

NAV08/ILA37

27th-30th October 2008

SESAR: Getting Good Value for Airlines

Peter Brooker

‘Even the longest journey must begin where you stand.’

Lao-tzu

‘In the long run, we're all dead.’

J. M. Keynes

What are the Problems?

Technically feasible to create a European Air Traffic Management – ATM – system that ensures flights are on time and navigate 4D fuel-efficient flightpaths?

- How long will it take to create it?**
- How much capacity has to be planned for?**
- What technical/operational choices are there?**
- Mix of ~COTS technology and R&D?**
- What are wise airline investments?**
- Is SESAR solving the right problems?**

Why SESAR? Why Airlines? Why Value?

SESAR?

- Europe's 'Single European Sky Air traffic Research system'
- Targeted at post 2020
- Integrate new technologies to improve ATM performance

Airlines?

- Core of system design is to meet airline/passenger needs
- Direct costs and contributions to ATC route charges
- Society/GDP gains
- But huge implications for military/general/business aviation

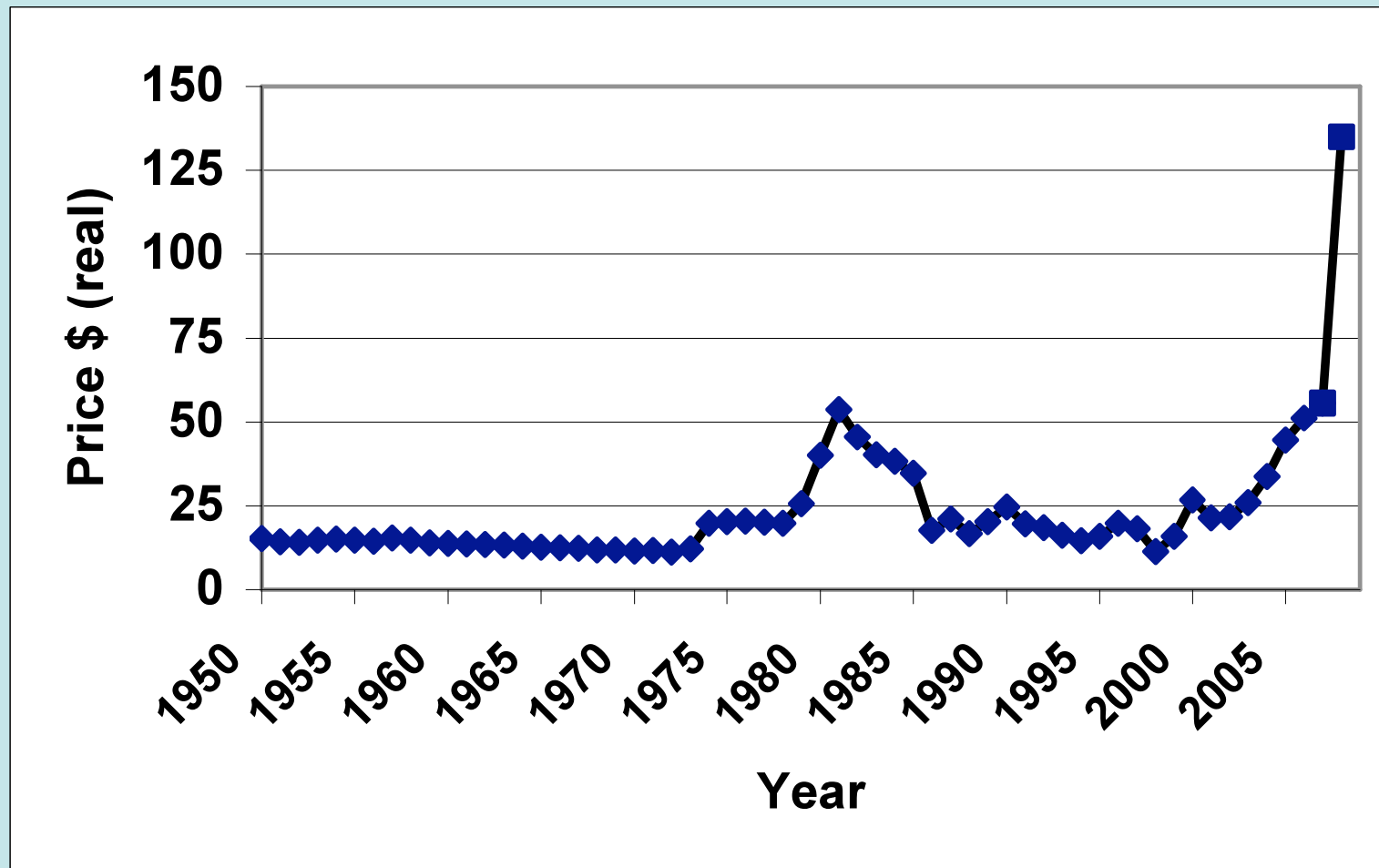
Value?

- Airlines operating in a challenging commercial market
- Progress with SESAR will only happen if *all* the key stakeholders agree to invest money in its core projects

