

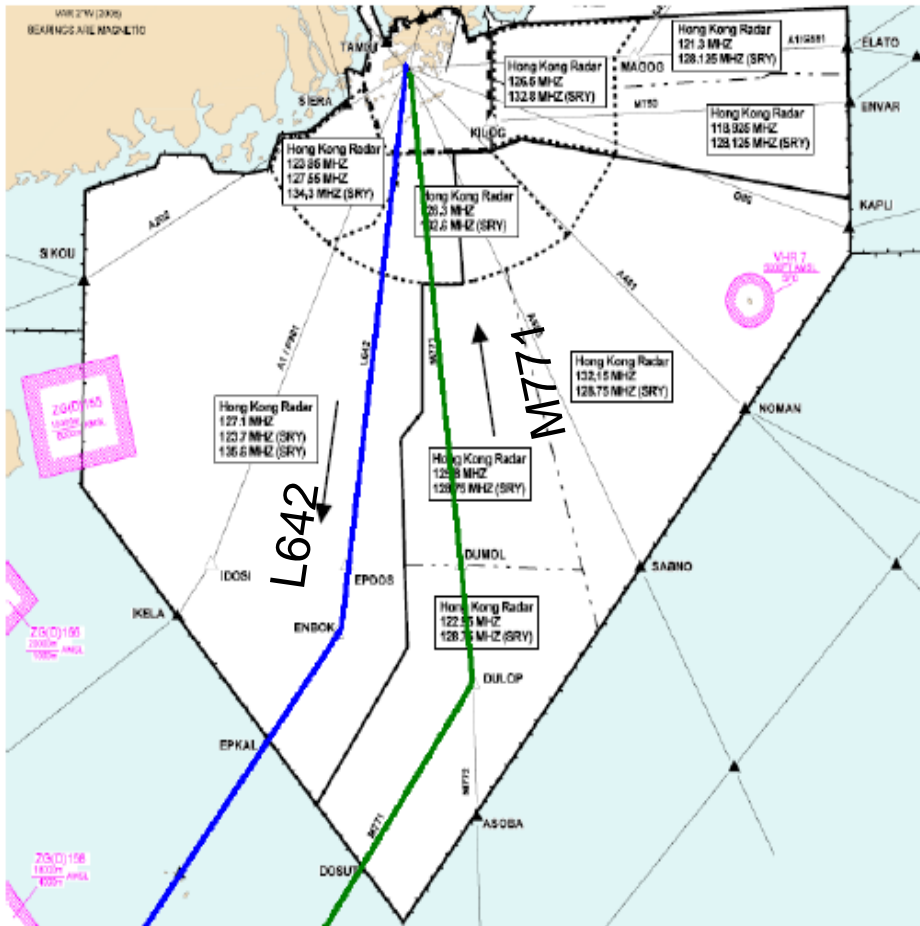


# Status of ADS-B Implementation in Hong Kong

Presented by Hong Kong, China  
for ICAO SEA/BOB ADS-B WG9  
30 Oct – 1 Nov 2013



# ADS-B Equipage for L642/M771



ADS-B mandates for FL290 and above  
 - 12 Dec 2013 along L642 and M771  
 - 11 Dec 2014 for entire HKFIR

