Improving ATM Capacity and Efficiency

Len Wicks

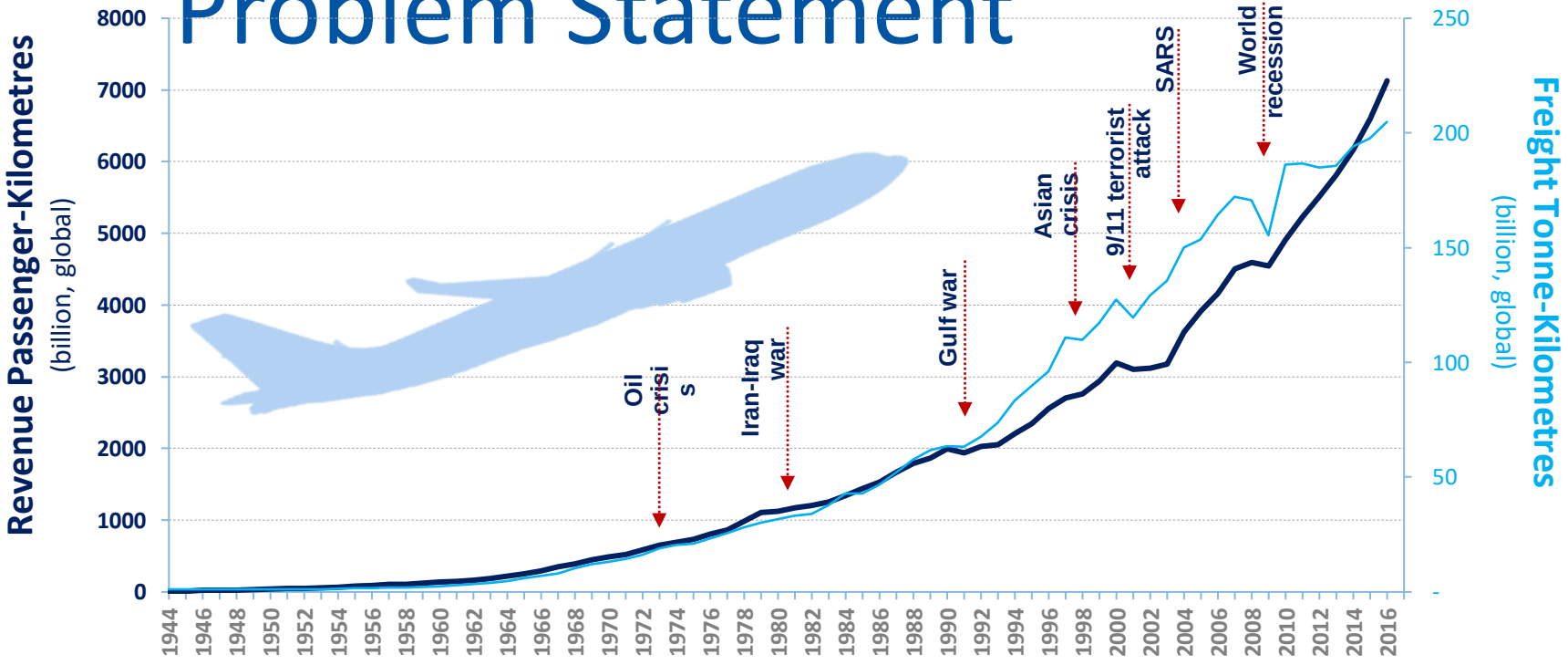
Regional Officer, Air Traffic Management,
International Civil Aviation Organization (ICAO)

Hangzhou, China, 16-18 May 2018

Contents

- Problem Statement
- Regional and National Policies
- Regional Planning
- Civil/Military Cooperation
- ATC Separation Standards
- AIM/ATFM
- Potential Solutions

