Safety Operations	13		X		-	4	-	9
10	Personnel Qualifications	7			X	-	-	-	7
						10	5	6	50
							11		

F38 UAS Standards Roadmap

ANSI (2020) Gap Analysis - Summary

In Work / Already on F38 Roadmap

- D&C Standard(s) for Control Segment
- Detect and Avoid Capabilities
- Power Sources and Propulsion Systems
- Parachute or Drag Chute
- Maintenance & Inspection of UAS

- Privacy (Update upon rulemaking)
- UAS Operations and Weather
- Remote ID – Direct Broadcast
- Remote ID – Network Publishing
- Aerodrome Facilities for UAS

Standards in Italicized Text → Collaboration with other committees / organizations

Add to F38 Roadmap

- *Avionics and Subsystems* – ***F39 TC***
- Autonomous Operations

- Beyond Visual Line of Sight (BVLOS)
- Geo-fence Exchange
- Geo-fence Provisioning and Handling

- Inspection of Building Facades
- Bridge Inspections

Collaboration with DroneResponders

- *sUAS for Public Safety Operations*
- *Hazardous Materials Response and Transport using UAS*
- *Forensic Investigations Photogrammetry*
- *Integration of UAS into FEMS Operations Section, Air Operations Branch*

Follow up and Contact

Philip Kenul
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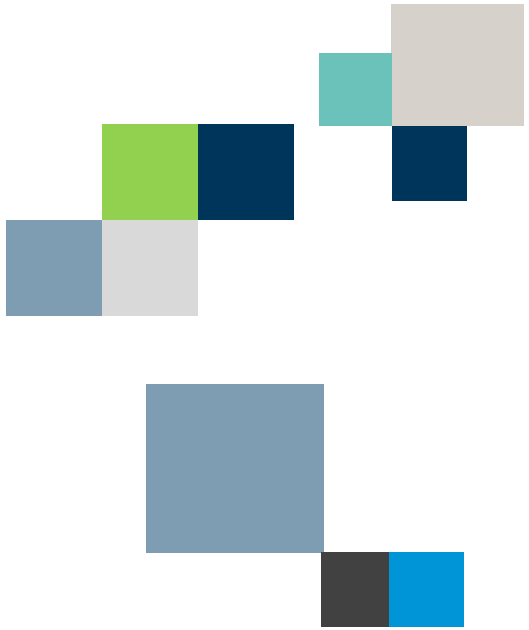
Philip.Kenul@gmail.com
Mobile: +1301.346.5939



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Committee F39 on Aircraft Systems

Panel 3: Advancements on Means of Compliance

26 January 2021
Ric Peri
F39 Vice-Chair

www.astm.org

ASTM F39 - 2020/2021

**See website for all revisions*

F39.01 Design, Alteration, and Certification of Electrical Systems

Published Standards

– Updated F2490 - Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis

Activities Underway

– No current activities underway

F39.02 Inspection, Alteration, Maintenance, and Repair

Published Standards

– None for 2020

Activities Underway

– No current activities underway

F39.03 Inspection, Alteration, Maintenance, and Repair

Published Standards

– None for 2020

Activities Underway

– F3011 – Standard Specification for Performance of Angle of Attack Systems
  – Revision out for ballot
– F3153 – Standard Specification for Verification of Avionics Systems
  – Revision underway

ASTM F39 - 2020/2021

**See website for all revisions*

F39.04 Aircraft Systems

Published Standards

– None for 2020

Activities Underway

– No current activities underway

F39.05 Design, Alteration, and Certification of Electric Propulsion Systems

Published Standards

– F3338 – Standard Specification for Design of Electric Propulsion Units for General Aviation Aircraft

Activities Underway

– Multiple revisions underway

– Proposed new standard

  – Design of Electric Propulsion Energy Storage Systems for General Aviation Aircraft

ASTM F39 - New Technology Trends

2021 - 2025

– Electric Propulsion
– Energy Storage
– Autonomy/SVO
– Coordination with F44 on above three

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Committee F44 on General Aviation Aircraft

Panel 3: Advancements on Means of Compliance

26 January 2021

Christine DeJong Bernat
F44 Chair

www.astm.org

ASTM F44 - 2020/2021

**See website for all revisions*

F44.10 General

Published Standards*

- F3264 "TLS" Normal Category Airplane Certification
- Crew Interface
- Icing Protection
- Non-Essential Icing

Activities Underway

- Alerting Methods (WK71557)
- Enhanced Indication Methods (WK71556)
- Inadvertent Icing (WK68757)
- TLS Annual Updates

Authority Acceptances

FAA

- 2019 edition accepted by FAA in October 2020
- 2017 edition accepted
- 2021 edition under consideration next

EASA

- 2018b & 2017 editions
- 2021 edition under consideration next

ASTM F44 - 2020/2021

**See website for all standards & revisions*

F44.20 Flight

Published Standards*

- Low Speed Flight Characteristics
- Aircraft Handling Characteristics
- Weights and CG
- Operational Limitations & Information
- A/C performance

Activities Underway

- eVTOL handling qualities
- Static Lateral stability & longitudinal control
- Integrate Multi-engine departure resistance

F44.30 Structures

Published Standards*

- Structures, General
- Structural Durability / Structural Compliance
- Water loads
- Emergency Conditions, Occupant Safety
- Aeroelasticity
- Simplified Loads Criteria
- Design Loads & Criteria
- Systems / Structures Interaction
- Emergency Parachute Recovery Systems
- Simplified Fatigue Load Spectra

Activities Underway

- Low Stress Airframe Structure
- Model Verification & Validation (finite element)
- VTOL Emergency Landing Conditions & Bird Strike

ASTM F44 - 2020/2021

**See website for all revisions*

F44.40 Powerplant (PP)

Published Standards*

- PP Installation
- PP Instruments
- PP Control, Operation & Indication
- PP Installation Hazard Mitigation
- Electric Propulsion Systems
- Fuel & Energy Storage / Delivery
- Propeller System Installation

Activities Underway

- PP Fire Protection (traditional systems)
- Fuel System Hot Weather Operation
- Powerplant Instruments

F44.50 Systems & Equipment

Published Standards*

- Systems & Equipment
- Flight Controls
- Environmental System
- Flight Data & Voice Recording
- Statis Pressure system
- Instrumentation in small aircraft
- System Safety Assessment
- HIRF protection
- HEP / electrical systems

Activities Underway

- Indirect flight controls
- Info security protection (cyber)
- Net Safety benefit
- SVO Aircraft
- Systems-Theoretic Process Analysis

ASTM F44 - New Technology Trends

2021 - 2025

- Hybrid and Electric Propulsion
- Alternative approaches to Crashworthiness
- Simplified Safety Assessment standard
- Autonomy/SVO
- Filling Gaps related VTOL aircraft
  - Structures, flight, powerplant
- Advanced Operations
- Infrastructure and Integration
  - Coordination with F38
- Increased coordination through F44.93 Industry Liaison

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Committee F46 on Aerospace Personnel

Panel 3: Advancements on Means of Compliance

26 January 2021

Rich Ochs
Chair

www.astm.org

Subcommittee Updates

F46.01 Aerospace Engineers and Technicians

F3376-19 Standard Guide for Core Competencies for Aviation Maintenance Personnel

F3457-20 Standard Guide for Aircraft Certification Education Standards for Engineers and Professionals in Aerospace Industry

WK51566 Soft Skills of Aerospace Personnel

WK74509 Foreign Object Elimination certification covers common knowledge, skills, and abilities related to the prevention of Foreign Object Damage to vehicles and personnel as a result of foreign objects and foreign object migration.

