

# Economic Performance and NGATS

NEXTOR 2<sup>nd</sup> National Airspace System Infrastructure  
Management Conference  
13 June 2006



Dr. Sherry S. Borener  
Director  
Evaluation and Analysis Division  
Joint Planning and Development Office



# Acknowledgement

This presentation includes work performed by a number of organizations and persons supporting the JPDO Evaluation and Analysis Division.



# Outline

- 2025 Aeronautics Activities and Worldwide Demand
- NAS Capacity Constraints Analysis – What if we can't satisfy 3X demand?
  - Estimating the loss in feasible throughput
  - Estimating the economic loss
- JPDO Cost Workshops
- Supplement – Alternative Funding Schemes

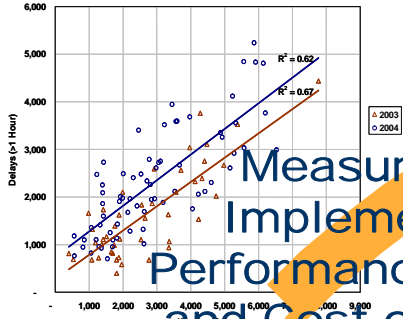


# 2025 Global Aeronautics Activities

- 2/3 of world aeronautics industry will take place outside of North America by 2025.
- U.S.-International trade in aeronautics goods and services will grow in importance with respect to U.S. domestic trade in goods and services.
- American airlines and aeronautics companies will form more partnerships with foreign partners.

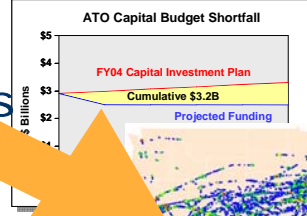


# JPDO Process for Achieving the NGATS

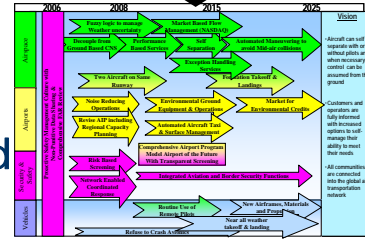
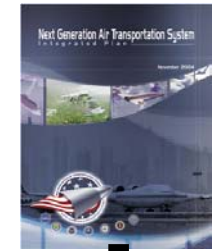


Measure Post-Implementation Performance, Service, and Cost of Segment

Baseline and Assess Today's Performance

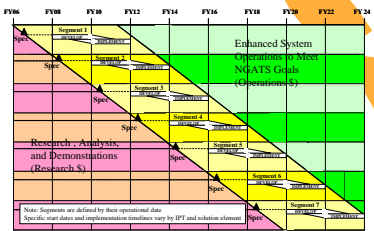


Define Concept of Operations; Identify Future Capabilities and Outcomes



- Define the "What"
- Architect & Analyze
- Define Solutions
- Execute & Measure

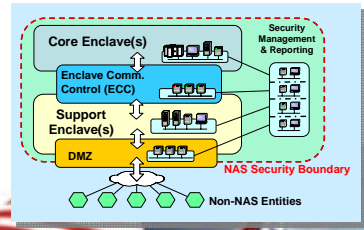
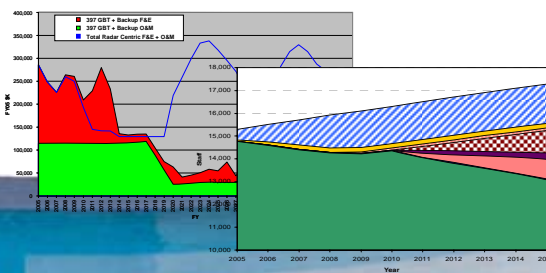
Define and Implement Incremental Solutions via Segments



Policy, Portfolio, Roadmaps, and Business Cases

Analyze Alternative Solutions and Assess Tradeoffs

Develop EA; Identify Gaps and Overlaps; Determine Research and Program Needs





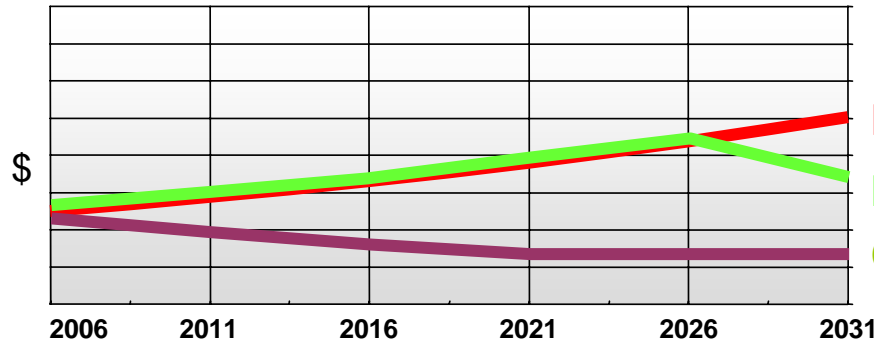
# 2025 – International Harmonization

- Successful NGATS implementation will require **significant coordination** between the U.S. government and industry and foreign governments and industry.
- We must develop truly ‘international’ standards for aircraft, required equipage, and operational paradigms.
  - Because of residual value concerns, this is an issue even for non-international carriers.
- Aeronautics companies must bear this in mind, paying more attention to other parts of the world.
- This will require placing increased emphasis on the needs of other countries and coordinating with key regions for the continued competitiveness of U.S. industry.



