Global Challenges to Improve Air Navigation Performance
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Session 5.1

US-European Joint Performance Analysis

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History of US-European joint performance analysis

EUROCONTROL and the US Air Traffic Organization (FAA-ATO) have produced a series of joint studies. Since 2013, they are done under EU/US MoC.

- **Common methodology, indicators, data sources**
- **Economic performance**
  - Detailed comparison of selected ACCs (2003)
  - ANS cost-efficiency trends 2002 - 2011 (2013)

- **Operational performance**
  - Four benchmarking reports since 2008
  - System wide overview
  - Analysis by flight phase
    - Focus on top 34 airports

Impact of US/Europe benchmarks

- Lead to the improvement of performance in US and Europe
  - Triggered a better understanding of the reasons for performance differences
  - Provided strong arguments for policy making
    - Key figures often quoted by policy makers to justify initiatives
  - Internally, both US and Europe were stimulated to take corrective action
    - Performance differences with similar technology was instructive to management
- EU/US Work is transparent and well publicized
  - Long history: US/Europe were the first to introduce large scale benchmarking
    - Overcame data challenges to establish meaningful comparison indicators
  - Used as input for other work internationally
    - ANSPs, CANSO, academic research

The various types of analysis performed

For each indicator:

- Explain operational differences between regions
  - Qualitative description
- Regional level performance analysis
  - Entire region + group of airports
  - Annual values, trends, benchmarking
- Local performance analysis
  - Individual facilities + airports
  - Annual values, trends, benchmarking
- Detailed performance analysis
  - E.g. seasonal, weekly
  - Only for some indicators

Geographical scope (airspace & airports)

20 US CONUS Centers vs. 63 European Area Control Centres (ACCs)
34 Airports tracked for each region

Focus of operational benchmarking

Key Performance Area	Key Performance Indicator
Capacity	**Declared Capacity**
	Maximum Throughput
Efficiency	**Airline Reported Delay Against Schedule**
	Airline Reported Attributable Delay
	ATM Reported Attributable Delay
	Taxi-Out Additional Time
	Horizontal en route flight efficiency (flight plan and actual trajectory)
	Descent/Arrival Phase Additional Time
	Taxi-In Additional Time
Predictability	**Airline Reported Punctuality**
	Capacity Variability
	Phase of Flight Time Variability

Related Area	Related Indicator
Traffic/Schedules	**System IFR Flight Counts**
	System IFR Flight Distance
	Facility IFR Flight Counts
	Traffic Density
	Traffic Variability
	Schedule Block Time
	Seat capacity on sched. flights
Weather	**Operations by Met Condition**
	Delay by Met Condition
System Characteristics	**System size & structure**

- Comparison focused on:
  - Capacity and throughput
  - Efficiency & Environment
    - Delay
    - Additional flight & taxi time
    - Additional distance
    - Additional fuel
    - Additional emissions
    - Translation of the above into Additional cost
  - Predictability
    - Punctuality
    - Variability

Results – Example 1

Key Performance Area	Key Performance Indicator
Capacity	**Declared Capacity**
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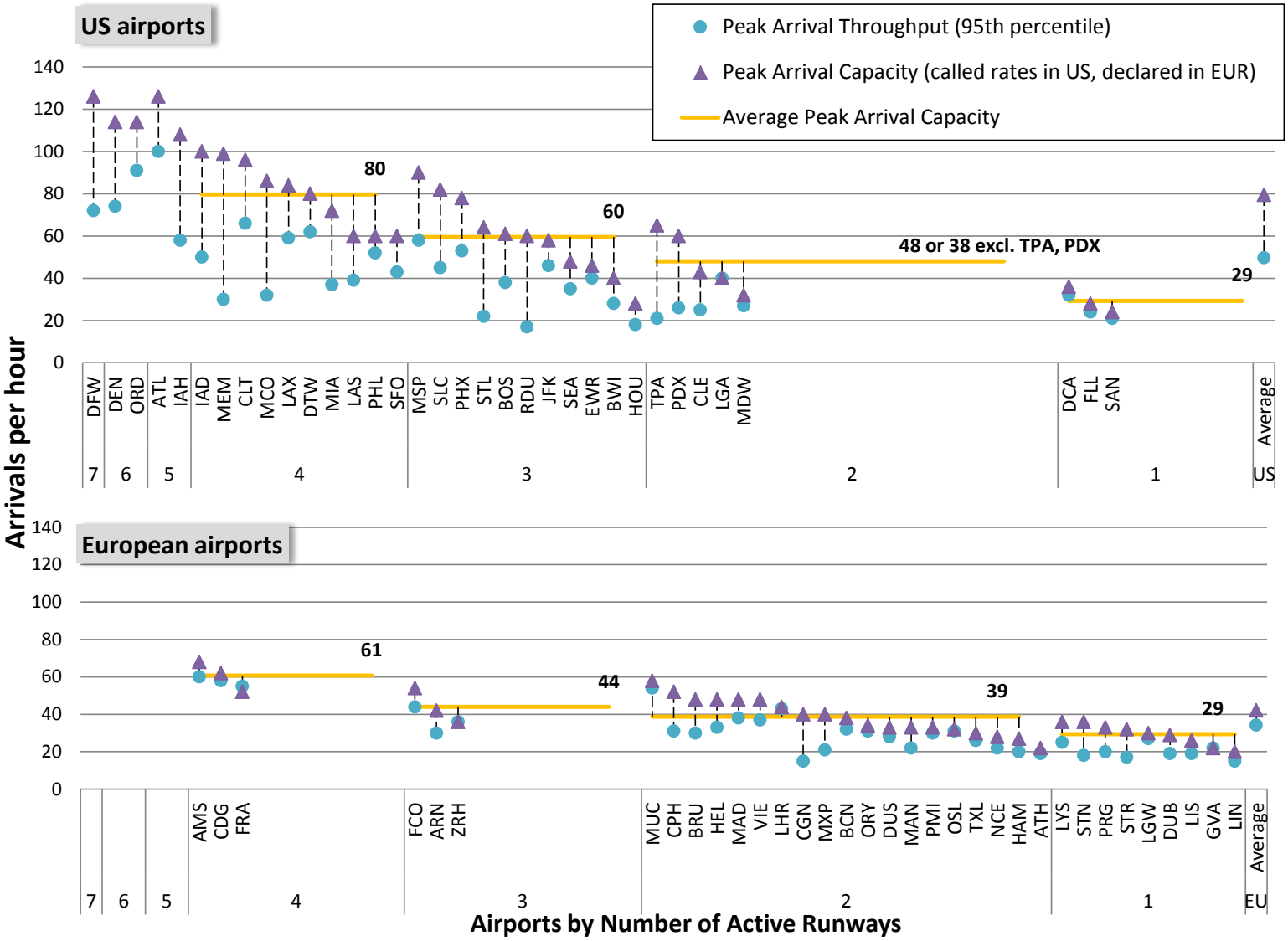
    - Variability

