Australia Indonesia Partnership

Kemitraan Australia Indonesia

AIR TRAFFIC MANAGEMENT

PLANNING REVIEW - FINAL REPORT




INDONESIA
INFRASTRUCTURE
INITIATIVE

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July 2010

INDONESIA INFRASTRUCTURE INITIATIVE

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Peder Alber
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Lars Adolfsson

Jakarta, 31 July 2010

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AAMA	Australian Airspace Monitoring Agency
A-SMGCS	Advanced Surface Movement Guidance and Control System
ABAS	Aircraft-Based Augmentation System
ACC	Area Control Centre
ACT	Aviation Consulting Team
ADC	Aerodrome Control
ADS	Automatic Dependent Surveillance
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AIDC	ATS Inter-Facility Data Communications
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Services
AIM	Aeronautical Information Management
AMAN	Arrival Manager
AMC	Airspace Management Cell
AMHS	Aeronautical Message Handling System
AMSS	Aeronautical Mobile-Satellite Service
ANS	Air Navigation Services
ANSP	Air Navigation Services Provider
AO	Aerodrome Operations
AOM	Airspace Organisation Management
APAC	Asia Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
AP1	PT Angkasa Pura 1
AP2	PT Angkasa Pura 2
APP	Approach Centre
ASM	Airspace Management
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
ATCO	Air Traffic Control Operator
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMSDM	ATM Service Delivery Management

ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
AUO	Airspace User Operations
AWOS	Acquisition Weather Observation Stations
BLU	Public Service Agency
CAA	Civil Aviation Administration
CASR	Civil Aviation Safety Regulations
CBT	Computer Based Training
CDA	Continuous Descent Approaches
CDM	Collaborative Decision Making
CDR	Conditional Route
CM	Conflict Management
CNS	Communications, Navigation and Surveillance
CPDLC	Controller-Pilot Data Link Communications
CTR	Control Zone
CVOR	Conventional VHF Omni-directional Range
CWP	Controller Working Positions
D-ATIS	Digital-Automatic Terminal Information Service
DCB	Demand and Capacity Balancing
DG	Director General
DGCA	Directorate General of Civil Aviation
DGAC	Directorate General of Air Communication
D-VOLMET	Digital Meteorological Information for Aircraft in Flight
DMAN	Departure Manager
DME	Distance Measuring Equipment
DVOR	Doppler VHF Omni-directional Range
FANS	Future Air Navigation Services
FDPS	Flight Data Processing System
FIR	Flight Information Region
FL	Flight Level
FMS	Flight Management System
FMP	Flow Management Position
FUA	Flexible Use of Airspace
GANP	Global Air Navigation Plan
GATMOC	Global ATM Operational Concept
GBAS	Ground-Based Augmentation System

GLONASS	Global Orbiting Navigation Satellite System
GNSS	Global Navigation Satellite System
GPI	Global Plan Initiative
GPS	Global Positioning System
GRBS	Ground-Based Augmentation System
HF	High Frequency
IATA	International Air Transport Association
IAVW	International Airways Volcano Watch
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ICVM	ICAO Coordinated Validation Mission Report
IndII	Indonesian Infrastructure Initiative
ITU	International Telecommunication Network
JAATS	Jakarta Advanced Air Traffic Control System
KPI	Key Performance Indicators
LoA	Letter of Agreement
LVP	Low Visibility Procedure
MAATS	Makassar Advanced Air Traffic Control System
MET	Meteorological Services for Air Navigation
METAR	Meteorological Report
MLAT	Multilateration
MoT	Ministry of Transport
MSSR	Monopulse Surveillance Radar
MSAW	Minimum Safe Altitude Warning
MTCD	Medium Term Conflict Detection
NDB	Non Directional Beacon
NOTAM	Notice to Airmen
OPMET	Operational Meteorological Information
PBN	Performance Based Navigation
PSR	Primary Surveillance Radar
PRM	Precision Runway Monitoring
PRNAV	Precision Area Navigation
R&D	Research and Development
RPL	Repetitive Flight Plan
RMA	Regional Monitoring Agencies

RDPS	Radar Data Processing system
RNAV	Area Navigation
RNP	Required Navigation Performance
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum
SARPs	Standards and Recommended Practices
SBAS	Satellite-Based Augmentation
SID	Standard Instrument Departure
SMS	Safety Management System
SSR	Secondary Surveillance Radar
SSP	State Safety Programme
STARs	Standard Instrument Arrival
STCA	Short Term Conflict Alert
SUP	Supplement
SWIM	System Wide Information Management
TLS	Target Level of Safety
TMA	Terminal Control Area
TOC	Table of Contents
TS	Traffic Synchronisation
VDL	VHF Digital Link
VCS	Voice Communication System
VFR	Visual Flight Rules
VHF	Very High Frequency
VHF-ER	Very High Frequency-Extended Range
VMC	Visual Meteorological Conditions
VOR	VHF Omni-directional Range
VSAT	Very Small Aperture Terminal
WGS-84	World Geodetic System — 1984
WAFS	World Area Forecast System
WRC	World Radio Communication Conferences
UTA	Upper Control Area

EXECUTIVE SUMMARY

BACKGROUND

The Republic of Indonesia is a huge archipelagic country in South-east Asia, spreading more than 5,000 km from west to east and more than 1,800 km from north to south.

Indonesia, with more than 15,000 islands, is therefore very dependent on a well functioning air transport system for the socioeconomic growth, both on a regional basis as well as on a national one.

In fact, it is not wrong to say that the entire Asia Pacific region is dependent on Indonesia's air transport, since almost 50 percent of all flights going to and from the Australian continent crosses the Indonesian airspace. Many studies concerning the air transport situation provided by traffic forecasts and analysis, Communications, Navigation and Surveillance and Air Traffic Management (CNS/ATM) systems analysis of current Indonesian infrastructure and the need for further change to adapt to future growth and adaptation to global requirements have been conducted. In this respect, the Asean Open Sky Policy will also emphasise the need for developing ATM.

The Air Navigation Services (ANS) in Indonesia are provided by three different organisations: the Directorate General of Civil Aviation (DGCA), which also provides regulatory oversight; and two state owned enterprises, PT Angkasa Pura 1 (AP1) and PT Angkasa Pura 2 (AP2). En-route services are provided primarily by AP1 and AP2, as are services at Indonesia's 27 largest airports. Terminal and airport services at more than 100 smaller airports are provided by DGCA..

According to the new Law no. 1/2009 on aviation, a single Air Navigation Services Provider (ANSP) will, at the latest by 12 January, 2012, be the sole provider of ANS for the Indonesian airspace and areas where the ANS will be delegated to the Indonesian ANSP. Exceptions are areas where the Indonesian ANSP will delegate the responsibility of ANS to another provider of this service.

The LFV Aviation Consulting Team (ACT) has made a total of 26 visits to the DGCA Directorate of Air Navigation on different sub-organisations, including a visit to the Notice to Airmen (NOTAM) Centre (NOF) in the same building as DGCA. The LFV ACT also visited the Area Control Centre (ACC) at the Jakarta International Airport and studied the facilities at the ACC, Approach Centre and Aerodrome Control (APP/ADC). With the help of a prepared questionnaire, the team also had discussions with the staff of ACC, APP andADC. The LFV ACT also visited the PT Angkasa Pura 1 (AP1) and PT Angkasa Pura 2 (AP2) headquarters, with further questions and discussions with the staff and managers.

The report information has mainly been collected from the following documents:

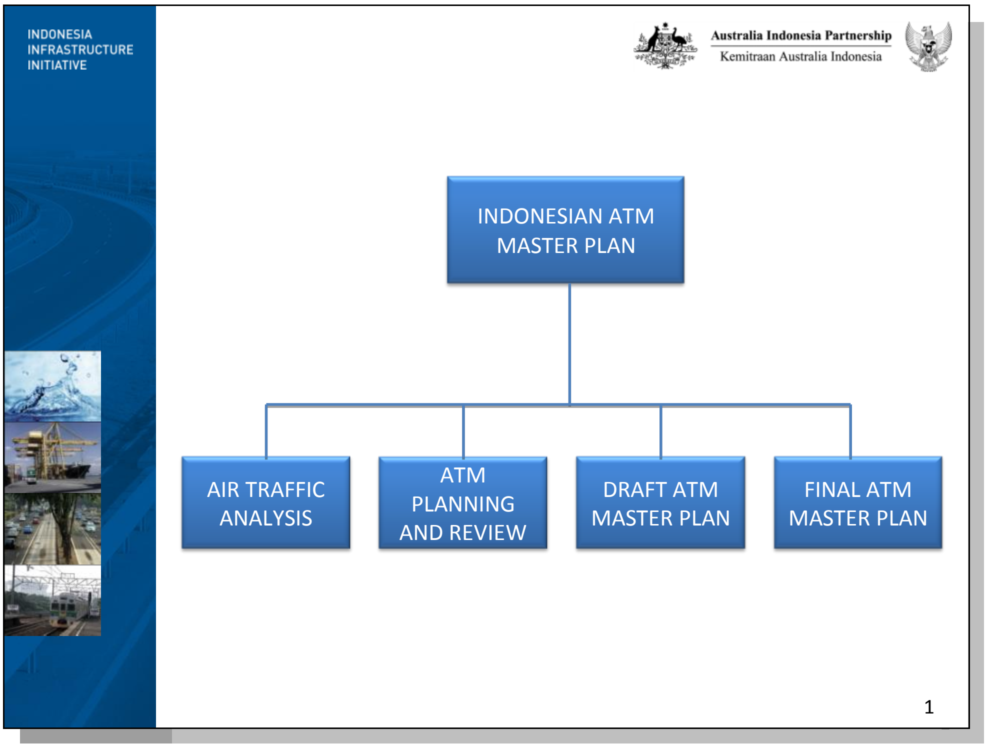
- The former Air Traffic Control (ATC) Master Plan 1994.
- The new Aviation Law no. 1/2009.
- Japan International Cooperation Agency (JICA) reports.
- ICAO`s [International Civil Aviation Organisation] Coordinated Validation Mission (ICVM) report based on the ICAO mission to Indonesia from 4 to 7 August, 2009 and
- relevant ICAO documents.

OBJECTIVE

The LFV ACT has been assigned the task by SMEC International Pty Ltd. (SMEC), for the Indonesia Infrastructure Initiative (IndII) to prepare an update of the 1994 ATM Master Plan , conducted by the French company Sofréavia.

This mission also included other earlier deliverables according to the time schedule, as mentioned in figure 1.

Figure 1: Indonesian ATM Master Plan and earlier deliverables



Source: Consultants' planning

The objective of this report on Indonesian ATM Planning Review is to:

- develop recommendations to align existing ATM infrastructure program with the ICAO Global Plan Initiatives (GPIs) and identify gaps between the existing programs and activities required to support the transition of Indonesia to the Global ATM Operational Concept (GATMOC);
- review the 1994 ATC Master Plan;
- identify the facilitating and constraining factors for Indonesian ATM planning and project implementation; and
- identify priority programs to address immediate safety and/or efficiency shortfalls.
- On the basis of this review and traffic analysis, update the DGCA 1994 ATC Strategic Plan, focusing on provision of ANS which is in line with the ATM community expectations described by ICAO.

The ATM Master Plan will consist of three evolutionary phases - short term 2011-15, medium term 2016-2020 and a long term 2021-2025 and beyond, followed by a recommended road map of required activities in order to assist DGCA in future ATM infrastructure replacement and refurbishment.

The aforementioned phases will follow the intention of ICAO for the Global Plan evolution and the seven key concepts described in the ICAO GATMOC.

Phase 1: This will be based on what we have today and will deal with procedures, processes and capabilities that are mostly available and will identify gaps that can be filled within the next evolutionary phase.

Phase 2: This will be based on what we know today and will deal with procedures, processes and capabilities that we know will be emerging and identify more gaps that will be a driver for future Research and Development (R&D).

Phase 3: This will be based on concept expectations and will deal with new procedures, processes and capabilities and fill the previous gaps and continue with required improvement in R&D.

FINDINGS

The LFV ACT has, during the fact finding process, experienced that ATM in Indonesia has been the object of many studies, encompassing analysis and recommendations conducted by several non Indonesian companies and agencies. The Ministry of Transport (MoT) has made a current investment plan for ATM for the time period 2010-2014.

Indonesian ATM has major challenges in order to be able to provide the ANS for the rapidly accelerating demand. In order to comply with the ICAO's Global Air Navigation Plan (GANP) with a future performance based operation, several actions have to be taken today to cater to future requirements. The updated ATM Master Plan will propose a road map that takes this into account, with required activities.

Many current discussions in the ANS system concern the plans of the forthcoming reorganisation. In the opinion of our team, waiting too long with the implementation of this single ANSP, will stall many urgent decisions to be taken, which will portray a negative impact on Indonesian ATM's possibilities to cater to the increasing demand of ANS.

Comparing ICAO´s GPIs and current ATM status in Indonesia indicates that there are some areas where Indonesia is fully compliant, areas where it is partly compliant and areas where it is not implemented. Likewise, the identified gaps between present ATM situation including established plans and the GATMOC vision according to ICAO, will also be described with a recommended road map.

Some findings during this fact finding process, are not further elaborated in this report but will be addressed in the updated Master Plan. Those issues concern the need for a Human Resource Management (HRM) that needs to focus on a recruitment and training process of new ATM staff, including both technical and operational categories. To fill present vacancies is vital to be able to accommodate the traffic growth from an ANS perspective, both, in the short-medium and long term. There is also an urgent need for Indonesia to further develop a Quality and Safety Management System (QSMS). Environmental sustainability is and will continue to play a major role in the future ATM community. Contingency is another important issue for safe ATM service. All these domains will be well reflected in the updated ATM Master Plan.

Some other findings, however, need to be addressed by immediate action, since they have an impact on safety and capacity within the ATM system in Indonesia today.

Some of these findings have resulted in the following tentative recommendations:

- Introduce as a first step of Air Traffic Flow Management (ATFM), a FMP (Flow Management Position) at Jakarta and Ujung Pandang ACC/APP.
- Regulate traffic at peak hours at Jakarta Soekarno Hatta (SH) airport after coordination with Airport and Airlines (CDM).
- Make a safety assessment of procedures for landing/departing traffic at Jakarta SH airport.
- Increase the manning in the Jakarta SH ADC to enable safe monitoring and operations on the two runways simultaneously; followed, as soon as practicable, by installation of an Advanced Surface Movement Guidance and Control System (A-SMGCS) for increased safety and capacity in low visibility situations. This requirement will also be assessed for other major airports.
- Expedite the replacement of the old Jakarta Advanced Air Traffic Control System (JAATS).
- Investigate the possibility of an interim solution in order to secure a safe and reliable ATM production in Jakarta Flight Information Region (FIR).
- Develop standardised procedures and working methods including segregated one way Air Traffic Services (ATS) routes for congested routes and Standard Instrument Departures (SIDs)/Standard Instrument Arrivals (STARs) for main airports.
- Establish an ATS route or Area Navigation (RNAV) between Jakarta and Bali separated from the route Jakarta-Surabaya. In a first step, it could be as a Conditional Route (CDR) to be used only when there is no military need for that airspace.

HOW TO READ THIS DOCUMENT

This report on Indonesian ATM Planning Review is structured in the following way:

CHAPTER 1: *gives an explanation on how the new Law no. 1/2009 with the effective date 12 Jan, 2009 will affect the ANSP organisation in Indonesia in the following years to come.*

CHAPTER 2: *reflects the planned single ANSP and its new role in ATM Community in Indonesia, from the perspective of the LFV ACT.*

0 gives a review of the ATM Master plan 1994 from the perspective of the LFV ACT.(ToR Objective 2).

0 gives a review of the ICAO GANP with focus on 23 GPIs. The chapter describes the ICAO scope and strategy description for these GPIs and LFV ACT is making an assessment of the current Indonesian status with respect to these GPIs (ToR Objective 1).

0 states ATM community expectations according to ICAO and gives some stakeholders' opinions concerning ATM in Indonesia.

0 reports on present ATM planning in Indonesia and in the Asia Pacific (APAC) region.

0 gives an explanation of the ICAO identified seven ATM operational concept components. This chapter also provides the assessment of the current situation in the country by the LFV ACT and gives a short description of improvement areas that require attention in order for Indonesian ATM to undergo an evolutionary transition to the vision described in the ICAO GATMOC (ToR Objective 1).

0 identifies facilitating and constraining factors for Indonesian ATM planning and project implementation (ToR Objective 3), based on the assessment of the LFV ACT.

0 identifies priority programs to address immediate safety and/or efficiency shortfalls (ToR Objective 4), based on the assessment of the LFVACT.

CHAPTER 1: IMPACT FROM LAW NO. 1/2009 ON AVIATION

1.1 INTRODUCTION

Air transportation plays a key role in the economic development and growth, ensuring the country's integration into the global economy, employing a large number of skilled workers and providing access to markets and resources. Provision of advanced consistent ANS is vital to the development and expansion of a local aviation industry, as well as to attract international carriers.

In January 2009, the President of Indonesia, Susilo Bambang Yudhoyono, signed the Republic of Indonesia Law no. 1/20092009 on Aviation. This new law recognises the importance of viable, safe and efficient national transportation systems and aims to transition Indonesian aviation to become disciplined, well organised, safe, secure, comfortable and well priced, with healthy business practices. Implementation of the new law will have significant implications for the delivery of ANS in Indonesia.

