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Transportation Research Board



Federal Aviation
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*Economic Realities of NAS Infrastructure Cost—
Making the Business Case for NAS Modernization:
A Step Beyond Benefit-Cost Analysis* © GRA, Inc. 2005

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Overview

- Traditional view of benefit-cost analysis

- Investing to reduce FAA costs
 - Who benefits
 - Types of benefits

- The use of financial projections
 - Benefits
 - Potential outcomes

- Wrap up



Traditional Benefit-Cost Analysis

- ➔ Used to justify NAS investments
 - Most appropriate tool
 - Meets OMB investment analysis standards

- ➔ Should consider all benefits
 - Airline (or other user) costs and revenues
 - FAA investment and operations and maintenance costs
 - Value of passenger time (not always included but should be)
 - External effects
 - Environment
 - Congestion
 - Safety

- ➔ Compensation principle
 - Pareto improving: benefits exceed costs and winners could compensate losers



Benefit-Cost Analysis Raises Questions

- Transfers/compensation rarely take place—impact on incentives and behavior
 - Not all benefits and costs are monetized
- Are financial implications considered?
 - Without cost-based fee for service, financial signals weak
 - FAA or users may not have resources to make cost-beneficial investments (capital limitations)
 - Congress may not recognize those implicit decisions accompanying investment and may not fund O&M at appropriate levels
- Pressures to focus on ATO cost reduction
- Benefits may be so diffuse or uncertain that users unwilling to pay for them
- Examples using FAA Establishment Criteria



Establishment Criteria for Air Traffic Control Towers

- Based on FAA Air Traffic Control Tower (ATCT) Establishment Criteria Model

- The criteria compare the value of ATCT tower benefits at the site with the level of ATCT Operations costs for 2004 (Total cost may be used in the comparison, when the data are available)

- The FAA ATCT Model includes the following user groups:
 - Scheduled commercial service
 - Non-scheduled commercial service
 - General Aviation
 - Military



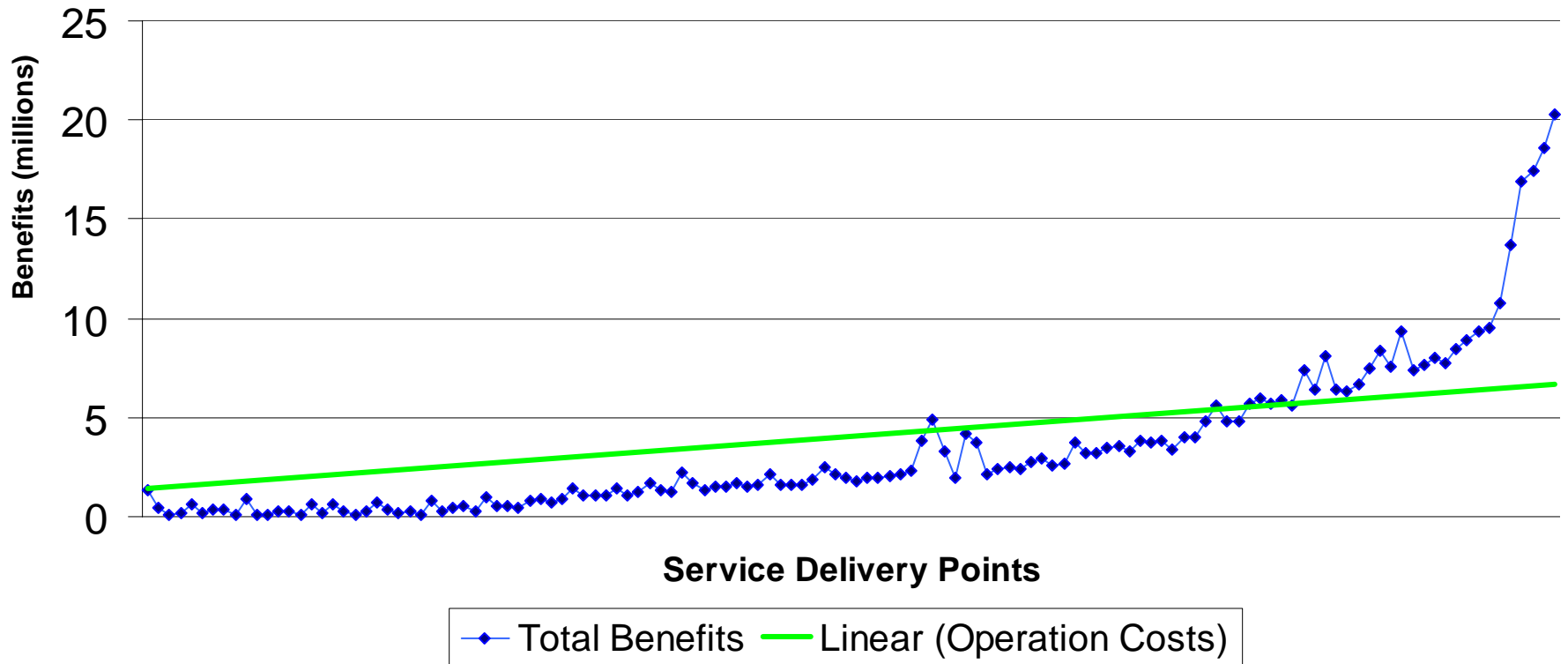
Results for Air Traffic Control Towers

- The type and level of activity at the airport determines the distribution of benefits
- While scheduled commercial aircraft activity drives most of the benefits, many of these facilities are well beyond the minimum threshold for establishment. However, the remaining activity may not be large enough to support tower establishment on its own
- For VFR and contract towers, military and GA activity comprise the largest share of benefits