Problem Statement



Source: ICAO Annual Report of the Council

Total (international and domestic) services

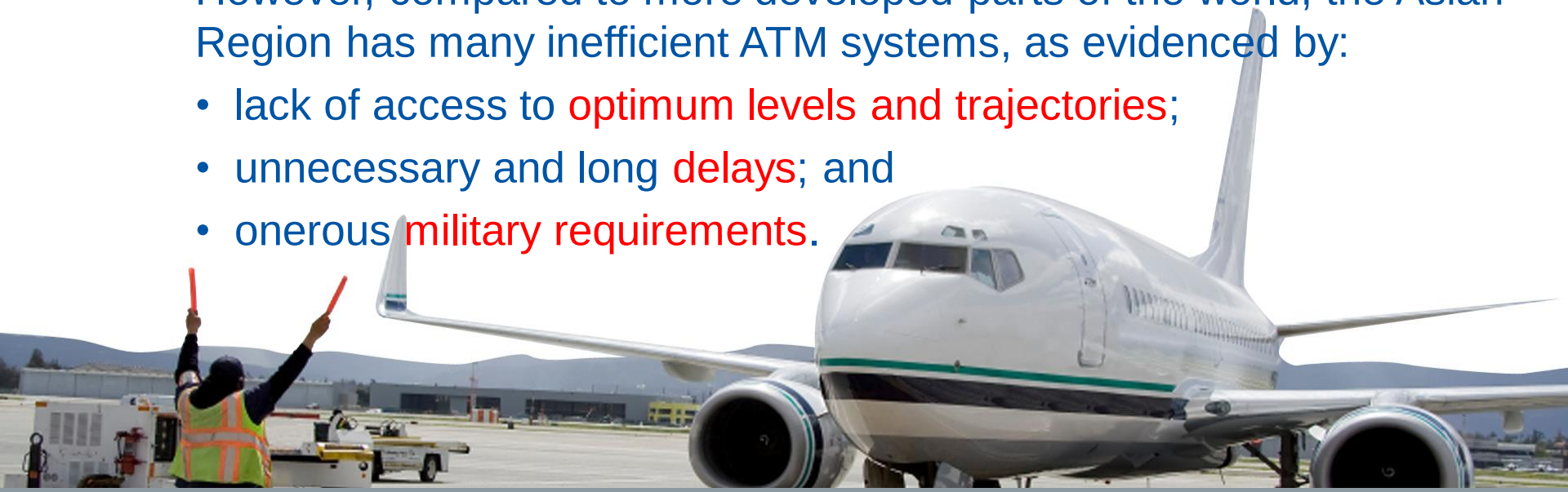
Problem Statement

The air traffic growth rate of the Asia/Pacific Region (APAC) is about 7% per annum so we now have approximately 34% of global operations, and traffic is forecast to be greater than North America and Europe combined within two decades.

Problem Statement

However, compared to more developed parts of the world, the Asian Region has many inefficient ATM systems, as evidenced by:

- lack of access to optimum levels and trajectories;
- unnecessary and long delays; and
- onerous military requirements.



Problem Statement

Why? Key underlying issues appear to indicate a lack of:

- State efforts to meet fully regional policy expectations, such as implementing an ‘aviation culture’;
- a customer-orientated approach by Air Navigation Service Providers (ANSPs); and
- effective civil/military cooperation.

Regional and National Policies

- The APAC region cannot rely on ICAO as the only entity driving convergence towards regional goals.
- A first-of-kind Asia/Pacific Ministerial Conference was held in China from 31 January – 01 February 2018.
- The DGCA Conference is an important forum but it doesn't normally involve ministry-level policy makers, nor the military.

Regional and National Policies

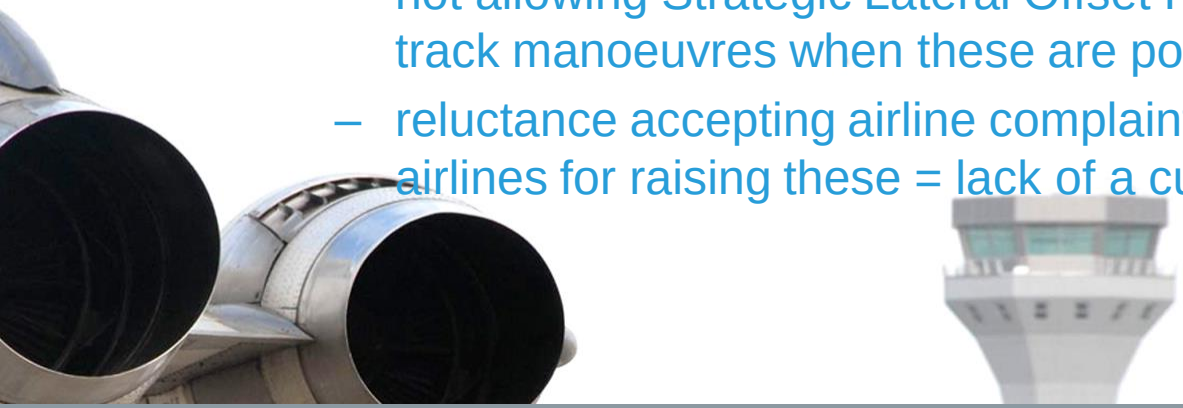
Examples of airspace/ATC difficulties caused by poor policies:

- APAC airspace is fragmented due to many Flight Information Regions (FIRs) being designed on the basis of sovereignty or revenue, instead of technical and operational considerations;
- the AKARA Corridor is managed by multiple ATC units; and
- multiple FIRs and provincial fragmentation have sometimes led to a lack of harmonized ATC procedures and systems like ATFM.

Regional and National Policies

Some States have policies known to affect flight operations:

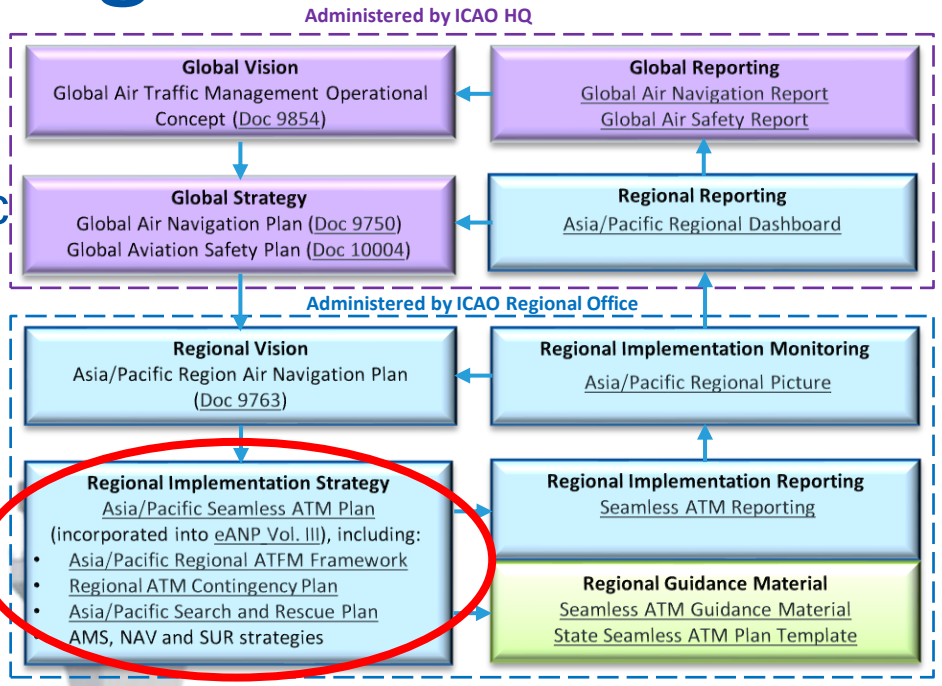
- domestic and international aircraft operators have different access rights and rules applied;
- not allowing Strategic Lateral Offset Procedures (SLOP) or off-track manoeuvres when these are possible; and
- reluctance accepting airline complaints/concerns (even punishing airlines for raising these = lack of a customer-orientated approach).



Regional Planning

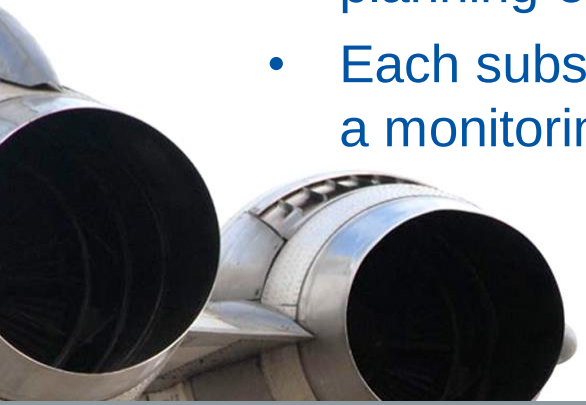
- As for the global and regional planning hierarchy, the Asia/Pacific Seamless ATM Plan is our main instrument for ATM improvement.