The law will change the current organisational structure of Indonesian service provision and regulation of ATM. Concerning impact in the field of ATM, the following Articles 271 and 261 of the law have a paramount influence.

1.2 ARTICLE 271

Article 271 of the law envisages the creation of a new single ANSP.

(1) The Government is responsible to provide flight navigation services to aircrafts operating within the air space served.

(2) In order to provide the flight navigation services as mentioned in point (1), the Government shall establish an agency as the flight navigation service provider.

(3) The agency as mentioned in point (2) should meet the following criteria:

- prioritise aviation safety;
- non-profit oriented;
- financially independent; and
- costs charged to users shall be used for investment and cost recovery.

(4) The agency as mentioned in point (3) shall be established by the Ministry and hence, report to the Ministry.

It is expected that this agency, as mentioned in point (2) above, be established no later than three years from the effective date of the new Law no. 1/2009 on Aviation, that is, by 12 January, 2012 (Article 460).

The criteria for this new single ANSP (agency) as mentioned in point (3) will alter the financial structure based on a cost recovery mechanism and an elaborated charging scheme, implemented for airspace users to receive air navigation service provision in Indonesia.

1.3 ARTICLE 261

Article 261 stipulates the structure of this new Indonesian ANSP with the objective to provide a safe, efficient and cost effective service and criteria for this.

Note: There are a number of Articles in the Aviation Law no. 1/2009 regarding ATM issues that will be considered in the updated ATM Master Plan.See Attachment 1 for a list on Articles from Aviation Law no. 1/2009 related to ATM.

1.4 SUMMARY

The Law will, apart from organisational issues, have an impact on many domains within the aviation sector such as the usage of space territory, aircrafts, airports, airlines, air transportation, flight navigation and environment.

The updated ATM Master Plan will however focus on flight navigation, safety and environment.

CHAPTER 2: DEVELOPMENT OF A SINGLE ANSP

2.1 INTRODUCTION

Discussions concerning plans to restructure the present organisation of ANS in Indonesia started well before the Law no. 1/2009 was established. A DGCA Task Force chaired by the DG established a working plan 2007 on how to make the transition from the present organisational structure to the creation of a single ANSP This new ANSP must be established before 12 January, 2012, according to the new Law no. 1/2009 on Aviation. This transition is a major challenge for the ATM community in Indonesia, where the provider role will be split from the regulative role.

DGCA will have the regulatory role, with oversight functions of the ANSP. The new ANSP will have the role of planning and developing ANS in Indonesia as well as provide all ANS in the country. A transition phase will most likely be needed before the new ANSP has reached sufficient maturity level.

The other major change is the separation of airports and ANS.

These changes are however not unique; most European ANSPs have, during the last decade, gone through this transition.

According to a JICA report (January 2008), this new ANSP will have a form of a Public Service Agency (Badan Layanan Umum , BLU) since BLU has the flexibility to manage its own revenues and expenses. The autonomous organisation operated on a not-for-profit basis is the reason for selecting this form of organisation. Selection of a BLU for this new single ANSP is relevant and well in harmony with the organisational forms of Australia and many European ANSPs.

The new ANSP will operate on a non-profit and a cost-recovery basis and be financially independent. This means all costs for procurement of ATM infrastructure and maintenance thereof, costs for training of all staff, salaries etc. must, in the new cost-base, be recovered from airspace users. This implies that a new charging scheme has to be elaborated. A charging scheme is established on the cost of a service unit, which, currently in Europe, is the cost of an aircraft of 50 metric tons flying a distance of 100 km. The cost of a service unit in a state is the “unit rate”, defined for each individual state.

Airspace users operating in the Indonesian airspace can expect a rather large increase in the Indonesian unit rate with the creation of this new ANSP, which will operate with new financial prerequisites.

2.2 CONCLUSIONS

The most natural attachment for this new ANSP would be directly under the MoT.

The LFV ACT welcomes this organisational change, which will make the roles of Regulator/Provider clear for both, internal as well as external, parties in the aviation community. This unification of ANS in one organisation might be beneficial for the future implementation of necessary changes in the Indonesian CNS/ATM system as well as ATFM in order to meet the growing demand from airspace users. Also, this new ANSP needs to focus on developing a QSMS and a HRM, where recruitment and training of staff is a major task.

However, the development of the updated ATM Master Plan is independent of the form to the ANSP's delivering the ANS.

As IndII states; it is not in the terms of reference to provide an action plan to the establishment of a single ANSP.

CHAPTER 3: REVIEW OF 1994 ATM MASTER PLAN

The DGAC (Directorate General of Air Communication) carried out a study to develop the National ATC Master Plan for Indonesia in 1993, in cooperation with the French company, Sofréavia. The study was completed in 1995 and the National ATC Master Plan was formed. The National ATC Master Plan established the following three phases of the development program:

Table 1: ATM Master Plan 1994 periods

Short Term (1994-1998)	• To make fully operational (improvement) the existing technical and operational facilities, particularly the remote ones.
Medium Term (1998-2003)	• Development of facilities, airspace structures and ATC procedures • Reorganisation of airspace into 2 ACCs and introduction of RNAV routes. • Development of automated functions and harmonisation of functional level and integration of ATC systems for ACCs and TMAs.
Long Term (2003-2010)	• Implementation of Future Air Navigation Services (FANS) equipment. This is not to bring about major new development, but rather an adaptation of ATC system to new satellite based technologies as soon as they will be available for operational use.

Source: ATM Master Plan 1994

As a result of rapid progress of new CNS/ATM technologies, the DGAC formed the National Commission on CNS/ATM, for planning and implementation of CNS/ATM in Indonesia. The National ATC Master Plan had been reviewed based on the ICAO Global Plan and APAC Regional Plan. The implementation plan for CNS/ATM system in Indonesia and harmonisation with APAC Regional Plans was produced by DGAC in June 2001 as a supplement and improvement of The National ATC Master Plan.

The National ATC Master Plan covered the following domains:

- Airspace Management (ASM)
- ATC
- ATFM
- Communications
- Navigation
- Surveillance

ASM

- Optimising the structure of the Indonesian airspace in two ACCs is accomplished.
- RNAV routes have been partly established.
- Implementing flexible use of airspace is not implemented.

ATC operations system

- JAATS was established in 1995
- Makassar Advanced Air Traffic Control System (MAATS) was established in 2005
- Standardising working methods in the ACCs are still a cause for improvement.
- Integrating progressively the airborne and ground system has not yet been implemented in operation.

ATFM

- ATFM centralised body for Indonesia has not been established.
- No FMPs are established.
- There is no centralised regional system.

Communications

- Improvement in ground/ground com has been established
- Controller-Pilot Data Link Communications (CPDLC) will be implemented in operations in Ujung Pandang ACC during 2010.
- Transition to Aeronautical Telecommunication Network (ATN) still not carried through.

Navigation

- Indonesia is in the process of providing sufficient conventional ground navigational aids in areas concerned.
- Performance Based Navigation (PBN) implementation in a small scale. Indonesia is following APAC Regional PBN Implementation Plan

Surveillance

- Indonesia has improved the surveillance capability during the planning period.

- Satellite based surveillance capability with the support of Automatic Dependent Surveillance-Contract (ADS-C) will go operational in Ujung Pandang ACC in 2010. MAATS also supports the Automatic Dependent Surveillance-Broadcast (ADS-B) capability.

CHAPTER 4: ICAO´S GLOBAL AIR NAVIGATION PLAN WITH 23 GPIS

4.1 INTRODUCTION

To provide near-term and medium-term guidance on air navigation systems improvements necessary to support a uniform transition to the ATM system of the future, ICAO‘s GANP sets out 23 GPIs. The initiatives are options for air navigation system improvements that will result in direct performance enhancements, if implemented. State can choose initiatives that meet performance objectives specific to their particular needs.

Each of these GPIs is addressed below.

AIRSPACE MANAGEMENT

ASM comprises the following seven components:

- Flexible use of airspace (FUA) GPI 1
- Reduced vertical separation (RVSM) GPI 2
- Harmonisation of level systems GPI 3
- Alignment of upper airspace classifications GPI 4
- Dynamic and flexible ATS route management GPI 7
- Collaborative airspace design and management GPI 8
- Terminal area design and management GPI 10

4.2 GPI-1 FLEXIBLE USE OF AIRSPACE

4.2.1 Scope

The optimisation and equitable balance in the use of airspace between civil and military users, facilitated through both, strategic coordination and dynamic interaction.

Related operational concept components: Airspace Organisation Management (AOM), Airspace User Operations (AUO).

4.2.2 Description Of Strategy

The use of airspace could be optimised through the dynamic interaction of civil and military ATS including real-time civil/military controller-to-controller coordination. This requires systems support, operational procedures and adequate information on civilian traffic position and intentions.

The concept of FUA is based on the principle that airspace should not be designated purely as civil or military, but rather as a continuum in which all user requirements are accommodated to the greatest possible extent. FUA should result in the removal of large areas of permanent or transient restricted airspace or special use airspace.

Where there are continued requirements to accommodate specific individual airspace uses, thereby blocking airspace of certain dimensions, this should be accommodated on a transient basis. Airspace should be released immediately after the operation requiring the restriction has been completed.

As reserved airspace is often established along critical flight paths at national boundaries, greater benefits associated with implementation of FUA will be obtained through inter-state cooperation which may entail regional and sub-regional agreements.

4.2.3 Current Situation In Indonesia

Indonesian ATM (AP1 and AP2) has not implemented FUA according to the ICAO FUA concept. Airspace is still segregated between civilian and military airspace users and no real-time civil/military controller-to-controller coordination takes place. Military sectors (used for military air exercises) are blocked for civilian use even if the military airspace sector is vacant of military flights. Any airspace segregation should be of temporary nature only. This is not the case in Indonesia. This fact might reduce the available capacity in the ACCs during peak hours, when less flexibility for the operational staff exists. In Europe, it is common to establish and declare two different sector capacities, one when military units are using the airspace and one when they are not.

The ASM does not include a strategically, pre-tactical or tactical phase as a joint cooperation between ANSPs /Regulator/Military Units. Most likely this is the reason no operational procedures or systems support have been developed to facilitate for FUA.

There are several Prohibited, Restricted and Danger (PR and D) areas and three Air Defence identification zones. The airspace is used in a segregated way.

Implementation of FUA and close civil/military coordination should benefit ATS capacity, and also fuel saving for civil aviation and have a positive environmental and economic impact for all stakeholders.

The Military Training Areas (MTAs) are mostly located where there are no ATS routes. Normally, these areas are, while utilised by the military, blocked for civilian use. There is, however, a need for a new civilian route from Jakarta to Bali, since the present first major portion of the route is shared by the intense traffic between Jakarta and Surabaya. During the visit to AP2 it was discovered that this route is currently declared as one of the most traffic intense ATS route in the world, with more than 700 flights a week and the traffic forecast in the report on Air Traffic Analysis (Deliverable 1) shows a major increase of traffic. On an average, it means that there are more than 100 flights a day going back and forth Jakarta- Bali/Surabaya. A new route south of the present, which will penetrate an Air Defence Area, is urgently needed to add additional capacity for the major traffic flows between Jakarta and Surabaya/Bali. According to received information, this issue has been on the agenda for a rather long time since the military authorities are reluctant to accept penetrating civilian flights at any time and at any altitude. These procedures are not considered compliant to the concept of FUA.

FUA implementation recommendations/proposals will be included in the update of the Master Plan included enhanced civil/military cooperation/coordination.

There is a delegation in Natuna area, where ATS is delegated from Indonesia to Singapore and the area over the Christmas Island is delegated from Australia to Indonesia. An amended solution might be necessary during the coming 15 years in order to follow Law no. 1/2009.

4.3 GPI-2 REDUCED VERTICAL SEPARATION

4.3.1 Scope

The optimisation of the utilisation of airspace and enhanced aircraft altimetry systems.

Related operational concept components: AOM, Conflict Management (CM)

4.3.2 Description Of Strategy

RVSM reduces vertical separation to 300 m (1000 ft) above Flight Level (FL) 290 from the current 600 m (2000 ft), thereby providing six additional FLs. The manual on implementation of a 300 m (1000 ft) RVSM between FL 290 and FL 410 (Doc 9574) provides specific guidance on implementation of RVSM.

A great deal of experience has been gained with RVSM, and all necessary Standards and Recommended Practices (SARPs) guidance material are available to support implementation.

4.3.3 Current Situation In Indonesia

The Indonesia RVSM program is monitored by Australian Airspace Monitoring Agency (AAMA).

AAMA is one of a number of organisations that ICAO has approved as Regional Monitoring Agencies (RMAs) following global implementation of RVSM. These agencies ensure the safe use of specific airspace designated by regional agreement.

RMAs assess how successfully the airspace meets the agreed Target Level of Safety (TLS). The target is determined by ICAO and depends on satisfactory aircraft height-keeping performance and measurement of risk associated with operational errors.

The AAMA also:

- collects traffic samples and assesses collision risk in the Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang FIRs and reports results to state authorities and ICAO;
- identifies non-RVSM approved operators that are incorrectly operating in airspace where RVSM is applied and notifies the relevant state approval authority;
- facilitates the transfer of approval data and monitoring data to and from other RVSM regional monitoring agencies; participates in international meetings that relate to safety assessment and monitoring; and
- facilitates a height-keeping performance monitoring service for assessing compliance of operators and aircraft with RVSM height-keeping performance requirements.

There are many RVSM issues to be dealt with in Indonesia today. The RVSM approvals database is managed by DGCA. The Aeronautical Information Publication (AIP) still has not been updated to include RVSM requirements; although there is an AIP Supplement (SUP) which now has a lot of outdated information (AIP SUP 07/03 dated 20 September, 2003). Because Indonesia uses an exclusive RVSM model, the assumption is made that all aircrafts that flight plan at RVSM levels are RVSM approved and capable, even if they do not include a W in their flight plan. The extensive use of Repetitive Flight Plans (RPLs) is also a problem for RVSM-monitoring.

The operational procedures for “Suspension of RVSM” are not known to the LFV ACT at this stage. Tentative RVSM shortcomings, such as presentation of RVSM status from the Flight Plan information (strip and/or label) for the ATC, will be included in the updated Master Plan.

4.4 GPI-3 HARMONISATION OF LEVEL SYSTEMS

4.4.1 Scope

The adoption by all states of the ICAO FL scheme based on feet as contained in Appendix three to Annex two - Rules of the Air.

Related operational concept components: AOM, CM, AUO

4.4.2 Description Of Strategy

The majority of ICAO contracting states have chosen to use the imperial measurement system for referencing altitudes and levels; however, some states continue to use the metric system. To compound matters, some states that use the metric system have adopted different vertical spacing standards than what is contained in ICAO Annex two - Rules of the Air.

Aircrafts registered in states that have adopted the imperial system have altimetry systems calibrated in feet. Those registered in states that have adopted the metric system generally have altimeters calibrated in metres. Aircrafts operating across boundaries into states with differing systems are required to carry additional altimeters or to use conversion charts. ATCs handling such flights are also required to use conversion charts.

The implementation of RVSM at the interface between states using the different systems has increased safety concerns and caused the loss of several levels resulting in a less efficient operation for aircrafts and a loss in airspace capacity. In addition, certain states that utilise the metric system have not made certain high-level cruising altitudes available, thereby imposing significant operating restrictions on aircrafts operating on long-range sectors.

Harmonisation of level systems, whereby all states adopt the ICAO FL scheme based on feet, should be pursued.

4.4.3 Current Status In Indonesia

Indonesia is fully compliant with ICAO FL scheme as well as adjacent centres. The same is valid for implementation of RVSM, so Indonesian ACCs don’t have to adapt to different systems in the interface with other states. The implementation of RVSM adding six new FLs above FL 290 of course have generated additional capacity in the ATM system.

4.5 GPI-4 ALIGNMENT OF UPPER AIRSPACE CLASSIFICATIONS

4.5.1 Scope

The harmonisation of upper airspace and associated traffic handling through application of a common ICAO ATS airspace class above an agreed division level.

Related operational concept components: AOM, CM, AUO

4.5.2 Description Of Strategy

To the extent possible, airspace should be structured as a continuum, free from operational discontinuities, inconsistencies and differing rules and procedures. Alignment of airspace classifications can help to achieve this goal. It would also facilitate the introduction and better utilisation of data link communications, improved flight plan processing systems, and advanced ASM coordination tools and message exchange capabilities, leading to progressively more flexible and dynamic management of airspace. Airspace classifications should be harmonised intraregional and, where possible, across several regions.

Air transport and most business aircraft operations should be contained within airspace within which positive ATC services are provided to all aircrafts (i.e. Class A, B, C or D).

ATM provided in various airspace volumes should be based on the ICAO airspace classification system as defined in Annex 11 - Air Traffic Services (i.e. Class A to G), and those classifications should be implemented on the basis of a safety assessment, taking into account the volume and nature of the air traffic.

4.5.3 Current Status In Indonesia

Division FL between upper and lower airspace is FL 245.