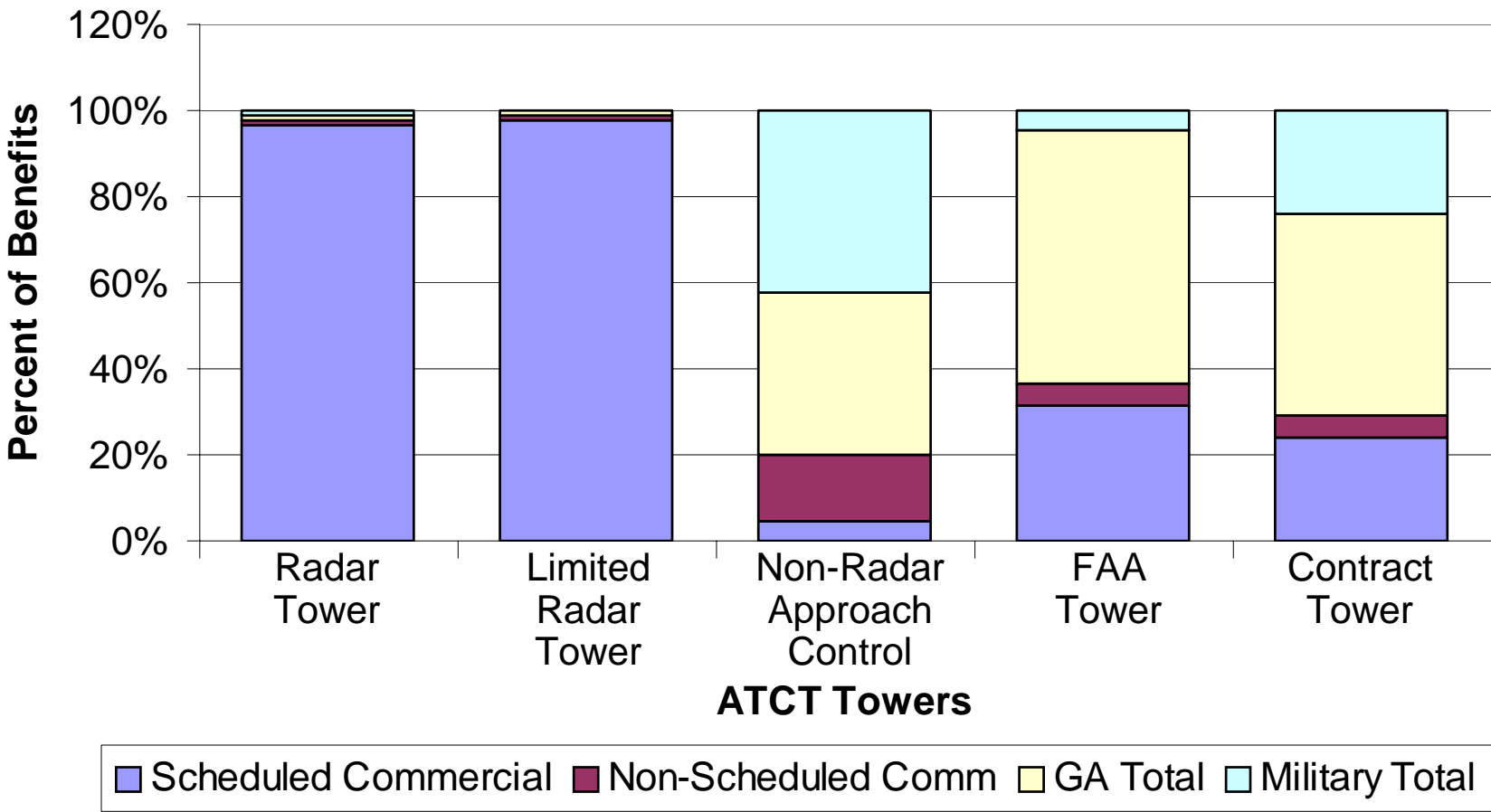
Establishment Criteria Results: Radar Towers

Radar Establishment Criteria
Total Benefits and Operation Costs
Scheduled Benefits Less than 20,000,000