Example 1 – Airport capacity and throughput



Results – Example 2

Key Performance Area	Key Performance Indicator
Capacity	Declared Capacity
	Maximum Throughput
Efficiency	Airline Reported Delay Against Schedule
	Airline Reported Attributable Delay
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    - Additional fuel
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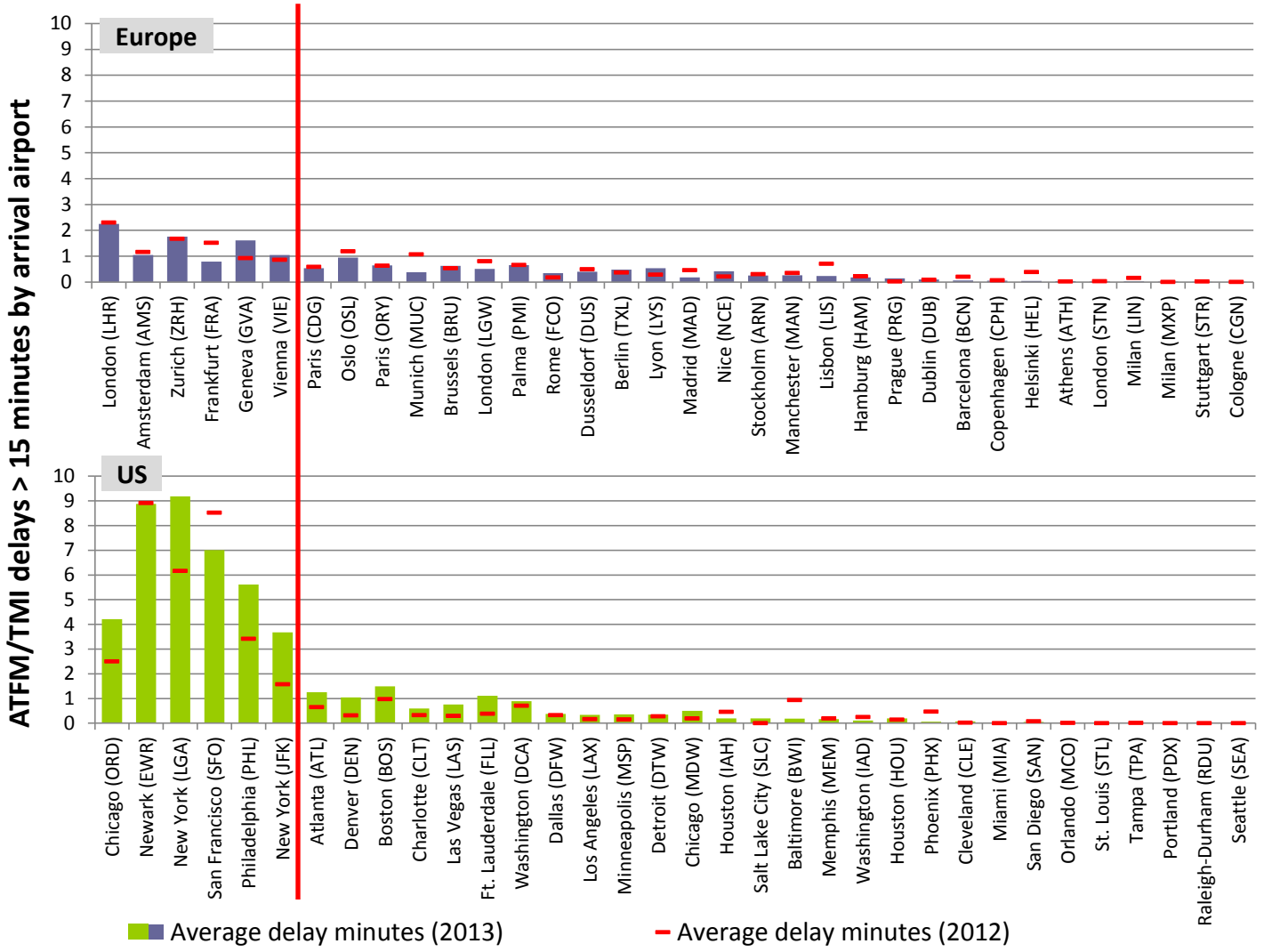
Example 2 – Airport ATFM arrival delay



Source: EUROCONTROL PRU/ FAA-ATO

Results – Example 3

Key Performance Area	Key Performance Indicator
Capacity	Declared Capacity
	Maximum Throughput
Efficiency	Airline Reported Delay Against Schedule
	Airline Reported Attributable Delay
	ATM Reported Attributable Delay
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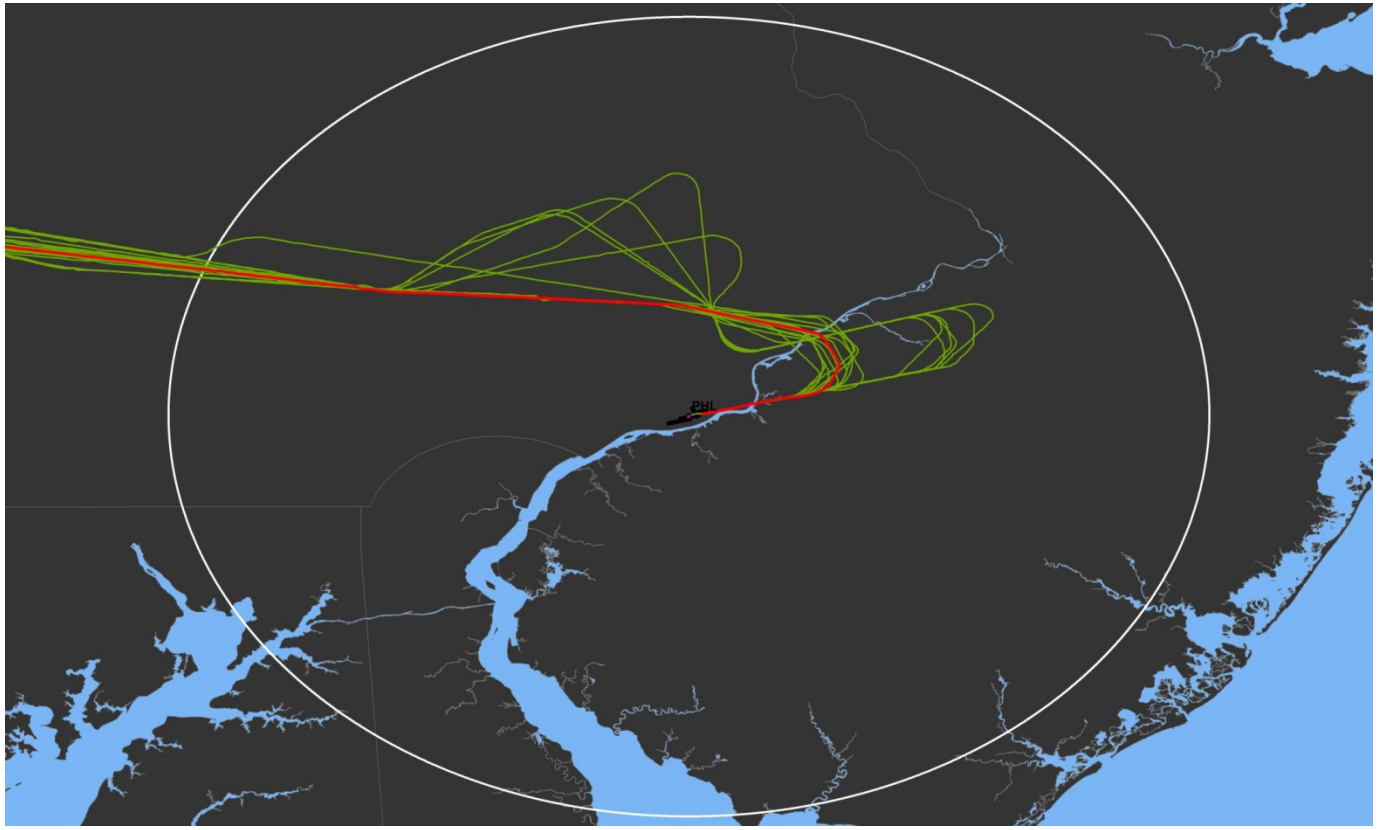
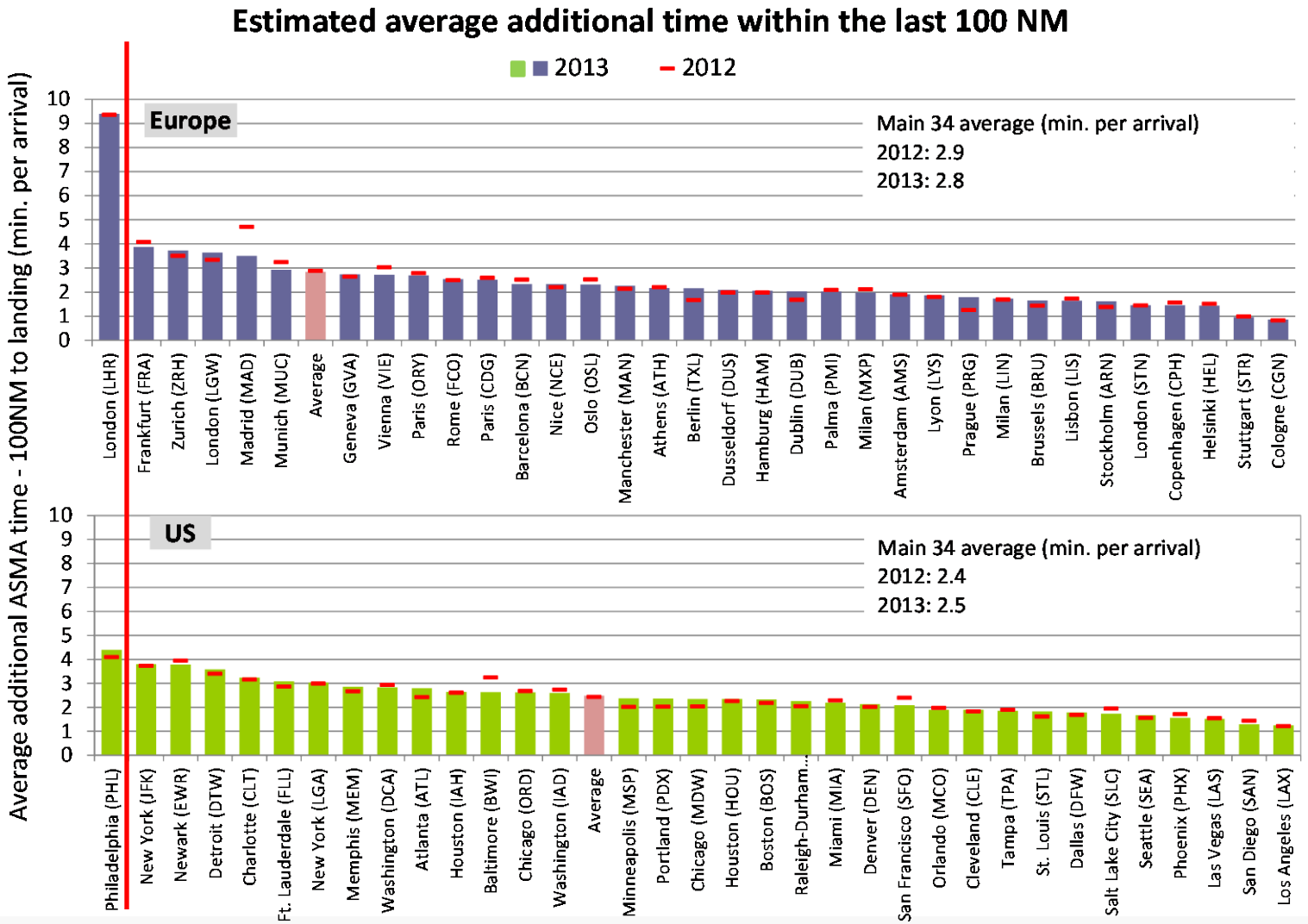
Example 3 – Additional time in terminal airspace (ASMA)