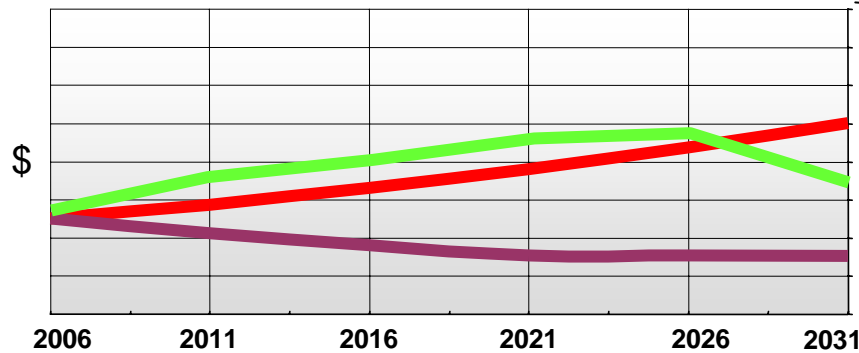
# Notional NGATS Funding Profiles

**Profile "A":** No new funds; Live within budget runouts



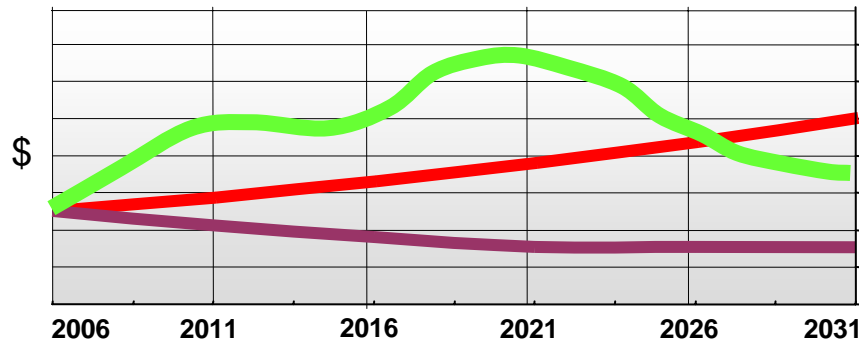
**Budget Runout @ 3%**  
**NGATS Budget**  
**Committed Budget**

**Profile "B":** Moderate constant resource increase required



**Budget Runout @ 3%**  
**NGATS Budget**  
**Committed Budget**

**Profile "C":** Major program phases and funding required



**Budget Runout @ 3%**  
**NGATS Budget**  
**Committed Budget**



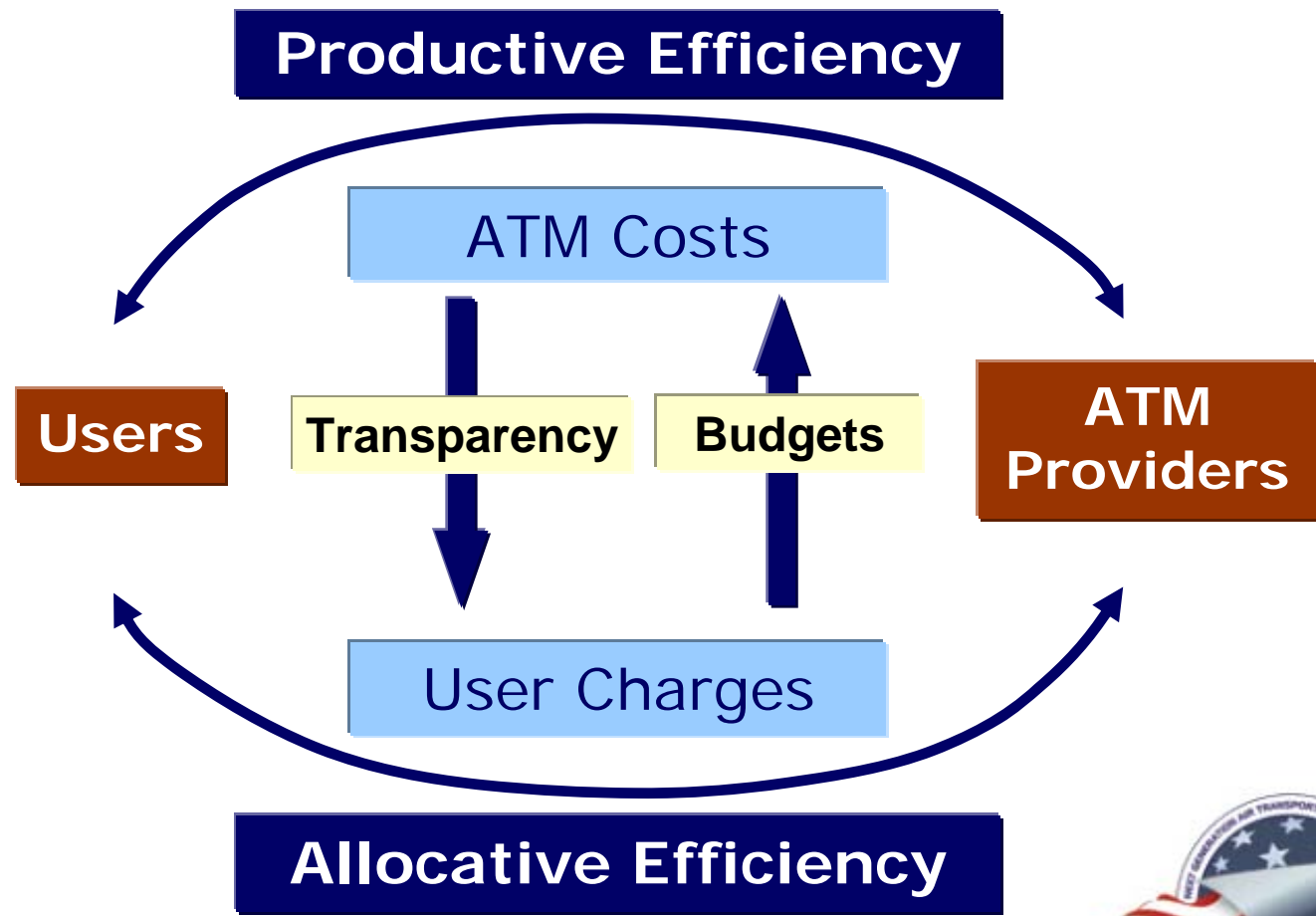
# 2025 Fleet Predictions

- Overseas demand for aircraft will by far outpace U.S. domestic demand over the next 20 years
  - Airbus predicts that 72 percent of the demand for new aircraft through 2025 will be outside of the United States
  - Boeing forecasts that 66 percent of the demand will be outside of the United States
- Of new aircraft needed, the United States will need 28 percent, Europe will need 32 percent, and Asia-Pacific countries will need 27 percent.
- Boeing predicts that the world passenger fleet will double in the next 20 years to almost 35,000 airplanes.
- The world freighter fleet will double over the next 20 years, from 1,766 to 3,456.
- By 2025, there will be more RPKs to/from the U.S. than within the U.S.





