Rethink Possible

Workshop on Rapidly Deployable Aerial Communications Architecture (DACA)

Panel 3 – Technical Issues Associated with the Deployment of DACA

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Deployment & Operational Issues

- *Integrate CMRS capabilities into DACA*
- *2G 4G, GSM, UMTS, LTE, cdma2000 will need to be incorporated in the DACA platform*
- *DACA systems must have "backhaul" for signaling/traffic and electrical power*
- *Time out scenarios can occur due to longer transmission paths*
- *DACA access controlled by creating a special home location register (HLR) on DACA terrestrial/platform*
- *E911 users not authorized use of DACA network go into "SOS mode" if no "home" terrestrial system is found*
- *CMAS alerts could be part of the DACA cellular network*
- *Alternate link budgets, power management, and possibly Doppler considerations since airborne platforms may be in motion*

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Potential for Harmful Interference and Spectrum Coordination

- *Spectrum interference coordination is needed to protect terrestrial communications systems from harmful interference from DACA systems as they are restored*
- *Coordination could be implemented and coordinated by the FCC in conjunction with FEMA and other federal and state agencies*

Licensing and Authorization

- *Any decision to incorporate CMRS spectrum into an aerial deployment must be expressly agreed to by relevant licensee*
- *Inclusion of CMRS spectrum must address feasibility*
  - ü*Interference to elements of the cellular architecture?*
  - ü*Adequate capacity for users of CMRS service?*
  - ü*Would resource allocation following a disaster be best to restore wireless infrastructure and expand capacity?*

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Avoiding interference from elevated relays (DACA systems) to existing and still operational ground infrastructure

- *Airborne cellular facilities should be activated only with coordination with cellular operators in the affected area*
- *One large cell vs. multiple spot beams over the coverage area*

- *Interference issues are reduced if DACA is only deployed during an emergency when almost all cell sites are out of commission*
- *DACA system designed with cognitive radio and smart antennas can be used to avoid interference with the commercial services*

Considerations to accommodate ground communication

- *cdma2000, UMTS, and LTE may be co-located as long as there are sufficient guard bands*
- *Use of non-cellular technologies (trunked LMR, P25) creates more need for guard bands between different technologies*
- *WiFi from the DACA could provide a wide area hot spot but having sufficient power may be an issue*
- *DACA Software-defined radio (SDR) provides a theoretical solution by dynamically controlling operating frequency and radio link protocols through software*

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DACA Window of Opportunity

A complete coverage strategy between deployable terrestrial assets and the DACA is important

Initial DACA window where number of terrestrial cell sites in service is low thus cannot provide adequate traffic handling capacity

Overlap period both the terrestrial assets and the DACA could be simultaneously deployed in time

- *Requires coordination between various different government and commercial agencies to insure that coverage areas are provided equitably and without redundancy*

Finally, restoration where the number of terrestrial cell sites restored can handle traffic and DACA is no longer needed

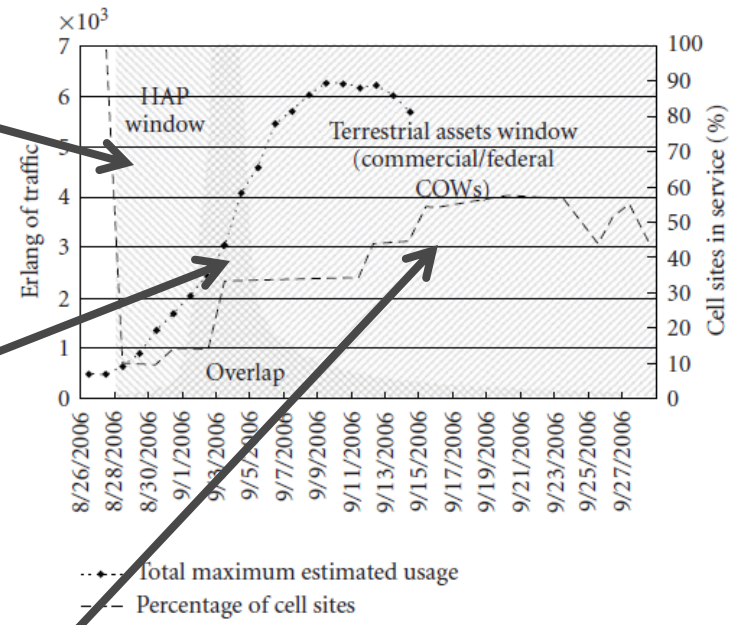

FIGURE 8: Effective disaster response windows.

From Juan Deaton, "High Altitude Platforms for Disaster Recovery: Capabilities, Strategies, and Techniques for Emergency Telecommunications

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Ad-hoc and/or peer-to-peer mesh networking to extend the reach of the DACA system

- *An ad-hoc, peer-to-peer radio access system could maximize the bits/hz/km^2 for the DACA systems*
- *Provides redundancy, less infrastructure is required, and that the RF spectrum could be more efficiently utilized ("mesh cloud" defines the coverage area)*
- *May have potential to resolve some of the issues with an airborne system*
- *May be able to provide communications directly between users, i.e. first responders and an EOC, through the ad-hoc network*
- *When used with WiFi technology, could provide a wide area "hot spot"*
- *Standards and further research & development is required*

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Standards that are currently in place or need to be developed.

- *Difficult to discuss existing standards without knowing the exact system being discussed*
- *For interoperability with existing handsets, the DACA system must follow existing industry standards for commercial systems*
- *Standards has looked at interference mitigation, satellite backhaul, extended cell radius issues, etc.*
- *Industry "best practices" or implementation guidelines should be developed and standardized to identify practices to limit potential interference from airborne facilities to area cellular systems*

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