Current UAS Airspace Access and Issues

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Topics

- Background
- Design concepts
- Competition
- FAA status
- Privacy
- Near term
- Future

Our Involvement

- UNITE, President
- NIAG 134
- FAA committees
- FAA UAS ARC
- RTCA SC 203
- RTCA SC 228
- AIA UAS subcommittee
- National Academy of Sciences

UAS Sizes

- NGC UAS
  - Global Hawk
  - Fire Scout
  - X47-B
  - Bat
- Mid range mid altitude
- Small (AeroVironment)
- Cessna 208, B737, B747

UAS Design Concepts

- Legacy aircraft designers and the FAA regulators tend to see UAS as conventional airplanes with the pilot taken out and a computer put in, bringing along all of the baggage and addressing all of the problems that can create

- Clean slate: The concept of UAS as a computer that is designed to fly

It is all engineering and integration. No new inventions are needed

Major System Design Difference PIL vs. POL

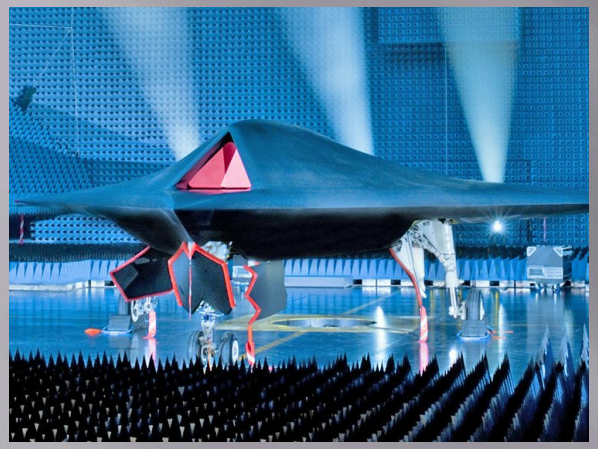
- Pilot-in-the-(control) loop is the “legacy” way of designing the system, having been done in production systems since the thirties.
  - It removes the pilot from the cockpit to a virtual cockpit on the ground or a ship, bringing along many of the problems of human operation.
  - Most current use UAS use this, with varying degrees of automation on board.
  - These are “RC” aircraft, dependent on the radio transmissions to fly the plane.

Major System Design Difference PIL vs. POL

- Pilot-on-the-loop control systems have a computer on board that is programmed to fly the plane, with the "pilot" on the ground monitoring it.
  - The POL can by keyboard instruct changes, and the computer makes the control surface movements that fly the plane as instructed.
  - Continued safe flight and landing (FAA requirement) is executed even with loss of radio link

Autonomy is Critical

- The Defense Science Board Task Force issued its final report on *The Role of Autonomy in DoD Systems*, which said that:
  - autonomy is being underutilized in DoD manned and unmanned systems
  - other nations, including potential adversaries, are investing heavily in unmanned systems and in autonomy research
  - the United States is vulnerable to falling behind the military capabilities of other nations that are exploiting this technology successfully



