

Measuring the Business of the NAS

***Presented at: Moving Metrics: A Performance
Oriented View of the Aviation Infrastructure***

The National Center of Excellence



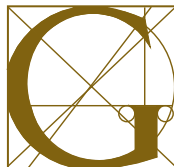
For Aviation Operations Research

NEXTOR Conference

January 29, 2004

Pacific Grove, CA

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PRESENTATION OVERVIEW

What business information can be measured for the ATO?

How could business information for the ATO be measured?

What could the ATO do with business information?



A LONG HISTORY OF BUILDING BLOCKS

ATC corporation pro forma financial statements (1994)

- ATS vs. non-ATS functions
- Division of budget and projections
- Accrual-based income and cash flow statement and balance sheets

FAA cost allocation for ATS LOB (1997)

- FAA costs
- Activity measures
- Cost models (incremental costs)
- Use of services

Advances in measurement (2003)

- FAA CAS SDP's for air traffic services
- ETMS flight level data
- Cost models for en route and terminal (developmental)



WHAT CAN BE MEASURED FOR THE ATO?

Activity—Who Uses Services?

- En route (ETMS/HAME/ATADS)
- Oceanic (ETMS/OAG)
- Terminal (ETMS/ATADS)
- Flight attributes (aircraft type, user type, passengers, etc.)

Costs—What do ATO Services Cost?

- Total and unit costs by ATO service (time, distance and activity)—en route, oceanic, terminal, etc.
- Comparative production costs (peer groups and time series)
- Alternative cost concepts for SDP's
 - CAS categories (AT operations, AF operations, capital, overhead and other)
 - Direct/Indirect
 - Fixed/Variable
 - Incremental/common and fixed

User Economics

- User aircraft operating costs (Form 41)
- User revenues (segment yield curves from DOT ticket sample)
- User taxes (built from activity, costs, revenues, other parameters and tax rates)



EFFICIENCY CONCEPTS

Allocative (consumption) efficiency—Value to user in relation to resources consumed in producing service

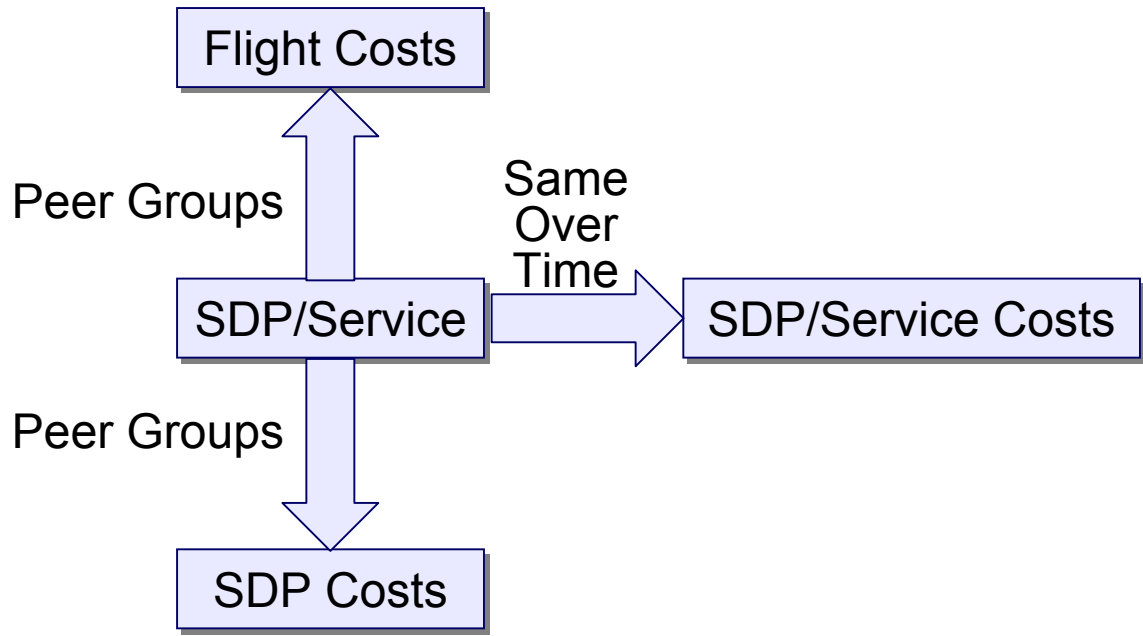
- Lack of real prices limits information on value to user
- Measurement of quality difficult
 - Safety
 - Delays
- Needed for economic decisions on what to produce