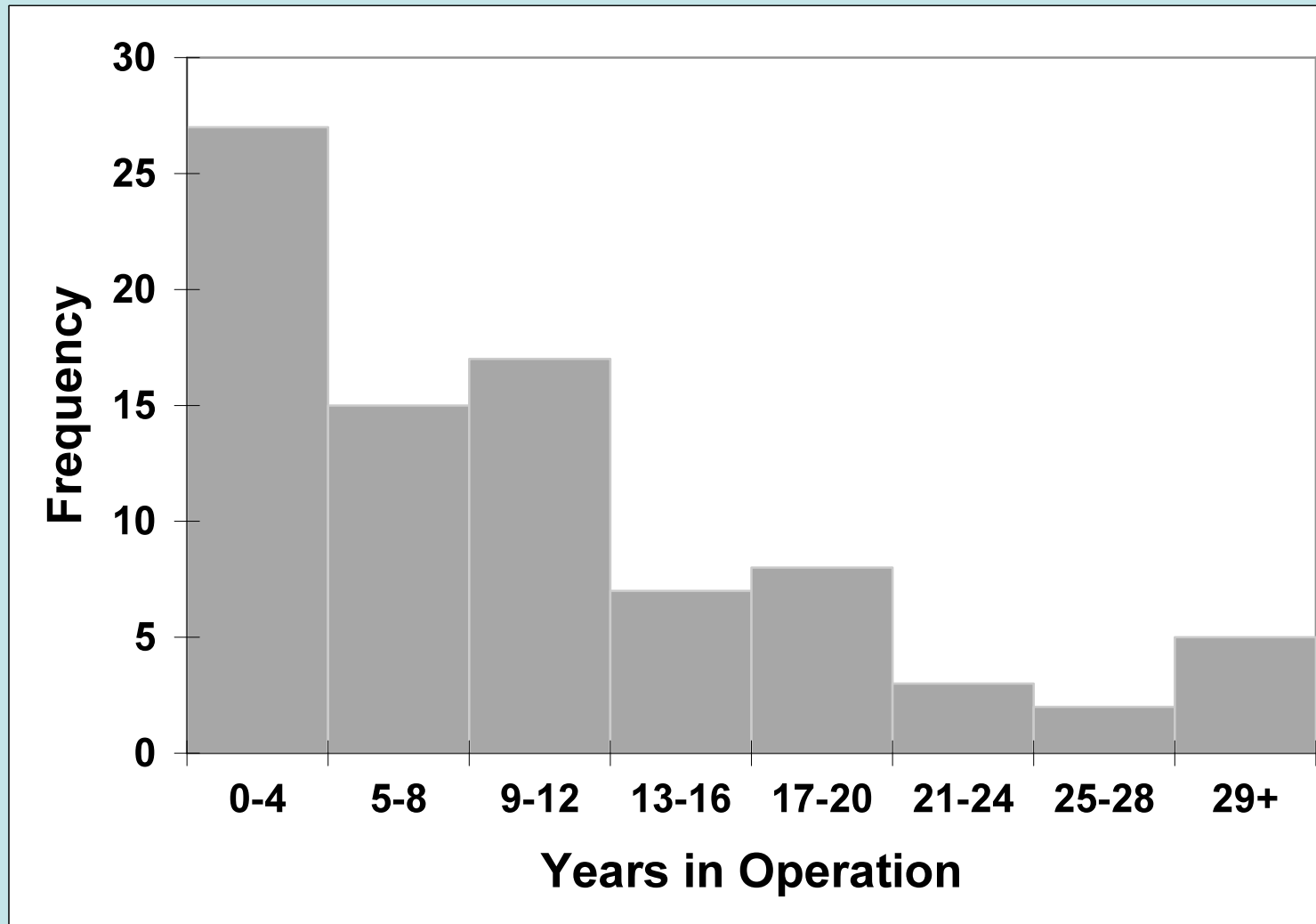
SESAR Features

- Gate-to-gate system integration
- Change from *reactive ATM* to *anticipatory ATM*
- Co-operative:
 - 4D trajectory planning & support tools
 - New roles & task distribution for pilots & controllers
 - Airborne separation assistance
 - Collaborative decision-making (ATM/Airlines/Airport)
- Network of ground-to-air data links to enable accurate 'trajectory' information exchanges
- System-Wide Information Management & Interoperability
- Exploit satellite navigation/communications technology

