

Data link Implementation in Singapore FIR

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Operational Data Link Seminar

2-4 May 2016

Scope

- Brief introduction to CAAS and Singapore FIR
- LORADS III ATM system
- History of data link in Singapore FIR
- Guidelines for implementation
- Checklist

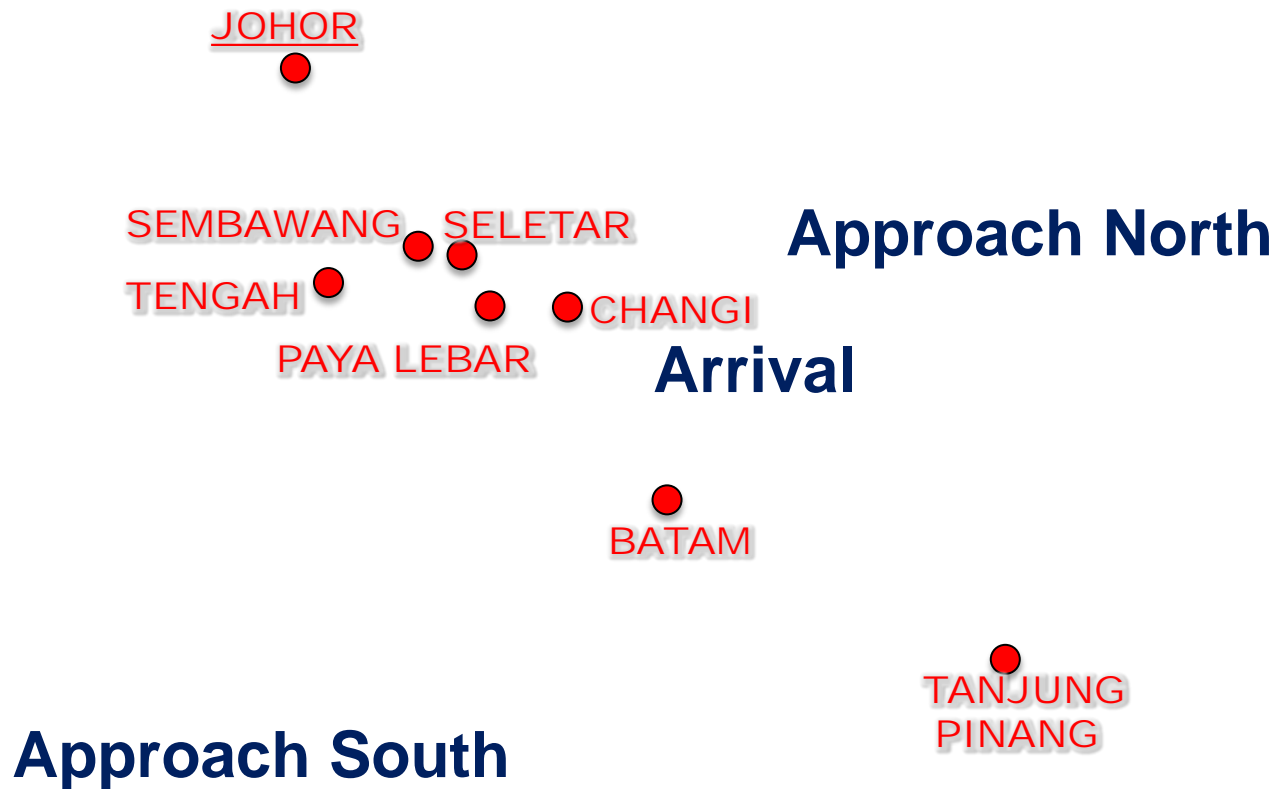
Singapore Flight Information Region

- Changi Airport has 7th highest international passenger traffic in the world (Source: ACI's ranking for July 2015)
- Changi passenger traffic is 55.45 million and air traffic is 346,300 movements in 2015
- Singapore FIR air traffic movements in 2015 is 656,000
- Traffic expected to double from 2010 by 2024

