



HELIOS

Impact of SESAR on the development of airport air traffic management systems

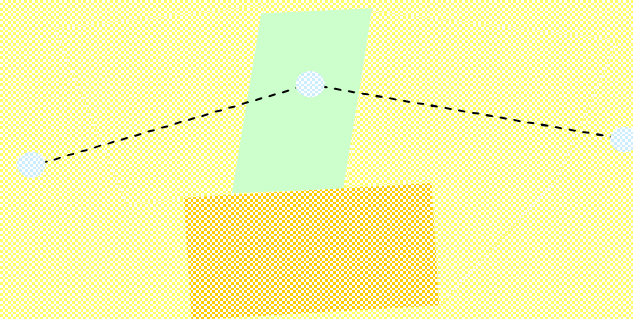
Martin Hawley, Helios
28 February 2008, Farnborough



Air traffic control in a nutshell!



Sectors



Recent history – what the papers said

***Europe decides to unify control of airline traffic
- Benefits foreseen in travel time and safety***

Strikes in Europe bring flight chaos

***UK and Spain send air traffic
reform into nosedive***

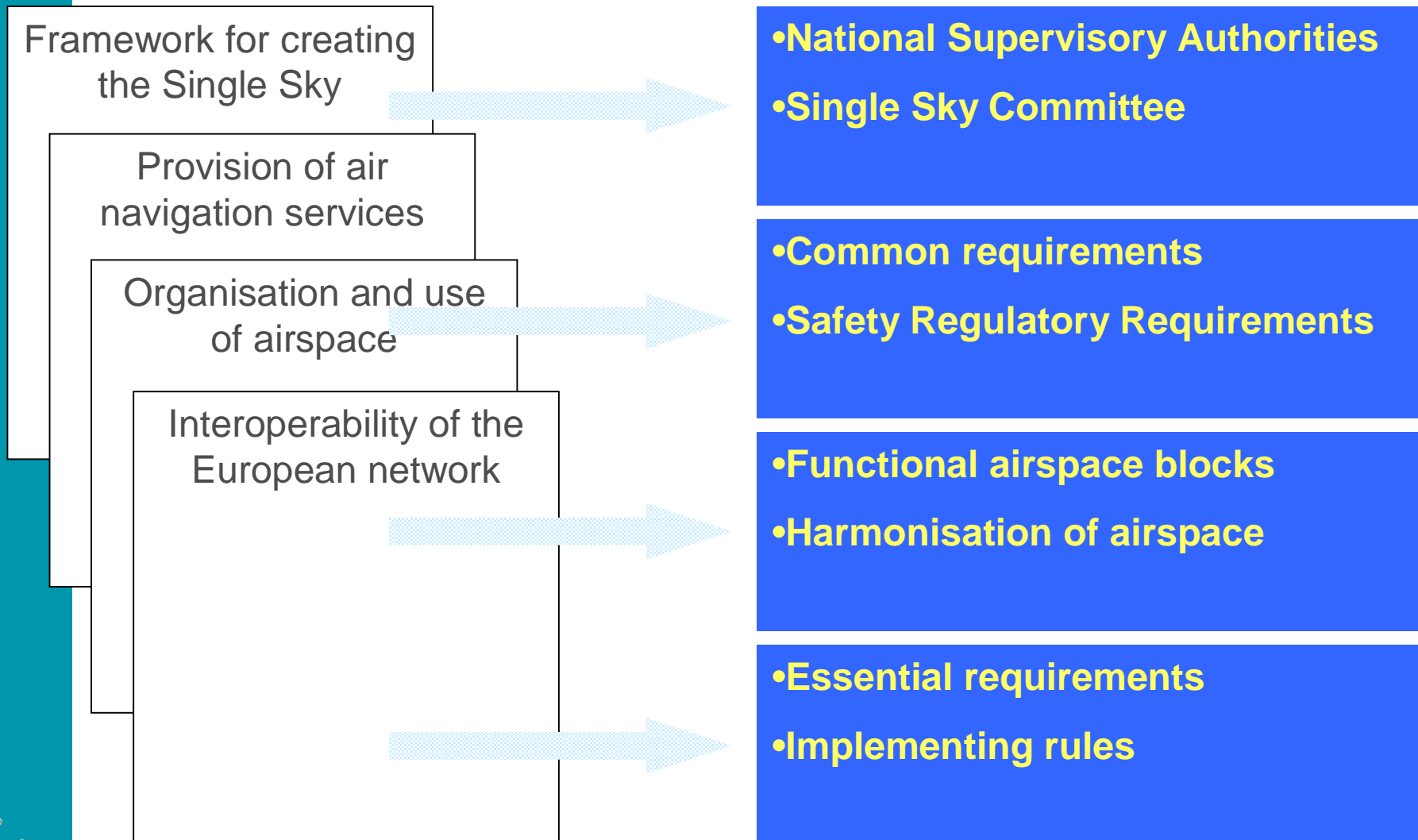
Europe faces air 'gridlock'