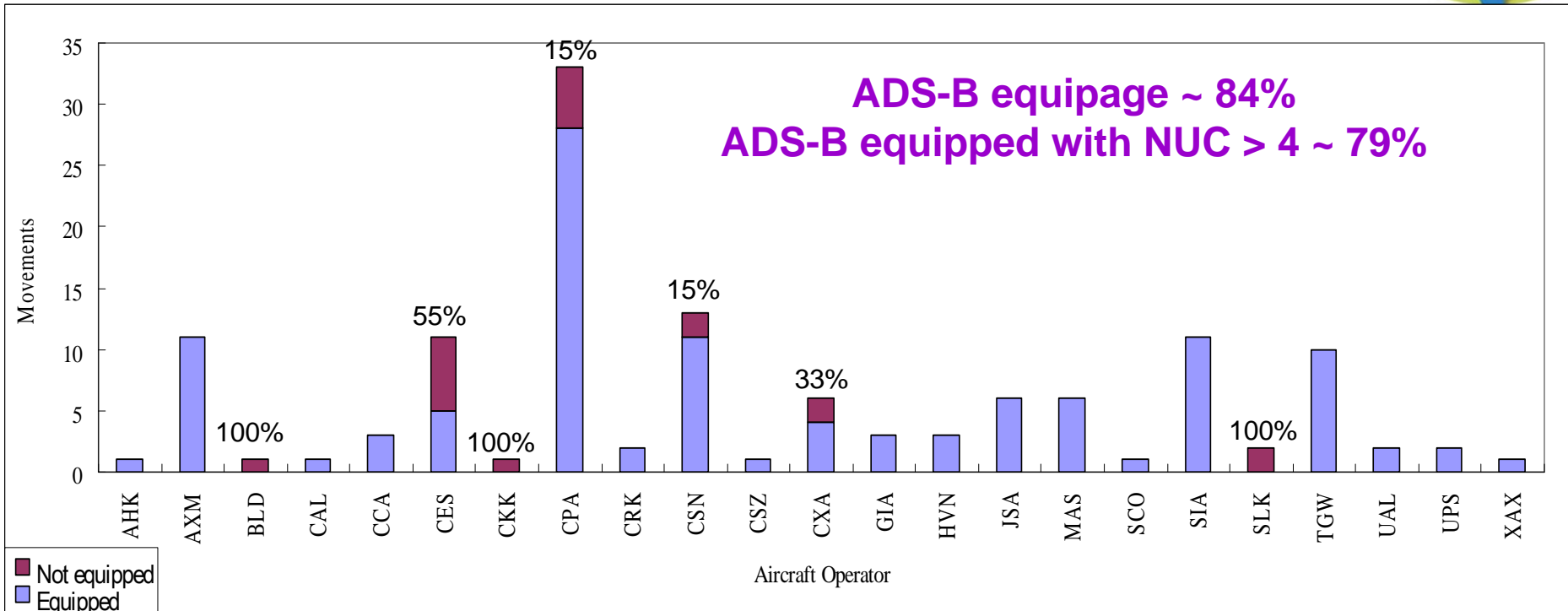
- Aircraft ADS-B equipage survey conducted:
 

	(Sep 2013)	(Sep 2012)
L642	84%	78% (↑6%)
M771	87%	75% (↑12%)
HKFIR	82%	73% (↑9%)
- ADS-B equipped with Good NUC (> 4)
 

	(Sep 2013)	(Sep 2012)
L642	79%	75% (↑4%)
M771	83%	74% (↑9%)
HKFIR	79%	70% (↑9%)