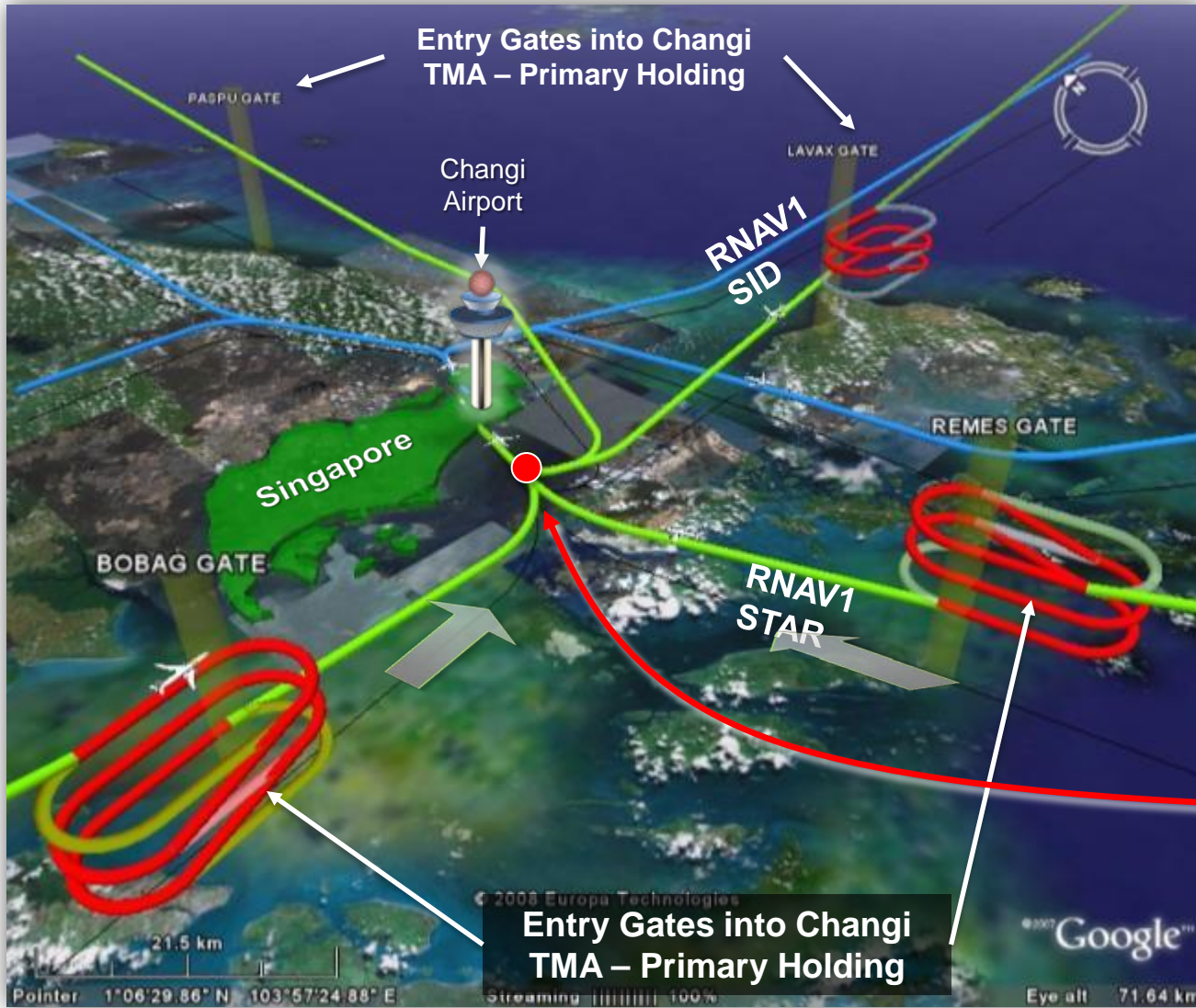
Approach Control Sectors

40NM RADIUS FROM CHANGI

— Arrival
— Departure



Changi Flow Management

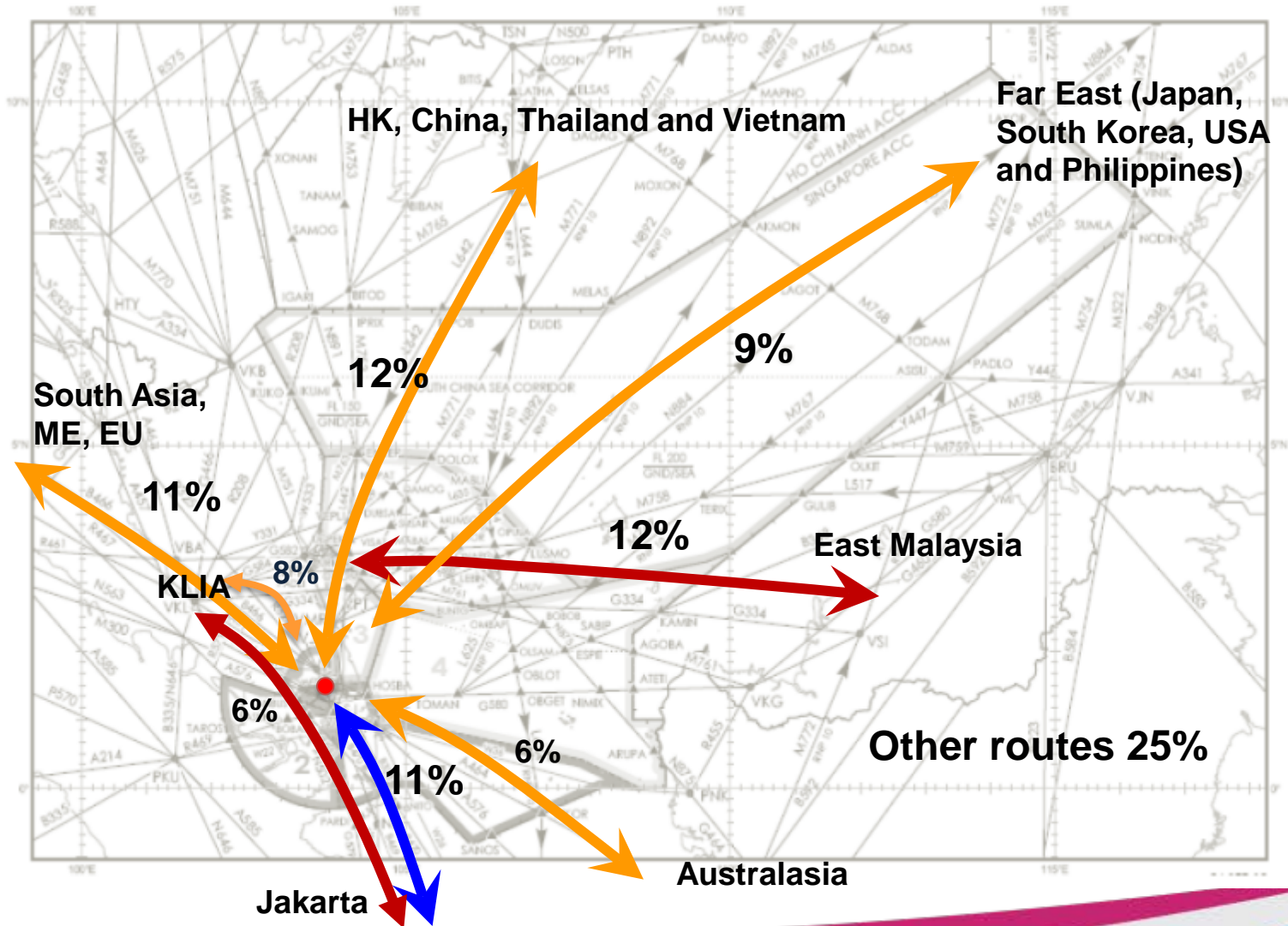


AMAN calculates spacing requirements between arrivals, manages sequence and advises ATC on Entry Gate crossing times for synchronized approaches