Aircraft Detailers Standards Work Group approved for launch

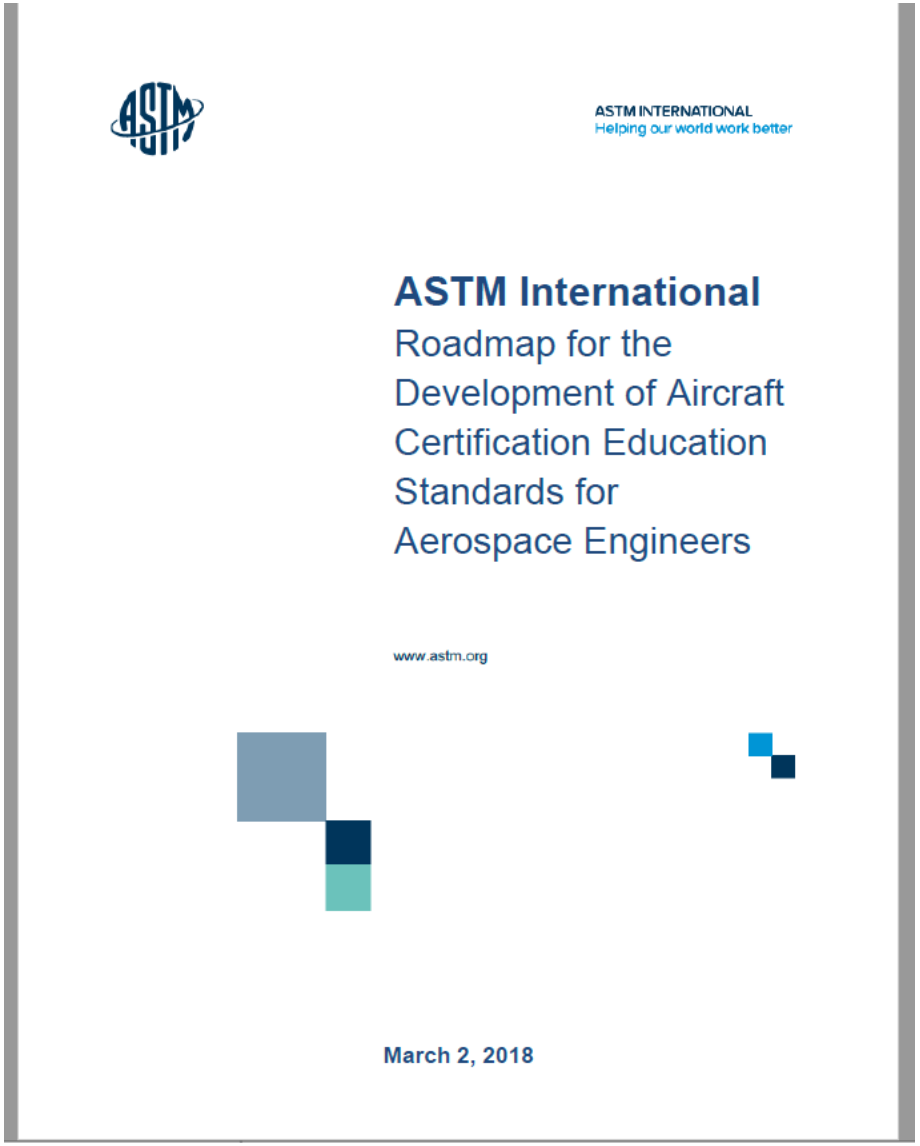
ASTM F46.01 Airworthiness WG 65044 - History

Milestones

– Engineering Airworthiness Training Standards working group formed in 2016

– Roadmap finalized in March 2018

– F3457-20 Standard Finalized July 2020



Working Group scope:

– Vision:

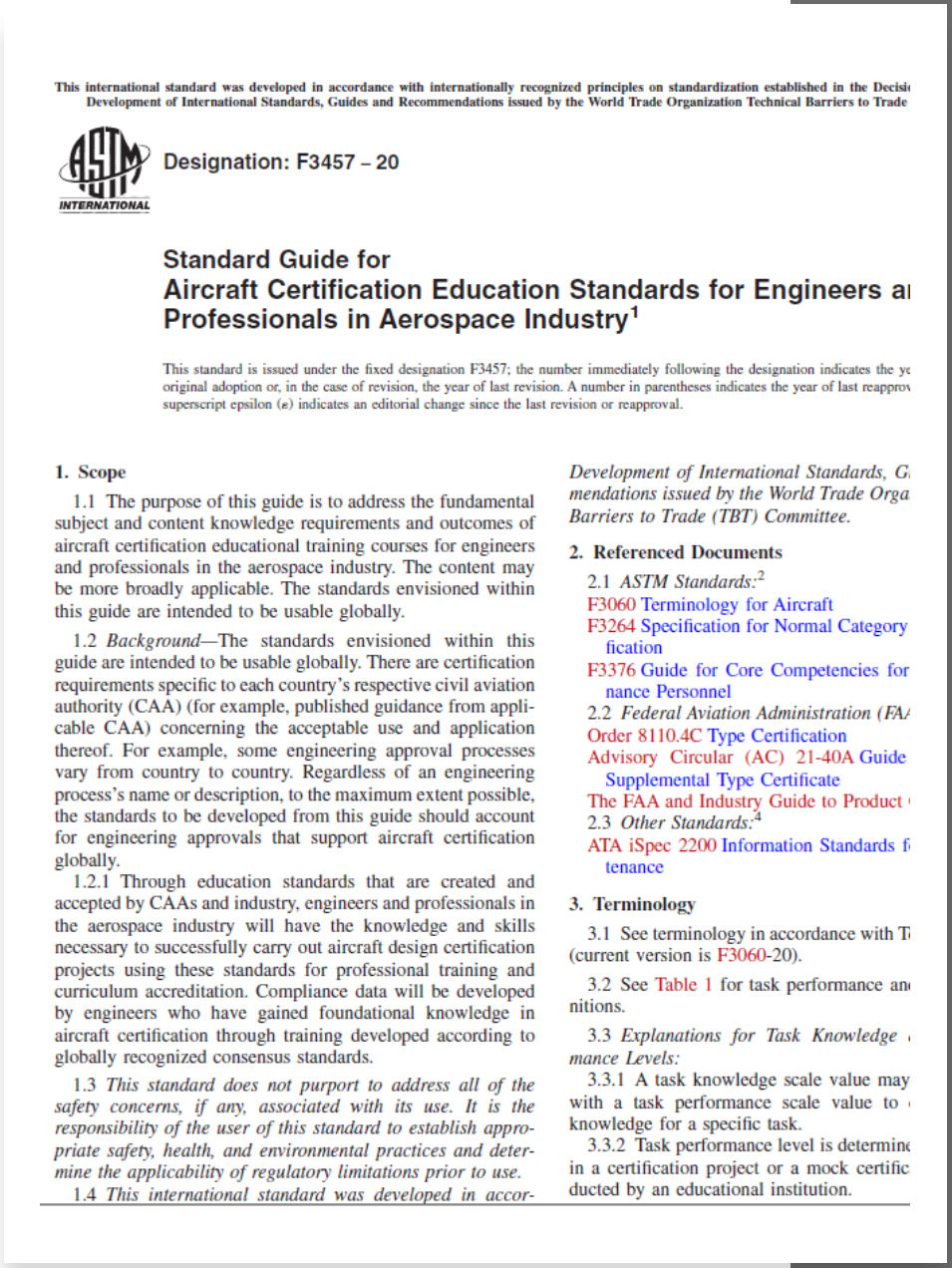
To create consensus standards that can be effectively implemented to equip aerospace engineers with the foundational knowledge and skills necessary to successfully carry out aircraft design certification projects.*

*Subsequently expanded vision to include “and other professionals”

5 Goals established early:

1. Advance Safety
2. Increase Stakeholder Accountability
3. Utilize Resources Efficiently
4. Establish Education Standards for Career Progression
5. Achieve International Recognition and Shared Approval Status

The new standard released summer 2020



This international standard was developed in accordance with internationally recognized principles on standardization established in the Decisi
Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade

Designation: F3457 – 20

Standard Guide for Aircraft Certification Education Standards for Engineers a Professionals in Aerospace Industry[1]

This standard is issued under the fixed designation F3457; the number immediately following the designation indicates the ye original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapprov superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 The purpose of this guide is to address the fundamental subject and content knowledge requirements and outcomes of aircraft certification educational training courses for engineers and professionals in the aerospace industry. The content may be more broadly applicable. The standards envisioned within this guide are intended to be usable globally.

