The Economic Importance of Adequate Aeronautical Telemetry Spectrum: A Summery for the ICTS

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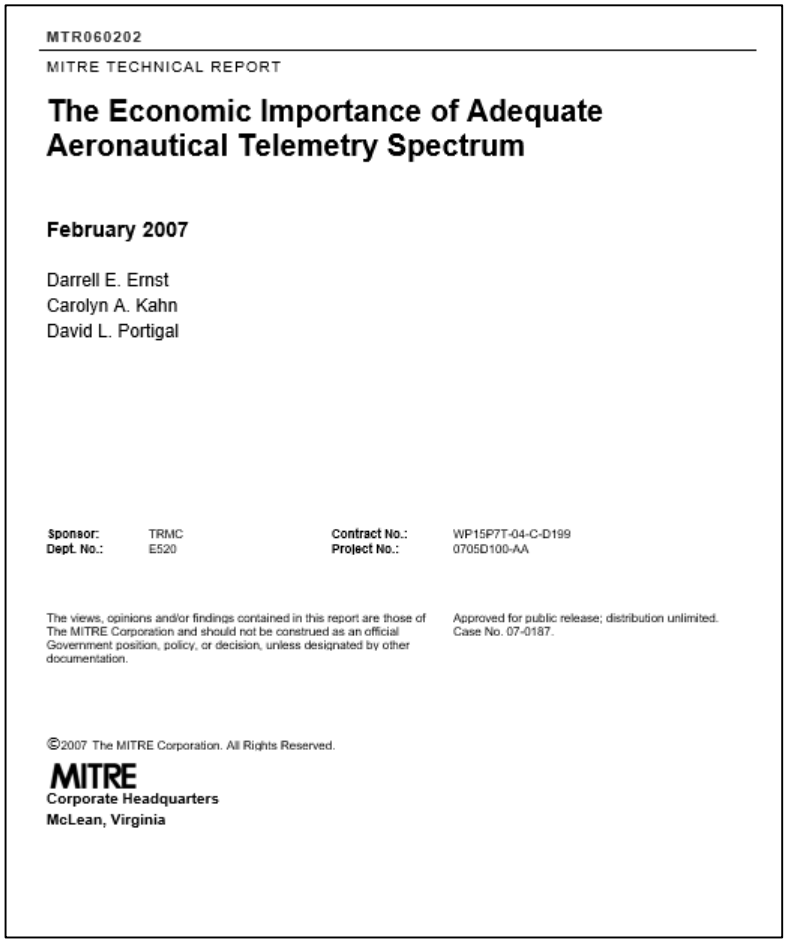
Agenda

- **2007 Report**
- **2019 Report methodology**
  - Describe input and data gathering effort
  - Review assumptions and estimations supporting the models
- **Provide a summary of preliminary findings**

Changes from 2007 Report

- **Different primary audience/sponsor**
- **Different purpose**
  - Associating cost to current spectrum allocation (previous: justified additional allocation)
- **Updated technology adaptation schedules**
- **Updated range and program testing schedules**
- **Expanded Spectrum Usage Data**
- **Extended analysis time period**
  - Now to 2035 (previous: 2005 to 2025)
- **Expanded Data collection**
- **Detailed questionnaire and broad outreach process to more Ranges**
- **Expanded Breadth of data inputs**
  - Updated data and added a more comprehensive look based on additional ranges (previous: largely based on one Range)