Productive efficiency—Least cost given desired quality

- Capital-labor trades
- Cost measurement being done with CAS
- Measurement of quality
 - Eurocontrol tracks sum of user charges for air traffic service and delay costs to users
- Relative efficiency can be measured; theoretical or maximum efficiency cannot



UNIT COST COMPARISONS



**Absolute efficiency measures are difficult;
but relative productive efficiency can and should be measured**



ALTERNATIVE ATS SDP COST ASSIGNMENTS

CAS	Element	SDP Nature	Variability	Function
AT Operations	Labor	direct	variable	operating
	Non-Labor	direct	variable	administration
	ATC Systems Command Center	indirect	fixed	management
	Contract Weather	direct	fixed	operating
	Contract Weather Observations	direct	fixed	operating
	Direct User Access	direct	fixed	operating
	Contract Training	direct	fixed	training
	Academy Training	direct	fixed	training
	Medical	direct	fixed	administration
	Security	direct	fixed	facilities
	Workers' Compensation	indirect	fixed	administration
AF Operations	SSC Labor	direct	variable	maintenance
	SMO Labor	indirect	variable	maintenance
	Accruals and Adjustments	direct	variable	maintenance
	Non-Labor	direct	variable	maintenance
	National Network Control Center	indirect	fixed	operating
	Atlantic Operations Control Center	indirect	fixed	management
	Mid-States Operations Control Center	indirect	fixed	management
	Pacific Operations Control Center	indirect	fixed	management
	Telecommunications	indirect	fixed	facilities
	Flight Inspection	direct	fixed	maintenance
	Utilities	direct	fixed	facilities
	Maintenance Contracts	indirect	variable	maintenance
	Logistics	direct	variable	maintenance
	Academy Training	direct	fixed	training
	Workers' Compensation	indirect	fixed	administration
SMP/Compliance	indirect	fixed	facilities	
Overhead	ATS Regional	indirect	fixed	administration
	ATS Headquarters	indirect	fixed	administration
	FAA Regional	indirect	fixed	executive
	FAA Headquarters	indirect	fixed	executive
Capital	Acquisition	indirect	fixed	facilities
	Implementation	indirect	fixed	facilities
	Depreciation	direct	fixed	facilities
Other	RE&D	indirect	fixed	facilities
	Gain/Loss	indirect	fixed	administration
	Accrued Liabilities	indirect	fixed	administration



MEASUREMENT CONSIDERATIONS

Be Flexible: Understand how choice of measures affects results

- Relative ranking of en route facilities differs when unit costs measured by time, distance or units
- Controllable costs
- Allocated costs

Align Activity and Cost Data

- Service distinctions
 - Terminal radar vs. tower
- Multiple activity measures
 - ETMS
 - ATADS
 - OAG
 - HAME
- Cost data support monthly measurement

