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November 24, 2008

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street SW.
Washington DC 20554

Re: ET Docket No. 08-59
<u>Ex Parte Filing</u>

Dear Ms. Dortch:

Under separate cover this date, Aerospace and Flight Test Radio Coordinating Council ("AFTRCC") filed the attached ex parte presentations in WT Docket No. 07-293 et al. These presentations deal with proposed technical rules for the Wireless Communications Service ("WCS") and, in particular, measures to protect flight test telemetry from WCS out-of-band emissions. While AFTRCC's presentations have not concerned ET Docket No. 08-59, certain aspects of today's filings may be perceived as also relating to the above-referenced docket. Accordingly, out of an abundance of caution, a copy of the WT Docket No. 07-293 ex partes are attached for inclusion in the record of ET Docket No. 08-59.

Any questions regarding this filing may be directed to the undersigned.

Respectfully submitted,

William K. Keane

Counsel for Aerospace and Flight Test Radio Coordinating Council

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Re: Ex Parte Filing
WT Docket No. 07-293; IB Docket No. 95-91;
GEN Docket No. 90-357; RM-8610

Dear Ms. Dortch:

This is to confirm that on Friday, November 21, the undersigned, together with Giselle Creeser, Lockheed Martin Corporation; Frank Weaver and Joseph Cramer, The Boeing Company; Darby Becker, United Technologies; Joe Siniscalchi, L-3 Communications; Chip Yorkgitis, Raytheon; Marc Ehudin, Textron; and Daniel G. Jablonski, Johns Hopkins Applied Physics Lab, met with Joel Taubenblatt and Robert Noel, Wireless Telecommunications Bureau, regarding the position of Aerospace & Flight Test Coordinating Council and its Member Companies in the above-referenced proceedings.

The AFTRCC representatives distributed the materials attached. The points covered during the meeting are reflected in those materials, as well as in AFTRCC's earlier filings in the Dockets.

A copy of this ex parte statement is being submitted for the above-referenced proceedings.

Sincerely,

William K. Keane

Counsel for Aerospace and Flight Test Radio Coordinating Council

cc: Joel Taubenblatt
Roger Noel

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

Aerospace and Flight Test Radio Coordinating Council

Presentation to The

Federal Communications Commission

November 21, 2008

43+10 log (P) Will Have Serious Adverse Impact on Flight Testing

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- For example, as explained in slides to follow, a single WCS base station will double the noise floor of an AMT station -- and thus reduce the maximum aircraft operating range -- 15.7 km from the AMT receiver
- Problem exacerbated by the fact that there is no guard band between WCS and AMT -- unlike top end of band (2390-2400 MHz). At bottom end (2360-2370 MHz) WCS and AMT are side-by-side.
- Flight testing uses high-gain antennas in noise-limited systems where all available link margin is applied to fade mitigation

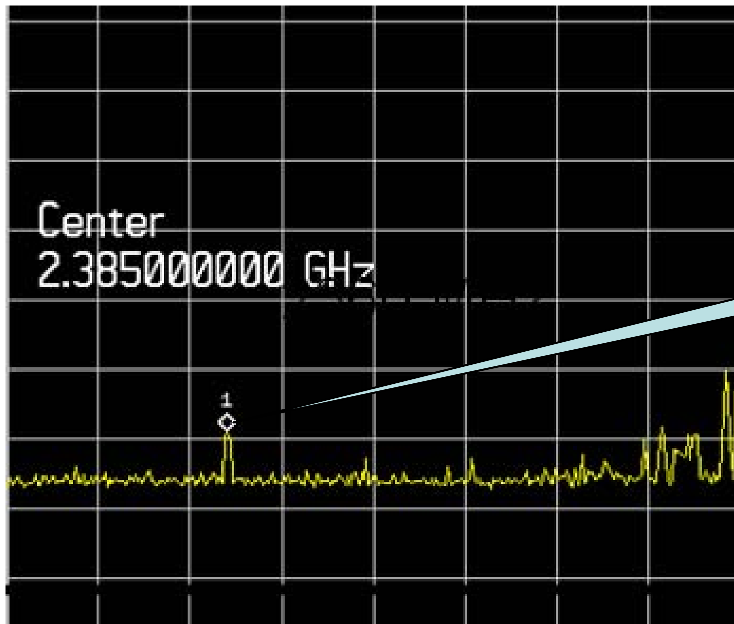
Typical AMT band noise floor measurement at Pax River, Maryland

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

Resolution bandwidth (RBW) of spectrum analyzer is 30 kHz

-30 dBm

-40 dBm



Remote test signal

1 MHz measured noise floor of AMT receiver (-91 dBm after 20 dB LNA gain at AMT receive antenna)

File: screen405

2360 MHz

2390 MHz

Note: the 30 kHz RBW noise floor of this spectrum analyzer measurement is 15 dB above the noise floor of a TM receiver whose receive bandwidth is set to 1 MHz.

Note absence of OOBE from 2345 – 2360 MHz into the 2360 – 2390 MHz band!
(as also validated by -91 dBm measured noise floor of AMT receiver)

Assumptions Favorable to WCS Used to Determine Impact

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- Although WCS usage could be significant, consider that only the closest of the WCS transmitters are directly in the field of view of an AMT ground station antenna:
  - For base stations, propagation is r^2, but assume only one tower is in view of an AMT antenna at a time
  - For portables, propagation is r^2, but assume 10 dB window attenuation, and that only 3 devices are in view at a time
  - For mobiles, assume propagation is $r^{2.4}$, there is no additional attenuation, and that only 10 devices are in view

Assumptions Favorable to WCS Used to Determine Impact of WCS on AMT Use (cont.)

- I/N = 0 dB (which is 8 dB higher than the aggregate I/N specified in Rec. M.1459)
  - – Reduction of maximum range at which an aircraft can be tracked in the direction of the WCS interference source by 30%
- AMT system noise temperature is assumed to be 455 K, although systems without combiners can operate at 250K
- All of these assumptions are extremely favorable to WCS

The Math:

$$\alpha\beta N[P_t G_t]A_{eff}/[4\pi r^x] = kT_{AMT}B_{AMT}$$

- Where
  - α takes into account decrease in OOBE emission level from 2360 – 2365 MHz
  - *B* is building attenuation
  - N = number of WCS emitters "seen" by AMT receive antenna
  - $P_t G_t$ is the WCS OOBE limit (e.g., 43 + 10 log (P) = $10^{-4.3}$), with G_t representing the WCS transmitter gain
  - A_{eff} = 4.67 m^2 is the effective area of an 8 foot diameter AMT receive antenna
  - *r* is the distance from the WCS source to the AMT receive antenna at which I/N = 0 dB
  - *x* is the assumed propagation constant
  - k is Boltzmann's constant = 1.38 x 10^{-23} Joule/Kelvin
  - T_{AMT} = AMT system noise temperature (including combiner contribution; not all AMT systems use combiners) measured to be 455 Kelvin (250 Kelvin is appropriate for non-combiner systems, but is less favorable to WCS proponents)
  - B_{AMT} = AMT channel bandwidth = 5 MHz

Chart Comparing Effects of Various OOBE Levels:

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- Showing distances at which WCS devices double the noise floor of an AMT station, thus decreasing the maximum aircraft operating range by 30 percent

	43 + 10 LOG (P)	55 + 10 LOG (P)	60 + 10 LOG (P)	70 + 10 LOG (P)
Single Base station[1,2]	15.7 km	4.6 km	2.8 km	1.1km
3 Portables[2,3]	8.6 km	2.5 km	1.5 km	0.6 km
10 Mobiles[2,3]	8.2 km	2.9 km	1.9 km	0.9 km

[1]This assumes the OOBE is measured after the antenna, and that peak, rather than average value is used.

[2]A factor of 4 increase in the number of WCS transmitters simultaneously in view will double the distance numbers for base stations and portables, and almost double the distance for mobiles.