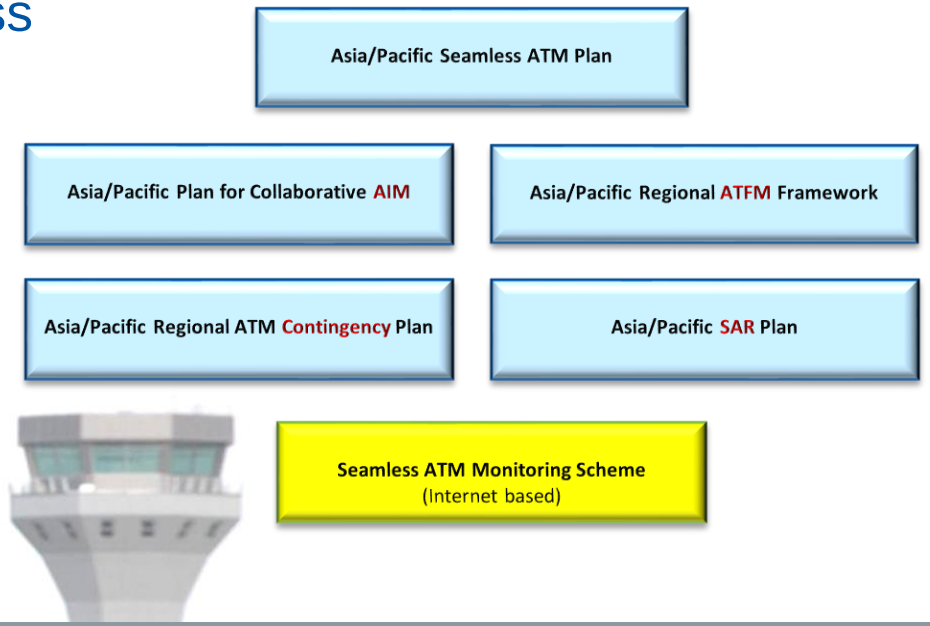
Asia-Pacific Plan for Collaborative AIM



Regional Planning

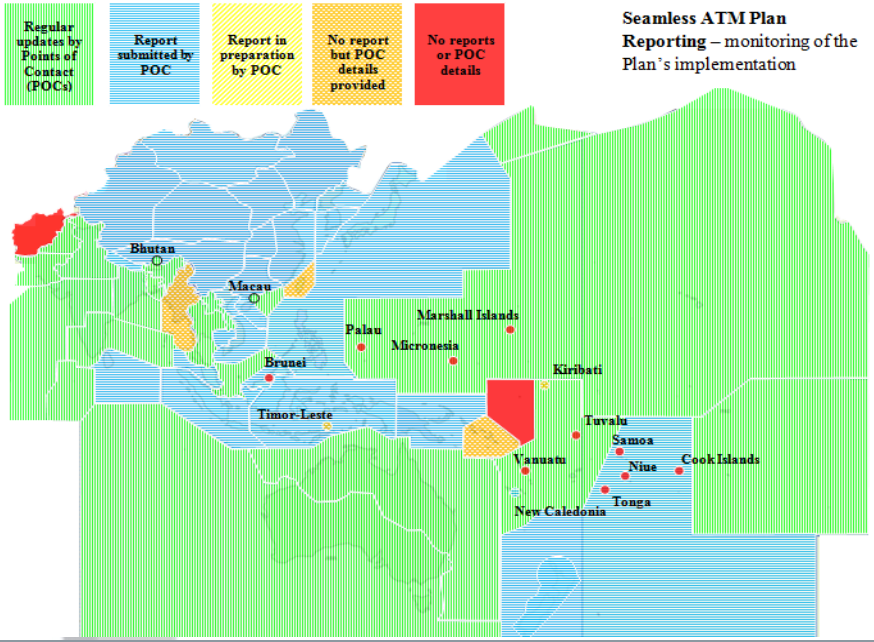
- The Asia/Pacific Seamless ATM Plan includes the regional PBN Plan's key planning elements.
- Each subsidiary plan has a monitoring scheme.





Regional Planning

- The good news! As at March 2018, 67% of Asia/Pacific (APAC) administrations had submitted a Seamless ATM report…



Regional Planning

- …but the results indicate a lack of effort by States to meet regional targets, as all 10 priority elements should be implemented by now, during Phase I.

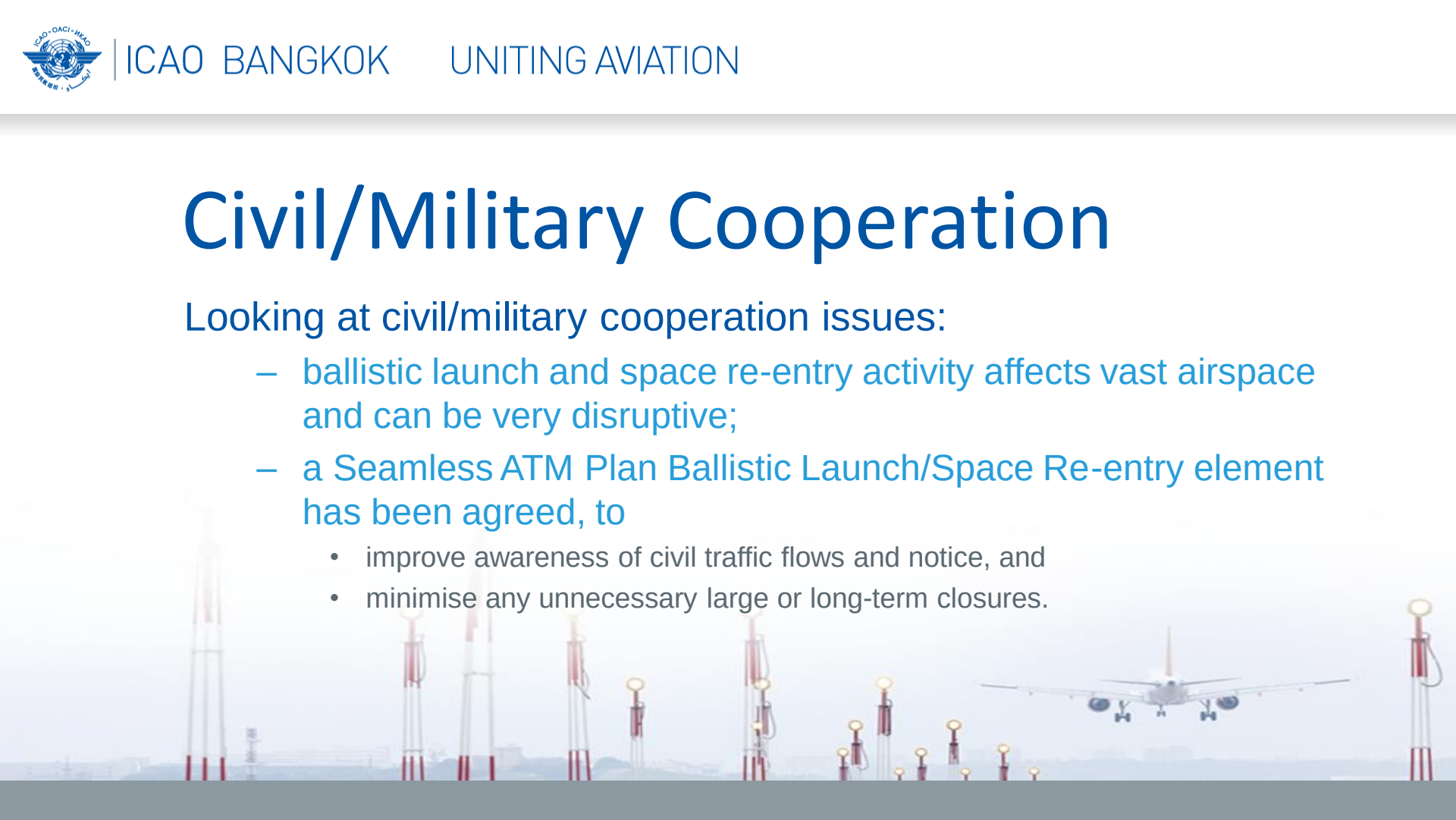
Acceptable Implementation	
ADS-C, CPDLC	**B0-TBO**
Partial Implementation	
Strategic Civil Military coordination	**Regional**
Tactical Civil Military coordination	**Regional**
ATS surveillance with data integrated	**B0-ASUR**
ATS Inter-facility Data-link Communications (AIDC)	**B0-FICE**
Partial and Slow Implementation	
Civil Military use of Special Use of Airspace (SUA)	**B0-FRTO**
Approaches, including PBN	**B0-APTA**
Air Traffic Flow Management/Collaborative Decision-Making (ATFM/CDM)	**B0-NOPS**
Unacceptable Implementation Progress	
ADS-B airspace	**B0-ASUR**
Aeronautical Information Management (AIM)	**B0-DATM**