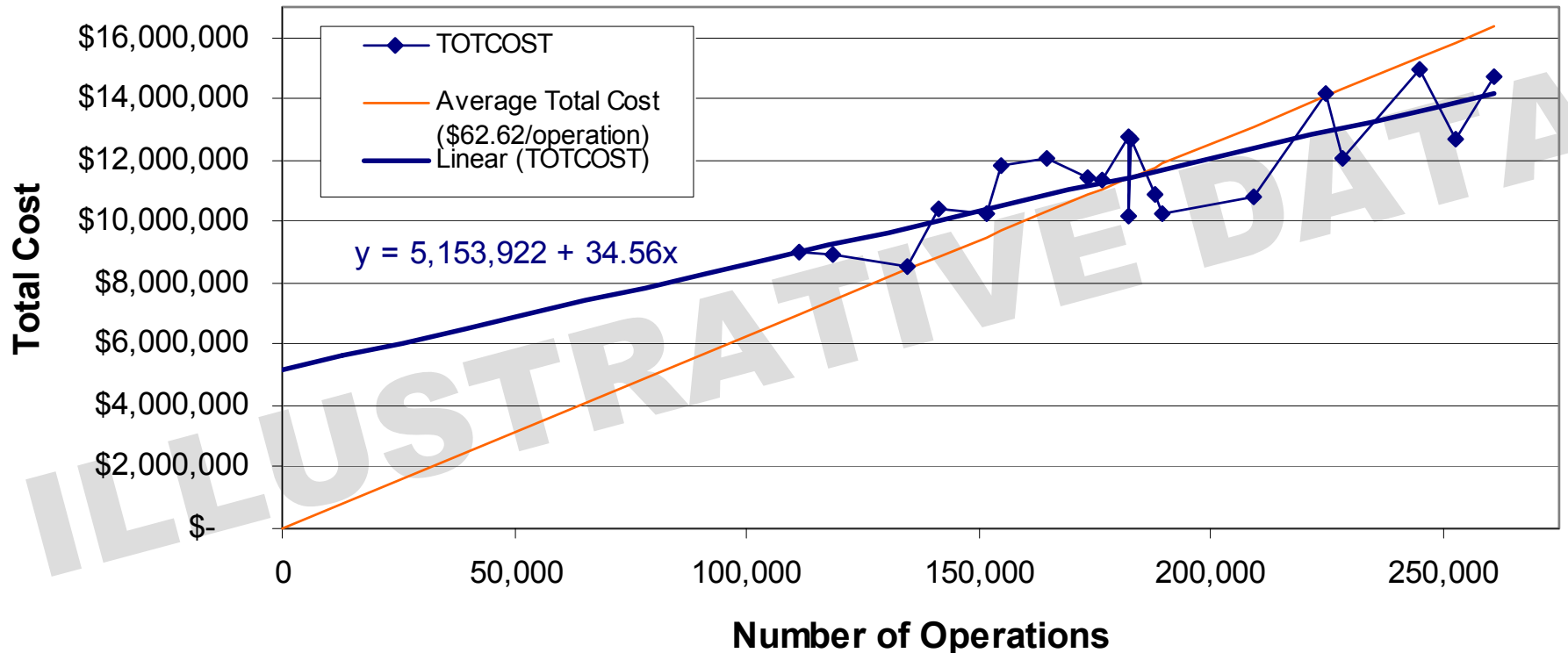
A Need to Get Started

- **Need agreed-on source data and measures of ATO output**
- Relative measures need history
- Data will not improve unless used



EN ROUTE TOTAL COSTS AND OPERATIONS (MONTHLY)

