

GBAS Trial at the Hong Kong International Airport

ICAO GBAS/SBAS Implementation Workshop
5 June 2019



Contents

- GLS procedures in the trials
- Pre-flight trials activities
- Flight trials arrangement
- GLS at HKIA



Four GLS Procedures



Four GLS Approaches

- Four RNP 1 into GLS approach procedures :

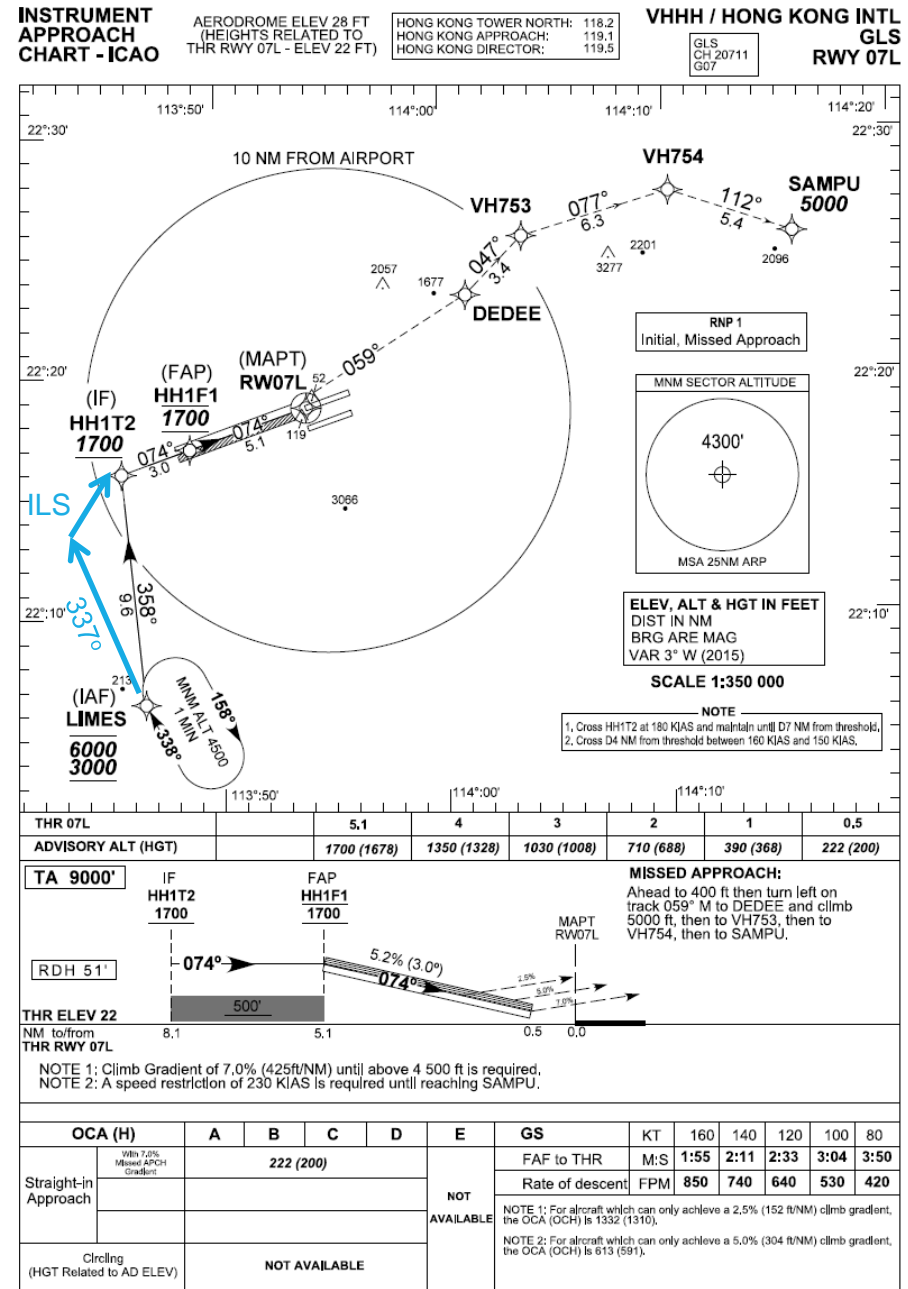
Procedure	Notes
GLS RWY 07L	Shortest practicable final approach
GLS RWY 25L	Replication of existing ILS approach
GLS Z RWY 25R	3.2° glide path angle
GLS Y RWY 25R *	Trial of limiting PANS-OPS criteria, 3.5° glide path angle

* For flight validation only, **NOT** for airline's flight demo.