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MITRE TECHNICAL REPORT

The Economic Importance of Adequate Aeronautical Telemetry Spectrum

February 2007

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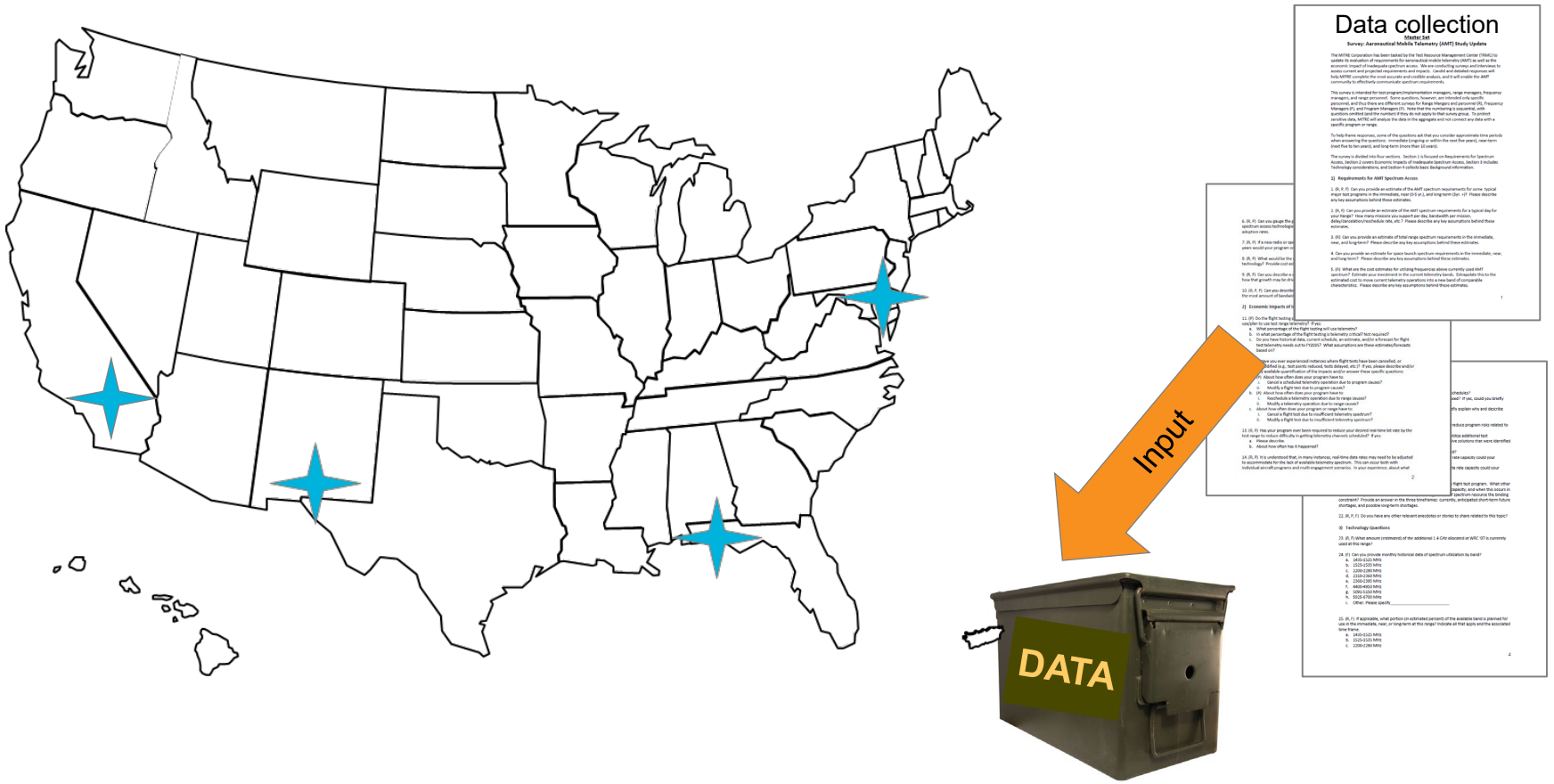
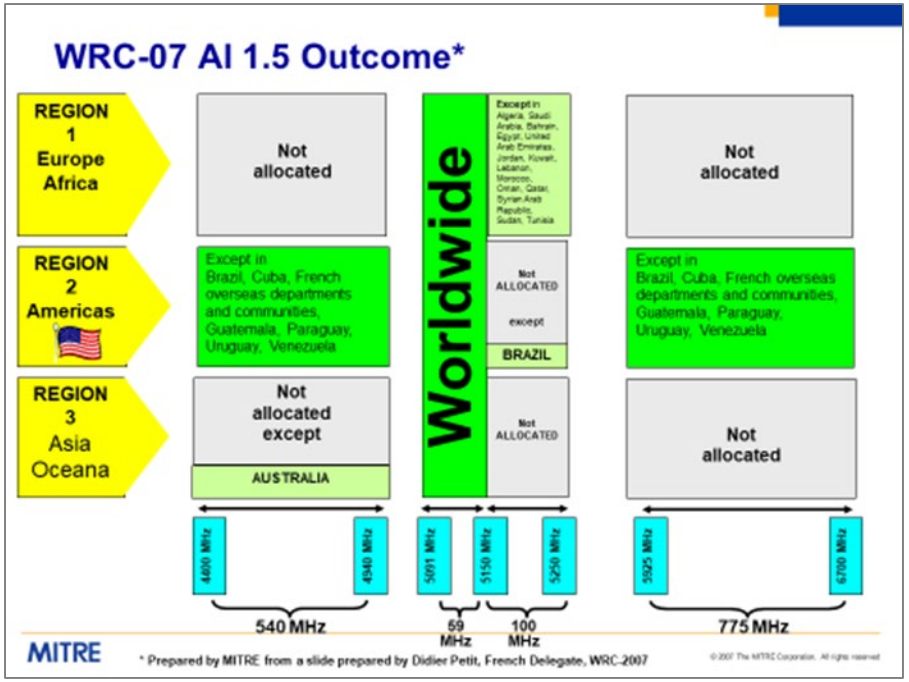
Outreach and Data Request