Airspace classification is regulated in Civil Aviation Safety Regulation (CASR) 170 published in AIP and consistent with options given in Law no. 1/2009 on aviation.

An assessment whether current airspace classes are optimum for Indonesia will be further elaborated.

4.6 GPI-7 DYNAMIC AND FLEXIBLE ATS ROUTE MANAGEMENT

4.6.1 Scope

The establishment of more flexible and dynamic route systems, on the basis of navigation performance capability, aimed at accommodating preferred flight trajectories.

Related operational concept components: AOM, AUO

4.6.2 Description Of Strategy

The implementation of ATS route structures that avoid concentrations of aircrafts over congested points and implementation of an ATS routing environment that meets the needs of the airspace users to operate along preferred and dynamic flight trajectories will increase capacity and increase aircraft operating efficiency.

RNAV routes are not restricted to the location of ground-based aids and provide benefits to aircraft operators and the ATM system. All modern aircrafts are RNAV capable, and efforts should be made to design and implement RNAV routes.

Dynamic route management involves the aircraft in the planning process. Typical scenarios include the generation of change-of-routing requests by the dispatch functions of the aircraft operators, the processing and approval of these requests by ATS providers and transmission of the change-of-routing approval to the aircraft. Advanced scenarios would have the aircraft making requests directly to ATS providers who would process and modify the request if necessary and then forward the approved route to aircraft and affected service providers along the route of flight.

Random routing strategically or pre-tactically defines areas within which fixed routes are not designated and where aircrafts determine an appropriate track from an entry point to an exit point.

User-preferred routes make use of the capability of aircraft operators to determine optimum tracks, based on a range of flight parameters. In accordance with this concept, ATS routes or tracks would not be fixed to pre-determined routes or waypoints, except where required for control purposes, however, trajectories would be available to ATM staff.

User-preferred routing requests are generated by the airspace user or their dispatch functions and submitted to the ATS provider for approval or renegotiation if a conflict results from their transmission to aircraft. Advanced scenarios would have the aircraft making requests directly to ATS providers who would process and modify the request if necessary and then forward the approved route to aircraft.

4.6.3 Current Situation In Indonesia

Currently, approximately 15 RNAV routes are used for international traffic. Many domestic conventional routes and pioneer routes have been established during the last five year planning cycle in order to connect more airports in the country. These pioneer routes are available only for VFR operations.

One domestic route will be established as a RNAV route. All domestic airlines are eager to operate on this route. However, there is a staff shortage of airworthiness inspectors that can certify both aircraft avionics and pilots eligible to fly RNAV. This could, without proper actions, lead to a bottleneck issue, when PBN is introduced on a large scale.

All conventional routes in the upper airspace are also superimposed as RNAV routes, meaning that all waypoints based on terrestrial navigational aids also are described as lat/long waypoints based on World Geodetic System — 1984 (WGS 84). This means those routes will each have two names, one as a conventional route and one as a RNAV route (L, M or N).This step can be seen as a start of PBN implementation in the country. Next step is to create more routes according to user requirements, where there are no ground navigational aids to guide the route trajectory.

During interviews with DGCA staff, it became known that there are plans however to only have RNAV routes in the upper airspace and the conventional ones in the lower airspace.

One of the major ingredients in flight efficiency for the airspace users is the possibility to flight plan and execute the flight as direct and short as possible. This option also provides a more environmental sustainable solution by reducing the greenhouse gas emissions. By constructing the ATS routes by means of conventional ground aids puts many constraints on requirements from users, flying new destinations etc. Therefore, with this growing traffic demand in Indonesia, both for domestic and international use, it is important to increase the amount of RNAV routes. For international traffic almost all airframes are eligible to fly these routes and domestic airline companies must equip their airframes with adequate navigational equipment based on satellite techniques.

From an ATM infrastructure viewpoint, a lot of navigational ground aids with high maintenance costs can be dismantled, bringing the CNS/ATM costs beneficial also for the airspace users.

The updated Master Plan will give this topic high priority.

Figure 2 ATS Routes in Indonesia

Source: JICA Report 2008

4.7 GPI-8 COLLABORATIVE AIRSPACE DESIGN AND MANAGEMENT

4.7.1 Scope

The application of uniform airspace organisation and management principles on a global basis, leading to a more flexible airspace design to accommodate traffic flows dynamically.

Related operational concept components: AOM, AUO

4.7.2 Description of strategy

Collaborative airspace design and management is aimed at organising airspace in a cooperative manner involving all users so that airspace is managed to accommodate the preferred trajectories of the users. States and regions should take advantage of aircraft capabilities when designing airspace. In designing and implementing airspace changes, the fleet capabilities among airspace users within a given airspace need to be taken into account. Furthermore, collaboration with airspace users will identify procedures and/or solutions that make use of available aircraft capabilities.

Other emerging developments such as Collaborative Decision Making (CDM), the “required time of arrival” function in the Flight Management System (FMS), the endorsement of the global ATM operational concept and the implementation of data link applications, will also allow improved airspace design and management.

Over an evolutionary period, dynamic airspace management should be applied where significant benefits would be gained. Dynamic ASM comprises integrated decision making; demand-based capacity. Integrated decision making is an extension of the principles of the flexible use of airspace to include airspace users in flight in decision making with respect to tactical assessment of the use of reserved airspace and requirements for transit times of special use airspace.

Aircraft FMSs can provide information on estimated time en-route for proposed route changes. In addition, data link communication through Controller-Pilot Data Link Communications (CPDLC), providing the ability to uplink and downlink flight planning information, can support deployment of integrated decision making.

4.7.3 Current situation in Indonesia

All airspace design and management is static and no flexibility exists in the usage of the available airspace. Re-sectorisation of airspace is a complicated, long procedure, which results in a new static airspace design. There is no flexible use of airspace currently and no way to measure the demand and balance it with the available capacity. No sector capacity is declared and there is no structured way of measuring the demand in due time to be able to regulate traffic if needed. Flight plans have to be submitted only one hour prior to estimated departure times.

Dynamic ASM requires integrated or CDM, where all stakeholders’ (civilian/military airspace users together with ANSP/Military Units) requirements will be assessed before a tactical integrated decision is made. CDM will be supported by CPDLC, which is currently in an implementing phase in parts of the Indonesian airspace.

4.8 GPI-10 TERMINAL AREA DESIGN AND MANAGEMENT

4.8.1 Scope

The optimisation of the Terminal Control Area (TMA) through improved design and management techniques.

Related operational concept components: AOM, Aerodrome Operations (AO), Traffic Synchronisation (TS), CM, AUO

4.8.2 Description of strategy

There are many ways by which a well designed and managed TMA can have an important impact on safety, capacity and efficiency. TMA design should be implemented uniformly across all TMAs within a state or region and should provide benefits while minimising pilot/controller communications and optimising pilot and controller workload. TMA arrival acceptance rates should be based tactically on a CDM process involving tower,TMA and en-route sectors, while strategically involving airspace users, to ensure optimum traffic handling.

The enhancement of TMA management includes:

(1) Complete implementation of WGS-84

(2) Design and implementation of optimised RNAV and Required Navigation Performance (RNP) arrival and departure procedures (see also RNAV and RNP Performance-based navigation GPI-5);

(3) Design and implementation of RNP-based approach procedures (see also Performance-based navigation in 4.12) and

(4) Enhanced traffic and capacity management.

The implementation of dynamic TMA management procedures may comprise several elements such as dynamic wake vortex detection and mitigation, and collaborative capacity management.

At those locations where a business case supports implementation, decision support tools should be developed and implemented to provide a more structured and efficient management of arrival and departure traffic flows and more efficient use of the runway(s), more fuel-efficient trajectories and reduced noise exposure.

4.8.3 Current situation in Indonesia

Design of major terminal areas in Indonesia is not optimal with regard to present and future traffic demand. Capacity to handle the departing/arriving traffic will be increased by proper airspace design for the TMAs. In and outbound traffic to/from an airport should be laterally separated when possible, to reduce workload for ATC, thereby increasing overall capacity. SIDs/STARs based on RNP and RNAV or even Precision Area Navigation (PRNAV) criteria (i.e., RNP5 and RNP1) require the aircraft fleet using the airport to be properly equipped. The higher navigational precision provides possibilities to reduce the lateral separation between the SID and STAR, saving valuable distance for the airspace users. Using SID/STAR also reduces the radio communication between ATC and cockpit.

Traffic handling in a major TMA like Jakarta would be much facilitated by some sequencing of inbound traffic from en-route sectors. Therefore an Arrival Manager (AMAN) will be necessary and eventually even a Departure Manager (DMAN) regulating the departure traffic. These sequencing tools are not implemented currently in Indonesia.

By the implementation of PBN in Indonesia, major cost savings will be possible for the whole aviation industry. For the airspace users the result will be shorter trajectories leading to less fuel consumption, less greenhouse gas emissions and for the ATM infrastructure owner, less need for investments in costly ground aids and maintenance. The overall capacity will increase when lateral separation will be reduced by higher precision offered by PBN.

An Asia/Pacific Regional PBN Implementation Plan was adopted as a conclusion 20/41 on Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG)/20.

ATFCM- AIR TRAFFIC FLOW AND CAPACITY MANAGEMENT

4.9 GPI-6 AIR TRAFFIC FLOW MANAGEMENT

4.9.1 Scope

The implementation of strategic, tactical and pre-tactical measures aimed at organising and handling traffic flows in a way that the totality of the traffic handled at any given time or in any given airspace or aerodrome is compatible with the capacity of the ATM system.

Related operational concept components: AOM, AO, Demand and Capacity Balancing (DCB), TS, CM, AUO

4.9.2 Description Of Strategy

The implementation of demand/capacity measures or ATFM, implemented on a regional basis where needed, will enhance airspace capacity and improve operating efficiency.

In the event that traffic demand regularly exceeds capacity, resulting in continuing and frequent traffic delays, or when it becomes apparent that forecast traffic demand will exceed the available capacity, the appropriate ATM units, in consultation with aircraft operators, should consider implementing steps aimed at improving the use of the existing system capacity and developing plans to increase capacity to meet the actual or forecast demand. Any such planning to increase capacity should be undertaken in a structured and collaborative manner.

Where warranted, states and regions should evolve to a collaborative-based approach to capacity management. The ATM operational concept envisages a more strategic approach to ATM overall, and through CDM, a reduction in the reliance on tactical flow management. It is inevitable that tactical flow intervention will continue to be required; however closer coordination between airspace users and ATM service providers can reduce the need for routine tactical intervention which is often disruptive to aircraft operations.

4.9.3 Current Situation In Indonesia

There is no ATFM in operation in Indonesia today. That means that there is nil or limited protection for system overload as well as ATC overload. This fact has a major impact on safety within the ATM domain in Indonesia.

The AP1 and AP2 headquarter as well as ACC/APP Jakarta expressed their urgent need for actions in this domain (Pre-tactical/Tactical).

A first interim solution could be to establish a FMP co-located with the ATS coordinator in the respective ACC with defined duties and mandate.

ATFM recommendations/proposals will be included as an early action in the update of the Master Plan.

Currently, the only tool to regulate air traffic flows is the agreed Letter’s of Agreement (LoA's) between Indonesia and adjacent centres stating separation standards. However, those separation criteria are based on the level of CNS and ATM system standard.

Traffic inbound Jakarta SH airport during peak hours needs quite urgently to be regulated coordinated with airport authorities and airlines.

In APANPIRG/20 meeting, a conclusion (20/12) was to adopt an ATFM communications handbook for the APAC region. The primary goal of this guidance material is to promulgate appropriate terminologies and phraseologies for the exchange of written and verbal ATFM messages between units providing ATFM services, both within states and between states.

COMMUNICATION

Under this heading, the following topics are covered:

- Data link applications GPI 17
- Communication infrastructure GPI 22
- Aeronautical radio spectrum GPI 23

4.10 GPI-17 DATA LINK APPLICATIONS

4.10.1 Scope

Increase the use of data link applications

Related operational concept components: DCB, AO, TS, CM, AUO, ATM Service Delivery Management (ATMSDM)

4.10.2 Description Of Strategy

The implementation of less complex data link services (for instance pre-departure clearance, oceanic clearance, Digital-Automatic Terminal Information Service [D-ATIS] and automatic position reporting) can bring immediate efficiency benefits to the provision of ATS. Transition to the use of data link communications for more complex safety-related uses that take advantage of a wide variety of CPDLC messages, including ATC clearances, is already being successfully implemented. Use of CPDLC and implementation of other data link applications can bring significant advantages over voice communication for both pilots and controllers in terms of workload and safety. In particular, they can provide efficient linkages between ground and airborne systems, improved handling and transfer of data, reduced channel congestion, reduced communication errors, interoperable communication media and reduced workload. The reduction of workload per flight translates into capacity increases and enhanced safety.

Communication data link and data link surveillance technologies and applications should be selected and harmonised for seamless and interoperable global operations. ADS-C, ADS-B and CPDLC are in service in various regions of the world but lack global harmonisation. Current regional initiatives, including utilising unique message subsets and CPDLC procedures, hinder efficient development and acceptance for global aircraft operations. Existing and emerging technologies should be implemented in a harmonised global manner in the near term, to support long-term goals. Harmonisation will define global equipage requirements and therefore minimise user investment.

FANS-1/A and ATN applications support similar functionality, but with different avionics requirements. Many internationally-operated aircrafts are equipped with FANS-1/A avionics initially to take advantage of data link services offered in certain oceanic and remote regions. FANS-1/A equipage on international business aviation aircraft is underway and is expected to increase.

4.10.3 Current Situation In Indonesia

The installation of 30 ADS-B ground stations will be finalised this year and the plan is to have them operational during 2012. This will give a good coverage for Indonesia.

The ATM system in Ujung Pandang has been updated to receive ADS-C/CPDLC (FANS-1/A protocols) messages. It will be operational from 23 September, 2010.

For Jakarta ACC the plan is to do an implementation of ADS-C/CPDLC in a minor back-up system available for some of the sectors. This will allow for some ADS-C/CPDLC functionality until the ATM system will be replaced.

4.11 GPI-22 COMMUNICATION INFRASTRUCTURE

4.11.1 Scope

To evolve the aeronautical mobile and fixed communication infrastructure, supporting both voice and data communications, accommodating new functions as well as providing the adequate capacity and quality of service to support ATM requirements.

Related operational concept components: AO, TS, CM, AUO

4.11.2 Description Of Strategy

ATM depends extensively and increasingly on the availability of real-time or near real-time, relevant, accurate, accredited and quality-assured information to make informed decisions. The timely availability of appropriate aeronautical mobile and fixed communication capabilities (voice and data) to accommodate ATM requirements and to provide the adequate capacity and quality of service requirements is essential. The aeronautical communication network infrastructure should accommodate the growing need for information collection and exchange within a transparent network in which all stakeholders can participate.

The gradual introduction of performance-based SARPs and system-level and functional requirements will allow the increased use of commercially available voice and data telecommunication technologies and services. In the framework of this strategy, states should, to the maximum extent possible, take advantage of appropriate technologies, services and products offered by the telecommunication industry.

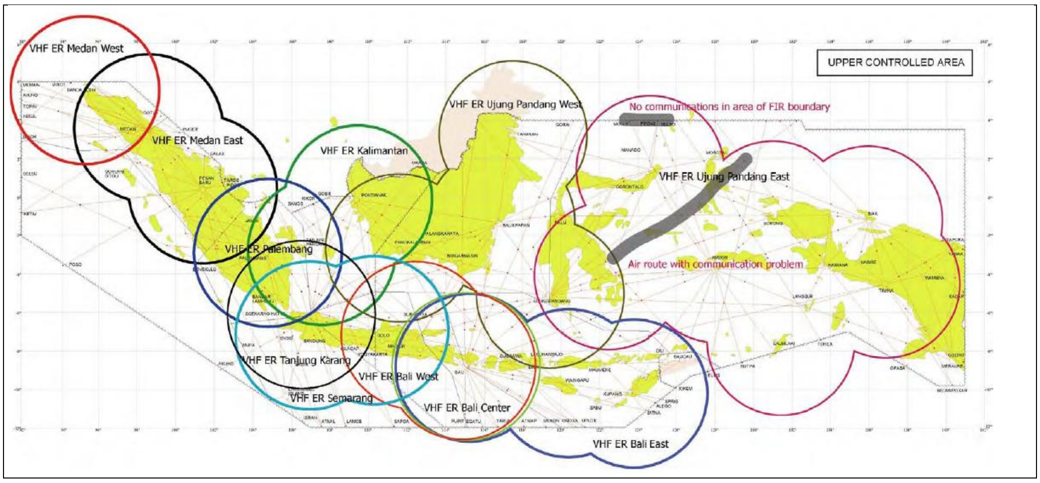
Considering the fundamental role of communications in enabling aviation, the common objective is to seek the most efficient communication network service providing the desired services with the required performance and interoperability required for aviation safety levels at minimum cost.

4.11.3 Current Situation In Indonesia

As regards air to ground voice communications, Very High Frequency (VHF) radio is used for the CTR, TMA and ADC. VHF radio units are basically located at the airports. The present major issue is the replacement of numerous quantities of aging equipment.