<Taranis supersonic bomber, Britain

Chinese HALE >

<Barracuda

Predator B

Talarion

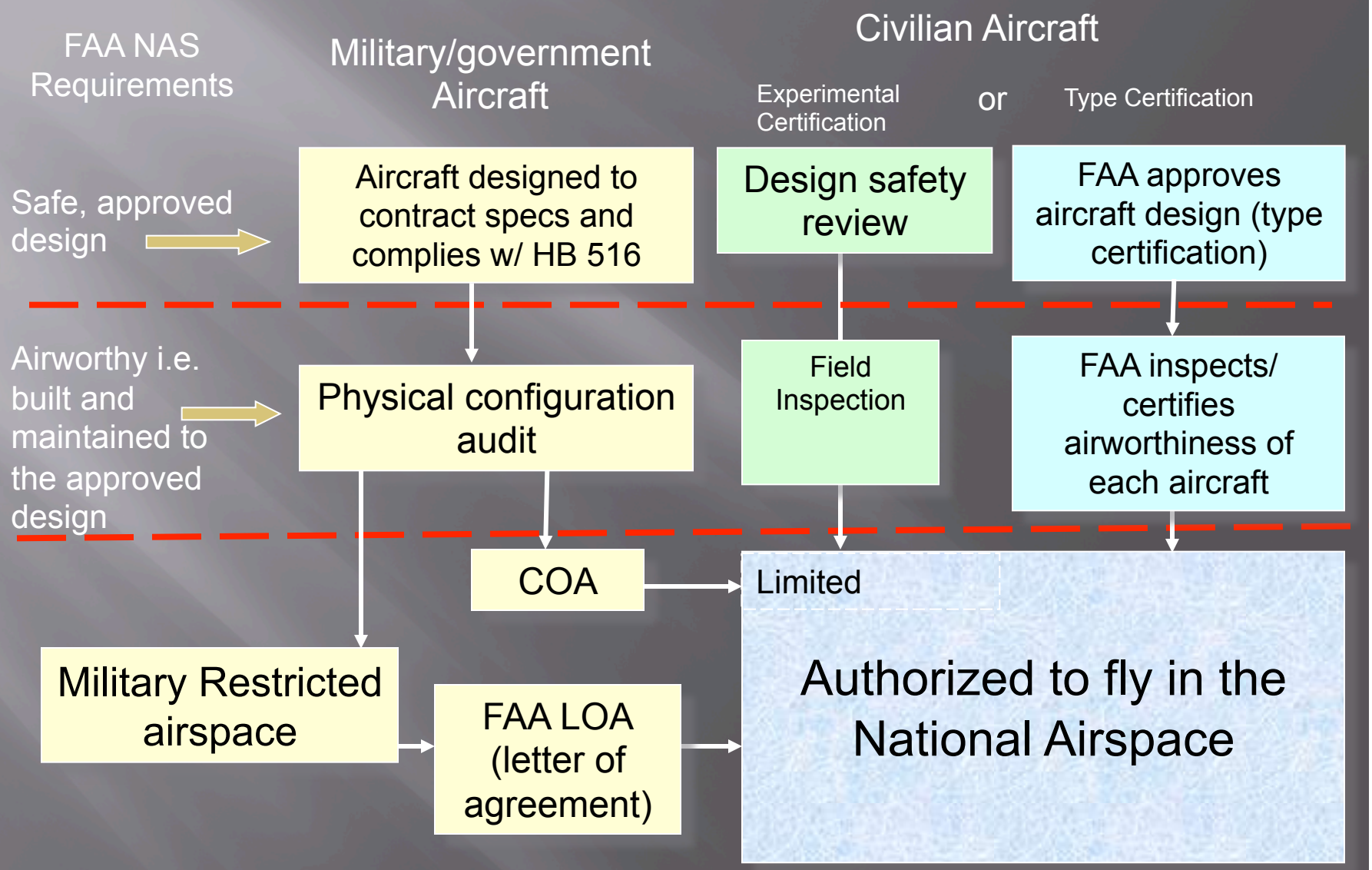
FAA Airspace Use

- Before the aircraft you design can leave the ground it must have some form of Certification, civil or military
- This includes severe restrictions on the systems and subsystems you can employ in your design, and requires extensive detailed technical information about them
- For civil cert, the requirements tend to be hardware oriented, requiring an exact item or one that you can show to exhibit an equivalent level of safety
- Problems:
  - Radical new technologies take a long time to be accepted
  - Most UAS were designed to (modified) military standards, and do not meet FAA requirements. Do you redesign from the ground up or show, where allowed, equivalent safety?

FAA Airspace Integration Situation

- Congressional mandate: "UAS integration by 2015"
  - Being interpreted by FAA as small UAS only, for several reasons
  - May miss it anyway (John Hickey, Certification Branch, FAA)
- Certification Regulations
  - UAS must presently meet manned certification regulations
  - The UAS ARC was established by the FAA to consider new regulations
- Certification Standards
  - To recognize the differences and provide means for meeting the regulations
  - FAA has tasked RTCA to develop (Special Committee 203)
  - SC 203 requires consensus for conclusions
  - The task is large and there are many committee participants
- Progress
  - Painfully slow

Routes of Access Into The NAS



FAA UAS Certification Status

- UAS under 55 lbs <u>may</u> have Type Certification available by FY 2015
- Experimental Certification is currently available to some unmanned aircraft
- Type Certification for full sized unmanned aircraft will continue to be a slow and painful process
  - 2 companies have recently achieved limited FAA Type Certifications
  - Further delayed over possible requirement for FAA to enforce privacy

The Privacy Surprise

- Made popular by the ACLU and its organizations, such as Electronic Frontier Foundation and the Electronic Privacy Information Center
  - Apparently inspired when police UAS tracking imagery was used in court in a criminal case
- AUVSI HQ was contacted by ACLU, and they worked together on the "Industry Code of Conduct" for UAS
  - Code neglected to recognize the fact that the manufacturer can not control the use or misuse of their product
- 7 or 8 bills now in Congress, with varying degrees of restriction on UAS flight, some reasonable, some not (there are also many more at the state level)
  - Some include requiring the FAA to cancel the aircraft's certification if it is used in a privacy violation
  - Some would require that the UAS be designed so that they <u>could</u> not be used to violate privacy

Civil Application

- Small UAS: public uses–police, fire, search, other public safety and health such as tracking mosquito swarms, ice melt, hurricane research
- MALE: Disaster monitoring, crop spraying, pipeline monitoring
- HALE: Long dwell disaster work, storm and hurricane watch
  - Replaces satellite where long dwell is needed
- Automated commercial freight aircraft
  - There is already a market pressure
- Automated passenger carriers
  - Safety performance will eventually overcome public reluctance