- **Range Visits and Briefings**



Assumptions

- **Supply**
  - Since last study, there is an increased actual (practical) supply from WRC beginning in 2008
  - Shared bands are weighted to approximate usability
- **Demand**
  - Max User: applies range data inputs to inform growth
  - Future on-going growth rate extrapolated from 2011-17 data
  - Technology implementation and adoption schedules: Tier 1 and Tier 2
  - iNET implementation starts in 2021, follows same adoption rate and anticipated usage as in 2007 report
- **Cost**
  - Inadequate testing impact: converted to cost per MHz of shortage
  - Delay impact: Rates ($/MHz)
  - Range extension costs
  - Technology investment cost



Technology Adoption Rates

Date	Tier 1 Use Adoption Rate	Tier 2 Use Adoption Rate	iNet Adoption Rate
2005	0.10		
2006	0.15		
2007	0.21		
2008	0.26		
2009	0.32		
2010	0.37		
2011	0.42		
2012	0.48		
2013	0.53		
2014	0.58		
2015	0.64		
2016	0.69		
2017	0.75		
2018	0.80		
2019	0.83		
2020	0.85	0.10	
2021	0.88	0.20	0.050
2022	0.91	0.30	0.100
2023	0.93	0.40	0.150
2024	0.96	0.50	0.200
2025	0.96	0.60	0.250
2026	0.96	0.70	0.300
2027	0.96	0.80	0.350
2028	0.96	0.90	0.400
2029	0.96	0.96	0.450
2030	0.96	0.96	0.500
2031	0.96	0.96	0.550
2032	0.96	0.96	0.600
2033	0.96	0.96	0.650
2034	0.96	0.96	0.700
2035	0.96	0.96	0.700

- **Adoption rates updated to reflect current and estimated future deployments**
- **The benefits of Tier 1, Tier 2, and iNET are weighted by efficiency factors, $(e_{\text{Tier 1}}, e_{\text{Tier 2}}, e_{\text{iNET}},)$**
- **Example:**