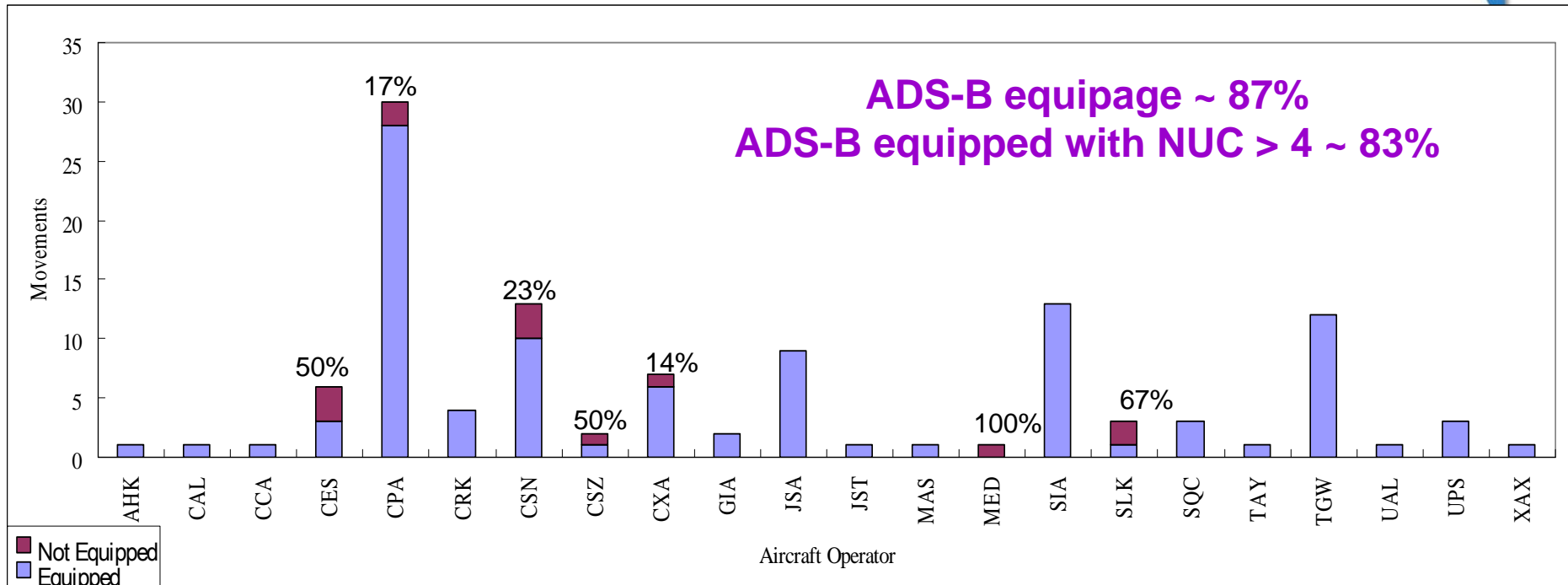


# ADS-B Equipage for L642



List of Aircraft Operators with non-equipped ADS-B along L642	
BOURNEMOUTH COMMERCIAL FLIGHT TRAINING CENTRE (BLD)	CATHAY PACIFIC AIRWAYS (CPA)
CHINA EASTERN AIRLINES (CES)	CHINA SOUTHERN AIRLINES (CSN)
CHINA CARGO AIRLINES LTD (CKK)	XIAMEN AIRLINES (CXA)
	SILKAIR (SINGAPORE) PTE LTD (SLK)

# ADS-B Equipage for M771



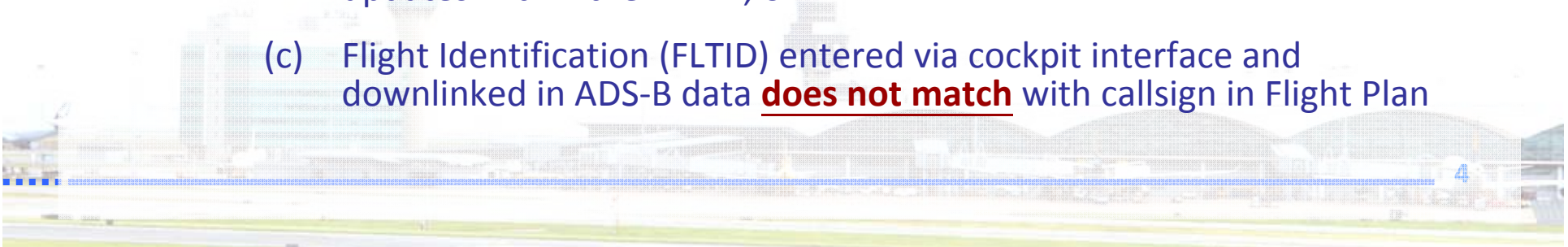
List of Aircraft Operators with non-equipped ADS-B along M771
CHINA EASTERN AIRLINES (CES)
CATHAY PACIFIC AIRWAYS (CPA)
CHINA SOUTHERN AIRLINES (CSN)

SHENZHEN AIRLINES (CSZ)
XIAMEN AIRLINES (CXA)
ONTARIO MINISTRY OF HEALTH (MED)
SILKPAIR (SINGAPORE) PTE LTD (SLK)