Crude Oil Price History – and Shocks

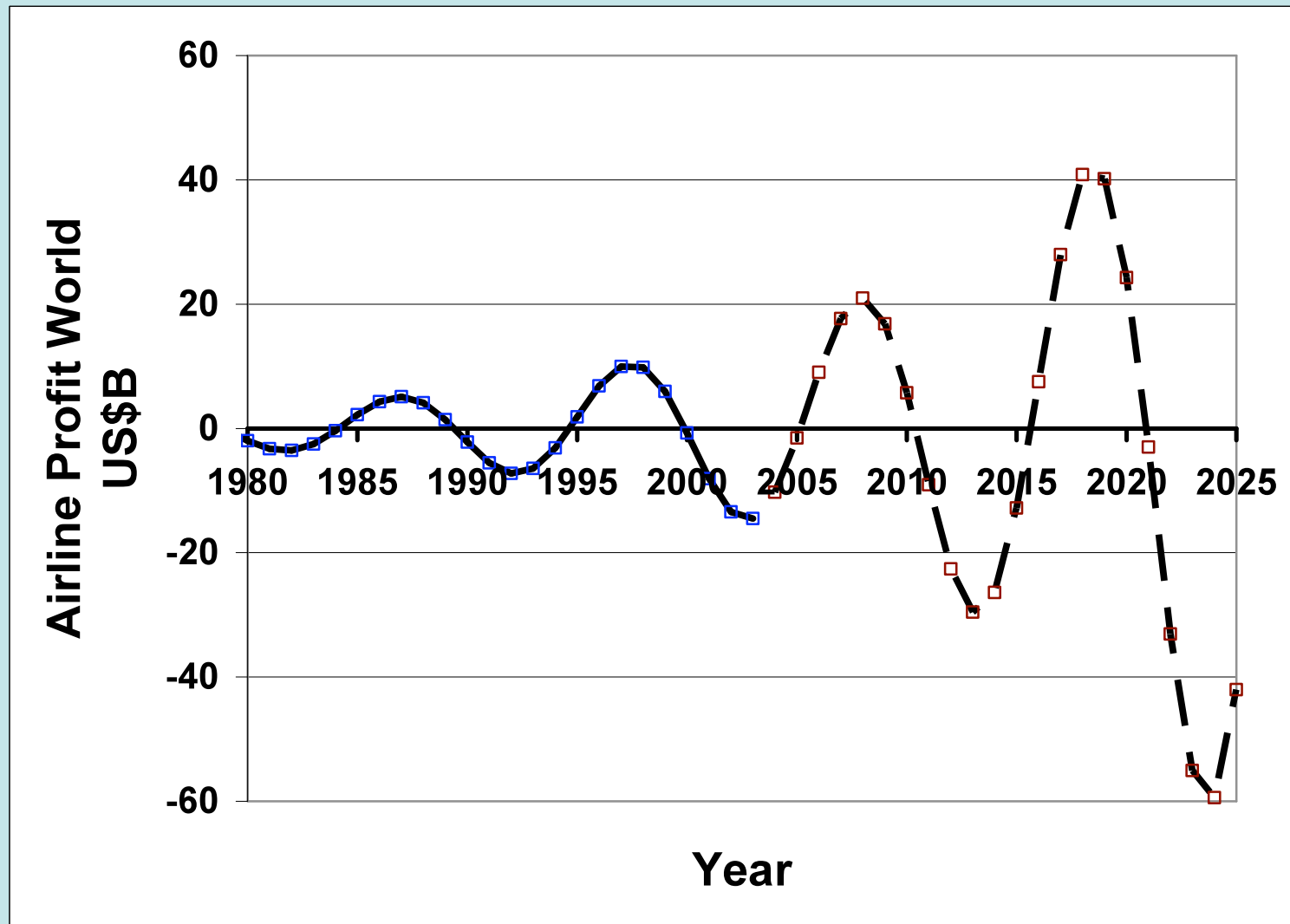


Defunct Post-war UK Airlines*



* Mid-year 2008 data

Projected (@2004) World Airline Profitability



Approach to ATM/SESAR

SESAR's objectives appear technically feasible, but big questions about how to achieve through optimally-chosen technical investment paths

Almost all of the technologies encompassed in SESAR have long histories of successful research

Key issues re *which* R&D & implementation projects should be chosen? System functions replaced? Overlaid or new?

Approach to use simple corporate finance:

- Examine different viewpoints & business environments of ANSPs & individual airlines**
- Focus on airspace capacity**
- Focus on succession of R&D & projects**

ANSPs and Airlines

ANSPs act as 'ATM agents' for airlines

ANSPs need to convince airline customers that capital expenditure plans are *necessary* to meet future traffic growth cost-effectively

Capital investments do not automatically reduce unit costs to customers

the rationale for an investment = a better bargain for the future than other options

ANSPs are not normal commercial (economically unregulated) companies

would lead to investment problems – in UK NATS set up as Public-Private Partnership

Investment Decisions: Corporate Finance Tools for CBA

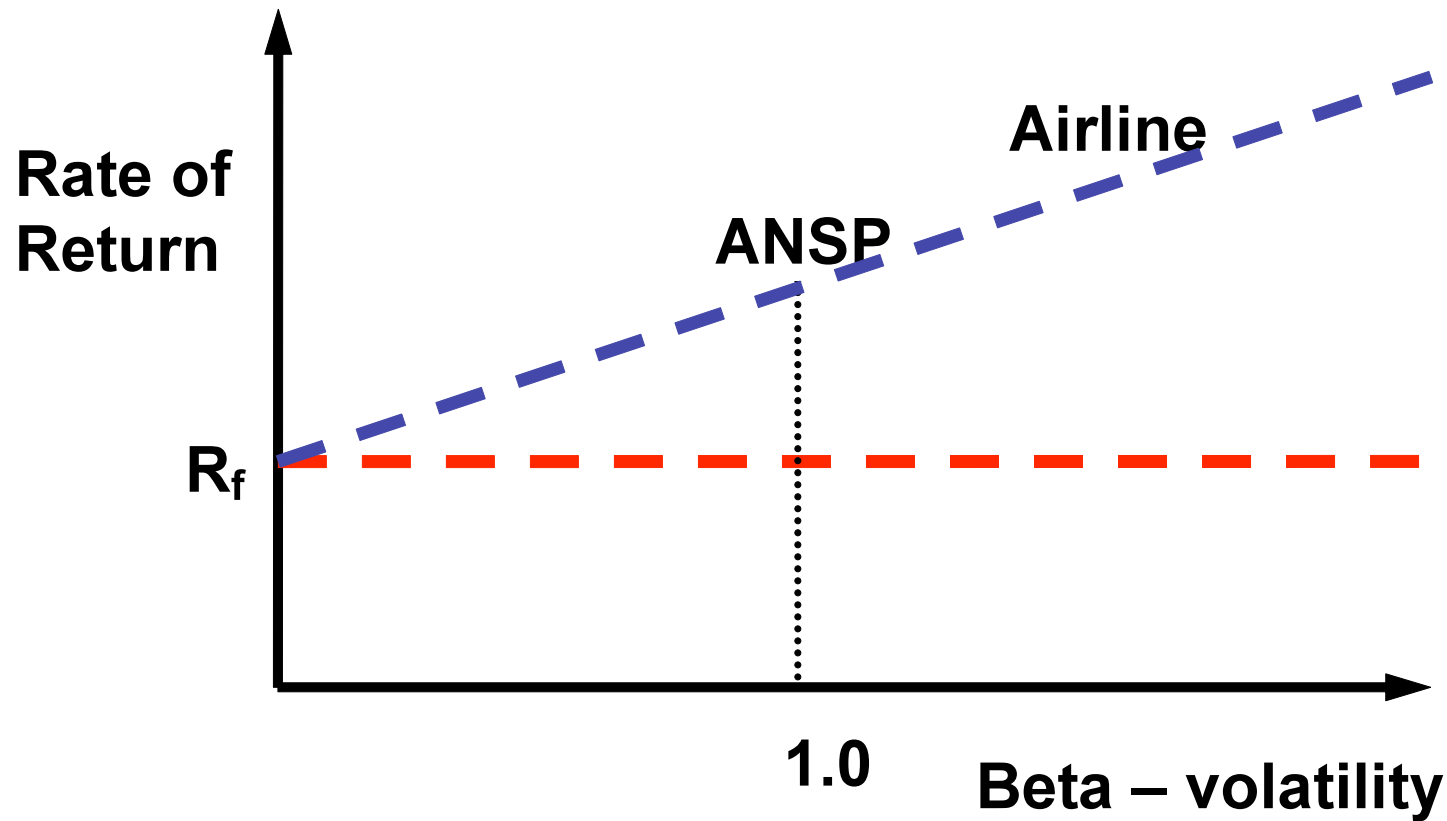
NPV = $\sum (B_i - D_i - C_i) / (1 + r)^i$

