

NATS Fast-Time Modelling

Technical Interchange Meeting
Centre d'Etudes de la Navigation
Aerienne (CENA)

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4th November 2003

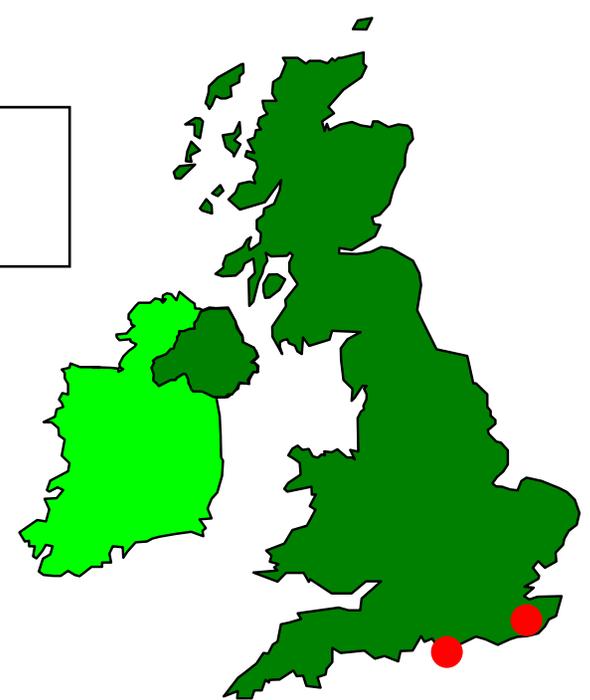
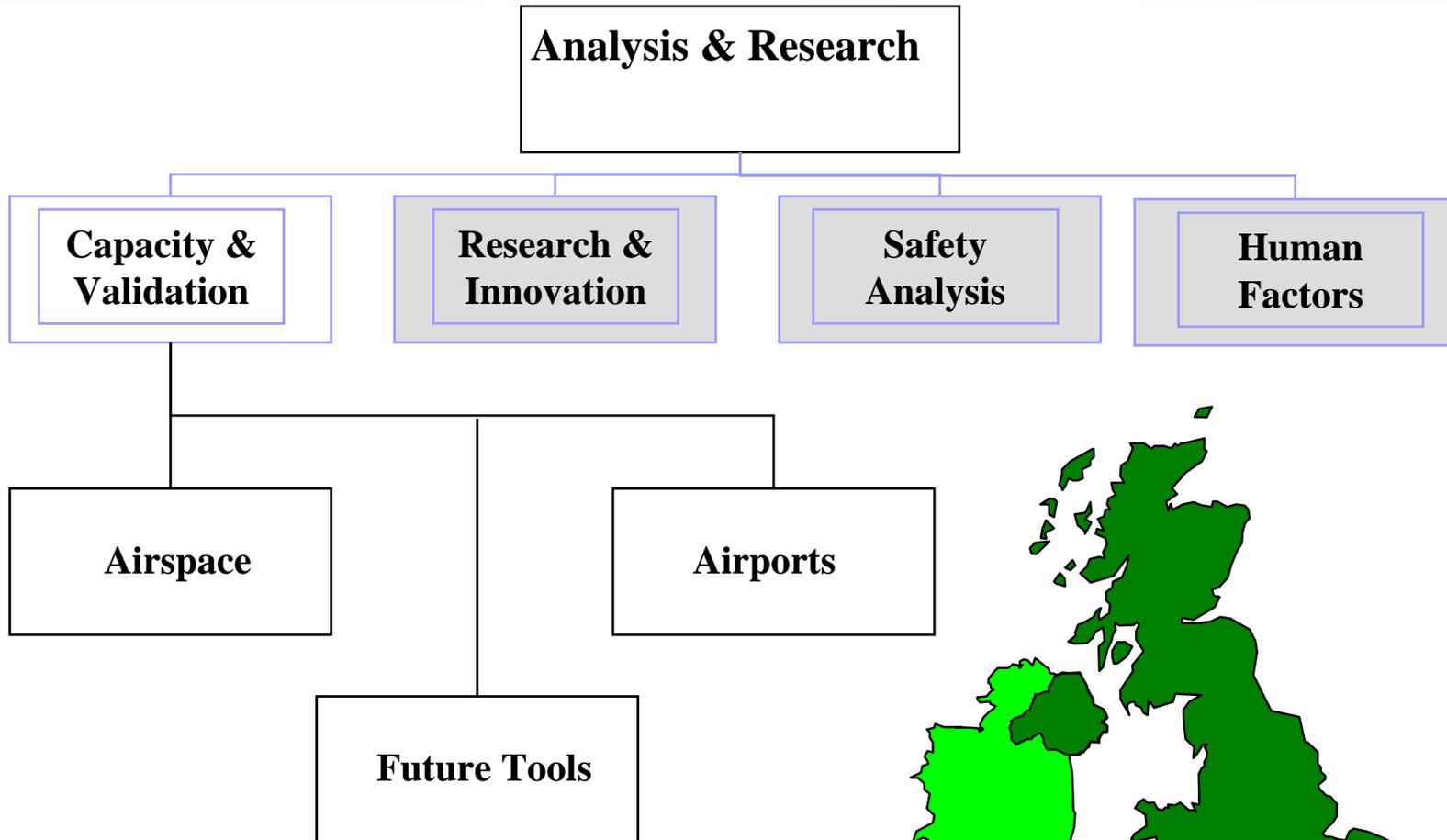