***Europe's borders in the
sky must go***



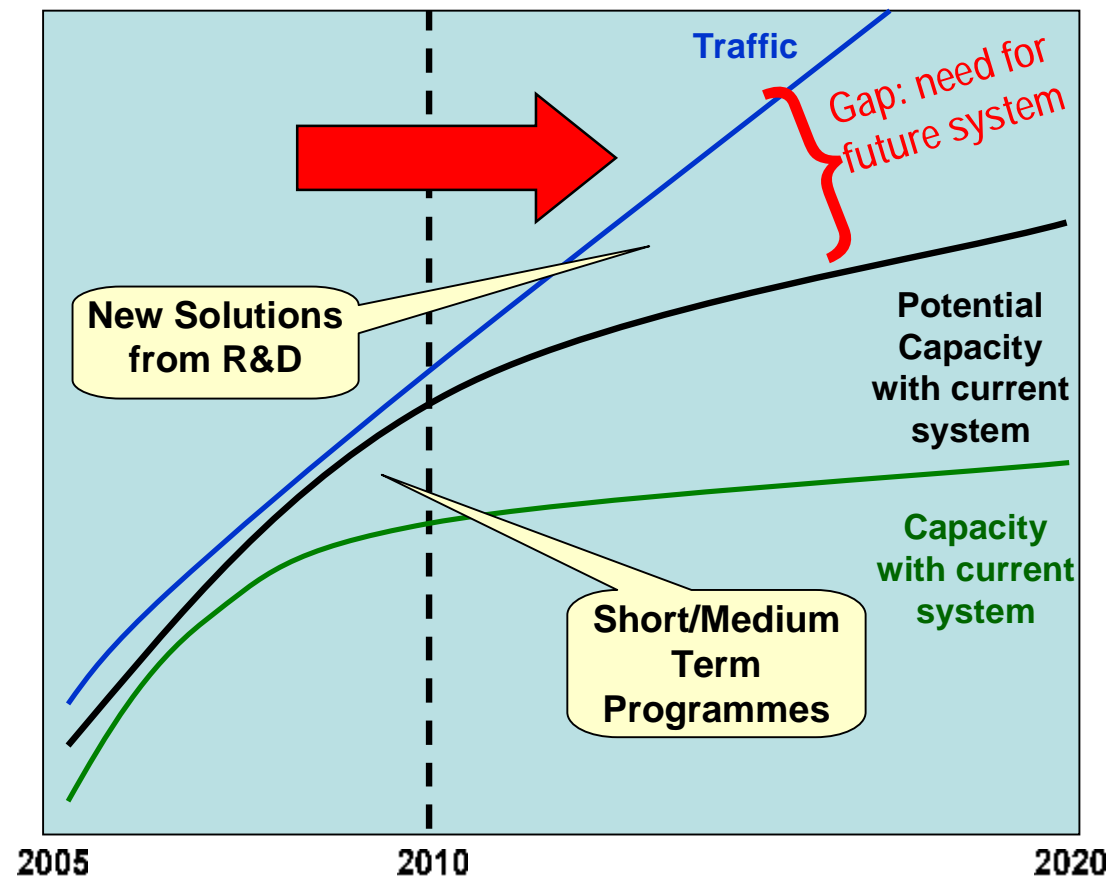
March 6, 1996: Weekly meeting of the European Commission expected to discuss an annual economic report, a white paper on air traffic, bananas and the appellation of agricultural produce.

The Single European Sky legislation



SESAR

- 'Single European Sky ATM Research'



Closing the capacity gap

What are the challenges to growth?

- Traffic demand is growing at 3-4% a year
 - 100% by 2025, which means air traffic management (ATM) needs to cope
 - Air traffic control (ATC) pushed to its limits
 - Airspace fragmentation
 - Obsolescent technologies
- The airport network can only handle about 60% more
 - Capacity surplus in parts of the network, shortage in others

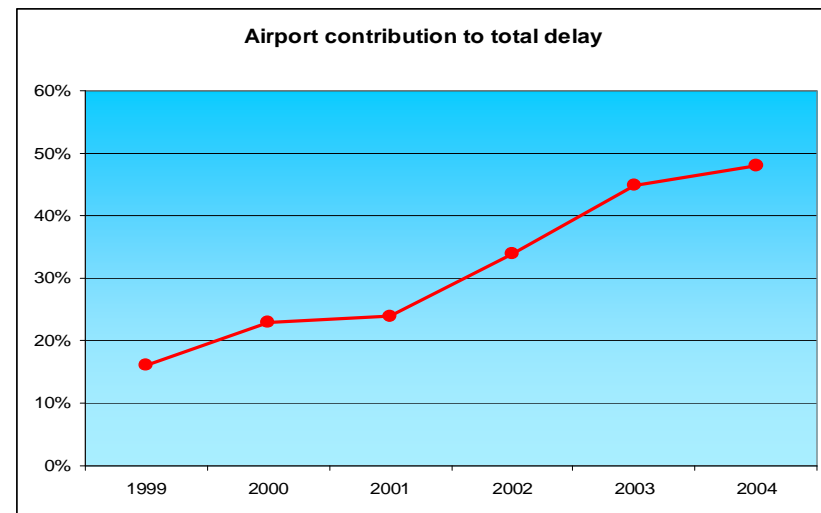
**A new ATM system
is needed!**

**More airport
capacity is needed!**

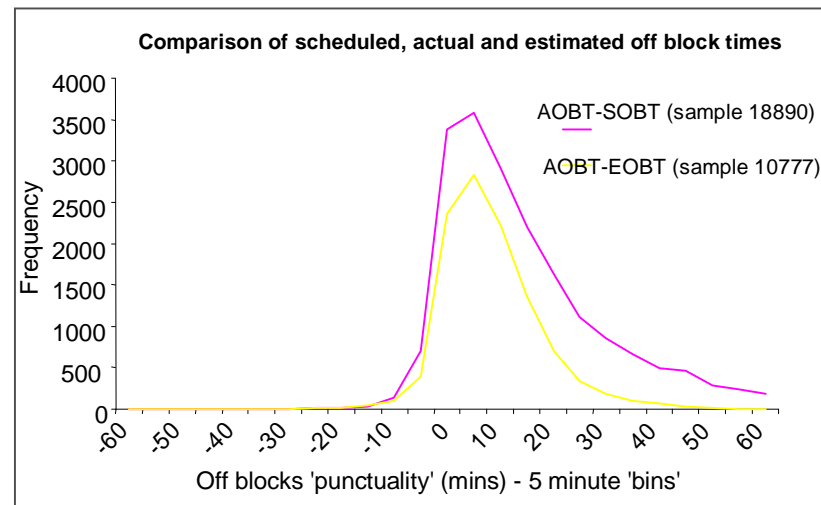


Airports will severely constrain traffic growth in 2025

- 'Un-accommodated' demand of 3.7 million flights per year
- En-route capacity development is keeping pace with traffic demand and delays are decreasing
- Many airports are congested, approaching capacity limits, affecting delay and punctuality
- '75% of European airports see no possibility for building new runways in the next 20 years' (Eurocontrol)