Terminal Value = NPV post the planning period – assumes simple growth in net benefits

Real Option Valuation = A 'Real Option' embodies flexibility in the development of a project – a form of insurance or means to take advantage of a favourable situation

'Real Options Analysis' is body of techniques used to value flexibility in the deployment of technical systems, Information Technology (IT) infrastructure (computer reservation systems)

Capital Asset Pricing Model*



***SESAR NPVs do not generally use different rates**

SESAR and Project Decision Making

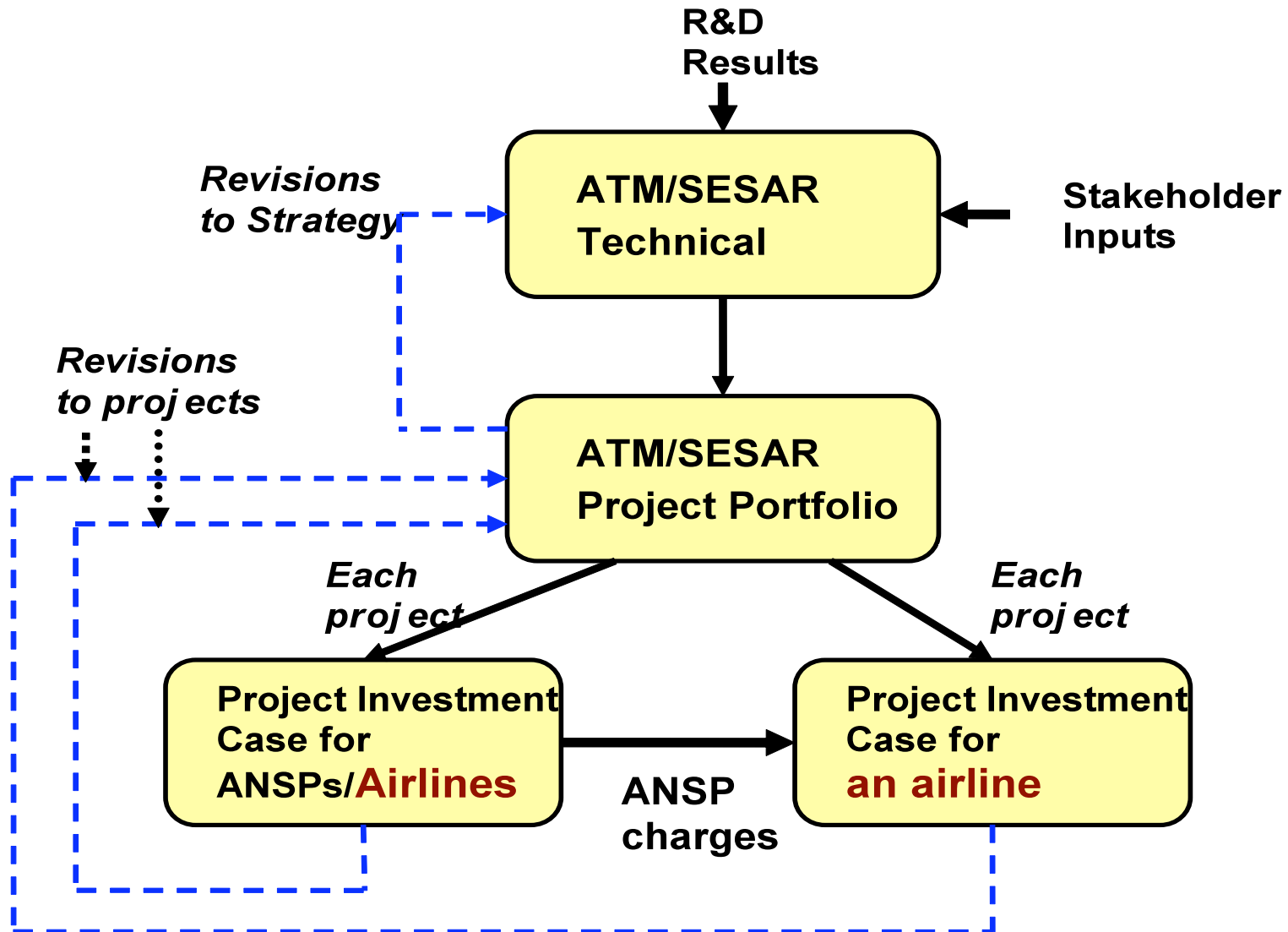
Need to identify the optimum portfolio – projects sequence that makes financial sense to each of the stakeholders

SESAR analyses of costs and benefits generally not estimates of the achievable project cash flows but illustrative calculations