[3]This is the number of "closest-in" WCS devices simultaneously in view of the AMT receive antenna; This extremely low estimate is highly favorable to WCS proponents.

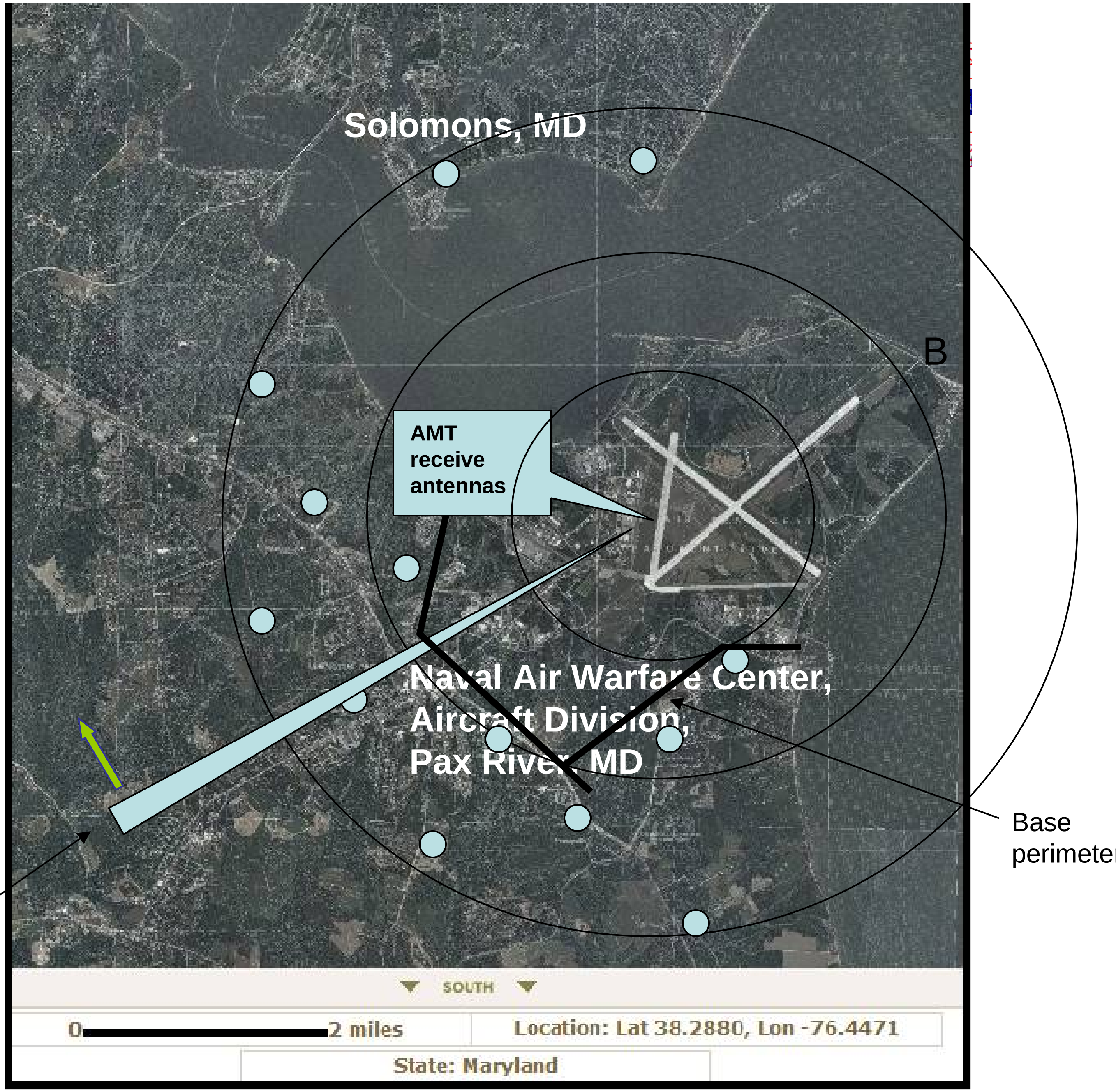
Impact on Flight Test Airspace

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- Illustrative material that follows is for Patuxent River, Maryland (F/A-18, V-22, Presidential Helicopter, etc.), and Mid-Continent Airport, Wichita, Kansas (Cessna, Learjet, etc.)
- Effect of WCS deployment near these test centers is to dramatically reduce the airspace available for testing since aircraft routinely operate up to the maximum possible range from the AMT ground station, as permitted by fading conditions
  - Due to aircraft maneuvering which blocks the AMT receive antenna
  - Due to multipath

Grey circles are potential WCS tower-mounted base stations at approximately 1-mile separations within a 3 mile radius of Pax River AMT operations.

Interference budget will be dominated by these “close-in” towers and their associated portable and mobile WCS terminals.

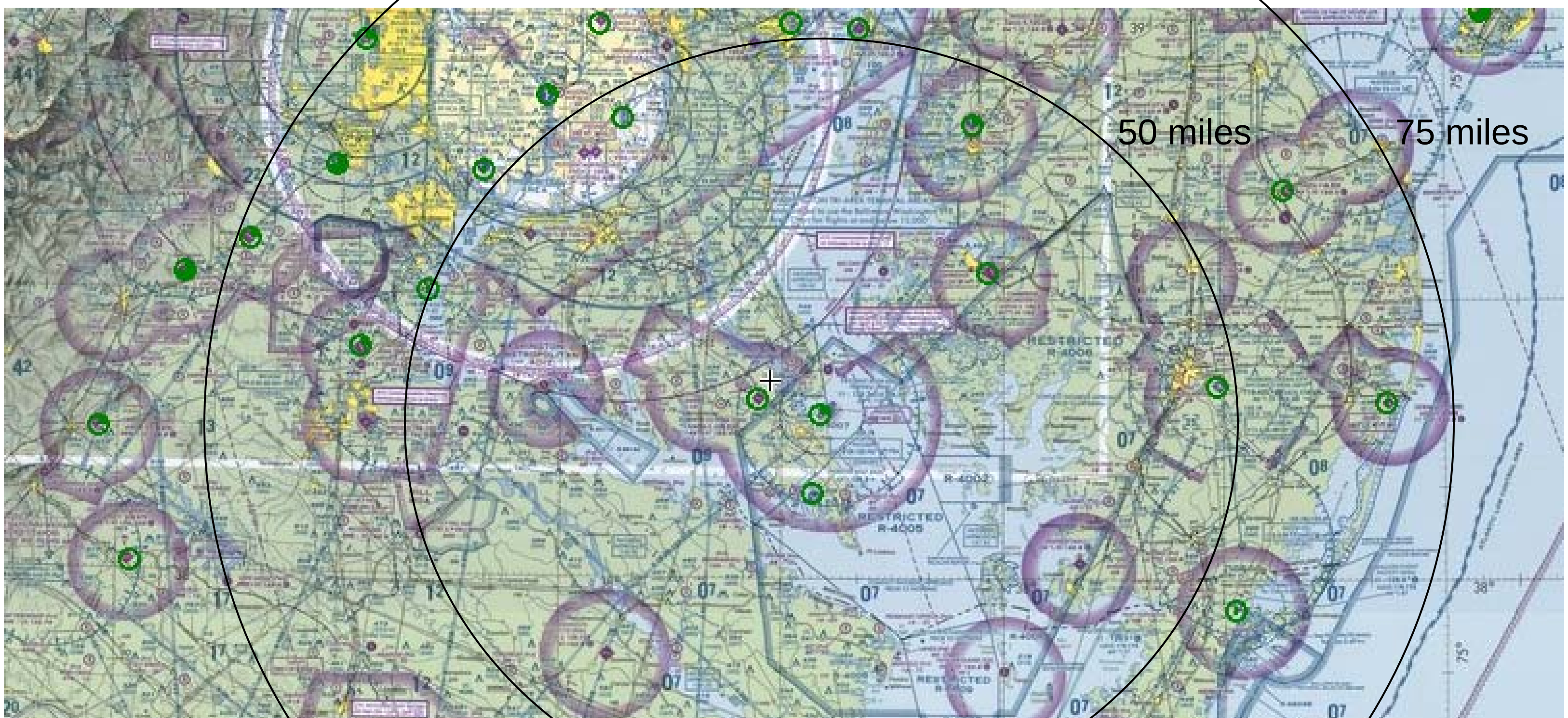


Beam of AMT receive antenna as it cuts across WCS towers while tracking an aircraft