For this indicator, an ideal trajectory as shown in red is compared to actual trajectories shown in **green**. The ideal trajectory is in fact a best achieved trajectory that is demonstrated in practice (“unimpeded”). The efficiency score is then a measure of actual versus a “best achieved”.

Example 3 – Additional time in terminal airspace (ASMA)



Results – Example 4

Key Performance Area	Key Performance Indicator
Capacity	Declared Capacity
	Maximum Throughput
Efficiency	Airline Reported Delay Against Schedule
	Airline Reported Attributable Delay
	ATM Reported Attributable Delay
	Taxi-Out Additional Time
	Horizontal en route flight efficiency (flight plan and actual trajectory)
	Descent/Arrival Phase Additional Time
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Predictability	Airline Reported Punctuality
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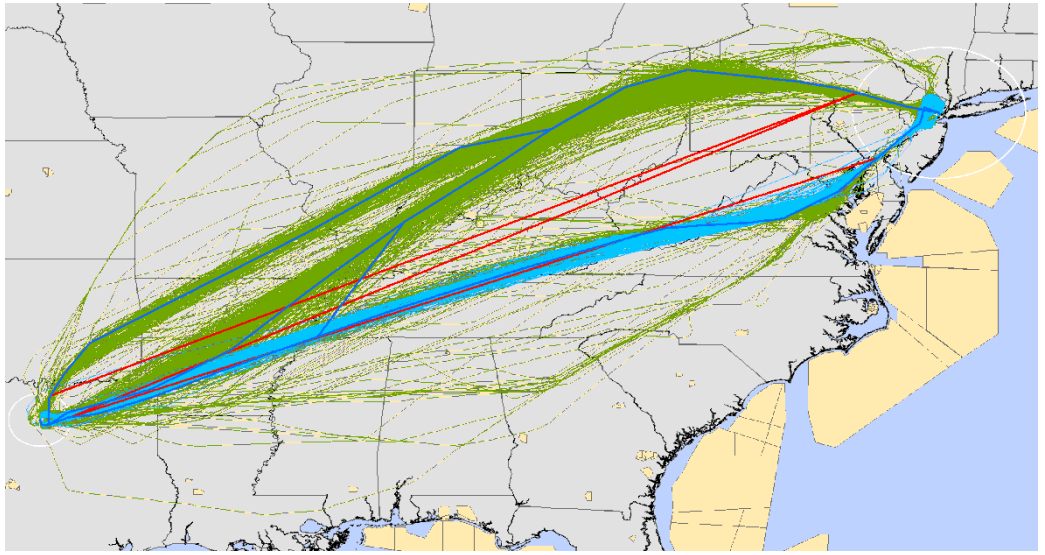
- Comparison focused on:
  - Capacity and throughput
  - Efficiency & Environment
    - Delay
    - Additional flight & taxi time
    - Additional distance
    - Additional fuel
    - Additional emissions
    - Translation of the above into Additional cost
  - Predictability
    - Punctuality
    - Variability

Example 4 – Enroute horizontal flight efficiency (US)