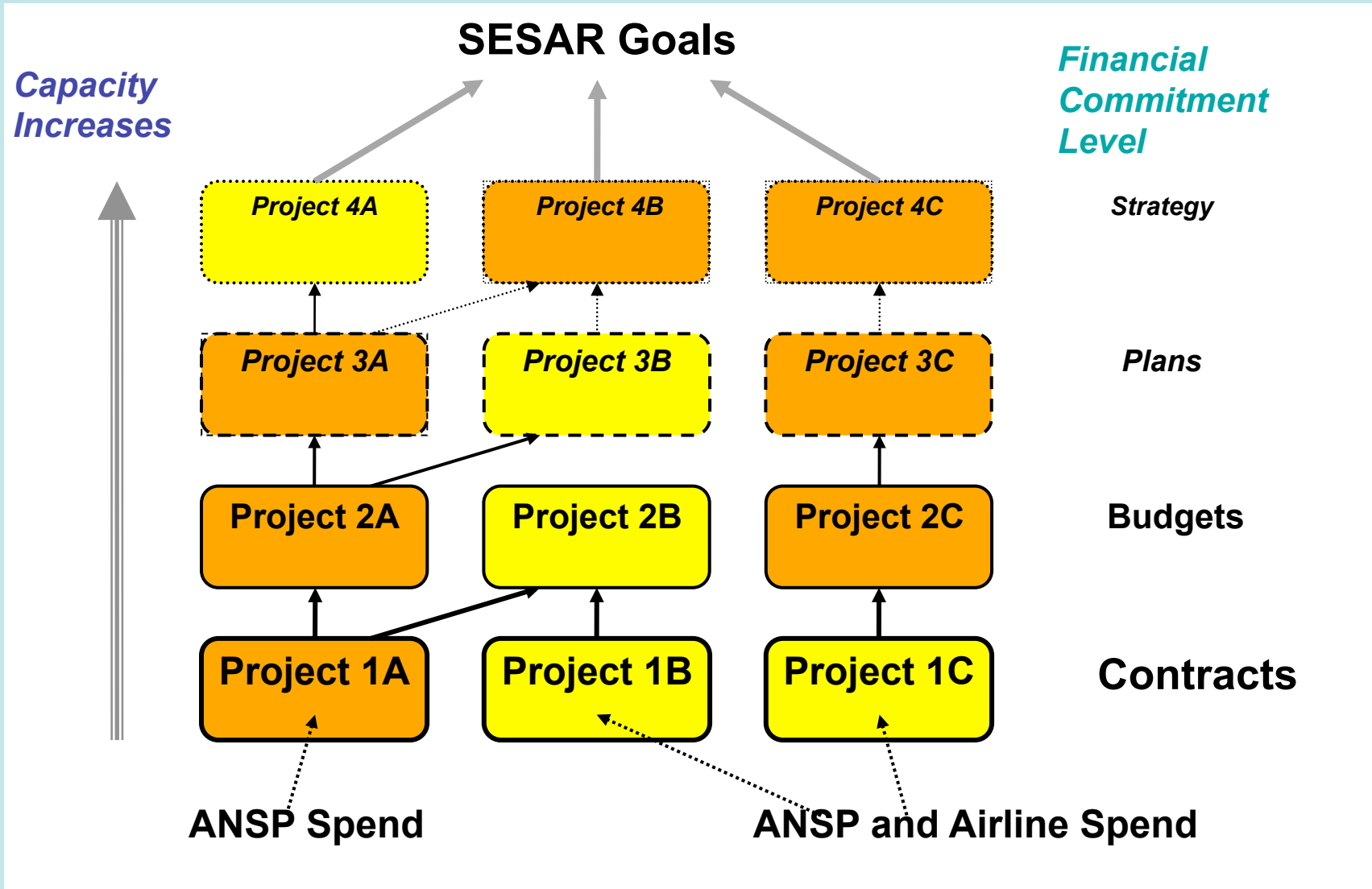
ANSPs' aim is a long-term cost-effective ATM system: must take into account NPV, *and* Terminal Value *and* very long-term Real Options

But an airline's aim is that the business makes cash, so focus is on commercial NPV with a ~five-year horizon, plus recognition of Real Options ,eg re investment phasing