VHF air to ground extended range (VHF-ER) is used basically for ATC of the Upper Control Area (UTA) from FL 245 to FL 600 in Indonesia (FIR) as shown in table below. Only UTA Indian Ocean is served by high frequency (HF) air to ground radio as the oceanic area is beyond VHF coverage.

Figure 3: VHF-ER coverage



Source: JICA Report 2008

HF air to ground radio for UTA (MWARA) is used for communications beyond VHF-ER coverage in UTA, e.g., UTA Indian Ocean, UTA Ujung Pandang East. It is also a backup communication system for VHF-ER. (See table below)

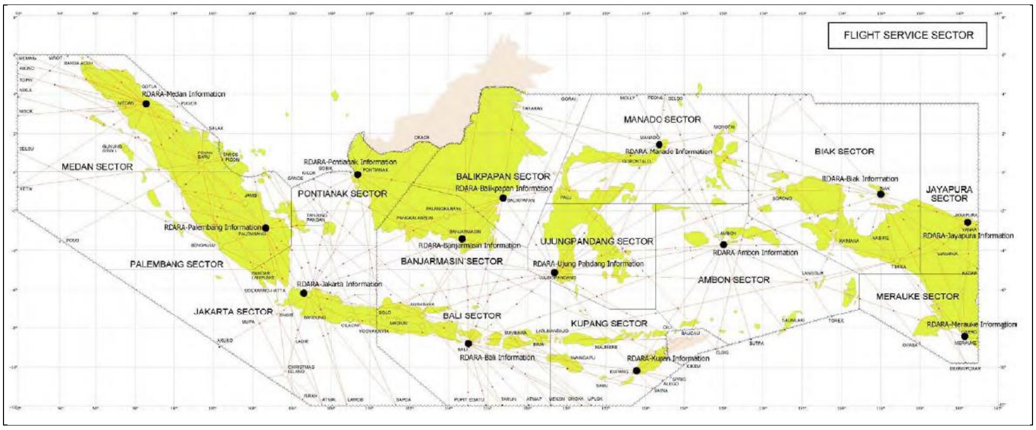
Table 2: HF Air to Ground for Flight Service Sectors

FIR	UTA	HF MWARA	Equipment Sites
Jakarta FIR	Upper control area not covered by VHF-ER	Jakarta Information	Jakarta ACC
Ujung Pandang FIR	Upper control area not covered by VHF-ER	Ujung Pandang Information	Ujung Pandang ACC

Source: DGCA

HF air to ground for Flight Service Sectors (FSS) is used in the uncontrolled airspace from ground to FL 245. The airspace is divided into four FSS in Jakarta FIR and ten FSS in Ujung Pandang FIR .HF radio RDARA is used in those FSS. AP1 has a plan to merge its ten sectors into four.

Figure 4: FSS in Indonesia



Source: JICA Report 2008

As regards air to ground data communications, there is a stand-alone ADS-C/CPDLC (FANS-1/A protocols) system made by ARINC a US based company), in Jakarta ACC. It operated on a trial basis from May to August 2001 and is not actually operated now. AP2 plans to replace JAATS system and to consolidate ADS-C/CPDLC in the automation system. In a minor back-up system produced by local technicians in AP2 ADS-C/CPDLC, it is planned to be available for some of the sectors.

Operation of MAATS started in July 2005. MAATS has an integrated ADS-C/CPDLC (FANS-1/A) function, and tests and trials have been going on since 2008. DGCA is presently issuing an AIP SUP that ADS-C/CPDLC will be operational in Ujung Pandang FIR with effect from 23 September, 2010.

Ground to ground data communications include ATS Inter-Facility Data Communications (AIDC), Aeronautical fixed telecommunication network (AFTN) and ATN. As regards AIDC, the MAATS system is technically ready to implement AIDC with Brisbane Air Traffic Control Centre (ATCC). The existing Jakarta JAATS system is not ready for AIDC, therefore there are no trials conducted between MAATS and JAATS. At present, messages are exchanged by verbal communication and there is no particular plan of introducing AIDC before the new JAATS system is introduced in 2013 (according to plan).

For AFTN, there are three communication centres, 20 sub communication centres and 17 tributary stations. AFTN has a nature of limitations such as character-based data, limited capacity and function and low transmission rate. ATN is superior in all these respects.

DGCA has a plan to carry out ATN (ground – ground) trials based on the MoT Decree (KP218/2004) in order to prepare concept of ATN, transition plan, ATN standard facilities and Indonesian legal body requirement. At present, the first ATN router has been introduced in Jakarta Communication Centre and an Aeronautical message handling system (AMHS) is under procurement process.

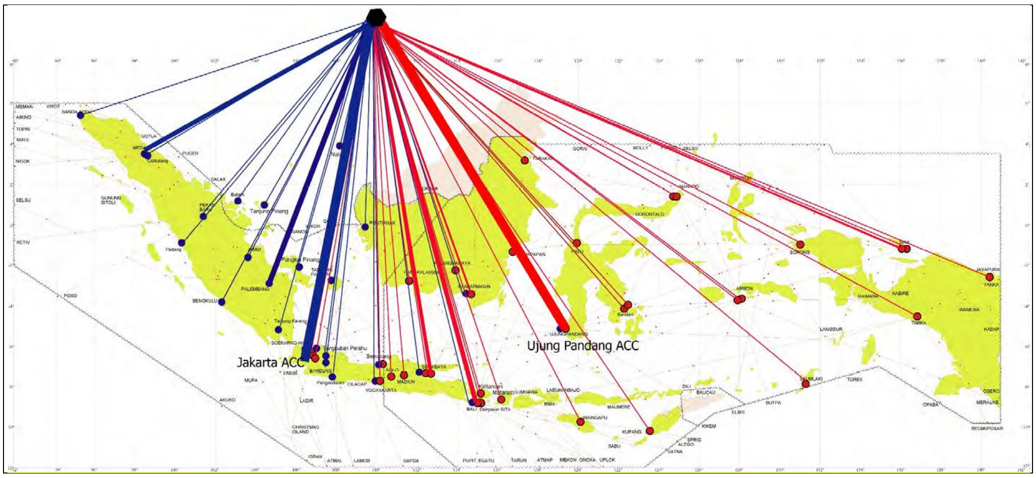
Communications by ANS providers include Very Small Aperture Terminal (VSAT) and VHF Digital Link (VDL).

There are nation-wide VSAT networks connecting ACCs, airports, remote radar sites, VHF extended range sites etc. The networks are operated by private telecommunications companies, viz., PT Indonesian Satellite Corporation (INDOSAT) for international links and PT INFOKOM Elektrindo (INFOKOM) for domestic links. AP1 and AP2 operate 36 and 37 VSAT terminals, respectively. The VSAT configuration is a star network sending data to each VSAT terminal. Makassar is the central uplink site for AP1 and Jakarta for AP2.

The following data is transmitted via VSAT:

- ATS direct speech circuit
- AFTN teletype
- Radar data
- VHF extended range
- Other data (ADS/B, etc)

Figure 5: VSAT Network Aviation Communication in Indonesia



Source: JICA Report 2008

Coming to VHF Data Link, AP2 and ARINC jointly have installed four ground stations at Medan, Palembang, Jakarta SH and Natuna. These stations are linked by domestic VSAT network and connected with Aeronautical Radio of Thailand Ltd. (AEROTHAI)in Bangkok. As of 2008, SITA and Garuda have installed 16 remote ground stations for VHF data link in Indonesia.

4.12 GPI-23 AERONAUTICAL RADIO SPECTRUM

4.12.1 Scope

Timely and continuing availability of adequate radio spectrum, on a global basis, to provide viable ANS and CNS.

Related operational concept components: AO, TS, CM, AUO, ATMSDM

4.12.2 Description Of Strategy

States need to address all regulatory aspects on aeronautical matters on the agendas for International Telecommunication Network (ITU) World Radio Communication Conferences (WRC). Particular attention is drawn to the need to maintain the current spectrum allocations to aeronautical services.

The radio spectrum is a scarce natural resource with finite capacity for which demand from all users (aeronautical and non-aeronautical) is constantly increasing. Thus, the ICAO strategy on aeronautical radio spectrum aims at long-term protection of adequate aeronautical spectrum for all radio communication, surveillance and radio navigation systems. The process of international coordination taking place in the ITU obliges all spectrum users (i.e. aeronautical and non aeronautical) to continually defend and justify spectrum requirements. Civil aviation operations are expanding globally, creating pressure on the already stressed and limited available aeronautical spectrum.

The framework of this initiative involves the support and dissemination by states of the ICAO quantified and qualified policy statements of requirements for aeronautical radio frequency spectrum agendas for ITU WRC. This is necessary to maintain the current spectrum allocations to aeronautical services and ensure the continuing availability of adequate aeronautical radio spectrum and ultimately the viability of existing and new ANS globally.

4.12.3 Current Situation In Indonesia

Responsible for managing the radio frequency in Indonesia is Ministry of Communication and Information Technology. For the whole aeronautical spectrum, DGCA has been delegated the full responsibility of these frequencies as long as it not is for commercial use. The Aviation Law no. 1/2009, chapter 12 part five regulates the use of aeronautical frequencies. The ITU WRC are attended jointly by DGCA and Ministry of Communication and Information Technology.

NAVIGATION

Under this heading, the following topics are covered:

- RNAV and RNP including PBN GPI 5
- RNP and RNAV SIDs and STARs GPI 11
- Navigation systems GPI 21

4.13 GPI-5 RNAV AND RNP (PBN)

4.13.1 Scope

The incorporation of advanced aircraft navigation capabilities into the air navigation system infrastructure.

Related operational concept components: AOM, AO, TS, CM, AUO

4.13.2 Description Of Strategy

The implementation of the PBN concept will lead to increased capacity and enhanced efficiency through reductions in separation minima, bringing benefits to aircraft operators that equip to meet performance requirements. PBN will also improve safety, particularly on approach, through a reduction of controlled flight into terrain.

A significant number of aircrafts are capable of RNAV and RNP. Where warranted, these capabilities should be further exploited to develop more efficient routes and aircraft trajectories that are not directly tied to ground-based navigation aids. Certain RNAV-equipped aircrafts also have a significantly enhanced capability to achieve sequencing requirements to runways, particularly through the use of the “required time of arrival” function within the FMS.

The PBN concept, which comprises RNAV and RNP operations, recognises that a clear distinction must be made in the designation of operations, between those aircraft operations that require on-board self-contained performance monitoring and alerting and those that do not.

In accordance with the PBN concept, all phases of flight are addressed including en-route (oceanic/remote and continental), terminal and approach. The concept, its implementation processes, navigation applications, as well as the operational approval and aircraft qualification requirements, are described in the PBN manual which will be published as a new edition of the Manual on RNP (Doc 961 3).

“*The PBN concept specifies RNAV and RNP system performance requirements in terms of accuracy, integrity, availability, continuity and functionality needed for the proposed operations in the context of a particular Airspace Concept, when supported by the appropriate navigation infrastructure.*

In that context, the PBN concept represents a shift from sensor-based to performance-based navigation. Performance requirements are identified in navigation specifications which also identify the choice of navigation sensors and equipment that may be used to meet the performance requirements. These navigation specifications are defined at a sufficient level of detail to facilitate global harmonisation by providing specific implementation guidance for states and operators” from 4.7 APAC Regional PBN Implementation Plan adopted on APANPIRG/20 2009.

ICAO also states from the same document;

Practical examples of tangible benefits derived from the implementation of PBN are:

- Increased airspace safety through the implementation of continuous and stabilised descent procedures using vertical guidance;
- provision of runway-aligned final approach path which may not be possible from conventional navigation;
- reduced aircraft flight time due to the implementation of optimal flight paths, with the resulting savings in fuel, noise reduction, and enhanced environmental protection;
- improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimised RNAV or RNP paths;
- implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows;
- reduced delays in high-density airspaces and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas;
- reduction of lateral and longitudinal separation between aircraft to accommodate more traffic;
- decrease ATC and pilot workload by utilising RNAV/RNP procedures and airborne capability and reduce the needs for ATC-Pilot communications and radar vectoring;
- increase of predictability of the flight path; and

- reduction of maintenance and flight inspection costs associated with conventional navigation aids.

4.13.3 Current Situation In Indonesia

PBN implementation in Indonesia can so far only be seen in approximately 15 international ATS routes, with the RNP 10/RNAV 10 –criteria as requirement.

By further implementation of PBN in Indonesia, major cost savings will be possible for the country's aviation industry. For the airspace users the result will be shorter trajectories leading to less fuel consumption, less greenhouse gas emissions and for the ATM infrastructure owner, less need for investments in costly ground aids and maintenance. The overall capacity will increase when lateral and longitudinal separation will be reduced by higher precision offered by PBN.

The updated ATM Master Plan will address this issue with high priority.

4.14 GPI-11 RNP AND RNAV SIDS AND STARS

4.14.1 Scope

The optimisation of the TMA through implementation of improved ATS route structures based on RNP and RNAV, connecting the en-route phase of flight with the final approach, based on improved coordination processes.

Related operational concept components: AOM, AO, TS, CM, AUO

4.14.2 Description Of Strategy

The implementation of optimised SIDs, STARs, instrument flight procedures, and holding, approach and associated procedures, taking advantage of aircraft navigation capabilities such as RNP and RNAV, as well as ATM decision support systems, will improve capacity and efficiency substantially.

The use of SIDs and STARs will maximise system capacity and predictability while easing the environmental impact, reducing fuel consumption, and reducing ATS coordination. States should take advantage of the performance characteristics that are currently available to design such route structures. Near-term benefits can be achieved by applying RNPI and RNAV 2 and 1 criteria to the design of SIDs and STARs allowing optimum spacing between the routes, leading to greater capacity and efficiency benefits.

SIDs and STARs allow the efficient transit of aircraft from the runway to en-route flight and vice versa, the segregation of departing traffic from arriving traffic to provide safe aircraft spacing, the maintaining of obstacle clearance requirements, the meeting of environmental requirements, and the provision of a predictable flight trajectory compatible with aircraft RNAV systems.

4.14.3 Current Situation In Indonesia

The following Indonesian airports have a SID/STAR system based on conventional navigational ground aids:

Ambon, Balikpapan, Aceh, Bandung, Banjarmasin, Batam, Bengkulu, Biak, Halim Soekarno-Hatta Jakarta, Jayapura, Hasanudin Makassar, SSK II Pekan Baru, Ngurah Rai Bali, Sultan Thaha Jambi, Sam Ratulangi Manado, Kendari, Kupang, Medan, Merauke, Padang, Palangkaraya, Palembang, Pangkalpinang, Pontianak, Semarang ,Solo, Sorong, Surabaya, Tanjung Pinang, Ternate, Timika, Yogyakarta.

No airport has a SID/STAR system based on PBN yet. However, Jakarta SH and Surabaya airport will, according to plan, establish a RNP 1 SID/STAR system next year. Ambon and Manado will, by funding from the Boeing Company, establish a RN PAR system for SID/STAR. The project is coordinated by the airline Lion Air. Both airports are situated in geographically very high level terrain with complicated approach trajectories making the airports more or less only available during Visual Meteorological Conditions (VMC). Installing RNP-AR arrival procedures will make the airport available also during Instrument Meteorological Conditions (IMC).

Design of major Terminal Areas in Indonesia is not optimal with regard to present and future traffic demand.

Capacity to handle the departing/arriving traffic will be increased by proper airspace design for the TMAs. In and outbound traffic to/from an airport should be laterally separated when possible, to reduce workload for ATC, thereby increasing overall capacity. SIDs/STARs based on RNP and RNAV or even PRNAV criteria (i.e. RNP5 and RNP1) require the aircraft fleet using the airport to be properly equipped. The higher navigational precision provides possibilities to reduce the lateral separation between the SID and STAR, saving valuable distance for the airspace users. Using SID/STAR reduces the radio communication between ATC and Cockpit thereby reducing workload for both parties.

RNP-1 STARs also provides prerequisites for Continuous Descent Approaches (CDA), more popularly called Green Approaches.

Proposed development for the most congested TMAs will be included in the updated Master Plan.

4.15 GPI-21 NAVIGATION SYSTEMS

4.15.1 Scope

Enable the introduction and evolution of PBN supported by a robust navigation infrastructure providing an accurate, reliable and seamless global positioning capability.

Related operational concept components: AO, TS, CM, AUO

4.15.2 Description Of Strategy

Airspace users need a globally interoperable navigational infrastructure that delivers benefits in safety, efficiency and capacity. Aircraft navigation should be straightforward and conducted to the highest level of accuracy supported by the infrastructure.

To meet those needs, the progressive introduction of PBN must be supported by an appropriate navigation infrastructure consisting of an appropriate combination of Global Navigation Satellite Systems (GNSS), self-contained navigation systems (inertial navigation system) and conventional ground-based navigation aids.

GNSS provides standardised positioning information to the aircraft systems to support precise navigation globally. One global navigation system will help support a standardisation of procedures and cockpit displays coupled with a minimum set of avionics, maintenance and training requirements. Thus, the ultimate goal is a transition to GNSS that would eliminate the requirement for ground-based aids, although the vulnerability of GNSS to interference may require the retention of some ground aids in specific areas.

GNSS-centred PBN enables a seamless, harmonised and cost-effective navigational service from departure to final approach that will provide benefits in safety, efficiency and capacity.