SFO-LAX

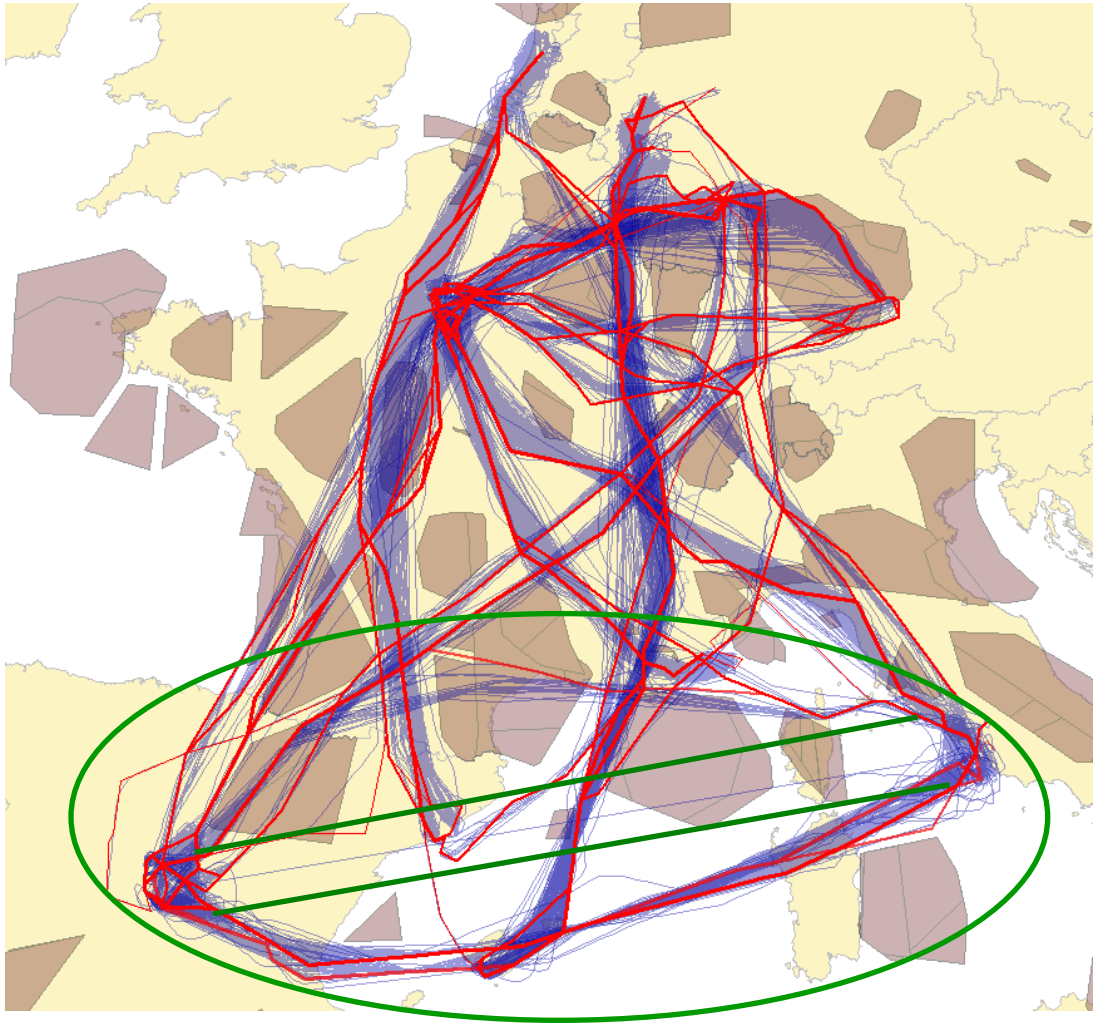
DFW-EWR



IAH,DFW – New York as well as areas impact by SUA are the exception. (LAS-SFO, Florida to New York)

In the US, busy city pair markets such as SFO-LAX, ORD-LGA, LGA-ATL receive fairly direct flight.

Example 4 – Enroute horizontal flight efficiency (Europe)



34 main airports

10 “most contributing” airport pairs

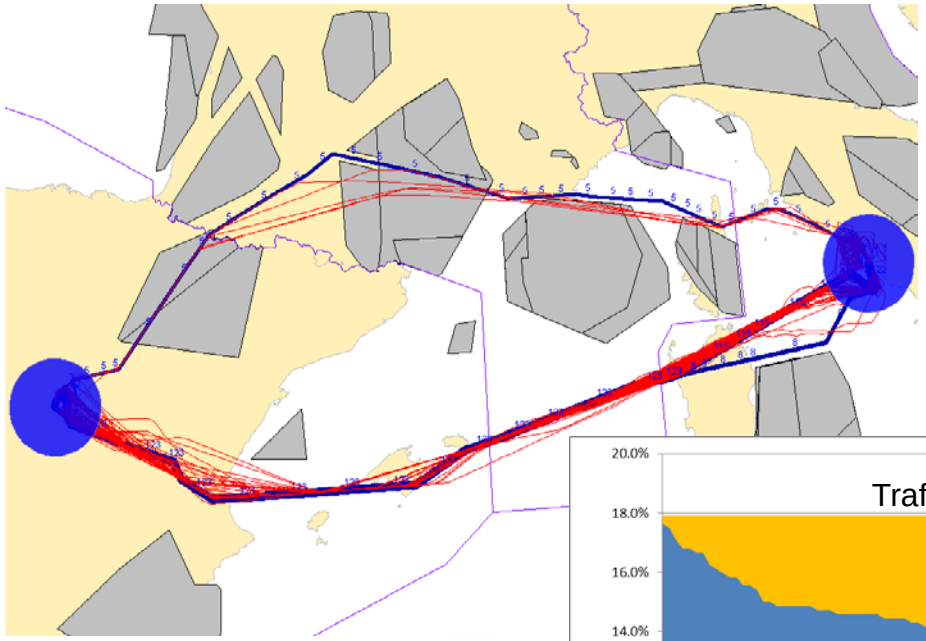
May 2013

Planned

Flown

MAD-FCO has high potential for efficiency improvements through more direct flight