Table 1: Summary of Priority Elements

Civil/Military Cooperation

Looking at civil/military cooperation issues:

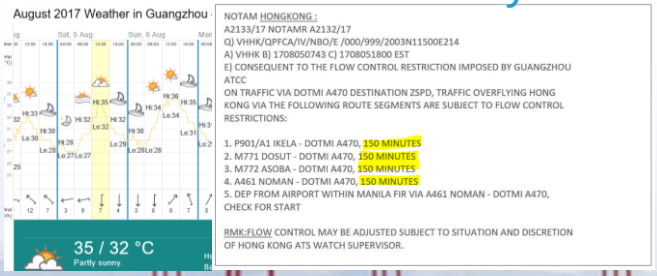
- ballistic launch and space re-entry activity affects vast airspace and can be very disruptive;
- a Seamless ATM Plan Ballistic Launch/Space Re-entry element has been agreed, to
  - improve awareness of civil traffic flows and notice, and
  - minimise any unnecessary large or long-term closures.



Civil/Military Cooperation

Looking at civil/military cooperation issues:

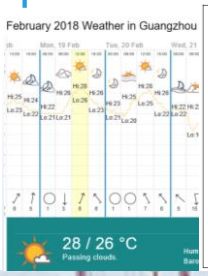
- in recent years, major delays related to East Asia have been reported, which are like to be at least partly due to military activity as this sort of delay is not evident in other areas during fine weather;
- in some airspace, conflict zones or potential conflict has led to avoidance/unavailability of airspace or restrictive measures.



NOTAM HONGKONG :
A2133/17 NOTAMR A2132/17
Q) VHHK/QPFCA/IV/NBO/E /000/999/2003N11500E214
A) VHHK B) 1708050743 C) 1708051800 EST
E) CONSEQUENT TO THE FLOW CONTROL RESTRICTION IMPOSED BY GUANGZHOU ATCC
ON TRAFFIC VIA DOTMI A470 DESTINATION ZSPD, TRAFFIC OVERFLYING HONG KONG VIA THE FOLLOWING ROUTE SEGMENTS ARE SUBJECT TO FLOW CONTROL RESTRICTIONS:

1. P901/A1 IKELA - DOTMI A470, 150 MINUTES
2. M771 DOSUT - DOTMI A470, 150 MINUTES
3. M772 ASOBA - DOTMI A470, 150 MINUTES
4. A461 NOMAN - DOTMI A470, 150 MINUTES
5. DEP FROM AIRPORT WITHIN MANILA FIR VIA A461 NOMAN - DOTMI A470, CHECK FOR START

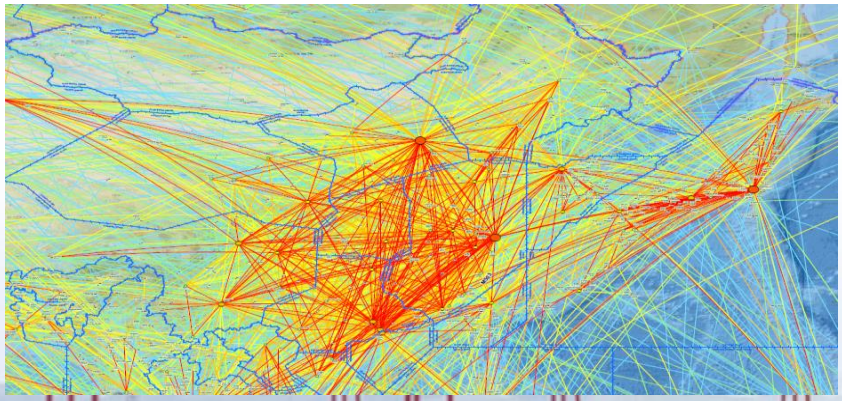
RMK:FLOW CONTROL MAY BE ADJUSTED SUBJECT TO SITUATION AND DISCRETION OF HONG KONG ATS WATCH SUPERVISOR.

