Topic: Improving VHF Spectrum Utilization

Problem Statement: Limited VHF communications system capacity and increasing air traffic results in congestion of the aviation VHF spectrum. The voice communications errors and delayed channel access create system congestion and air traffic delays. Regulatory subdivision of bands for specific functions limits flexibility in the frequency usage.

Objective: Identify near/mid/far term technologies to improve the performance and spectrum efficiency of current and emerging VHF communications systems. Select technologies with the highest potential, perform research and development to bring them to implementation stage.

Previous Identified Technologies and Research

Previously identified technologies and concepts
- VHF Antennas (multiple vs re-configurable)
- Dynamic geographic frequency allocation

Previously identified research areas
- VHF Co-site interference
- Reduce frequency guard band requirements
- VDL 2,3 system performance characterizations

Today Focus

- Identify key research and technologies to focus on?

- Identify existing work and organizations addressing research and technology issues, specifically issues not being addressed, or where current work is inadequate or under funded?

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Identify key research and technologies to focus on?

- Near term limited by aircraft equipage
    - Research frequency pooling techniques (do not reserve band width by applications and other requirements)
    - Investigate the data requirements for aircraft applications
        - Look into the RTCA report (SC-185 Spectrum Requirements for 1997-2010 …)
        - Research issues associated with moving VHF applications to other frequency bandwidth
    - Research the issues associated with moving AWOS/ASOS (weather) to the 112 to 118 band

- Research mid term and long term solutions
    - OFDM technology/ Software based technology (prototype available in 2006/2007)
    - Look at the French proposal to use L-band for en route communication
    - C-band for terminal area communication
        - Issues to be addressed:
            - Power
            - Antenna
    - Full duplex techniques

Identify key research and technologies to focus on? (Cont …)

- Dynamic frequency allocation in the VHF band
  - Research the applicability of cellular model for NAS
  - Service availability (non blocking)
  - Take a look at the paper presented by MITRE
  - Can VDL Mode 3 Handle the handoff issue?

- Will there be enough channels for VDL Mode 2 in the future?
  - Strategy for allocating more channel for VDL mode 2
  - Research the issues associated with moving AWOS/ASOS (weather) to the 112 to 118 band

Identify key research and technologies to focus on? (Cont …)

- Research mid term and long term solution
  - VDL mode 3 capacity study
    - Study the effect of dynamic re-sectorization on frequency utilization
    - Dynamic frequency allocation techniques
    - Study Power control strategies

  - Research NAS traffic over a year or more and develop techniques for dynamic allocation of frequency

  - Adaptive modulation for digital voice
    - Power efficient modulation vs bandwidth efficient modulation

Identify key research and technologies to focus on? (Cont …)

- Superconducting filter (reduces the co site guard band requirements)
  - DARPA

- Smart Antenna
  - Co-location issues
  - Coupling issues

- Security and bandwidth requirement
  - Techniques to ID the controller and aircraft
  - Spread spectrum techniques to increase the band width utilization

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