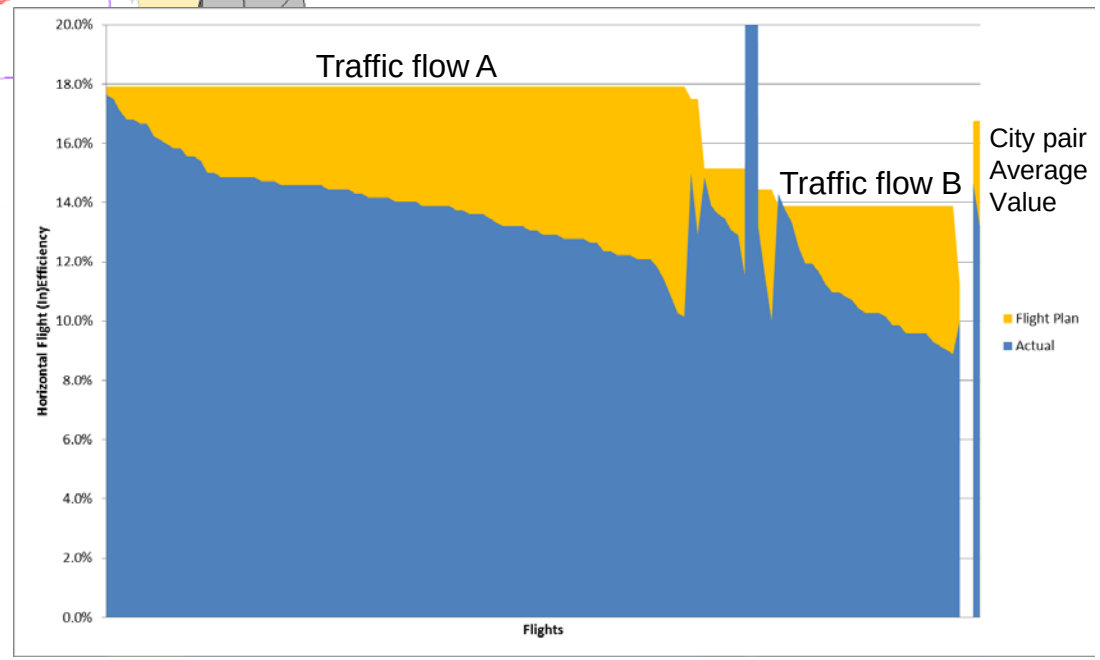
Example 4 – Madrid to Rome



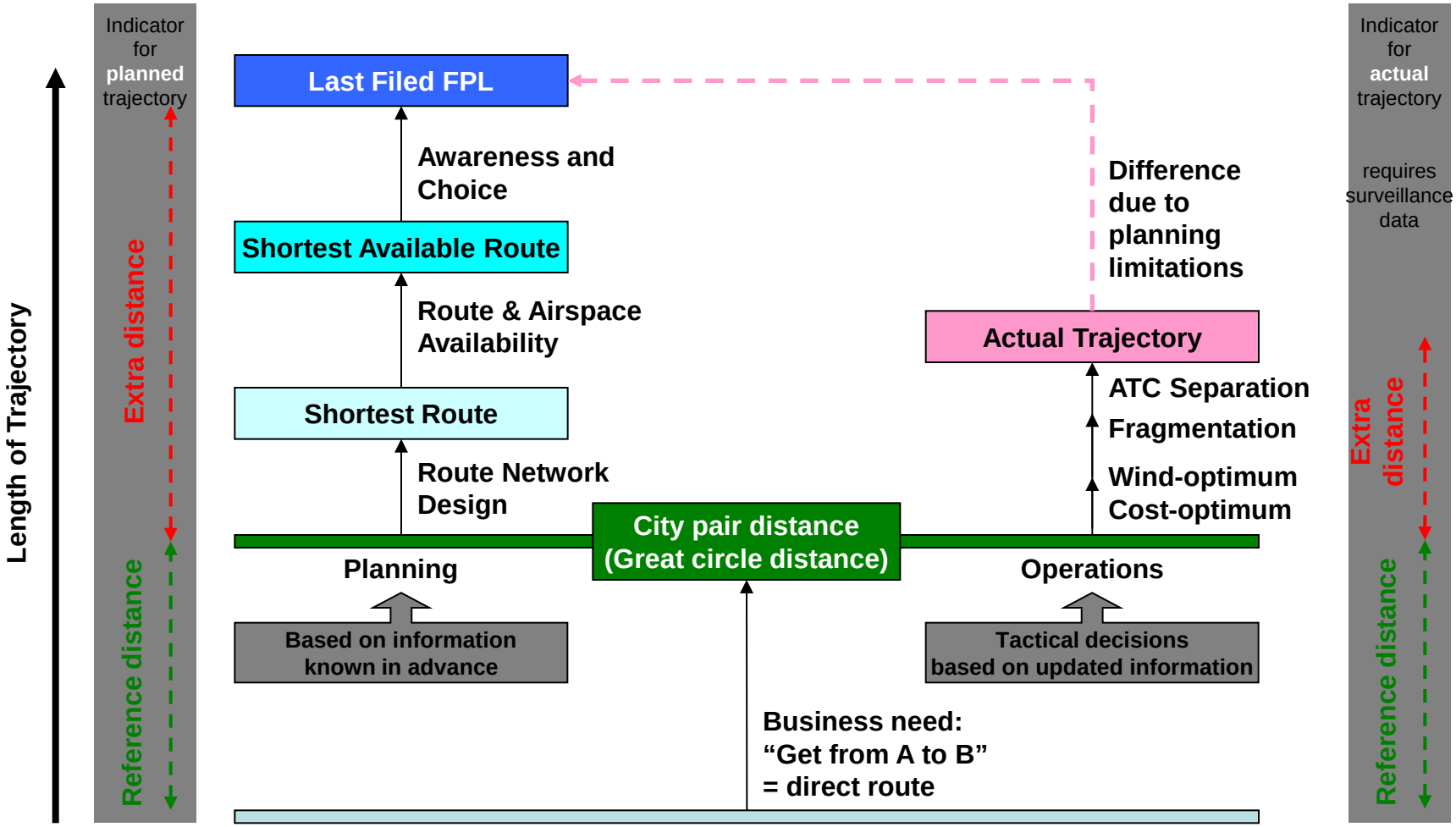
May 2013

Planned

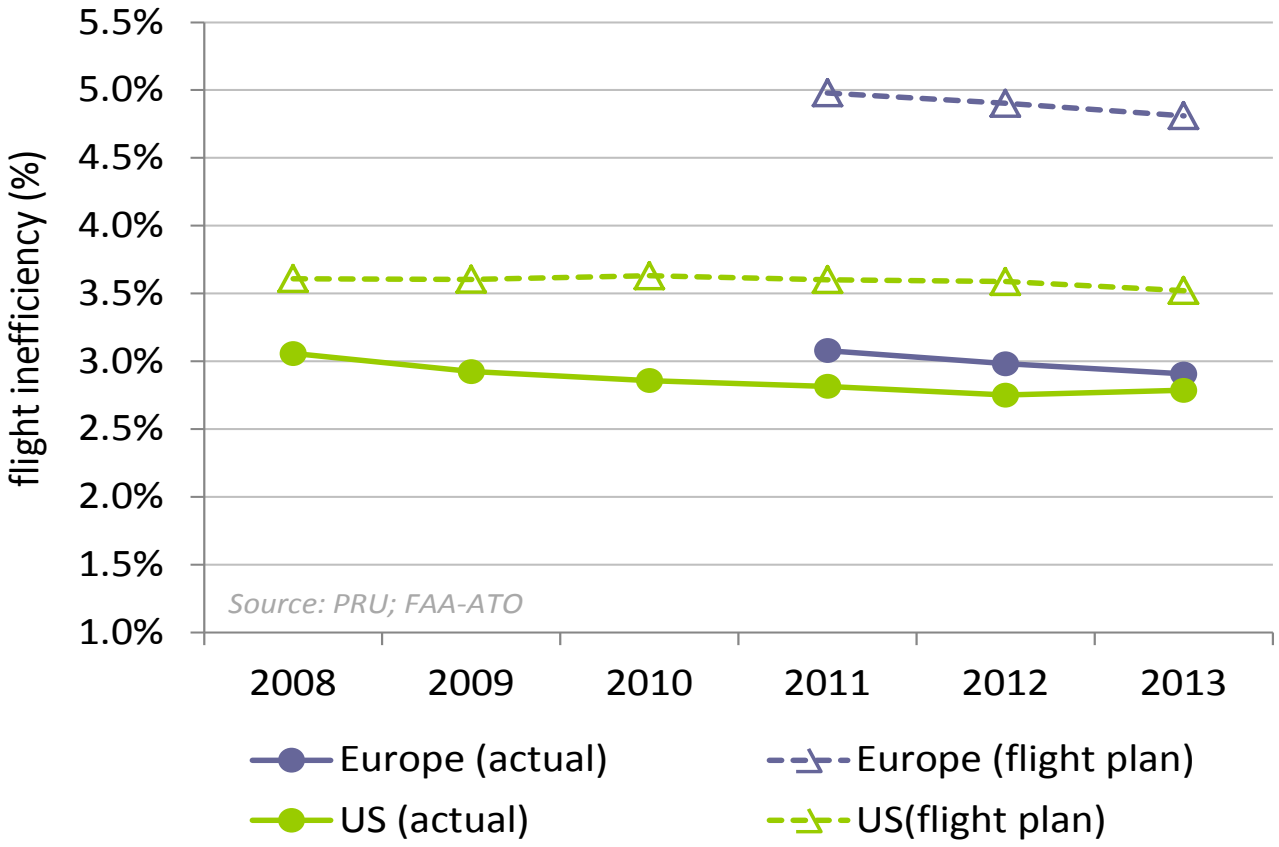
Flown



Example 4 – Horizontal trajectory inefficiencies

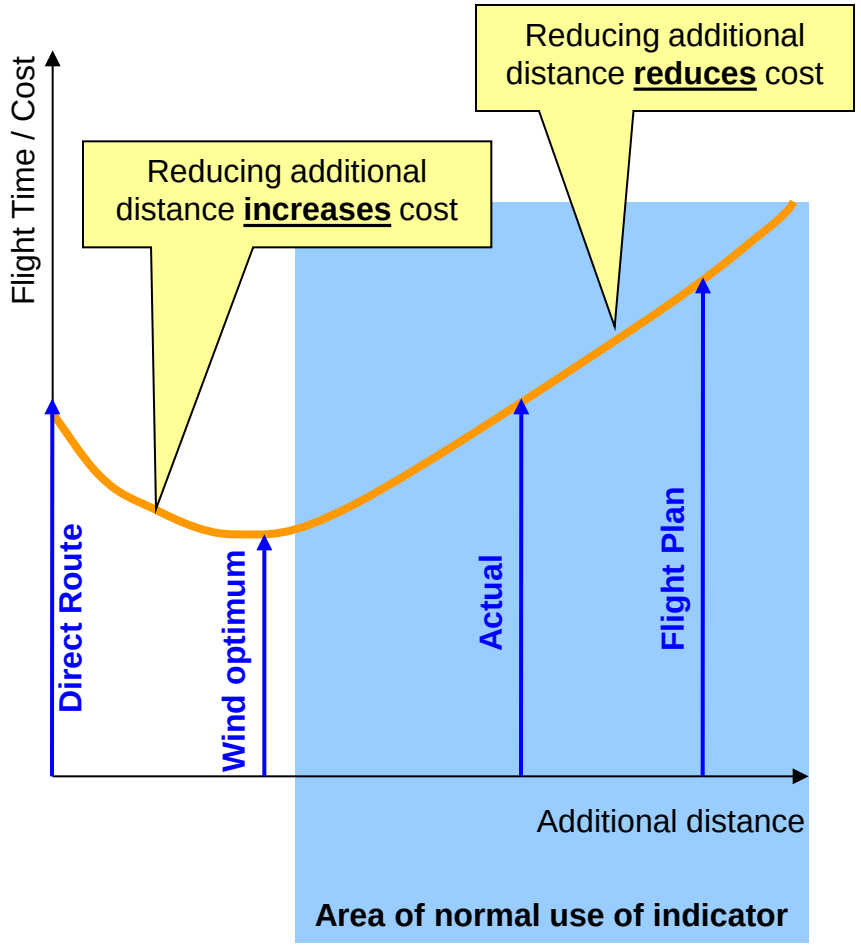


Example 4 – Enroute horizontal flight efficiency trends and comparison



Example 4 – Optimum vs direct route

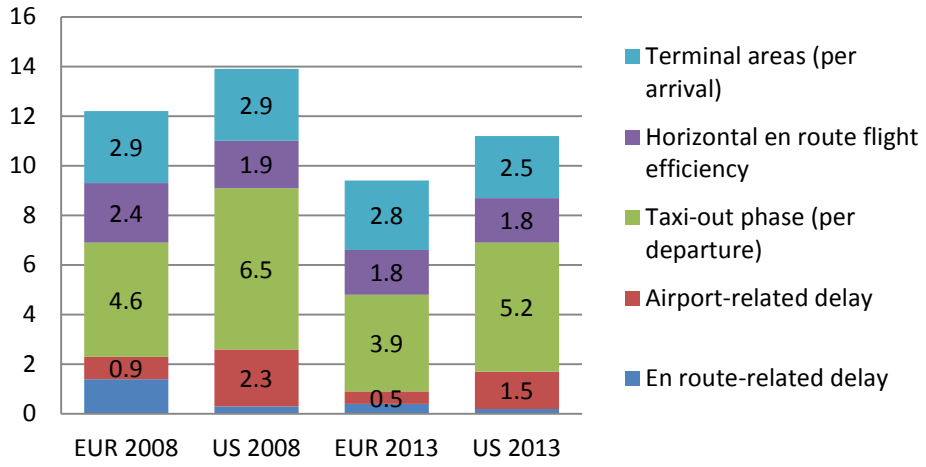
- Wind optimum route is often longer than the direct route
  - In particular for long haul flights
- Implies that optimal horizontal flight efficiency does not correspond to zero additional distance