En Route Centers Appear to Have a Large Fixed Cost Component

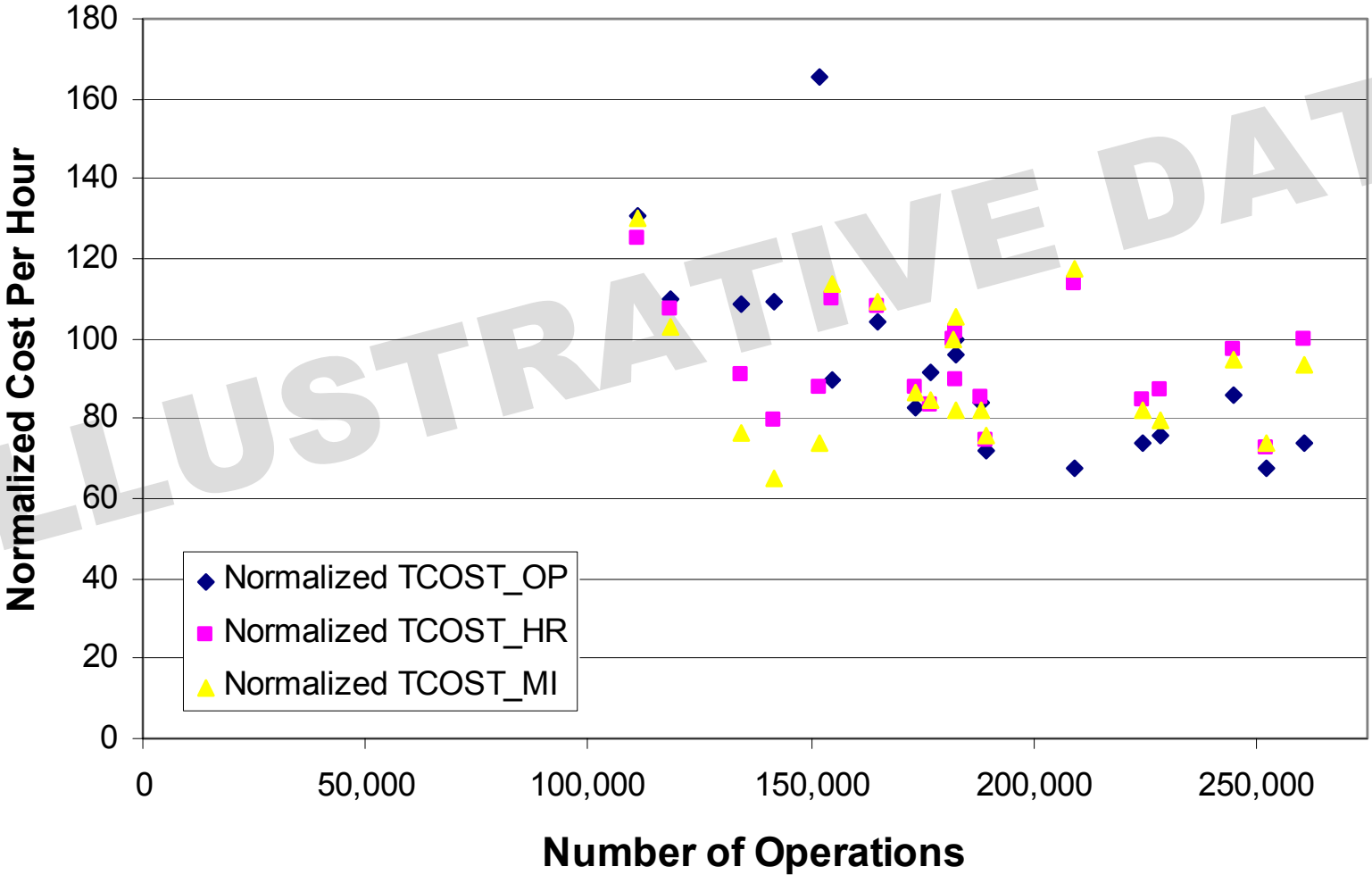


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COMPARISON OF EN ROUTE UNIT COSTS PER ACTIVITY

Relative Ranking of Centers Varies with Measure of Unit Cost



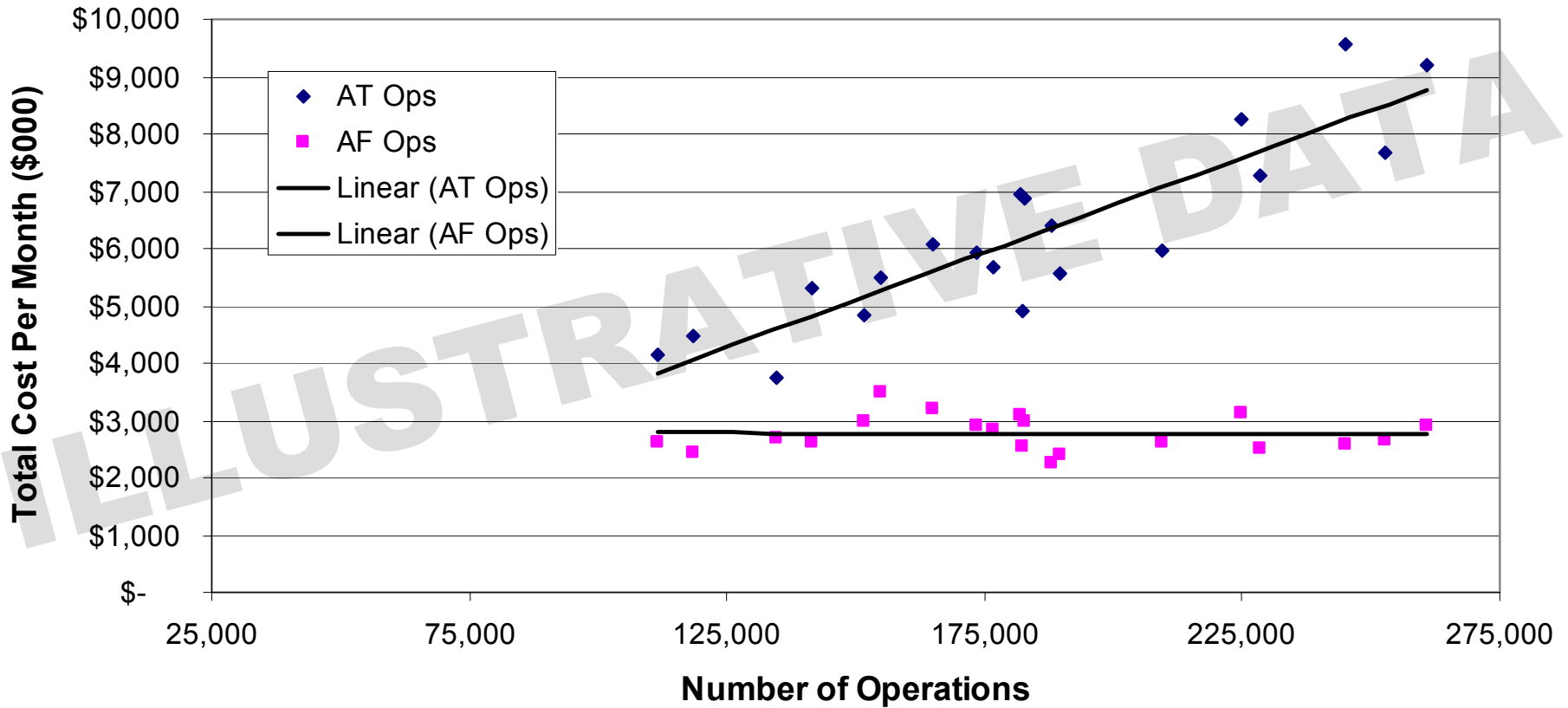
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Costs normalized based on facility with median number of operations: unit cost = 100



MONTHLY AF OPS AND AT OPS COSTS AT EN ROUTE CENTERS BY OPERATIONS

Air Traffic Operations Costs Vary with Activity, While Airway Facility Operations Costs Do Not