GLS RWY 07L

- Based on existing ILS with a tighter turn onto final approach
- Intended to provide the shortest practicable final approach using RNP 1 into GLS criteria
- Aircraft can accept vectors to intercept final approach course



Proposed PANS-OPS Amendment

6.3.2 Intermediate approach segment alignment

The intermediate approach segment of a GLS procedure shall be aligned with the final approach segment-, except when an RF turn to the final approach course is used (see 6.3.6 below).

Insert new text as follows

6.3.6 RF turn to the final approach course

Not yet in current PANS-OPS

6.3.6.1 The intermediate approach segment may incorporate a PBN route ending with a radius-to-fix turn to the final approach course. In this case the RF turn shall terminate at a waypoint located on the final approach course. The position of this waypoint is considered as the point of localizer interception. Refer to Part III, Section 1, Chapter 1, Table III-1-1-1 for the navigation specifications that can be used for intermediate approach segment.

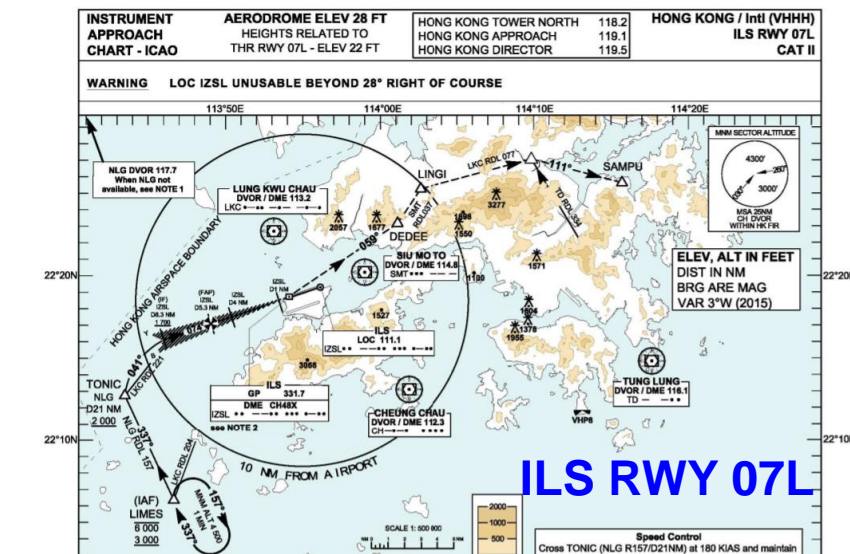
Table III-3-6-1. Minimum distance between final approach course and glide path interceptions

Intercept angle with final approach (degrees)	Cat A/B/H	Cat C/D/D _f /E
RF turn to the final approach course	1.8 km (1.0 NM)	1.8 km (1.0 NM)
< 0 — 15	2.8 km (1.5 NM)	2.8 km (1.5 NM)
16 — 30	3.7 km (2.0 NM)	3.7 km (2.0 NM)
31 — 60	3.7 km (2.0 NM)	4.6 km (2.5 NM)
61 — 90	3.7 km (2.0 NM)	5.6 km (3.0 NM)
or within a racetrack or reversal procedure		