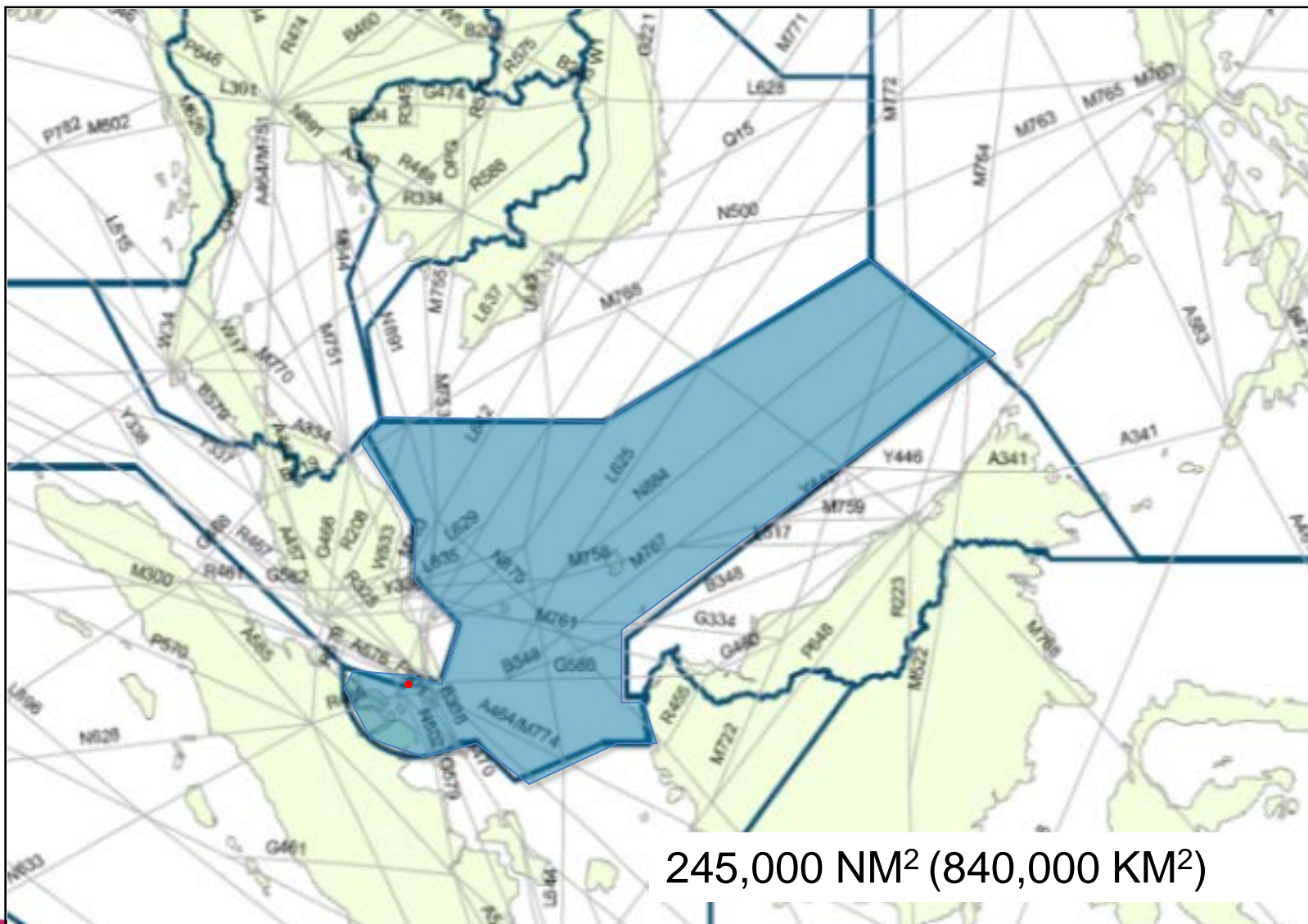
STARs 

SIDs 

Air Traffic Flow

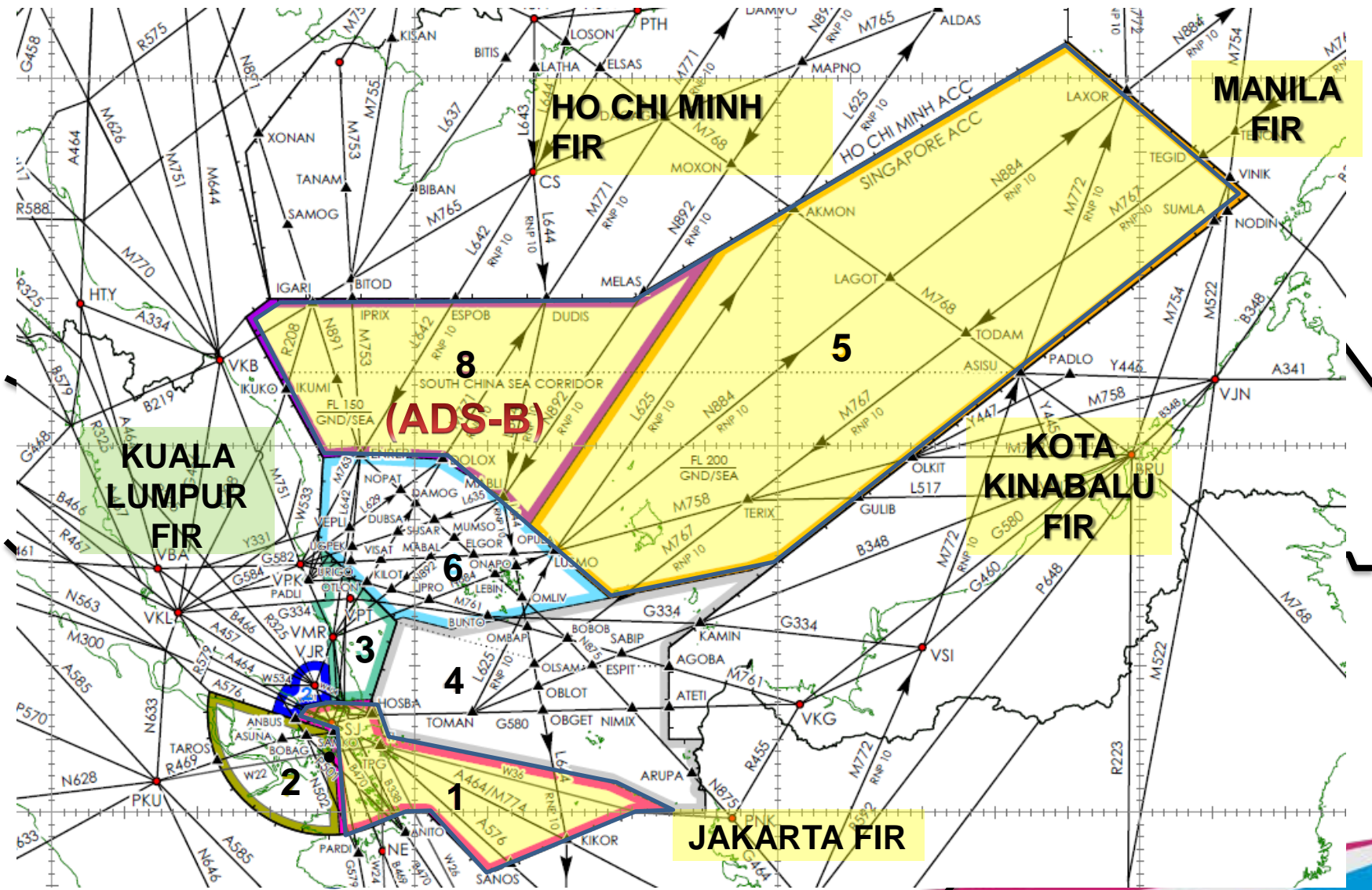


Singapore FIR



245,000 NM² (840,000 KM²)