Overview

- NATS Capacity & Validation
- Fast-time Simulators
- Analysis Tools
- Metrics
- Projects
- SMART project
- Summary



Capacity & Validation



Fast-Time Simulators

- HERMES

(Heuristic Runway Movement Event Simulator)

- RAMS Plus

(Re-organised ATC Mathematical Simulator)

- TAAM Version 1.3.2

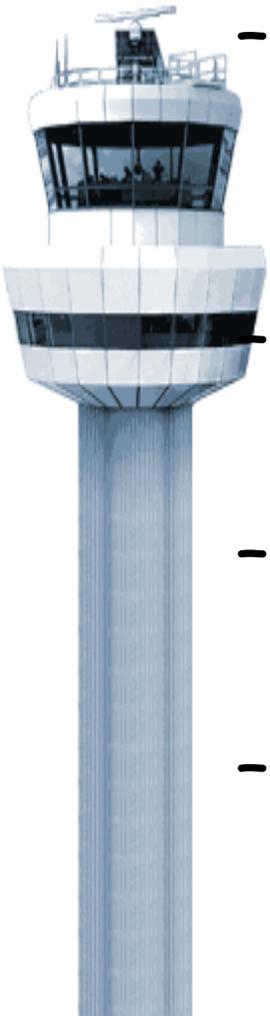
(Total Airspace and Airport Modeller)



HERMES Analysis Tools



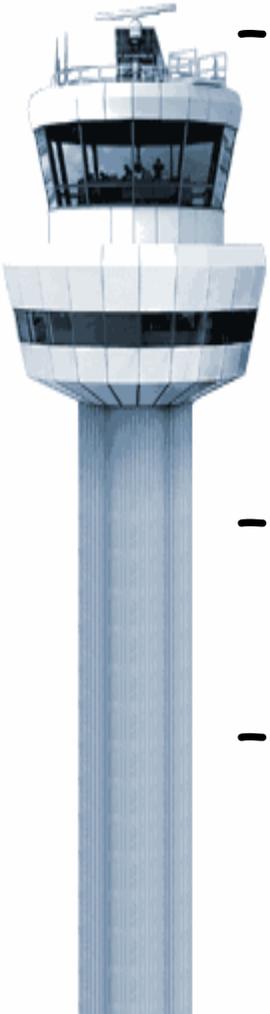
- Airport radar data collection/analysis/playback tool (APT)
- Airport visual observations (ANORAC)
- Airport operational database (AMACS)
- HERMES-TAAM Interface (HERMIT)



