30 Years of ATM Strategies and Concepts

US-Europe ATM Seminar 2015

Bernard Miaillier
Hd of ATM Strategies, EUROCONTROL
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Behind the Title:
Some (Last) Personal Thoughts

Some sort of assessment, but not a judgement

- Stability or lack of progress; optimism or illusion?
- If we think right, where are the problems to make it happen?

1. 30 years of the past for 30 years in the future
2. The key conceptual tenets
3. ATM Myths & Paradoxes
4. Concept trends and options
   - Is knowledge documented enough?
   - Transition issues: continuous Vs disruptive evolution
5. R&D work I would have liked to see more

2014 – 30 = 1984

Not as portrayed by George Orwell !

- Macintosh: a mouse & windows, no hard drive
- A320 programme launch
- ICAO FANS Cee
- Notion of “Random RNAV routings” defined
- Sony 2k x 2k raster scan screens

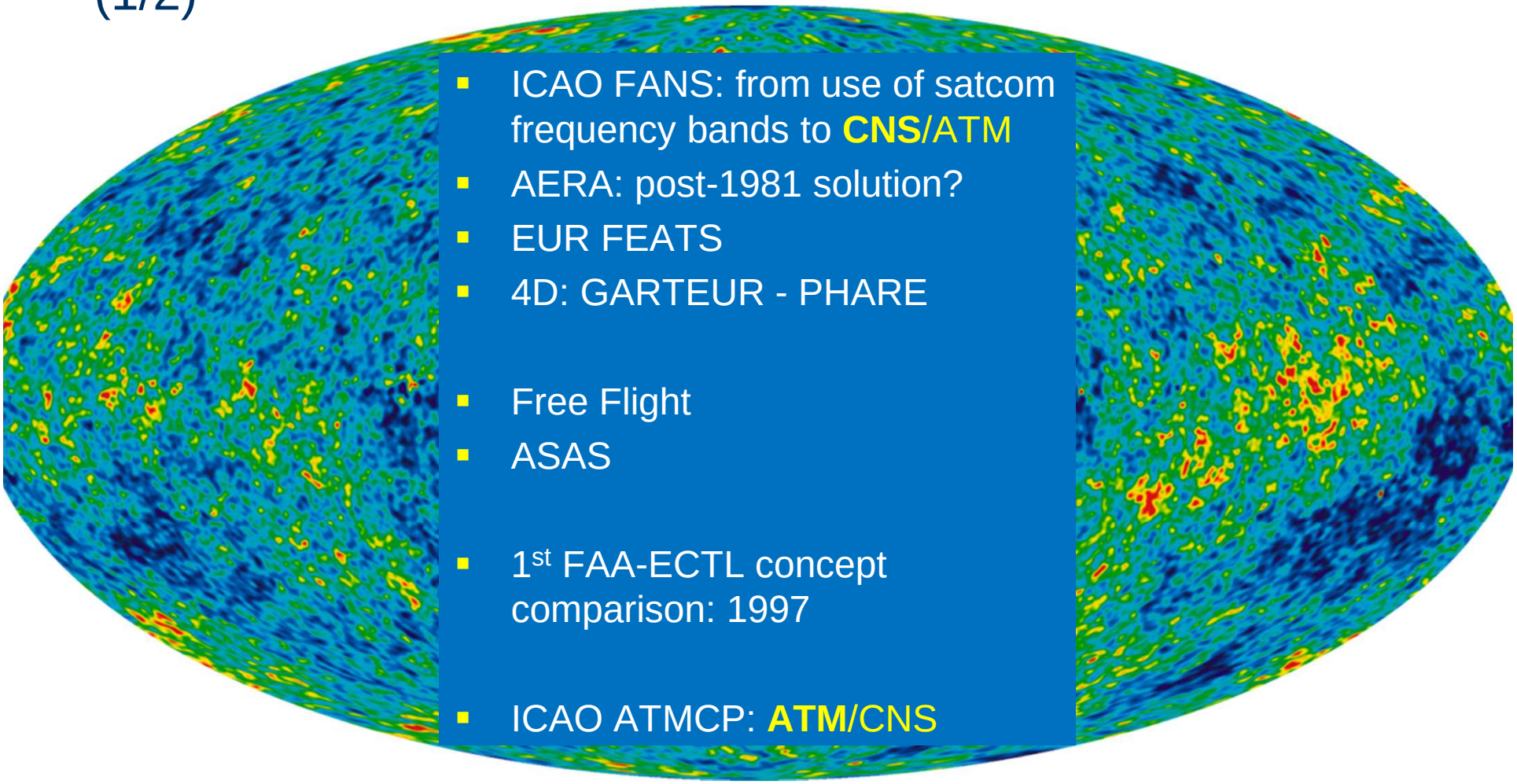
1985

- 1st ETOPS NAT flight (TWA B767)
- ATR42 in service
- August: commercial aviation's deadliest month for passengers & crew
- Fuel: from 31.75 to 10 USD/barrel within weeks
- Windows 1.0
- Back to the Future

2015 + 20 = 2035
(= Horizon of Updated European ATM Master Plan)

- BOTH FAR AND NEAR
  - Acceleration of change in the world Vs long lead times in aviation (e.g. airport infrastructure)
- Environment – Fuel ?
  - Traffic x 1.5 in US-Europe ?
  - Same high traffic densities in Asia
- New vehicles & applications
  - In proportion, not so many except light RPAS…
  - A/c delivered today still there
  - Software more than hardware
- Is vision long enough?
  - Integrated CNS
  - Architecture evolution
  - Transition