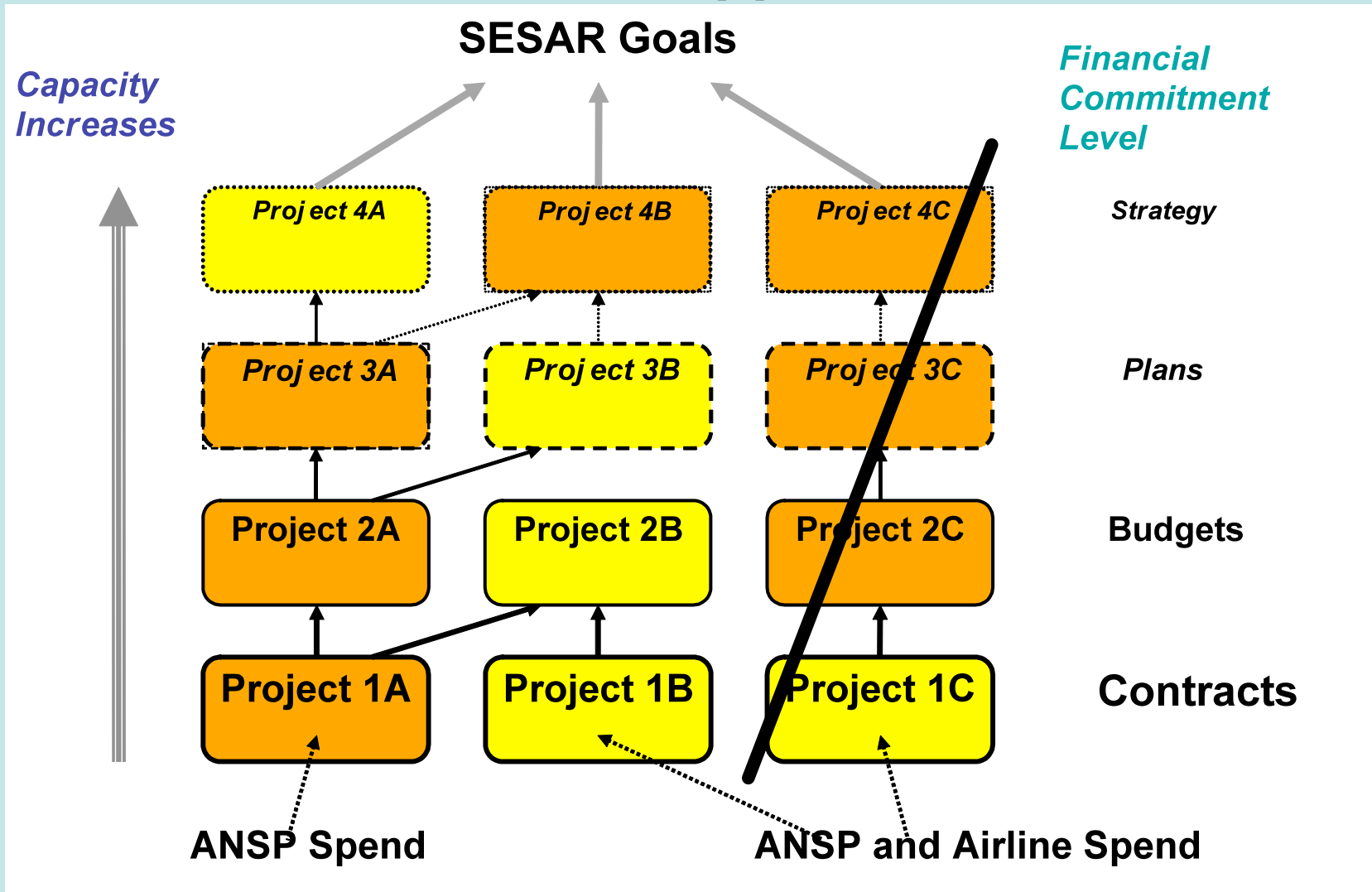
ATM Investment Feedback Loops



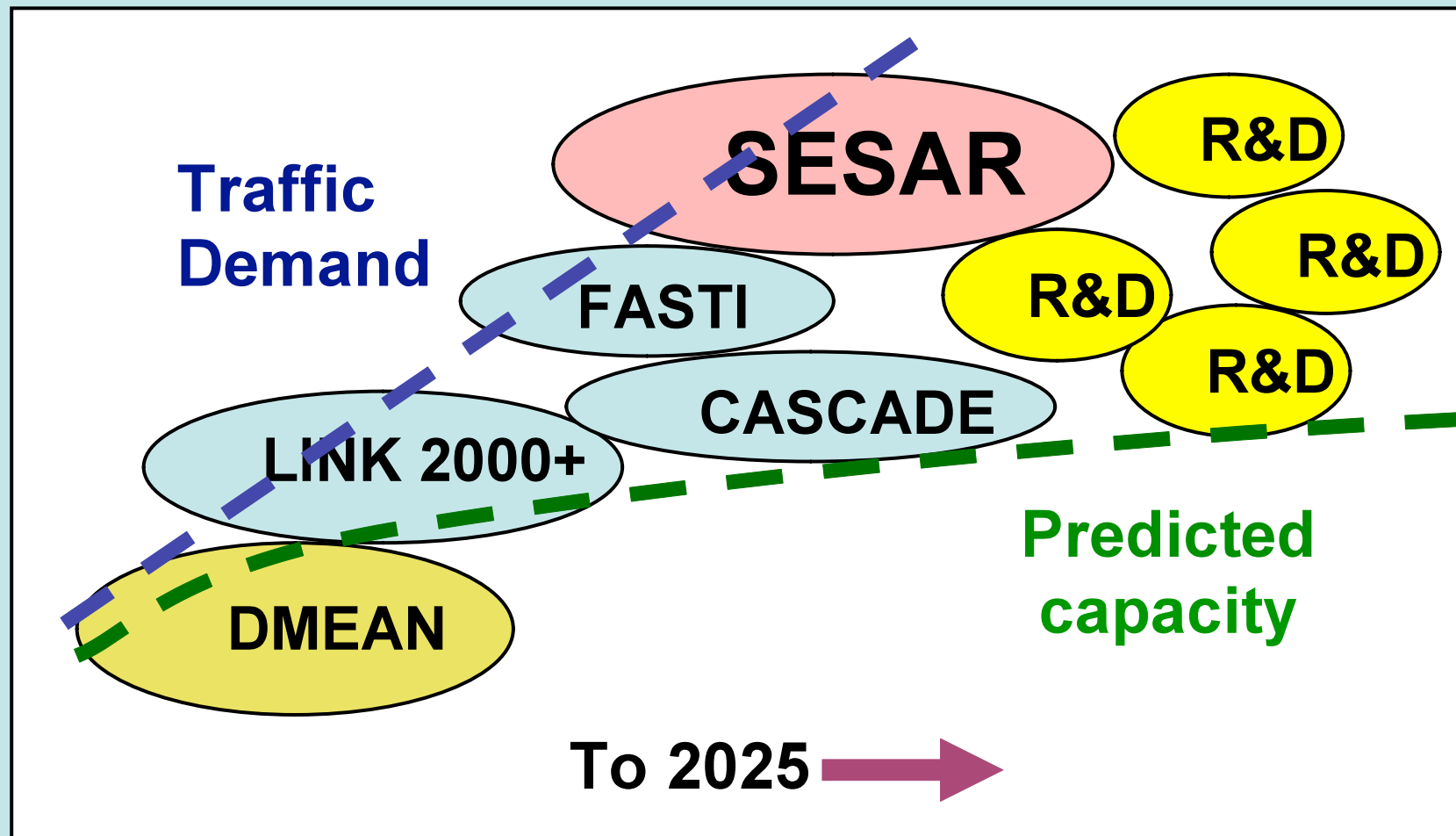
Schematic: Phased Investment decisions



Schematic: Phased Investment decisions – *1C Not supported*



SESAR path



Key pre-SESAR Projects

DMEAN	Amalgamates current Eurocontrol initiatives in airspace design, collaborative decision-making, Flexible Use of Airspace, Flow/Capacity Management
LINK 2000+	Provides controllers/pilots with second comms channel: air/ground data link – CPDLC
CASCADE	Implementation of ADS-B: surveillance purposes (ADS-B-out), air traffic situational awareness (ADS-B-in), airborne separation assistance
FASTI	Deploys initial set of controller support tools, meets short/medium term needs & establishes foundation for further automation
<i>aFDPS</i>	<i>Advanced Flight Data Processing Systems – using new standard for flight data exchange in Europe</i>