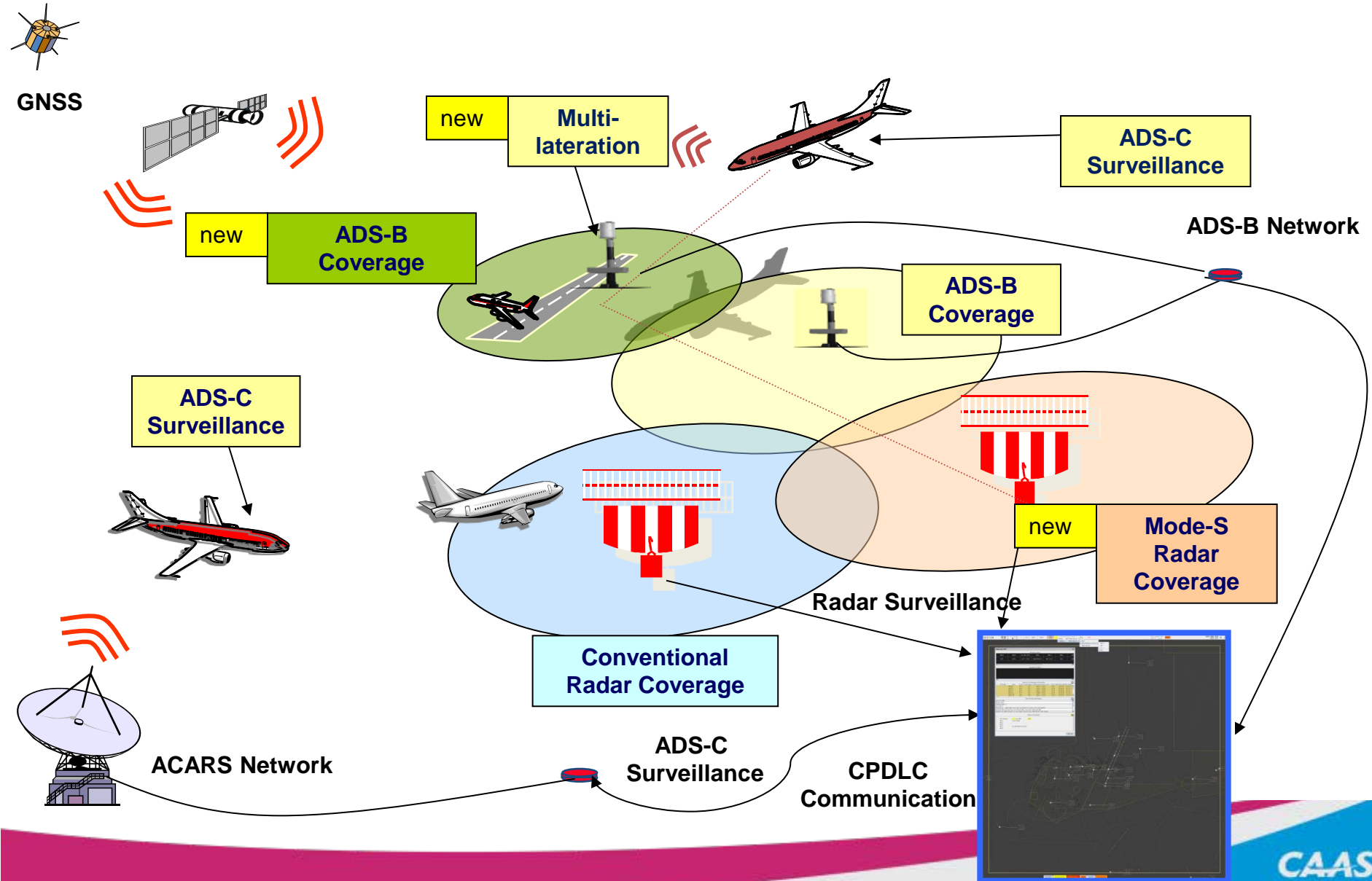
Area Control Sector



SATCC Area Control Centre



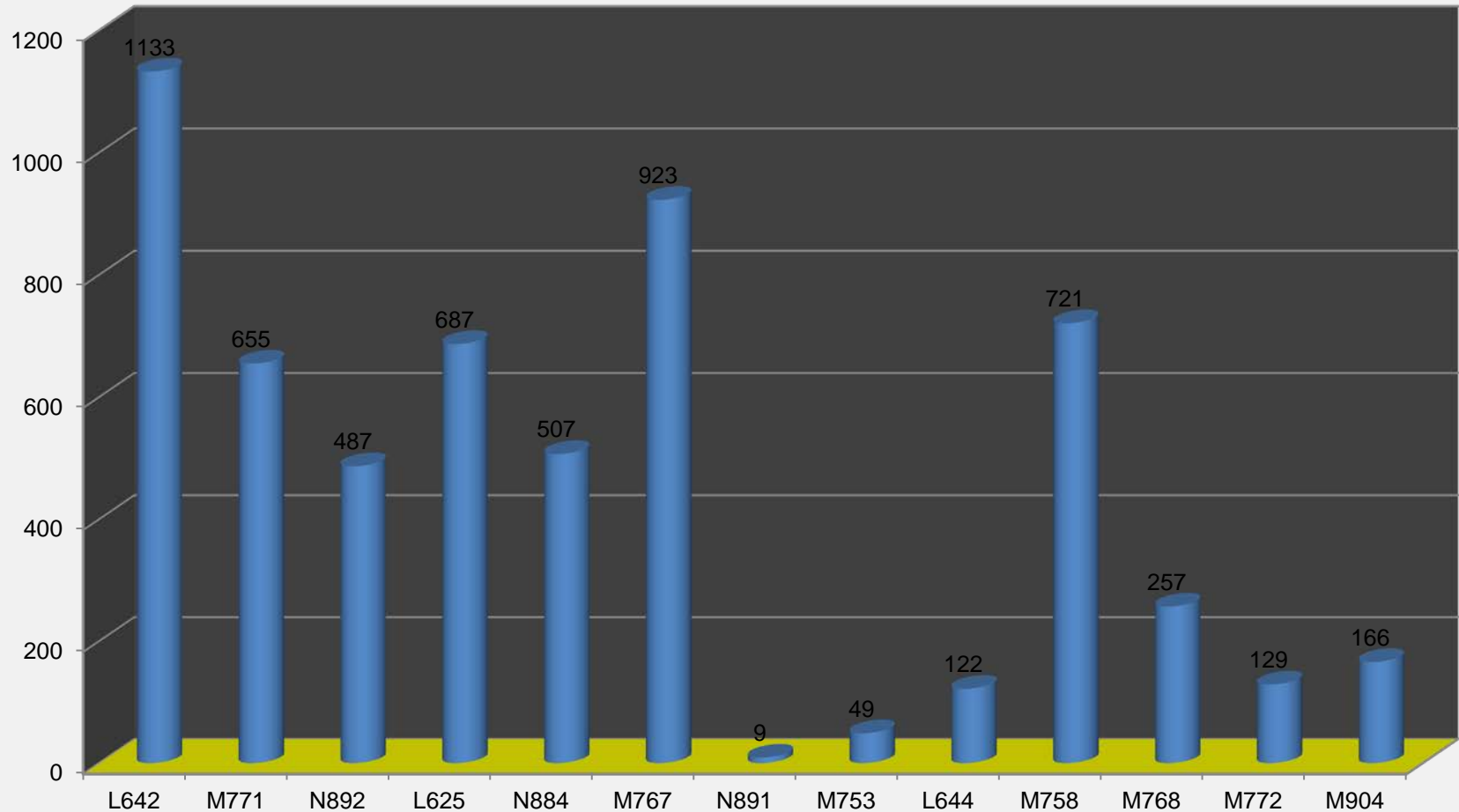
Communications and Surveillance



ADS/CPDLC logons by route

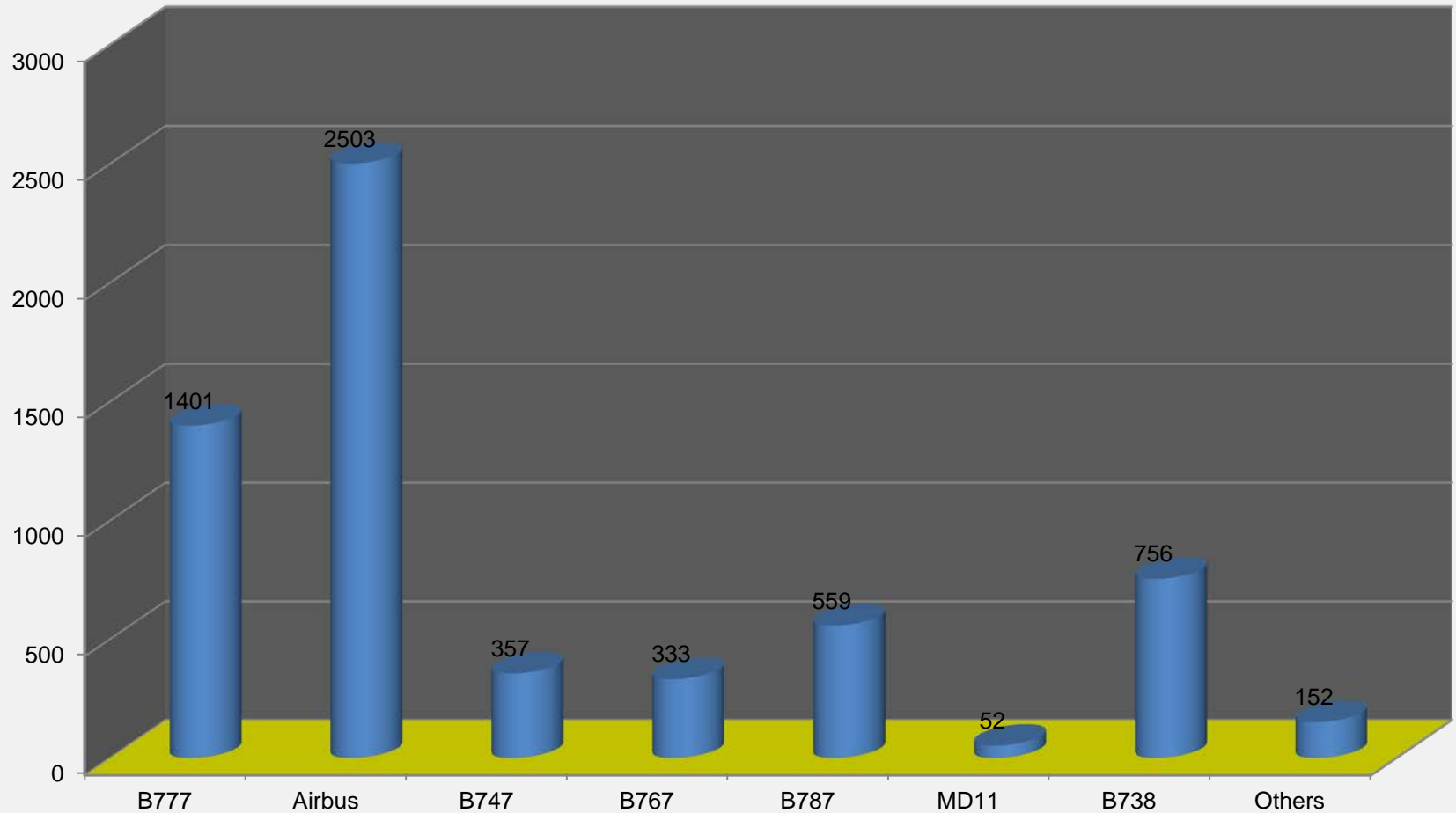
Mar 2016

Approx 190 per day



ADS/CPDLC logons by type

Mar 2016



LORADS III ATC System

LORADS III ATC System

- Next generation ATC system customized by Thales
- Basic system commissioned in Feb 2013 and operational with effect from 16 Oct 2013
- System planned for management of air traffic for the near future, taking into account the expected doubling of traffic movements

Multiple LORADS III Sites

- Multiple sites
 - SATCC - Area and Approach Control Centres



- Changi Tower and Back-up Tower Cabins
- Various sites at Changi Airport, (including CAG Airside Operations, MET, RSAF Tower)