GNSS implementation will be carried out in an evolutionary manner, allowing gradual system improvements to be introduced. Near-term applications of GNSS are intended to enable the early introduction of satellite-based area navigation without any infrastructure investment, using the core satellite constellations and integrated multi-sensor airborne systems. The use of these systems already allows for increased reliability of non-precision approach operations at some airports.

Medium/longer-term applications will make use of existing and future satellite navigation systems with some type of augmentation or combination of augmentations required for operation in a particular phase of flight.

GNSS (according to ICAO)

GNSS is a satellite-based navigation system utilising satellite signals, such as Global Positioning System (GPS), for providing accurate and reliable position, navigation, and time services to airspace users. In 1996, ICAO endorsed the development and use of GNSS as a primary source of future navigation for civil aviation. ICAO noted the increased flight safety, route flexibility and operational efficiencies that could be realised from the move to space-based navigation.

GNSS supports both RNAV and RNP operations. Through the use of appropriate GNSS augmentations, GNSS navigation provides sufficient accuracy, integrity, availability and continuity to support en-route, terminal area, and approach operations. Approval of RNP operations with appropriate certified avionics provides on-board performance monitoring and alerting capability enhancing the integrity of aircraft navigation.

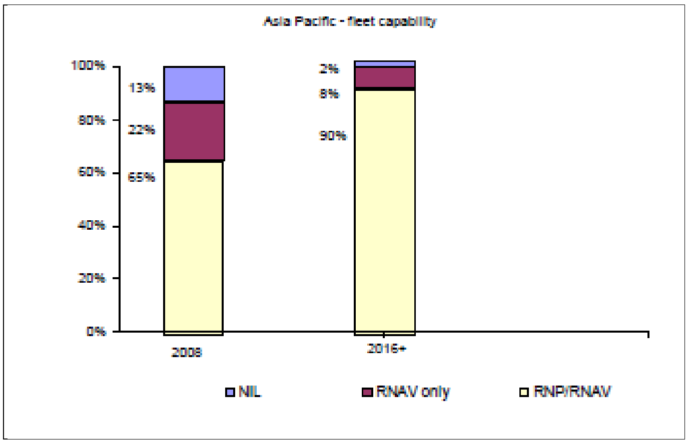
GNSS augmentations include Aircraft-Based Augmentation System (ABAS), Satellite-Based Augmentation System (SBAS), Ground-Based Augmentation System (GBAS), and Ground-based Regional Augmentation System (GRAS).

Aircraft fleet readiness status with respect to RNAV/RNP capabilities in the APAC Region

All major commercial aircraft manufacturers since the 1980`s have included RNAV capabilities and commercial aircraft currently produced incorporate an RNP capability.

An analysis in March 2008 based on fleet numbers from Ascend Online Fleets database and RNAV/RNP classification by International Air Transport Association (IATA) shows:

Figure 6: Asia Pacific RNAV/RNP fleet capacity



Source: ICAO APAC 2009

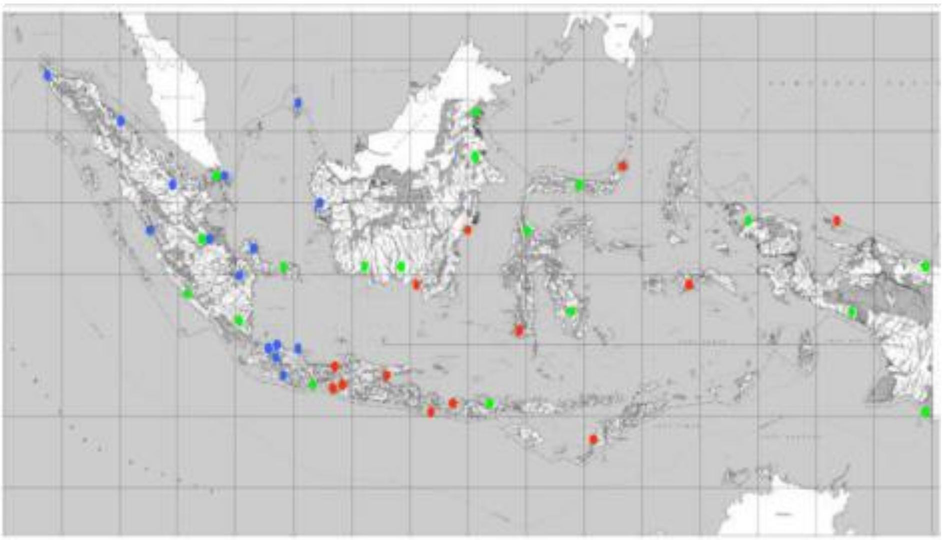
4.15.3 Current Situation In Indonesia

Table 3 : Navigational Aids in Indonesia

Navigational Aids	Quantities (Units)	Remarks
NDB	183	
DVOR	59	
CVOR	3	
DME	62	

Source: DGCA

Figure 7: VOR stations in Indonesia



Source: DGCA

Future development targets and need for replacements of ground aids versus the development of PBN in the short, medium and long term will be reflected in the updated Master Plan by assistance from the counterpart group.

There are, however, some doubts expressed concerning the vulnerability of the GNSS,

that could interfere with the quality of the satellite signals and following impacts on navigation capabilities. DGCA are discussing whether a monitoring tool for GNSS signal strength would be a requirement before PBN implementation plans are finalised for the country.

SURVEILLANCE

Surveillance includes following topics:

- GPI-9 Situational awareness GPI 9
- GPI-12 Functional integration of ground and airborne systems GPI 12

4.16 GPI-9 SITUATIONAL AWARENESS

4.16.1 Scope

Operational implementation of data link-based surveillance. The implementation of equipment to allow traffic information to be displayed in aircrafts supporting implementation of conflict prediction and collaboration between flight crew and the ATM system. Improve situational awareness in the cockpit by making available electronic terrain and obstacle data of required quality.

Related operational concept components: AO, TS, CM, AUO

4.16.2 Description Of Strategy

The further implementation of enhanced surveillance techniques (ADS-C or ADS-B) will allow reductions in separation minima and an enhancement of safety, increase in capacity, and improved flight efficiency, all on a cost effective basis. These benefits may be achieved by bringing surveillance to areas where there is no primary or secondary radar, when cost-benefit models warrant it. In airspaces where radar is used, enhanced surveillance can bring further reductions in aircraft separation minima and improve, in high traffic density areas, the quality of surveillance information, both on the ground and in the air, thereby increasing safety levels. The implementation of sets of quality assured electronic terrain and obstacle data necessary to support the ground proximity warning systems with forward looking terrain avoidance function as well as a Minimum Safe Altitude Warning (MSAW) system will benefit safety substantially.

Implementation of surveillance systems for surface movement at aerodromes where weather conditions and capacity warrant will also enhance safety and efficiency while implementation of cockpit display of traffic information and associated procedures will enable pilot participation in the ATM system and improve safety through greater situational awareness.

In remote and oceanic airspace where ADS-C is used, FANS capabilities exist on many air transport aircraft and could be added to business aircraft. ADS-B can be used to enhance traffic surveillance in domestic airspace. In this respect, it should be noted that the 1090 Extended Squitter (ES) is available and should be accepted as the global choice for the ADS-B data link.

At terminal areas and at aerodromes surrounded by significant terrain and obstacles, the availability of quality assured terrain and obstacle databases containing digital sets of data representing terrain surface in the form of continuous elevation values and digital sets of obstacle data of features, having vertical significance in relation to adjacent and surrounding features considered hazardous to air navigation, will improve situational awareness and contribute to the overall reduction of the number of controlled flight into terrain related accidents.

4.16.3 Current Situation In Indonesia

Primary Surveillance Radar (PSR)/Secondary Surveillance Radar (SSR)

The radar surveillance is made for UTA, CTA and TMA.

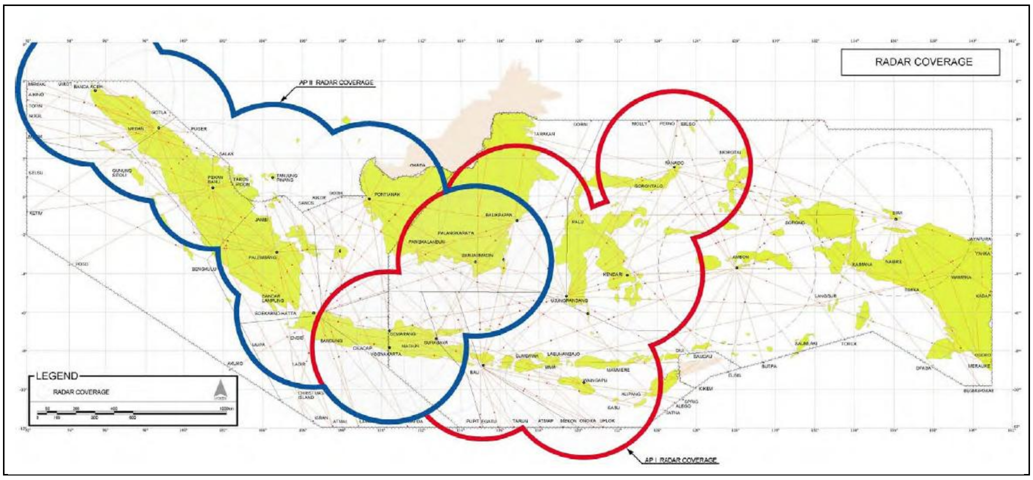
Existing Radars

There are currently 13 PSRs, 13 SSRs and 10 Monopulse Surveillance Radars (MSSRs), where six of them have Mode S capability.

The existing radars, which are mostly installed within airport property, are used for both en-route and terminal radar control. In order to extend en-route radar coverage, data renewal rate of every five seconds is applied for PSR and SSR. Radar data extracted from PSR/SSR is processed and displayed at approach control at airport. At the same time, each radar data is transmitted to Jakarta ACC and/or Ujung Pandang ACC, and processed for radar surveillance in UTA.

The radar network includes mixture of radars with different years of operation and different quality of radar data (accuracy, integrity, continuity, availability). This may result in duplicated radar target display, loss of radar target at Jakarta and Ujung Pandang ACCs.

Figure 8: Radar coverage in UTA in Indonesia



Source: JICA Report 2008

ADS-B

There are 27 ADS-B ground stations installed in Indonesia and three more are planned to be installed this year.

There is an immediate need and possibility for ADS-B to be approved for operational use in Ujung Bandang ACC. The need for having ADS-B implemented in Jakarta ACC is also quite urgent.

Jakarta SH airport needs to have an A-SMGCS installed in order not to lose too much capacity in poor IMC conditions. This requirement will also be assessed for other major airports.

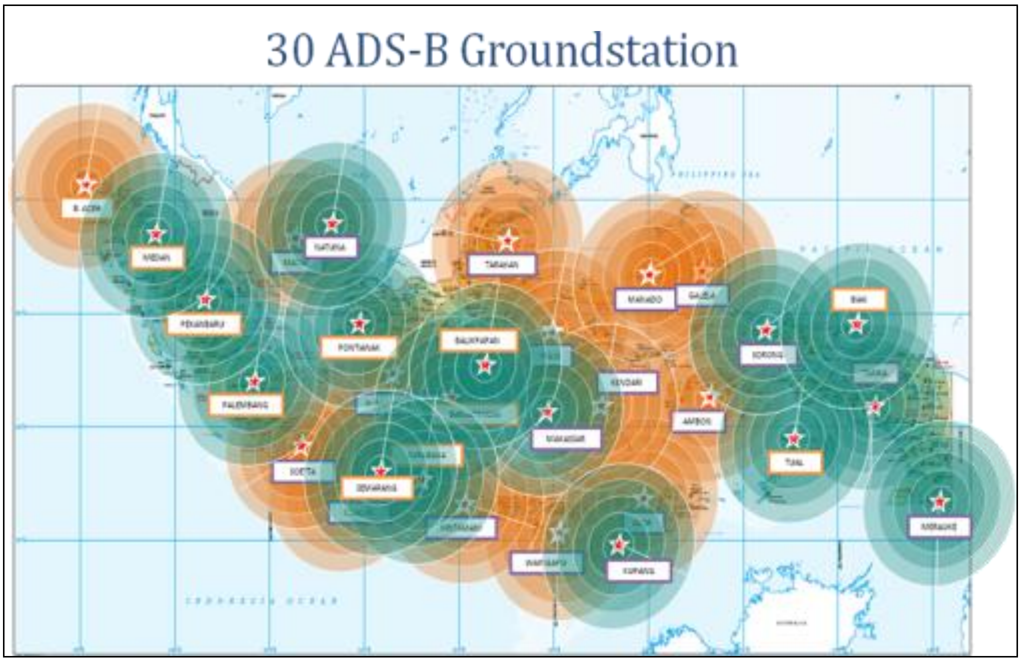
Multilateration

In an effort to increase efficiency, streamline operations, minimise infrastructure costs and,

most importantly, improve safety, many ANSPs are turning away from traditional radars and looking toward a different technology: multilateration.

Multilateration is an important technology to be considered during the development of an ATM Master Plan regarding future surveillance capabilities in the Indonesian airspace.

Figure 9: ADS-B coverage in UTA in Indonesia



Source: DGCA

4.17 GPI-12 FUNCTIONAL INTEGRATION OF GROUND SYSTEMS WITH AIRBORNE SYSTEMS

4.17.1 Scope

The optimisation of the TMA to provide for more fuel-efficient aircraft operations through FMS-based arrival procedures and functional integration of ground and airborne systems.

Related operational concept components: AOM, AO, TS, CM, AUO

4.17.2 Description Of Strategy

In recent years there have been several efforts to develop flight procedures that provide the most efficient trajectory during an aircraft's approach to the destination aerodrome. These procedures allow an uninterrupted flight trajectory from top of descent until the aircraft is stabilised for landing. For the purposes of design work, it may be necessary to implement these procedures in phases.

The design of en-route and arrival air routes and associated procedures should facilitate the routine use of continuous descent procedures. Similarly, the design of departure procedures should facilitate the routine use of unrestricted climb procedures.

To maximise efficiency in TMA airspace, it is critical to take advantage of improved TMA design and make the best use of automation. Therefore, in addition to continuous descent capabilities, aircraft will increasingly be equipped with time-of-arrival computation. This capability will integrate with ground automation to deliver time of arrival over fixes to assist in the sequencing process allowing aircraft to remain closer to their 4-D preferred trajectory.

4.17.3 Current Situation In Indonesia

Common reference system is defined in the CASR 170.028.

No trails have been performed in Indonesia with functional integration of airborne and ground systems. Implementation of AMAN/DMAN system in Jakarta TMA would provide for the capability to improve efficiency in the TMA airspace. More efficient SIDs/STARs will allow for an optimised use of continuous descent and unrestricted climb procedures.

AERODROME

The following topics are covered:

- Aerodrome design and management GPI 13
- Runway operations GPI 14
- Matching IMC and VMC operating capacity GPI 15

4.18 GPI-13 AERODROME DESIGN AND MANAGEMENT

4.18.1 Scope

The implementation of management and design strategies to improve movement area utilisation.

Related operational concept components: AO, CM, AUO

4.18.2 Description Of Strategy

Improved aerodrome design and management activities, including coordination and collaboration between ATM providers, vehicle operators and aircraft operators can have an important impact on safety and capacity at aerodromes.

Local collaborative decision-making processes should lead to sharing of key flight scheduling data that would enable all participants (aerodrome, ATC, ATFM, aircraft operators and ground handling) to improve their awareness of aircraft status throughout the “turn around” process. This will allow minimal and precise ATFM measures to be applied and higher predictability of schedules to be achieved. Benefits would include more efficient use of aerodrome resources and ground handling, reduction in delays and greater predictability of schedules.

As an integral part of the air navigation system, the aerodrome will provide the needed ground infrastructure including, inter alia, lighting, taxiways, runway and runway exits, and precise surface guidance to improve safety and to maximise aerodrome capacity in all weather conditions. The ATM system should enable the efficient use of the capacity of the aerodrome airside infrastructure. To ensure optimum use of aerodromes:

- runway occupancy time should be reduced where capacity and efficiency benefits would be gained;
- the ability to safely manoeuvre in all weather conditions whilst maintaining capacity should be sought;
- where warranted, precise surface guidance to and from a runway will improve capacity and efficiency; and
- the position (to an appropriate level of accuracy) and intent of all vehicles and aircrafts operating on the manoeuvring and movement areas should be known and available to the appropriate ATM community members at those aerodromes where a cost-benefit analysis shows that substantial capacity and efficiency gains would be achieved.

4.18.3 Current Situation In Indonesia

Aerodromes operate autonomously vis-à-vis the ATM Community. This lack of collaborative decision-making process between airport, ATM (including of course ATFM) and aircraft operators is a hindrance for a positive development of a full gate-to-gate process. Aerodrome design inclusive of all necessary ground infrastructure on the main aerodromes must be improved in order to cope with the increasing demand of aircraft operations.

The need of A-SMGCS for Jakarta SH airport will be included in the updated Master Plan. Together with the "counterpart team" The LFV ACT will investigate if it is likely that there are additional needs and if there could be cost benefit found for other airports during the Master Plan period.