State Letter: SP 65/4-19/28

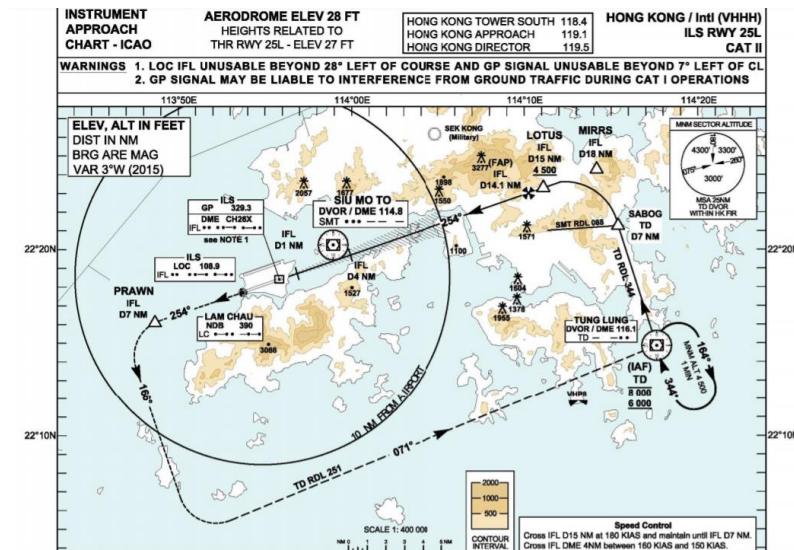
Published on: 10 Apr 2019

Planned applicability: 5 November 2020

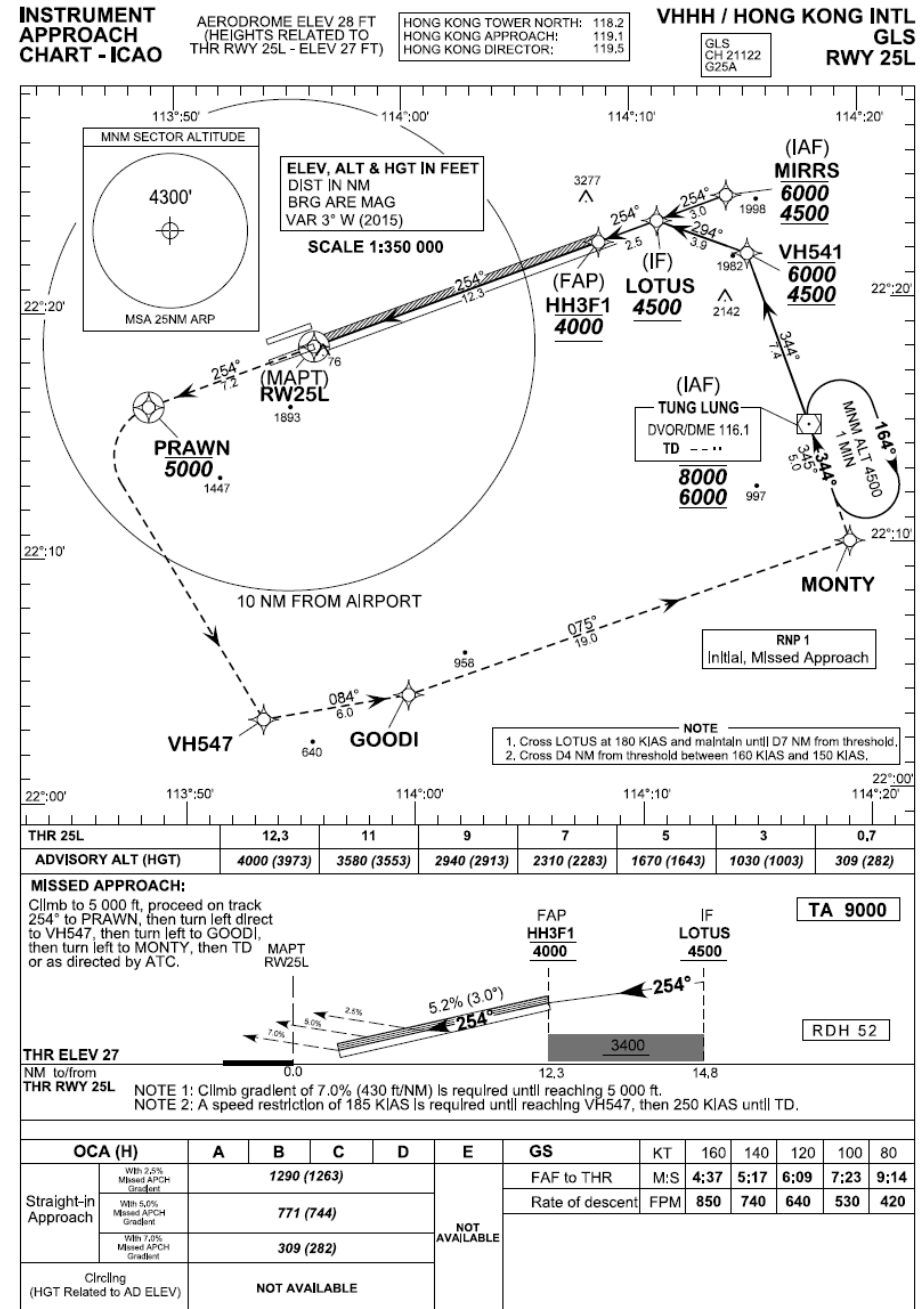


GLS RWY 25L

- Replication of existing RNP (RNP) y RWY 25L



- Possible solution for addressing South Runway ILS signal interference from ground operations of aircraft



- GLS procedure with 3.2° descent angle
- A steeper 3.2° descent angle may bring benefit in noise reduction



GLS y RWY 25R

- For flight validation only,
not intended for
operational use
- Short intermediate
approach segment
 - 2.0 NM after a 90° turn
 - RF turn not feasible due to
design criteria limitation
- 3.5° glideslope
- Evaluate the feasibility of
its application in the
obstacle-rich environment
of Hong Kong

