



Performance-Based Navigation

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to represent, lead and serve the airline industry

Misconceptions on PBN

- PBN, may **look** complicated but it is not:
 - It does **not** add new navigation philosophy,
 - It **is** a pragmatic tool to implement navigation procedures using aircraft capabilities that have existed for more than 30 years!
 - It does **not** require States to:
 - Completely overhaul navigation infrastructure,
 - It can be implemented step-by-step
 - Implement the most advanced NavSpec
 - It only needs to accommodate operational needs

Need for PBN

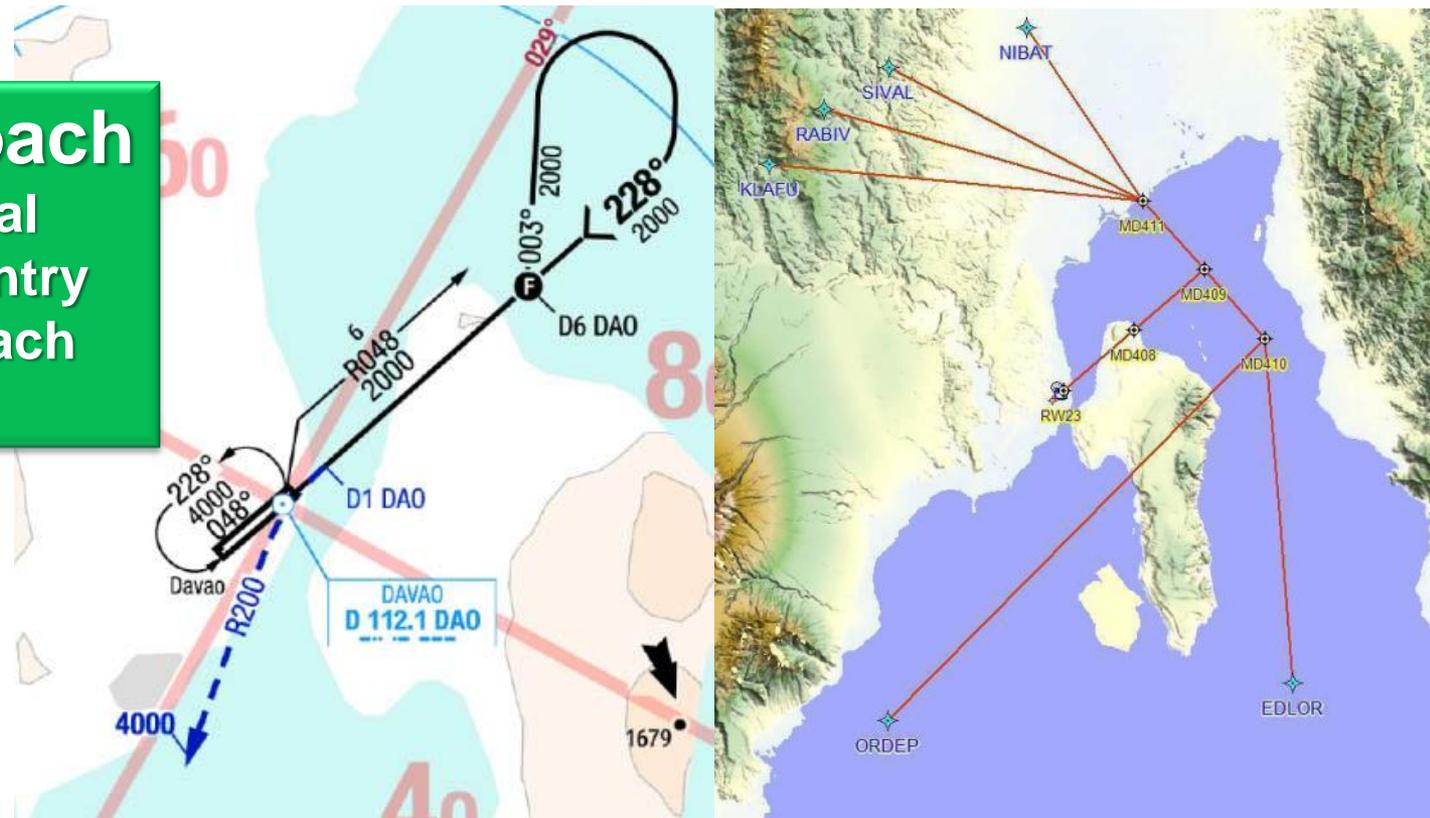
- Benefits all phases of flight
- Safety
 - Include vertical guidance
- Route flexibility
 - Not constrained to NAVAIDs-based routes
- Reduction of fuel, noise and CO2 emissions
 - Efficient arrival and departure procedures
- Airport and airspace access increased
 - In all weather conditions

A formation of five commercial aircraft flying in a blue sky with scattered white clouds. The aircraft are arranged in a descending line from the top right towards the bottom left. A large green rectangular box with white text is superimposed over the middle of the image.