Source: CODA annual report 2004



Source: Eurocontrol CDM CBA 2005

SESAR Long-Term goals



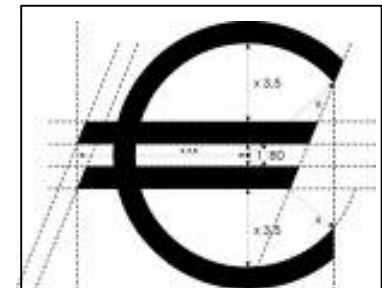
Safety x 10



Environment
impact -10%



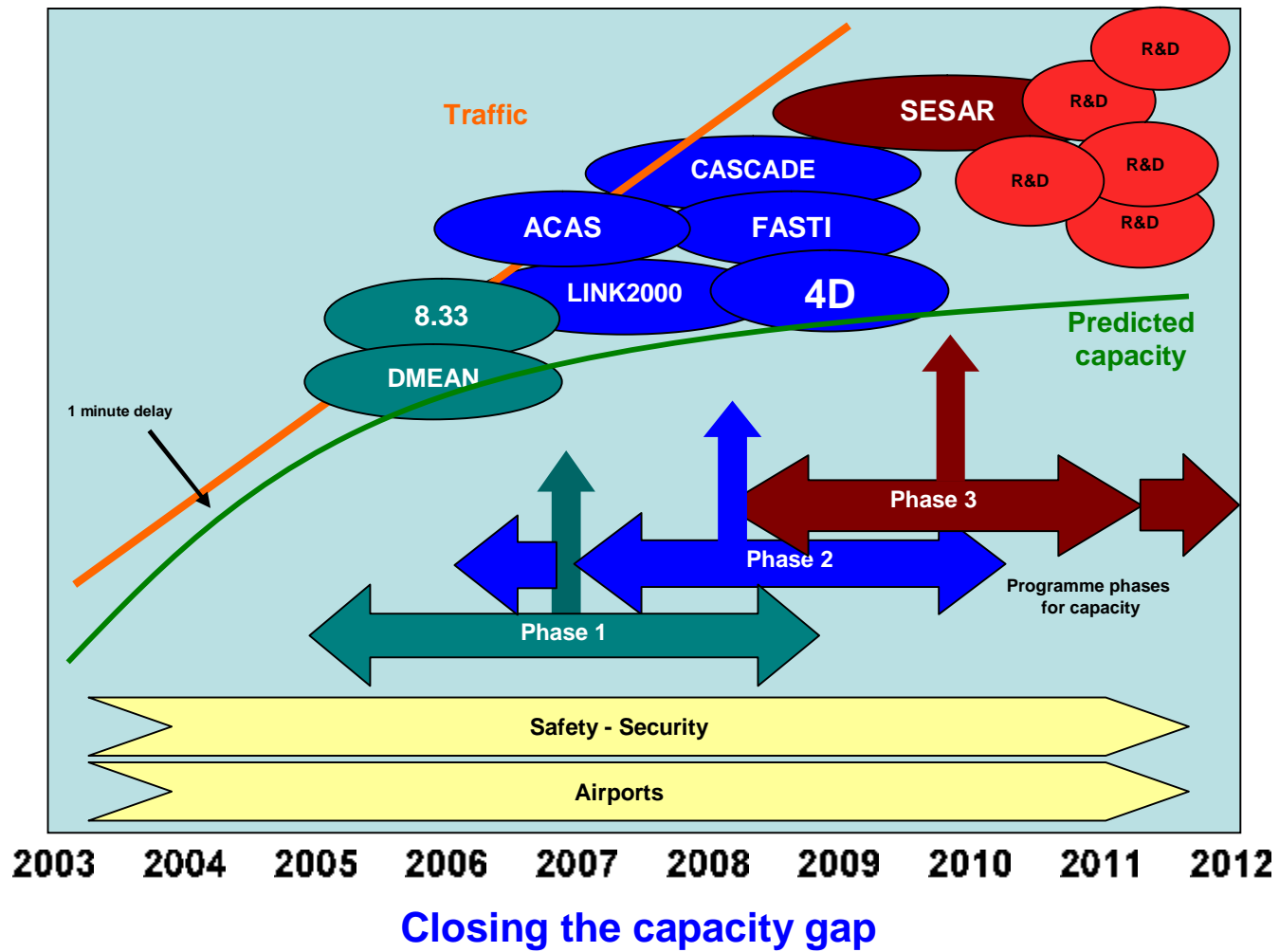
Capacity x3



ATM
cost/flight
-50%



SESAR plugging the gap



Potential Sector Productivity Gap



An evolution in operational concepts

Past



Procedural

Estimate the current and planned a/c positions

Today



Radar

Know the current and estimate planned a/c positions

Future



Trajectory

Know & share the current and planned a/c positions

The target concept

- Performance Driven
- Process Orientated
- Trajectory Based
- Founded on SWIM – ‘system wide information management’