# Monitoring & Analysis of ADS-B Avionics Performance



- After reporting in the APANPIRG/23 in Sep 2012, CAD has commenced early monitoring and analysis of ADS-B aircraft avionics performance since early 2013, allowing all parties to get better prepared
- An in-house developed scheme/system to detect and verify bad ADS-B data, based on systematic monitoring algorithm proposed below:-
  - ✓ The system will compare each ADS-B flight with its corresponding radar and flight plan information, and analyse if the following pre-defined criteria are met :-
    - (a) Deviation between ADS-B and radar position is **greater than 1NM** for more than 5% of total number ADS-B updates within the HKFIR; or
    - (b) Navigation Uncertainty Category (NUC) of each ADS-B reported position is **smaller than 4** for more than 5% of total number of ADS-B updates within the HKFIR; or
    - (c) Flight Identification (FLTID) entered via cockpit interface and downlinked in ADS-B data **does not match** with callsign in Flight Plan

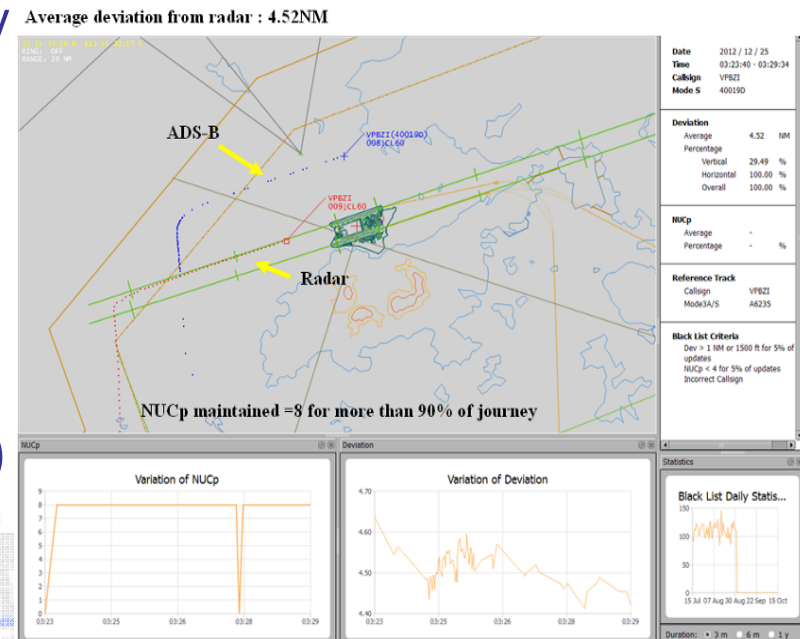




# Monitoring & Analysis of ADS-B Avionics Performance



- The system tracked more than **350,000 ADS-B aircraft** movements for 9 months (from Dec 2012 to Aug 2013)
- **Erroneous data** observed from analytical results are as expected and in line with observations for ADS-B equipage over recent years
- Three major categories of problems have been identified:
  - ✓ ADS-B position report with **good** integrity but position is actually **bad** as compared with radar (6 aircraft)
  - ✓ FLTID transmitted by ADS-B aircraft does **not** match with callsign in FPL for 15,598 (or 4.4%) of ADS-B flights
  - ✓ ADS-B position report with **no** integrity (i.e. NUC always “0”) for 16,612 (or 4.6%) of ADS-B flights

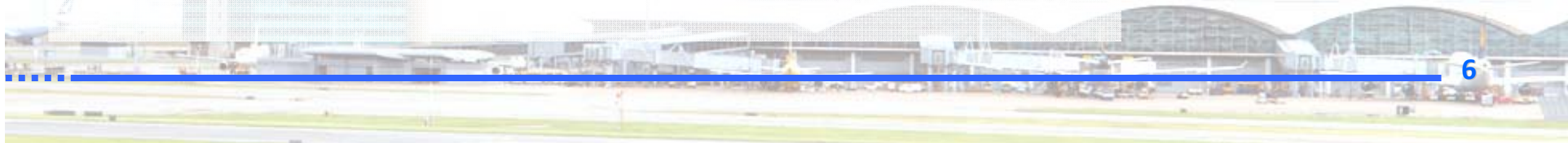


# ADS-B Ground Infrastructure in Hong Kong



- ADS-B Ground Stations Network

- ✓ Capable to detect DO260/DO260A/DO260B aircraft
- ✓ ASX CAT 21 Version 2.1 (latest Eurocontrol Version)
- ✓ Output all mandatory (Group 1), desirable (Group 2) and optional (Group 3) data fields as per Hong Kong WP and AIGD to ensure interoperability
- ✓ Installed at 8 sites to provide optimum coverage for both high-level aircraft (250NM) and low-level GA/helicopters within Hong Kong territories
- ✓ Designed for inter-connection through redundant paths via Optical Fibres + Wireless Links