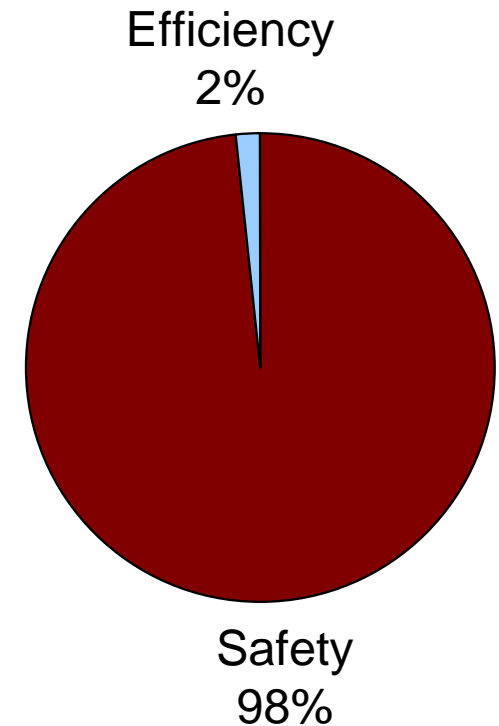
Distribution of Benefits by Type of User and Tower

Average Percent of Benefits by Users



ATCT Benefits by Type

ATCT by Type of Benefits (\$million)			
EMDF	Safety	Efficiency	Total
Radar Tower	\$426.8	\$17.0	\$443.8
Limited Radar Tower	\$2,027.7	\$6.9	\$2,034.7
Non-Radar Tower	\$0.3	\$0.1	\$0.4
VFR Tower	\$74.1	\$10.8	\$84.9
Contract Tower	\$28.8	\$9.7	\$38.5
Total	\$2,557.7	\$44.5	\$2,602.3



Establishment Criteria for Airport Surveillance Radar

- Based on FAA Establishment Criteria Model for Airport Surveillance Radar (ASR)
- Compares the value of ASR benefits at the site with the ASR radar one-time investment and installation cost, plus operations and maintenance costs for 2004
- The FAA ASR Model is based on the following user groups:
 - Scheduled commercial service
 - Non-scheduled commercial service
 - General Aviation
 - Military