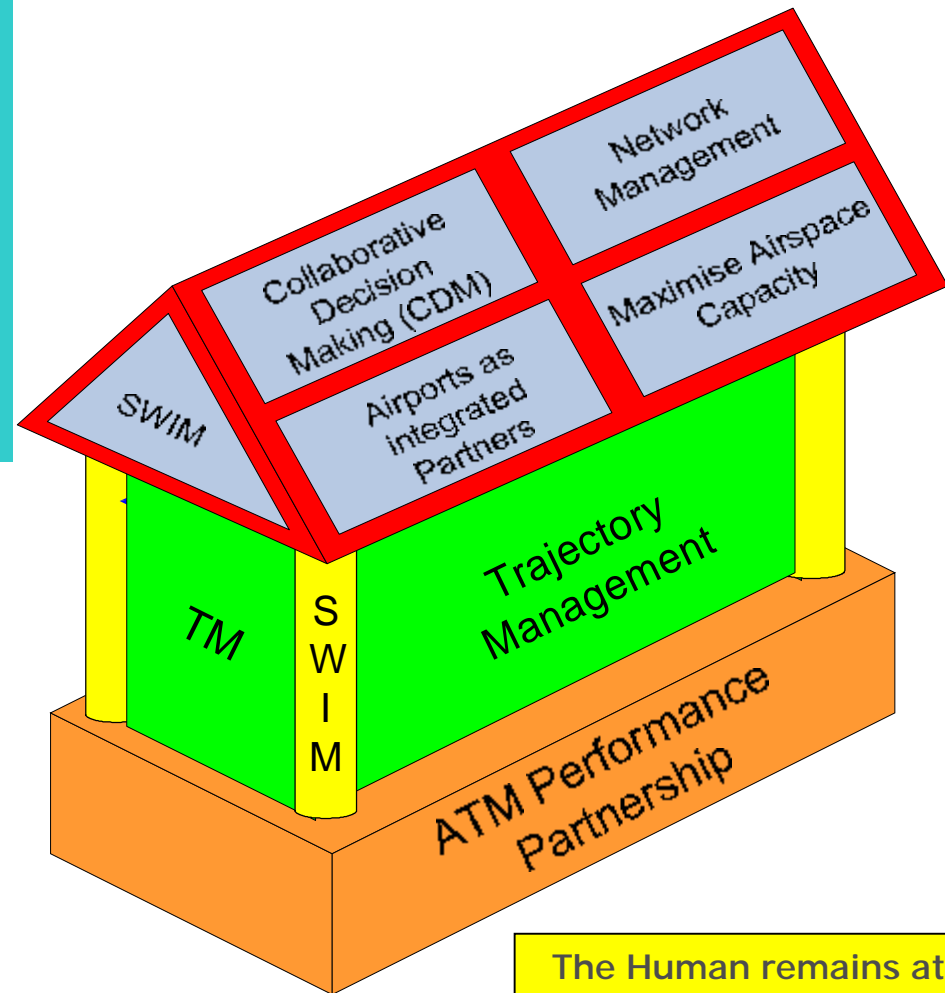
Principles of the target concept

All actors (Users, ANSPs and Airports) in the ATM System are integrated in The ATM Performance Partnership (ATMPP)

Trajectories are Managed through:
1 - System Wide Information Sharing (SWIM) and
2 - Collaborative Decision Making (CDM)

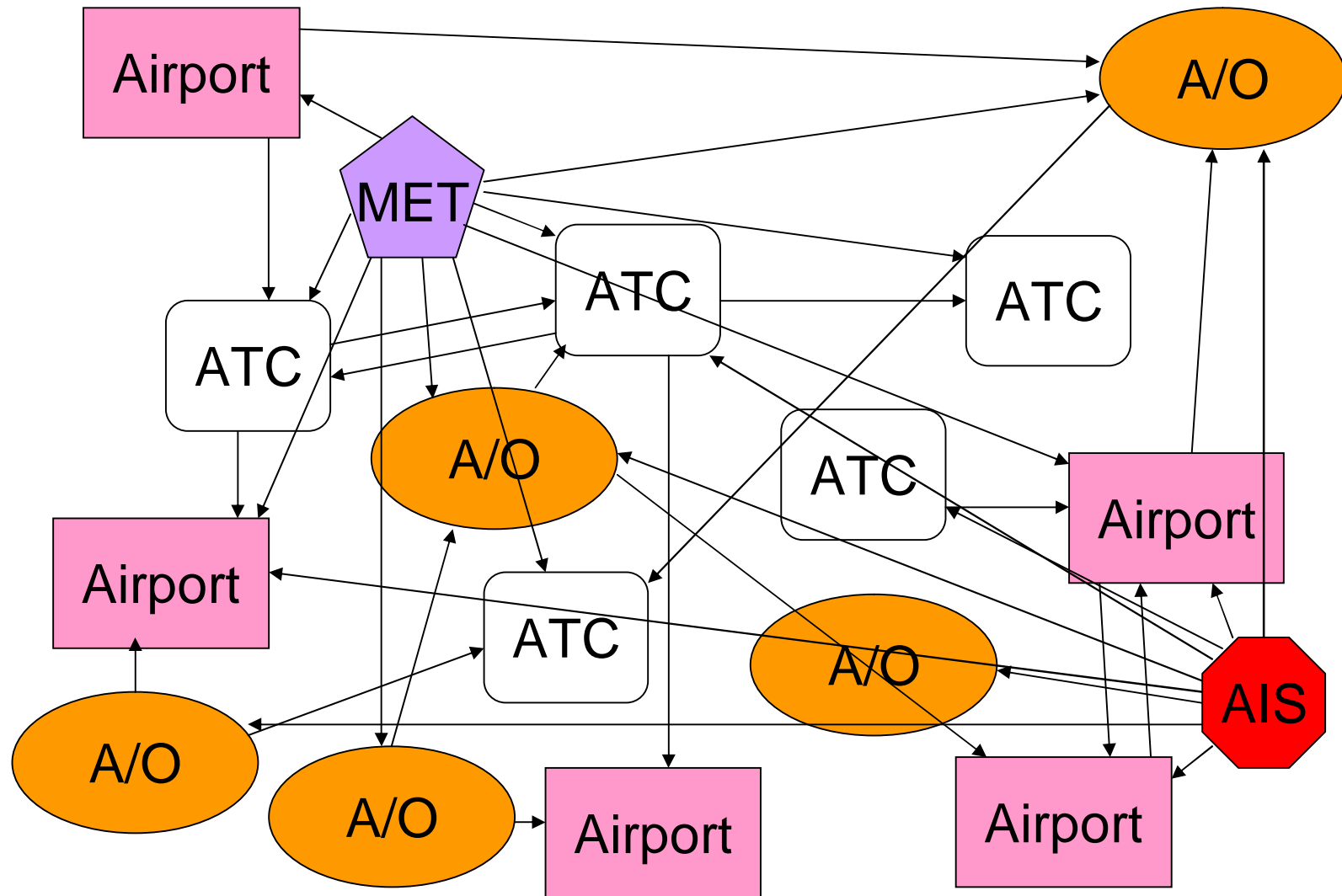
Five key enablers have been identified, each of them is vital:

1. Information Sharing
2. Collaborative Decision Making
3. Network Management
4. Airport as integrated partners
5. Maximise Airspace Capacity

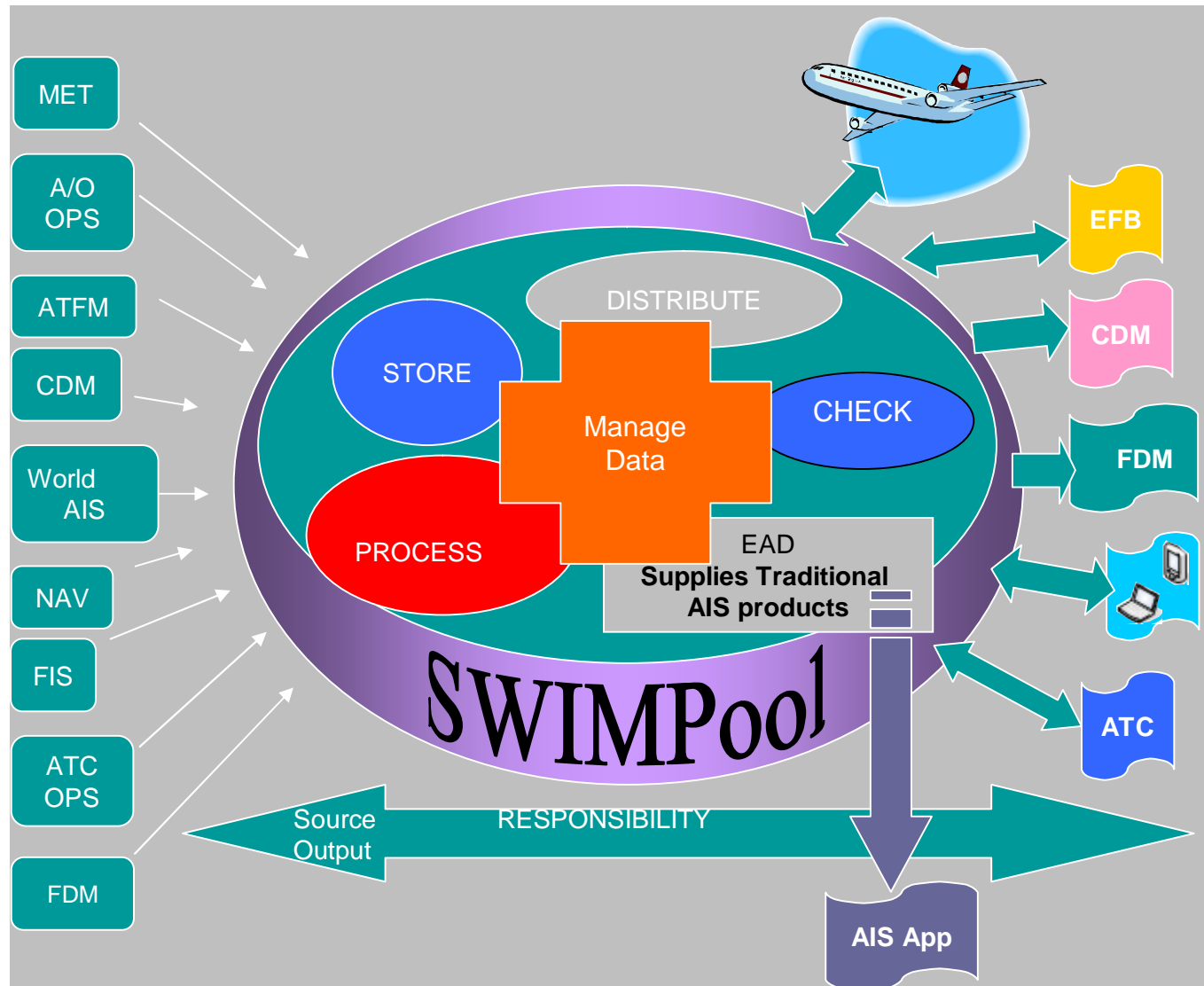


The Human remains at the core of The Concept
– at all levels.

Without system wide information management...