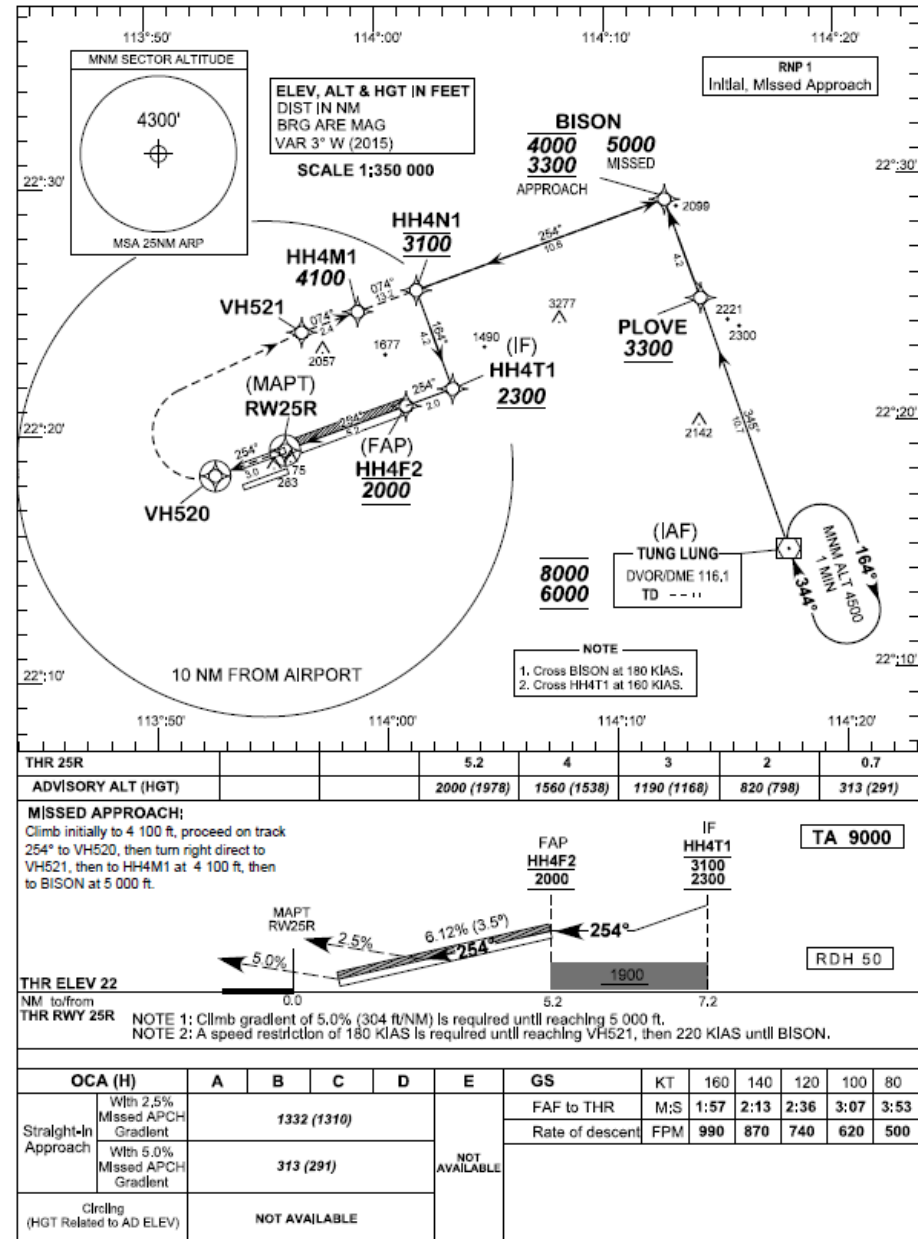
INSTRUMENT
APPROACH
CHART - ICAO

AERODROME ELEV 28 FT
(HEIGHTS RELATED TO
THR RWY 25R - ELEV 22 FT)