Concepts & Strategies: Progressive Emergence (1/2)



- ICAO FANS: from use of satcom frequency bands to **CNS**/ATM
- AERA: post-1981 solution?
- EUR FEATS
- 4D: GARTEUR - PHARE

- Free Flight
- ASAS

- 1st FAA-ECTL concept comparison: 1997

- ICAO ATMCP: **ATM**/CNS

In an historical vision of a/g D/L, satnav & satcom, automation (our "Cosmic background radiation")

Concepts & Strategies: Progressive Emergence (2/2)

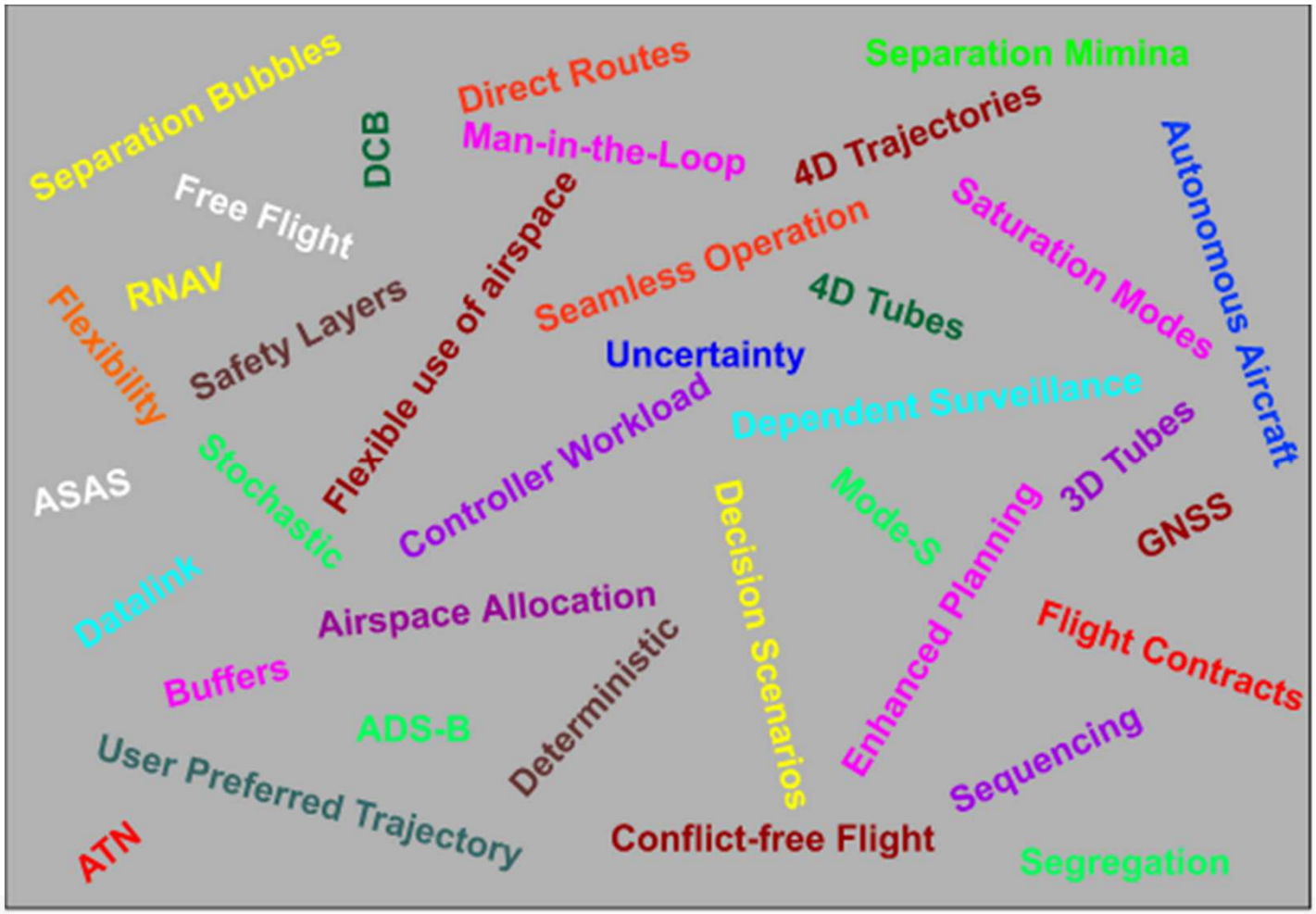
- Concept <-> Strategy

- Performance in late 90's

  Layered Performance Concepts and different abstractions
  - Outcome/society
  - Airspace users, Services (RTSP)
  - Systems (RNP, RCP, etc.)
  - Technologies (SARPs, MOPS)

- Recognition of interrelated processes
  - CDM
  - Network
  - SWIM
  - Global aviation needs & global solutions
  - A common object, subject of all decisions by all actors: the flight trajectory