At Jakarta SH airport, the international terminal is located in the northern part, which is easier to proceed to if the northern runway is used. If runway 07R should be used for this international flight, the aircrafts have to taxi a long way to reach the intended terminal.

If ATC is using runway 07R for landing and an international flight is coming in, it is common for ATC to facilitate for this flight to reach its terminal to let it land on runway 07L instead, where you have planned your departures. This mix of procedures, not having a standard procedure to follow, may be an issue of grave safety concern. The LFV ACT, during their stay in Jakarta, was informed about an incident that occurred very recently at Jakarta SH. With the ambition from ATC to facilitate for an arriving international flight it was directed to the northern runway, where a departing aircraft did not take off in due time. There should also be a study to find out the runway capacity and means to monitor and act if this capacity value will be exceeded. This will also be an issue for the updated ATM Master Plan.

4.19 GPI-14 RUNWAY OPERATIONS

4.19.1 Scope

Maximise runway capacity.

Related operational concept components: AO, TS, CM, AUO

4.19.2 Description Of Strategy

Enhancing the performance of runway operations begins with the establishment of runway capacity benchmarks which are usually defined as the maximum number of flights an aerodrome can routinely handle in an hour for above Category I weather minimum. These benchmarks are estimates that vary with runway configurations and the mix of aircraft types. Where warranted, it should be an objective to utilise aircraft capabilities and available runways in the most appropriate manner to move the all weather throughput at as close to the levels of visual throughput as possible.

Achieving the optimum capacity for each runway is a complex task involving many factors, both tactical and strategic. In order to effectively manage that task it is essential to measure the effects of operational changes and to monitor performance of the airspace users and ATM providers. The latter case will be applicable to the analysis of pilot and controller performance and must recognise the requirement to maintain the confidence of the users and to work within the existing culture of safety. A system of performance indicators that forms the basis of measurements and analyses should be devised. Tactical factors affecting runway occupancy include flight operations and ATM factors. The flight operations aspects include operator performance, effects of company procedures, use of the airfield infrastructure, and aircraft performance issues.

Runway capacity constraints are defined by, inter alia, procedures, runway physical characteristics, aircraft performance capabilities, surveillance capabilities, aircraft spacing, weather limitations, environmental restrictions and surrounding land use management. Improved procedures for minimising spacing such as reduced runway separation, Precision Runway Monitoring (PRM) and RNP+-approaches for closely-spaced parallel runways will optimise spacing capability.

4.19.3 Current Situation In Indonesia

Coordination between Aeronautical Information Service (AIS) and ATS authorities is defined in CASR 170.021.

Jakarta SH airport has a capacity of 54 movements/hour. Whether the other major airports, i.e., Surabaya, Bali, Medan etc. have declared a maximum hourly throughput of traffic is not clear at this point for the LFV ACT.

Implementation of A-SMGCS and PRM and RNP+ approaches, for closely-spaced parallel runways will be recommended in the updated Master Plan when so required based on demand capacity balance. Implementation of a multilateration system could be an option to consider.

Taxiway structure combining the two parallel runways at Jakarta SH airport is not efficient and will most likely have to be put into a specific Airport Design study. Such a study will most likely also contain other major airports in the country.

To expedite throughput of traffic, taxiways have to be constructed to facilitate for rapid exits of runway, with the aim to reduce the runway occupancy time. Such actions will be of great importance in order to accommodate forecasted traffic growth and to reduce the risk for airports to be future “bottlenecks” for aviation in Indonesia. When the ASEAN Open Sky policy is fully implemented the traffic load on the airports could increase even further.

4.20 GPI-15 MATCH IMC AND VMC OPERATING CAPACITY

4.20.1 Scope

Improve the ability of aircraft to manoeuvre on the aerodrome surface in adverse weather conditions.

Related operational concept components: AO, CM, AUO

4.20.2 Description Of Strategy

It should be an objective of the ATM system to utilise all airborne and service provision capabilities to maintain VMC capacity to the greatest practical extent during IMC. More use should be made of the capability of modern aircraft systems and ground systems in evolving toward this objective. Taxiway design and guidance capability may then be matched to those conditions.

Implementation of A-SMGCS, decision support tools and associated procedures offer the best solution for aircrafts to operate in all weather conditions. At those locations where cost benefit analysis indicates a positive value, the improved guidance and control of taxiing aircrafts and moving vehicles on the movement area as well as impending conflict alert may be fully automated.

Synthetic vision, based on a detailed aerodrome map, can enhance situational awareness under adverse weather conditions where runway/taxiway markings may be obscured. Head-up display and guidance systems that can synthesise enhanced vision sensor data and synthetic vision images can offer an integrated solution to enhance situational awareness.

Enhanced conflict detection and alerting technologies and procedures will improve the aerodrome surface movement throughput while meeting established levels of safety. Controllers should also have access to systems to help them develop and maintain situational awareness of all traffic on the movement area in all weather conditions.

4.20.3 Current Situation In Indonesia

Lack of A-SMGCS makes monitoring of large manoeuvring areas difficult during time of limited visibility and darkness. However, for airports where cost/benefit indicates a positive outcome such implementation should be considered. (Ref GPI 13) The manning of operational staff and working methods and coordination procedures in ADC must be adjusted during situations with limited visibility and reduced monitoring ability from the tower cab. For safety reasons a reduced capacity must be accepted by stakeholders and traffic congestions overcome by implementation of ATFM measures.

It is not known to the LFV ACT if such actions are taken or prepared for Indonesian airports, or if a special Low Visibility Procedure (LVP) is introduced.

In order to increase accessibility to airports situated in mountain areas during IMC conditions, introduction of curved approaches (RNP-AR) needs in some cases be established. In Ambon- and Manado airports, such procedures are already planned to be introduced during this year. (See also GPI-11)

ATC TOOLS

The following GPI is covered:

- Decision support systems and alerting systems GPI 16

4.21 GPI-16 DECISION SUPPORT SYSTEMS AND ALERTING SYSTEMS

4.21.1 Scope

Implementation of decision support tools to assist air traffic controllers and pilots in detecting and resolving air traffic conflicts and in improving traffic flow.

Tools are available that would improve safety. Examples are minimum safe altitude warning systems (MSAW), short-term conflict alert (STCA) and runway incursion alerting tools. Tools that can improve efficiency could be automated Flight Data Processing Systems (FDPS), Medium Term Conflict Detection (MTCD) and sequencing tools, and online data exchange systems.

Related operational concept components: DCB, TS, CM, AUO

4.21.2 Description Of Strategy

Decision support systems facilitate early resolution of potential conflicts, provide basic levels of explorative probing to optimise strategies, and reduce the need for tactical action. The executive role of controllers is thereby enhanced, giving scope for management of more traffic within acceptable workload limits.

Several tools are available that have the ability to substantially enhance safety. These include MSAW systems, STCA and runway incursion alerting tools. Tools that can improve efficiency include automated FDPS, longer term conflict prediction and sequencing tools, ‘and online data interchange systems.

Conflict prediction tools span several sectors and permit improved sectoral planning, thereby providing the advantage of more expeditious traffic flow and fewer potential conflicts within established arrival schedules. This will allow sector teams to operate more effectively and will result in more optimum and efficient arrival flows.

The automation of coordination tasks between adjacent sectors improves the quality of information on traffic transiting between sectors and makes it more predictable, thereby allowing reduced separation minima, decreased workload, increased capacity and more efficient flight operations.

4.21.3 Key Features Of A Modern ATC System

A modern ATC system has a number of characteristics such as:

- Interactive
- Information sharing
- Safety Nets
- Coordination and Automation
- Flexible
- Conflict Detection
- Monitoring

4.21.4 Current Situation In Indonesia

The ATM system for Jakarta FIR (JAATS) has been operational from 1997 and it is now quite difficult to find spare parts. JAATS is based on an American manufactured ATS system called Guardian. JAATS provides safety nets like STCA and MSAW, but does not provide any tool for conflict detection. The Guardian system is providing paper strips and does not provide for ADS-B surveillance. There is no AIDC data exchange with adjacent FIRs. A replacement project has started and a new system is expected to be operational by 2013. This replacement is of vital interest for development of the ATM capacity in the country. If this will be delayed it will most likely cause major delay situations also for the airspace user’s growing demand for ANS.

Ujung Pandang FIR ATM (MAATS) system is newer and has been operational from 2005. The MAATS system is a Thales production named Eurocat X. The MAATS provides for safety tools like STCA and MSAW. Monitoring aids, like MTCD (for conflict detection) is operational. The system also can give you Route Adherence Monitoring (RAM) warnings and Cleared Level Adherence Monitoring (CLAM) warnings. MAATS operates with electronic strips and can integrate ADS-B surveillance. The system also provides for AIDC with adjacent FIRs.

The radar data and flight data at Jakarta ACC and Ujung Pandang ACC are not linked to each other, and thus radar hand-off between Jakarta and Ujung Pandang ACCs has not been made yet.

SYSTEM WIDE INFORMATION MANAGEMENT

Under this heading, the following topics are covered:

- Aeronautical Information GPI 18
- Meteorological systems GPI 19
- WGS-84 GPI 20

4.22 GPI-18 AERONAUTICAL INFORMATION

4.22.1 Scope

To make available in real-time, quality assured electronic information (aeronautical, terrain and obstacle).

Related operational concept components: AOM, DCB, AO, TS, CM, AUO, ATMSDM

4.22.2 Description Of Strategy

RNAV, RNP, computer-based navigation systems and ATM requirements introduced a need for new corresponding AIS requirements for quality and timeliness of information. To be able to cope and manage the provision of information and satisfy these new requirements, the traditional role of AIS should change into a system-wide information management service with changing duties and responsibilities.

Electronic information

To facilitate coordination, improve efficiency and safety and ensure that the ATM community shares the same information when collaborating on decisions, it is essential that quality assured electronic information (aeronautical, terrain and obstacle) be available in real-time. Electronic information will enhance pilots' situational awareness during en-route, terminal and AO by loading on-board equipment with geo-referenced data sets containing en-route, terminal and aerodrome information. The same information may be made available at different ATC positions and pre-flight planning units as well as for access by airlines' flight planning departments or private/general aviation users. The electronic information can be tailored and formatted so that it satisfies ATM user requirements and applications. Standardised data formats will be used in creating the information databases which will then be populated with quality assured data sets.

4.22.3 Current Situation In Indonesia

In the new CNS/ATM environment when the majority of commercial aircrafts flying in or over Indonesia are equipped with GPS and equipment reliant on database for navigation, it is essential to have accurate and reliable data which is created and supplied by AIS.

There have been considerable errors in the information materials published by DGCA in the past, according to reports such as the JICA report.

Current AIS of Indonesia (DGCA) is conducted under the ICAO SARPS but there have been deficiencies in products and complaints from witness (airlines, pilots and chart industry). Quality assurance programs must therefore continue in order to restore and maintain confidence by stakeholders. Also refer to GPI-20 WGS 84.

International NOTAM Office (NOF) is located at DGCA headquarter and open H24.

There are several AIS units (offices) located at airports in Indonesia.

The future Aeronautical Information Management (AIM), assuring that the ATM community shares the same real-time information for decision making will be addressed in the updated ATM Master Plan.

Indonesia is promulgating AIP and amendments according to Aeronautical Information Regulation and Control (AIRAC) circles but currently the updated information is not available on the website.

4.23 GPI-19 METEOROLOGICAL SYSTEMS

4.23.1 Scope

To improve the availability of meteorological information in support of a seamless global ATM system.

Related operational concept components: AOM, DCB, AO, AUO

4.23.2 Description Of Strategy

Immediate access to real-time, global operational meteorological information (OPMET) is required to assist ATM in tactical decision-making for aircraft surveillance, ATFM and flexible/dynamic aircraft routing which will contribute to the optimisation of the use of airspace. Such stringent requirements will imply that most meteorological systems should be automated and that meteorological service for international air navigation be provided in an integrated and comprehensive manner through global systems such as the World Area Forecast System (WAFS), the International Airways Volcano Watch (IAVW) and the ICAO tropical cyclone warning system.

Enhancements to WAFS, IAVW and the ICAO tropical cyclone warning system to improve the accuracy, timeliness and usefulness of the forecasts issued will be required to facilitate the optimisation of the use of airspace.

Increasing use of data-link to downlink and uplink meteorological information (through such systems as D-ATIS and Digital Meteorological Information for Aircraft in Flight [D-VOLMET]) will assist in the automatic sequencing of aircraft on approach and will contribute to the maximisation of capacity. The development of automated ground-based meteorological systems in support of operations in the terminal area will provide OPMET information (such as automated low-level wind shear alerts) and automated runway wake vortex reports. OPMET information from the automated systems will also assist in the timely provision of forecasts and warnings of hazardous weather phenomena. These forecasts and warnings, together with automated OPMET information, will contribute to maximising runway capacity.

4.23.3 Current Situation In Indonesia

ATC receive Meteorological Report (METAR) information every 30 minutes for the main airports in Indonesia and that is similar to the procedures valid in other ICAO states.

Meteorological Services for Air Navigation (MET) and airport information for some of the main airports are automatically transmitted via ATIS to the pilot.

Specific weather data presentation from weather radars are not presented on the existing radar presentation system for the controller.

Exchange of reported significant weather conditions between controller and MET office seems to be limited and not formalised. This shortcoming might be overcome at a low or no coast for the benefit of safety. This is especially valuable in this tropical area and have an impact on both en-route and airport operations.

4.24 GPI-20 WGS-84

4.24.1 Scope

The implementation of WGS-84 by all states.

Related operational concept components: AO, CM, AUO

4.24.2 Description Of Strategy

The geographical coordinates used across various states in the world to determine the position of runways, obstacles, aerodromes, navigation aids and ATS routes are based on a wide variety of local geodetic reference systems.

With the introduction of RNAV, the problem of having geographical coordinates referenced to local geodetic datum is more evident and has clearly shown the need for a universal geodetic reference system. ICAO, to address this issue, adopted in 1994 the World Geodetic System - 1984 (WGS-84) as a common horizontal geodetic reference system for air navigation with an applicability date of 1 January, 1998.

Fundamental to the implementation of GNSS is the use of a common geographical reference system. ICAO adopted the WGS-84 Geodetic Reference System as that datum, and many states have implemented or are implementing the system. Failure to implement, or a decision to use an alternative reference system, will create a seam in ATM service and will delay the full realisation of GNSS benefits. Completion of the implementation of the WGS-84 Geodetic Reference System is a prerequisite for a number of ATM enhancements, including GNSS.

4.24.3 Current Situation In Indonesia

Concerning implementation of WGS-84, Indonesia is considered mostly compliant. Some airport data still needs to be verified, while coordinates for terminal areas and en-route navigation are quality assured.

4.25 SUMMARY

These 23 GPIs set out in the ICAO GANP are seen as necessary steps to provide a global enhanced ATM system. The time period for this transition is determined to the short and medium term perspective. An analysis of the current situation in Indonesia indicates that Indonesian ATM systems are compliant in nine of these GPIs. In three GPIs, Indonesia is partly/almost compliant, and in the remaining 11 GPIs, Indonesian ATM system needs to take actions in order to comply with ICAO documents.

In the updated ATM Master Plan, the LFV ACT will, in collaboration with the counterpart team, provide a roadmap where these GPIs are included, with necessary actions in the short , medium and long term, that need to be taken in order for Indonesian ATM to comply to ICAO GANP.

Table 4: Status of 23 GPI in Indonesia

	Global Plan Initiative	Description	Indonesian Status
GPI-1	Flexible use of airspace	Fair and balanced distribution of airspace between civil and military users.	Not implemented
GPI-2	Reduced vertical separation minima	Application of 1,000 ft vertical separation.	Already compliant
GPI-3	Harmonisation of level systems	Adoption of the ICAO FL Scheme based on feet.	Already compliant
GPI-4	Alignment of upper airspace classifications	Application of a common ICAO ATS Airspace Class above an agreed division level.	Already compliant
GPI-5	RNAV and RNP (Performance-based navigation)	Use of advanced aircraft navigation capabilities.	High level implementation plan communicated to ICAO, but very few steps taken
GPI-6	Air traffic flow management	Optimisation of the ATM system's traffic capacity.	Not implemented
GPI-7	Dynamic and flexible ATS route management	Accommodation of user preferred flight trajectories.	Not implemented
GPI-8	Collaborative airspace design and management	Implementation of harmonised global airspace organisation and management principles.	Not implemented
GPI-9	Situational awareness	Improved situational awareness for pilots and air traffic controllers through use of data-link based surveillance and cockpit display of traffic.	Limited implementation of ADS-C ADS-B ground stations in place Limited implementation of STCA
GPI-10	Terminal area design and management	Optimisation of traffic management in the terminal area.	Not implemented
GPI-11	RNP and RNAV SIDs and STARs	Use of improved coordination processes to seamlessly link the enroute and terminal phases of flight.	Not implemented

	Global Plan Initiative	Description	Indonesian Status
GPI-12	Functional integration of ground systems with airborne systems	Provision of more fuel efficient flight trajectories through trajectory management.	Not implemented
GPI-13	Aerodrome design and management	Improvement of airport movement area utilisation.	Federal Aviation Administration (FAA) runway incursion study completed
GPI-14	Runway operations	Optimisation of runway capacity	Not implemented
GPI-15	Match IMC and VMC operating capacity	Reduce effect of adverse weather conditions on airspace and airport capacity	Not implemented
GPI-16	Decision support systems and alerting systems	Automated tools for detecting traffic conflicts and improving traffic flow	Limited implementation of automated alerting for ATC (in Ujung Pandang ACC)
GPI-17	Data link applications	Increase use of data link and reduce voice transmissions	Partly compliant
GPI-18	Aeronautical information	Management and distribution of high quality, real-time aeronautical information	Not implemented
GPI-19	Meteorological systems	Improved availability and quality of meteorological information	Not implemented
GPI-20	WGS-84	Implementation of WGS-84	Almost compliant
GPI-21	Navigation systems	Transition to performance based navigation	Partly compliant
GPI-22	Communication infrastructure	Provision of voice and data communications capability with adequate capacity and capability to support evolving ATM requirements	New VSAT implemented and standardised. No plans for 8.33 kHz channel spacing
GPI-23	Aeronautical radio spectrum	Protection of aviation radio frequencies	Already Compliant

Source: Consultants' Estimates

CHAPTER 5: ATM COMMUNITY EXPECTATIONS

5.1 INTRODUCTION

Key to the operational concept is a clear statement of the expectations of the ATM community. The expectations for the global ATM system have been discussed among members of the ATM community in general terms for many years. These expectations stem from efforts to document ATM "user requirements".