- Does not make the indicator less useful
  - Algorithm can be used to compute an additional indicator value corresponding to wind optimum trajectory (if data available)
  - Indicators computed from actual and wind optimum trajectory can be compared



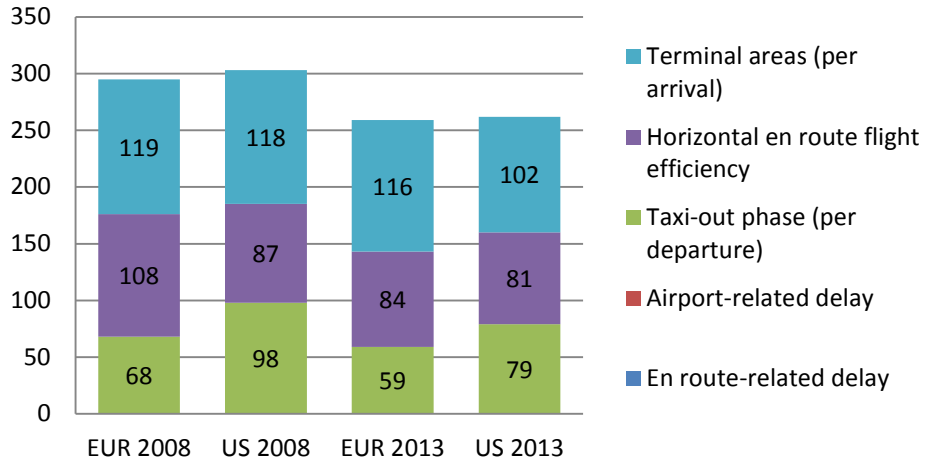
Overall estimate for ATM “Benefit Pool”

Estimated benefit pool actionable by ATM for a typical flight
(flights to or from the main 34 airports)

Estimated avg. additional time (min.)

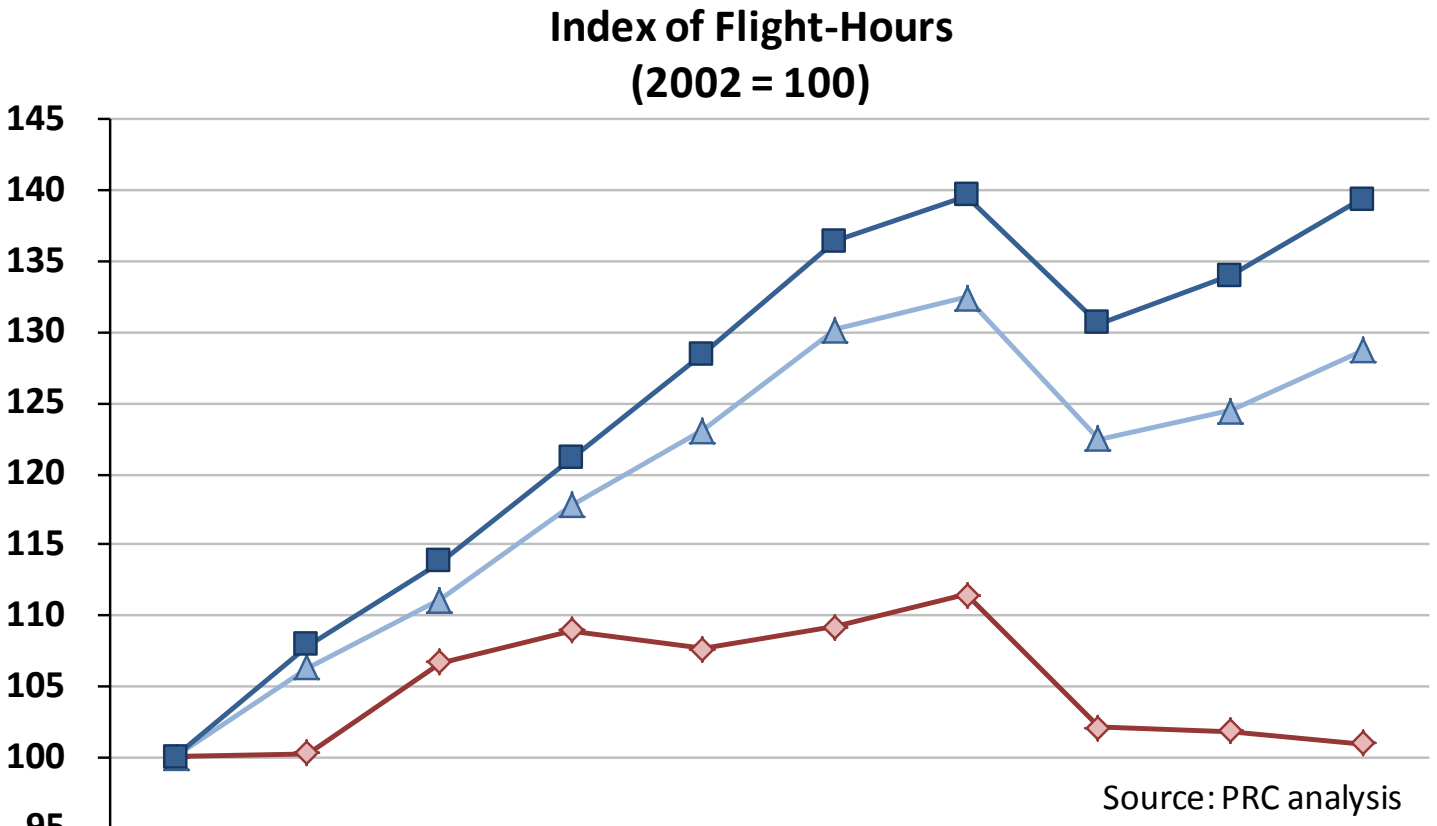


Estimated excess fuel burn (kg)