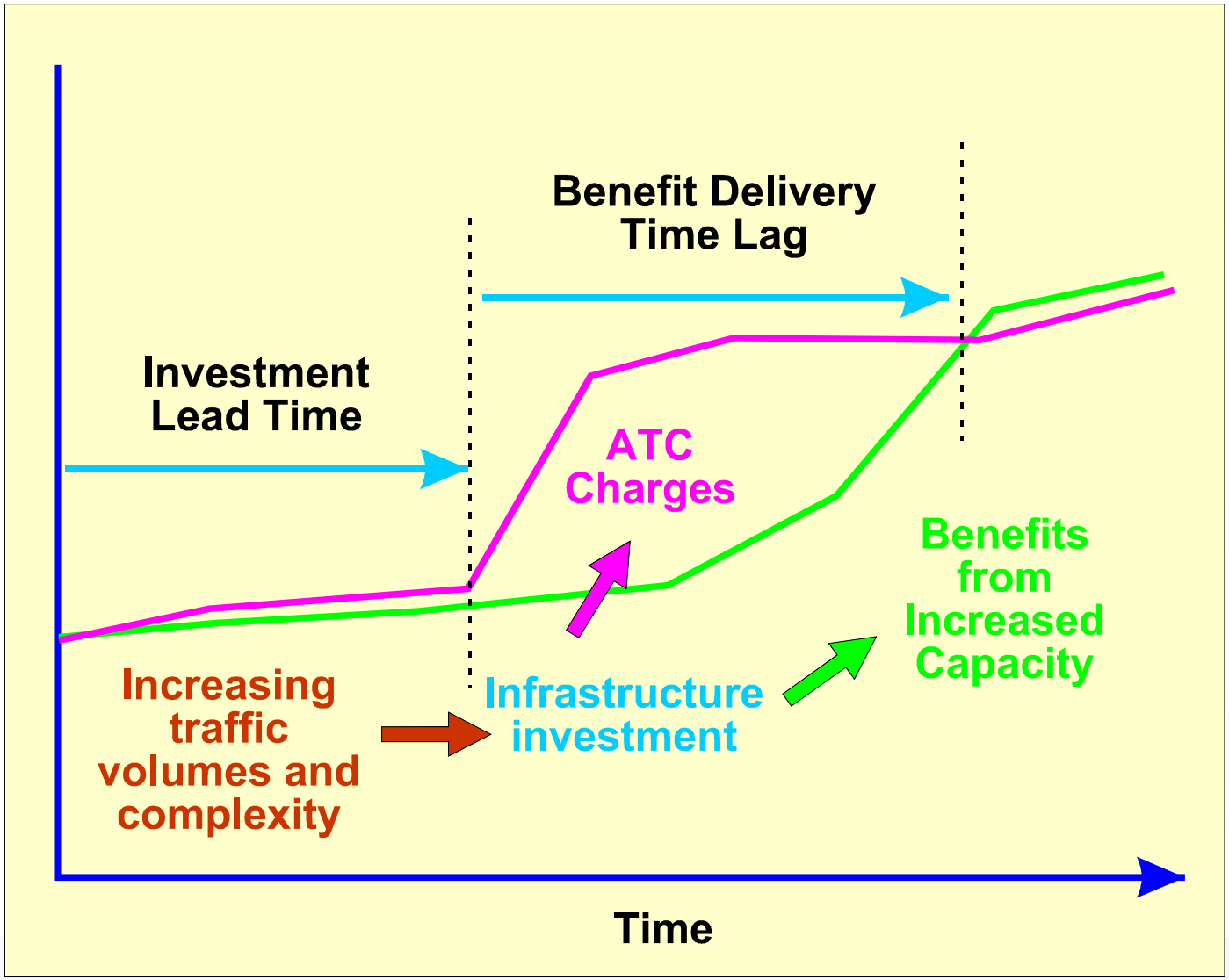
Many Issues Discovered & Discussed - A Rich Terminology, Diverse Interpretations – Myths & Paradoxes