1.2 *Background*—The standards envisioned within this guide are intended to be usable globally. There are certification requirements specific to each country's respective civil aviation authority (CAA) (for example, published guidance from applicable CAA) concerning the acceptable use and application thereof. For example, some engineering approval processes vary from country to country. Regardless of an engineering process's name or description, to the maximum extent possible, the standards to be developed from this guide should account for engineering approvals that support aircraft certification globally.

1.2.1 Through education standards that are created and accepted by CAAs and industry, engineers and professionals in the aerospace industry will have the knowledge and skills necessary to successfully carry out aircraft design certification projects using these standards for professional training and curriculum accreditation. Compliance data will be developed by engineers who have gained foundational knowledge in aircraft certification through training developed according to globally recognized consensus standards.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accor-*

Development of International Standards, G mendations issued by the World Trade Orga Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*[2]
F3060 Terminology for Aircraft
F3264 Specification for Normal Category fication
F3376 Guide for Core Competencies for nance Personnel
2.2 *Federal Aviation Administration (FA*
Order 8110.4C Type Certification
Advisory Circular (AC) 21-40A Guide Supplemental Type Certificate
The FAA and Industry Guide to Product
2.3 *Other Standards:*[4]
ATA iSpec 2200 Information Standards f tenance

3. Terminology

3.1 See terminology in accordance with T (current version is F3060-20).

3.2 See Table 1 for task performance an nitions.

3.3 *Explanations for Task Knowledge mance Levels:*

3.3.1 A task knowledge scale value may with a task performance scale value to knowledge for a specific task.

3.3.2 Task performance level is determin in a certification project or a mock certific ducted by an educational institution.

WG 65044 Facts and Future Direction

Key Facts

- Outlined 3 levels each for Task Performance and Task Knowledge:
  - 1 Professional
  - 2 Expert
  - 3 Advanced

WG Included Wide Representation:

-FAA

-NATCA

-MROs

-OEMs

-Academia

-Suppliers

-Independent Consultants

Future Direction

- Developing Knowledge Test Bank
- Credit for DER/DAR?
- Credit for ODA unit member?
- Recurrent?

Subcommittee Updates cont'd.

F46.02 Avionics and Information Technology Endorsements

Published surveillance and install standards and are actively working on the test question banks.

F3245-19 Standard Guide for Aircraft Electronics Technician Personnel Certification – Revised

F3362-18 Standard Guide for Onboard Communication & Safety Systems Personnel Certification

F3425-20 Standard Guide for Aircraft Electronics Installation Technician Certification
F3450-20 Standard Guide for Flight Hazard and Surveillance Systems Personnel Certification

WK64987 Autopilot & Flight Control Systems

WK70986 Software, Configuration, and Database Management

F46.03 Airframe and Systems Endorsements

The group is talking to the Rotorcraft Industry about creating a Rotorcraft endorsement for this standard.

WK55185 Airframe and Systems Personnel In final ballot process

F46.04 Powerplant Endorsements

WK59806 Powerplant Personnel Certification Working group making great progress. Spring 2021 ETA for draft Standard

F46.05 Furnishings and Equipment Endorsements – Subcommittee Chair needed

Subcommittee Updates

F46.06 Autonomous and Electric Aircraft Maintenance Personnel

The task group subdivided into avionics and airframe/powerplant focused groups which meet weekly. Nick Brown is running the avionics side and they are moving quickly. The existing ASTM standard from F38 and the original NCATT UAS standards are being utilized to perform a gap analysis. Will shape the standard to be like AET and tailor requirements for UAS. Strong SME support from industry and academia.

WK71061 Lightweight UAS Maintenance Technician Qualification (Technical Contact: Brad Hayden)

F46.07 Cabin Crew Personnel Subcommittee – Chair

Carolyn getting an impressive group of Cabin Crew Personnel together. Testing has been ongoing. The current test's academic requirements will be translated into a new ASTM standard utilizing collaboration tools formatted from other F 46 Sub Committees.

FAA Acceptance as an Alternate Means of Compliance to F46 Standards

Aircraft Electronics Technician (AET) certification - F46.02

The FAA has formally recognized ASTM's National Center for Aerospace and Transportation Technologies (NCATT) Aircraft Electronics Technician (AET) certification as equivalent to formal training when showing eligibility for earning a repairman certificate in response to an October 2018 petition from the Aircraft Electronics Association.

"After careful review of the NCATT AET certification and endorsement program, we find that these certifications demonstrate the technicians' knowledge base and will assess the competencies of the qualified individual," wrote Jackie L. Black, manager of the FAA's Aircraft Maintenance Division, in a Dec. 7, 2018, letter to the AEA.

Black further wrote that the NCATT AET certification, along with a minimum of one additional endorsement, meets the intent of the regulation stated in 14 CFR section 65.101 (a)(5)(ii) for the issuance of a repairman's certificate.

FAA Acceptance as an Alternate Means of Compliance

FAA Involvement of the Aircraft Certification Education Standards for Engineers and Professionals in Aerospace Industry - F46.01

The FAA and NATCA (Aerospace Engineers of the FAA) have been directly involved in the development of the Aircraft Certification Education Standards for Engineers and Professionals in Aerospace Industry Working Group since its foundation in 2018. The recently released Standard will assist the FAA in developing new professional credentialing criteria for Designated Engineering Representatives.

This standard may also be used by AIR 9 for FAA workforce development needs of their internal Aerospace Engineers and Airworthiness professionals.

Industry & DOD Acceptance of F46 Standards

Aircraft Electronics Association - Petitioner to FAA for utilizing AET as an AMOC to meet the 18-month experience requirement for Repairmen as certified under FAR 145.

Sponsor of many AET tests provided free Avionics Technician applicants.

President – Mike Adamson Founding member of F46 and NCATT

NBAA –Maintenance Manager's Committee

Advanced Education and Training Sub-Committee

GAMA – Christine DeJong –

Joint Task Group Chair for ASTM F37, F38, F44 & F46. ASTM Standards expert and previous staff member experience in standing up F 46 working for ASTM.

NATCA FAA Aerospace Engineers – Tomaso DiPaolo

Many MRO's such as **Spirit Aeronautics & Garmin International** utilize the AET as a prerequisite requirement for the hiring of Avionics Technicians & Electricians. Other Certifications such as Foreign Object Elimination are a part of many FAA approved training program for Repair Stations.

U.S. Navy COOL Program – Assists transitioning Vets with industry credentialing and licensures.

Academic Members in F46

Kansas State University Aerospace Engineering Program – Professor Kurt Barnhart founding and active member of F46

Embry Riddle University – Professor Chuck Horning founding & active member of F46

Kent Career Tech Center – Nick Brown is leading the Avionics Working Group for F46.06 E/VTOL Personnel. He teaches High School students avionics using the AET test as the final in a Vocational Education program in Grand Rapids, MI.

Purdue University - J. M. Thom **-** Associate Professor
Aeronautical Engineering Technology
School of Aviation and Transportation Technology

Academic Programs accredited to F 46 Standards- 32

Aviation centric schools such as Spartan, PIA, Flight Safety Int'l., George T. Baker, AIM are included in our membership.

Industry Acceptance of F46 Standards

Aircraft Electronics Technicians (AET) certifications – 3244

AET Endorsements ie. Autonomous Navigation Systems - 1270

Foreign Object Elimination certifications - 907

Unmanned Aircraft Systems certifications - 40

Cabin Crew Member certifications - 34

Aircraft Assembler - 20

Panels 2&3: Moderated Q&A

Moderator:

- Mary Mikolajewski, ASTM International

Panelists:

F37 Light Sport Aircraft -

- *Adam Morrison, Streamline Designs LLC*
- *Steve Hamblin, Virgin Galactic*

F38 Unmanned Aircraft Systems -

- *Phil Kenul, Trivector Services*
- *Ajay Sehgal, Wyle*

F39 Aircraft Systems -

- *Ric Peri, Aircraft Electronics Association*

F44 General Aviation Aircraft -

- *Christine DeJong Bernat, General Aviation Manufacturers Association*
- *Christoph Genster, Diamond Aircraft*

F46 Aerospace Personnel -

- *Rich Ochs, Spirits Aeronautics*
- *Kurt Barnhart, Kansas State University Polytechnic*

Questions for a Panelist?