# Aligning Incentives Between Providers and Users

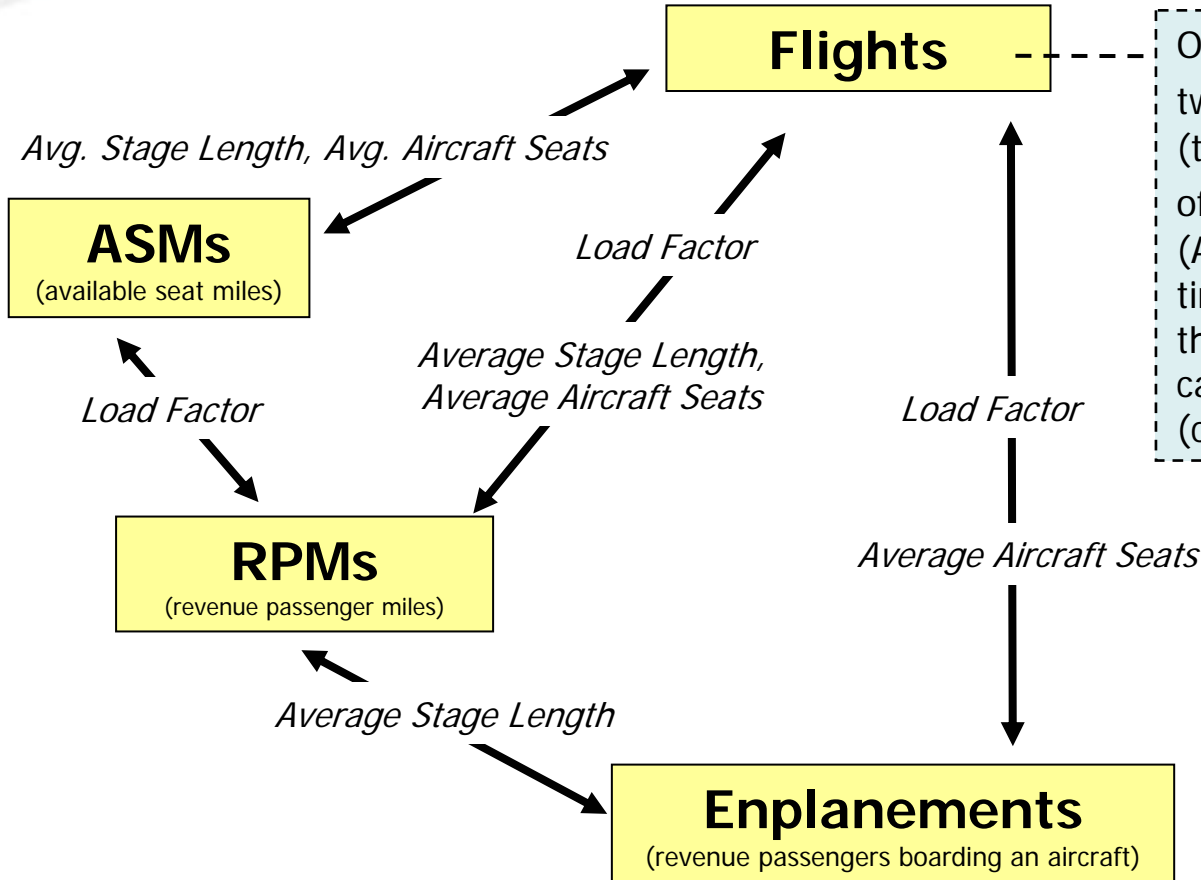


# Analysis of NAS Capacity Constraints

- We know that there are many facets of National Airspace System (NAS) capacity
  - Terminals, Runways, Taxiways, En Route sectors
- At a macro level, for this analysis, we have lumped capacity into only two categories: en route and airport
- What we'd like to see is which of these two categories constrains NAS performance first and to what degree
- We also want to investigate characteristics of the traffic when the NAS performance is constrained



# Capacity Analysis Approach



One single-stage flight consists of two **airport operations** (takeoff and landing) plus a number of **en route operations** (ATC communications). The total time required for takeoff, travel through the NAS and landing is calculated for every flight (commercial and general aviation).



# Capacity Analysis Metrics

- “Unconstrained demand” represents the public’s desire for air transportation
  - The FAA’s Terminal Area Forecast, based on socio-economic data, does not consider whether future NAS capacity will be sufficient to accommodate all the demand
  - Capacity constraints will force some of the demand to be left unsatisfied
- Our composite capacity metric is “***feasible throughput***” which is measured in terms of number of flights
  - Flights are eliminated from the future flight schedule after a specified airport delay tolerance or sector capacity is reached