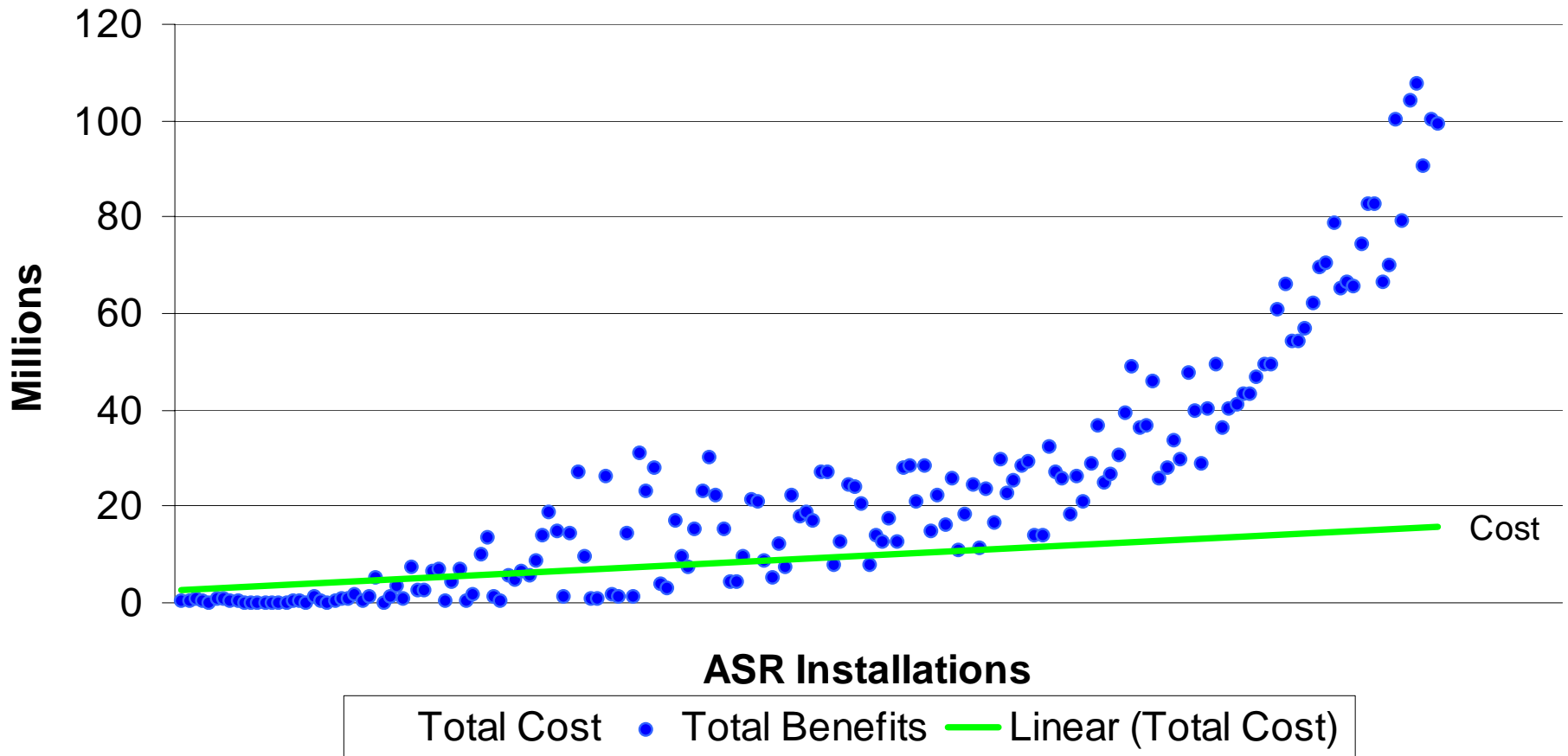
Results for Airport Surveillance Radar

- Major benefits are in efficiency measured as reduced delays, saving aircraft operating costs and passenger time costs
- Scheduled commercial aircraft operations drive most of the benefits

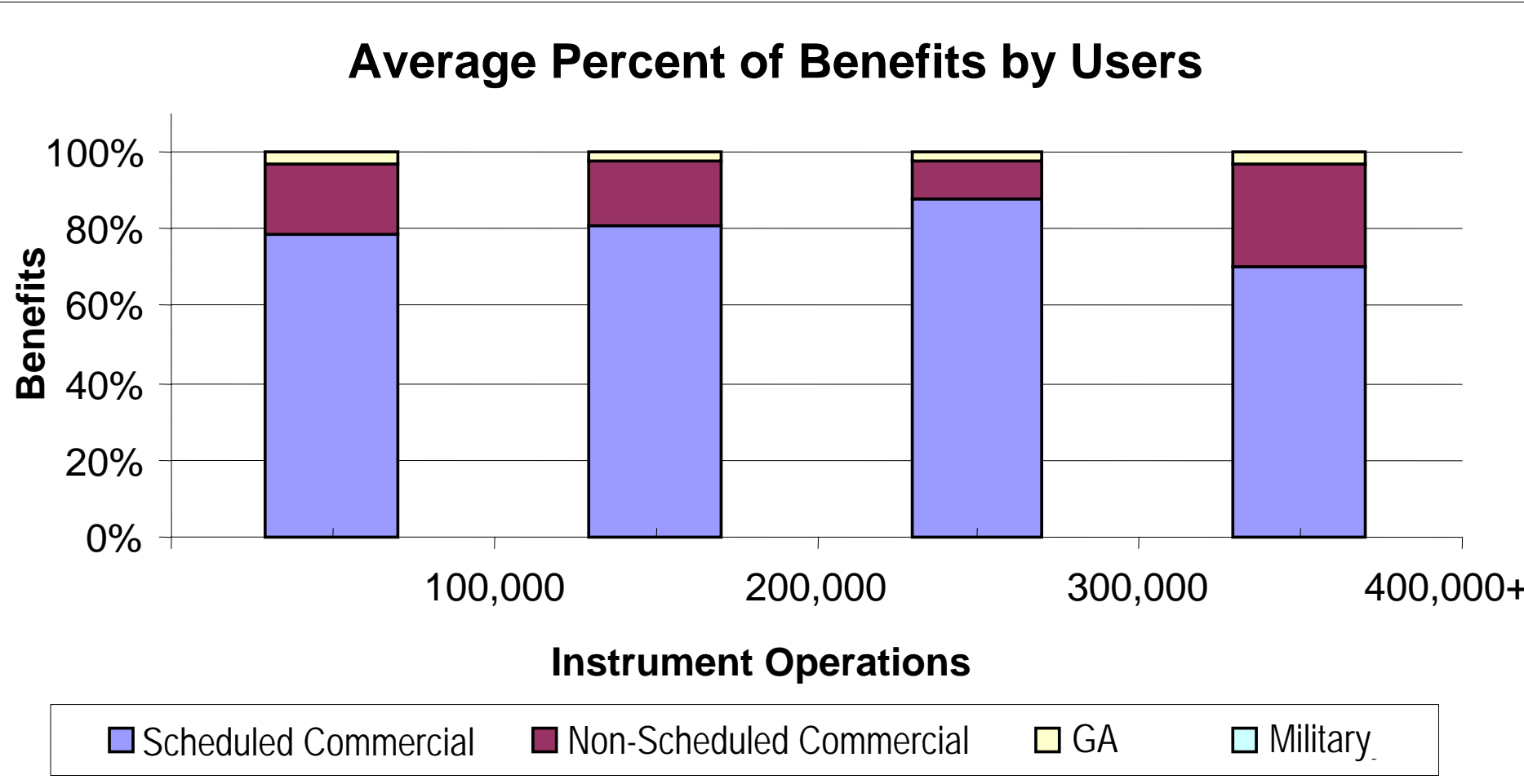


Total Benefits and Costs for ASR

Total Benefits and Total Costs for
Scheduled Traffic Benefits less than \$100,000,000