With System Wide Information Management



The Business Trajectory

- 4D Trajectory which expresses the Business/Mission intention of the airspace user
- Changes involve user but do not interfere with ATC or pilot time-critical decisions
- Based on most timely and accurate data available
- When constraints are needed the solution is chosen by the user whenever possible – an iterative process

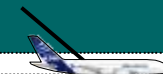
Exists during Business Development processes.
Internal to the User
(Not all users have a Trajectory at this time)

Trajectory that airspace user agrees to fly
and the ANSP and Airport agrees to
facilitate

Business Development Trajectory

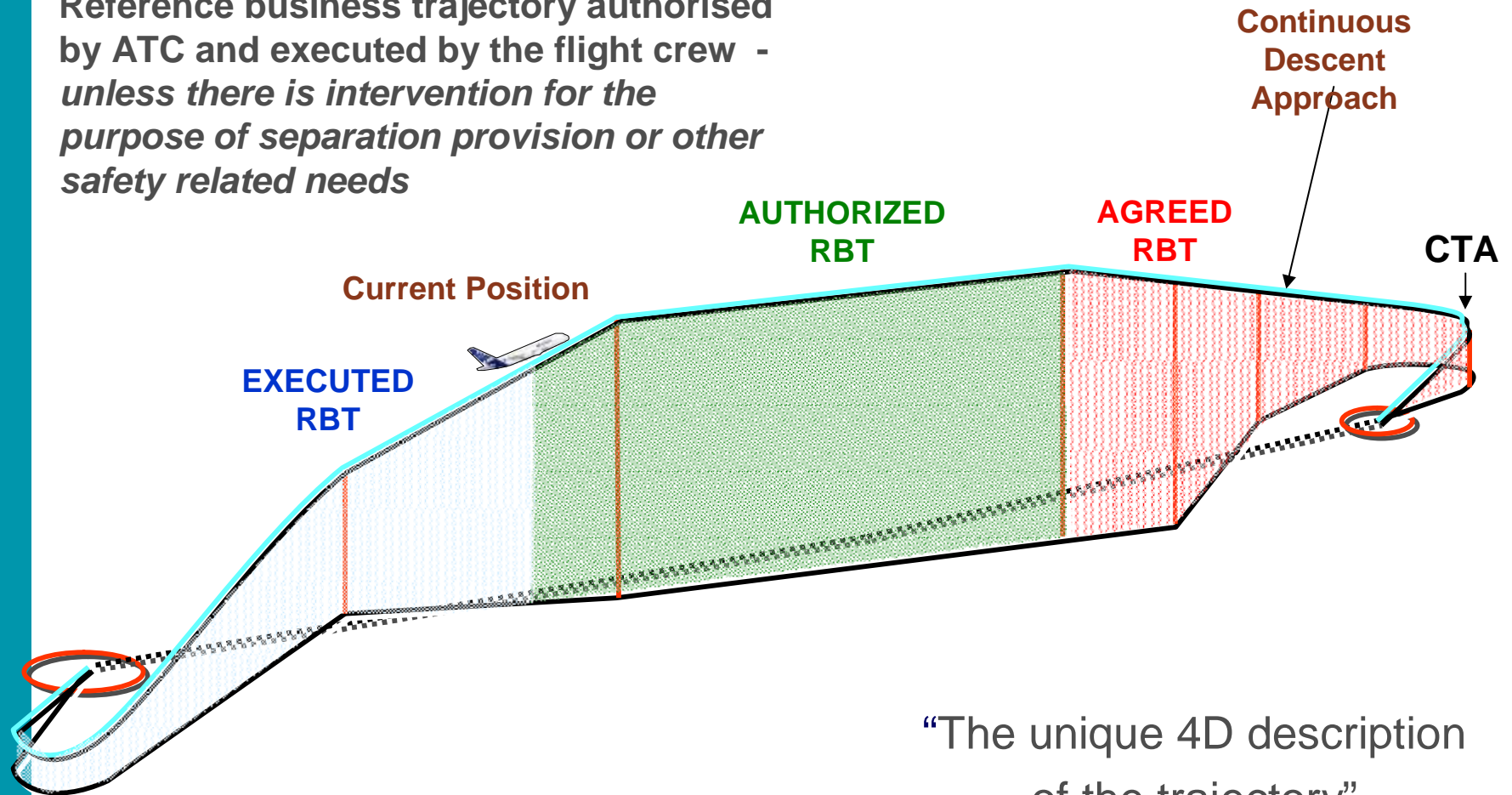
Shared Business Trajectory

Reference Business Trajectory



Reference business trajectory

Reference business trajectory authorised by ATC and executed by the flight crew - *unless there is intervention for the purpose of separation provision or other safety related needs*



“The unique 4D description of the trajectory”

Solving the airport capacity challenge is key

- Long term infrastructure planning is required
- Demand and capacity balancing requires realistic airport scheduling
- Scheduling must include the turnaround process
- Queue management ensures a smooth transition of airport traffic into and out of the ATM network
- Safety demands improved ground movement management
 - to prevent collisions and unintentional runway incursions, particularly in low visibility conditions
- Increasing demand will probably require the utilisation of airports previously seen as regional, ex-military or satellite