HONG KONG TOWER NORTH: 118.2
HONG KONG APPROACH: 119.1
HONG KONG DIRECTOR: 119.5

VHHH / HONG KONG INTL
GLS Y
RWY 25R

GLS
CH 21944
G25C

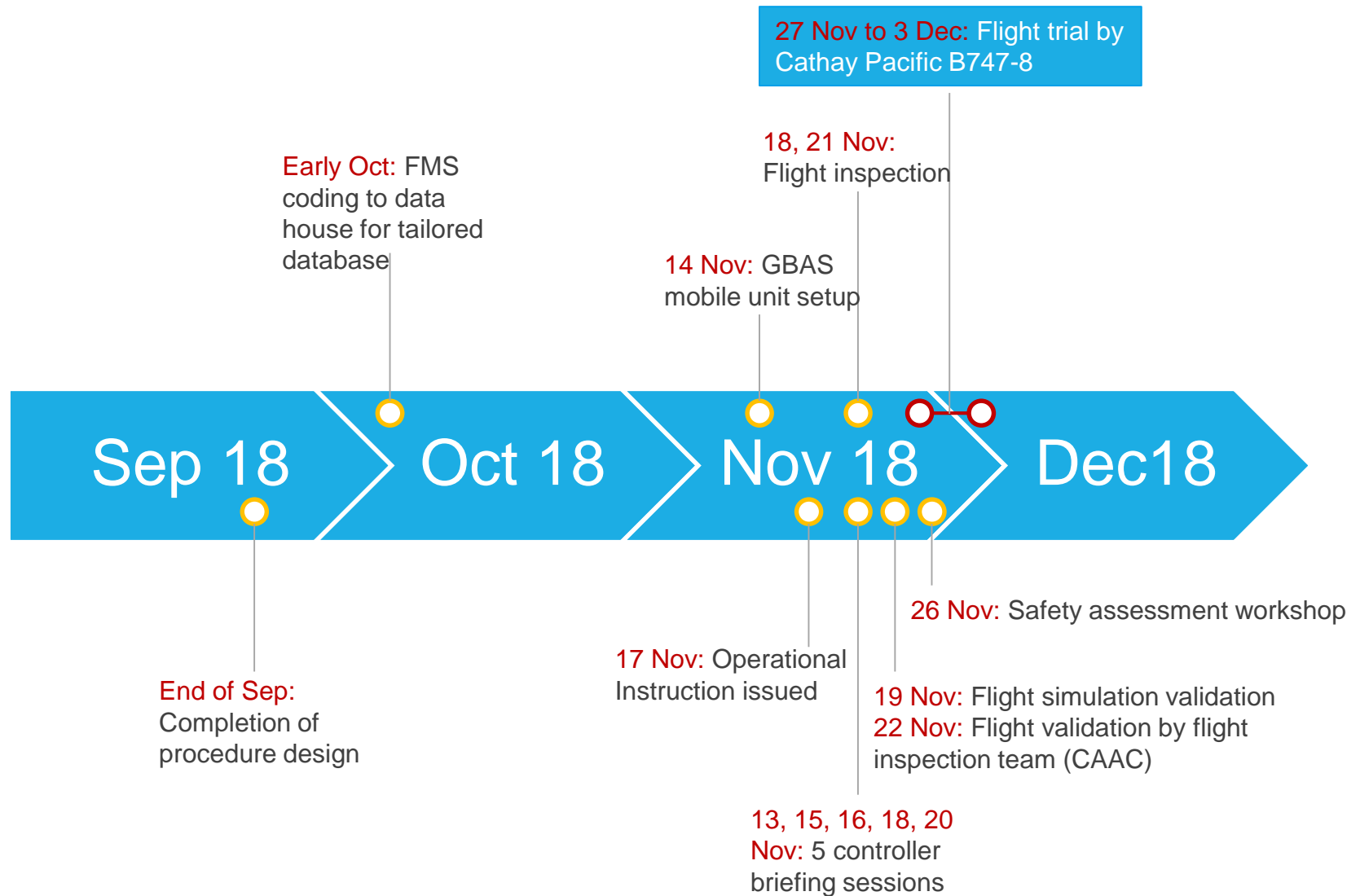


Flight Trial by Airline Operator

27 Nov to 3 Dec 2018

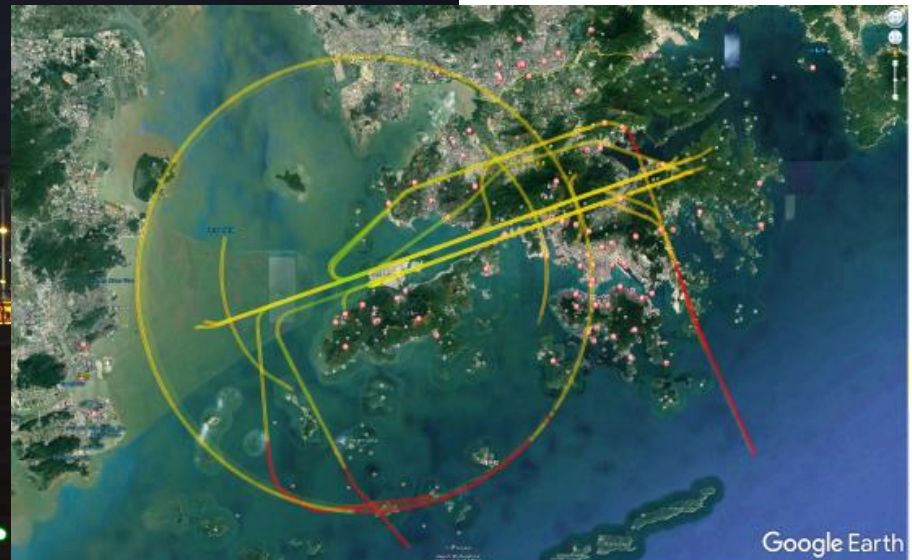


Trial overview (Flight Procedure Perspective)