Capacity / Efficiency

PBN Benefits vs. Legacy Approach

VOR Approach
 20 NM Arrival
 17 NM Hold entry
 33 NM approach
 = 70 NM

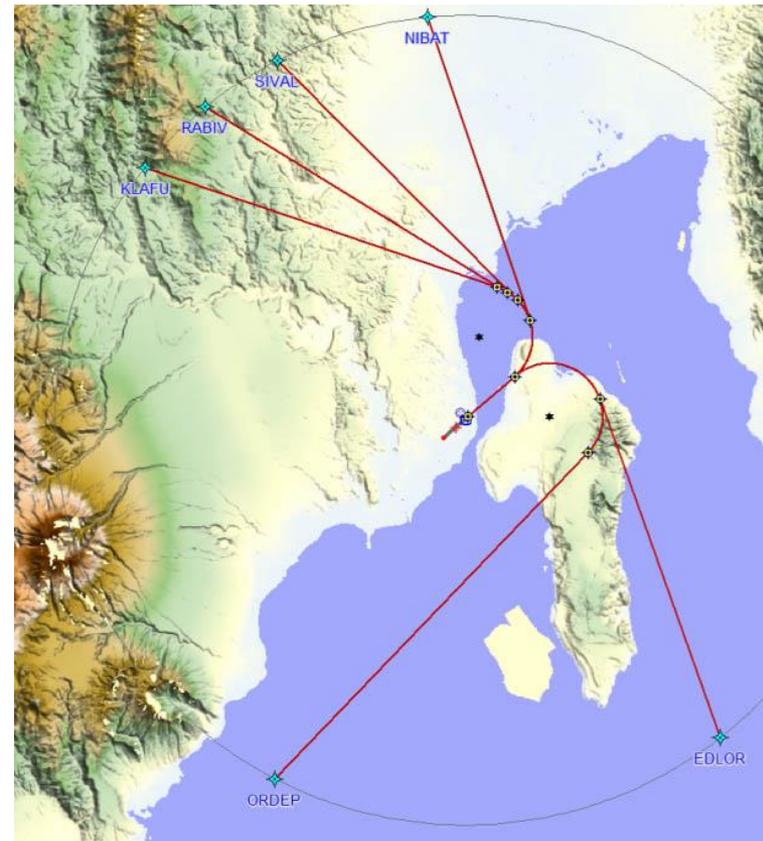


PBN Optimized Tracks

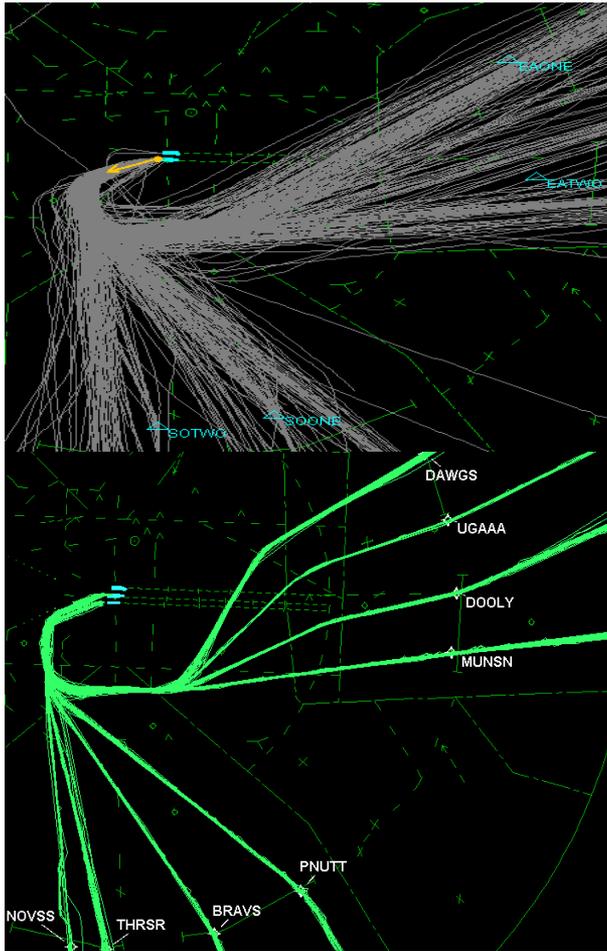
RNP AR Optimized Tracks

Savings via:

NIBAT – 3.8 NM
EDLOR – 7.2 NM
ORDEP – 10.3 NM
KLAFU – 7.7 NM
RABIV – 7 NM
SIVAL – 5.7 NM
≈ 7 NM

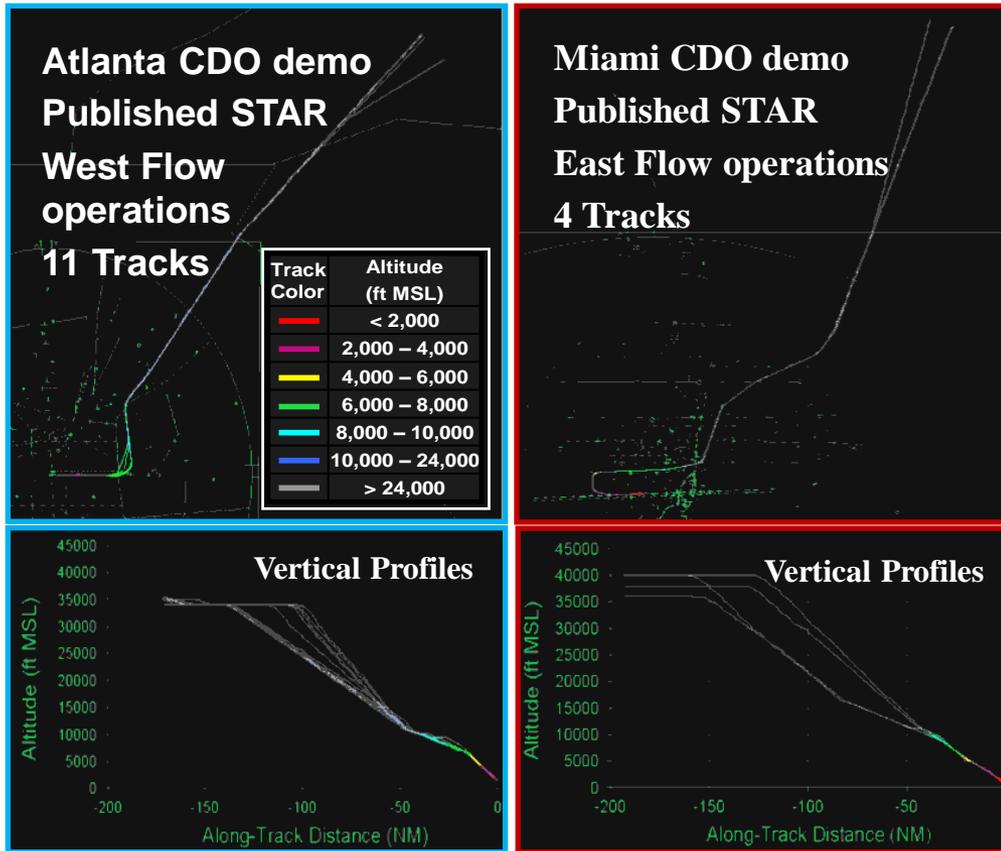


Improving Runway Utilization at Atlanta (ATL)



- Approximately 94% of daily departures are RNAV-capable
- More departure lanes and exit points to the enroute airspace
 - Capacity gain of 9-12 departures per hour
- Repeatable and predictable paths
- Benefits
 - Increased throughput
 - Reduced departure delays
 - 40-50% reduction in communications

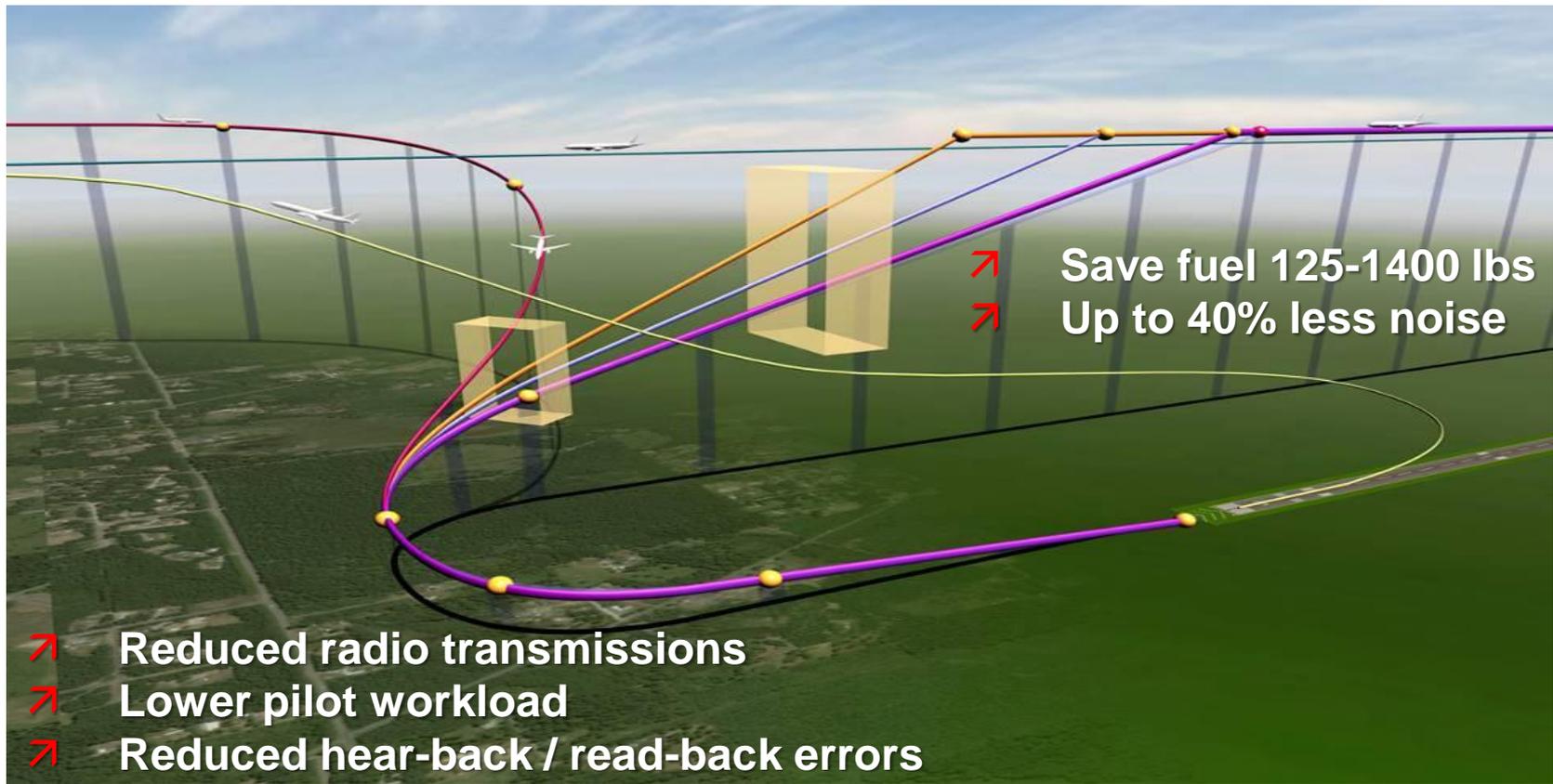
Fuel Savings/Emission Reduction



Continuous Descent Ops provide large benefits in fuel, emissions, and flight time.