5.2 EXPECTATIONS FOR THE GLOBAL ATM SYSTEM

The expectations hereafter are interrelated and cannot be considered in isolation. Furthermore, while safety is the highest priority, the expectations are shown in alphabetical order as they would appear in English.

5.2.1 Access And Equity

A global ATM system should provide an operating environment that ensures that all airspace users have right of access to the ATM resources needed to meet their specific operational requirements and that the shared use of airspace by different users can be achieved safely. The global ATM system should ensure equity for all users that have access to a given airspace or service. Generally, the first aircraft ready to use the ATM resources will receive priority, except where significant overall safety or system operational efficiency would accrue or national defence considerations or interests dictate that priority be determined on a different basis.

5.2.2 Capacity

The global ATM system should exploit the inherent capacity to meet airspace user demands at peak times and locations while minimising restrictions on traffic flow. To respond to future growth, capacity must increase, along with corresponding increases in efficiency, flexibility and predictability, while ensuring that there are no adverse impacts on safety and giving due consideration to the environment. The ATM system must be resilient to service disruption and the resulting temporary loss of capacity.

5.2.3 Cost-effectiveness

The ATM system should be cost-effective, while balancing the varied interests of the ATM community. The cost of service to airspace users should always be considered when evaluating any proposal to improve ATM service quality or performance. ICAO policies and principles regarding user charges should be followed.

5.2.4 Efficiency

Efficiency addresses the operational and economic cost-effectiveness of gate-to-gate flight operations from a single-flight perspective. In all phases of flight, airspace users want to depart and arrive at the times they select and fly the trajectory they determine to be optimum.

5.2.5 Environment

The ATM system should contribute to the protection of the environment by considering noise, gaseous emissions and other environmental issues in the implementation and operation of the global ATM system.

5.2.6 Flexibility

Flexibility addresses the ability of all airspace users to modify flight trajectories dynamically and adjust departure and arrival times, thereby permitting them to exploit operational opportunities as they occur.

5.2.7 Global Interoperability

The ATM system should be based on global standards and uniform principles to ensure the technical and operational interoperability of ATM systems and facilitate homogeneous and non-discriminatory global and regional traffic flows.

5.2.8 Participation by the ATM community

The ATM community should have a continuous involvement in the planning, implementation and operation of the system to ensure that the evolution of the global ATM system meets the expectations of the community.

5.2.9 Predictability

Predictability refers to the ability of airspace users and ATM service providers to provide consistent and dependable levels of performance. Predictability is essential to airspace users as they develop and operate their schedules.

5.2.10 Safety

Safety is the highest priority in aviation, and ATM plays an important part in ensuring overall aviation safety. Uniform safety standards and risk and safety management practices should be applied systematically to the ATM system. In implementing elements of the global aviation system, safety needs to be assessed against appropriate criteria and in accordance with appropriate and globally standardised safety management processes and practices.

5.2.11 Security

Security refers to the protection against threats that stem from intentional acts (such as terrorism) or unintentional acts (such as human error, natural disaster) affecting aircraft, people or installations on the ground.

Adequate security is a major expectation of the ATM community and of citizens. The ATM system should therefore contribute to security, and the ATM system, as well as ATM-related information, should be protected against security threats. Security risk management should balance the needs of the members of the ATM community that require access to the system, with the need to protect the ATM system. In the event of threats to aircraft or threats using aircraft, ATM shall provide the authorities responsible with appropriate assistance and information.

5.3 STAKEHOLDERS VIEW

The LFV ACT has, in order to understand stakeholders, such as the view of neighbouring ANSP and airlines associations on ATM in Indonesia, made some inquiries which are documented below. Holding regular interviews with documented minutes with the ANSPs of the FIRs adjacent to Indonesia is not part of the TOR for the ATM Master Plan project. In order to develop short, medium and long term actions in an ATM Master Plan, it is important, however, to have a concept of the maturity of the ATM system and plans in the neighbouring states in order to cater for an optimum coordinated approach in the region. Information concerning regional ATM status and plans via ICAO Regional Office in Bangkok and regional ANSPs need to be collected. Most likely this information will be collected via telephone and mail.

5.3.1 What are the most important/urgent issues to deal with in your opinion?

There are a number of very significant issues in Indonesia that impact the safe delivery of ATM services. These include:

- Role confusion: the distinction between the roles of the service providers and the regulator is not clear in Indonesia. This causes problems with standardisation of services and procedures, because it is unclear who should be responsible for procedural development or publication of something like a Manual of ATS. The level of service provision across the country is inconsistent.
- The automation system used by AP2 has been unsupported for some time and is in urgent need of replacement. Ownership of the replacement of the system is unclear (while AP2 operates it, DGCA will most likely specify and buy the new system).
- There is no clear linkage between desired or required ATM services and the infrastructure required to support those services. Instead, there is a lot of unused or unusable equipment throughout Indonesia and a focus on technology as a solution for all problems (even when simple procedures could lead to rapid resolution of problems).
- Indonesia’s Law no. 1/2009 directs that a new single ANSP will be in place by January 2012. AP1 and AP2 management have started the process of separating out their airport and air navigation

business; funding for air navigation (including salaries) could be withdrawn at any time. The uncertainty needs to be resolved as soon as possible, and once established the new organisation must be appropriately empowered (i.e., able to manage their own budget, procure their own equipment, set appropriate fees and charges, determine and deliver training).

- There are differences between AP1 and AP2. Given the limitations of the system in which they work, the front line controllers generally do an excellent job.
- The two organisations are structured very differently and have different systems of remuneration. For example, AP2 has a Corporate Safety and Risk group that reports to the President Directors and oversees safety for Airports and ATS; as of three months or so again, AP1 was still trying to decide where responsibility for safety management should fall within the organisation.

5.3.2 Other opinions from a stakeholder:

- We have worked extensively with DCGA on mitigating safety issues, including EU Ban and what we see are inherent safety issues in their services and infrastructure.
- The response has been very positive - it took some time but we now have an excellent relationship with DCGA - they are sponsoring an IATA safety workshop in early August for example.
- We understand the political issues which the organisation needs to deal with, including internal issues which result. This is sometimes frustrating but cannot be avoided. This is the major concern - getting what we see as critical issues on the agenda and ensuring consistency of effort.
- Request from stakeholders for extended operational hours for airports in the eastern part of the country.

CHAPTER 6: ATM PLANNING FOR THE REGION

6.1 INTRODUCTION

The LFV ACT was tasked to consider relevant ATM planning for the region. Besides the national strategical plan developed by MoT in Indonesia for the time period 2010-2014, the team has reviewed the APAC Regional PBN implementing plan from September 2009.

The LFV ACT will, in the next step, prepare the update of the ATM Master Plan, make an assessment of the strategic plan issued by the MoT for the time period 2010-2014 and in cooperation with the counterpart group determine the road map with actions necessary. This also includes the MoT plans concerning facility development, rehabilitation and maintenance of ATM infrastructure. The updated ATM Master Plan will also have the APAC Regional PBN implementation plan in consideration. In this context, the procurement process as a part of the budget process is a key enabler for CNS/ATM infrastructure development.

6.2 BUDGETS

Table 5: Strategic Plan of MoT 2010-2014

WORKING UNIT	Year (Rp.000,-)					
	2010 *)	2011	2012	2013	2014	TOTAL
LAND TRANSPORT	1,838,442,619	6,183,268,101	6,732,915,154	7,427,691,172	7,800,266,930	29,982,583,976
RAILWAY	3,729,460,695	9,520,002,367	11,830,655,567	14,235,428,010	15,362,651,195	54,678,197,834
SEA TRANSPORT	4,438,417,303	5,655,723,219	7,598,978,245	10,026,363,652	13,072,792,228	40,792,274,647
CIVIL AVIATION	3,873,546,579	11,078,739,631	11,916,705,362	13,276,190,624	14,145,623,591	54,290,805,787
R & D	87,828,682	136,168,820	105,456,117	165,813,545	127,381,323	622,648,487
EDUCATION AND TRAINING	1,472,198,019	2,721,285,699	3,218,376,112	4,061,041,638	4,676,365,043	16,149,266,511
SECRETARIAT GENERAL (+KNKT)	322,940,226	445,218,145	502,472,713	578,475,099	671,773,801	2,520,879,983
INSPECTORATE GENERAL	71,001,767	78,988,786	90,088,417	102,230,919	116,191,483	458,501,372
TOTAL	**15,833,835,890**	**35,819,394,768**	**41,995,647,687**	**49,873,234,659**	**55,973,045,594**	**199,495,158,597**

Source: RPJMN 2010 – 2014 of MoT

Table 6: Allocation of Funding for Transportation Sector Period 2010-2014

NO	Ministry/Sector	(Rp Trillion)
1	Land Transportation	11.8510
2	Railways	33.7925
3	Sea Transportation	33.0447
4	Air Transportation	19.5356
5	Research and Development Bureau	0.623
6	Education and Training Bureau	15.938
7	Secretariat General (+KNKT)	2.521
8	Inspectorate General	0.459
	Total for MoT	**117.7638**

Source: RPJMN 2010 – 2014 of MoT

The five-year funding allocation of Rp 117.7638 is less than the required amount which is Rp 199.495 trillion. The shortfall of Rp 81.731 trillion is expected to be covered by the investments of State Owned Enterprises (SOE) and the private sector.

6.3 AIR NAVIGATION

In the MoT strategy plan for 2010-14, the long term air navigation development, especially ATM, is done through the harmonisation of ANSP and ATFM corresponding to the regional strategy (Asia – Pacific). In addition, ATN air ground strategy will be implemented for aviation communication, GNSS-based aviation route restructuring strategy and National AIS System Centre (NASC) integration strategy.

6.4 DEVELOPMENT OF POLICY FOR AIR NAVIGATION

Development of policy for Air Navigation in the MoT strategic plan 2010-14 is defined as follows:

- The procurement and replacement of radar and the use of ADS-B in regions unreachable by radar;
- The integrated harmonisation of two FIR (MAATS and JAATS);
- The implementation of CNS/ATM system;
- The implementation of surveillance technology such as ADS-B and Multi-lateration;

- The implementation of GNSS augmentation system for terminal/NPA;
- Establishing ATCC system;
- ADS-B data sharing with adjacent countries;
- NASC ownership;
- AIS system upgrade with five to seven years cycle;
- Indonesia's AIS system is integrated with the world's IAS system, ATS, aerodrome operator, airlines and all users in general;
- Independent ADS-B network;
- The revitalisation of air navigation facilities aged more that 15 years.
- The revitalisation of radar system in Makassar, Balikpapan, Banjarmasin and Surabaya.
- The formulation of State Safety Programme (SSP).
- The implementation of Safety Management System (SMS).

6.5 THE DEVELOPMENT, REHABILITATION AND MAINTENANCE OF AIR NAVIGATION

The MoT Strategic Plan for 2010-14 also defines the development, rehabilitation and maintenance of air navigation infrastructure.

Air navigation facility development consists of:

- ATM facility, including the establishment of navigation service provider, handover of airspace sector A,B and C, new CNS/ATM system development, procurement and installation of landing facility, tower simulator 3D for refreshing and license/rating test, Computer Based Training (CBT) for refreshing and ATC personnel license test, English Proficiency Laboratory, Electronic Safety Incident Reporting System, Simulator Design ASM for airspace improvement, ATFM unit etc.;
- Aviation surveillance facilities including the implementation of ATM Net for ADS-B purposes, the procurement and installation of ASMGCS/Multi-lateration (MLAT), the procurement of MLAT Wide Area System, Information Automated Aviation Server Billing, procurement and installation of ATC automation, ADS-B procurement with Universal Access Technology (UAT), the procurement of ATCC equipment, the procurement and installation of MSSR radar;
- Air navigation support facilities includes the procurement and installation of Doppler VHF Omni-directional Range (DVOR), Distance Measuring Equipment (DME), VHF Omni-directional Range (VOR), Instrument Landing System (ILS), GBAS (GLS), Runway Visual Range (RVR);
- Aviation communication facilities include ADC, Mobile Tower Set, VHF APP-Set, VHF-ER, Recorder, VHF-Portable, HF-SSB, Teleprinter, Aeronautical Mobile-Satellite Service (AMSS), Integrated AIS System, VCSS, AFTN PTP, ATN/AMHS, Master Clock, the procurement of radio frequency monitoring equipment, VSAT, meteorology facilities consisting of Acquisition Weather Observation Stations (AWOS), Doppler weather and the procurement of network for ADS-B.

The rehabilitation of air navigation equipment consists of:

- Aviation surveillance facilities (maintenance of NOTAM Office system and briefing, the replacement of ATC Automation at JAATS, radar coverage procurement, the replacement of SSR with MSSR Mode S, PSR replacement, the replacement of MSSR with MSSR Mode S, the procurement of the spare parts of ATC automation for MAATS, ADS-B Manage of service operational, the procurement of radar spare parts, the procurement of ADS-B spare parts, VCS capacity improvement);
- Air navigation facilities (the replacement of DVOR/DME, DVOR, DME, DVOR/DME spare parts, Non Directional Beacon (NDB), ILS and ILS spare parts).

6.6 PIONEER AIR TRANSPORTATION SERVICE

Subsidies for pioneer air transportation in 2010 – 2014 are calculated under an assumption that the hourly Total Ownership Cost (TOC) increases 10 percent per year and so does the tariff. Aircraft types used are the same as the ones used in 2009. Additionally, several regions obtain fuel subsidy. The number of pioneer aviation routes will remain constant within the period of 2010 – 2014, with estimated number between 114 – 118 routes.

Whether or not Pioneer Service should be included in the ATM Master Plan will be assessed together with counterpart group in the elaboration of the ATM Master Plan work.

6.7 REGIONAL RELATIONS AND PLANS

Indonesia is a member of the ICAO APAC region.

Indonesia takes part in APANPIRG as well as the sub-groups ATM/AIS/SAR/SG, Regional Airspace Safety Monitoring Advisory Group (RASMAG) and CNS/MET SG.

Meetings are frequently hosted by DGCA in Jakarta.

The twentieth meeting of the ATM/AIS/SAR sub-group (ATM/AIS/SAR/SG/20) of APANPIRGwas held in Singapore from 5 to 9 July 2010. The meeting adopted a regional guidance material to assist states for the implementation of changes to the flight plan format introduced by Amendment 1 to PANS-ATM (Doc 4444) which is the result of the hard work of the Flight Plan and ATS Message Implementation Task Force. ATM/AIS/SAR/SG/20 identified a need for the development of harmonised state contingency plan and also a sub-regional Volcanic Ash Contingency Plan. ATM/AIS/SAR/SG/20 invited ICAO to hold APAC Seamless ATM Workshop in February 2011.

6.8 REGIONAL SHORT TERM PBN IMPLEMENTATIONS IN ASIA/PACIFIC REGION

Table 7: Regional Short term PBN Implementation in ASIA/Pacific Region

Short Term (2008-2012)*		
Airspace	**Preferred Nav. Specifications**	**Acceptable Nav. Specifications**
Route – Oceanic	RNP 4	RNAV 10
Route – Remote continental	RNP 4	RNAV 10
Route – Continental en-route	RNAV 2, RNAV 5	
TMA – Arrival	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
TMA – Departure	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
Approach	RNP APCH with Baro-VNAV in most possible airports RNP AR APCH in airport where there are obvious operational benefits.	
Implementation Targets • RNP APCH (with Baro-VNAV) in 30% of instrument runways by 2010 and 50% by 2012 and priority should be given to airports with operational benefits • RNAV 1 SID/STAR for 50% of international airports by 2010 and 75% by 2012 and priority should be given to airports with RNP Approach • Re-defining existing RNAV/RNP routes into PBN navigation specification by 2012 • Implementation of additional RNAV/RNP routes		

Source: ICAO APAC Regional PBN implementation plan

This table shows the PBN implementation in the short term in ASEAN Pacific region.