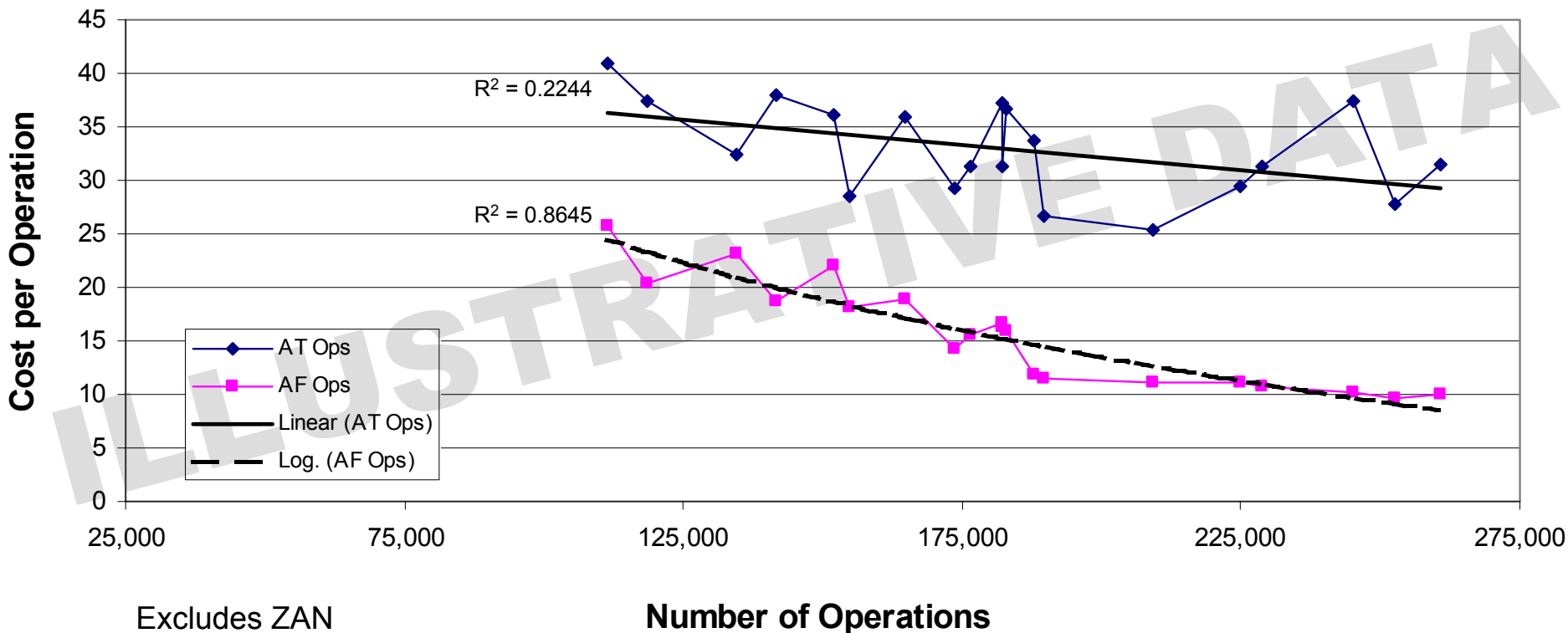


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EN ROUTE UNIT COSTS FOR AT OPS AND AF OPS