- North Arrival STAR at Atlanta (ATL)
 - **144 liters** of fuel savings and **360kg** reduction in CO₂ emissions per flight
 - North Arrival STAR at Miami (MIA)
 - **182-197 liters** of fuel savings and **460-500kg** reduction in CO₂ emissions per flight
- 600 CDO night demos at ATL
Two North Arrival STARs
- **151-227 liters** of fuel savings / **380kg** reduction in CO₂ emissions per flight

Continuous Descent Operations (CDOs)

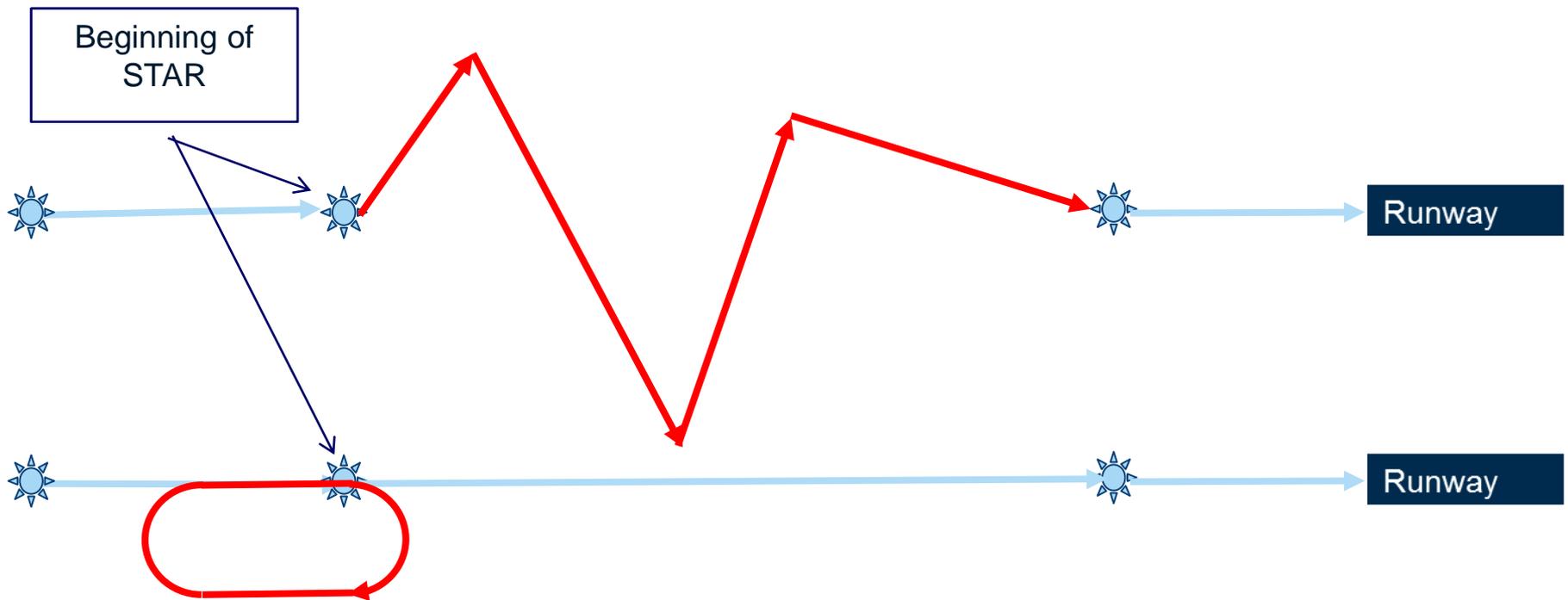


Sequencing - metering

- Traffic sequencing could be achieved by small speed interventions during the cruise or early phases of descent.
- Reduce sequencing maneuvers at lower altitudes with the consequent benefit on fuel burn and noise.
- With merge points technique Holding patterns are rarely used under these conditions
- Available technology nowadays