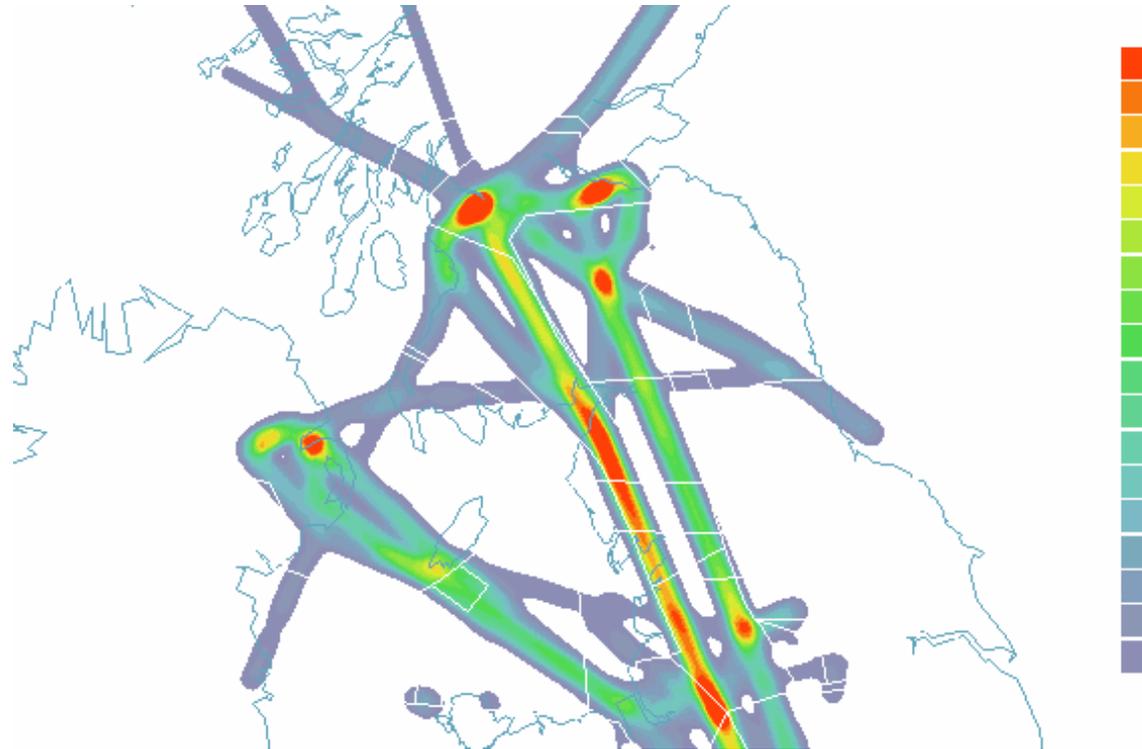
RAMS/TAAM Analysis Tools



- Traffic Data Pre-Processor
 - UKFDB - RAMS format - add restrictions
 - RAMS - TAAM - RAMS
 - for traffic and sectors
- Model playback facility (ReView)
- Investigating LUCIAD



Analysis Tools ReView

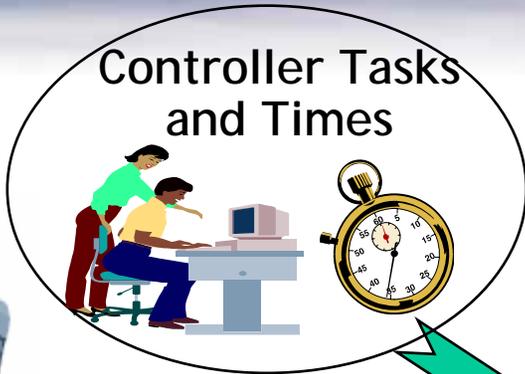


RAMS Analysis Tools

- Workload
- Sector Capacity (OSCAR)
- ATM Analyser (RAMS+)



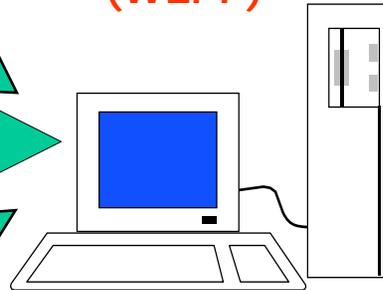
Metrics



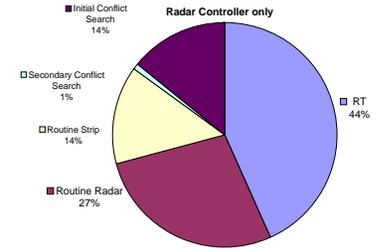
Simulation Output



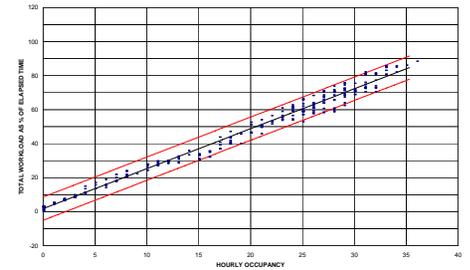
Workload Model (WLPP)



