The Future of Commercial Aviation and Its Spectrum Requirements

A look into the Future
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The Future of Aviation

• The future of aviation is being developed today – for automobiles.
  • Concept of not driving yourself will gain acceptance.
    • Your children/grandchildren already accept this.
    • As people age and cannot drive, a driverless car provides freedom.
  • As people release “control” to a car, they will also be comfortable with not having a pilot in the aircraft.

• No Pilot on or in the aircraft.
  • How much does this actually change the way people fly and how the air transportation system is managed?
The Future of Aviation – Spectrum Requirements

• What will be the Requirements for an Air Transportation System dominated by unmanned aircraft?
  • But first, what do we need to do?
    • Keep aircraft and passengers safe – These are the 1\textsuperscript{st}, 2\textsuperscript{nd} and 3\textsuperscript{rd} … Priorities!
    • Keep traffic moving (safely and efficiently)
  • How do we accomplish this?
    • Aircraft must be able to continue to perform these essential functions:
      • Know and provide its location, direction and speed to others (3 dimensions – Latitude/Longitude/Altitude)
      • Sense and Avoid other aircraft (respond safely and effectively) – quickly.
      • Receive commands/instructions from “pilot”/air traffic control in case of unexpected issues
      • Operate in high density traffic environments both on the ground and in the air
      • Operate safely when the “unexpected” occurs
The Future of Aviation – Spectrum Requirements

• What will be the Radio Frequency Spectrum Requirements?
  • Spectrum is critical:
    • Aircraft must be able to continue to perform their essential functions:
      • Know its location: Currently exists. Use same systems/spectrum (GLONASS/GPS, etc.)
      • Altitude: Radio Altimeter (4200-4400 MHz)
      • Direction/speed: calculated and from measurements
      • Sense and Avoid other aircraft – quickly: (960-1164 MHz for ADS-B, TCAS, DME, ACAS; 1250-1390 MHz for ARSR; 8750-8850 Doppler radar, etc.)
      • Provide to others location/direction/speed: (1030/1090 MHz for ADS-B)
      • Receive commands/instructions from “pilot”/air traffic control: (5030-5091 MHz; FSS)
      • Operate in high density traffic environments both on the ground and in the air (autonomy?)
      • Operate safely when the “unexpected” occurs (autonomy?)
How Do We Get to this Future State?

• It will not be easy!
  • It is easier to build a new house, than renovate an old house.

• What might need to change from the radio frequency spectrum standpoint:
  • Systems designed 30+ years ago could be more efficient and more resistant to harmful interference. Do we need all of them?

• What additional Communication (Command/Control), Navigation, Surveillance Systems are needed?
  • Many interests in the “old” house!
  • The landscape is changing around us, we must move faster.
  • Remember! -- Safety must still be the #1 priority.
Thank You