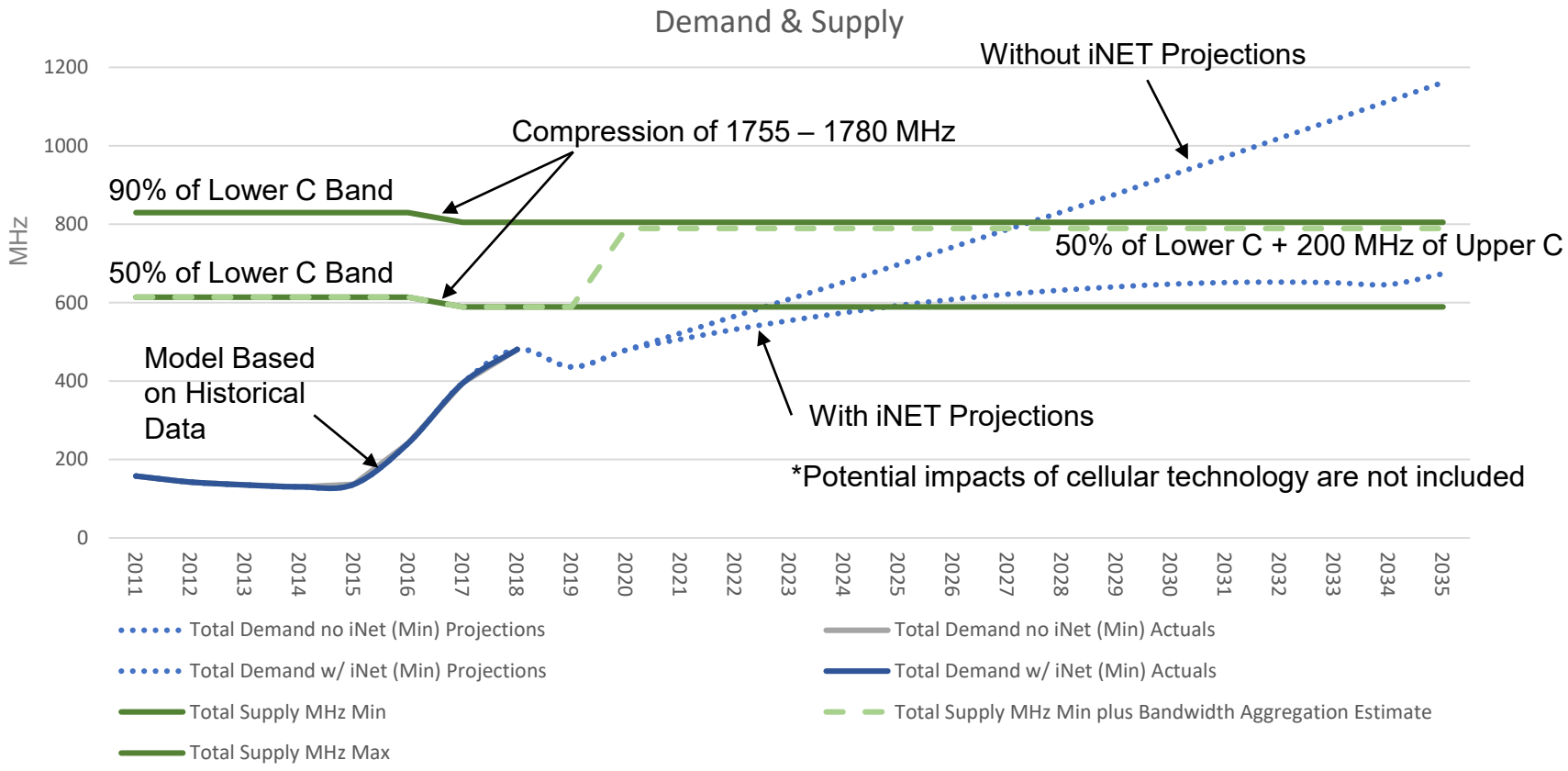
$$BW_{2020} = BW_{nominal,2020} \times (1 - e_{\text{Tier 1}} \times 0.85) \times (1 - e_{\text{Tier 2}} \times 0.10)$$

where the “nominal” is the bandwidth required assuming Tier 0 technology

BW = bandwidth

Summary of Preliminary Findings (1 of 3)