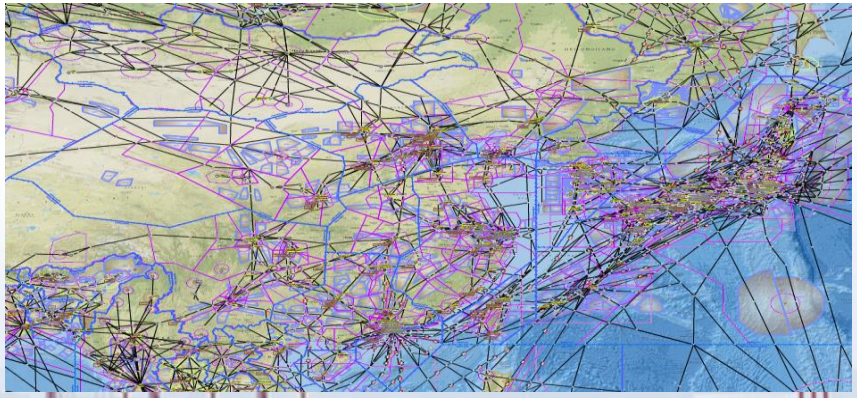


NOTAM VHHK A0348/18
A0348/18 NOTAMN [Activated Flow control procedure]
Q)VHHK/QPFCA/IV/NBO/E/000/999/2003N11500E214
A)VHHK B)1802190500 C)1802191600
E)CONSEQUENT TO THE FLOW CONTROL RESTRICTION IMPOSED BY GUANGZHOU ACC
ON TRAFFIC VIA DOTMI A470 DESTINATION ZSHC, TRAFFIC OVERFLYING HONG KONG VIA THE FOLLOWING ROUTE
SEGMENTS ARE SUBJECT TO FLOW CONTROL RESTRICTIONS:
1.P901/A1 IKELA - DOTMI A470, 120 MINUTES
2.M771 DOSUT - DOTMI A470, 120 MINUTES
3.A461 NOMAN - DOTMI A470, 120 MINUTES
4.M772 ASOBA - DOTMI A470, 120 MINUTES
RMK: FLOW CONTROL MAY BE ADJUSTED SUBJECT TO SITUATION AND DISCRETION OF HONG KONG ATS WATCH SUPERVISOR.

Civil/Military Cooperation

Theoretical city pair operations in East Asia (left) can be compared to actual route network and FIR entry points for international operations (right) – indicating military/national restrictions in some States.





Civil/Military Cooperation

What civil/military guidance does APAC have?

- The Seamless ATM Plan has 11 civil/military cooperation elements (many are incorporated into the new ICAO Doc 10088).
  - *Note: Flexible Use Airspace (FUA) is recognized as not being the most important element in the Asia/Pacific Seamless ATM Plan – strategic and tactical cooperation, and Special Use Airspace are!*
- The Asia/Pacific SAR Plan also has civil/military cooperation elements.

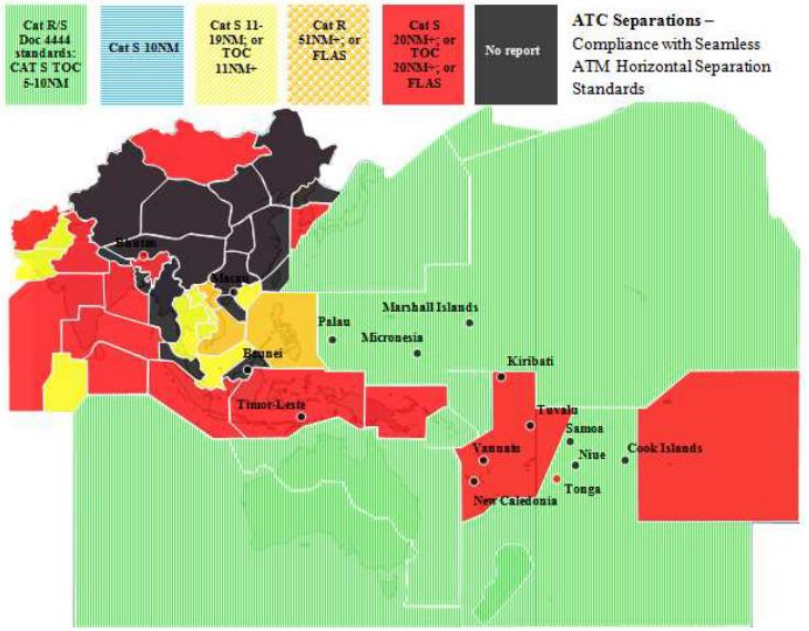
ATC Separation Standards

It is a truly strange situation – the difference in mindsets when it comes to land transport and aviation in many parts of Asia:

- leading to the application of overly conservative standards and practices that are inconsistent with safe aviation systems in more developed States, including the use of inefficient ATC separation standards.

ATC Separation Standards

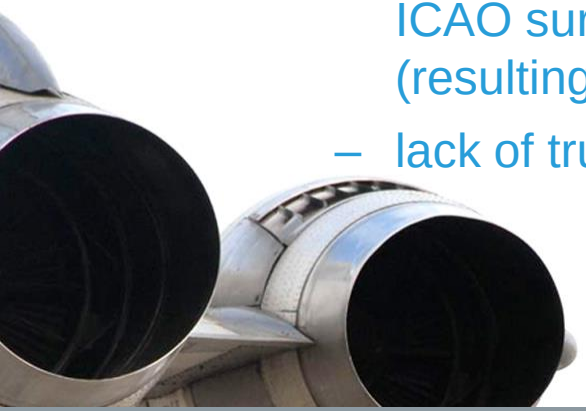
- Many Asian States impose:
  - a procedural Flight Level Allocation Scheme (FLAS), even in surveillance environments; and
  - restrictive Transfer of Control (TOC) measures of 30-80 NM.
    - it appears to be a matter of culture!