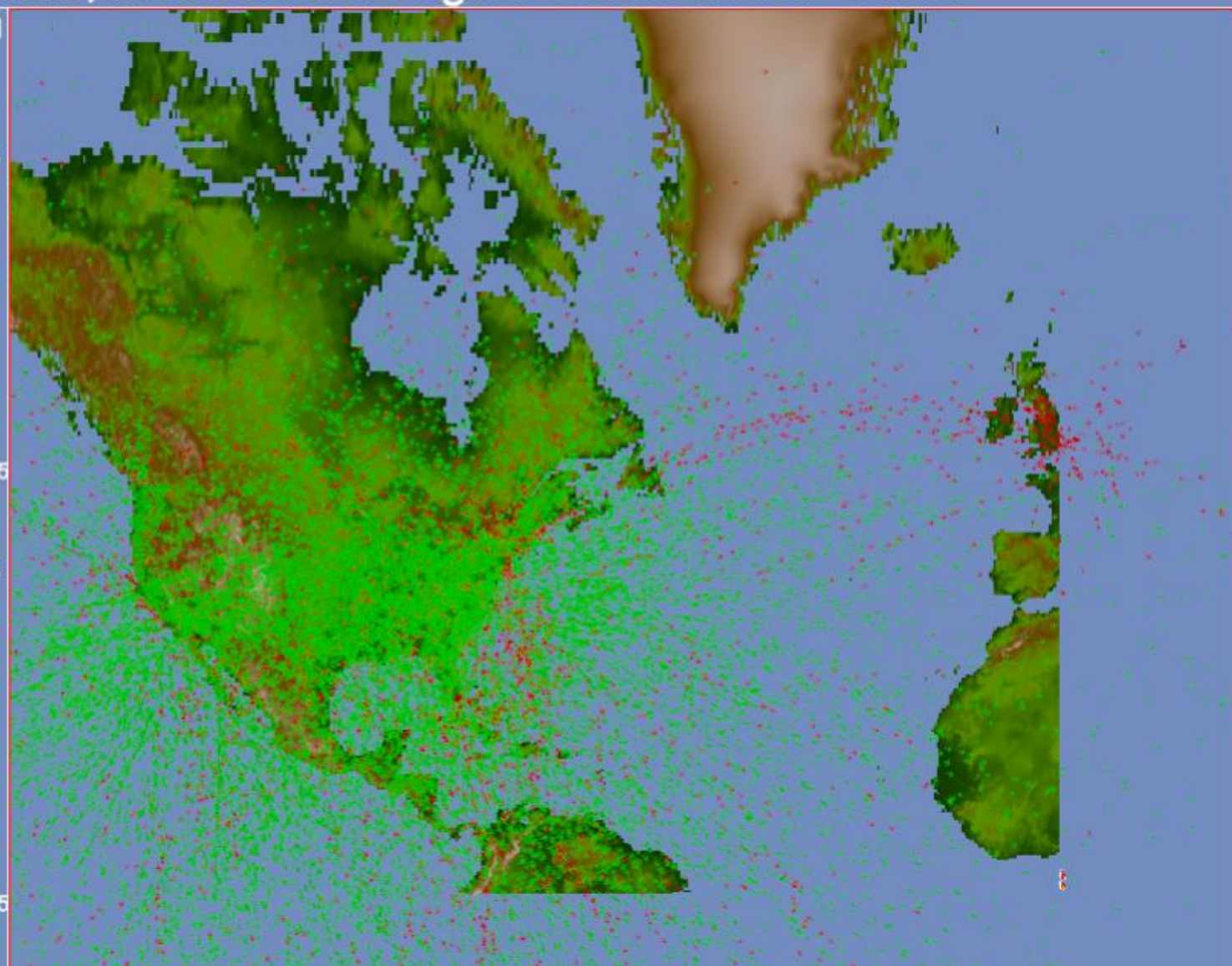
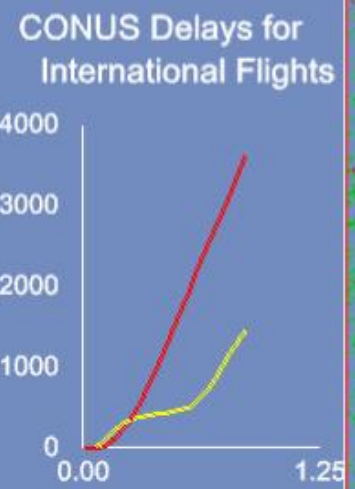
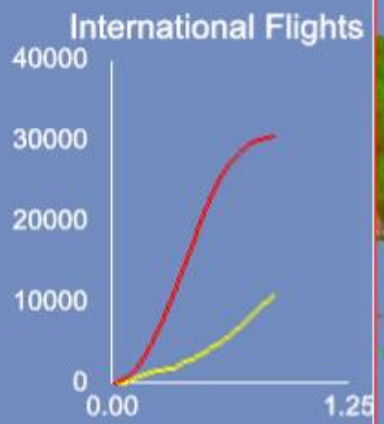
# Fred's Visualization



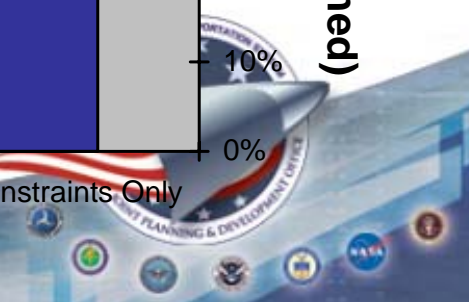
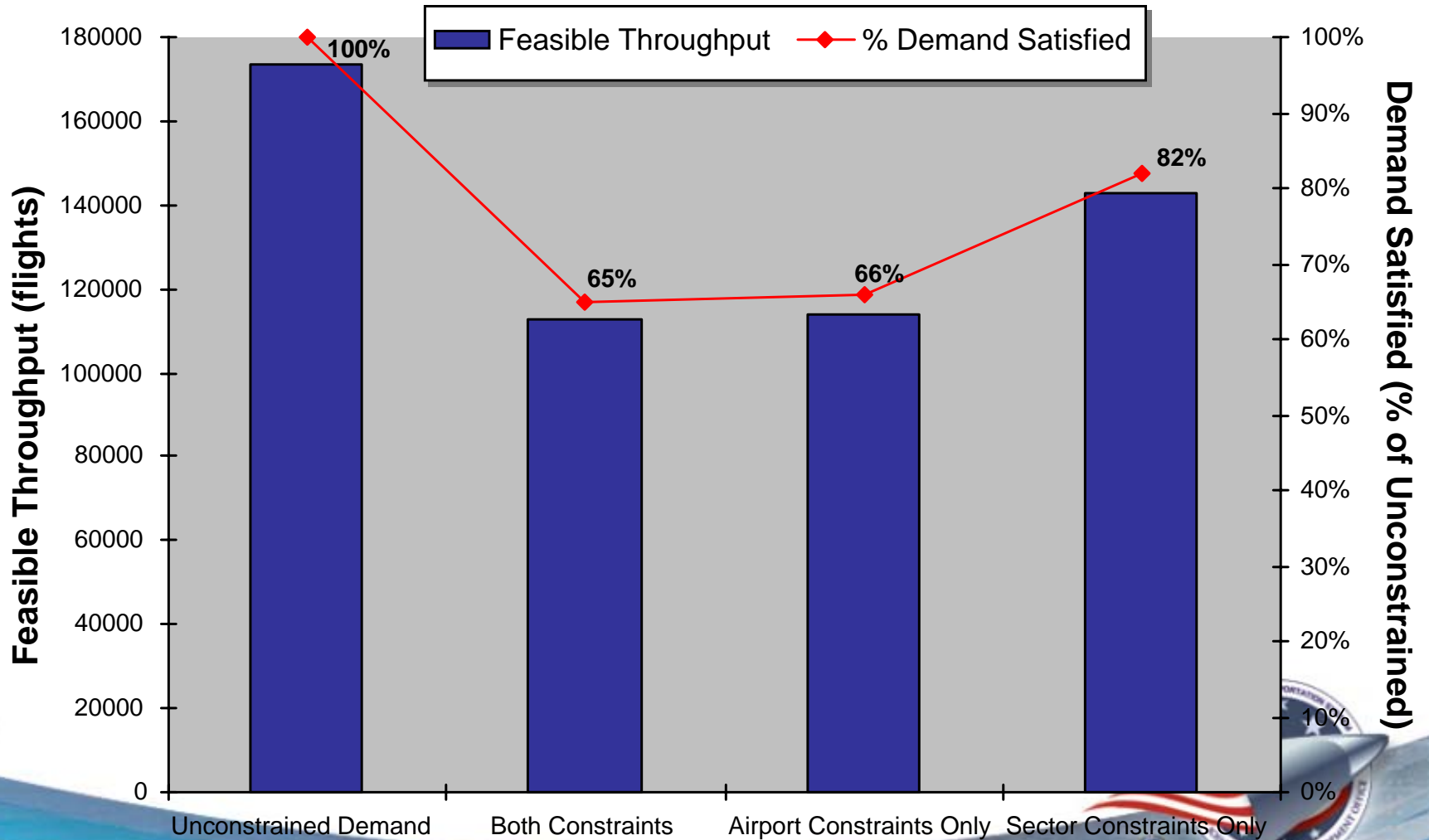