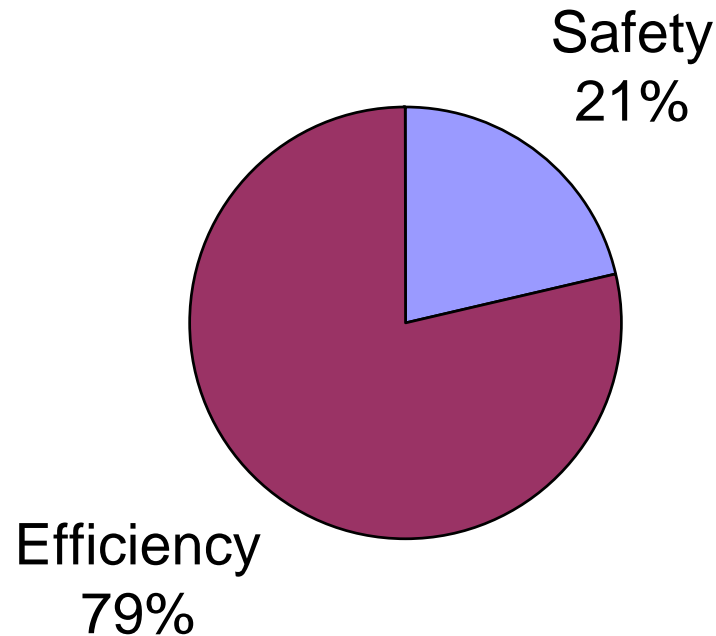
Distribution of Benefits by Type of User



ASR Benefits by Type

Benefits by Types (\$millions)

