ANSI Unmanned Aircraft Systems Standardization Collaborative (UASSC)

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Vertical Infrastructure Inspections

- Use cases:
  - Boilers & Pressure Vessels, Cranes, Building Facades, Low-Rise Residential and Commercial Buildings, Communications Towers
- Issues:
  - BPV – UAS not in current guidelines by ASME for BPV inspections (internal and external)
  - Cranes – regulations, location (ground, roof top, waterway), proximity (structures and infrastructure), public safety, environment (weather, navigation, communications)
  - Building Facades – regulations, environment (weather, navigation, communications), public safety (e.g. Sep 12th – **DJI Phantom Crashes Inspecting Sinking Millennium Tower in San Francisco)**
  - LR Res & Com Properties – location (confined space within property boundaries), flight path (VLOS, low altitude, over people)
  - Comms Towers – location (open v confined space, ground, roof top), proximity, environment (weather, navigation, communications), flight path (VLOS, low altitude, over people)

Vertical Infrastructure Inspections (cont..)

- Gaps:
  - No known published standards covering the use of UAS for these types of Vertical Infrastructure Inspections.
  - There is a need for a set of best practices or standard operating procedures (SOP) to inform industry practitioners on how to conduct Vertical Infrastructure Inspections using UAS
    - For example, NATE best practices published in Jan. 2017: "Unmanned Aerial Systems Operations Around Vertical Communications Infrastructure")
- Recommendations:
  - BPV – develop standards for UAS BPV inspections (both internal and external)
  - Cranes – complete work on ASME B30.32 to address crane inspections using UAS
  - Building Facades – expand work on ASTM WK58243, *Visual Inspection of Building Facade using Drone* to include non-visual sensors
  - LR Res & Com Properties – develop a guide or SOPs for low-rise residential and commercial inspections using UAS
  - Comms Towers – conduct more research to determine what standards, if any, are required for inspections using UAS

Linear Infrastructure Inspections

- Use cases: Bridges, Railroads, Power Transmission Lines
- Issues:
  - Bridges – features (type, size, location), flight path (access, VLOS v BVLOS, low altitude, impact on traffic), environment (weather, navigation, communications
  - Railroads – location (urban v country), proximity (structures, infrastructure, hazardous materials), flight path (confined space v open space, VLOS v BVLOS, low altitude, over people), environment (weather, navigation, communications)
  - Power Transmission Lines – location (urban v country), proximity (power and telecommunication assets share transmission corridors),flight path (confined space v open space, VLOS v BVLOS, low altitude, over people), high-risk environment (high voltage assets, potential EMI, weather, navigation, communications

Linear Infrastructure Inspections (cont..)

- Gaps:
  - Bridges – there are no known published or in-development standards for conducting bridge inspections using a UAS.
  - Railroads – a standard is needed to address rolling stock inspections by UAS for regulatory compliance of transporting hazardous materials. Standards are also needed to address BVLOS and night operations for railroad inspection.
  - Power Transmission Lines – a standard is needed to address UAS pilot qualifications and operational best practices in how to conduct a safe inspection of power transmission lines using UAS.
- Recommendations:
  - Develop standards for the use of UAS to conduct inspections of Linear Infrastructure, including bridges, railroads and power transmission lines. These standards should address the potential for UAS BVLOS and night operation.
  - Railroads – develop guidance incorporating OSHA and FRA requirements for performing UAS inspections of hazardous material rolling stock.

Wide Area Environment Infrastructure Inspections/ Precision Agriculture

- Use cases: Environmental Monitoring, Pesticide Application, Livestock Monitoring and Pasture Management
- Issues:
  - Environmental Monitoring – location (open space), proximity (structures and infrastructure), flight path (BVLOS, low altitude, over people), environment (weather, navigation, communications), policy and regulatory (framework lags behind technology)
  - Pesticide Application – application type (precision, spot, wide area), location (open space), proximity (obstacles, people, animals, etc.), flight path (VLOS v BVLOS, low altitude – statistically dangerous), public safety (error margins), environment (weather, navigation, communications)
  - Livestock Monitoring and Pasture Management – location (confined space within property boundaries), proximity (obstacles), flight path (VLOS v BVLOS, low altitude), environment (weather, navigation, communications)

Wide Area Environment Infrastructure Inspections/ Precision Agriculture (cont..)

- Gaps:
  - Environmental Monitoring – no UAS standards gap identified. Best practices are available through published articles and non-profit environmental organizations, including several specifically relating to the use of UAS.
  - Pesticide Application – Standards are needed to address pesticide application using UAS. Issues to be addressed include operational safety, environmental protection and integration into the NAS.
  - Livestock Monitoring and Pasture Management – no UAS standards gap identified. Many published best practices for precision agriculture available, including several specifically relating to the use of UAS to monitor livestock.
- Recommendations:
  - Environmental Monitoring, Livestock Monitoring and Pasture Management – should be covered by standards being developed for UAS BVLOS operations and UAS low-altitude aerial surveys/inspections.
  - Pesticide Application – develop standards for pesticide application using UAS.

Commercial Package Delivery

- Use cases: Operations include deliveries made directly to consumer homes in suburban and rural areas and to drop-off stations in more densely populated urban areas.
- Issues:
  - location (urban, suburban, rural), proximity (structures and infrastructure), flight path (confined space v open space, VLOS v BVLOS, low altitude, over people), environment (weather, navigation, communications)
- Gaps:
  - standards are needed to enable UAS commercial package delivery operations.
  - standards and regulatory framework supporting BVLOS operations, remote ID & tracking, and UTM need to evolve before such operations can become ubiquitous.
- Recommendations:
  - complete work on ASTM WK60746, WK62344, WK27055, and WK63418.
  - consider adapting SAE J2735 for UAS.

Questions for WG3

1) Is the presentation of [use cases] issues, gaps, and recommendations for new or revised standards clearly stated?

2) What could be improved?

3) Is there any content that conflicts with or should be consolidated with another section?

4) Are there any [use cases] issues or gaps that have been overlooked?