Pre-Airline Flight Trials Activities

- Flight Inspection on the Portal GBAS (18th, 21st Nov)



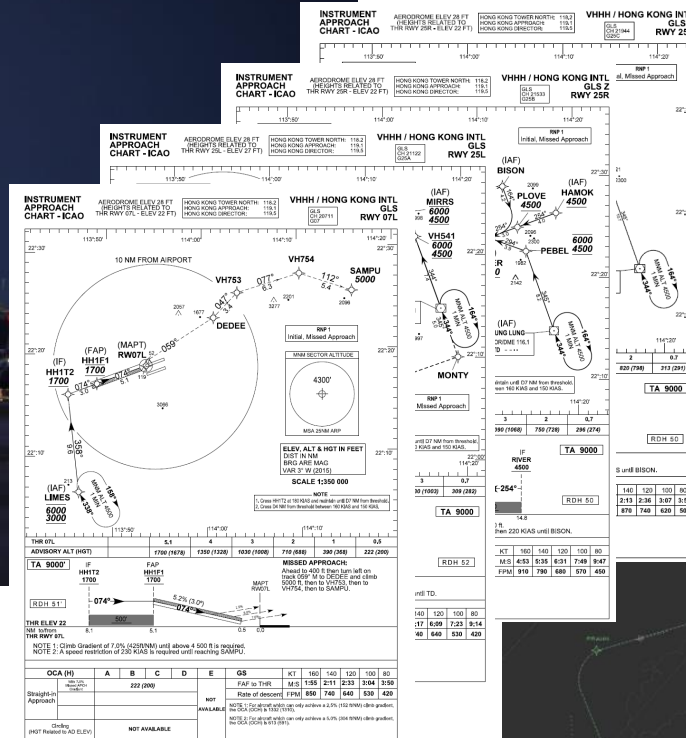
Pre-Airline Flight Trials Activities

■ Simulator Session (19th Nov)



By courtesy of Cathay Pacific

■ Flight Validation (22th Nov)



Pre-Airline Flight Trials Activities

■ Safety Assessment Workshop (26th Nov)

- Airline Representative
- CAD-Air Traffic Engineering Services Division
- CAD-Flight Standards and Airworthiness Division
 - Flight Ops
 - Airworthiness
- CAD- Air Traffic Management Division
 - OPS
 - Safety and Quality Officer (Approach)
 - Aerodrome Supervisor
 - Approach Supervisor
 - ATCO
 - Training Unit
 - Training Officer

Pre-Airline Flight Trials Activities

■ ATC related activities:

- 5 controller briefings
- Operational Instruction issued
- Maps available on controllers' display
- Approach charts available in the information display system for controllers



Flight Trials Arrangement



Flight Trials Overview

- Following successful flight check, flight validation and safety assessment
- GLS flight trials period: **27 Nov to 3 Dec 2018**
- Cathay Pacific Airways (CPA)'s B747-8 (non-passenger flight) participated the flight trial
- All B747-8 aircraft of CPA's fleet are GLS capable

Flight Trials Overview

- Portable GBAS not authorized as a sole means of navigation
- GLS are conducted with the special conditions agreed between the airline operator and regulator
- NOTAM issued to promulgate the availability of GBAS for flight trial
- Pilots' feedback collected after the flight trials

Flight Trials – The Procedures



ATC: Cleared GLS
Approach RWY 07L



Enroute controllers pass on
GLS requests to approach
controllers who would input
“GLS” on the situation display