Transforming Airport Operations

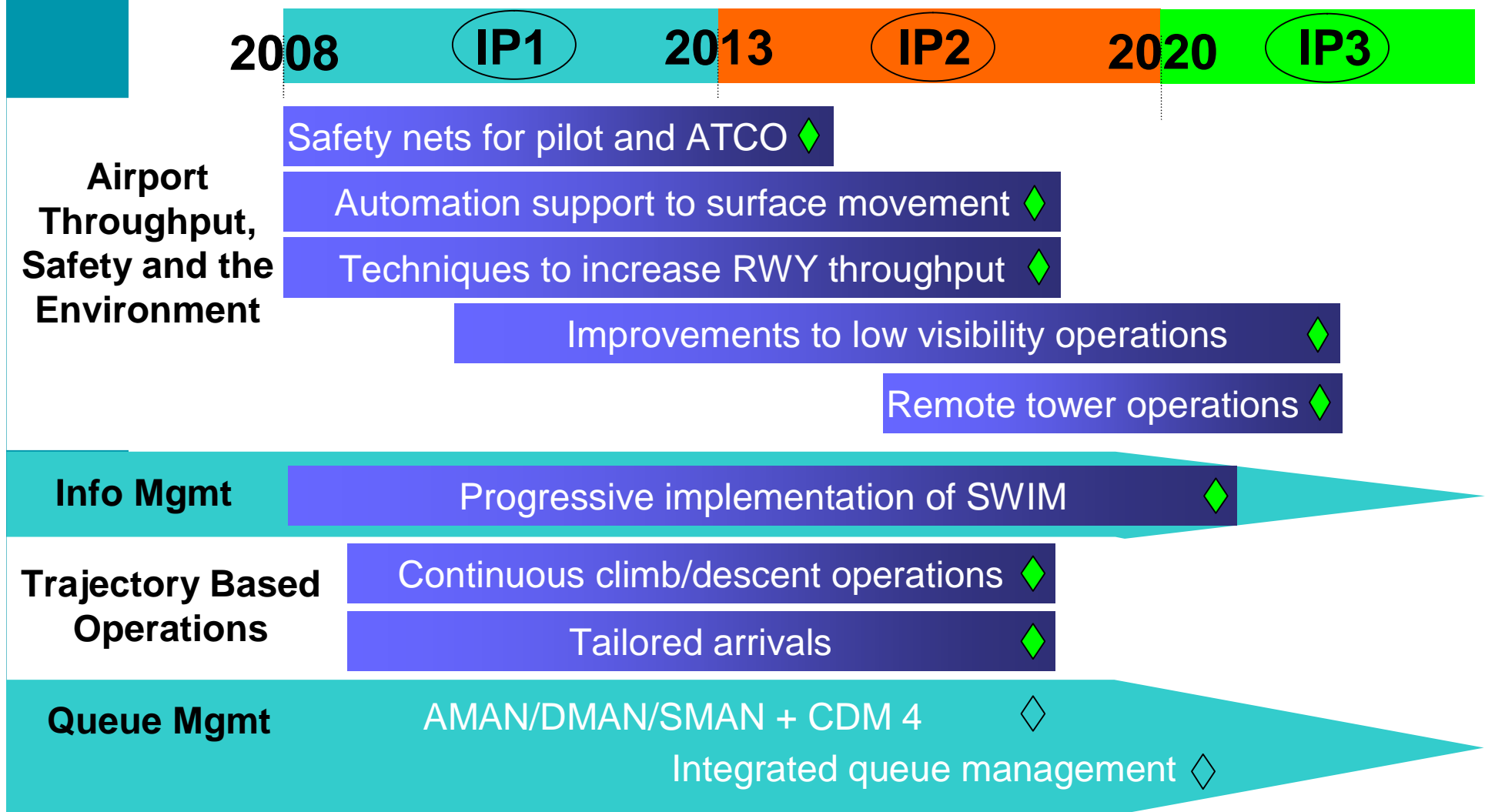
- Increased runway and surface safety
 - Elimination of runway incursions, improved surface movement management
- Increased runway throughput
 - Improved wake vortex separation techniques – prediction/detection
 - Minimizing and predicting runway occupancy times
 - Accurate time-based spacing on final approach
 - Reduced departure spacing
- Increased and consistent runway utilisation
 - Arrival and departure management tools – sequence optimisation
 - Optimising runway configuration / mode of operation
 - Increase runway utilization during low visibility conditions
- Reducing noise and pollution through operational improvements
 - Continuous descent approaches, continuous climb departures
 - Minimal ground and air holding



Technologies to help integrate operations



SESAR Implementation Packages (IP) relevant to airport performance



Airport Operations

IP1

2008	IP1	2013	IP2	2020	IP3
<input type="checkbox"/>	<input type="checkbox"/>	AIRPORT CDM			
<input type="checkbox"/>	<input type="checkbox"/>	BEST PRACTICES FOR RWY MGT			
<input type="checkbox"/>	<input type="checkbox"/>	SAFER AIRPORT OPERATIONS			
<input type="checkbox"/>	<input type="checkbox"/>	IMPROVED LV OPERATIONS			

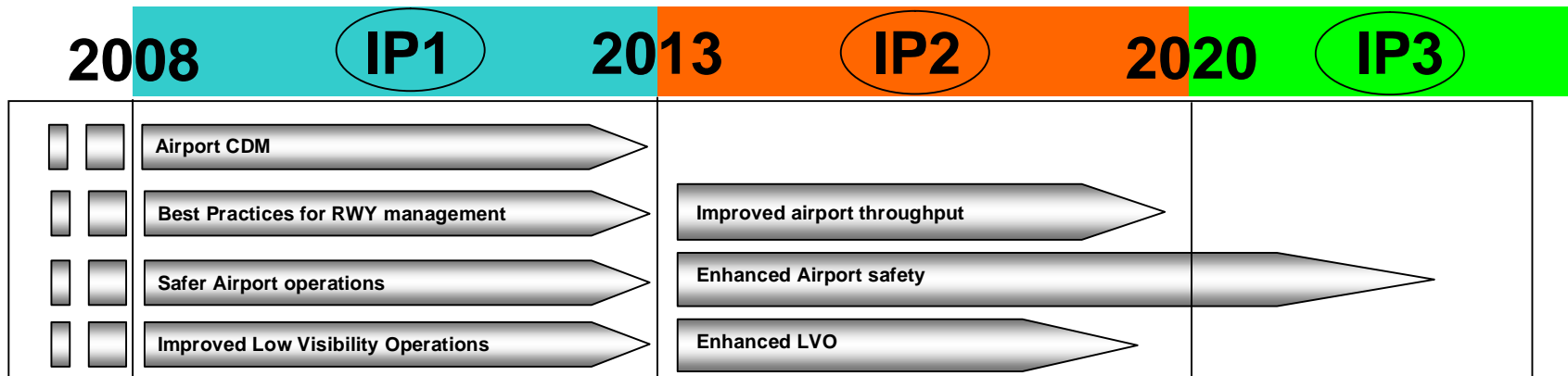
Airport/TMA safety, efficiency, capacity and environmental gains