Please use Webex Chat

Panel 4: Advisory Committee Programs for 2021

Moderator:

- Kristy Straiton, ASTM International (Manager F46)

Panelists:

- AC377 Autonomy in Aviation - Stephen Cook, Northrop Grumman
- AC433 eVTOL Certification - Tom Gunnarson, Wisk
- AC478 BLOS Strategy & Roadmapping - Adam Morrison, Streamline Designs LLC

Questions for a Panelist? Please use Webex Chat

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AC377 Autonomy in Aviation

Panel 4: Advisory Committee Programs for 2021

26 January 2021

Stephen Cook, Northrop Grumman

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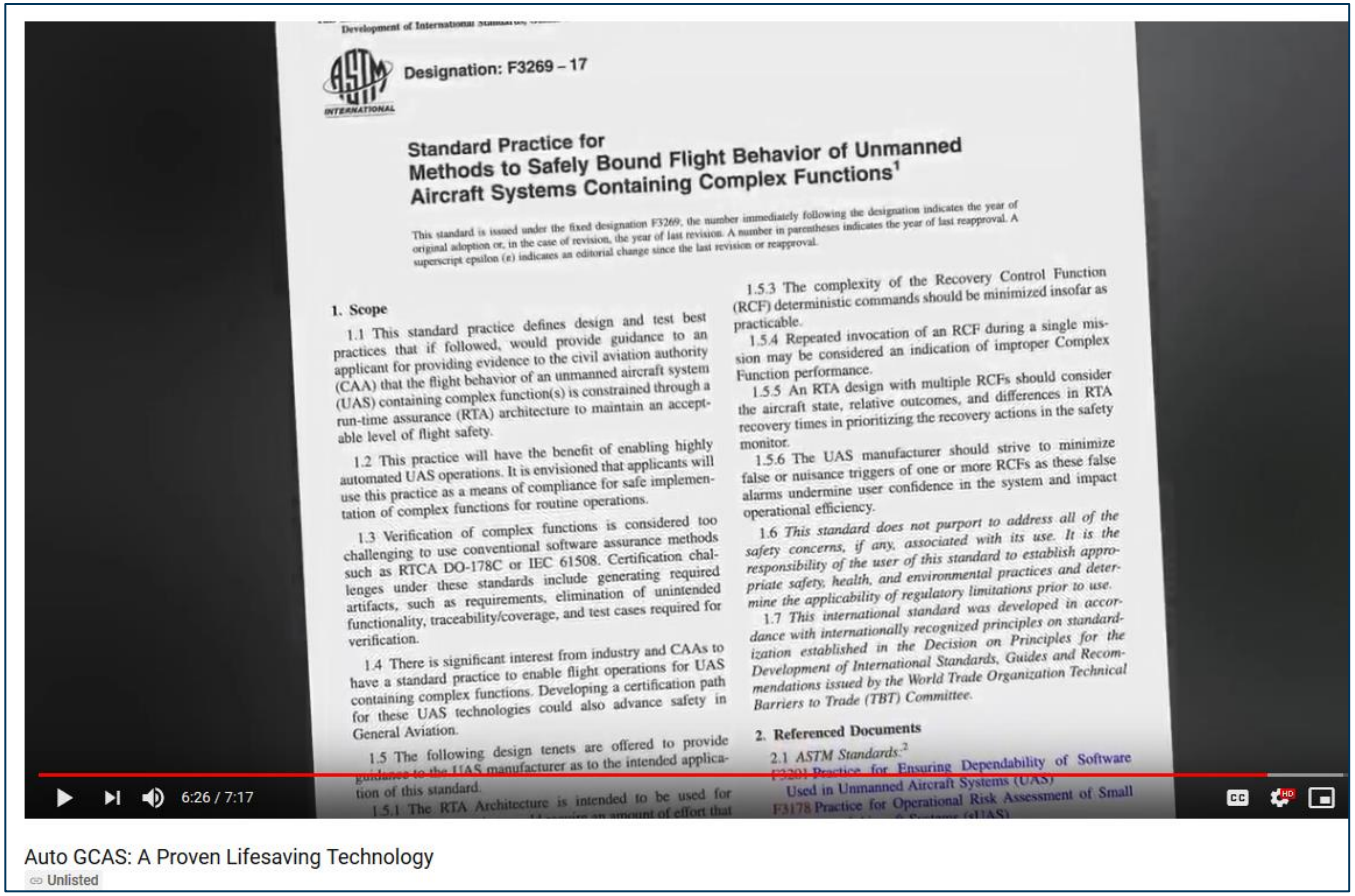
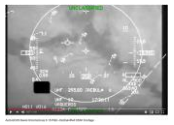
“The Age of Autonomy”



“Auto GCAS set certification standards that marked aviation’s entry into the age of autonomy”

https://www.youtube.com/watch?v=WkZGL7RQBVw



Aviation is becoming increasingly autonomous

Is a Cambrian Explosion Coming for Robotics?

Gill A. Pratt

JOURNAL OF ECONOMIC PERSPECTIVES

8 key drivers: computing performance, design tools, energy storage, power efficiency, wireless digital communications, networking, data storage, and global computing power