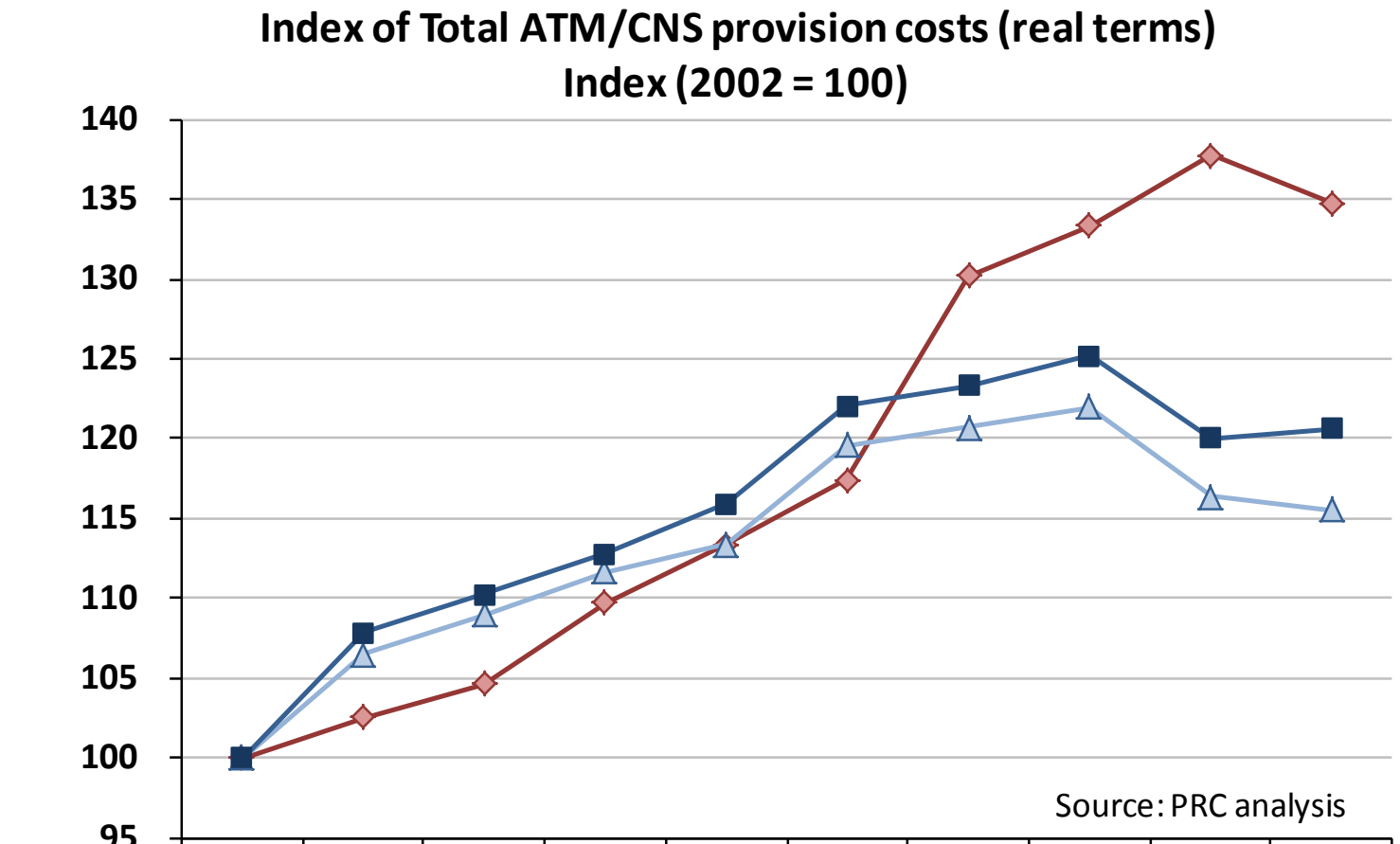
Fuel burn calculations are based on averages representing a “standard” aircraft in the system.
The EUR 2008 figure for horizontal en route flight efficiency is based on an estimate as the radar data was not yet available at system level in 2008

Economic benchmarking – traffic trends



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
US	100	100	107	109	108	109	111	102	102	101
SES	100	106	111	118	123	130	132	123	124	129
Europe	100	108	114	121	128	136	140	131	134	139

Economic benchmarking – cost trends

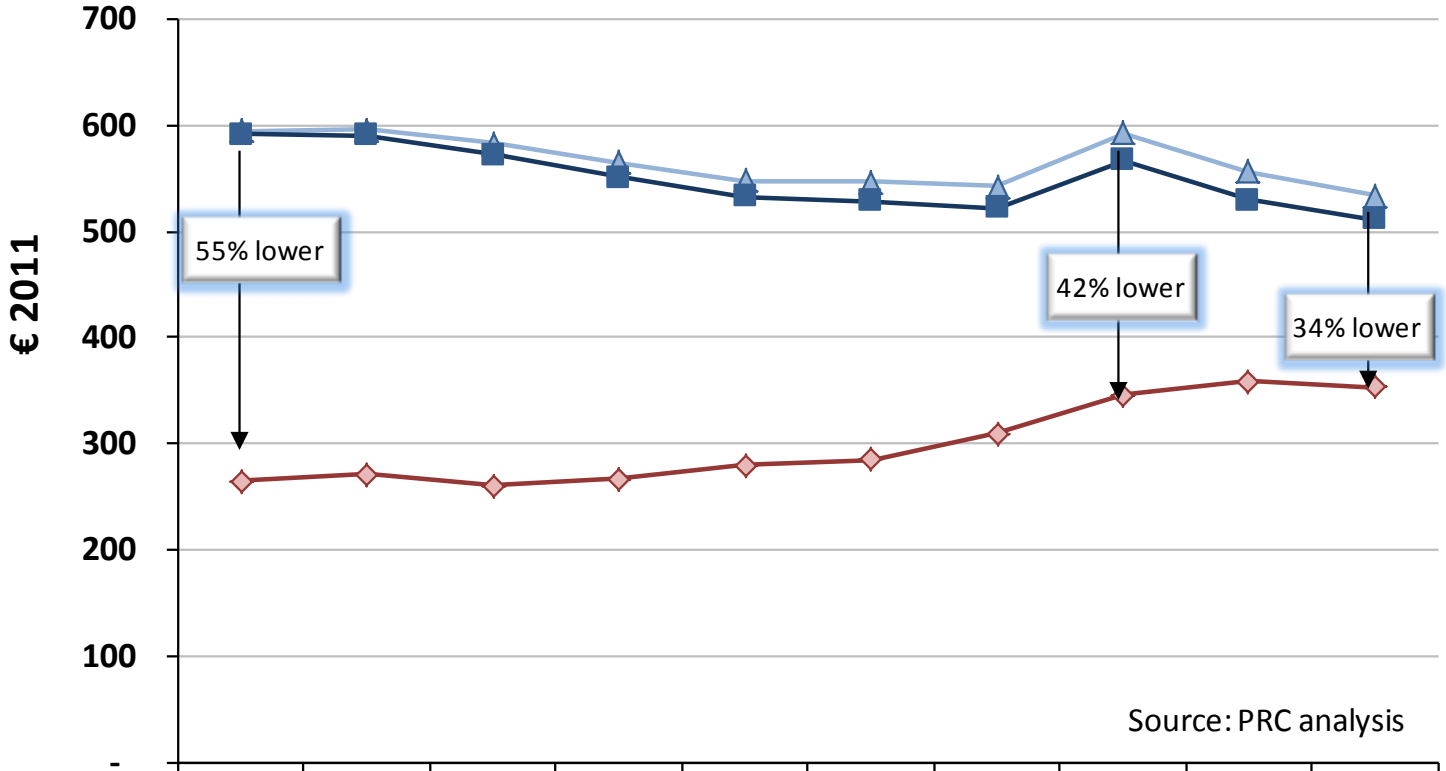


	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
US	100	103	105	110	113	117	130	133	138	135
SES	100	107	109	112	113	120	121	122	116	116
Europe	100	108	110	113	116	122	123	125	120	121