Cost Per Operation for AT Ops and AF Ops

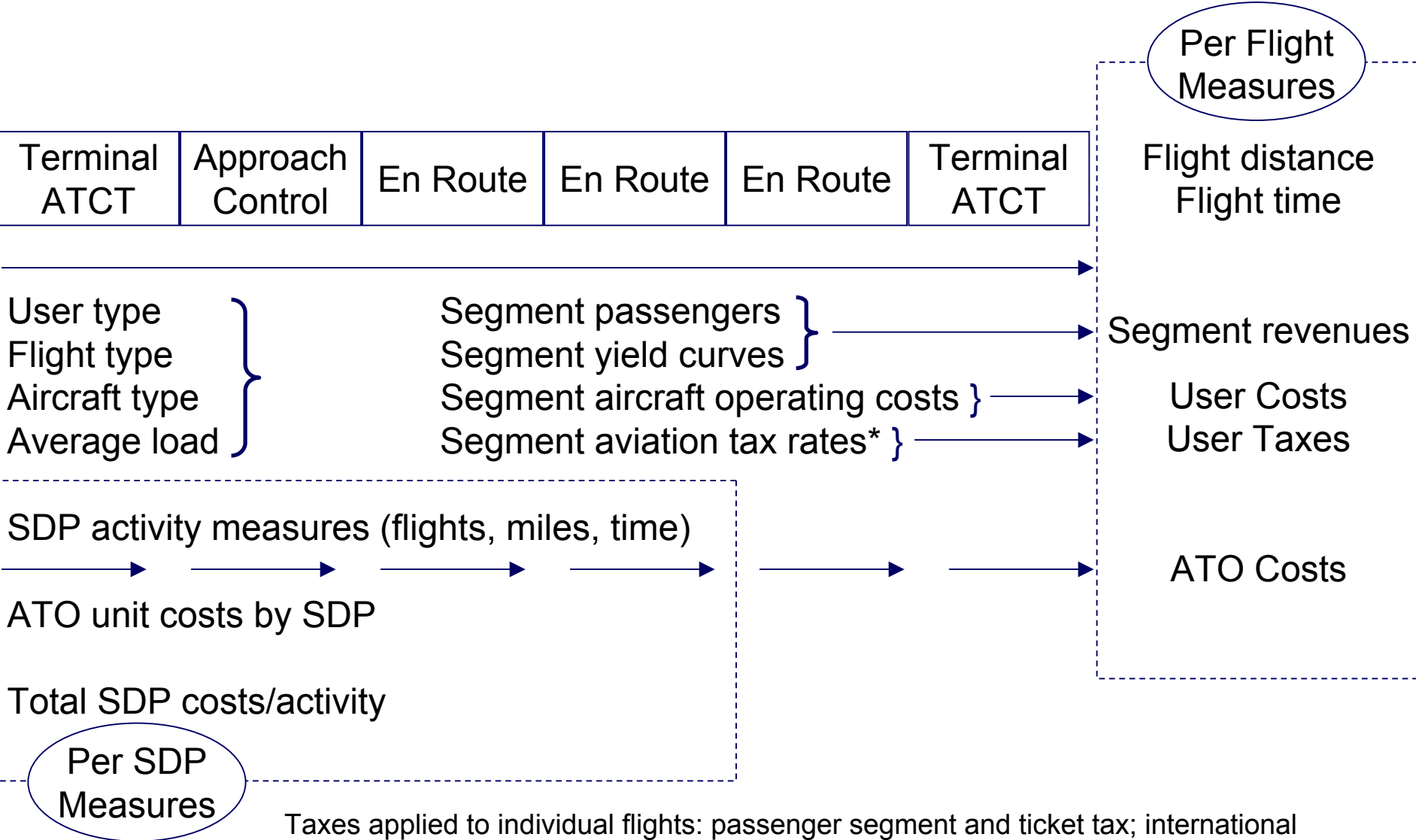


Excludes ZAN

Number of Operations



THE FLIGHT IS THE MEASURE OF CONSUMPTION



Taxes applied to individual flights: passenger segment and ticket tax; international departures and arrival taxes; freight waybill taxes and aviation fuel taxes



AGGREGATION MEASURES FOR FLIGHTS

Origin

Destination

Airport Pair

City Pair

Market Area

} Airline flight profitability

Domestic

International

Geographic

→ Northeast → Florida

→ Transcon

→ Intra West Coast

→ Etc.

} Airline system profitability



SUMMARY ECONOMIC MEASURES

Monthly Estimates

	Average per Flight by Flight Distance in Nautical Miles					Total
	0 - 300	301 - 700	701 - 1,500	1,501 - 2,500	2,501 +	
Flights	669,592	458,406	250,374	67,761	44,133	1,490,266
ATO Costs	\$182	\$264	\$368	\$528	\$375	\$260
Terminal	\$86	\$101	\$110	\$111	\$63	\$95
Enroute	\$96	\$163	\$258	\$417	\$312	\$165
User Costs	\$1,189	\$3,086	\$7,001	\$15,073	\$50,587	\$4,843
User Revenues	\$2,159	\$6,262	\$13,811	\$26,924	\$94,536	\$9,240
User Taxes	\$187	\$580	\$1,323	\$2,449	\$10,111	\$895