ATC Separation Standards

Why do many ATC units use conservative separation standards?

- due to unreliable TOC coordination, instead of fixing the root causes;
- often, ATC managers with a procedural background don't believe ICAO surveillance standards are safe, so impose larger spacing (resulting in increased ATC workload due to more conflicts); and
- lack of trust in controllers; often due to punitive reactions to incidents.



ATM Systems

7.35 The delivery of CNS/ATM services should be based primarily on the CNS/ATM capability. All ATC units should authorise the use of the horizontal separation minima stated in ICAO Doc 4444 (PANS ATM), or as close to the separation minima as practicable, taking into account such factors as:

a) the automation of the ATM system;

b) the capability of the ATC communications system;

c) the performance of the ATS surveillance system, including data-sharing or overlapping coverage at TOC points; and

d) ensuring the competency of air traffic controllers to apply the full tactical capability of ATS surveillance systems.

Seamless ATM Plan Extract

ATC Separation Standards

- The Asia/Pacific Seamless ATM Plan has expectations on:
  - human performance (including use of surveillance-based separations and avoidance of FLAS); and
  - the establishment of an 'Aviation Culture'.

At least two States have been known to conduct 'collective punishment' for errors by individuals that should have no punitive action under 'Just Culture, and for merely raising a safety concern!

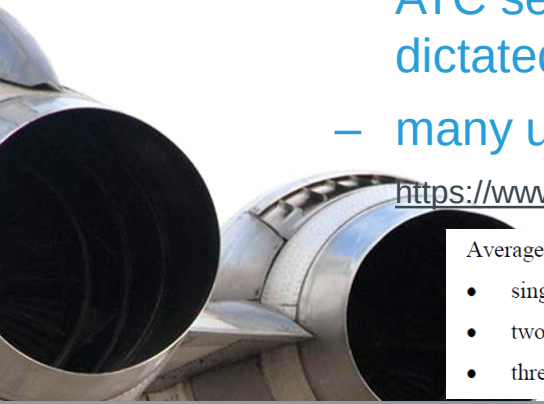
ATC Separation Standards

- Other major causes for the establishment of efficient ATC separation standards are:
  - using the wrong PBN specifications:
    - RNAV 10 50NM should be eliminated by 2019 in oceanic airspace and never used elsewhere (RNP 4 is better and RNP 2 [RNAV 2/RNP 1/GNSS] is best);
    - RNAV5 is not part of APAC planning because of a lack of terrestrial nav. aid geometry, ATC separation standards, and lack of requirements for waypoint sequencing and database;

ATC Separation Standards

Looking specifically at terminal airspace:

- runway capacity studies in the Seamless ATM Plan indicate arrival rates much greater than used for many Asian aerodromes, and ATC sector capacities may also be an issue (spacing is sometimes dictated due to excessive runway occupancy times = mindset); and
- many units do not use runways for both arrivals and departures https://www.youtube.com/watch?v=fhUqv-qg4tE (lack of trust in 'ready' reports?).



Average aerodrome arrival capacity expectations (range):

- single runway: IMC average **26** (25-34), VMC average **32** (26-42);
- two parallel/near parallel runways: IMC **55** (40-68), VMC **64** (52-82);
- three parallel/near parallel runways: IMC **74** (72-76), VMC **97** (96-100);

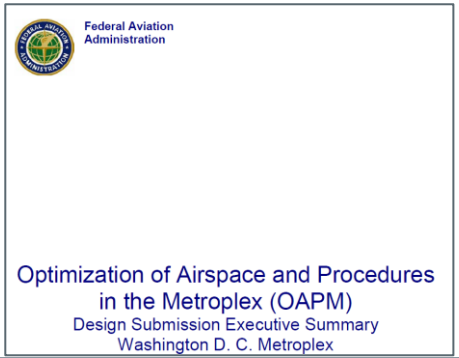
ATC Sector capacity expectations:

- terminal/low level Category T airspace: **12-18** aircraft; and
- en-route Category S airspace: **16-20** aircraft; and
- en-route Category R airspace: **17-24** aircraft.

ATC Separation Standards

Looking specifically at terminal airspace:

- many ANSPs fail to use the 3NM and 2.5NM surveillance standards, or use them inconsistently;
- lack of ‘metroplex’ big picture planning is an issue to establishing efficient approach and departure procedures.



AIM/ATFM

- Aeronautical Information Management (AIM) issues:
  - less than 56 days' notice NOTAM issuance for major ATM changes (often poor project management or lack of AIM empowerment); and
  - Lack of quality assurance in AIM (56% of APAC States!):
    - Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, Cook Islands, Indonesia, Kiribati, Lao PDR, Maldives, Marshall Islands, Micronesia, Myanmar, Nauru, Nepal, Palau, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Vanuatu;

AIM/ATFM

- Aeronautical Information Management (AIM) issues:
  - one State deliberately offsetting runway end coordinates so the aeronautical data is incorrect; and
  - at least one State uses two AIPs – one ‘secret’ for national use.