Enhanced ATC Workstations

Air Situation Display



Interactive Auxiliary Display

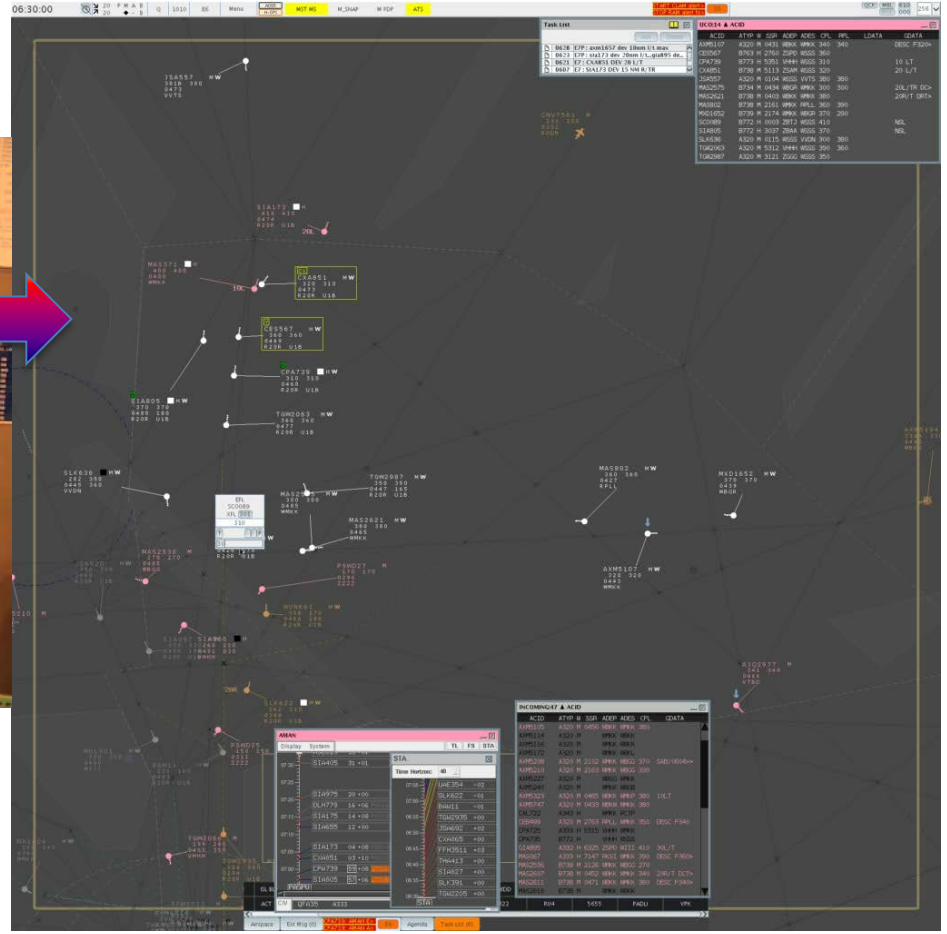
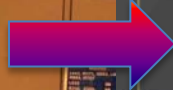
**Award winning ergonomic
designer consoles**

Advanced LORADS III Features

- Advanced ATC automation features
 - Silent coordination for both internal and inter-centre tasks
 - Tasks are performed on objects of interest e.g. labels including CPDLC messages
 - Better management of flight information
- Enhanced decision-making tools
 - Integrated Arrival Manager
- Safety nets
 - Flight plan conflict probe
 - Short term conflict alert
 - Mid-term conflict alert
 - Vertical and lateral adherence monitoring
 - Holding Adherence Monitoring
- Multiple layers of redundancy

Advanced Java-based Human Machine Interface

OLD



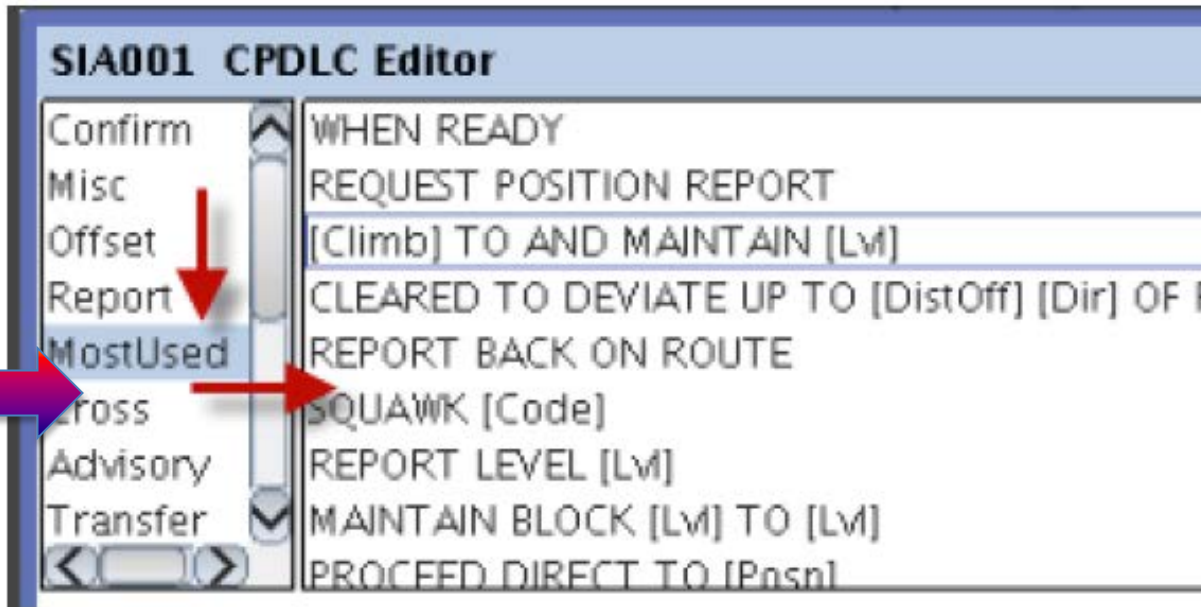
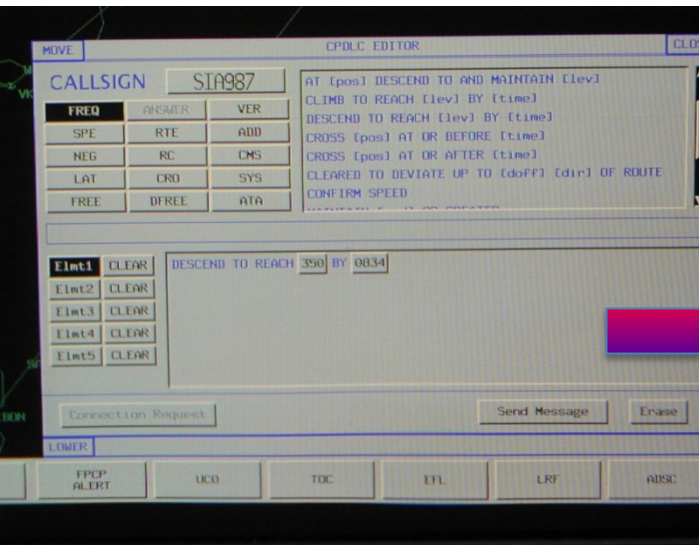
Paperless Environment