	Safety	Efficiency	Total
ASR	\$932.5	\$3,409.6	\$4,342.1



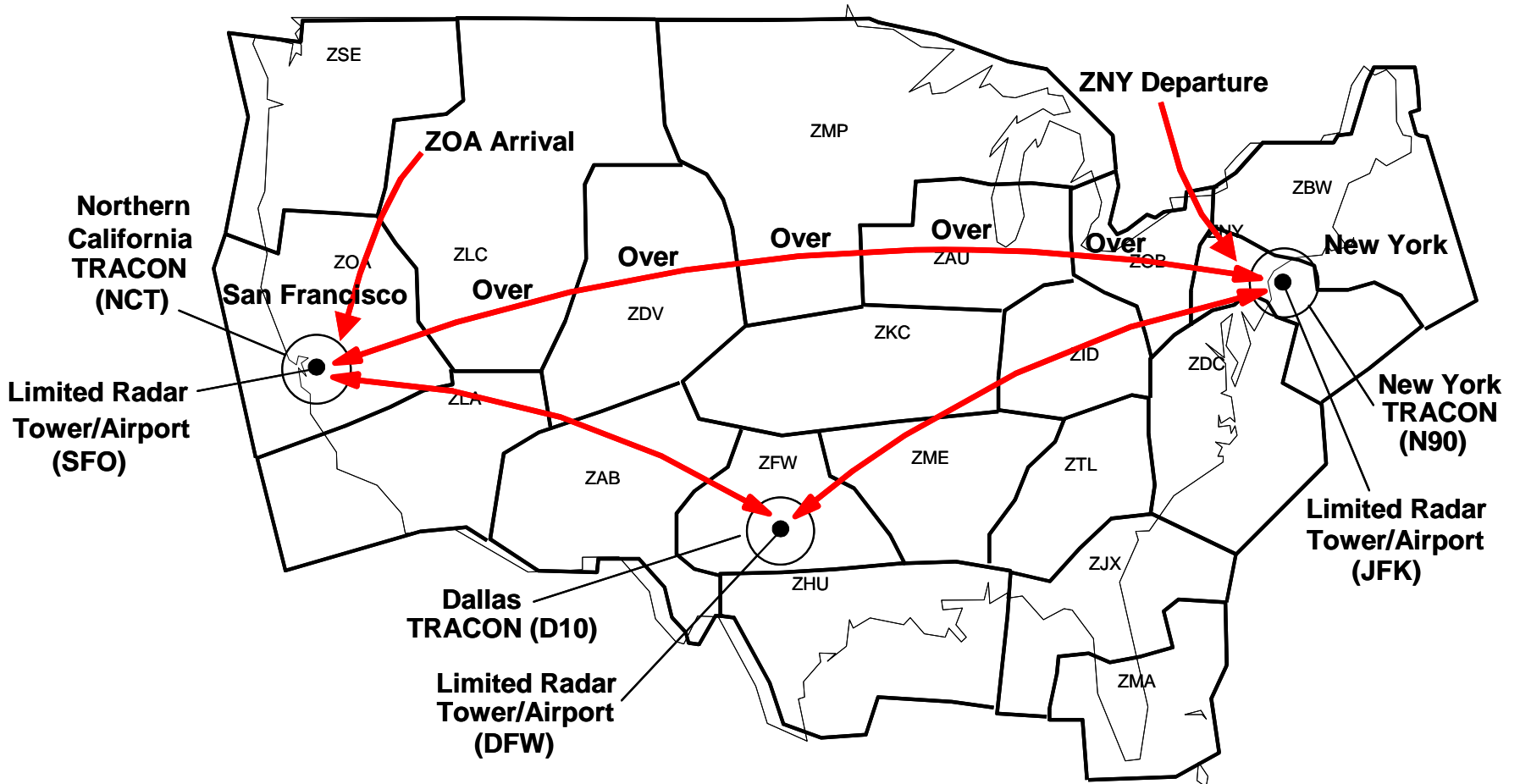
Investing to Reduce ATO and User Costs

- ➔ Cost reductions to passenger and airlines drive many ATO investments
- ➔ Investments rarely tracked to see what actually happened
- ➔ Transparency dictates disclosure
 - Require pro forma projections for each major investment
 - With and without investment
 - For all actors (ATO, aircraft operators, airports, passengers and shippers, external parties, etc.)
 - Maintain pro forma financial model with all programs to determine overlapping benefits and duplication of costs
 - Build into budgeting
 - Regular consultation with users and other stakeholders
 - Consider operating costs and financial flows
 - Identify complementary investments and costs incurred by airports, balance of FAA users, etc.



Service Delivery to IFR Flights

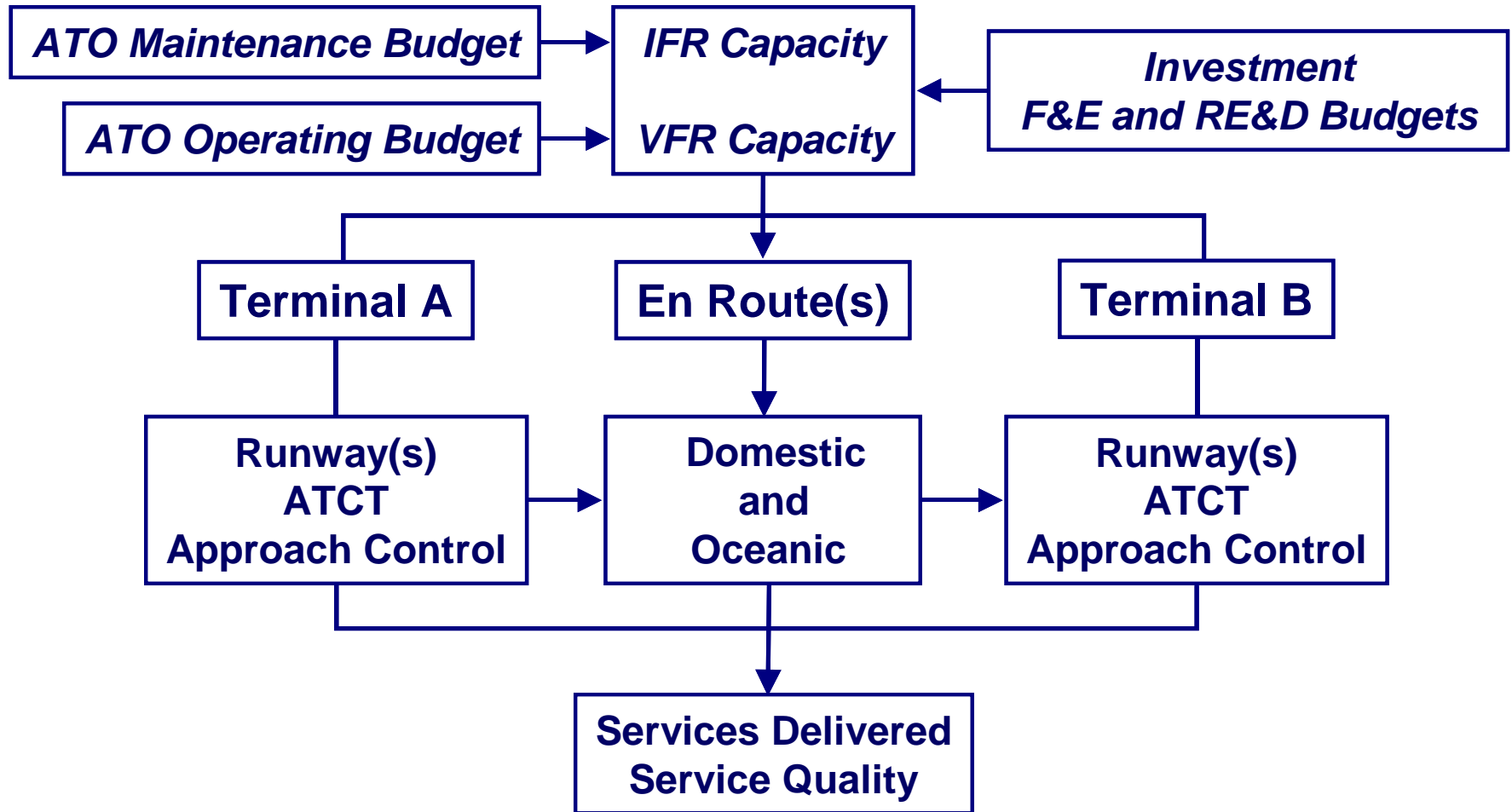
Tower Approach/Departure En Route₁ En Route₂ En Route₃ Tower