Geography near Pax River, Maryland

Impact of WCS on AMT Airspace at Pax River

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL



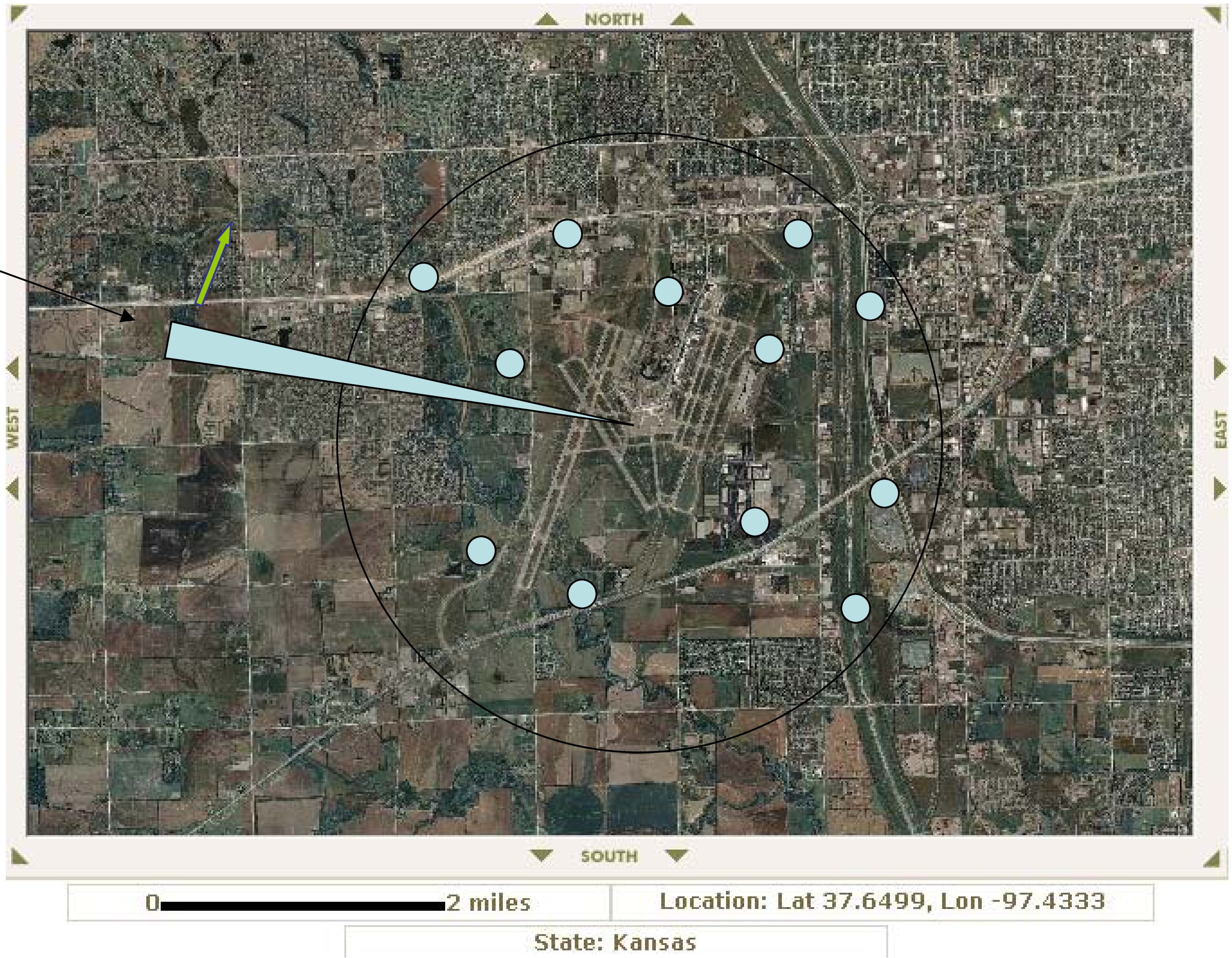
For a given value of signal to noise ratio, doubling the AMT noise floor shrinks the maximum telemetering distance from the aircraft by 30%. A 30% reduction is illustrated above by comparing the airspace usable for testing at distances from Pax River of 75 and 50 miles, respectively.

Impact to Flight Test Airspace at Wichita, Kansas

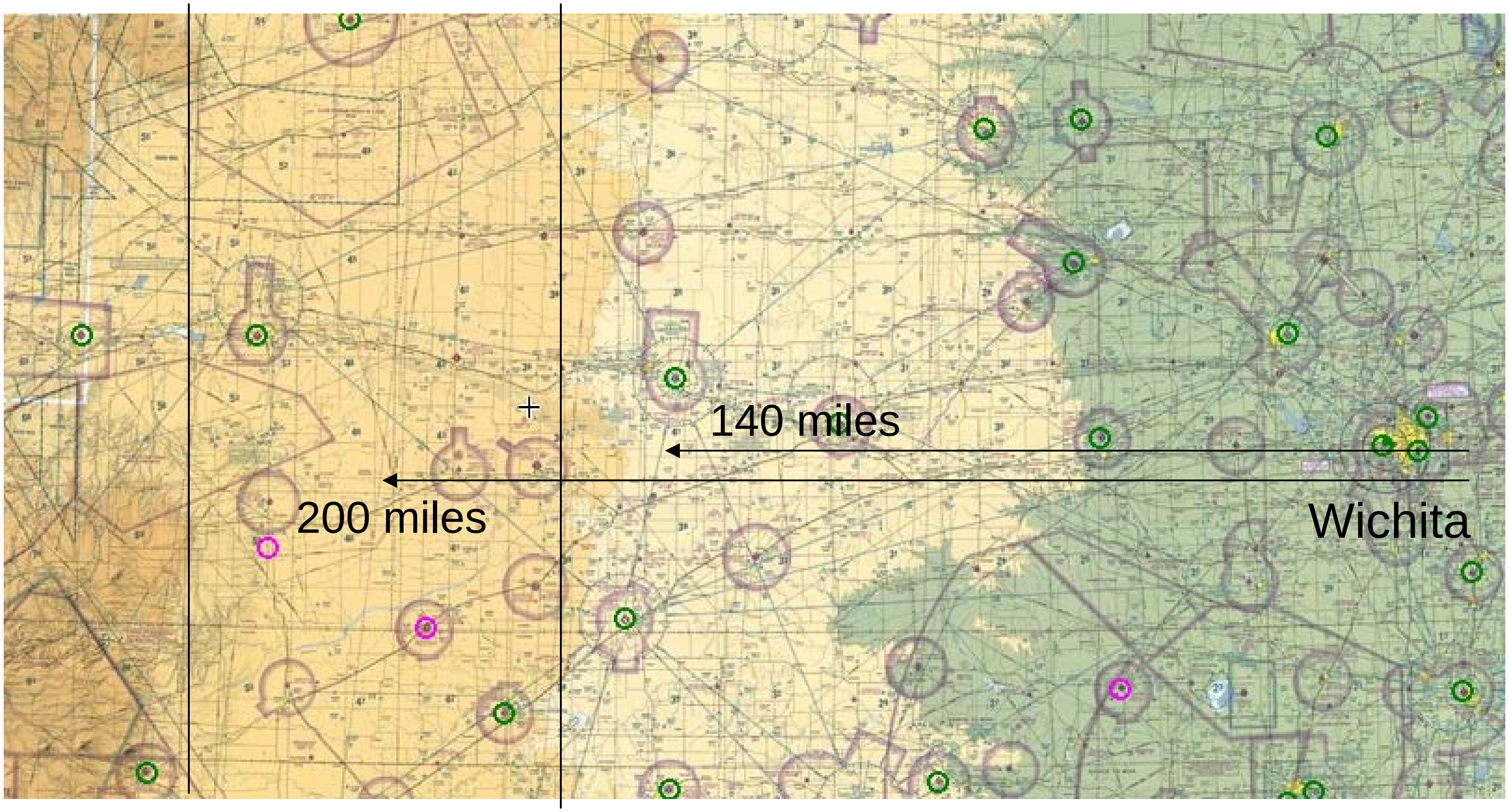
AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

Geography near Wichita, Kansas showing possible WCS base station tower placement within 2 miles of Mid-Continent Airport, where Cessna, Learjet, and others conduct their flight tests

Beam of AMT receive antenna as it cuts across WCS towers and their associated portable and mobile terminals while tracking an aircraft



Impact to Flight Test Airspace at Wichita, Kansas (cont.)