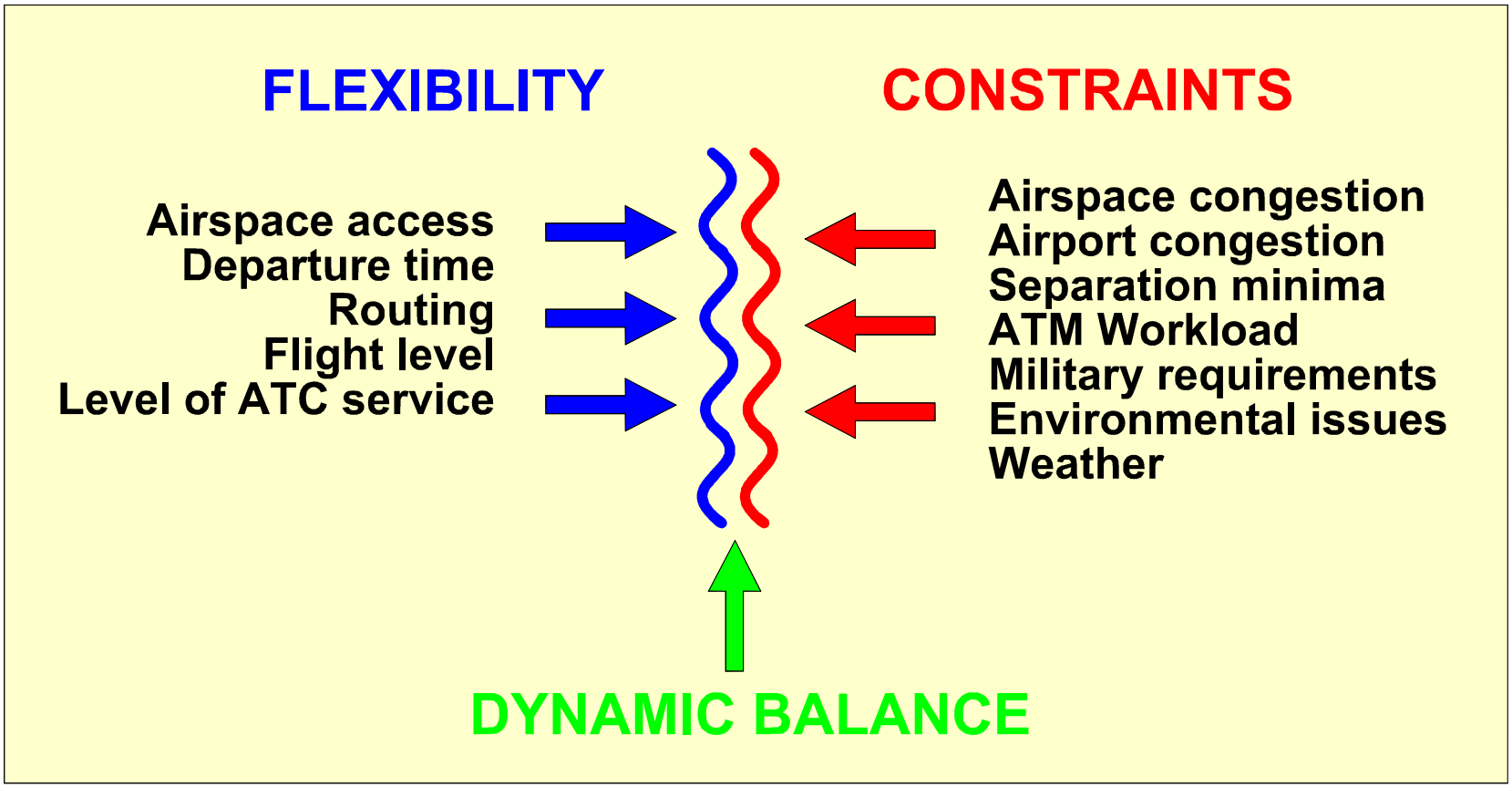
Going Beyond Apparent Paradoxes

- Safety is paramount but not the main driver of change
- No commitment to new investment without justification but how much longer can existing concepts and systems cope?
- We have to provide solutions that can lead into the future but uncertainty increases with look-ahead time
- Airspace users want to fly where/when they wish but also want maximum access to shared resources
- The human - both the strongest and weakest link in the chain!
- Centralised planning and control is often seen as ‘bad’ but how to achieve capacity, efficiency and safety in a free-for-all?

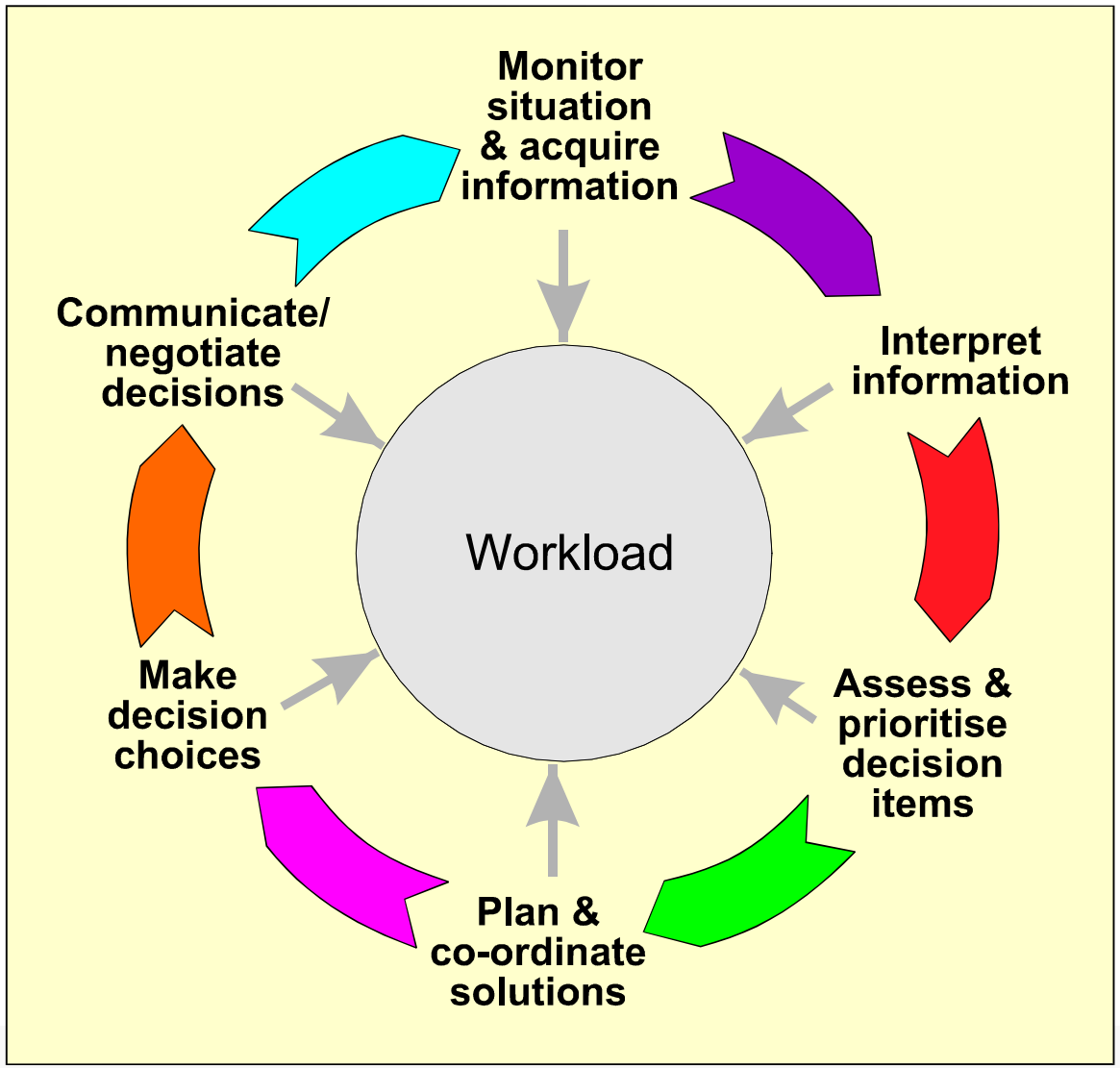
How to Escape Lead Time Effects?