Possible benefits of bringing autonomy into aviation

Improved Light sport and general aviation safety

Refuse-to-crash

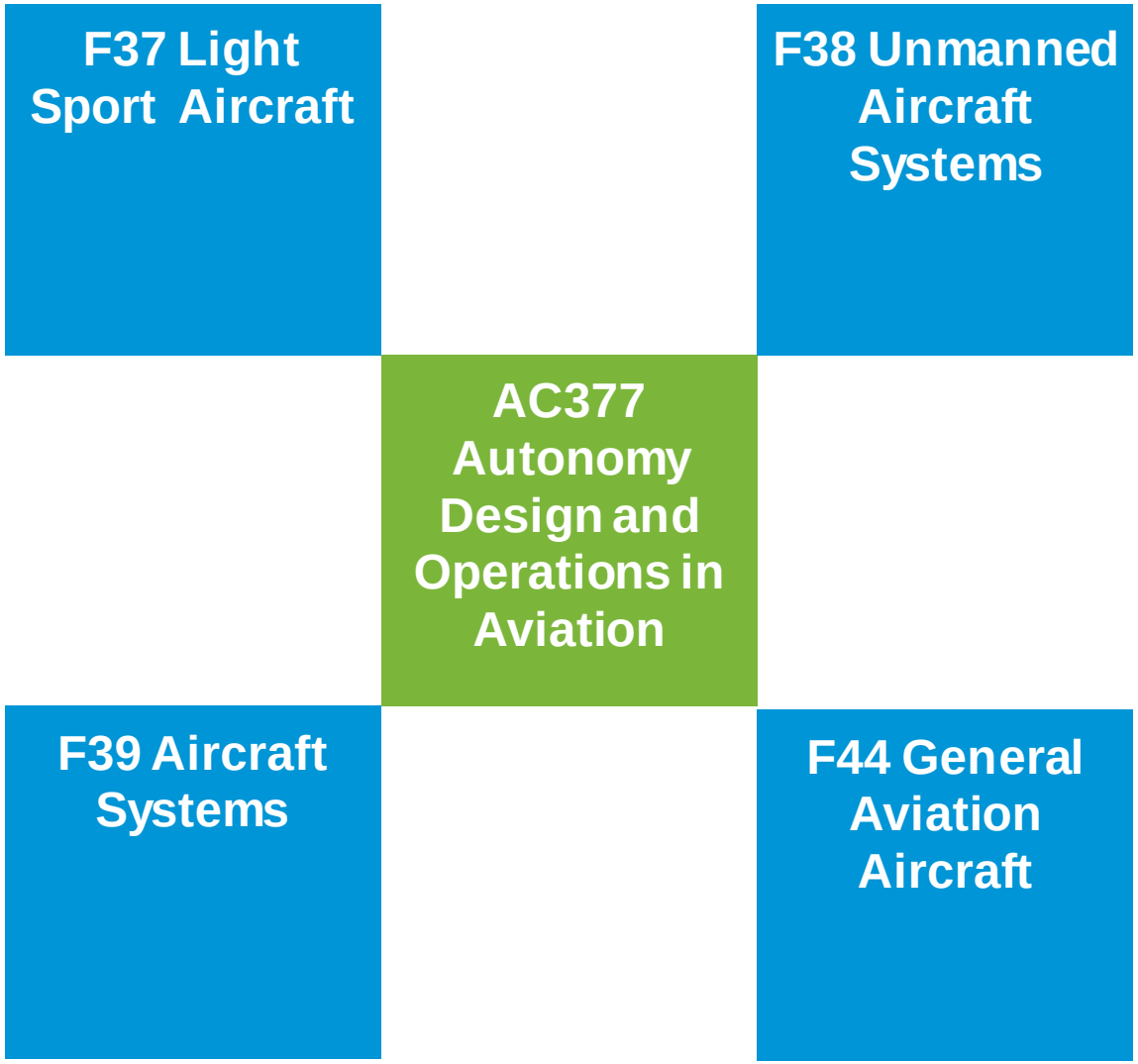
New UAS applications

Automated collision avoidance

System robustness and certification

Advanced aerial mobility - unlock underutilized areas of airspace

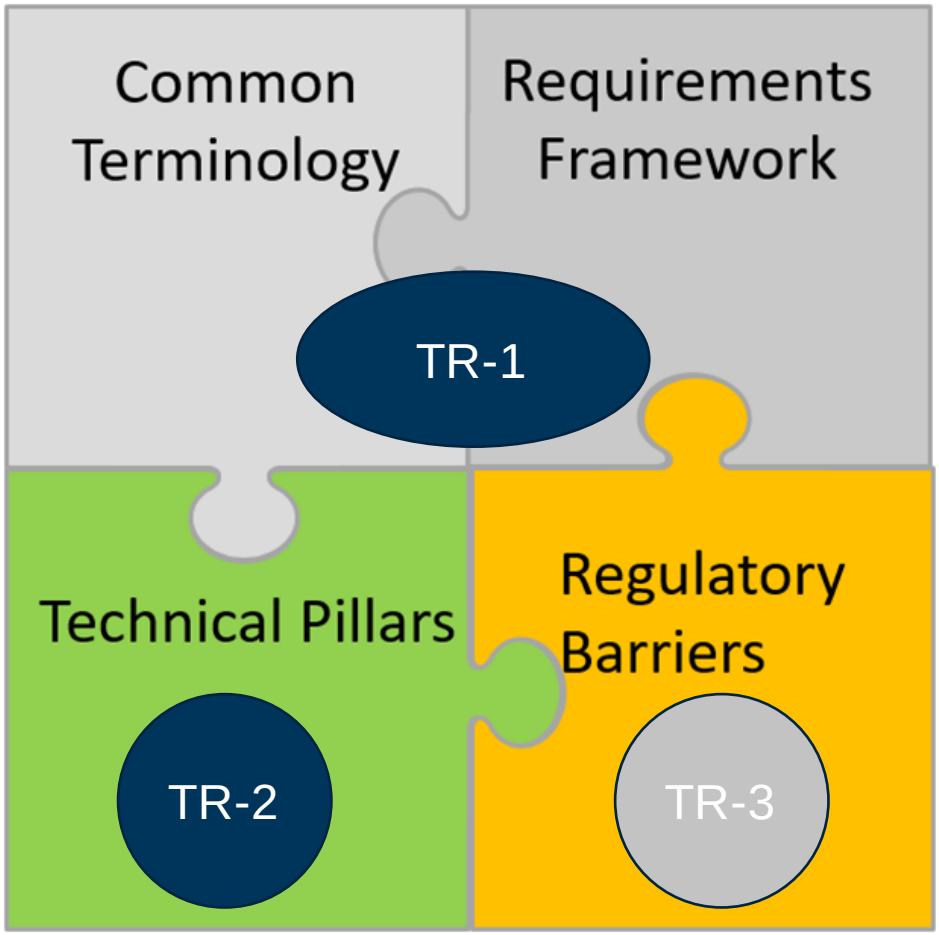
ASTM AC377 – Supporting Aviation Committees



5 Areas of Focus for AC377:

- Terminology
- Requirements framework for certification
- Design "pillars" of autonomy
- Regulatory barriers
- Standards Gaps

AC377 proposes a Holistic Approach to safely incorporate autonomy in aviation



Bring stakeholders together from industry, government, academia, research, operations, etc.

Build consensus recommendations regarding autonomy for standards committees

Publish recommendations in the form of Technical Reports:

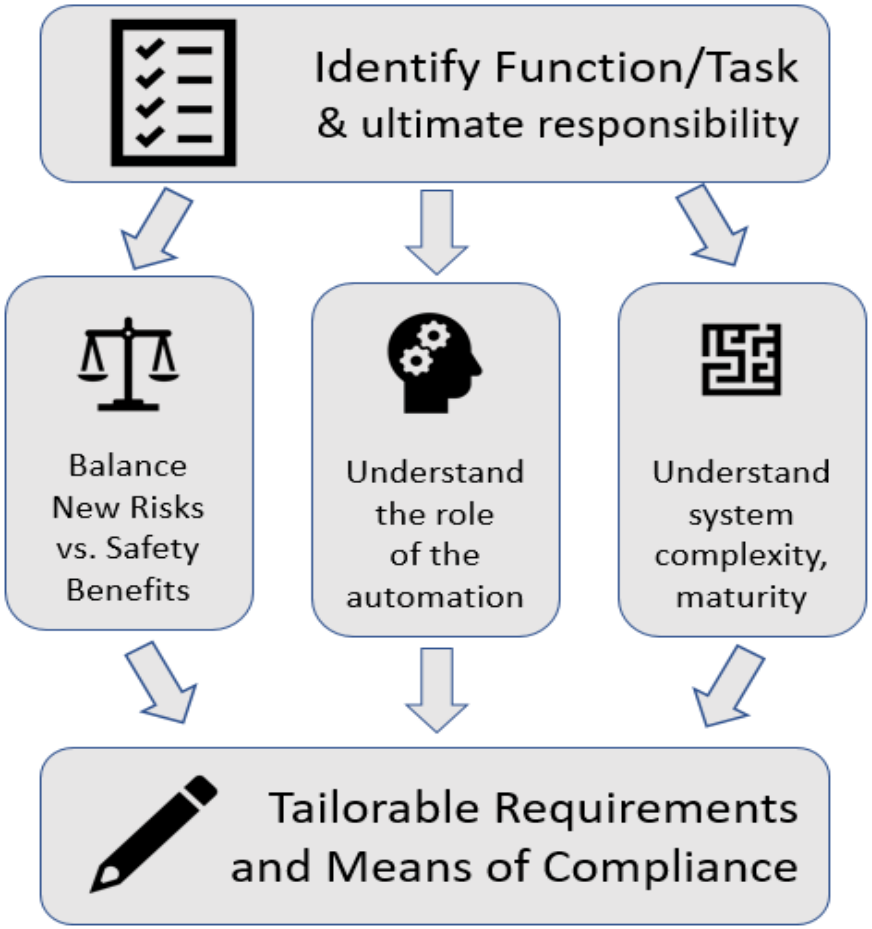
- Terminology and Requirements Framework – 2019
- Technical Pillars – 2020
- Regulatory Barriers - 2021

Common Terminology

"Language, and primarily written language, is the prerequisite for our modern technology" – Wolfgang Teubert