Max AMT operational distance near Wichita of 200 miles is reduced to 140 miles if WCS placement doubles the AMT noise floor.

Flight Test Operating Areas Already Constrained. 43+10 log (P) dB will add Further Constraints -- as well as Risks and Costs.

- FAA Considerations
  - FAA designates daily flight test areas, high speed corridors, sub-space corridors, etc.
  - FAA Air Traffic Control exercises real time control of aircraft operations during testing in National Air Space
    - Redirect test aircraft to avoid other aircraft
    - Redirect test aircraft to avoid weather hazards
    - Redirect aircraft to avoid “keep out” areas
    - Clear 3-D “blocks” of airspace by altitude, area and time. Clearance often paused or suspended with no warning
    - Prohibit flights in certain areas (commercial air traffic corridors, MOAs, Homeland Security No Fly Zones)

Flight Test Operating Areas Already Constrained. 43+10 log (P) dB will add Further Constraints -- as well as Risks and Costs (cont.).

- Test Requirement Considerations
  - Safety - fly to the clear sky (pilot must be able to see the ground)
  - Natural Icing Tests – fly where the ice is forming
  - Stall and Flutter Testing – fly where the air is calm and the sky is clear
  - Runway Performance Testing – calm air
- Fly-by-wire technology makes data quality even more critical

Impact of Reduction in TM Range

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- $A_{circle} = \pi r^2$. A 30% reduction in reliable range results in a 51% reduction in reliable operating area for a point radius authorization
- With less airspace to work with, there is increased likelihood of encountering bad weather in airspace that remains = test cancellations/delays
- With less airspace to work with, increased likelihood of encountering changes in air traffic patterns = test cancellations/delays
- With less airspace to work with, increased likelihood of spectrum congestion between and among manufacturers seeking to operate at the same time

Sample Cost Impacts

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- Impact data supplied in Appendix for selected Companies. Data characteristic of impacts to be expected across the industry.
- Test flights can cost $50,000 or more depending on the aircraft and program. Cancellations/delays affect FAA certification, contract delivery schedules, and ability to attract future business.
- Test cancellations/delays places U.S. manufacturers at a competitive disadvantage in the global marketplace -- losses for Company, customers, employees, and the economy.
- Reduced flight test airspace impacts safety in the event of interference to the telemetry stream.

AFTRCC Proposals are Reasonable

- 70+10 log (P) in 2360-2370 MHz will not hamper mobile use.
- 75+10 log (P) for base stations subject to prior coordination.
- FCC itself proposed 90+10 log (P) in H-block FNPRM -- on top of a 10 MHz guard band.
- Continue to require use of peak power, not average power, measurement.
  - Peak is used for WCS band (Rule 27.50(a)); AWS-1 band (Rule 27.50(d)); 1390-1395/1432-1435 MHz bands [adjacent to flight testing] (Rule 27.50(e)); and 1670-1675 MHz band (Rule 27.50(f)).
- Require use of TPC to control/minimize interference.

Mobile Devices Can Meet a 70 + 10 log (P) db Limit

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- By using better modulation techniques, pre-mod low-pass filters, and/or post-mod stagger-tuned micro-miniature band-pass filters
- One example of commercially available filter technology that can be adapted for low cost mass production of filters for WCS portable and mobile transmitters

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Microwave Filter Company, Inc.
International Calls: (315) 438-4700
Toll Free: (800) 448-1666
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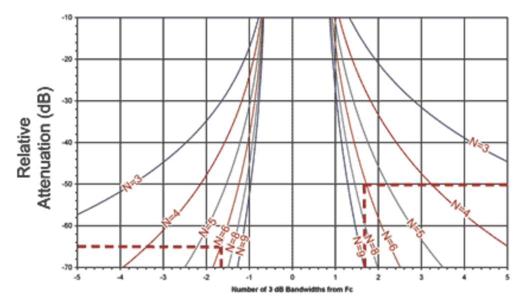
The curves below show the attenuation as a function of the normalized 3dB bandwidth. The following formula is used to predict the attenuation for a given number of sections:

$$\text{Number of normalized 3 dB bandwidths from center frequency, } BW_N = \frac{\text{Rejection Frequency (MHz)} - \text{Center Frequency (MHz)}}{\text{3 dB Bandwidth (MHz)}}$$



Note 60 dB per octave fall-off!

FCC Has Repeatedly Recognized Protected Status for Flight Test Band

- Has recognized that flight testing is a safety service which must be protected "from harmful interference that could result in loss of life."[1/]
- Has determined that telemetry bands should be classified as Restricted and protected from fundamental emissions of unlicensed devices. In so doing, the agency stressed that the telemetry band "involv[es] safety of life." [2/]

[1/] *In the Matter of Amendment of Part 2 of the Commission's Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva,* 1979. FCC 84-306, released July 2, 1984, at 2.

[2/] *In the Matter of Revision of Part 15 of the Rules Regarding the Operation of Radio Frequency Devices Without an Individual License,* 4 FCC Rcd 3493, 3502 (1989).

FCC Has Repeatedly Recognized Protected Status for Flight Test Band (cont.)

- Has recognized that the potential cost to manufacturers and the taxpayer from even brief telemetry drop-outs is significant, e.g.

  "[F]light test, telemetry, and telecommand operations are vital to the U.S. aerospace industry to produce, deliver, and operate safe and efficient aircraft and space vehicles."[3/]

[3/] *Second Notice of Inquiry in GEN. Docket No. 89-554, In the Matter Of An Inquiry Relating to Preparation for the International Telecommunication Union World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum,* FCC 90-316, 5 FCC Rcd 6046, 6060, para. 101 (1990).

U.S. Has Protected Flight Test Band

- U.S. took extraordinary measures at WRC-07 to protect S-band telemetry:

  "The United States of America and Canada refer to footnote number 5.394 of Article 5 of the Radio Regulations concerning the use of the 2 300-2 390 MHz band in the United States and the 2 300-2 400 MHz band in Canada and state that, in application of the Final Acts of the World Radiocommunications Conference (Geneva, 2007) in those bands, the aeronautical mobile service for telemetry has priority over other uses by the mobile services."[4/]

[4/] Declaration No. 78, Document 427-E (WRC-07) (emphasis added).