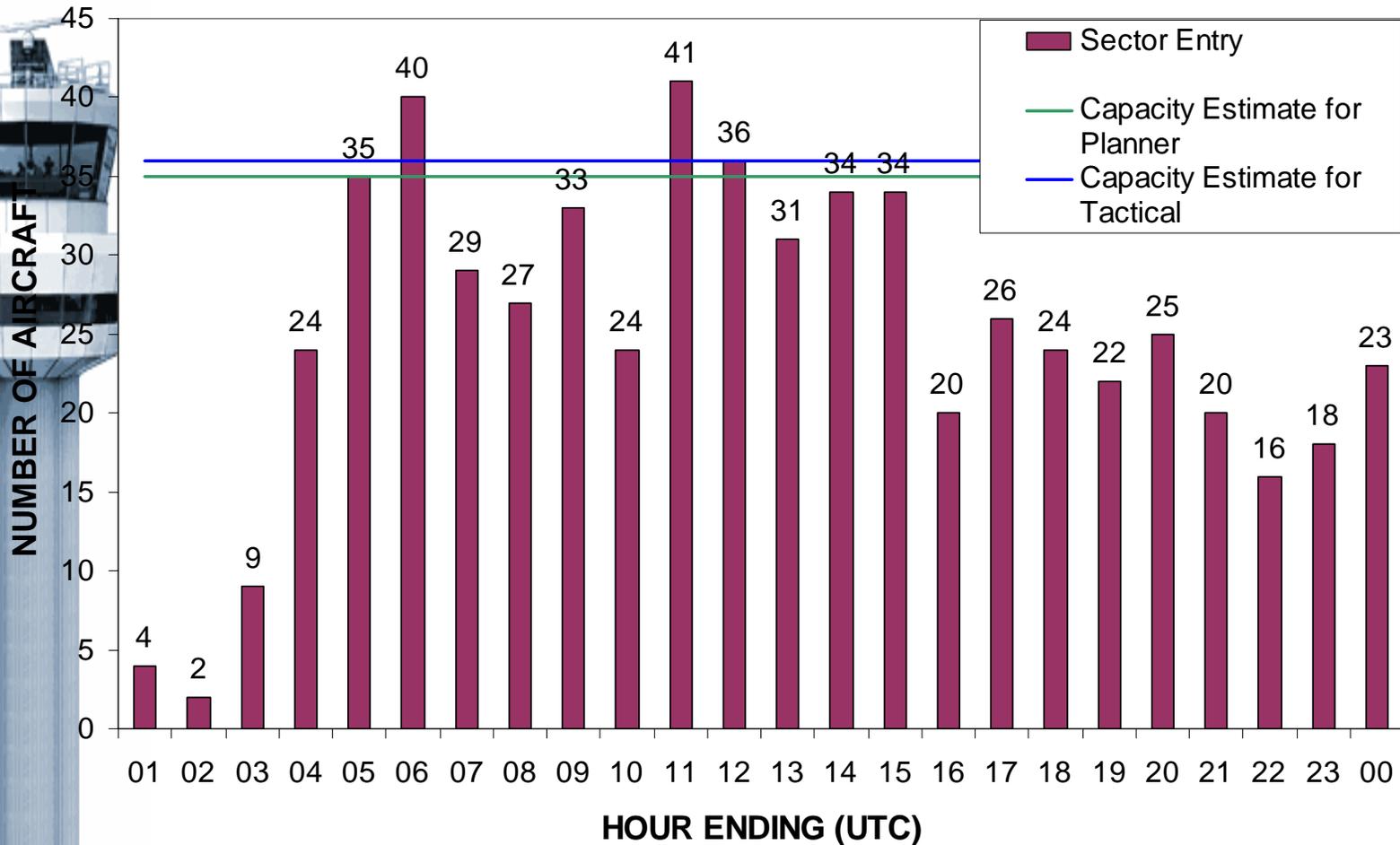
Workload Analysis



Capacity Estimate



Example of Metrics

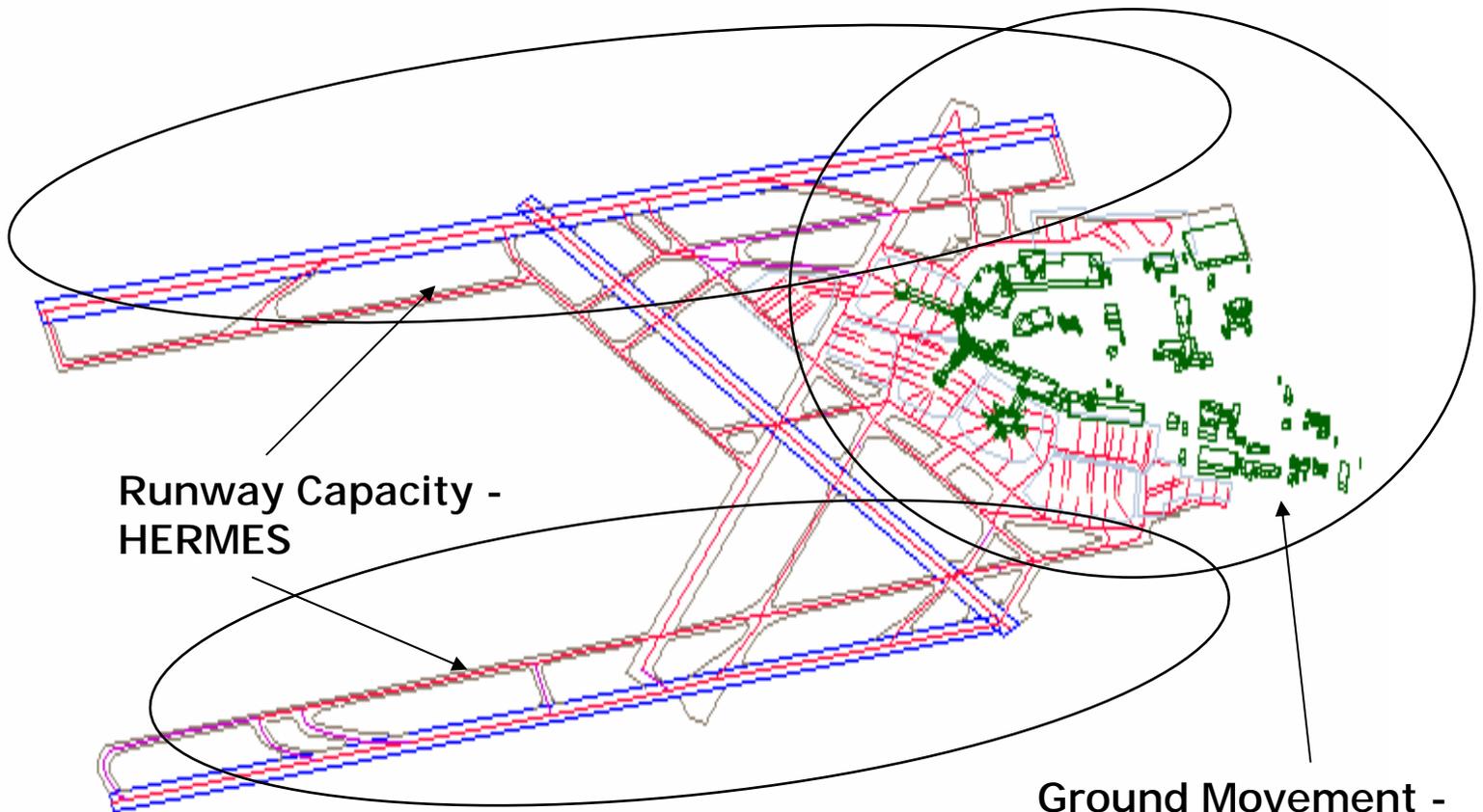
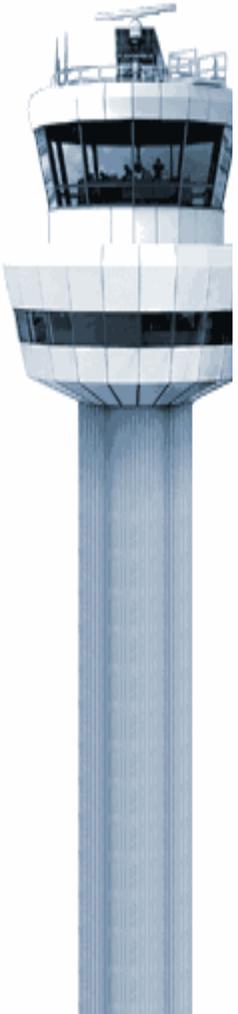


HERMES Projects

- Runway Capacity Studies
 - Heathrow, Gatwick, Birmingham
 - Stansted and Manchester
- HERMES + TAAM
 - to study ground movement infrastructure and airspace capacity



Combined Runway and Ground Movement Studies



Runway Capacity -
HERMES

Ground Movement -
TAAM

RAMS Projects

- Baseline of UK Airspace
- En-route Re-sectorisation
 - North Sea, Clacton
- En-route Procedures
 - Hurn, West End
- Sector Capacity
 - New En-route Centre



TAAM Projects

- 
- A tall, white air traffic control tower is positioned on the left side of the slide. The tower has a cylindrical upper section with a glass-enclosed observation deck and a smaller, narrower section at the very top. The background behind the tower is a blue sky with light, wispy clouds.
- Airport Studies
 - Manchester, Edinburgh, Dublin
 - Heathrow, Southampton
 - TMA Studies
 - South East & East of England Regional Airspace Study (SERAS)
 - Simulation Modelling and Analysis of Area Navigation in Terminal Control Area (SMART)