OLD



ARR	-1349	STAC05	0460	E	
TOP	-1347	230		B779 R3	
BOC	0332	EGLL	ARR4	BOBA	
ARR	0417	AXM1811	0060	E	
TOP	-0433	340		A320 R	
BOC	0423	NNXX	ARR4	BOBA	
ARR	0400	SLK321	0467	E	
TOP	-0208	230		A320 R	
BOC	0324	NNXX	ARR4	BOBA	
ARR	0347	AXM1860	0060	E	
TOP	-0247	350		A320 R	
BOC	0304	NNXX	ARR4	BOBA	
ARR	0304	SLK353	0460	E	
TOP	-0238	390		A320 R	
BOC	0401	NNXX	ARR4	BOBA	
ARR	0340	MOL701	0467	E	
TOP	-0335	2106	350		A320 R
ARR	0340	SLK353	0460	E	
TOP	-0238	390		A320 R	
BOC	0401	NNXX	ARR4	BOBA	
ARR	0304	MAST17	0060	E	
TOP	-0308	370		B738 R	
BOC	0308	NNXX	BOGA	ARR1	
ARR	0303	FFR2503	0260	E	
TOP	-0300	2142	350		A772 R
BOC	0329	NNXX	ARR4	BOBA	
ARR	0254	VLL282	0460	E	
TOP	-0252	370		A320 R	
BOC	0333	NNXX	ARR4	BOBA	
ARR	0249	SLK345	0463	E	
TOP	-0247	390		A320 R	
BOC	0332	NNXX	ARR4	BOBA	
ARR	0230	MAS125	0470	E	
TOP	-0229	2155	370		A320 R
BOC	0242	NNXX	ARR4	BOBA	
ARR	0233	MPH095	0490	E	
TOP	-0231	370		B744 R	
BOC	0309	NNXX	ARR4	BOBA	
ARR	0225	MAS611	0460	E	
TOP	-0223	2143	330		B738 R
BOC	0244	NNXX	ARR4	BOBA	
ARR	0146	AXM1702	0060	E	
TOP	-0144	2146	350		A320 R
BOC	0218	NNXX	ARR4	BOBA	

CPDLC Editor



Implementation process

Implementation of Data link in Singapore FIR

- Clear CONOPS: primarily focus is the non-radar airspace over the South China Sea, where the maximum benefits could be derived from data link operations
- Deployed in Phases
- Phase 1: First use of ADS/CPDLC in Feb1997 using standalone system
- Phase 2: Integrated into LORADS II (*previous system*) in Feb 1999
 - 24 hours operations in Nov 1999

Implementation of data link

- Attend ISPACG/IPACG in early days to learn from experiences
- Small FIT group was formed consisting of air and technical crew of local carrier, SITA and CAAS
- Regular meetings to present discuss issues relating to data link operations
- Effective resolution and monitoring of performance despite not being part any of FIT then.

Establishment of FANS Interoperability Team

- In 2004, FIT-SEA was established.
- Setup to facilitate and foster the implementation of data link services in the non-radar oceanic airspace of South China Sea.
- After Singapore, Vietnam was next to operationalize ADS/CPDLC in 2008.
- The Philippines conducted trials in 2011.
- FIT-SEA and FIT-BOB were subsequently merged in 2012 to form FIT-ASIA

Basic Implementation checklist

- ✓ Engagement with operators
- ✓ Procedures are established
- ✓ Training completed
- ✓ NOTAM issued / AIP updated
- ✓ System parameter settings decided
 - ✓ E.g. NDA, messaging
- ✓ Safety case completed
- ✓ Performance monitoring

Enhancements to ATC

- ADS

- Improved surveillance of aircraft beyond radar cover in oceanic airspace
- ADS tracks eligible for safety alerts which warns controllers of aircraft deviations

- CPDLC

- Overcome shortcomings of HF voice communications
- Prompt and clear message exchanges between pilots and controllers
- More efficient means of communication

Thank you