Pre-SESAR Projects as Investments

DMEAN, LINK 2000+, CASCADE, FASTI, aFDPS: long R&D histories, not novel

Merits depend on different combinations of NPV, Terminal Value (dependent on growth), and Real Option Value

Weakest hard evidence at present is CASCADE: multilateration better investment than surveillance systems replacement? Merits of later ADS-B stages?

aFDPS investment decision as key IT software platform, implementing value-generating applications and reducing the costs of fragmentation

Projects have to be assessed against *good* estimates of software development costs/timescales – in practice often much higher than anticipated in plans

Pre-SESAR Project Valuations*

	Direct Spend by ANSPs <i>'In trust' for Airlines</i>			Direct Spend by <u>an</u> Airline	
	NPV	Terminal Value	Real Option	NPV	Real Option
DMEAN	✓	✓		x	
LINK 2000+	✓	✓	✓	✓	✓
CASCADE	?	?	?	?	?
FASTI	✓	✓	✓	x	x
aFDPS**	x	x	?	x	x

* Using existing Eurocontrol/ANSP best published estimates, focusing on en route airspace gains

Economic Context

- **Airline profitability in recent decades subject to large – and increasing – cyclical oscillations**
- **Now overlaid with chronic oil price shock & credit crisis**
- **Airline costs increased with EU's Aviation Emissions Trading Scheme (ETS - 2012)**
- **SESAR's goals now appropriate – present economic and oil price position?**
- **Fuel economy much higher priority, likelihood of a High growth scenario much lower**
- **Low growth reduces benefits cash flow – need to look carefully at SESAR's flexibility, eg phasing of its project components**

Eurocontrol Low Growth Scenario

Critical SESAR assumption is large growth in new airports/runways

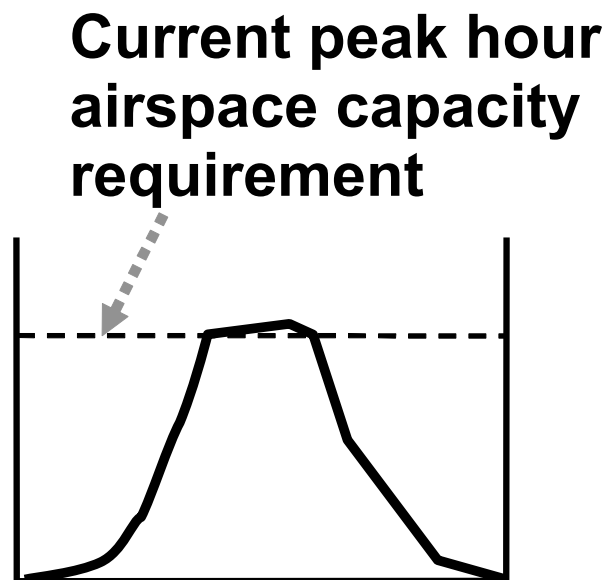
Right goal a challenging 'peak hour loading' scenario – very low probability of occurrence?

Must assess range of strategies re the stakeholders costs/benefits/disbenefits from over- or under-investment

Low Growth (~2.5% growth pa) scenario has major implications for the SESAR portfolio:

Defer projects in the portfolio that deliver capacity above what is projected as needed *or* do not have big real options values – revise the financial priority stages