- Goal: Promote consistent standards development and reuse
- Reviewed multiple government and industry sources of terminology and definitions
- Wrote own definitions as a last resort
- Produced definitions for 51 terms

Requirements Framework



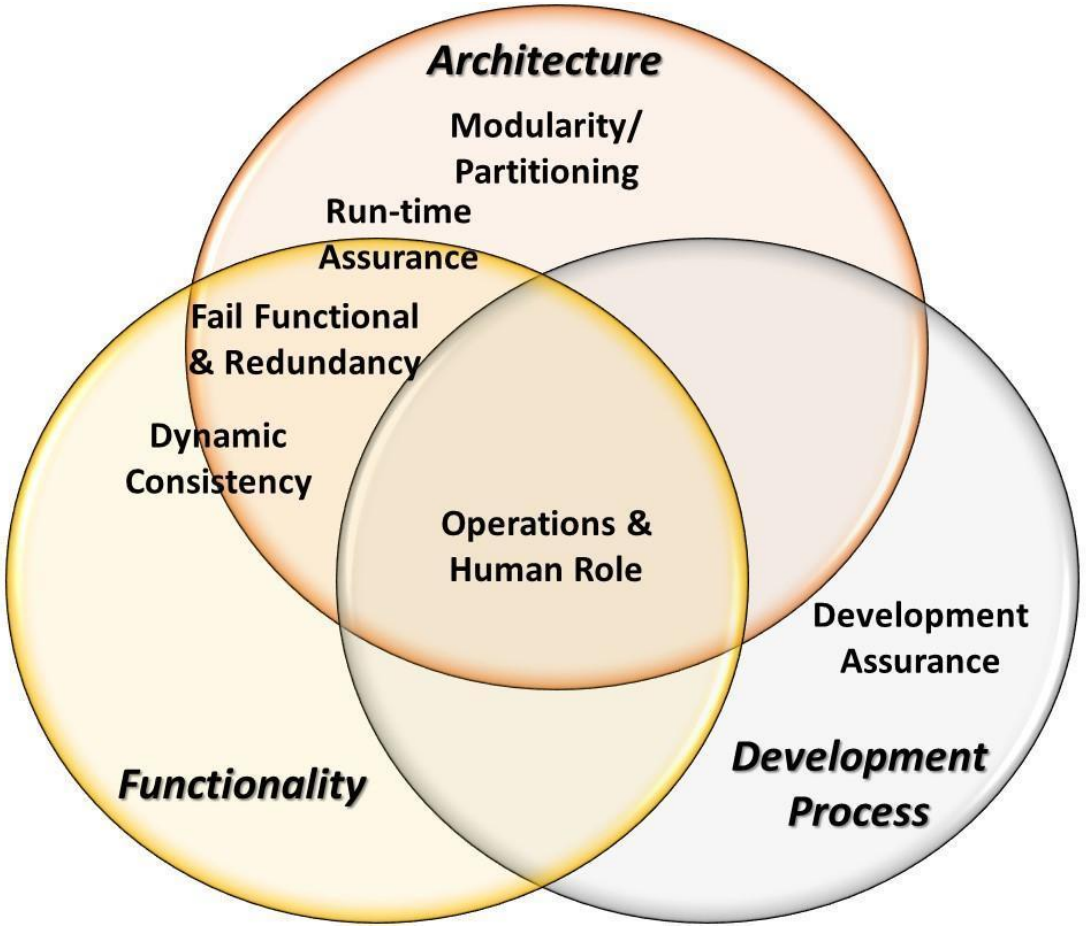
Decompose the function that is being automated

Then look at 3 sets of questions:

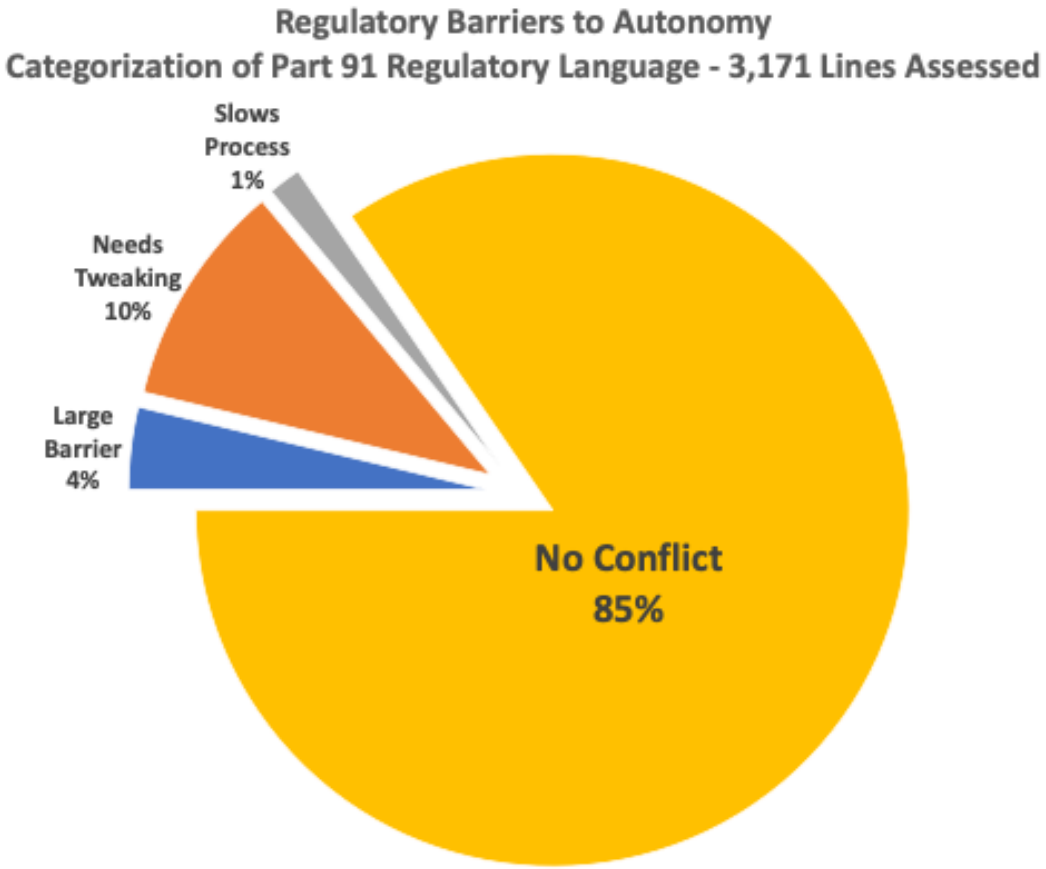
- Risks vs. benefits of the automation
- Role of the automation
- Complexity and maturity of the automation

Pillars of Autonomy

What are the foundational technologies that can safely enable autonomy?



Regulatory Barriers



Our aviation system was developed on the assumption of the human performing most of the functions

As functionality is shifted from humans entirely to systems without potential human direct oversight, we must understand the compatibility with the aviation regulatory system

Conclusions

- Autonomy has the potential to improve aviation by increasing safety and enabling new aviation applications
- Aviation standards bodies like ASTM can support development of means of compliance for increasingly autonomous systems through consensus standards
- AC377 is using a holistic approach:
  - Use of common terminology
  - Consistent framework for developing requirements and means of compliance
  - Understanding of the developmental pillars of autonomy
  - Identification of regulatory barriers associated with human-centric regulations
  - *Newest effort: Identification of aviation autonomy standards gaps*

Together we can safely bring aviation into the age of autonomy

Thank you!