# 3X Traffic, International Flights Colored Red 15:40

Produced by Fred Wieland  
Sensis Corporation  
Copyright 2006 Sensis Corp.



# 3X Scenario Results



# Summary of Capacity Constraints Analysis 3X Demand

Category	3X Baseline Demand	3X Feasible Throughput (Airspace Constrained)	3X Feasible Throughput (Airports Constrained)	3X Feasible Throughput (Airports and Airspace Constrained)
Flights in NAS	173,980	142,782	114,156	112,595
Number of Flights Trimmed	N/A	31,198	59,824	61,385
% of Flights Trimmed	N/A	18%	34%	35%

*• Assuming only FAA airport capacity benchmark report airport capacity improvements and no airspace capacity improvements, the portion of demand that cannot be satisfied ranges from 18% to 35%.*

*• Note that the unsatisfied demand for the Airport Constrained and the Airport/Airspace Constrained cases are almost identical.*



# Impact on U.S./International Traffic

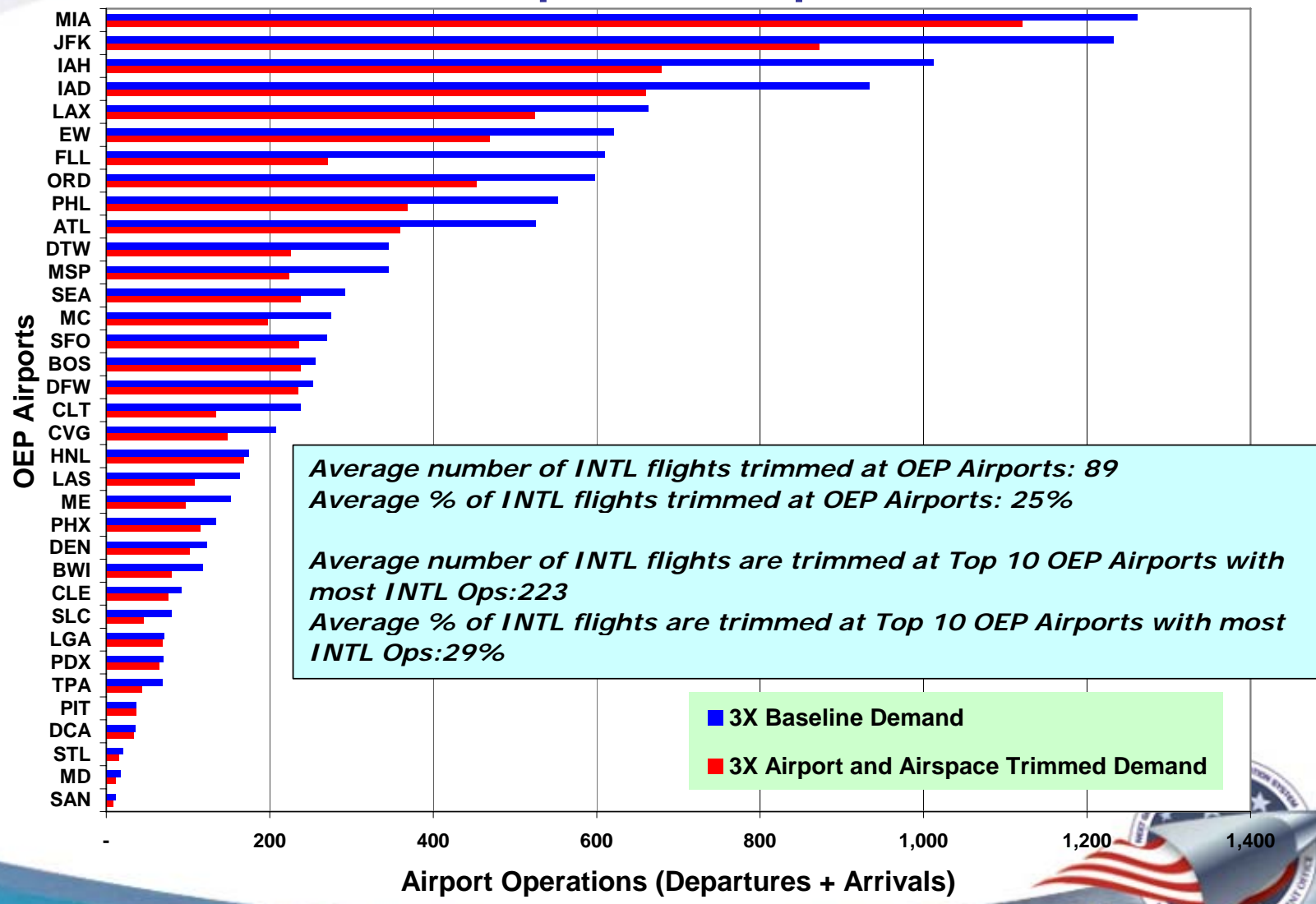
## 3X Demand – Airports/Airspace Constrained