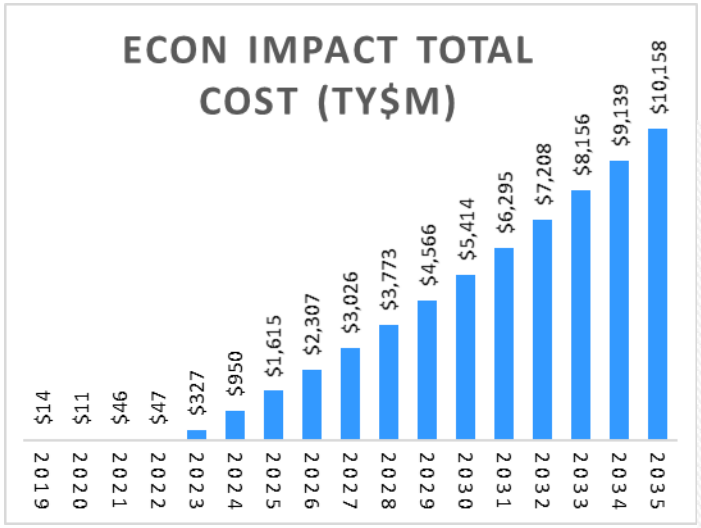
Under current spectrum allocations, assumed schedule of technological adaptation, and anticipated testing schedule, the gap is dependent on the supply of the BW.

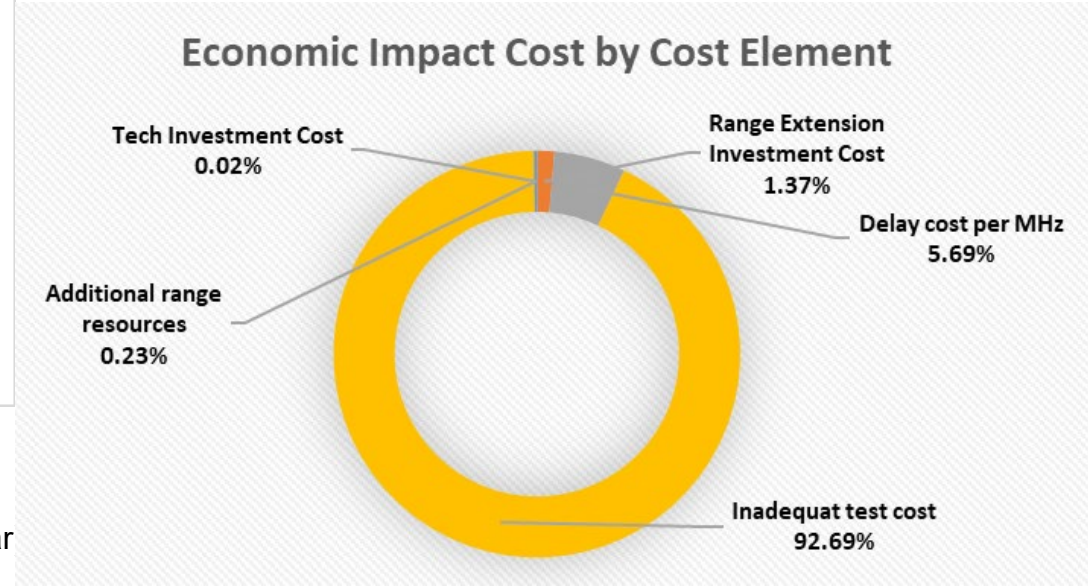


Summary of Preliminary Findings (2 of 3)

The total US economic impact analysis from 2019 to 2035 is ~$63 billion.

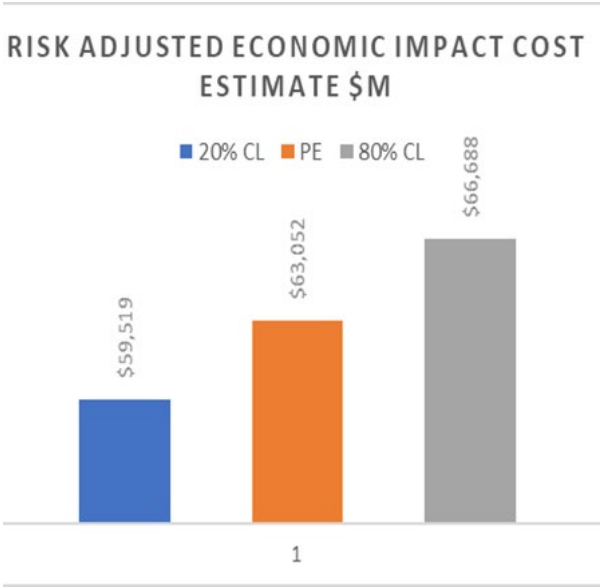
This is based on the 50% Lower C Band supply curve and without iNET deployment included in the demand.