Task Group Participation Questions

Stephen Cook, AC377 Chair
NG Fellow, Airworthiness
Stephen.Cook@ngc.com

Task Group Operations Questions

Len Morrissey, Director
ASTM Global Business Development and Strategy
lmorriss@astm.org

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AC433 eVTOL Certification

Panel 4: Advisory Committee Programs for 2021

26 January 2021

Tom Gunnarson, Wisk

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AC 433

F44.90.01 Advanced Technologies Gap Analysis and Activity Update

ASTM International 1st Annual Advancements in Means of Compliance Workshop

January 26, 2021

Tom Gunnarson | Wisk

F44.90.01 Task Group on Emerging Technology

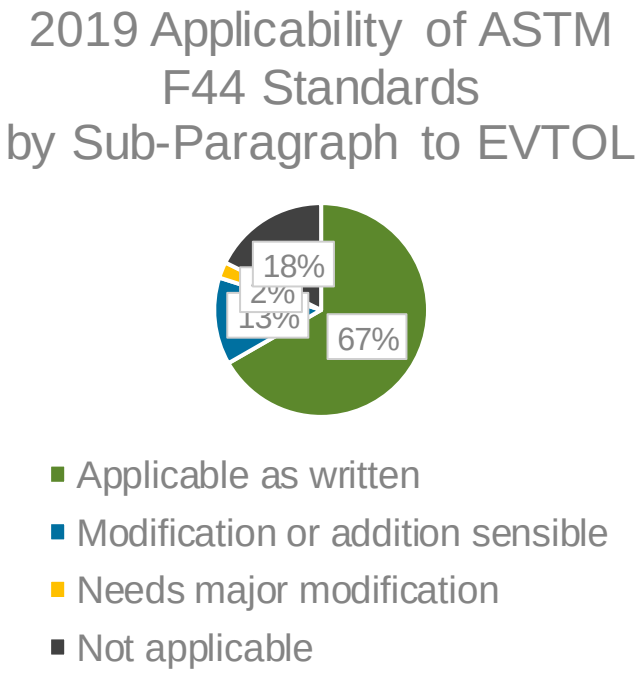
Chair: Tom Gunnarson, Wisk

Scope:

- Capture information about emerging technology and trends that could be applicable to future aviation standards development.
- The F44 executive subcommittee will use this to establish new work as it applies to General Aviation Aircraft on an as-needed basis.
- It will also share this with other ASTM aviation committees for their consideration.

AC433 Means of Compliance for eVTOL Aircraft: Gap Analysis of CS/Part 23 MoC

- Based on CS/Part 23 Performance Based Rules (PBR) to accommodate new technologies
- Covers eVTOL aircraft, simplified vehicle operations, and complex systems
- Currently 22 work items, 1 retired within AC433
- Bi-monthly update calls with reports to GAMA, ASTM, industry, and authorities as needed



AC433 Activity Update

- Items are revisions to existing standards and a few are new
- Activity supports cooperation between FAA, EASA and other CAA activity in this trade space
- New items are added as need is discovered
- Items cover wide spectrum from Distributed Electric Propulsion to Handling to Bird Strike
- Several items have been through at least one ballot cycle
- Some items cross to other committees, holistic approach
- Looking for more scoping and drafting support from eVTOL industry

AC433 Work Item status as of Jan 2021

Subject/Title	Distance to Ballot	Industry Priority	Existing Standard	Sub Comm	WK number	Lead
Electric Propulsion Unit Design (EPU)	1	1	F3338	F39.05	WK67455	Peter Lyons
Electric Propulsion Energy Storage Systems (ESS)	3	1	NONE	F39.05	WK56255	Tom Gunnarson
Emergency Conditions	5	2	F3083	F44.30	WK68781	Eric Nottorf
Bird Strike	5	2	F3114	F44.30	WK68805	Eric Nottorf
Handling Characteristics	4	2	F3173	F44.20	~~WK68839~~ WK63578	Mike Feary
Performance	4	2	F3179	F44.20	~~WK68838~~ WK63580	Nick Borer
Energy Shedding (Crashworthiness)	4	2	F3239	F44.40	WK65629	Tine Tomazic
Electric Propulsion Unit Design (EPU)	1	2	F3338	F39.05	WK66523 | (new: WK68764)	William Fletcher
Integral Thrusters	2	2	F3338	F39.05	WK70381	Srinivas Chunduru
Aircraft Powerplant Control and Indication	1	3	F3064	F44.40	WK68803	Carlos Mourão & Herb Schlickenmaier
Aircraft Propeller System Installation	1	3	F3065	F44.40	WK68801	Herb Schlickenmaier
Powerplant Hazard Mitigation	1	3	F3066	F44.40	WK68795	Herb Schlickenmaier
Safety Assessment of Systems and Equipment	5	3	F3230	F44.50	WK68765	Ryan Naru
Distributed Electric Propulsion	2	3	F3239	F44.40	WK66028	Herb Schlickenmaier
Inadvertent Icing	3	3	NONE	F44.10	WK68757	Garrett Holand
Simplified Vehicle Operations (SVO)	3	3	NONE	F44.50	WK68767	Carl (Anna) Dietrich
Weight and CG	3	4	F3082	F44.20	WK68849	Larry Van Dyke
Crew Interface - SVO modifications/coordination	5	4	F3117	F44.10	WK68779	Anna Dietrich
Specification for Low-Speed Flight Characteristics of Aircraft	5	4	F3180	F44.20	~~WK68850~~ WK70924	Nick Borer
Maintenance Standards	5	4	NONE	F44.10 - may move to F46	WK68762	Ryan Naru
Design Loads and Conditions	5	4	F3116	F44.30	Pending	Jose Martin
Acoustic Evaluation Practice	5	5	NONE	F44.10	WK68763	Ryan Naru
Sensor Fusion	5	5	NONE	F44.50	WK68766	~~Doug Davidson~~ David Rottblatt?
Aircraft Electric Propulsion System (EPS) Design & Installation	OBE	OBE	F3239	F44.40	WK65620	Christoph Genster

Stakeholder Connection

- Industry driving innovation and has need for clear aircraft and operational certification path
- ASTM bringing stakeholders together to:
  - Highlight issues and help direct efforts
  - Develop guidance and means of compliance for industry, authorities and policy makers
  - Support AAM regulatory and standards development worldwide
- Many industry members are active in standards development
- Industry driving the coordination of SDO activity with support from regulators
- Working together “raises all boats”

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AC478—BLOS Strategy & Roadmapping for UAS

Advancements in Means of Compliance Workshop
26 January 2021

Adam Morrison
Streamline Designs

www.astm.org

About AC478 on BLOS Strategy

- Formed in 2019 to focus on setting a robust strategy for a standards-based approach to BVLOS
  - Move away from tactical solution
  - Unlock certification/approval pathways
- Core group of about 18 active participants, pretty much all from Committee F38
- Overall Vision (Condensed Version)

  Routine, commercial operations are enabled through a clear and regulator-accepted, standards-based path to system and operational approval for any operation where the Unmanned Aircraft (UA) may not be visible to the Remote Pilot (RP) or within [direct] radio line of sight.

  The functions and/or topics needed in supporting standards are clearly identified and prioritized with a plan and sequence for their development.

About AC478 on BLOS Strategy

- Scope of Work
  - Beyond visual or radio line of sight (near or far). This is generically called “BLOS”.
  - Civil, commercial operations; not military, public use, etc.
  - Any operational framework (Part 91, Part 107, Part 135, etc.).
  - Mass of the UA is not a factor. Physical size, however, is relevant as it relates to visibility.
  - The outputs should have relevance internationally.
  - The roadmap and strategy should work with or without UAS Traffic Management (UTM). For the purposes of this work, UTM is one possible mechanism to deliver functions needed for BLOS operations.