Through the implementation of:

- Airport Capacity Enhancement (ACE) programme actions
- Airport CDM
- TMA improvement programme
- Best practices
- European action plan for the prevention of runway incursions

Airport Operations

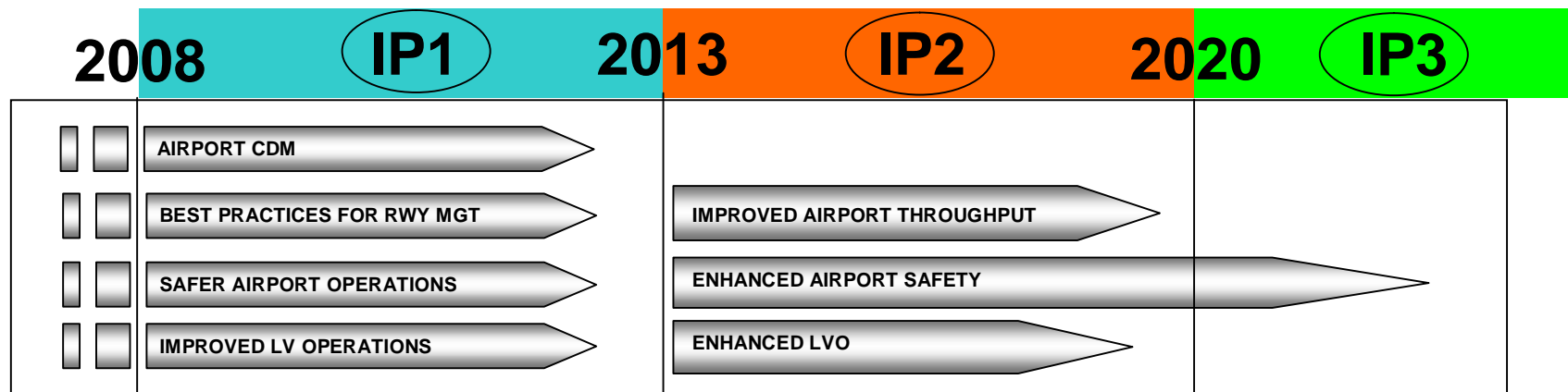
IP2



- Improved Runway Throughput:
 - Surface movement planning and routing
 - Separation based on detected wake vortices
- Improved Throughput in Low Visibility Operations:
 - GNSS-based operations
 - GBAS landing and surface navigation
- Airport Safety improved:
 - Airport safety nets
 - Enhanced navigation for airport vehicle

Airport Operations

IP3



- Synthetic Vision Systems (SVS):
 - Provides flight crew with synthetic/graphical view
 - Uses terrain imagery and position/altitude on HUD technology
 - Facilitates approach and ground operations in low visibility
- Remote Tower Operations:
 - Exploit remote sensors in real-time, enhancing safety of operations in a cost-effective way

Expected improvements, eg LED airport lighting



IP1

**400
Tonnes
CO₂/year**



IP2

**20
Tonnes
CO₂/year**

Light Emitting Diode technology provides improved environmental performance, & signalling

Expected improvements, eg approach and landing

IP2

GBAS III



IP3

SVS

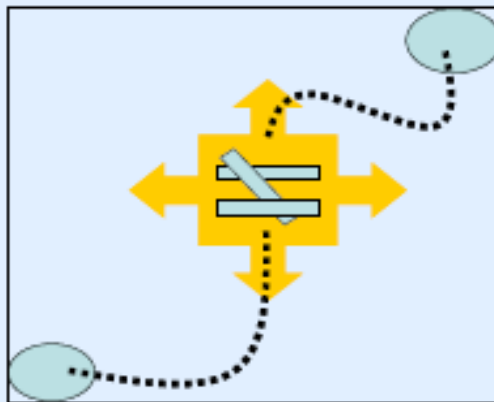
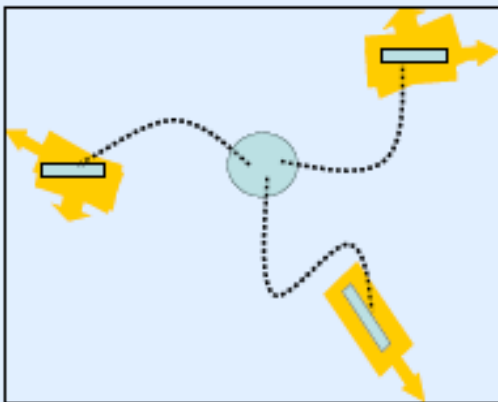


Improved low visibility operations
for increased runway throughput

Airports – Beyond SESAR

- Landside in city centre, airside far away from city
- A network of runways distributed around city
- Shared runways between several cities
- Underground terminals, green energy
- Virtual / Remote towers

Need for innovative research and out-of-the-box thinking!





HELIOS

Thank you for your attention

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