Airports Diurnal Demand Pattern – Now



**Airports demand on current
airspace system**

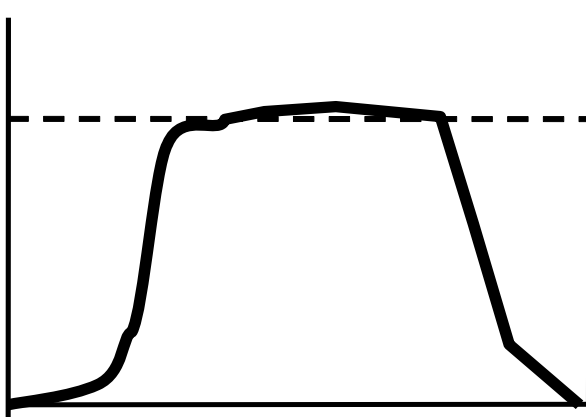
Congested group of airports

Demand vertical axis

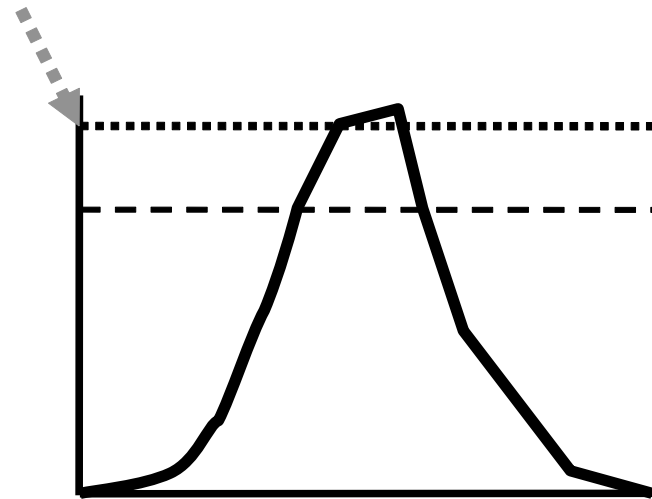
Time of day horizontal axis

Airports Diurnal Demand Pattern – Future

**New peak hour airspace
capacity requirement**

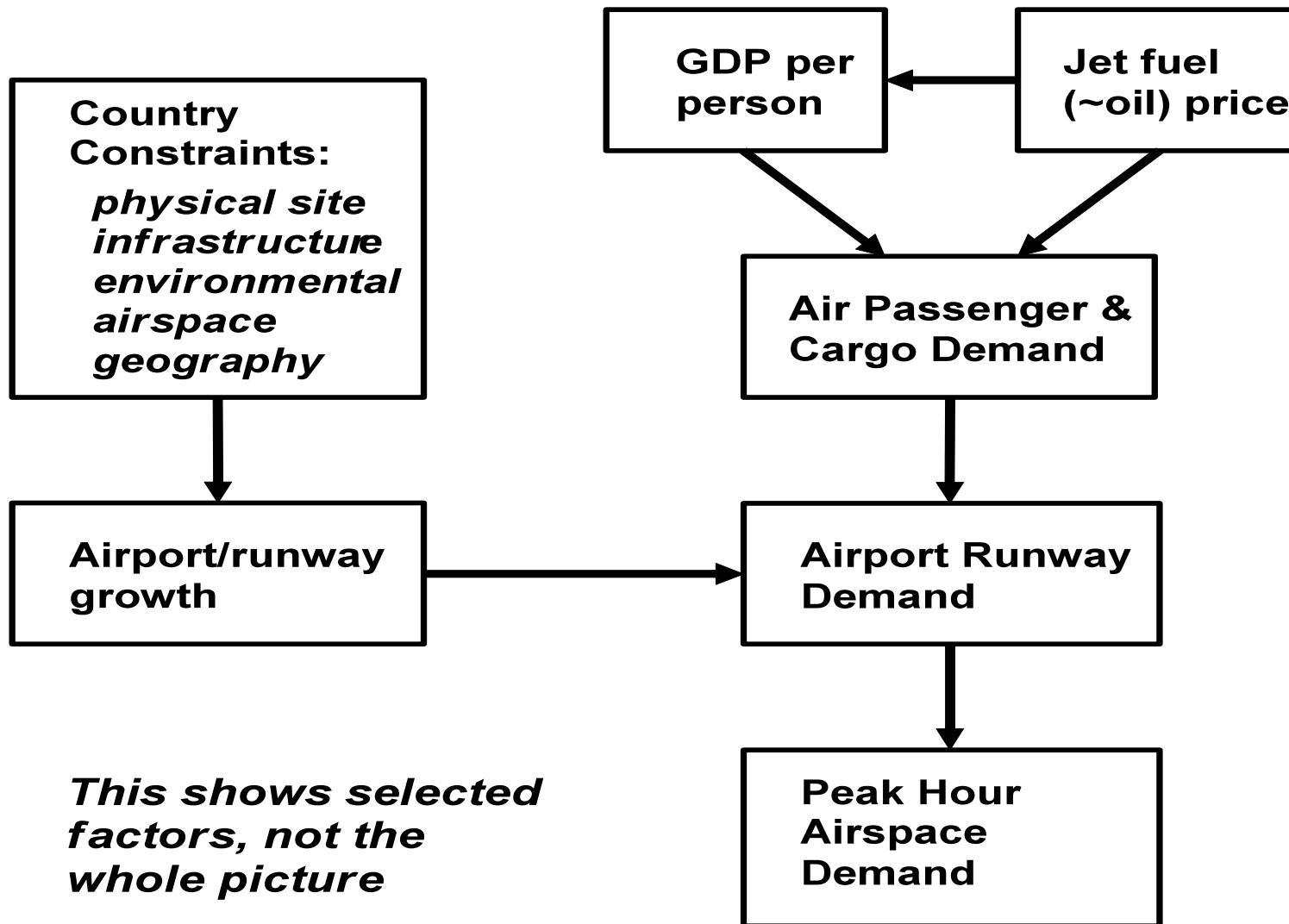


No new runways



New runways

Selected Factors in Predicting Peak Hour Airspace Demand



Low Growth and Peak Hour Airspace Demand

**Peak demand is constrained by airport capacity
in use**

**So planning for extra airspace capacity requires
good projections on the number of new runways**

**So the phasing of existing and SESAR-related
projects must take account of fluctuating demand
and the practical phasing of new airport capacity**

**Eurocontrol's 2004 Challenges to Growth study
attempted estimates of constrained demand if
major new commercial airports were not
developed – will they be?**

**Low GDP growth and long-term high oil prices
generate 'Eurocontrol Low Growth scenario'**

Airspace Capacity pre-SESAR Projects

- DMEAN plus ATFCM together produce an airspace capacity increase of 24%-32%**
- CPDLC at 100% fit is estimated at 14% improvement**
- FASTI generates gains of up to 15%**
- In combination, the sector capacity gain would be substantial – 63%-73%**

This is about the amount required for the Eurocontrol Low Growth scenario to 2025

ATM/SESAR 'Best Value' Issues for Airlines

- **European GDP, traffic and airport growth?**
- **Oil impact?**
 - **Fuel economy**
 - **Climate change (taxes and ETS)**
- **Financial Decision making criteria**
 - **NPV – ANSP ('airline agent') & an airlines cash flows**
 - **Real Options**
- **ATM Growth potential using 'existing' technology**
- **Project choices & sequences**
- **R&D and project linkages**

Potential ATM/SESAR Strategic Decisions

- **Must recognise complexities of aviation financial & operational decision making**
- **Must provide hard evidence to airlines about returns on investment and options value [cash flow!]**
- **Must implement mature pre-SESAR programmes with major business benefits & real options for stakeholders – these secure the ‘Eurocontrol Low Growth scenario’ (few new airports) future**
- **Must keep SESAR Europe-wide momentum**
- **Examine SESAR priorities: create R&D/project portfolio assuring CBA cash flow paybacks & maximising real options value – build system framework that can meet higher demand by re-phasing**