SMART

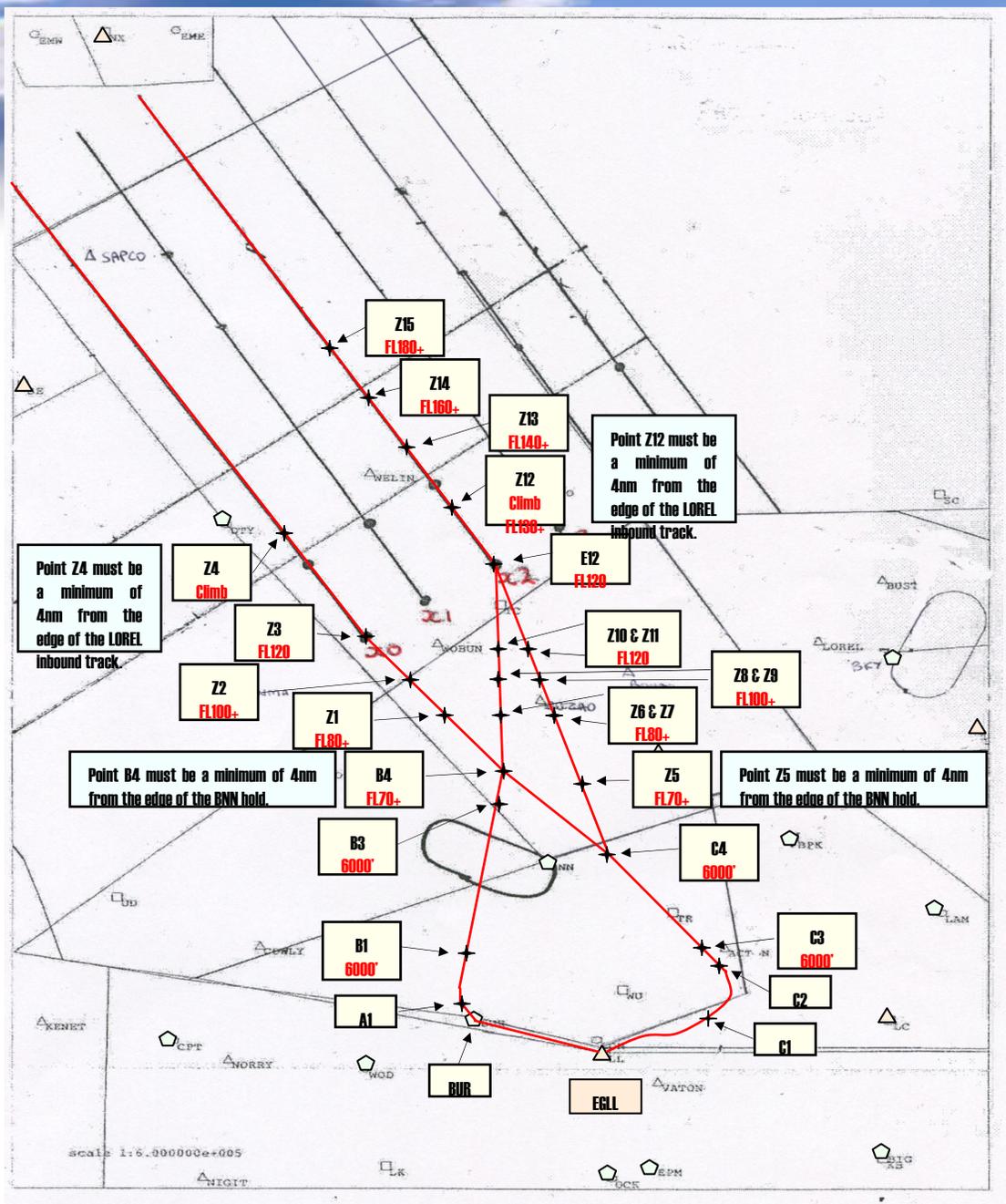
- Sponsored by ATC Design team at London Terminal Control Centre
- To determine how RNAV can be introduced in the London TMA
- Stage 1 - Design RNAV SIDs
- TAAM ideal for designing SIDs