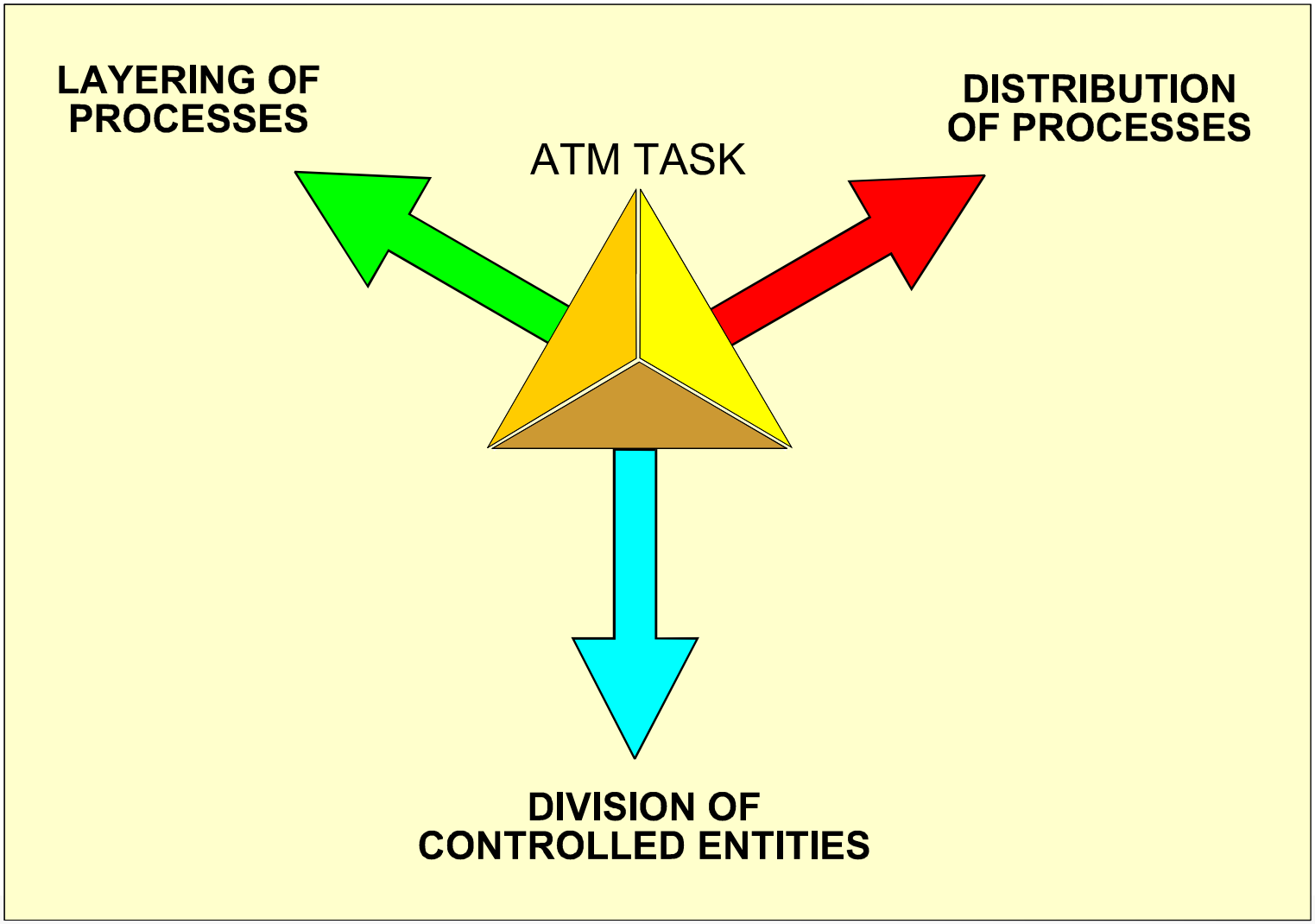
Trade-Offs


FLEXIBILITY
CONSTRAINTS
Airspace access
Departure time
Routing
Flight level
Level of ATC service
Airspace congestion
Airport congestion
Separation minima
ATM Workload
Military requirements
Environmental issues
Weather
DYNAMIC BALANCE

