In Touch-In Flight®

FCC Update

September 3, 2003

Business Aviation - Status

- **Over 1,400 Systems "On Net"**
- **Offered by Major OEMs**
  - Citation, Bombardier, Lear, Embraer, Raytheon
- **Leading Supplier to Fractionals**
  - Flight Options, NetJets, Citation Shares
- **Major Customers**

  US Army, US Navy, Dept of Energy, Intel, Sony, Conoco, ConAgra
  - 300+ Dealer Network

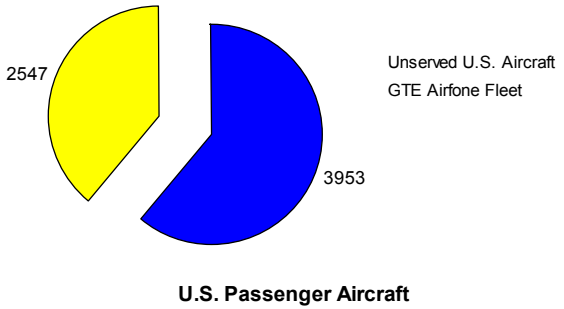
Unique "Window of Need" in Commercial Aviation Communications

- **Aviation Security Applications**

- **"Evolutionize" Passenger Voice/Data**
  - *One Phone Goes Anywhere* - Personal Mobiles In-flight
  - Prototype systems successfully tested

- **Alternative for Airlines stranded by AT&T**

Airlines - Market Drivers



ATT Claircom Gone

- 61% of Market Unserved

Verizon Airfone

- Too Heavy, Too Expensive…. Unused
- Obsolete, Stand-Alone Network Model

Crew Needs: Medical and Flight Ops

9/11 Radically Changed Security Requirements

AirCell Has Requested Authority Necessary to Meet Growing Aviation Communication Needs

→AirCell has requested: (1) a long-term renewal of its waiver authority; (2) an increase in authorized channels to allow cost effective growth when and where needed; and (3) removal of the digital exclusion in frequency coordination to allow growth and continued operation as analog is phased out for terrestrial service.

→AirCell's filings have been vigorously opposed by Verizon Wireless, AT&T Wireless and Cingular Wireless because of concerns over potential interference, FCC policy and spectrum rights.

→AirCell's operating results and rigorous testing continues to demonstrate that AirCell's system does not and will not cause harmful interference.

Opposing Carriers' Flight Tests Are Flawed

Tests do not reflect actual AirCell system operation:

- **Tested with DPC disabled**
- **Tested with non-representative flight routes and attitudes**

Significant misrepresentations:

- **Manipulated AirCell switch parameters from AirCell-defined settings**
- **Flew outside of range of designed cell coverage**
- **No Handoffs to adjacent site, where victim sites were located**
- **Lowered AirCell serving site antennas into the trees**

- **AirCell retest in May confirms these factors seriously taint the results .**

- **Analysis and comparison shows that 1997 test results are still valid.**

→ Net effect is incorrectly reported victim site signals (tens of dB's)

Recent Photo of Marlboro Site showing AirCell Receive Antennas below the tree line

Figure 2.3.b.13

→ Low antennas force much higher DPC levels and loss of diversity

Vcomm Flight Test - Summary

- DPC Off data is wholly unrepresentative (still)
- DPC On data is overstated due to site mis-configuration
- Flight routes grossly unrepresentative, chosen to exaggerate effects
- Marlboro Site has severe Co- and Adjacent-Channel Interference
  which distorts the reported data
- Selectively presented flight test data out of context for impact;
  no statistical basis provided to evaluate the data (histograms)
- AirCell retest and analysis shows that 1997 flight data is still valid, and
  and correlates with Vcomm data, IF all their erroneous factors are corrected