Economic benchmarking – cost effectiveness trends

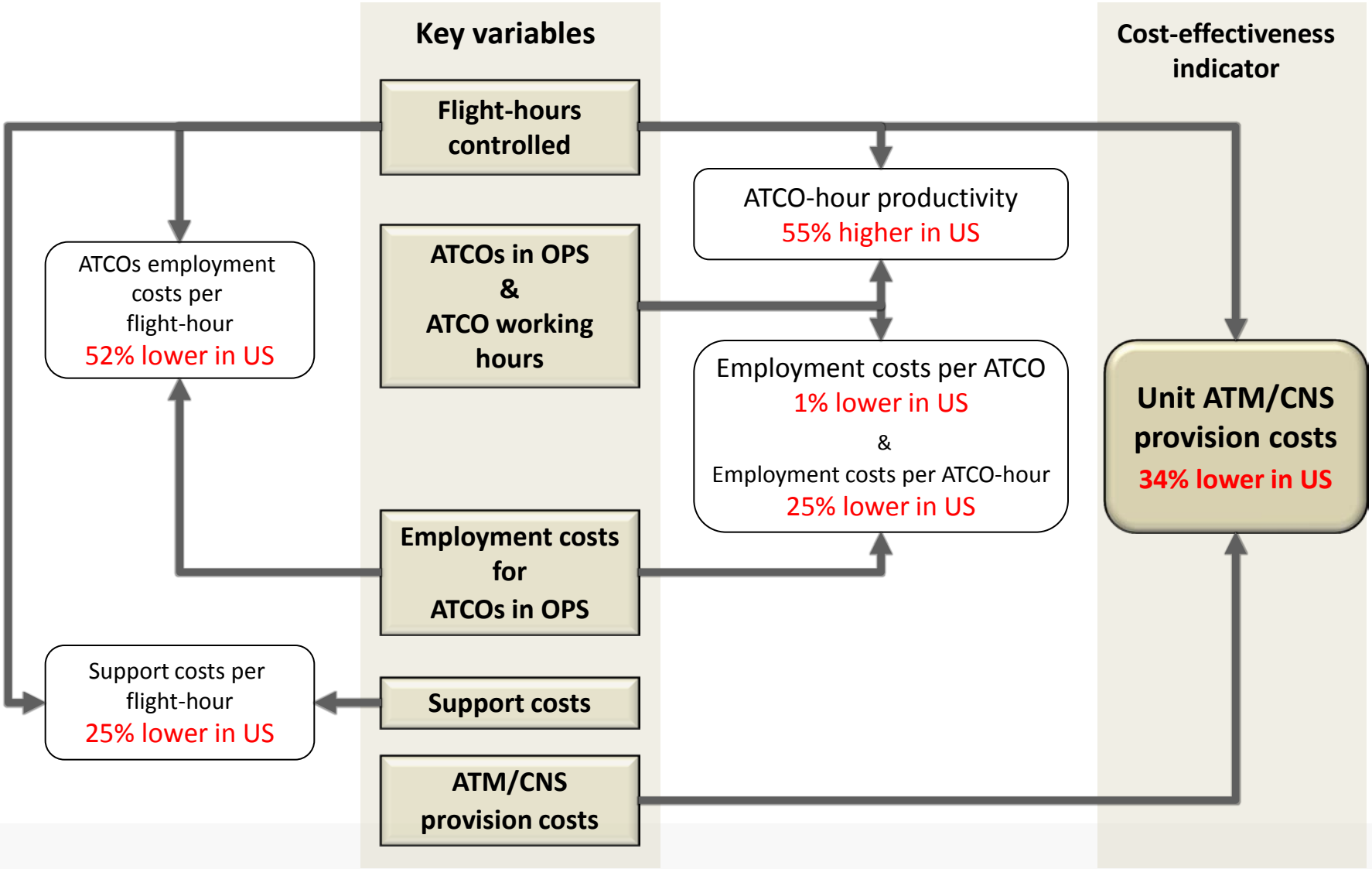
Total ATM/CNS provision Costs per Flight-Hour (€ 2011)

(% difference corresponds to US vs SES)



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
US	265	271	260	267	279	285	310	346	358	354
SES	595	596	583	564	548	547	542	592	556	534
Europe	591	591	572	550	533	529	522	567	529	511

Economic benchmarking – cost effectiveness decomposition

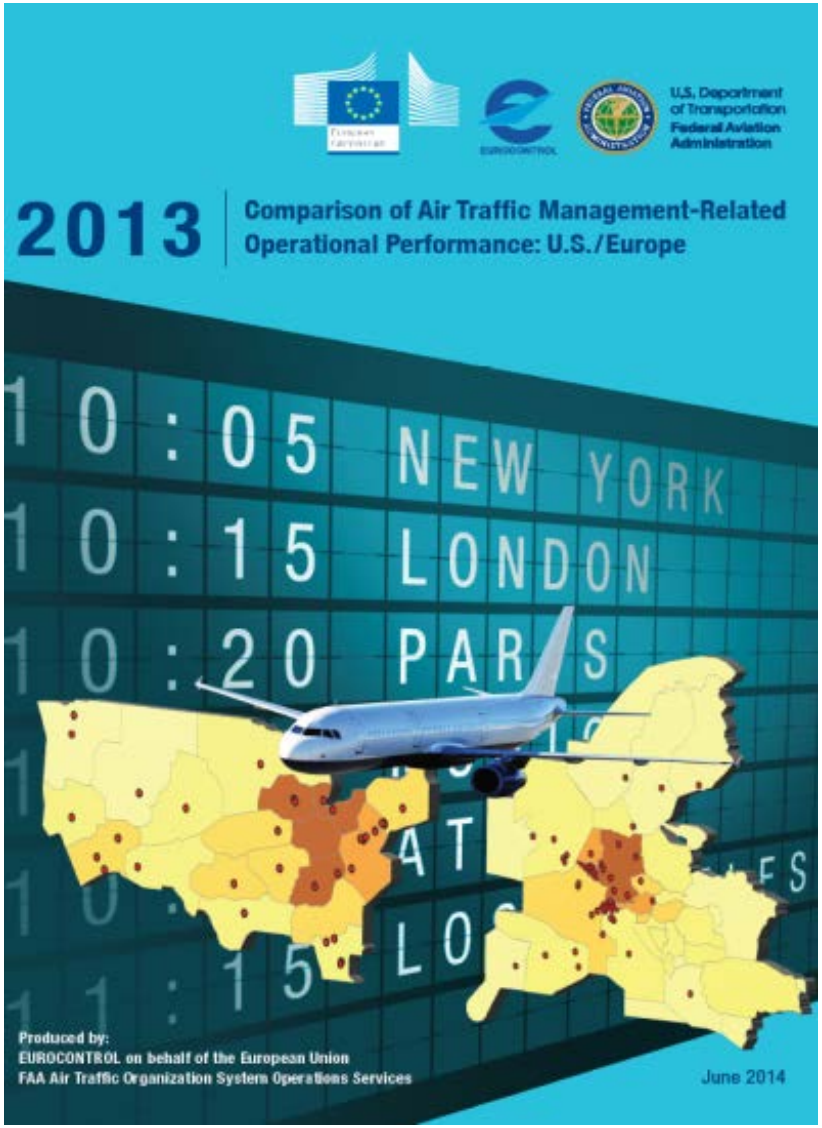


Lessons learned by US and Europe

- It takes time to develop a PBA
  - This is not a one-off exercise
  - Start pragmatic and expand later
  - Focus first on KPIs that can be used for policy development
- It takes a solid foundation
  - Prerequisites for successful benchmarking
    - Harmonized definition of underlying data
    - Harmonized definition of indicators
  - Data collection and analysis requires a lot of resources
    - Spend enough time to set up and streamline the data production chain
    - Spend enough time to ensure the quality and trustworthiness of the collected data
    - Spend enough time on analyzing differences to gain credibility

Lessons learned (Slide 2)

- Presentation and use of results
  - *"One size does not fit all"*
    - Local needs (States, regions, groups of regions)
      - States/Regions will always need dedicated reports for their own policies
      - Supra-regional initiatives such as US/Europe benchmarking are a catalyst for harmonization
    - Global needs
      - How to satisfy global performance analysis needs (ICAO)…
      - … while making maximum use of effort already spent for local needs?
  - Performance results may be sensitive area for States
    - Internal sensitivities, unwanted public visibility, risk of wrong/misleading data being published, risk of data being used against the State/organisation, risk of wrong interpretation, loss of "control of the story", potential financial impact (e.g. reaction of markets to the published numbers), behavior purely aimed at changing the numbers rather than improving true performance, etc.



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THANK YOU !

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