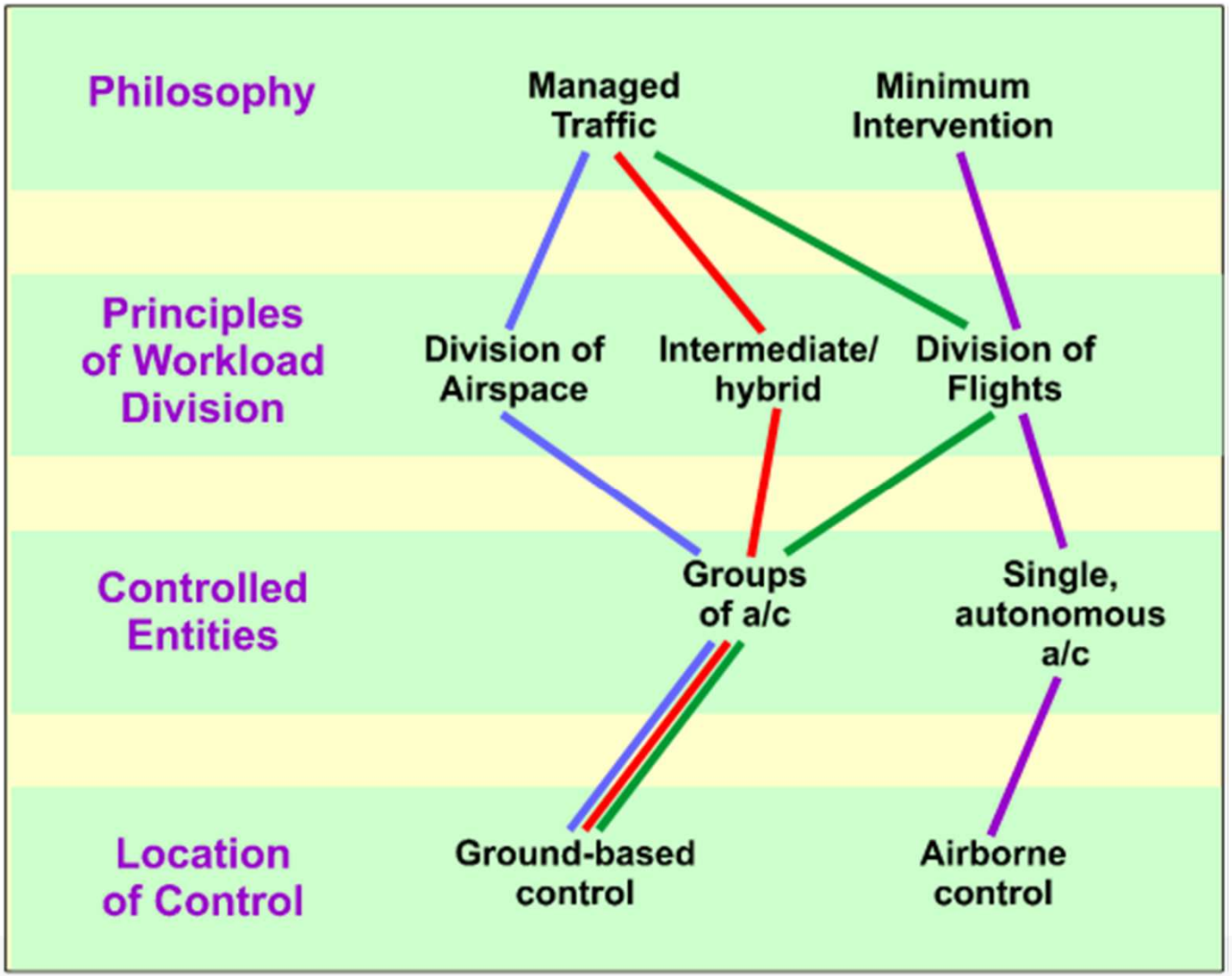
A Universal Loop, …



… but are Roles Set for Ever?