Pilot: Request
GLS approach



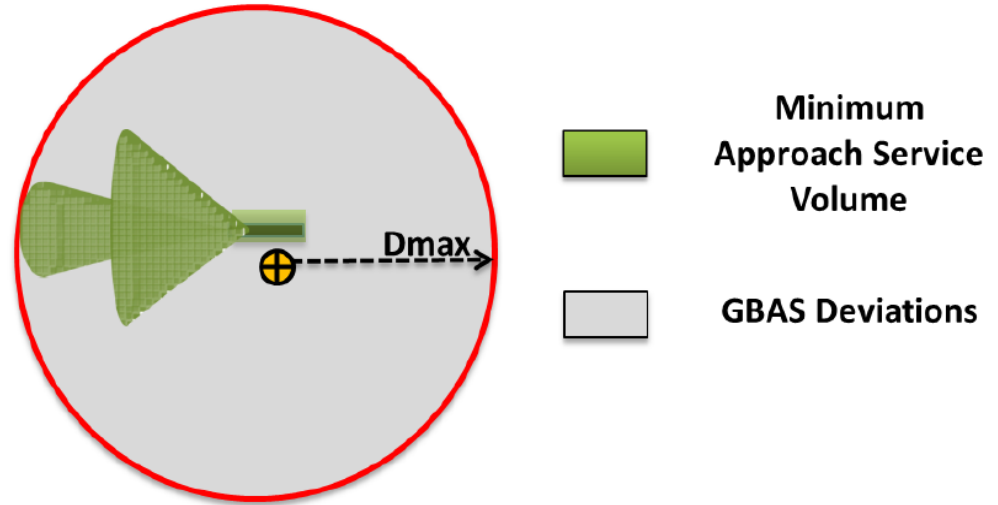
Engineers
stationed on site



GLS at HKIA

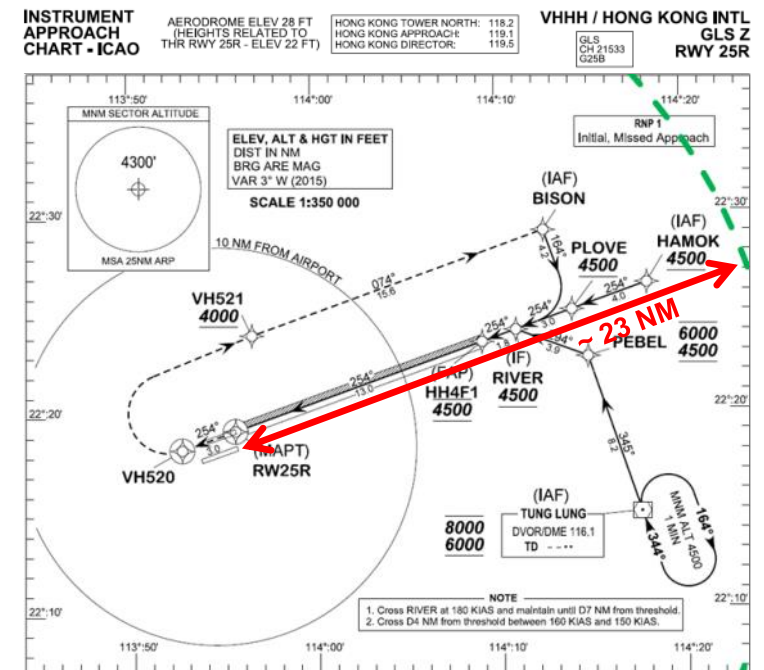
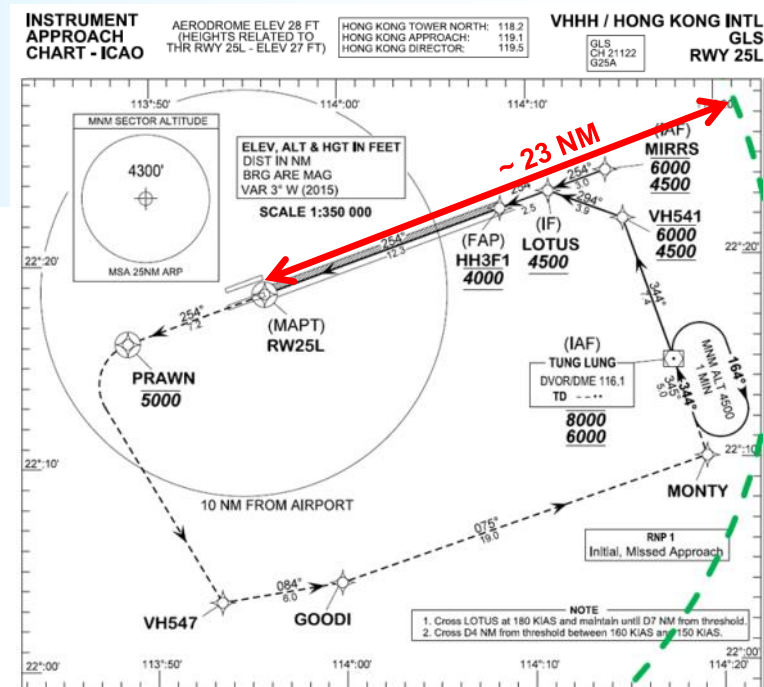
Dmax Limit – 30 NM