Appendix

Additional Risks/Costs

- A large part of the cost to certify a new aircraft comes in preparing the aircraft for each test flight.
- 43+10 log (P) dB will reduce and also segment the remaining airspace, thereby decreasing the number of test points flown per flight
- 43+10 log (P) dB will require aircraft manufacturers to fly many additional flights resulting in substantial increases to:
  - Cost
  - Safety Risk (more take-offs & landings)
  - Carbon Footprint (twice as much fuel burned at take-off)

Bell Helicopter Cost Impacts

- A “medium” developmental flight test program at Bell costs $20-30,000 per flight hour
- Practically, we have ~4-6 hours in the morning of each test day that provide the weather conditions needed (All test A/C have similar requirements)
- This fact makes operational readiness and test efficiency paramount – the aircraft must be properly-configured, the onboard instrumentation packages fully-functional, and the ground-based data/telemetry systems active and available to take advantage of a narrow time window
- Reduction in telemetry range limits flexibility in scheduling and reduces productivity, thereby increasing the cost of flight test programs

Boeing Analysis of Test Delays

AFTRCC
AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- A reduction in TM range WILL impact test efficiency.
- Delays in aircraft certification and aircraft modifications due to reduced flight ranges could cost Boeing programs, customers, contractors, and the national economy -- potentially billions of dollars.
- Additional losses occur when one considers the loss of competitive advantage due to delays.
- Immediate costs for the 787 program can be over $175,000/day for each additional day the test aircraft is in flight – costs increase with size of the test.
- FAA/DoD certification and delivery delays also cost the US economy in lost revenue, investor confidence and future US aerospace business.
- Reduced usable flight areas impacts safety if unforeseen interference causes signal/communications loss.

L-3 Cost Impacts

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- L-3 flight testing costs range from $48,000 per hour to over $60,000 per hour.
- Delivery delays cost in excess of $100,000 per day in penalties, and can impact vital Federal programs and missions.
- Reduction in telemetry range limits flexibility in scheduling, e.g. Greenville, TX area already heavily impacted by air traffic restrictions due to DFW.

Learjet Cost Impacts

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- A "medium" test program at Learjet costs $70,000 for each day in a certification flight test phase (salaries and other expenses)
- A one month delay in delivery of a certified aircraft costs $2.1 million (not counting any contractual delivery penalties)
- A 30% reduction in TM range WILL impact test efficiency and safety by
  - reducing the time available during each flight to complete test points (turn-arounds add no value)
  - increasing the likelihood of interference at test range boundaries
  - increasing flight crew workload to fit a test profile into a smaller area

Impacts on Lockheed Martin

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- Lockheed Martin performs flight testing at various facilities including government ranges with manned and unmanned assets.
- Flight telemetry is integral to the testing of new aircraft and to aerospace companies being able to accomplish their mission.
- Pilot safety: Interference free telemetry data is essential to ensuring pilot safety. Flight telemetry provides the only real-time link between the test pilots and engineers providing a layer of safety during flight testing that cannot be substituted by other means.
- Cost: Flight testing for fighter jets, e.g. F-16, JSF, can range from $30K to $85K per flight hour – retesting to compensate for non-valid telemetry data due to interference will quickly lead to significant cost and program delays.
- Significant cost and schedule impacts will be experienced due to infringement and further limited use of the S-band.

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AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

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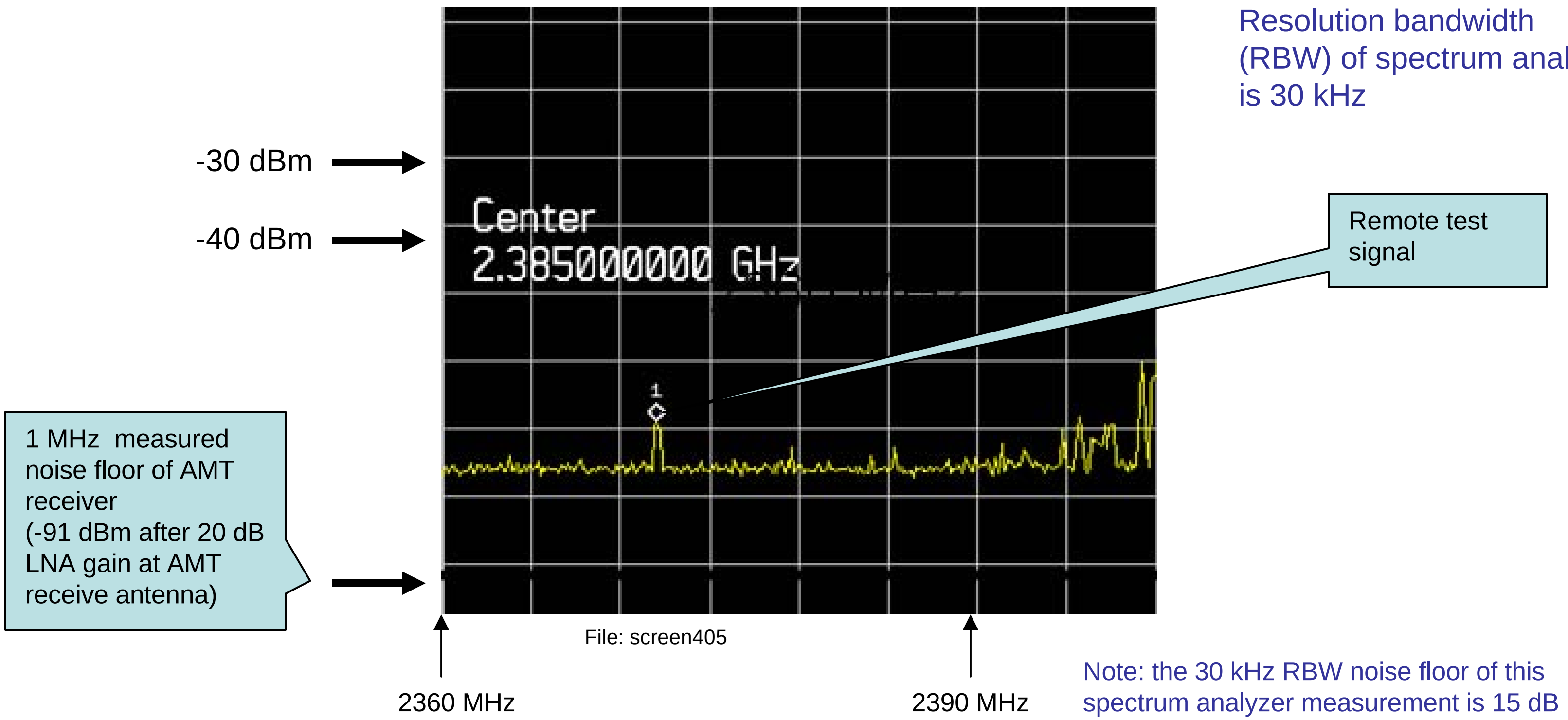

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AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