AIM/ATFM

APAC ATFM development is well behind, currently focused on the multi-nodal ('virtual ATFM') concept, and developments in China (some regions), India (C-ATFM), and in East Asia (NARAHG):

- there is some progress in the exchange of Daily ATFM Plans and the in-principle agreement on ATFM information exchange;
- at present, the multi-nodal trial is at a limited application of the Ground Delay Programme (GDP) stage but communications systems have been tested;

AIM/ATFM

There has been concern raised about divergence from global and regional (Asia/Pacific Regional ATFM Framework) ATFM principles:

- one State proposes arbitrary over-restrictive minutes in trail (MINIT) to be imposed instead of a properly formulated ATFM program; and
- another State is signaling that they would like to 'use' the future ATFM system's Calculated Time Over (CTO) for fixes as a means of 'proceduralising' what should be tactical (surveillance) airspace.

Doc 9971 Extract

4.8.3 **Calculated time over (CTO) and required time of arrival (RTA)**. Traditional ground delay measures use CTOT (calculated take-off time) calculated back from the required time at the constrained ATM resource (CTO or RTA). Most modern aircraft and AU flight planning systems are fully capable of integrating the required time at the constrained resource, directly into their FMS and trajectory plan. This can enable the flight to manage its speed in order to meet the ATFM constraint with a high degree of accuracy. The use of CTO and RTA delegates the compliance responsibility for ATFM measures more to the airspace user whereas the ATS unit takes on an oversight role. Any effect on ATC (e.g. reduction of true air speed (TAS) en-route) must be notified and coordinated with the affected ATC units, preferably via online data interface (OLDI) or other appropriate means. The transition to time-over/arrival time ATFM measures is a gradual process that requires education and collaboration to ensure that requirements are understood and met. Such techniques should be considered as advanced and require substantial experience for their implementation.

Potential Solutions

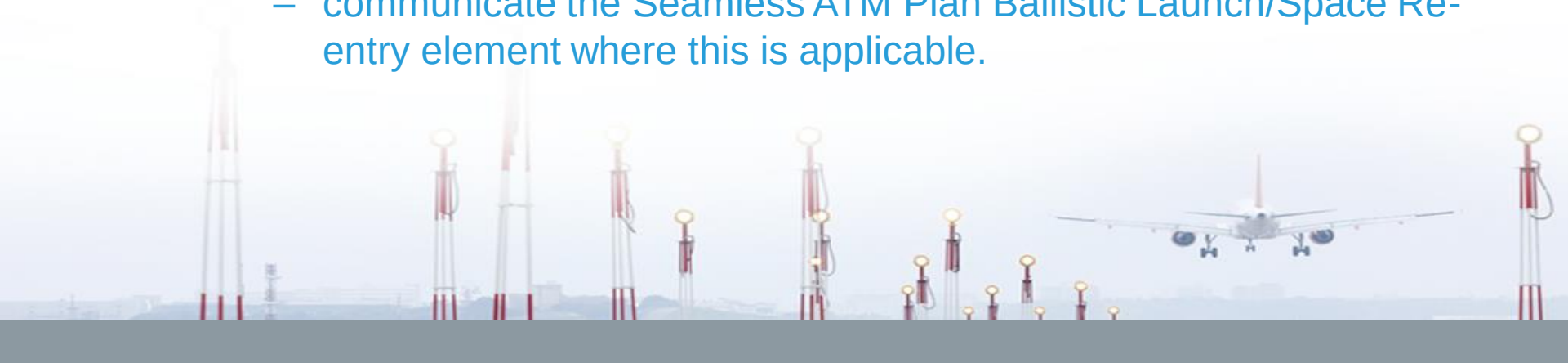
- Potential solutions to assist ATM capacity and efficiency:
  - IATA and airlines should provide more data on airline performance so ATC systems can measure capabilities and identify improvements; and
  - other bodies such as ICAO, IFALPA, IFATCA, ACI and CANSO should assist IATA in assessing the overall performance of ANSPs.

Potential Solutions

- Potential solutions to assist ATM capacity and efficiency:
  - greater engagement in and understanding by airlines of ANSP and airspace (including FIR) planning – especially ‘aviation culture’;
  - more assured discipline when using runways to minimize occupancy;
  - better airline knowledge of Seamless ATM expectations; and
  - encouragement of ‘metroplex’ style planning where appropriate and the use of the most efficient ATC separations.

Potential Solutions

- Potential solutions to assist ATM capacity and efficiency:
  - encourage focused, ‘single State’ civil/military cooperation workshops; and
  - communicate the Seamless ATM Plan Ballistic Launch/Space Re-entry element where this is applicable.



Potential Solutions

- Potential solutions to assist ATM capacity and efficiency:
  - emphasising the need to improve aeronautical data and AIM empowerment;
  - insisting on compliance with regionally-agreed ATFM policies; and
  - issuance of APANPIRG deficiencies against failure to provide Annex 15 compliant notice of major changes or use of the EUR 'work-around' (Temporary Reserved and Segregated Areas (TRAs/TSAs)) without having ATFM and Network Manager capabilities.

ICAO


North American Central American and Caribbean (NACC) Office Mexico City
South American (SAM) Office Lima
ICAO Headquarters Montréal
Western and Central African (WACAF) Office Dakar
European and North Atlantic (EUR/NAT) Office Paris
Middle East (MID) Office Cairo
Eastern and Southern African (ESAF) Office Nairobi
Asia and Pacific (APAC) Sub-office Beijing
Asia and Pacific (APAC) Office Bangkok
THANK YOU