Management Philosophies: Division of Airspace or Flights



Trends

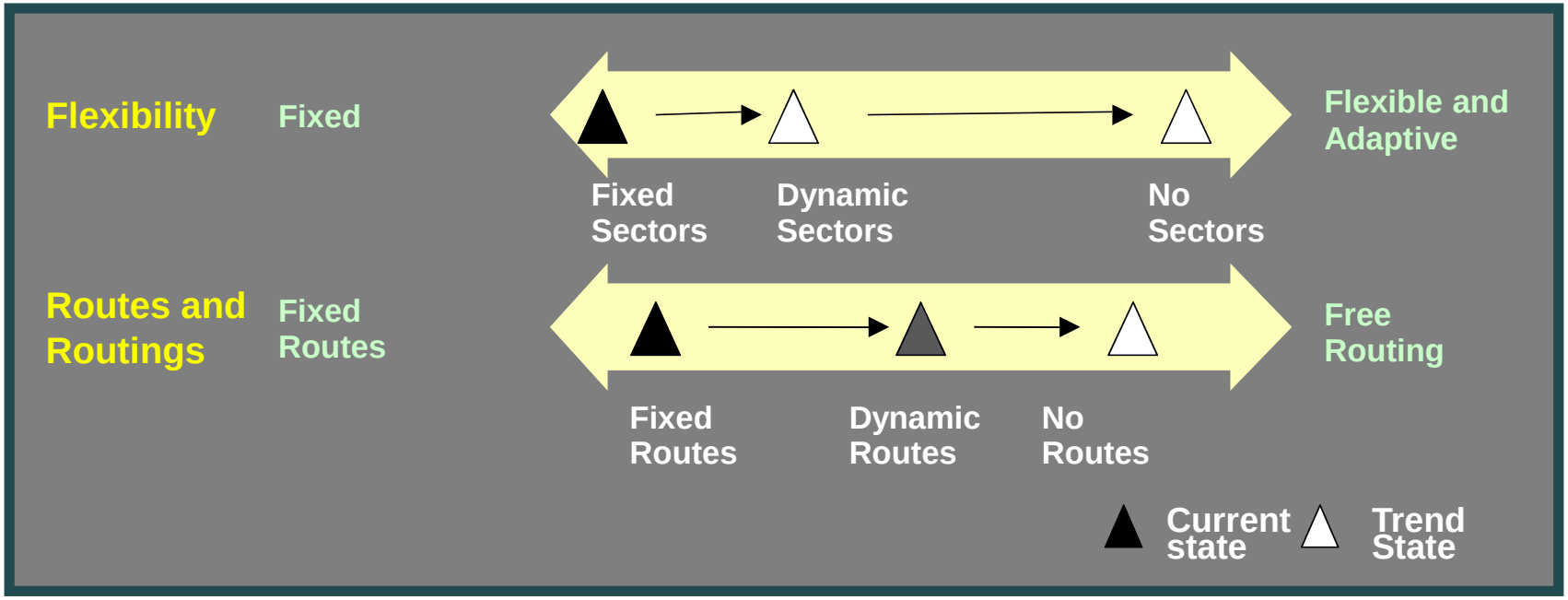
Concept

- ATM as a network
  - ATM providers, airspace users, airport operators
- Gate-to-Gate perspective
  - (or en-route to en-route)
- Customer orientation (CDM)
  - Enhanced Flexibility & Efficiency
- Information society
  - timely information of adequate quality to make decisions
  - increased levels of automation to enhance safety, capacity & efficiency
  - integration of systems &information

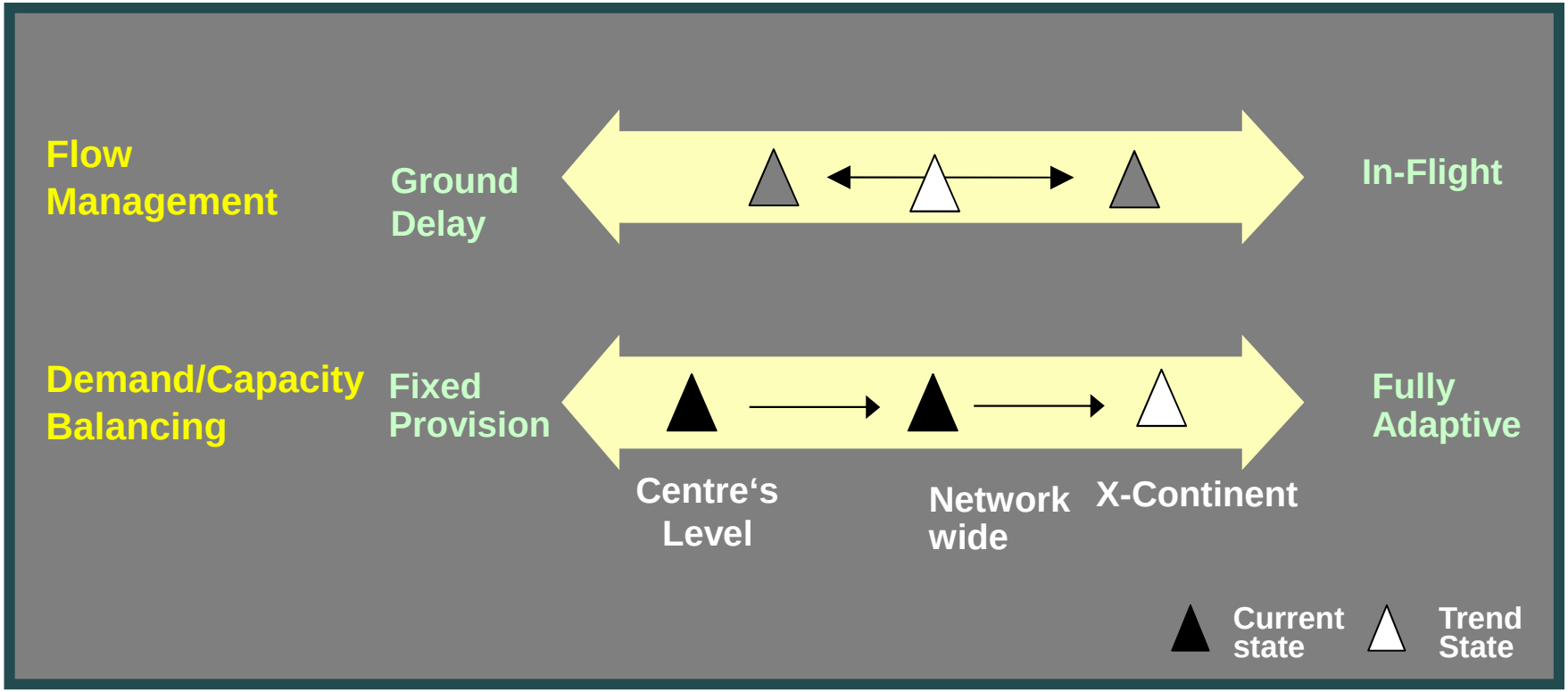
Implementation

- Performance orientation
- Users call for global not regional solutions
  ... and short term ROI !
- Successive steps of change
  - Operational improvements and enablers
  - Notion of road map of change steps through time
- Synchronisation
- Incentives