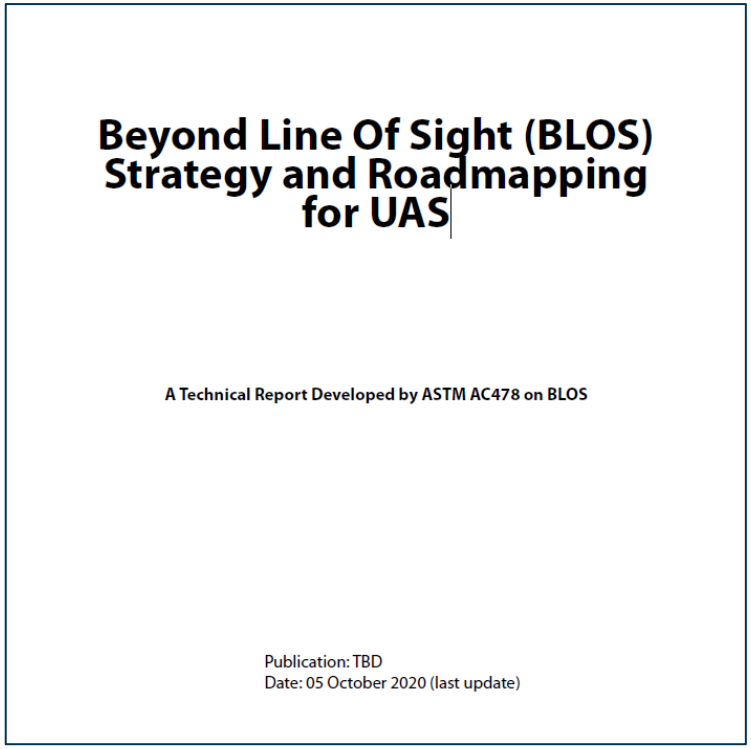
Timeline and Activities

- Sept-Dec 2019
  - Characterize the problem statement
  - Establish working frameworks, terminology, concepts, and deliverables
  - Evaluate existing BVLOS standard
- 2020
  - Build out deliverables
  - Publish initial strategy and standards roadmap with at least near-term coverage
  - Begin outreach to new standards development
- 2021-Q1
  - Publish ASTM Technical Report: “Beyond Line Of Sight (BLOS) Strategy and Roadmapping for Unmanned Aircraft Systems (UAS)”
  - Work through initial strategy implementation plan with F38
  - Regulator engagement
- 2021-Q2+
  - Outreach to standards task groups
  - Refinements to strategy and roadmap

AC478 Initial Deliverables

Deliver a report containing:

- Strategy and framework concept to establish robustness, scalability, flexibility, and compatibility with regulatory frameworks
- Essential Functions identification and definition
- Common operational scenarios as test cases for the framework
- Standards development roadmap for BLOS
  - Strategic sequencing for standards development for essential functions aligned with reasonable time horizons
  - Consideration of priority of market demands and market relevance of functions
- Draft Terms of Reference (TOR) for standard development needs
  - 'Prime the pump' for standards task group work within F38
- A plan for regular maintenance and updates to the report and roadmap



Strategy Concept and Framework

- Robust
  - Far-ranging use cases demand robust underpinnings.
  - Purely tactical solutions are not likely to deliver for the whole industry and may not be right-sized for varied operations.
- Modularity through "Essential Functions"
  - Systems engineering approach to boil down the fundamental needs into a *right-sized* set of "Essential Functions" that can be standardized.
  - "Essential Functions" are all potentially relevant to any BLOS operation.
  - A set of "ingredients" that span both system and operational aspects.
- Scalability & Flexibility
  - Performance measures of Essential Functions must be defined and standardized *without* prescribing the limits of acceptability for a particular CONOPS.
  - Avoids highest/least common denominator problems.
- Implementation Agnostic
  - Method of achieving functional performance is not prescribed.

Strategy Concept and Framework

- Transparency
  - System manufacturers and operators report their performance for specific functions transparently in accordance with standardized definitions so that the outcomes are more universal.
- Pathway to Certification/Approval through Assignment of Functions and Performance
  - Needed Essential Functions and level of performance for each function can be selected on an as-needed basis based on the operation/CONOPS desired (risk overlay).
  - Compliance to the applicable standards to the performance level deemed acceptable by regulators creates a standards-based pathway to approval.
  - Regulators are provided a list of 'ingredients' (functions) and performance measures to conduct risk evaluations for managing safety. Over time, industry can develop Standard Practices for the application of common use cases as 'recipes' that use the right amount of the right 'ingredients'.

Essential Functions (Current)

High-level functions that may be needed for any given BLOS operation

1. Handoff from one pilot to another
2. Link handoff
3. Command system/aircraft
4. RPIC system status notification
5. Aircraft & airborne hazard avoidance
6. Terrain & obstacle avoidance
7. Alerting other airspace users to contingency situations
8. Geo-awareness
9. Maintain operations within limitations
10. Provide cybersecurity
11. Positioning assurance
12. Navigation
13. Time synchronization
14. Remote ID
15. Autonomy & automation
16. Risk evaluation
17. Ability to land safely
18. Weather
19. Path-planning within the rules (4D trajectory)
20. Contingency planning

Current Status

- Technical Report is about 70% complete (current draft is ~52 pages)
- Remaining development:
  - Terms of Reference (about 40% complete)
  - Sequencing of roadmap
  - Additional graphics to illustrate key concepts
  - Final review, editing, and scrubbing
- Initial discussions with ASTM about publishing Technical Report have been initiated.
- Focus on publishing in 2021-Q1.

Panel 4: Moderated Q&A

- **Moderator:**
- Kristy Straiton, ASTM International (Manager F46)

- **Panelists:**
- AC377 Autonomy in Aviation - Stephen Cook, Northrop Grumman
- AC433 eVTOL Certification - Tom Gunnarson, Wisk
- AC478 BLOS Strategy & Roadmapping - Adam Morrison, Streamline Designs LLC

Questions for a Panelist?

Please use Webex Chat

Workshop Agenda

10:30-11:30	**PANEL 1: AUTHORITY ENGAGEMENT AND ACCEPTANCE OF CONSENSUS STANDARDS** ▪ Moderator, Joe Koury, ASTM International *(Manager F37, F39, F44)* ▪ EASA Reorg: Policy, Innovation & Knowledge Branch - Dominique Roland, EASA ▪ FAA Reorg: Consensus Standards Management Branch - Robert Bouza, FAA ▪ FAA Remote ID / OOP Issuances - Ben Walsh, FAA AUS
11:30-11:45	**MODERATED Q&A**
11:45-12:00	**BREAK**
12:00-12:30	**PANEL 2: AVIATION STANDARDS ACTIVITY** ▪ Moderator, Joe Koury, ASTM International *(Manager F37, F39, F44)* ▪ F37 Light Sport Aircraft - Steve Hamblin, Virgin Galactic ▪ F38 Unmanned Aircraft Systems - Ajay Sehgal. Wyle ▪ F39 Aircraft Systems - Ric Peri, Aircraft Electronics Association ▪ F44 General Aviation Aircraft - Christoph Genster, Diamond Aircraft ▪ F46 Aerospace Personnel - Kurt Barnhart, Kansas State University Polytechnic
12:30-13:45	**PANEL 3: ADVANCEMENTS ON MEANS OF COMPLIANCE** ▪ Moderator, Mary Mikolajewski, ASTM International *(Manager F38)* ▪ F37 Light Sport Aircraft - Adam Morrison, Streamline Designs LLC ▪ F38 Unmanned Aircraft Systems - Phil Kenul, Trivector Services ▪ F39 Aircraft Systems - Ric Peri, Aircraft Electronics Association ▪ F44 General Aviation Aircraft - Christine DeJong Bernat, General Aviation Manufacturers Association ▪ F46 Aerospace Personnel - Rich Ochs, Spirits Aeronautics
13:45-14:00	**MODERATED Q&A**
14:00-14:30	**PANEL 4: ADVISORY COMMITTEE PROGRAMS FOR 2021** ▪ Moderator, Kristy Straiton, ASTM International *(Manager F46)* ▪ AC377 Autonomy in Aviation - Stephen Cook, Northrop Grumman ▪ AC433 eVTOL Certification - Tom Gunnarson, Wisk ▪ AC478 BLOS Strategy & Roadmapping - Adam Morrison, Streamline Designs LLC
14:30-14:45	**MODERATED Q&A**
14:45-15:00	**CLOSING REMARKS** ▪ Jeff Grove, ASTM Vice President of Global Policy, Cooperation and Communication

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Closing Remarks

Jeff Grove
ASTM Vice President of Global Policy, Cooperation and Communication

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Presentations will be made available post-event by ASTM HQ.