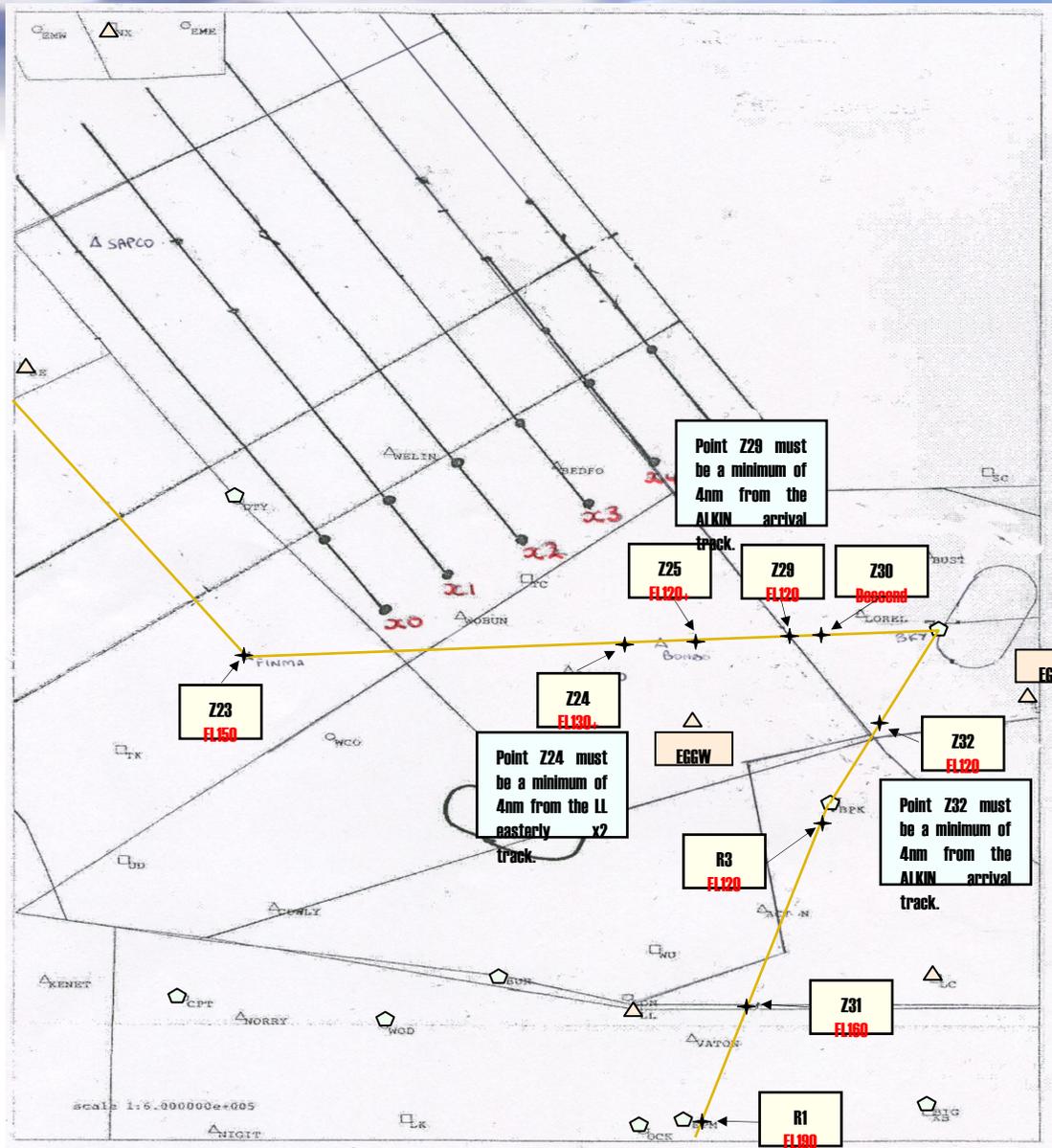


SMART

- Stage 2 - Establish 2020 TC airspace model, incorporating full RNP(x)-RNAV environment
- Re-design of outbound and inbound routes
- Starting with TC North West
- Maps provided by design team







Project Progress

- Modelled in TAAM
- ReView created and sent to the design team
- Produce Conflict Analysis
- Meet to discuss project progress and investigate conflicts



Conflict Analysis

Conflict Analysis				
Criteria	3.9 nms	950ft	above 2500'	
SMART	WP2a	Phase 2		
TC North West				
Scenario 1	TimedSample		All Westerly	
Time	Callsigns	route	Flight Level	Closest Point of Approach
07:12	EZY357	Luton Departure	65	3.2 nms
	BAW18Y	Heathrow Departure	60	
Time	Callsigns	route	FL	Closest Point of Approach
07:24	EZY171	Luton Departure	70	1.7 nms
	EIN151	Heathrow Departure	70	
Time	Callsigns	route	FL	Closest Point of Approach
07:27	EZY085	Luton Departure	60	2.1 nms
	EIN149	Heathrow Departure	60	
Time	Callsigns	route	FL	Closest Point of Approach
07:39	CRX89N	London City Departure	50	3.0 nms
	XJT3	Luton Departure	50	



SMART re-host to RAMS?