Airspace Organisation & Management Trends



Flow & Capacity Management Trends



Transition Challenges

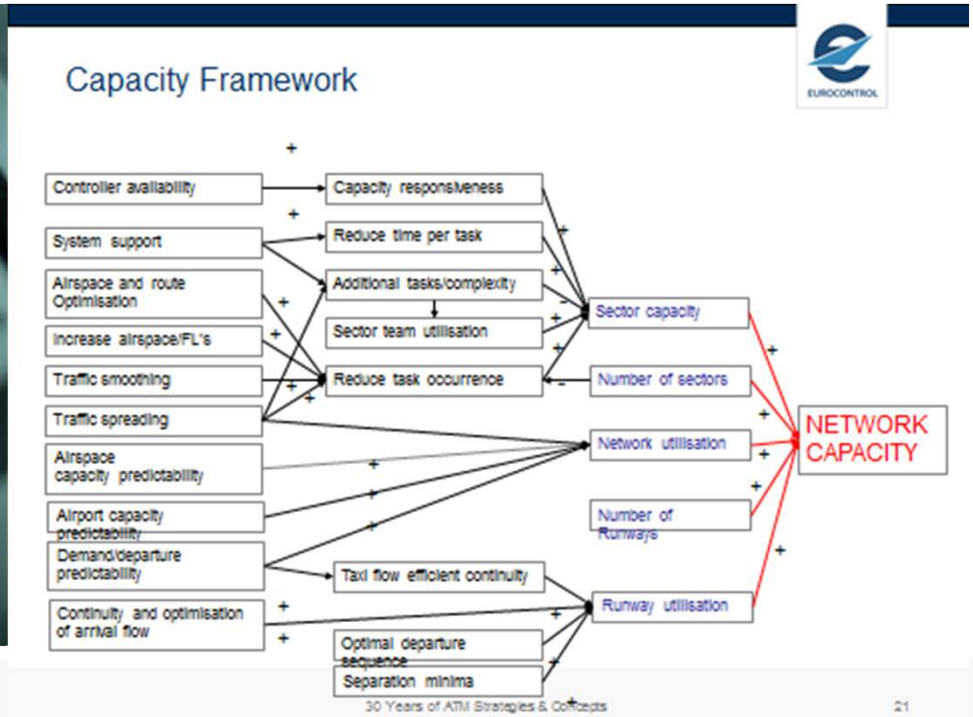
- A/C & ground systems life
  - Software updates
  - Older generation retrofit costs
  - Mixed fleets/capabilities, "last mover advantage“
- Synchronisation, costs & training
  - Differential service Vs efficiency
  - Time to get benefits after investment
- Global Vs Europe/US
  - Different starting points, legacies
- Who decides what?
  - Reconcile individual companies’ investment decisions &“community”/association agreements
  - How to ensure synchronisation?
  - Regulation to help start or finish?

Transitions studies: what is possible?

- From analog VHF to something else (whatever it is): could disruption be avoided?
  - “Party line”, GA
- Are incremental changes a fate?

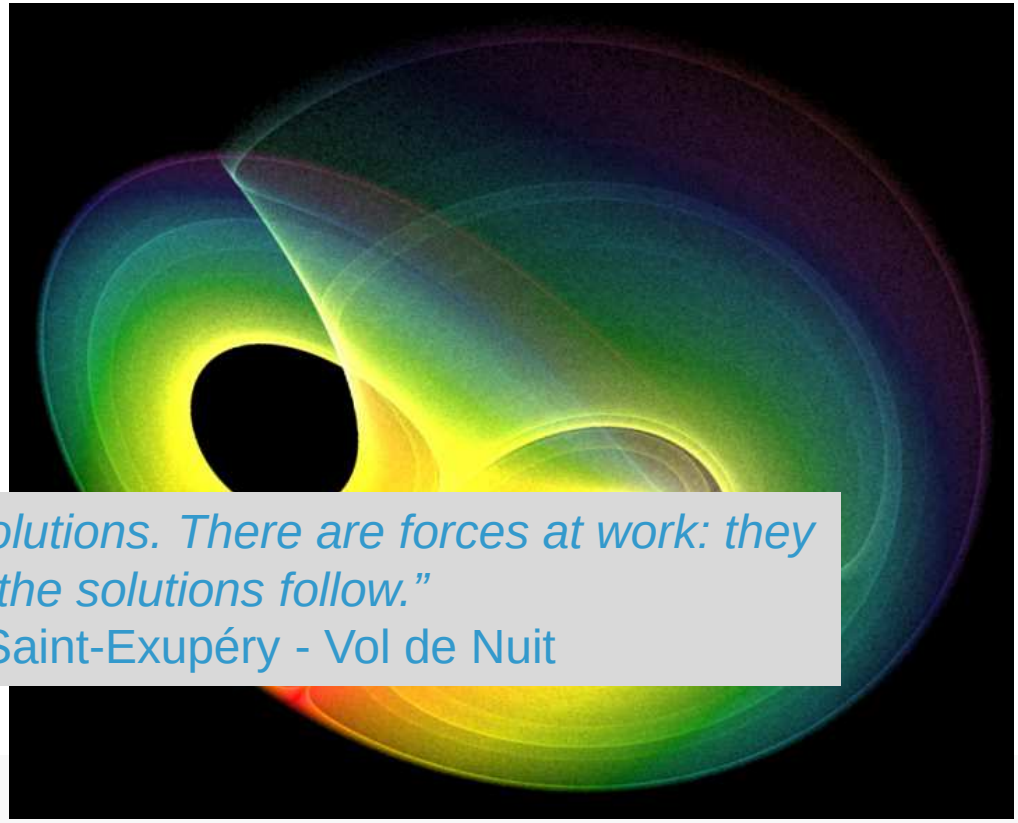
Back to the Future

- Do we look far enough? too much?
- Can we only look to where precise needs are identified?
- Do we address those issues which can really make a difference?



More Research: What ?

- Integrated CNS
- Uncertainty Management (cumulative or not) –The Chaos Theory in practice?
  - Position
  - FTE & control loop
  - Weather
  - Departure time
  - Action uncertainty
  - A Strategy?
- …



“In life there are no solutions. There are forces at work: they must be created and the solutions follow.”
Antoine de Saint-Exupéry - Vol de Nuit