*Alaska, Hawaii, Puerto Rico, and Oceanic airspace not shown



Budgets Drive Service Delivery by ATO SDPs

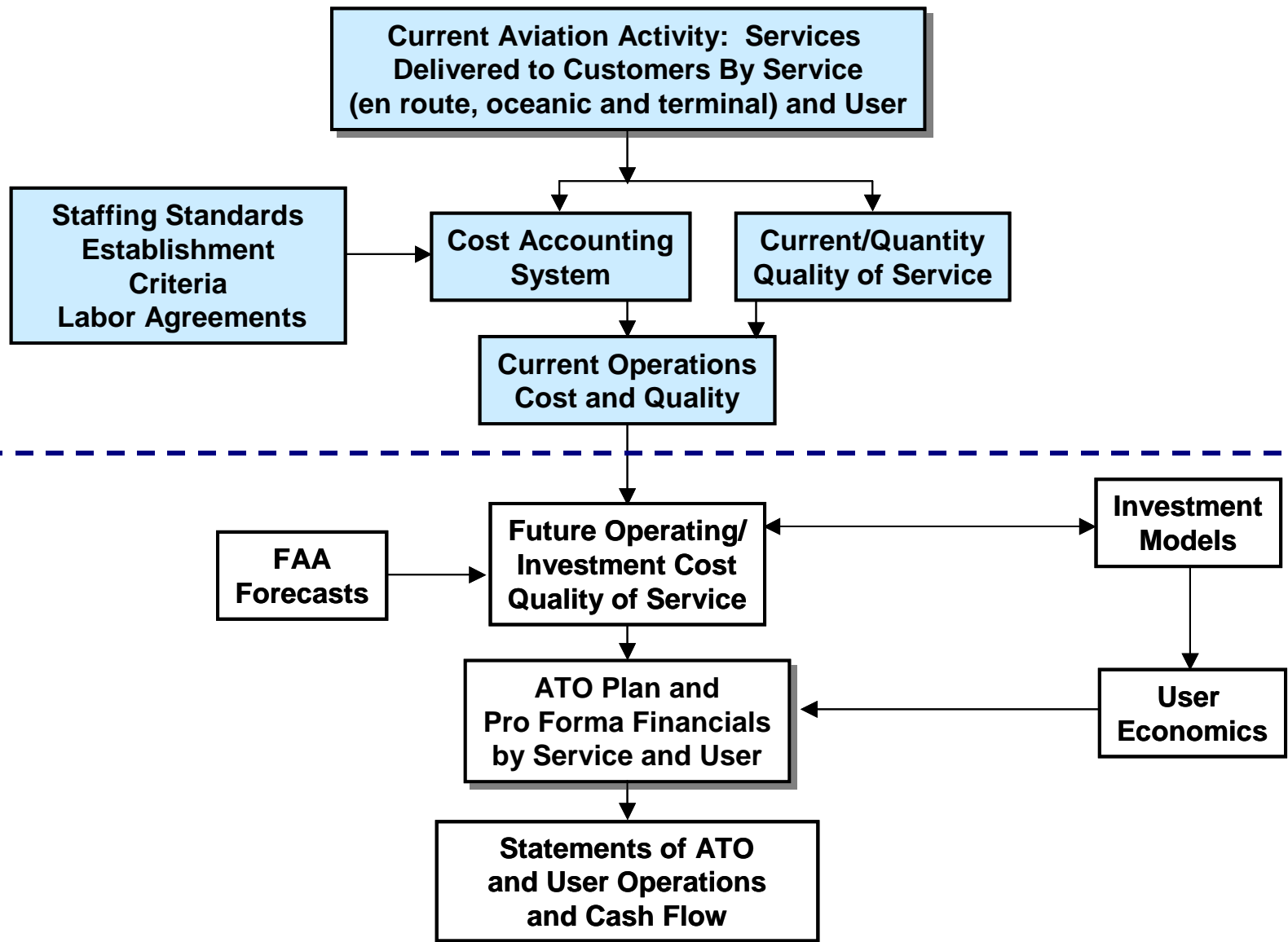


Drive Pro Formas to Produce Unit Costs of Services

- Need to determine impacts of investments on ATO and user productivity
 - CAS can support
 - Track ATO services and service delivery points
- Public utility framework for ATO
 - Used and useful investment in “rate base”
 - Activity projections
 - Unit costs of service
- Revenue, cost and cash flows for airports, users and other parties
- Ability to project future demand and financial performance by users at SDPs, and roll up ATO results by service