- 
- A tall, white air traffic control tower with a glass-enclosed observation deck at the top, set against a blue sky with light clouds.
- Problems with Holding and Sequencing in TAAM
 - C&V running several projects on TAAM with only one license
 - RAMS plus has TMA rules with holding.
 - Can we run SMART on RAMS?

Process for SMART re-host

- 
- A tall, grey air traffic control tower is positioned on the left side of the slide. The tower has a cylindrical base and a glass-enclosed observation deck at the top with a radar scanner on the roof.
- For the TMA baseline scenario convert SMART from TAAM to RAMS
 - Re-format traffic files
 - Sectorisation as in the RAMS baseline
 - Run RAMS and compare with TAAM

Comparing RAMS/TAAM

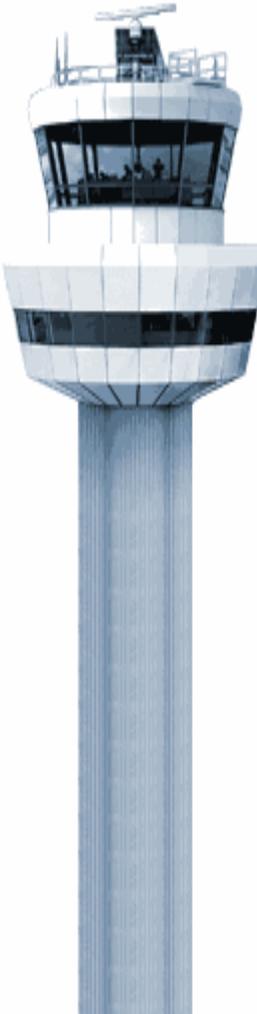
- Flight details for a sample flight on each route
- Holding in RAMS/TAAM
- Conflict Analyses





Flight Details

ANZ2	B744	60N	EGLL							
		RAMS			TAAM				RAMS - TAAM	
	Navaid	Time	Flight Level		Time	Flight Level		Flight Level Difference	Time Difference (secs)	Change in Time Difference
1	60N	06:10:00	390		60N	06:10:01	390	0	-1	0
2	STN	06:30:26	390		STN	06:30:17	390	0	9	10
3	GOW	06:49:49	390		GOW	06:49:29	390	0	20	21
4	FENIK	06:51:11	390		FENIK	06:50:40	390	0	31	32
5	NGY	06:55:21	390		NGY	06:55:36	390	0	-15	-14
6	DCS	07:00:25	390		DCS	07:00:35	390	0	-10	-9
7	LAKEY	07:04:28	390		LAKEY	07:04:36	390	0	-8	-7
8	CALDA	07:08:21	390		CALDA	07:08:27	390	0	-6	-5
9	CROFT	07:09:35	390		CROFT	07:09:40	390	0	-5	-4
10	BARTN	07:10:54	390		BARTN	07:10:58	390	0	-4	-3
11	LOVEL	07:12:44	387		LOVEL	07:12:46	390	-3	-2	-1
12	CONGA	07:13:40	370		CONGA	07:13:40	390	-20	0	1
13	HON	07:20:31	230		HON	07:20:42	229	1	-11	-10
14	WCO	07:27:45	150		WCO	07:33:59	125	25	-374	-373
15	BNN	07:31:10	80		BNN	07:37:11	80	0	-361	-360



RAMS Holding

- Conflict Resolution needed to incorporate holding
- Introduced for Heathrow and Stansted with Holdstack Rules only
- Resolution sometimes causes vectoring



Next Steps

- 
- A tall, white air traffic control tower with a glass-enclosed observation deck at the top, set against a blue sky with light clouds.
- Can we stop a/c being vectored
 - Produce Conflict Analyses
 - Has anybody else re-hosted a project from TAAM to RAMS?
 - Would welcome any advice, help, or suggestions.

Summary



- Fast-time simulation forms a very useful tool within C&V covering all ATC operational environments.
- The team has developed tools for processing data, and analysis of results.
- Current work includes modelling Ground, Terminal and Area operations
- The team is always looking to improve and investigate new technology.