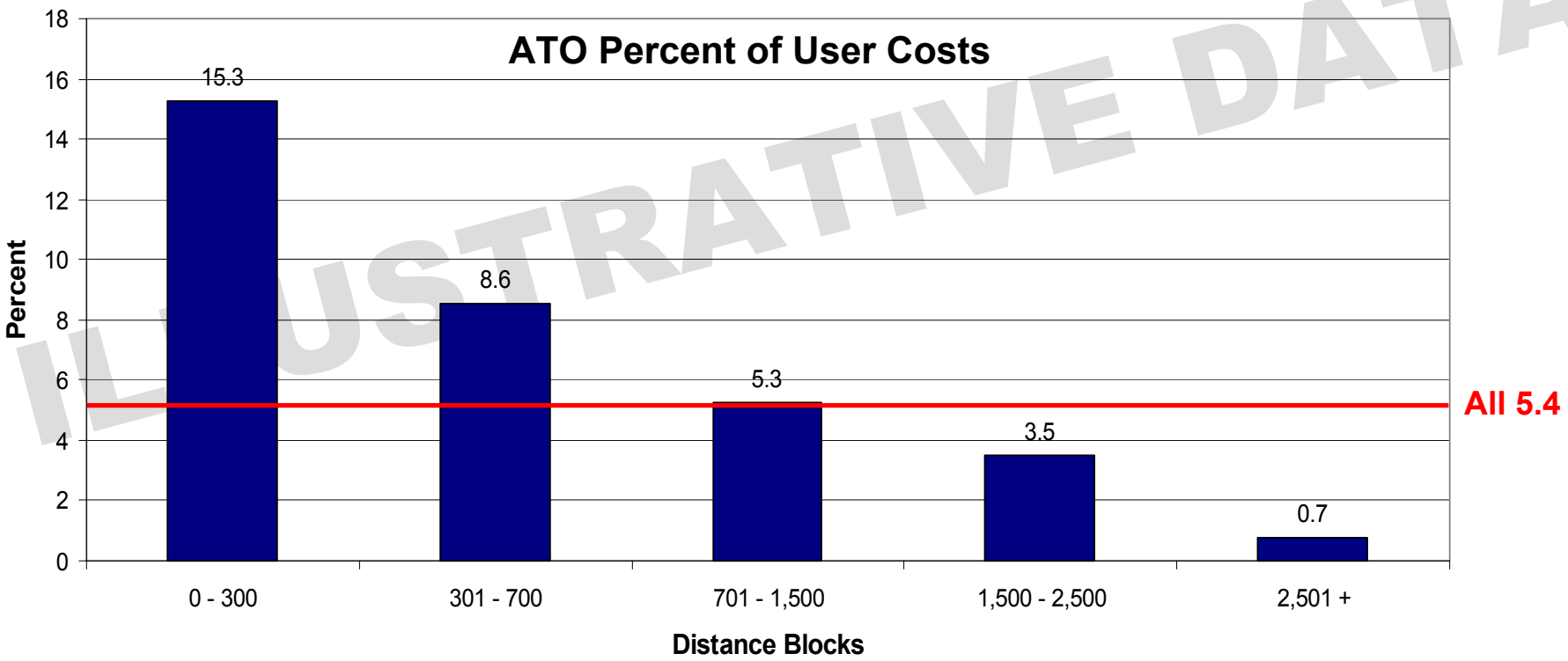
- Notes:
1. ATO costs include only CAS costs distributed to en route, oceanic and terminal SDPs.
 2. En route costs include oceanic costs.
 3. User costs include only aircraft operating costs including ownership; calculated per flight hour.
 4. For general aviation, military and other, user revenues set equal to user costs.
 5. Includes all user taxes which support more than air traffic programs.



ATS* AND USER COSTS PER FLIGHT BY DISTANCE

User Type	0-300	301-700	701-1,500	1,501-2,500	2,501 +	All
ATO Costs Per Flight	\$182	\$264	\$368	\$528	\$375	\$260
User Costs Per Flight	\$1,189	\$3,086	\$7,001	\$15,074	\$50,587	\$4,843
ATO Costs as Percent of User Costs	15.3%	8.6%	5.3%	3.5%	0.7%	5.4%

Based on CAS costs assigned to ATO SDP's; user costs represent total aircraft operating costs; flights greater than 2,500 miles generally are international and use oceanic airspace and only one terminal activity in U.S.



HOW TO USE

ATO Must Understand Its Business

- Who uses services?
- What do they cost?
- Components of cost
- Cost drivers

Agree on Measure(s) of ATO Service Outputs

- Source data
- Measure(s)
 - Distance
 - Time
 - Activity

Align CAS with ATO

- Fold ARA into ATO
- System operations LOB
- Technical operations LOB
- Update other service delivery LOBs

Identify Cost Variances

- Aggregate
- By CAS category

Understand Trades

- Cost-quality
- Investment-operating

Build Analytic Capability

- Cost and activity data
- Distribute all costs to SDPs
- Projected costs
- User taxes attributable to ATO

Build Cost Ethos in ATO

- Cost trends
- ATO cost/user cost relationships