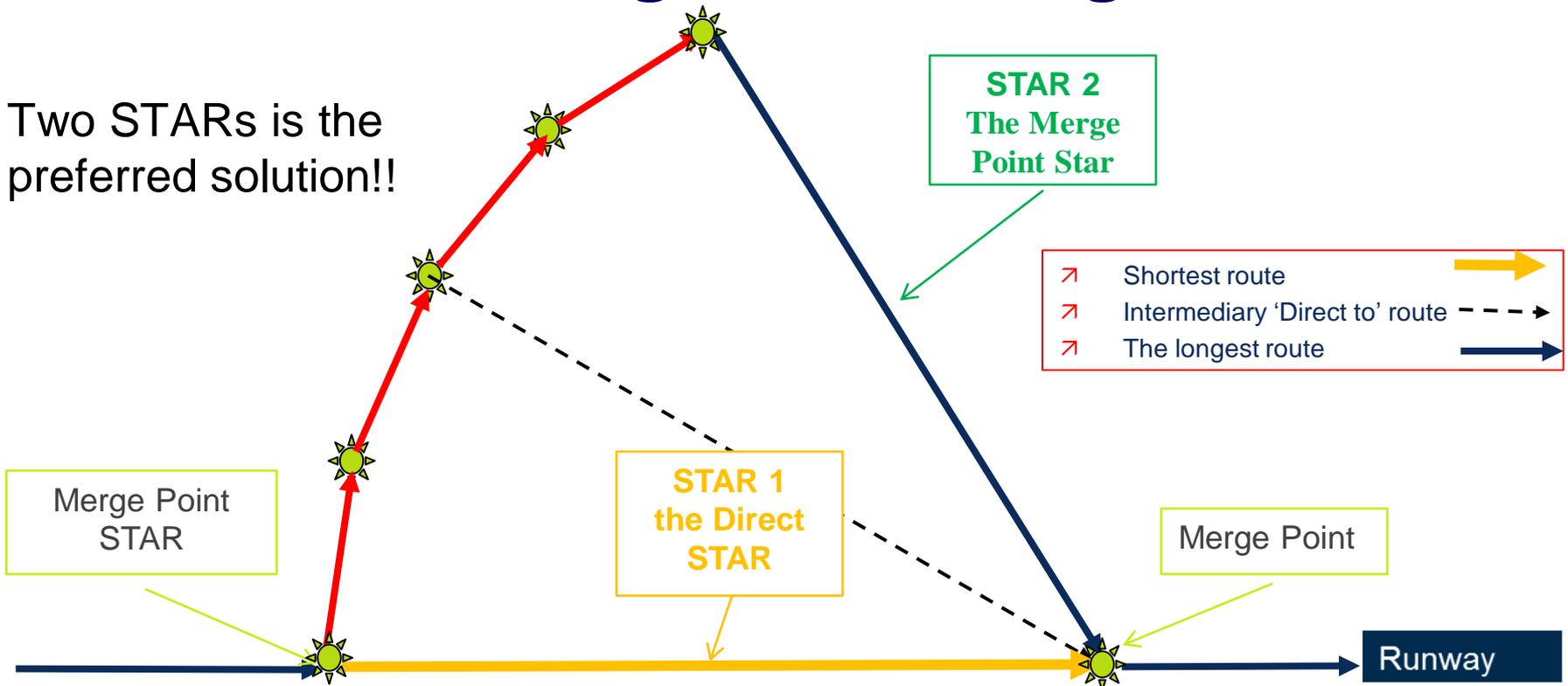


Merging Points



Merge point procedure, an other form of Holding or vectoring

➤ Two STARs is the preferred solution!!



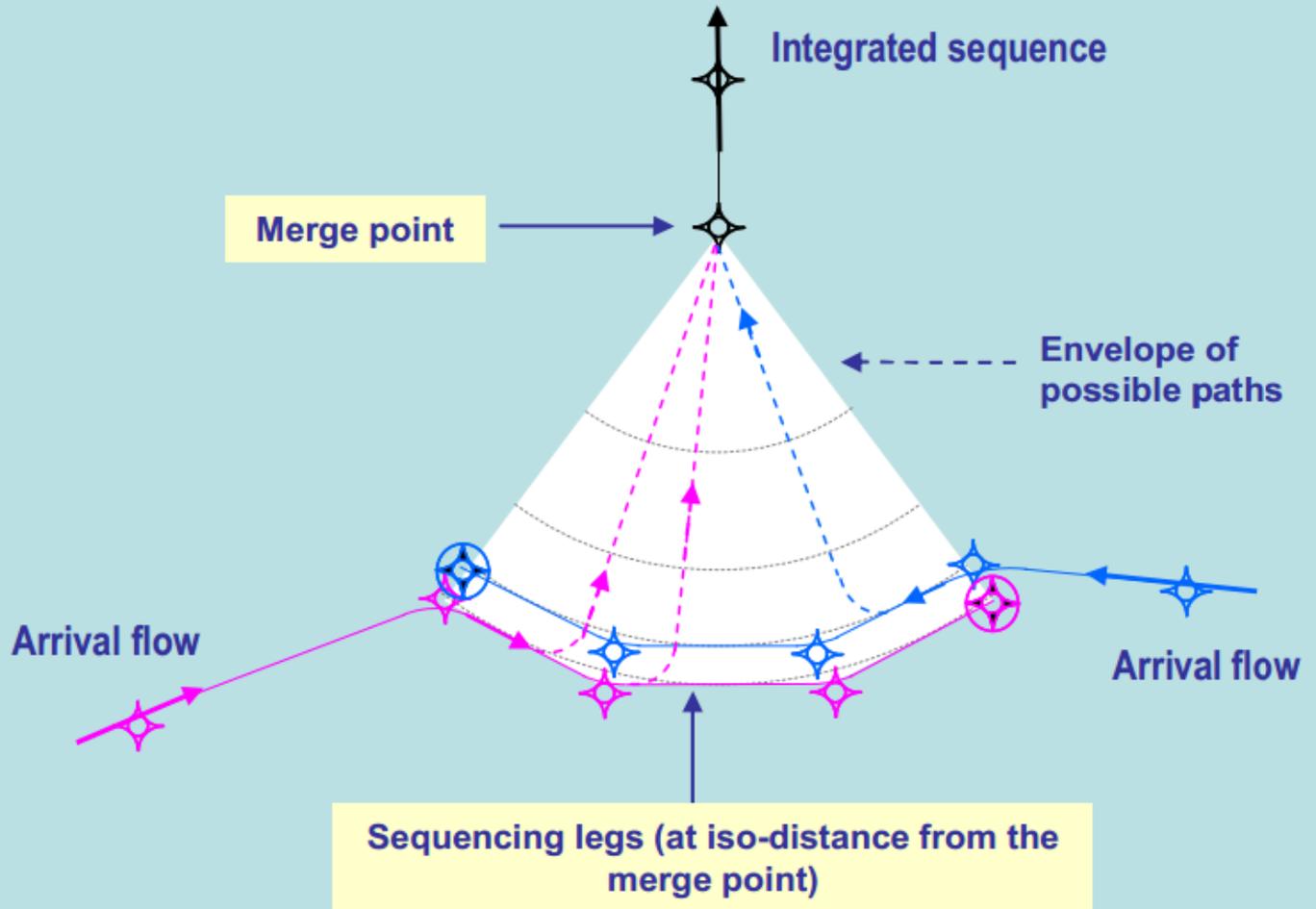
➤ Clue word:
“equidistant
reference points”