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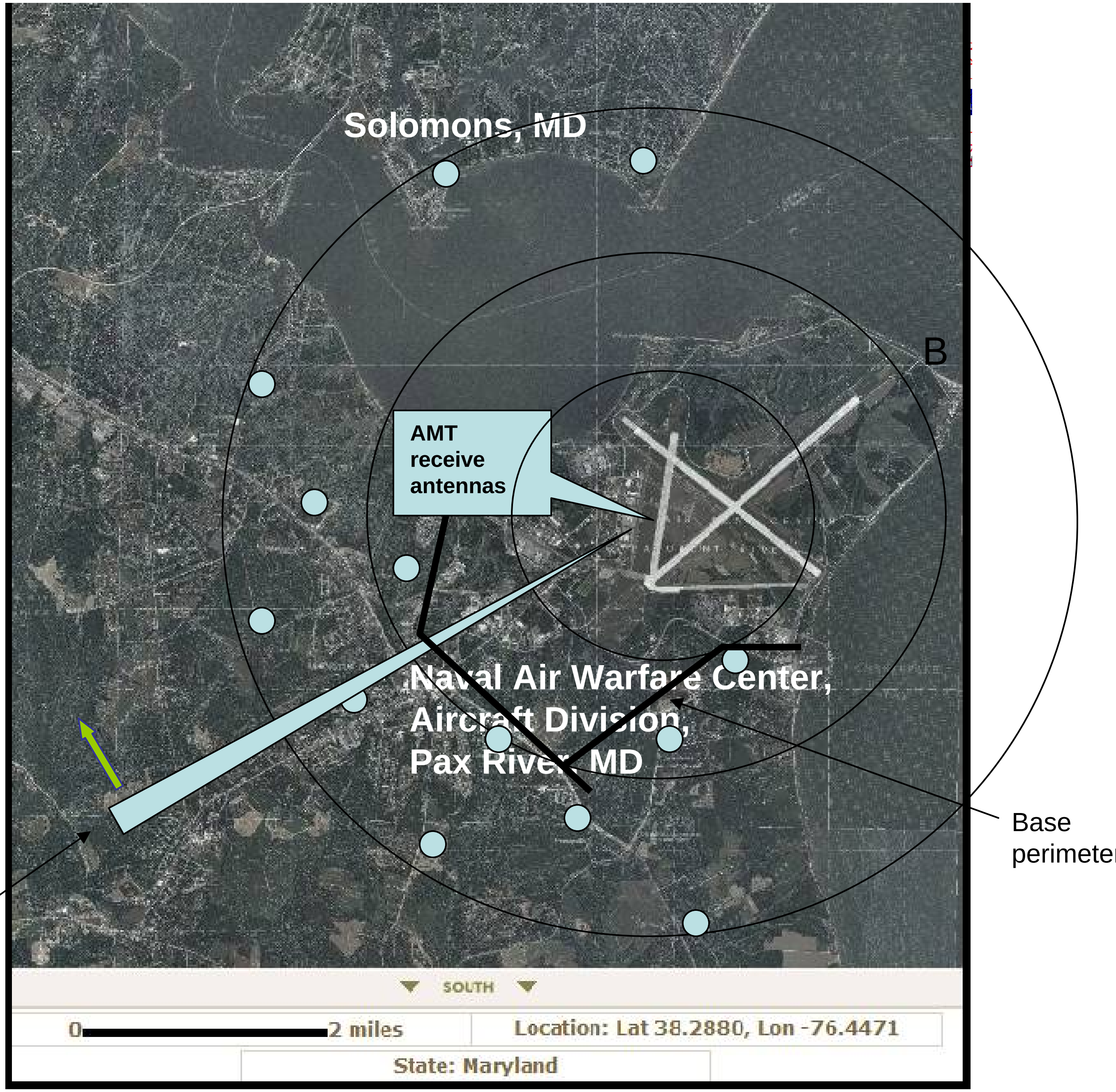

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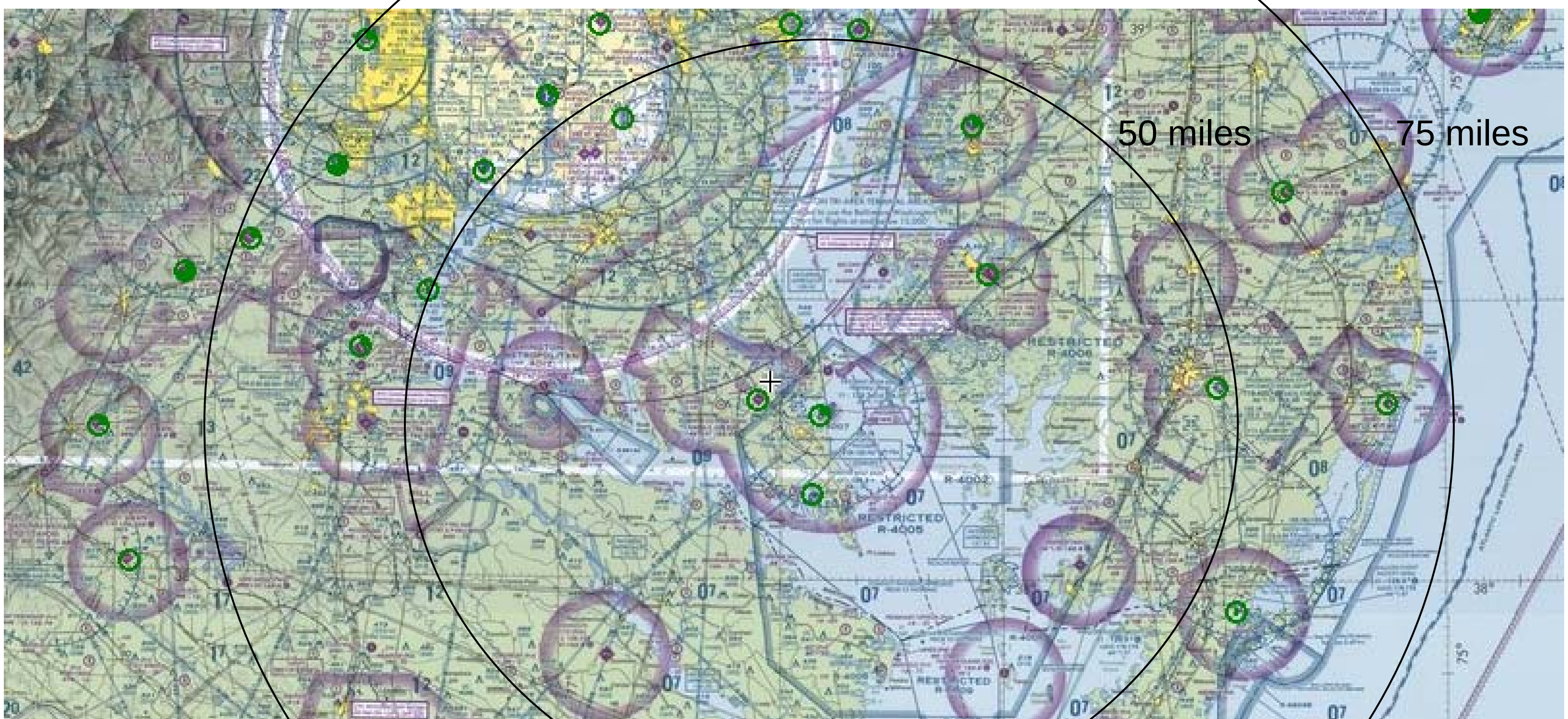

For a given value of signal to noise ratio, doubling the AMT noise floor shrinks the maximum telemetering distance from the aircraft by 30%. A 30% reduction is illustrated above by comparing the airspace usable for testing at distances from Pax River of 75 and 50 miles, respectively.