Category	International Outbound Flights	International Inbound Flights	International Overflights
<b>3X Unconstrained Demand</b>	8,100	7,400	20,106
<b>3X Feasible Throughput</b>	6,012	5,550	20,044
<b>Number of Flights Trimmed</b>	2,088	1,850	62
<b>% of Flights Trimmed</b>	26%	25%	0%

- *Approximately ¼ of both International Inbound and International Outbound flights to/from the U.S. could not be satisfied under the 3X scenario.*
- *The impact on International Overflights is negligible.*

# Reduction in INTL flights at OEP Airports

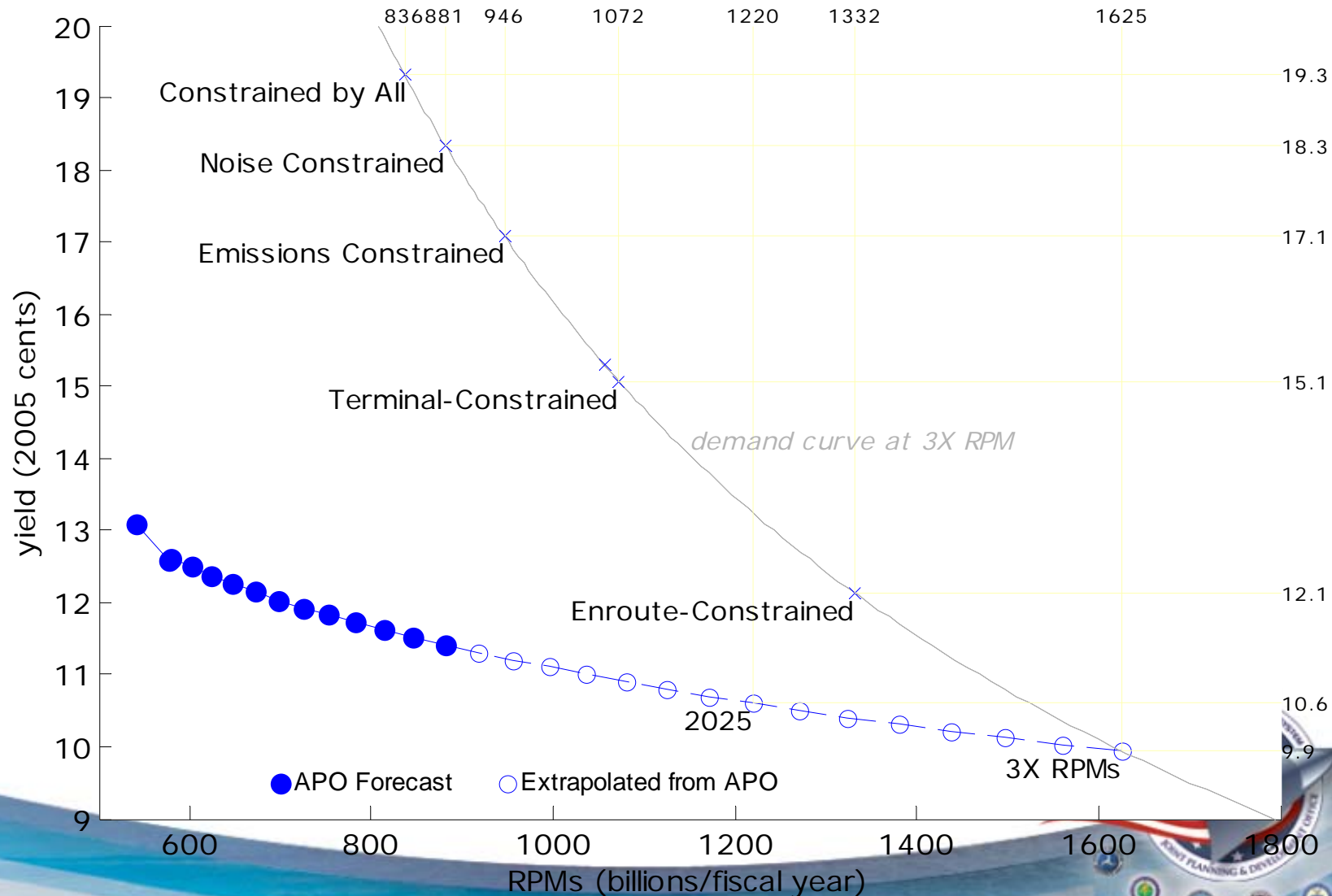
## 3X Demand – Airports/Airspace Constrained