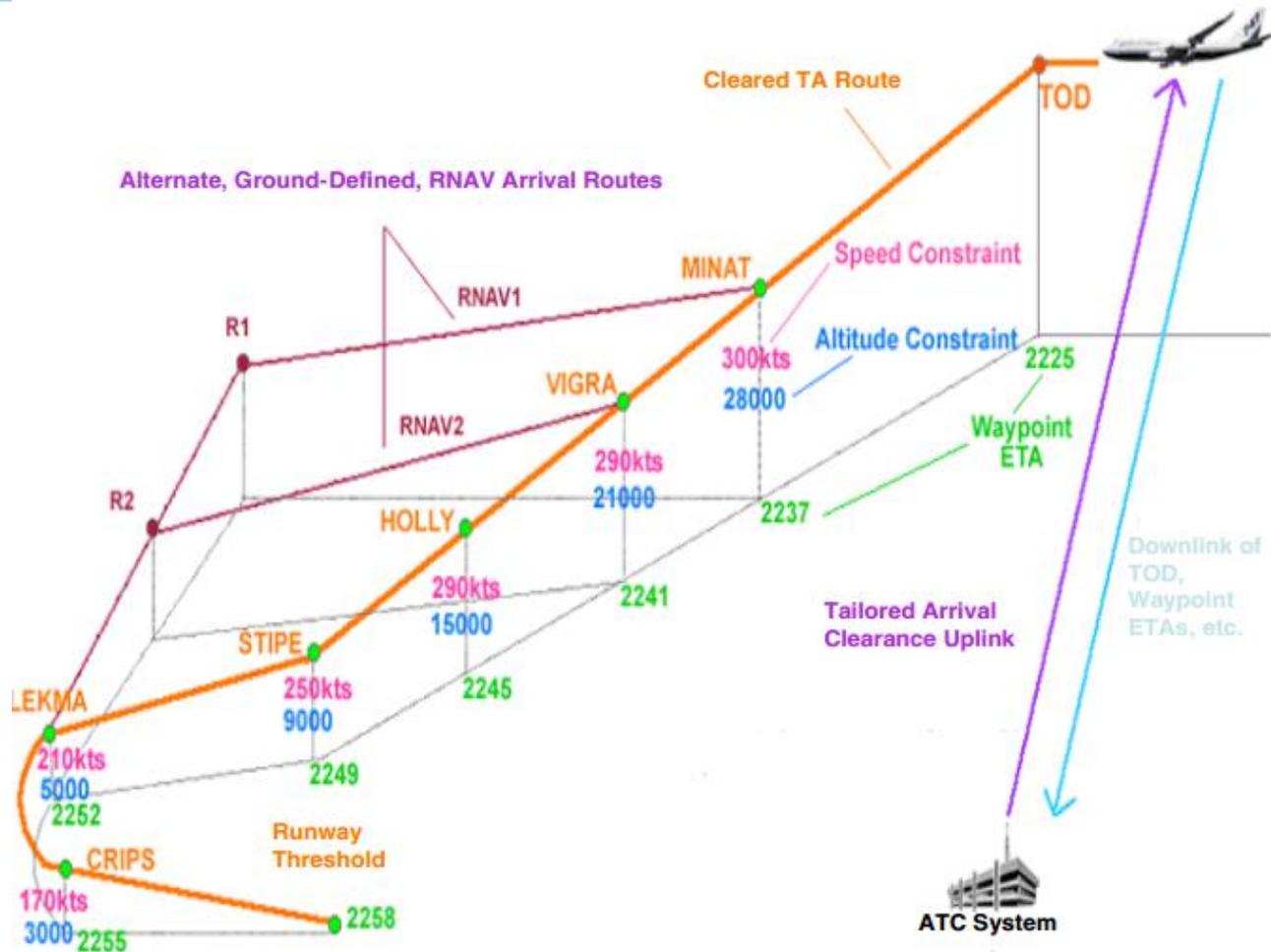


Vectoring

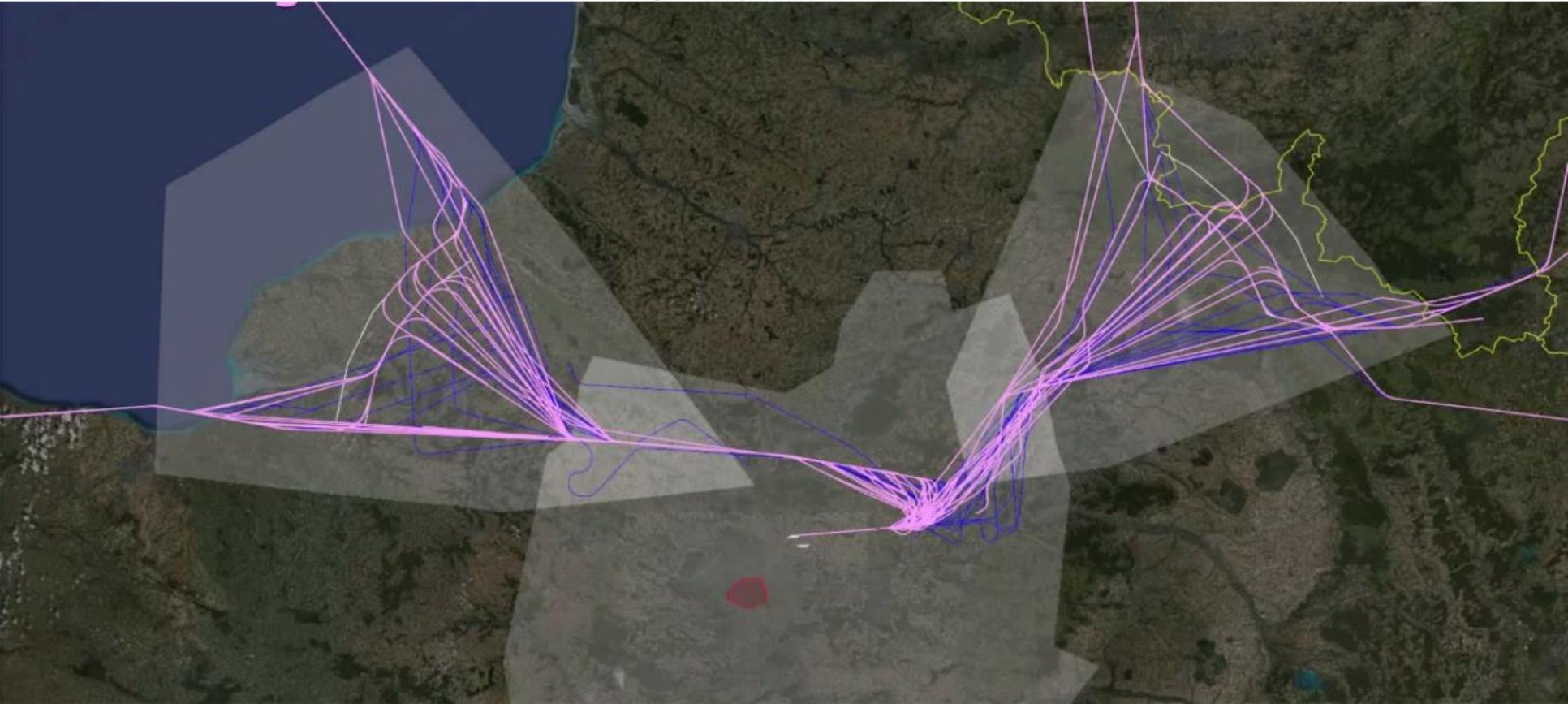
VS

STAR - DCT TO
(merge point)





Merge points CDG



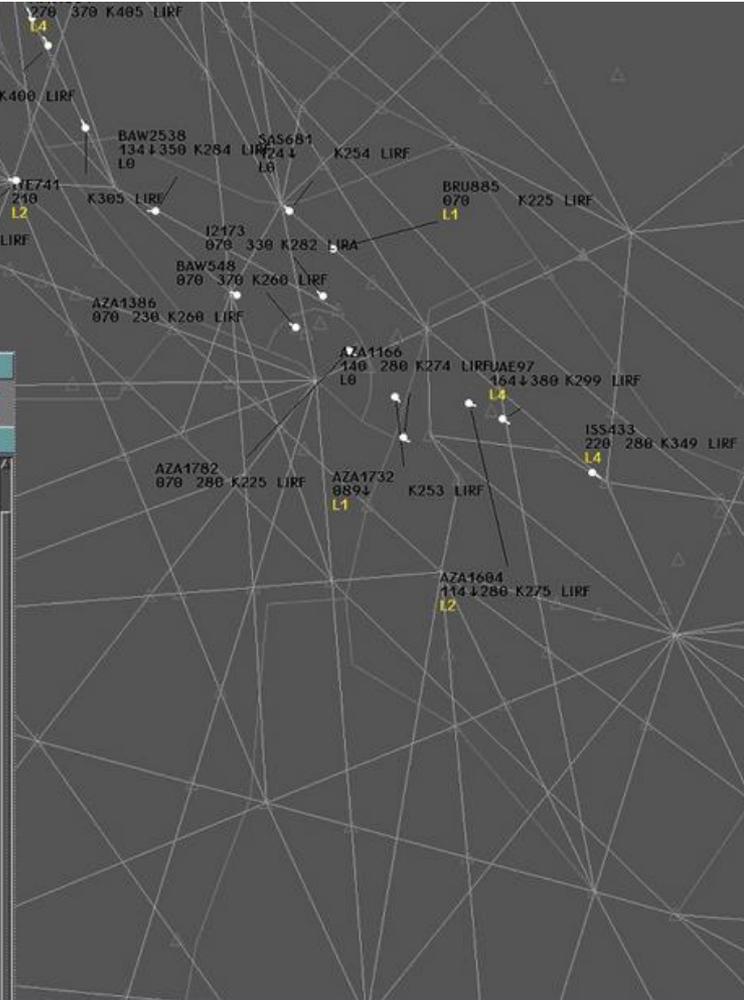
➤ Sequencing & Metering (SDP+FDP)

Sequence TAG					
RT0	G/L	N	CALLSIGN	A.	P.
10:22	L5	10	ETH0725	N	N
10:19	L5	9	AZA403	N	N
10:14	L4	8	SVA162	N	N
10:11	L5	7	AZA203	N	N
10:09	L4	6	BAW1850	N	N
10:07	L6	5	AZA571	N	N
10:06	L4	4	AFR1604	N	N
10:03	L3	3	ADH59T	N	N
10:01	L2	2	IYE741	N	N
09:57	L0	1	BAW2538	N	N