Convergence

- Manned aircraft are becoming extremely automated
  - Taxiing – automatic warnings
    - That you are lined up on the wrong runway
    - That you are entering a runway already in use
  - Takeoff
  - Landing
  - Navigation
  - Flight control
  - Command terrain avoidance
  - "Wings level" panic button
  - Stall avoidance
- Trending toward total automation, i.e. unmanned

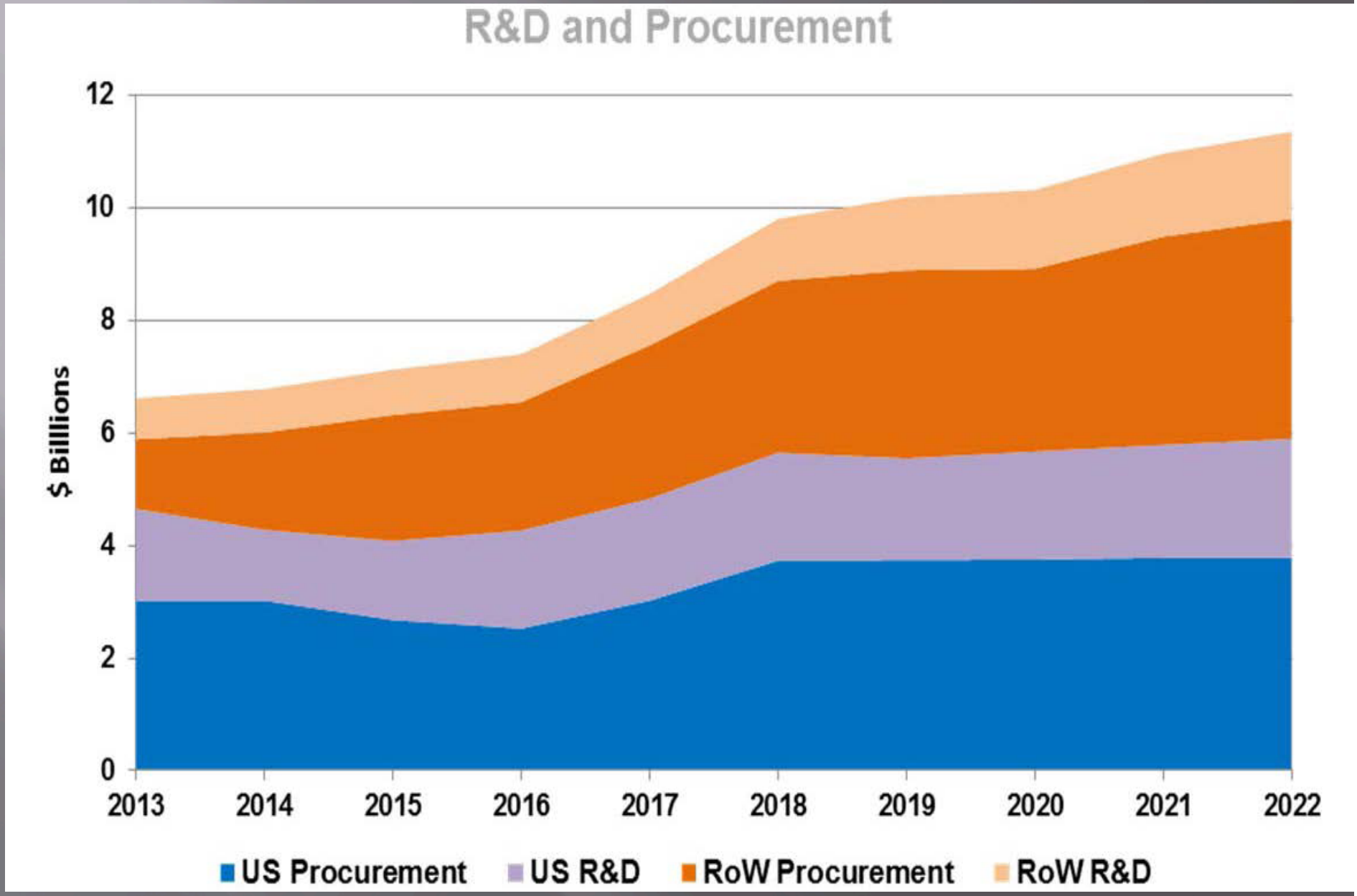
Automation is being incorporated because they are safety improvements, not for pilot convenience

Future

- Big.
  - All projections are very positive - military, public and civil

- Technologies needed to get there –
  - First: more automation, and collision avoidance in particular
  - Next: systems for automatic -
    - weather avoidance,
    - terrain avoidance,
    - obstacle avoidance,
    - complex operations such as go-around and ground operations,
    - voice command and response
  - Which means advanced software, and sensors, sensors, sensors.
  - ADS-B integration (NextGen)

Teal UAS Budget forecast, Published in the "FAA Aerospace 2013-2033 Forecast"



Thank You