Impact to Flight Test Airspace at Wichita, Kansas

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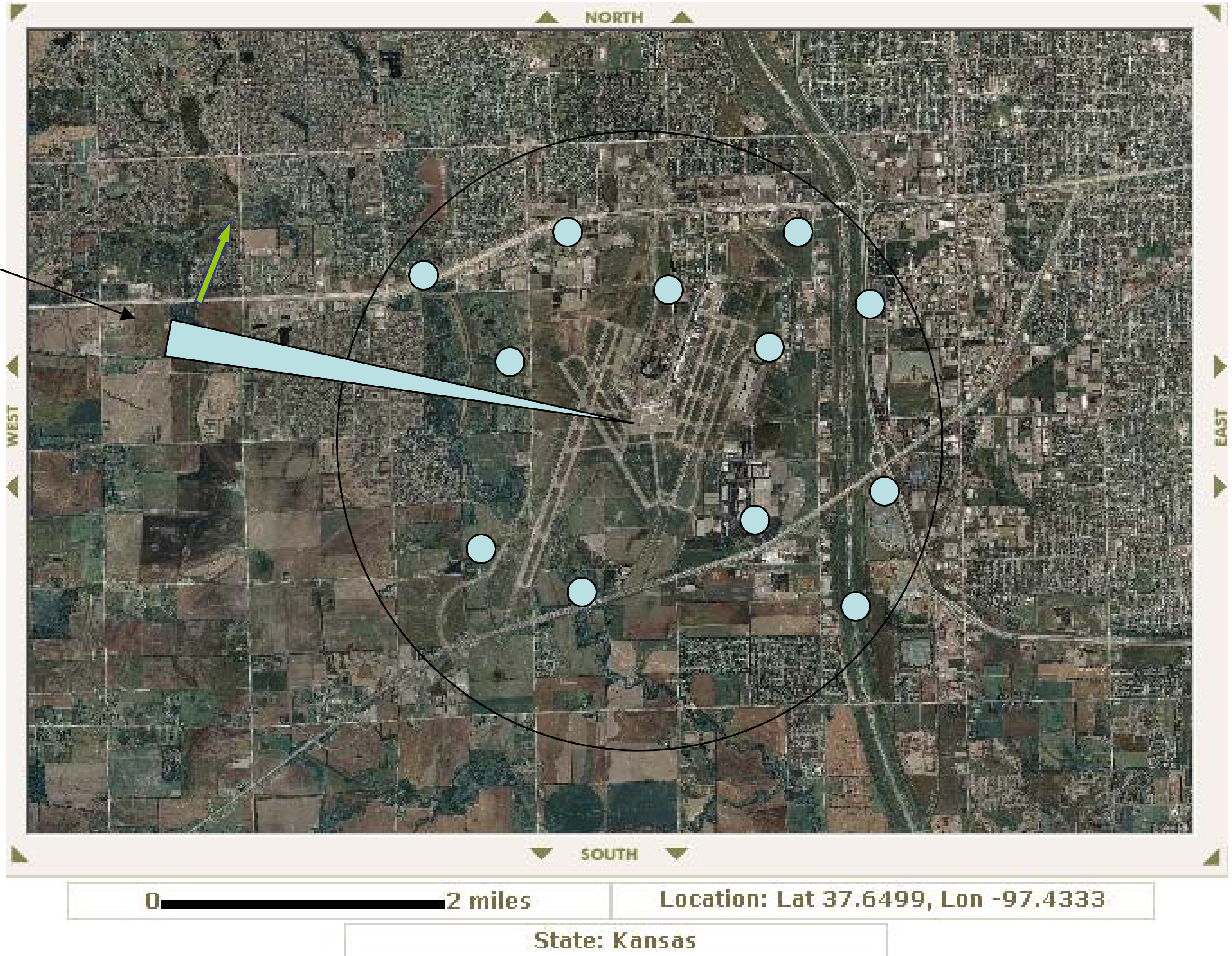
Geography near Wichita, Kansas showing possible WCS base station tower placement within 2 miles of Mid-Continent Airport, where Cessna, Learjet, and others conduct their flight tests

Beam of AMT receive antenna as it cuts across WCS towers and their associated portable and mobile terminals while tracking an aircraft



Impact to Flight Test Airspace at Wichita, Kansas (cont.)

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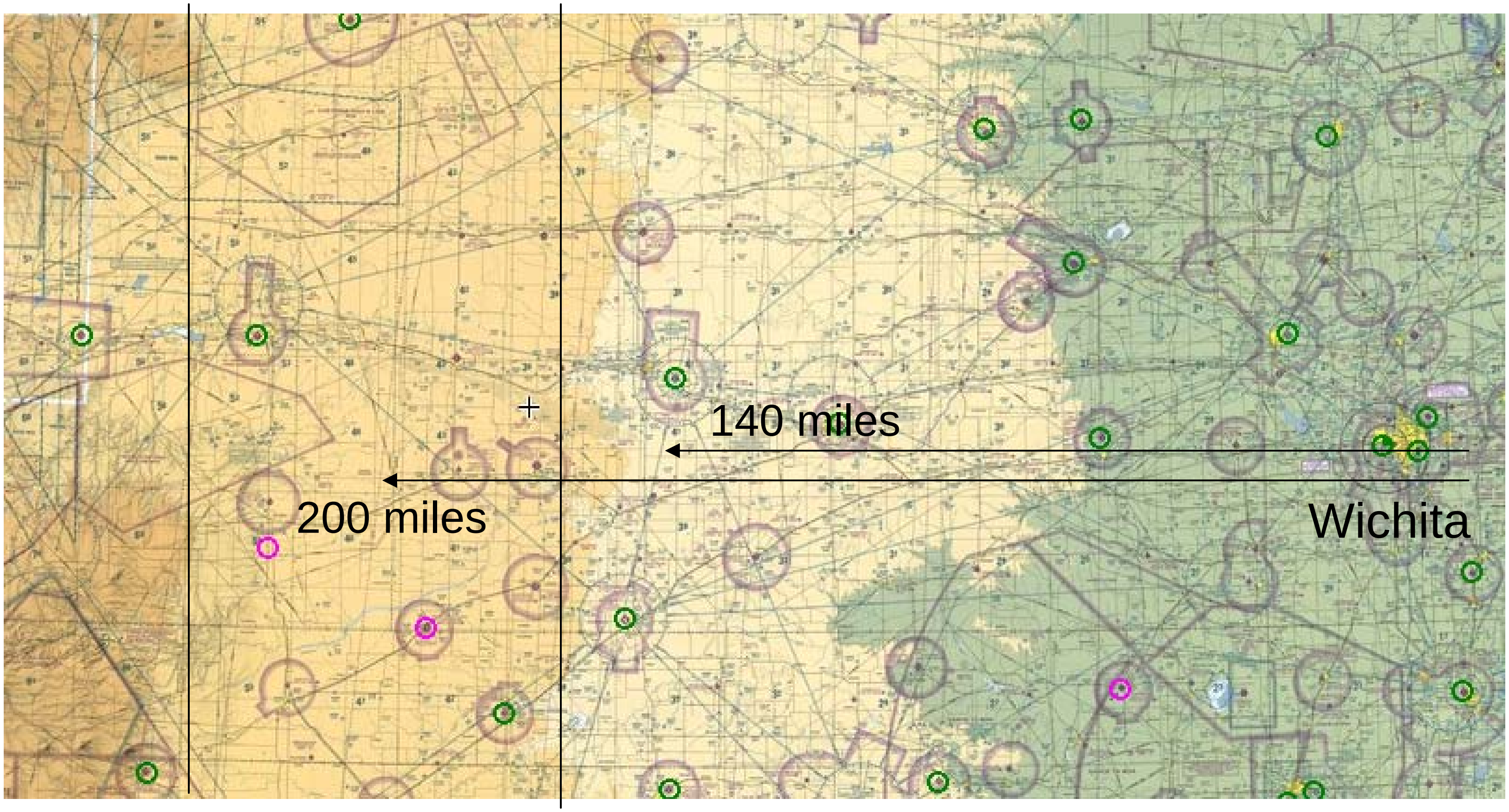

Max AMT operational distance near Wichita of 200 miles is reduced to 140 miles if WCS placement doubles the AMT noise floor.

Flight Test Operating Areas Already Constrained. 43+10 log (P) dB will add Further Constraints -- as well as Risks and Costs.

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- FAA Considerations
  - FAA designates daily flight test areas, high speed corridors, sub-space corridors, etc.
  - FAA Air Traffic Control exercises real time control of aircraft operations during testing in National Air Space
    - Redirect test aircraft to avoid other aircraft
    - Redirect test aircraft to avoid weather hazards
    - Redirect aircraft to avoid "keep out" areas
    - Clear 3-D "blocks" of airspace by altitude, area and time. Clearance often paused or suspended with no warning
    - Prohibit flights in certain areas (commercial air traffic corridors, MOAs, Homeland Security No Fly Zones)

Flight Test Operating Areas Already Constrained. 43+10 log (P) dB will add Further Constraints -- as well as Risks and Costs (cont.).

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- Test Requirement Considerations
  - Safety - fly to the clear sky (pilot must be able to see the ground)
  - Natural Icing Tests – fly where the ice is forming
  - Stall and Flutter Testing – fly where the air is calm and the sky is clear
  - Runway Performance Testing – calm air
- Fly-by-wire technology makes data quality even more critical

Impact of Reduction in TM Range

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- $A_{circle} = \pi r^2$. A 30% reduction in reliable range results in a 51% reduction in reliable operating area for a point radius authorization
- With less airspace to work with, there is increased likelihood of encountering bad weather in airspace that remains = test cancellations/delays
- With less airspace to work with, increased likelihood of encountering changes in air traffic patterns = test cancellations/delays
- With less airspace to work with, increased likelihood of spectrum congestion between and among manufacturers seeking to operate at the same time

Sample Cost Impacts

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- Impact data supplied in Appendix for selected Companies. Data characteristic of impacts to be expected across the industry.
- Test flights can cost $50,000 or more depending on the aircraft and program. Cancellations/delays affect FAA certification, contract delivery schedules, and ability to attract future business.
- Test cancellations/delays places U.S. manufacturers at a competitive disadvantage in the global marketplace -- losses for Company, customers, employees, and the economy.
- Reduced flight test airspace impacts safety in the event of interference to the telemetry stream.