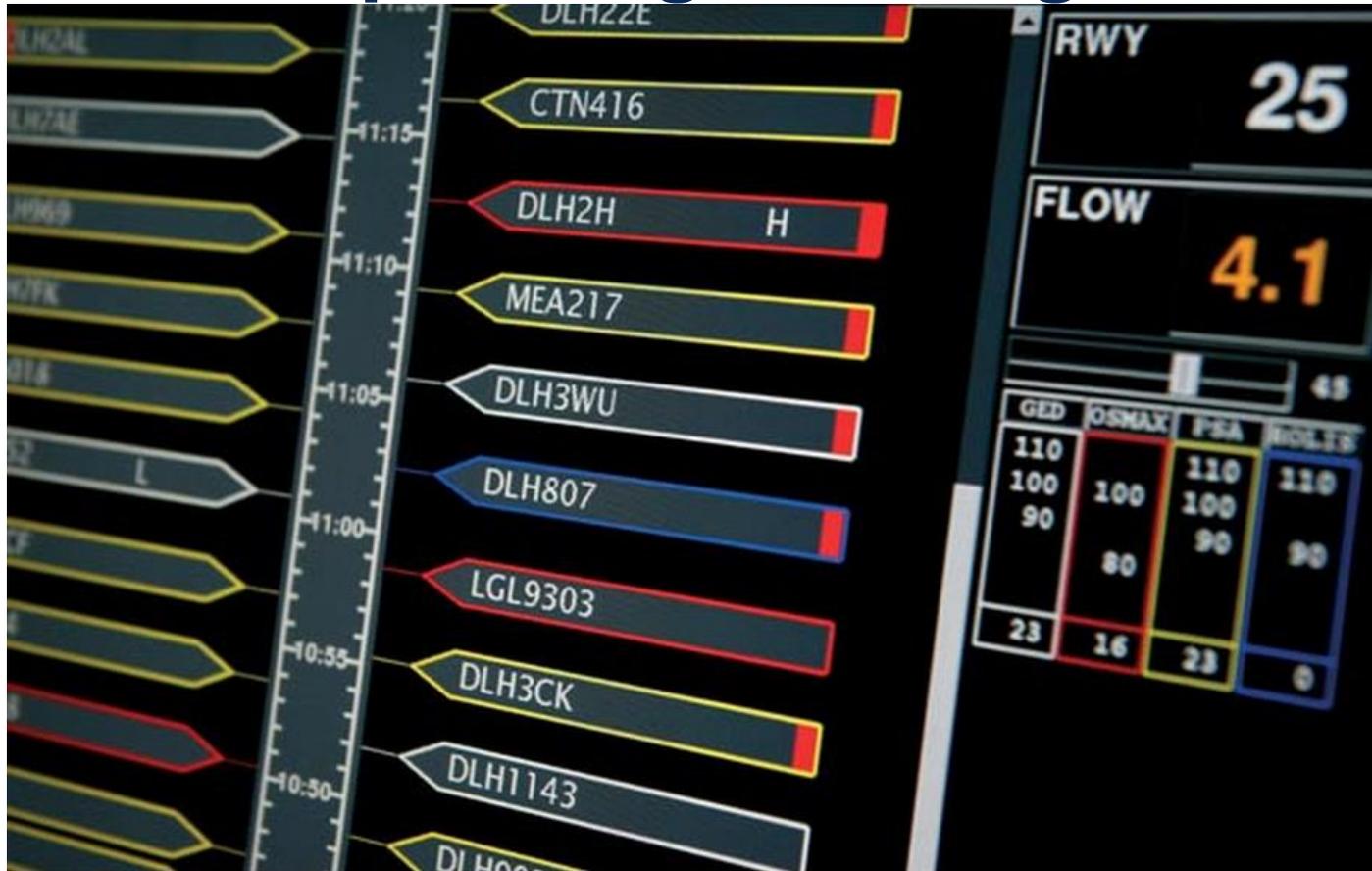
Sequence CMP					
RT0	G/L	N	CALLSIGN	A.	P.
10:27	L4	8	VLE2200	N	N
10:24	L5	7	DLH5628	N	N
10:21	L4	6	SWR1760	N	N
10:19	L5	5	MAS15	N	N
10:16	L4	4	AZA437	N	N
10:13	L4	3	AZA191	N	N
09:58	L0	2	SAS681	N	N
09:56	L1	1	BRU885	F	N

Sequence CIA					
RT0	G/L	N	CALLSIGN	A.	P.
10:26	L5	6	BBC0057	N	N
10:06	L4	5	ISS433	N	N
10:01	L4	4	UAE97	N	N
09:59	L2	3	AZA1604	N	N
09:53	L0	2	AZA1166	F	N
09:51	L1	1	AZA1732	F	N

Landing List 16L					
25					
RTA	N	CALLSIGN	A.	P.	
10:33	26		N	N	
10:32	25	ETH0725	N	N	
10:31	24	DLH5628	N	N	
10:29	23	AZA403	N	N	
10:28	22	SWR1760	N	N	
10:26	21	MAS15	N	N	
10:24	20	SVA162	N	N	
10:23	19	AZA437	N	N	
10:21	18	AZA203	N	N	
10:20	17	AZA191	N	N	
10:19	16	BAW1850	N	N	
10:17	15	AZA571	N	N	
10:16	14	AFR1604	N	N	
10:15	13	ISS433	N	N	
10:13	12	ADH59T	N	N	
10:11	11	IYE741	N	N	
10:09	10	UAE97	N	N	
10:08	9	AZA1604	N	N	
10:07	8	BAW2538	N	N	
10:04	7	SAS681	N	N	
10:03	6	BRU885	F	N	
10:01	5	AZA1166	F	N	
10:00	4	AZA1732	F	N	



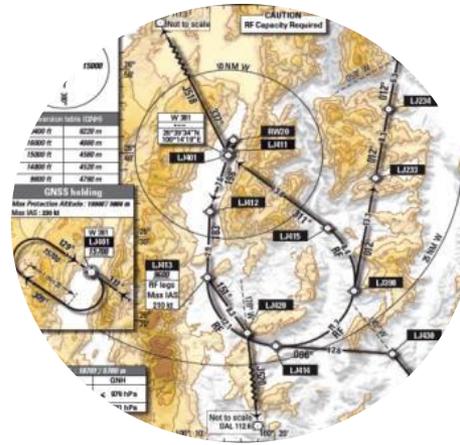
Sequencing/metering



Stakeholders must work together...



...to realize the benefits



Implement and fly fully
automated operations

PBN True / False Quiz

- PBN is an ATC issue... they are responsible for implementation
- PBN is only about procedure design – publish and done
- PBN can provide benefits such as safety, efficiency, capacity all by itself



Questions?





Thank you!

Contact through:
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