Noise Floor incorrectly measured and reported

- **Measured "system noise" rather than Cochannel Interference**
  (which is the real world limiting factor)
- **Implied *"Median"* System Noise is the interference level**
  (versus using the highest AirCell signals)
- **Reported data below the measurement capability of the equipment**
- **Own test data actually disputes their conclusion**
- **Retest in May, by AirCell, at their sites confirms this incorrect conclusion**
- **Despite Lucent "audit", they did not follow published Lucent Procedures**

- **Conclusions on noise floor levels are 13 to 17 dB low, and seriously bias drive test operating results**

Understanding Lucent PLM2 "noise" measurements

PLM2 only measures "noise plus interference"

During a PLM2 measurement, no measurements are made when a call is in place on the local sector

Therefore:
- the "served mobile" portion of the graph does not occur in the data
- a busy site will report more occurrences of thermal noise than interference

Lucent instructs to throw out System Noise:

The Lucent Autoplex Manual on page 8[1] states that:

> *"After the histogram is completed, however, it should be apparent that the counts in the lowest few bins that have nonzero counts represent noise, rather than the interference of interest. The counts in the lowest bins can be thrown out before subsequent processing. The statistics of the remaining counts…represent the actual interference…".*

→ V-Comm ignored this instruction, and Lucent did not question the error

GSM is less sensitive to Interference

C/I Standard states 9 dB required (vs 17 for AMPS and TDMA)

200 KHz Channel (3 dB bandwidth is 170 KHz – higher thermal noise floor) and slightly higher operating points vs AirCell histograms

Frequency planning process is the same as AMPS except they do use more adjacent channels due to the 9 dB spec on C/A as well

Multilevel Coding, Frequency hopping make it more robust than IS-136 TDMA.

AirCell is farther in the noise on GSM than on TDMA or AMPS, and thus has even less impact potential.

Calculated Capacity

A computation *used in selecting a design center*, not a system operating attribute, based on a set of fixed parameters that are not static in an operating cell.

A change in "calculated capacity" does not necessarily translate into a harmful impact on a user call. Systems in reality adapt to any change in noise by adjusting operating point. *Nortel says Reverse Capacity calculation is a "soft limit"*

→ *USERS DO NOT "FALL OFF" A CELL DUE TO SLIGHT INCREASES IN NOISE!*

Why?

-Soft Handoffs
-Power Control
-Eb/Nt adjusts to retain users and manage FER
-System must do this to tolerate its own users and those in neighbor cells
-Interference impact is mitigated by processing gain

→ *Sprint agreed that user call quality is not impacted by AirCell Operation*

Eb/No and FER – the REAL metrics

Cells operate by managing to an FER target via adjusting mobile power and Eb/Nt, not dropping users

FER is what the user "hears" – what is "harmful"... >4%?

- Per Lucent CDMA Design document, *Mean Opinion Score (MOS) stays constant for up to about 0.4% FER, which occurs at an Eb/Nt near 4.5 dB*.
- *MOS drops below 3.3 at a FER of about 4%* (ie, >2.5 dB decrease in Eb/Nt)
- Other Lucent literature states a *1-2 dB decrease in Eb/Nt (from 7 dB) "does not necessarily cause a decrease in call quality".*