AFTRCC Proposals are Reasonable

- 70+10 log (P) in 2360-2370 MHz will not hamper mobile use.
- 75+10 log (P) for base stations subject to prior coordination.
- FCC itself proposed 90+10 log (P) in H-block FNPRM -- on top of a 10 MHz guard band.
- Continue to require use of peak power, not average power, measurement.
  - Peak is used for WCS band (Rule 27.50(a)); AWS-1 band (Rule 27.50(d)); 1390-1395/1432-1435 MHz bands [adjacent to flight testing] (Rule 27.50(e)); and 1670-1675 MHz band (Rule 27.50(f)).
- Require use of TPC to control/minimize interference.

Mobile Devices Can Meet a 70 + 10 log (P) db Limit

AFTRCC
AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- By using better modulation techniques, pre-mod low-pass filters, and/or post-mod stagger-tuned micro-miniature band-pass filters
- One example of commercially available filter technology that can be adapted for low cost mass production of filters for WCS portable and mobile transmitters

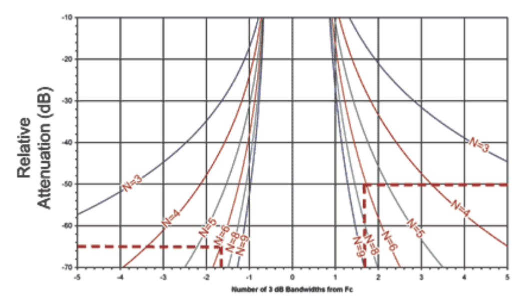
Surface Mount
Filters

Microwave Filter Company, Inc. offers lumped constant filters for a broad range of selected frequencies, topologies and packages. Use of standard packages has enabled MFC to provide OEM and custom filters while keeping design time to a minimum.
http://www.microwavefilter.com/

MFC
Microwave Filter Company, Inc.
International Calls: (315) 438-4700
Toll Free: (800) 448-1666
An ISO 9001:2000 Registered Company

The curves below show the attenuation as a function of the normalized 3dB bandwidth. The following formula is used to predict the attenuation for a given number of sections:

$$\text{Number of normalized 3 dB bandwidths from center frequency, } BW_N = \frac{\text{Rejection Frequency (MHz)} - \text{Center Frequency (MHz)}}{\text{3 dB Bandwidth (MHz)}}$$



Note 60 dB per octave fall-off!

FCC Has Repeatedly Recognized Protected Status for Flight Test Band

- Has recognized that flight testing is a safety service which must be protected "from harmful interference that could result in loss of life."[1/]
- Has determined that telemetry bands should be classified as Restricted and protected from fundamental emissions of unlicensed devices. In so doing, the agency stressed that the telemetry band "involv[es] safety of life." [2/]

[1/] *In the Matter of Amendment of Part 2 of the Commission's Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva,* 1979. FCC 84-306, released July 2, 1984, at 2.

[2/] *In the Matter of Revision of Part 15 of the Rules Regarding the Operation of Radio Frequency Devices Without an Individual License,* 4 FCC Rcd 3493, 3502 (1989).

FCC Has Repeatedly Recognized Protected Status for Flight Test Band (cont.)

- Has recognized that the potential cost to manufacturers and the taxpayer from even brief telemetry drop-outs is significant, e.g.

  "[F]light test, telemetry, and telecommand operations are vital to the U.S. aerospace industry to produce, deliver, and operate safe and efficient aircraft and space vehicles."[3/]

[3/] *Second Notice of Inquiry in GEN. Docket No. 89-554, In the Matter Of An Inquiry Relating to Preparation for the International Telecommunication Union World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum,* FCC 90-316, 5 FCC Rcd 6046, 6060, para. 101 (1990).

U.S. Has Protected Flight Test Band

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- U.S. took extraordinary measures at WRC-07 to protect S-band telemetry:

  "The United States of America and Canada refer to footnote number 5.394 of Article 5 of the Radio Regulations concerning the use of the 2 300-2 390 MHz band in the United States and the 2 300-2 400 MHz band in Canada and state that, in application of the Final Acts of the World Radiocommunications Conference (Geneva, 2007) in those bands, the aeronautical mobile service for telemetry has priority over other uses by the mobile services."[4/]

[4/] Declaration No. 78, Document 427-E (WRC-07) (emphasis added).

Appendix

Additional Risks/Costs

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- A large part of the cost to certify a new aircraft comes in preparing the aircraft for each test flight.
- 43+10 log (P) dB will reduce and also segment the remaining airspace, thereby decreasing the number of test points flown per flight
- 43+10 log (P) dB will require aircraft manufacturers to fly many additional flights resulting in substantial increases to:
  - Cost
  - Safety Risk (more take-offs & landings)
  - Carbon Footprint (twice as much fuel burned at take-off)

Bell Helicopter Cost Impacts

- A “medium” developmental flight test program at Bell costs $20-30,000 per flight hour
- Practically, we have ~4-6 hours in the morning of each test day that provide the weather conditions needed (All test A/C have similar requirements)
- This fact makes operational readiness and test efficiency paramount – the aircraft must be properly-configured, the onboard instrumentation packages fully-functional, and the ground-based data/telemetry systems active and available to take advantage of a narrow time window
- Reduction in telemetry range limits flexibility in scheduling and reduces productivity, thereby increasing the cost of flight test programs

Boeing Analysis of Test Delays

AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL

- A reduction in TM range WILL impact test efficiency.
- Delays in aircraft certification and aircraft modifications due to reduced flight ranges could cost Boeing programs, customers, contractors, and the national economy -- potentially billions of dollars.
- Additional losses occur when one considers the loss of competitive advantage due to delays.
- Immediate costs for the 787 program can be over $175,000/day for each additional day the test aircraft is in flight – costs increase with size of the test.
- FAA/DoD certification and delivery delays also cost the US economy in lost revenue, investor confidence and future US aerospace business.
- Reduced usable flight areas impacts safety if unforeseen interference causes signal/communications loss.

L-3 Cost Impacts

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- L-3 flight testing costs range from $48,000 per hour to over $60,000 per hour.
- Delivery delays cost in excess of $100,000 per day in penalties, and can impact vital Federal programs and missions.
- Reduction in telemetry range limits flexibility in scheduling, e.g. Greenville, TX area already heavily impacted by air traffic restrictions due to DFW.

Learjet Cost Impacts

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- A “medium” test program at Learjet costs $70,000 for each day in a certification flight test phase (salaries and other expenses)
- A one month delay in delivery of a certified aircraft costs $2.1 million (not counting any contractual delivery penalties)
- A 30% reduction in TM range WILL impact test efficiency and safety by
  - reducing the time available during each flight to complete test points (turn-arounds add no value)
  - increasing the likelihood of interference at test range boundaries
  - increasing flight crew workload to fit a test profile into a smaller area

Impacts on Lockheed Martin

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- Lockheed Martin performs flight testing at various facilities including government ranges with manned and unmanned assets.
- Flight telemetry is integral to the testing of new aircraft and to aerospace companies being able to accomplish their mission.
- Pilot safety: Interference free telemetry data is essential to ensuring pilot safety. Flight telemetry provides the only real-time link between the test pilots and engineers providing a layer of safety during flight testing that cannot be substituted by other means.
- Cost: Flight testing for fighter jets, e.g. F-16, JSF, can range from $30K to $85K per flight hour – retesting to compensate for non-valid telemetry data due to interference will quickly lead to significant cost and program delays.
- Significant cost and schedule impacts will be experienced due to infringement and further limited use of the S-band.