Developing Pro Forma Statements for the ATO



Hypothetical ATO and User Statements of Revenues and Costs

→ ATO Receipts

- Current taxes apply to flights and not to locus of service delivery—can only track at ATO level
- User fees would measure revenues for specific ATO services

→ ATO Expenditures

- Capital investment
- Operating and maintenance costs
- SDP, service and ATO levels

→ User Costs and Revenues

- Capital investment
- Operating and maintenance costs
- Fares



Cost and Cash Flow ATO Perspective

Hypothetical ATO Investment Example

Cost of Service	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
ATC	\$0.00	\$0.00	(\$1.00)	(\$2.00)	(\$2.00)	(\$2.00)	(\$3.00)	(\$3.00)	(\$3.00)	(\$3.00)	(\$3.00)	(\$3.00)
Technical Ops	\$0.00	\$0.00	(\$1.00)	(\$2.00)	(\$2.00)	(\$2.00)	(\$2.00)	(\$2.00)	(\$2.00)	(\$2.00)	(\$2.00)	(\$2.00)
Communications	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Utilities	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Flight Inspection	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
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Depreciation (10 Yr)	\$0.00		\$1.50	\$1.50	\$1.50	\$1.50	\$1.50	\$1.50	\$1.50	\$1.50	\$1.50	\$1.50
Administration	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Net Cost (Benefit)	\$0.00	\$0.00	(\$0.50)	(\$2.50)	(\$2.50)	(\$2.50)	(\$3.50)	(\$3.50)	(\$3.50)	(\$3.50)	(\$3.50)	(\$3.50)
Cash Flow												
Investment	(\$5.00)	(\$5.00)	(\$5.00)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Operating Costs			\$1.00	\$2.00	\$2.00	\$2.00	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00
Maintenance Costs			\$1.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00
Other			\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Net Cash Flow	(\$5.00)	(\$5.00)	(\$3.00)	\$4.00	\$4.00	\$4.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00



Income and Cash Flow: User Perspective

Hypothetical User Investment Example

User Costs	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
Fuel	\$0.0	\$0.0	-\$1.0	-\$1.0	-\$1.0	-\$1.0	-\$1.0	-\$1.0	-\$1.0	-\$1.0	-\$1.0	-\$1.0
Crew	\$0.0	\$0.0	-\$0.5	-\$0.5	-\$0.5	-\$0.5	-\$0.5	-\$0.5	-\$0.5	-\$0.5	-\$0.5	-\$0.5
Maintenance	\$0.0	\$0.0	\$1.00	\$0.05	\$0.05	\$1.00	\$0.05	\$0.05	\$1.00	\$0.05	\$0.05	\$1.00
Depreciation	\$0.0	\$0.0	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90
Net costs			\$0.40	(\$0.55)	(\$0.55)	\$0.40	(\$0.55)	(\$0.55)	\$0.40	(\$0.55)	(\$0.55)	\$0.40
User Revenues												
Fares	\$0.0	\$0.0	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00
Net Income			\$0.60	\$1.55	\$1.55	\$0.60	\$1.55	\$1.55	\$0.60	\$1.55	\$1.55	\$0.60
User Cash Flow												
Investment	(\$3.0)	(\$3.0)	(\$3.0)	\$0.0	\$0.0	\$0.0	\$0.0					
Operating Costs												
Fuel			\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Crew			\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5
Maintenance			(\$1.00)	(\$0.05)	(\$0.05)	(\$1.00)	(\$0.05)	(\$0.05)	(\$1.00)	(\$0.05)	(\$0.05)	(\$1.00)
Revenues			\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00
Net Cash Flow	(\$3.00)	(\$3.00)	(\$2.40)	\$0.55	\$1.55	\$0.60	\$1.55	\$1.55	\$0.60	\$1.55	\$1.55	\$0.60



Cash Flows and Net Present Values

Combined ATO and User Cash Flow

	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
ATO Net Cash Flow	(\$5.00)	(\$5.00)	(\$3.00)	\$4.00	\$4.00	\$4.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00	\$5.00
User Net Cash Flow	(\$3.00)	(\$3.00)	(\$2.40)	\$0.55	\$1.55	\$0.60	\$1.55	\$1.55	\$0.60	\$1.55	\$1.55	\$0.60
Societal Net Cash Flow	(\$8.00)	(\$8.00)	(\$5.40)	\$4.55	\$5.55	\$4.60	\$6.55	\$6.55	\$5.60	\$6.55	\$6.55	\$5.60
Social NPV @ 10%	\$7.27											
ATO NPV @ 10%	\$9.72											
User NPV @ 10%	(\$2.45)											



Wrap Up

- Benefit-cost takes a societal view and is how government makes investment decisions
 - Efficiency benefits to airlines and passengers function of aircraft size
 - Safety benefits function of inherent accident and fatality rates

- Users don't necessarily reflect willingness to pay in current tax structure
 - Taxes do not vary by type or cost of services provided
 - No direct linkage of taxes and benefits

- Financial analyses of ATO and user perspectives can identify disparity in incentives