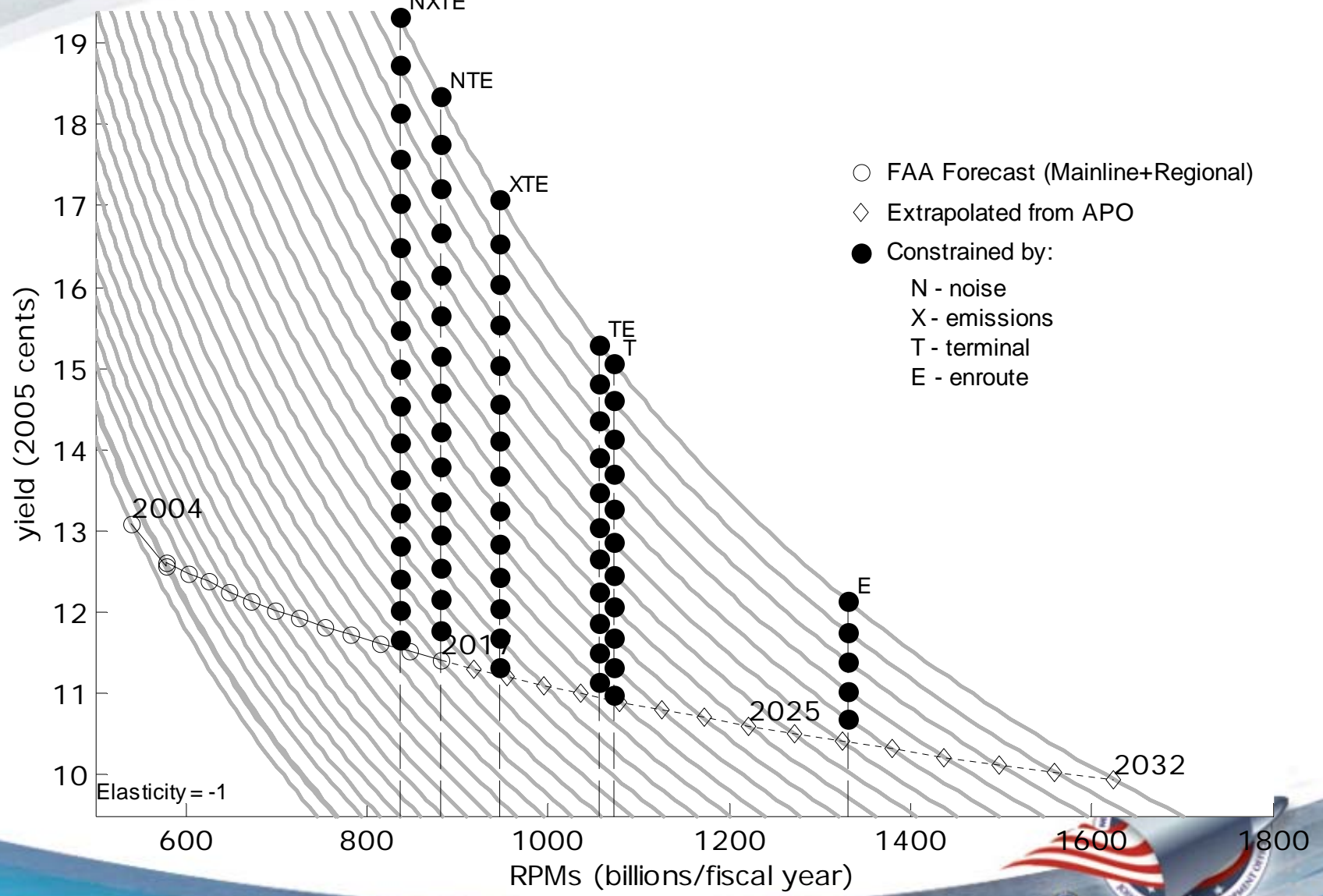


# 3X Constraints Analysis

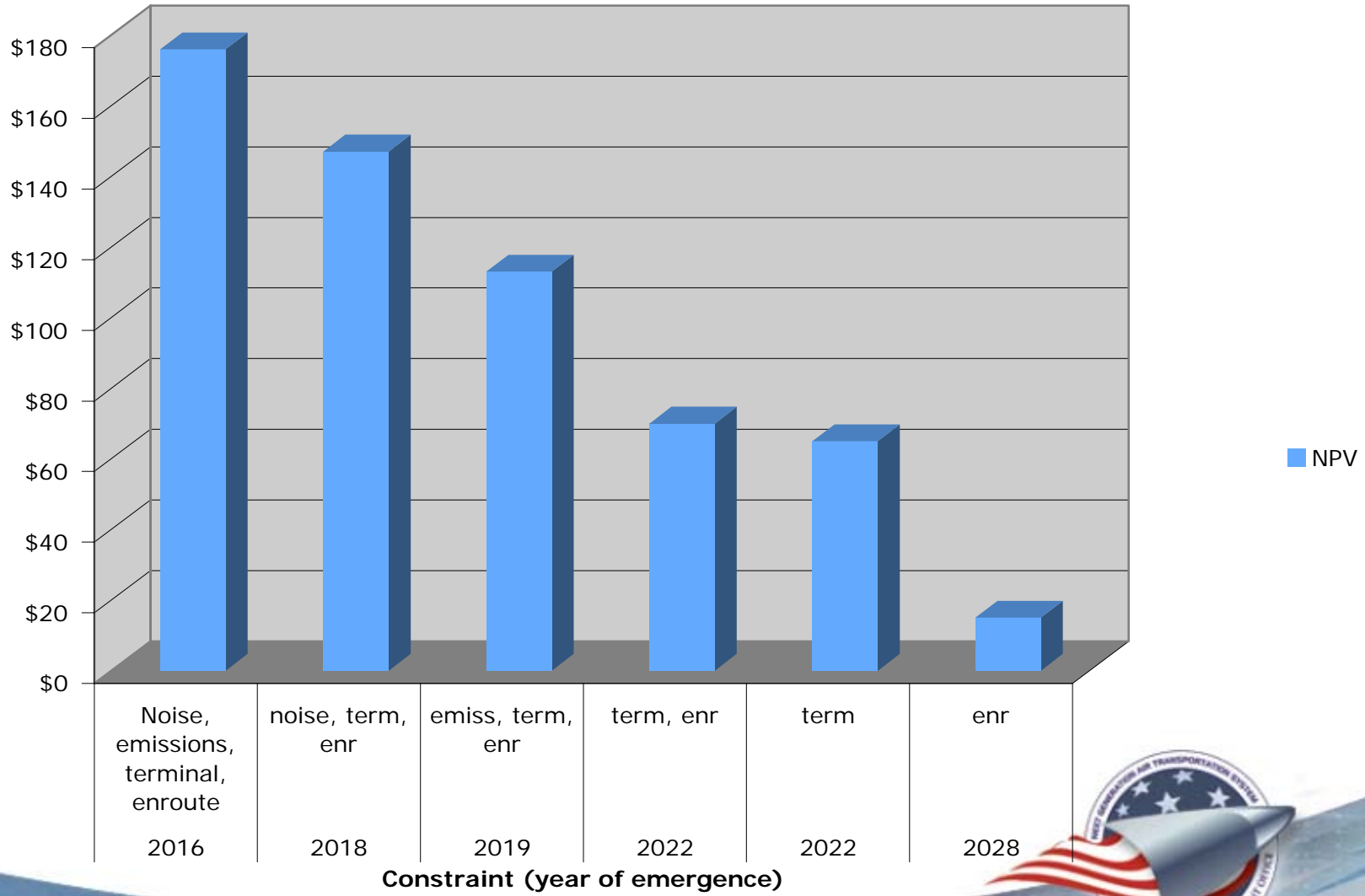
## Yield and Consumer Surplus



As demand grows while constraints limit supply, prices will rise

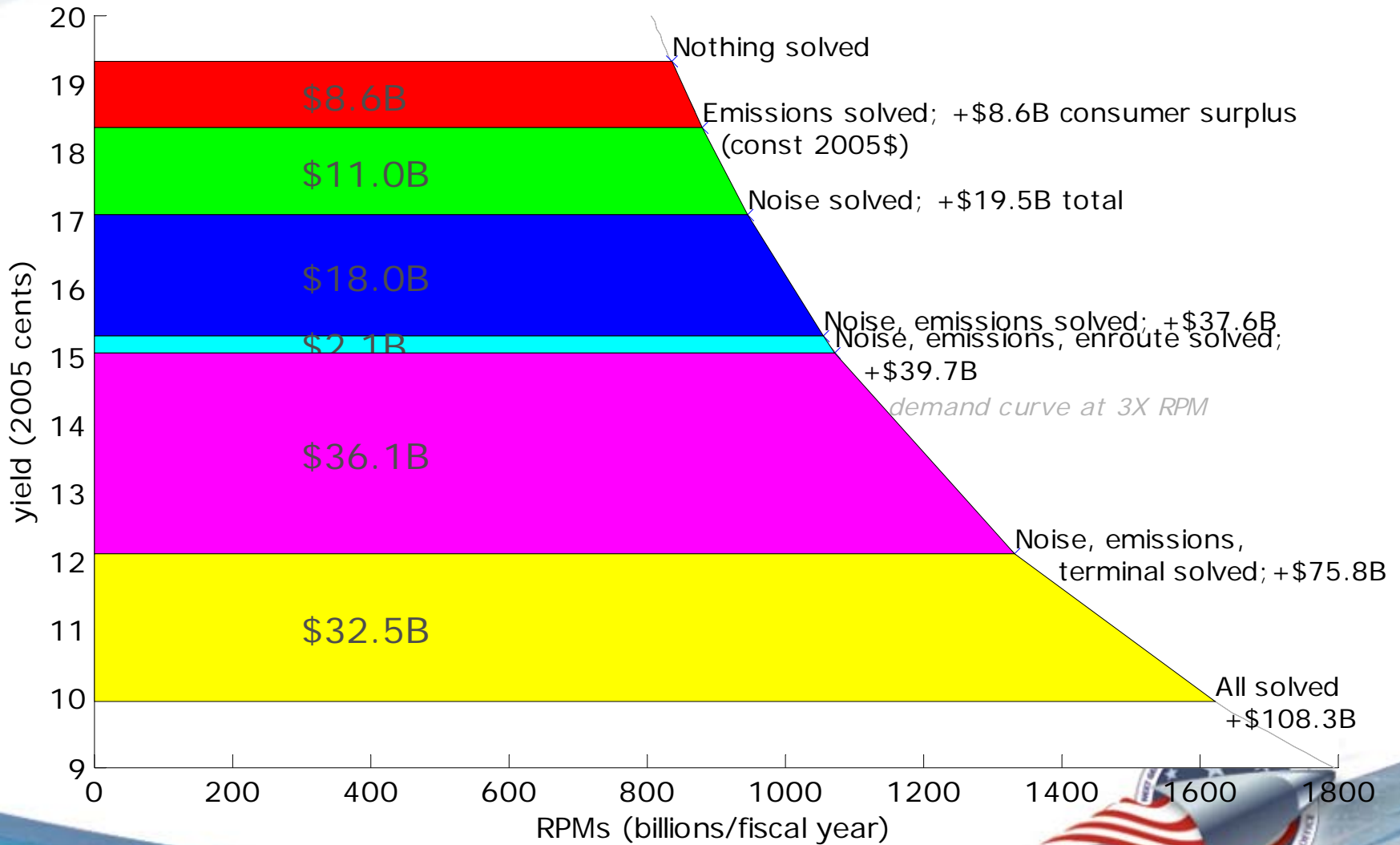


### NPV of Constraints Reduction (3X)



# 3X Constraints Analysis

## Yield and Consumer Surplus



# JPDO Cost Workshops

- A detailed “bottom-up” design cost for a program of this complexity, duration, and number of “known unknowns” is not yet practicable
- Objective of Cost Workshops are to make first order engineering estimates of:
  - required total funding
  - contingency reserves
  - funding profile shape, magnitude, and duration with acceptable performance outcomes and risks
- Continually justify requirements through political and technical reviews





# Cost Workshop 1 – Key Policy Issues

- Who (NASA or FAA) will do the research?
  - Distribution of funding and people?
  - Are the combined resources available?
- **Research should account for international harmonization issues and requirements**
- Industry wants to work collaboratively to develop specifics of the architecture
- Successful execution to the NGATS schedule requires strong linkage & leadership from fundamental research through decision points to certification and implementation
- FAA must gain commitment from other agencies



# Cost Workshop 1 – Key Policy Issues

- FAA commitment must be demonstrated
  - Exploit existing aircraft capabilities, e.g., RNP1 procedures
  - Develop integrated process representing all FAA players and necessary steps for implementation (including certification)
  - **Harmonize international standards to preclude extra equipage (impacts residual aircraft values)**
  
- NAS users have short ROI horizons
  - Less than one year for existing equipment
  - Approximately 1 – 3 years for new equipment
  - Implication: early adopters will need hard incentives
    - Subsidies, tax breaks, financing options, targeted deployments for early adopters
  
- An NGATS service roadmap is needed that
  - Specifies required equipage in specific time increments and airspace accessibility
  - Bundles capabilities with clearly defined anticipated benefits and needed investments
  - Uses a 4 – 5 year equipage cycle to synch with maintenance schedules



# Questions?