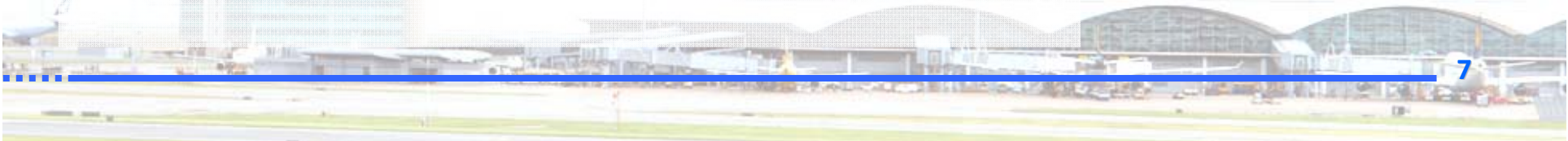


# ADS-B Ground Infrastructure



- **Central Data Processors**

- ✓ Design followed Hong Kong's WP and APAC "Guidance Material on Generation, Processing and Sharing of Asterix Category 21 ADS-B Messages"
- ✓ Fusion of ADS-B data fed from 8 sites
- ✓ Real-time conversion for different Asterix CAT 21 versions (0.23/0.26/2.1)
- ✓ Cater for both external data sharing and internal feeding to ATM automation systems
- ✓ Filtering capabilities - could pass data that meet sharing criteria
- ✓ ADS-B "Black List"

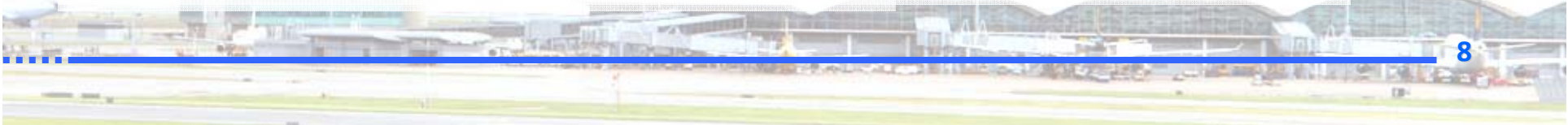




# ADS-B Ground Infrastructure



- **Air Traffic Management System (ATMS)**
  - ✓ Supports SSR and ADS-B data fusion
  - ✓ Shows different symbols for ADS-B only, ADS-B/SSR fused and SSR only targets
  - ✓ Not display ADS-B to controllers when integrity is below configurable threshold value
  - ✓ Supports monitoring of low level targets from 8,000 ft down to 50ft AMSL within 50 NM of HKIA



# Selected ADS-B Ground Station Sites in Hong Kong







# ADS-B Low-Level Surveillance



- Cooperates with Government Flying Service (GFS) for design and modification of helicopter for mounting on-board ADS-B transponder



- Launched flight trials in 2013 with GFS to assess actual low-level surveillance coverage using ADS-B



# ADS-B Deployment Plan



- **End 2013 – Mid 2014**

- ✓ Continue to collect, analyze and monitor ADS-B equipage along L642/M771
- ✓ Alert local airlines and CAAs of erroneous ADS-B transmission, contribute to allow more time for their rectification of 3 problem categories (see WP/10 from Hong Kong, China)
- ✓ Verify and formulate “black-listed” aircraft

- **Mid 2014 – End 2014**

- ✓ Make ready “good” ADS-B data for fusion with radar for ATC operations
- ✓ Conduct prelim safety assessment on trial use of ADS-B + radar signals
- ✓ Track aircraft to re-confirm their completed rectification

- **End 2014 and beyond**

- ✓ Review safety assessment on aircraft separation with experience so gained
- ✓ Make ready ground facilities coupled with satisfactory outcomes of safety assessment to support RNP4 operations along enroute L642/M771



**Thank You !**