TY = Then-Year (i.e., inflation adjusted base-year

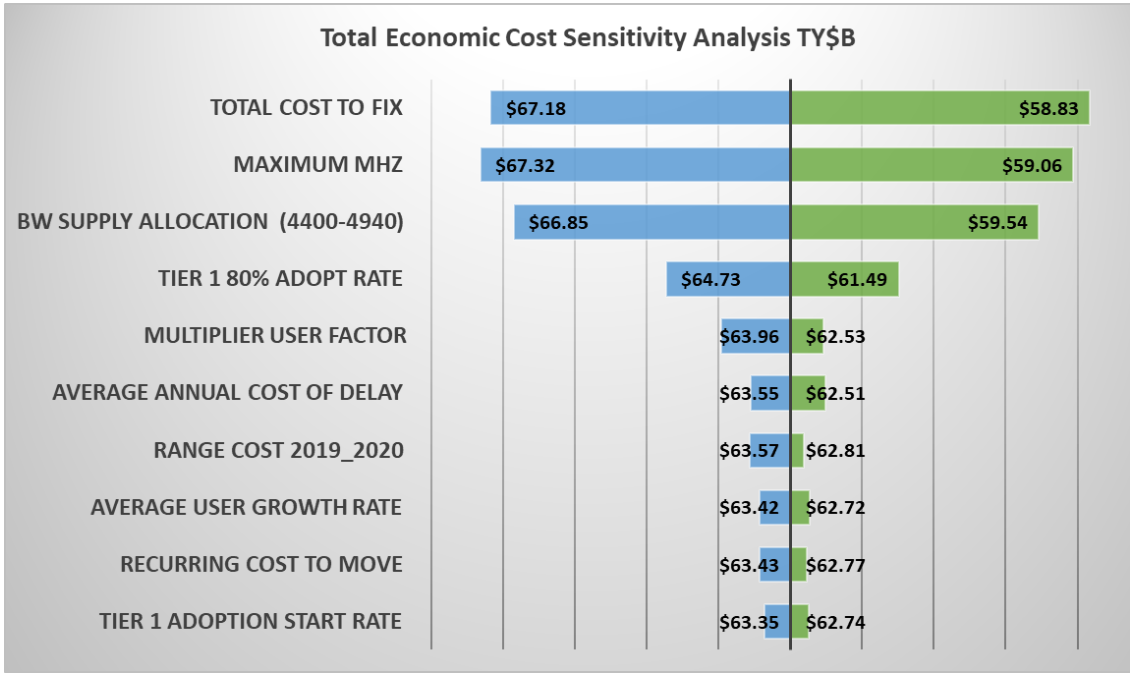
Summary of Preliminary Findings (3 of 3)



The risk adjusted economic impact cost estimate ranges between **$60B** @ 20% confidence level (CL) to **$67B** at 80% CL

PE = Point Estimate

Sensitivity analysis shows the “Total Cost to Fix”, “Maximum MHz”, and “BW Supply Allocation” variables have the most influence on the mean total cost output.



Conclusion

- **Spectrum is a key enabler of the U.S Aerospace and Defense (A&D) Industry.**
  - GDP: 1.8%; $307 billion in value added products and service
    - Aerospace Industries Association (AIA) 2017 Facts and Figures, October 2018, https://www.aia-aerospace.org/report/2017-facts-figures/. Data is for 2017.
- **In near and mid-term projections, spectrum supply and demand start to diverge.**
- **In the long-term, spectrum allocations and projected testing demands project demand gaps which must be addressed to avoid significant cost impacts.**
  - Additional technological advancements can potentially play a role in both demand and supply
    - Cellular technology
    - Spectrum aggregation technologies
  - Additional or extended range capabilities
  - More frequency management (efficiency improvements are limited)