- Dmax (Maximum Use Distance) was set to 30 NM in response to comment from the flight inspection team



Dmax Limit

- Due to the **long final** for RWY 25L/R, Dmax of 23 NM was not adequate to provide advance information to pilots for advisory use



23 MAY 19

AIP HONG KONG

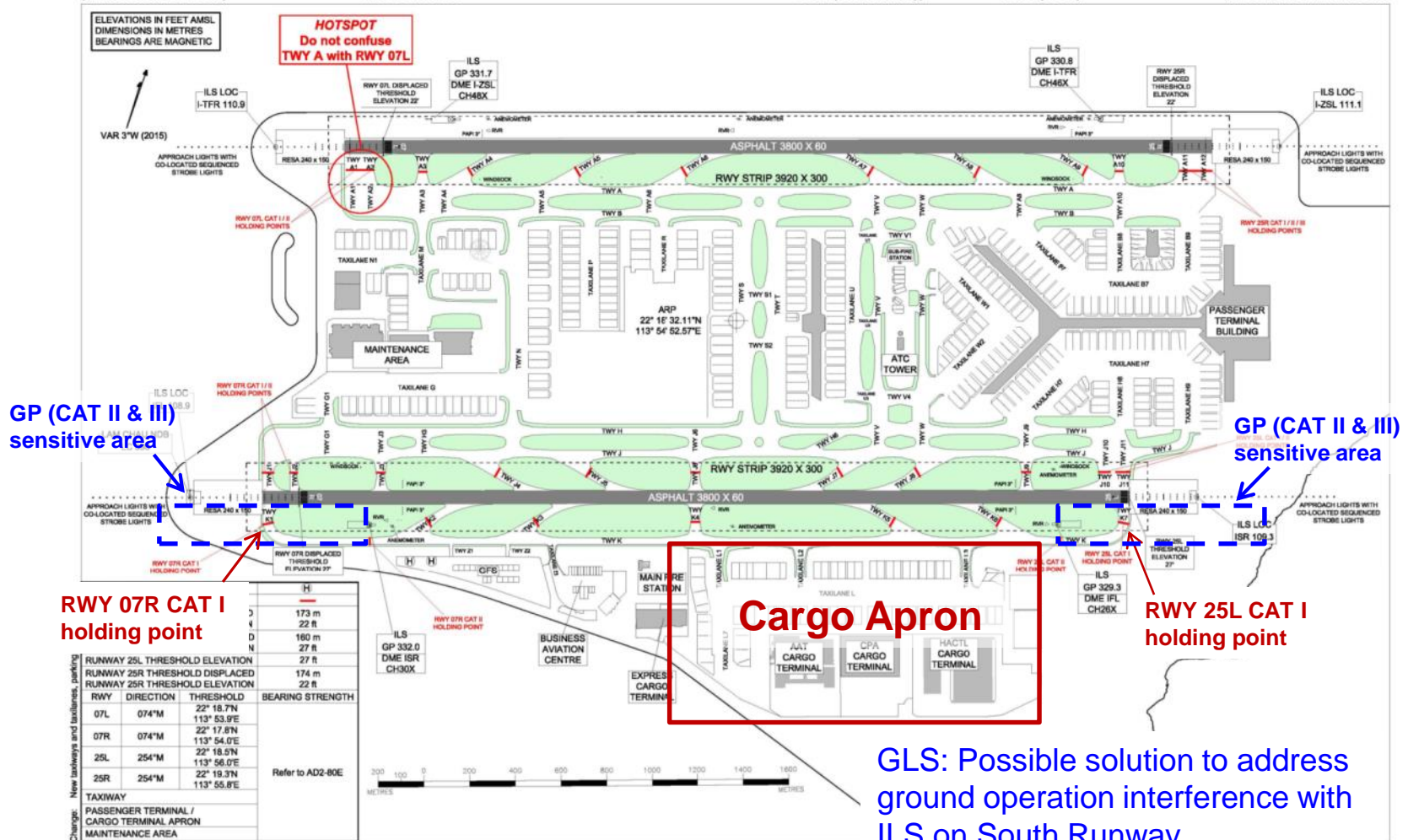
AERODROME CHART
(AERODROME LAYOUT)

ARP 22° 18' 32.11"N
113° 54' 52.57"E

ELEVATION 28 FT AMSL

TWR 118.2 (North Runway)
118.4 (South Runway)

GMC 121.6 (North) 121.875 (Midfield)
122.55 (South)

VHHH / HONG KONG
INTERNATIONAL AIRPORT

Civil Aviation Department
Hong Kong

Amendment 2/19