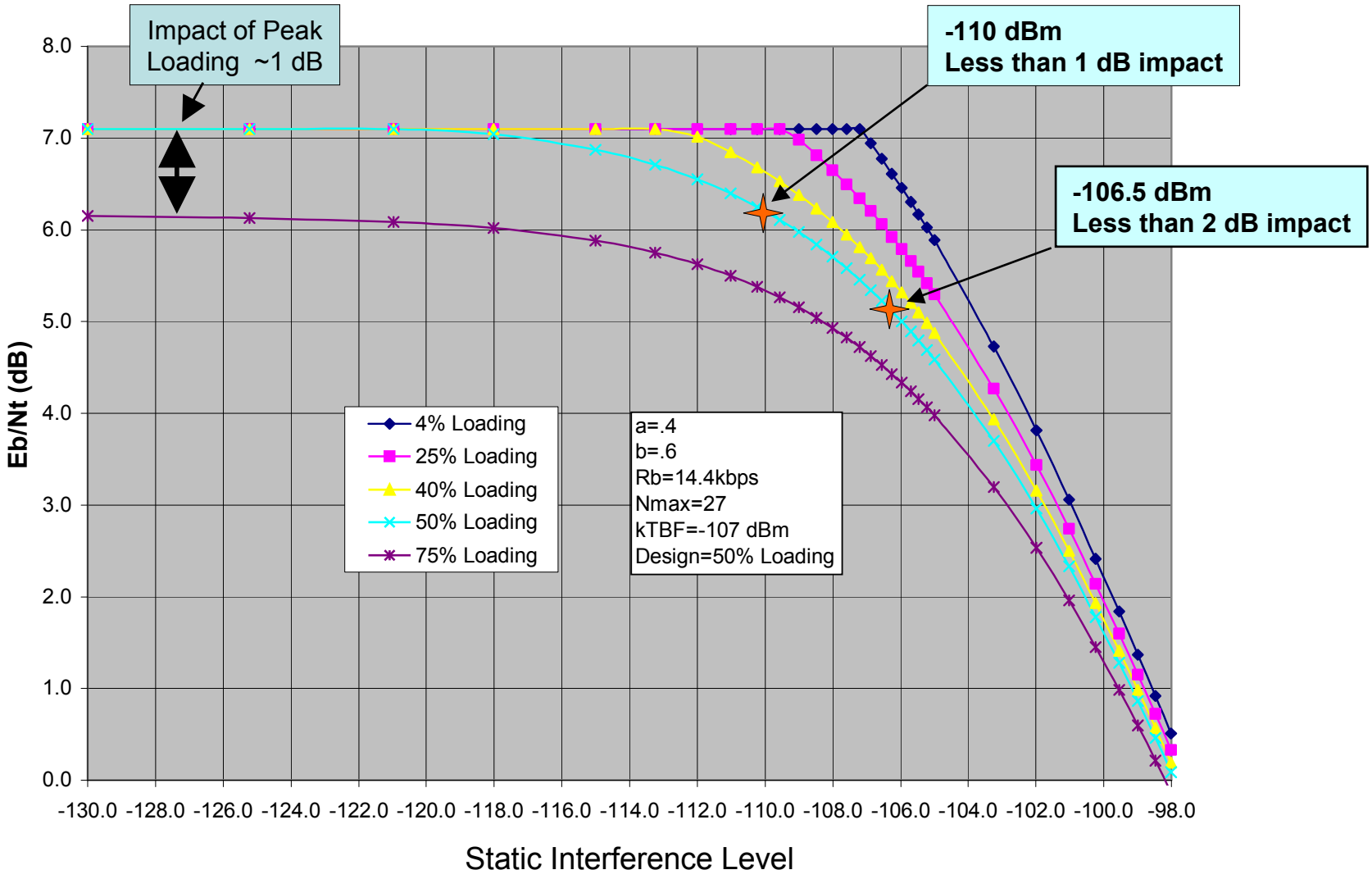
AirCell CDMA test shows it takes more than 2 dB degradation in Eb/Nt to cause FER to increase above zero (starting at reduced Eb/Nt of 4 dB)

Confirming fact:

Cells designed for 50% of pole point regularly are operated at 70+% in busy hour (ie, a 1+ dB decrease in Eb/Nt from the design center for some remote mobiles), with no apparent harmful impact to users.

Impact on Eb/Nt of an Interfering signal, vs cell loading

Impact for the worst case mobile at cell edge



Conclusion

AirCell 1997 Flight Tests are still valid and representative
Reinforced by test series with another provider, and retests in May ’03

V-Comm data confirms FCC’s -100 dBm threshold;
in fact shows it is probably conservative for AMPS and TDMA by 5-10 dB

AirCell causes no harmful interference to digital services

AirCell Waiver renewal should be Granted
Digital exclusion should be removed
Increased channel capacity should be allowed