6.9 REGIONAL MEDIUM TERM PBN IMPLEMENTATIONS IN ASIA/PACIFIC REGION

Table 8: Regional Medium PBN Implementation in ASIA/Pacific Region

Medium Term (2013-2016)*		
Airspace	**Preferred Nav. Specification**	**Acceptable Nav. Specification**
Route – Oceanic	RNP 2**, RNP 4	RNAV 10
Route – Remote continental	RNP 2	RNAV 2, RNP 4, RNAV 10
Route – Continental en-route	RNAV 1, RNP 2	RNAV 2, RNAV 5
TMA – Arrival	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
TMA – Departure	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
Approach	Expansion of RNP APCH (with Baro-VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations	
Implementation Targets • RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016 • RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016 • RNAV 1 or RNP 1 SID/STAR for 70% of busy domestic airports where there are operational benefits • Implementation of additional RNAV/RNP routes		

Source: ICAO APAC Regional PBN implementation plan

This table shows the PBN implementation in the medium term in Asia Pacific region.

6.9.1 Summary

The LFV ACT will, in the next step, prepare the updation of the ATM Master Plan, make an assessment of the strategic plan issued by the MoT for the time period 2010-2014 and in cooperation with the counterpart group, determine the road map with actions necessary. This also includes the MoT plans concerning facility development, rehabilitation and maintenance of ATM infrastructure. The updated ATM Master Plan will also have the APAC Regional PBN implementation plan in consideration. In this context, the procurement process is a key enabler for CNS development.

In order to develop short, medium and long term actions in the ATM Master Plan, it is important to have a concept of the maturity of the ATM system and plans in the neighbouring states in order to cater for an optimum coordinated approach in the region. Information concerning regional ATM status and plans via ICAO regional office in Bangkok and regional ANSPs need to be collected. This is also part of the ToR.

CHAPTER 7: GAPS BETWEEN CURRENT SITUATION AND GATMOC

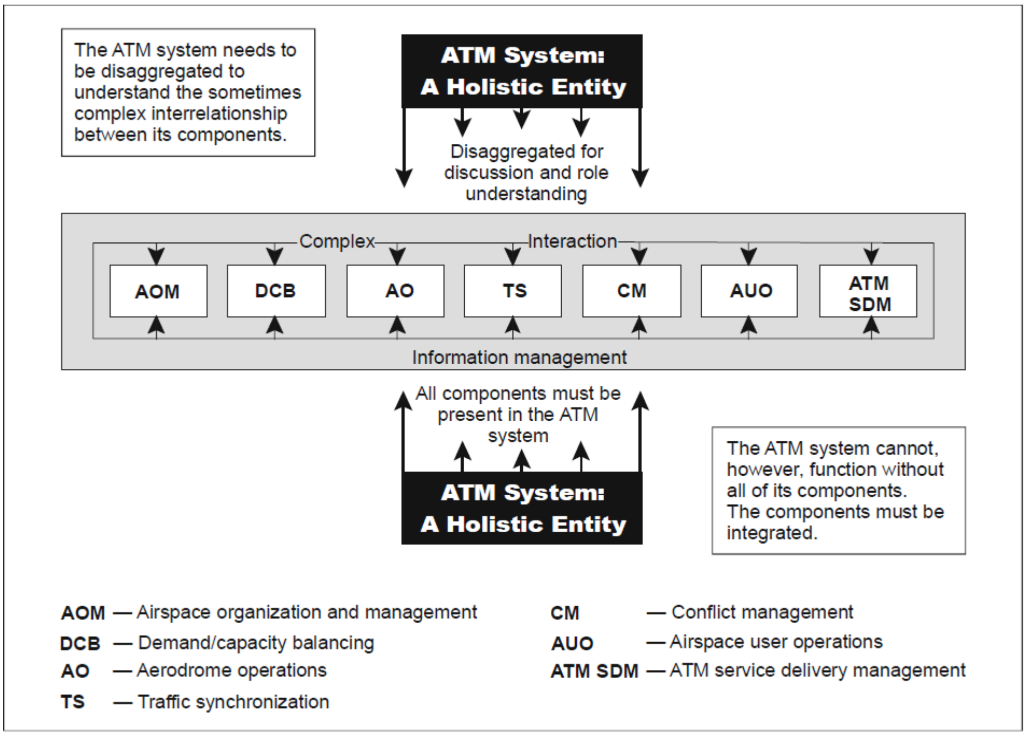
7.1 INTRODUCTION

The ICAO sets guidance and regulated expectations for all aspects of civil aviation, including ATM. To form the basis for the coordinated implementation of the technologies that support ATM, based on clearly established and internationally agreed requirements, ICAO developed the GATMOC). It is envisaged that the world's ANSPs and their customers will have made significant progress towards implementation of the GATMOC by 2020.

This operational concept defines seven interdependent concept components that will be integrated to form the future ATM system. They comprise AOM, AO, DCB, TS, CM, AUO, and ATM SDM. The order of these components implies no priority. The management, utilisation and transmission of data and information are vital to the proper functioning of these components.

The ICAO model will be used for the development of the updated ATM Master Plan.

Figure 10: ICAO concept components



Source: ICAO GATMOC

7.2 AIRSPACE ORGANISATION AND MANAGEMENT

7.2.1 Introduction

Airspace organisation will establish airspace structures in order to accommodate the different types of air activity, volume of traffic and differing levels of service. ASM is the process by which airspace options are selected and applied to meet the needs of the ATM community.

Key conceptual changes include:

- all airspace will be the concern of ATM and will be a usable resource;
- ASM will be dynamic and flexible;
- any restriction on the use of any particular volume of airspace will be considered transitory;
- all airspace will be managed flexibly. Airspace boundaries will be adjusted to particular traffic flows and should not be constrained by national or facility boundaries.

7.2.2 Current Situation In Indonesia

Airspace is classified according to ICAO ATS Airspace Class above FL 245 (ref GPI-4) and fully compliant with ICAO FL scheme (ref GPI-3), as well as adjacent FIRs. Indonesia introduced RVSM in 2003 between FL 290 and FL 410, but is not, via ATS strip or label in ATM system radar display, able to present for the operational ATC whether the flight is eligible to fly in RVSM airspace or not (ref GPI-2). One of the reasons is the extensive use of RPL. The airspace of Indonesia is of a static, rigid nature, where once defined segregations between civilian and military airspace users are permanent. No flexibility exists to tactically (dynamically) manage the airspace with a CDM process between ATM and airspace users (ref GPI-8).

No flexible use of airspace is implemented (ref GPI-1). The sectorisation of terminal and en-route airspace is also rigid and not flexible according to the users changing need for new destinations and therefore a new adapted route structure. Since the majority of ATS routes are based on conventional navigational ground aids, the rigidness and difficulties to adapt to users requirement, will remain (ref GPI-7). The in-and outbound routes in the TMA are not adapted to users' requirement and capabilities and therefore are preventing a development of environmentally enhanced procedures (ref GPI-10).

7.2.3 Recommendations

In order to close the gap between the current programs and activities required for the transition to the ICAO GATMOC, the LFV ACT will establish an action plan for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025), documented as a road map in the new updated Master Plan.

The recommendations will focus on enhanced ASM introducing a flexible and dynamic airspace optimum for all users requirement including a major implementation of PBN.

7.3 AERODROME OPERATIONS (AO)

7.3.1 Introduction

As an integral part of the ATM system, the aerodrome operator must provide the needed ground infrastructure including, inter alia, lighting, taxiways, runways, including exits, and precise surface guidance to improve safety and maximise aerodrome capacity in all weather conditions. The ATM system will enable the efficient use of the capacity of the aerodrome airside infrastructure. Key conceptual changes include:

- runway occupancy time will be reduced;
- the capability will exist to safely manoeuvre in all weather conditions while maintaining capacity;
- precise surface guidance to and from a runway will be required in all conditions; and
- the position (to an appropriate level of accuracy) and intent of all vehicles and aircraft operating on the movement area will be known and available to the appropriate ATM community members.

7.3.2 Current situation in Indonesia

The airport infrastructure on the major airports in Indonesia is generally not designed to handle the growing number of aircrafts. Jakarta SH airport is currently at its maximum capacity during peak hours (ref GPI 14). There is only one taxiway that links the parallel runways, which in some cases makes the taxiing distances for some aircrafts very long, which of course effects ATC capacity , aircraft operators' cost and also impacts the environment negatively. The Controller Working Positions (CWP) in the tower can only fully see operations on one of the runways at a time. There are no CWPs facing one of the runways, which makes the controller sitting on the other side of the operational room turn his head 180 degrees etc. to be able to monitor the operations on that manoeuvre area. It is easy to "forget" movements on that part of the airport's manoeuvre area and therefore substitutes a safety hazard.

There are no A-SMGCS installed either on Jakarta SH or any other aerodrome in Indonesia, which have a direct impact on capacity during poor visibility conditions (Ref GPI-15).

There is no airport CDM process (ref GPI-13), which facilitates smooth operations for all parties concerned. Such a process will not allow 16 flights to have a departure time within five minutes. To have aircrafts waiting on the taxiways for departure is not contributing to a "green" airport.

7.3.3 Recommendations

In order to close the gap between the current programs and activities required for the transition to the ICAO GATMOC, the LFV ACT will establish an action plan for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025), documented as a road map in the new updated Master Plan.

The recommendations will focus on infrastructural requirements on the major airports enabling them to operate with an enhanced capacity, regardless of meteorological conditions.

7.4 DEMAND AND CAPACITY BALANCING

7.4.1 Introduction

DCB will strategically evaluate system-wide traffic flows and aerodrome capacities to allow airspace users to determine when, where and how they operate, while mitigating conflicting needs for airspace and aerodrome capacity. This collaborative process will allow for the efficient management of the air traffic flow through the use of information on system-wide air traffic flows, weather and assets.

Key conceptual changes include:

- Through collaborative decision making at the strategic stage, assets will be optimised in order to maximise throughput, thus providing a basis for predictable allocation and scheduling.
- Through collaborative decision making at the pre-tactical stage, when possible, adjustments will be made to assets, resource allocations, projected trajectories, airspace organisation, and allocation of entry/exit times for aerodromes and airspace volumes to mitigate any imbalance.
- At the tactical stage, actions will include dynamic adjustments to the organisation of airspace to balance capacity, dynamic changes to the entry/exit times for aerodromes and airspace volumes, and adjustments to the schedule by the users.

7.4.2 Current Situation In Indonesia

It is not possible in the ATM system to balance the users' demand for services versus the available capacity in a structural way. The LFV ACT has been informed of traffic overloads that occur regularly, both within AP1 and AP2. There is no ATFM system in operation in Indonesia today. That means that there is no or limited protection for system overload as well as ATC Controller overload (ref GPI-6). This fact has a major impact on safety within the ATM domain in Indonesia.

All air traffic analysis forecast a substantial growth of traffic in the years to come and in order to meet this growing demand; Indonesian ATM must increase its available capacity. There is no dialogue or CDM process with airspace users on a strategical, pre-tactical or tactical level. In the future, "in order to allow users to determine when, where and how to operate" additional AIS/MET information, via data-link applications, needs to be part of this CDM-process (ref GPI 17-19).

System Wide Information Management (SWIM) is not introduced yet in a structural way in Indonesia.

7.4.3 Recommendations

In order to close the gap between the current programs and activities required for the transition to the ICAO GATMOC, the LFV ACT will establish an action plan for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025), documented as a road map in the new updated Master Plan.

The recommendations will focus on a CDM-process on a strategical, pre-tactical and tactical level, in order to balance the demand from user's requirement to available capacity. This also includes a development of SWIM.

7.5 TRAFFIC SYNCHRONISATION

7.5.1 Introduction

TS refers to the tactical establishment and maintenance of a safe, orderly and efficient flow of air traffic.

Key conceptual changes include:

- creation of a dynamic four-dimensional (4-D) trajectory control and negotiated conflict-free trajectories;
- elimination of choke points; and
- optimisation of traffic sequencing, that will achieve maximisation of runway throughput.

7.5.2 Current Situation In Indonesia

There is no ATFM function that regulates the traffic flow, either by delaying the departure or issuing an alternate route in order to create a safe, orderly and efficient traffic flow. PBN has only been introduced for international routes. There is no dynamic ASM that can provide for a more user preferred routing for both terminal and en-route trajectories. Aircraft capabilities cannot be utilised by ground system, leading to inefficiencies and unnecessary negative impact on environment.

7.5.3 Recommendations

In order to close the gap between the current programs and activities required for the transition to the ICAO GATMOC, the LFV ACT will establish an action plan for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025), documented as a road map in the new updated Master Plan.

The recommendations will focus on establishment of an ATFM function and development of terminal airspace design that includes PBN capabilities and additional surveillance capabilities, system supporting 4D-trajectories and AMANs for sequencing of inbound traffic.

7.6 AIRSPACE USER OPERATIONS

7.6.1 Introduction

AUO refer to the ATM-related aspect of flight operations.

Key conceptual changes include:

- addressing the needs of the accommodation of mixed capabilities and worldwide implementation in order to enhance safety and efficiency;
- using relevant ATM data for an airspace user's general, tactical and strategic situational awareness and conflict management;
- making available relevant airspace user operational information to the ATM system;
- dynamically-optimised 4-D trajectory planning with the help of individual aircraft performance, flight conditions, and available ATM resources;
- ensuring that aircraft and airspace user system design impacts on ATM are taken into account in a timely manner, through CDM; and
- designing of the aircraft with the ATM system as a key consideration.

7.6.2 Current Situation In Indonesia

There is no integration between the FMS in aircraft and the ATM system. Reason is that the ATM system and aircraft FMS are not interoperable, which is the general case in the global ATM community. Airspace is not dynamic and manageable for 4D-trajectories and no CDM –process between airspace users and ATM exists.

7.6.3 Recommendations

In order to close the gap between the current programs and activities required for the transition to the ICAO GATMOC, the LFV ACT will establish an action plan for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025), documented as a road map in the new updated Master Plan.

The recommendations will focus on integration of airborne avionics and ground based ATM systems in order to have an enhanced operation based on mutual real-time information enabling the airspace user to have a safe, efficient user preferred 4D-trajectory.

7.7 CONFLICT MANAGEMENT (CM)

7.7.1 Introduction

CM will consist of three layers: strategic CM through AOM, DCB, and TS; separation provision; and collision avoidance. CM will limit, to an acceptable level, the risk of collision between aircraft and hazards. Hazards that an aircraft will be separated from are: other aircrafts, terrain, weather, wake turbulence, incompatible airspace activity and, when the aircraft is on the ground, surface vehicles and other obstructions on the apron and manoeuvring area.

Key conceptual changes include:

- strategic conflict management will reduce the need for separation provision to a designated level;
- the ATM system will minimise restrictions on user operations; therefore, the predetermined separator will be the airspace user, unless safety or ATM system design requires a separation provision service;
- the role of separator may be delegated, but such delegations will be temporary;
- in the development of separation modes, separation provision intervention capability must be considered;
- the conflict horizon will be extended as far as procedures and information will permit; and
- collision avoidance systems will be a part of the ATM safety management but will not be included in determining the calculated level of safety required for separation provision.

7.7.2 Current Situation In Indonesia

The sole provider of separation is ATM. Separation criteria follow ICAO SARPs and is a result of the CNS and ATM system technical status and is stated in the CASR, produced by DGCA. The Guardian ATM System in JAATS provides some safety nets such as STCA, and Predict Alert Conflict (PAC) that is a kind of a MTCD, and MSAW. In MAATS, using the Eurocat X system, both STCA, MSAW and MTCD is provided.

Airborne collision avoidance systems are used according to ICAO regulations.

7.7.3 Recommendations

In order to close the gap between the current programs and activities required for the transition to the ICAO GATMOC, the LFV ACT will establish an action plan for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025), documented as a road map in the new updated Master Plan.

The recommendations will focus on establishing a CM function in the long term. Prior to that recommendations will focus on providing supporting tools in the ATM system facilitating for conflict detection in order to provide more available capacity for the operational staff.

7.8 ATM SERVICE DELIVERY MANAGEMENT

7.8.1 Introduction

ATM SDM will operate seamlessly from gate to gate for all phases of flight and across all service providers. The ATM SDM component will address the balance and consolidation of the decisions of the various other processes/services, as well as the time horizon at which, and the conditions under which, these decisions are made. Flight trajectories, intent and agreements will be important components to delivering a balance of decisions.

Key conceptual changes include:

- services to be delivered by the ATM service delivery management component will be established on an as-required basis subject to ATM system design. Once established, they will be provided on an on-request basis;
- ATM system design will be determined by CDS and system-wide safety and business cases;
- services delivered by the ATM SDM component will, through CDS, balance and optimise user-requested trajectories to achieve the ATM community's expectations; and
- management by trajectory will involve the development of an agreement that extends through all the physical phases of the flight.

7.8.2 Current Situation In Indonesia

Indonesian airspace and ATM system don't provide for trajectory based operations. CDM and SWIM are not developed and the airspace, sectors and ATS routes are rigid, not eligible for user preferred trajectories.

7.8.3 Recommendations

In order to close the gap between the current programs and activities required for the transition to the ICAO GATMOC, the LFV ACT will establish an action plan for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025), documented as a road map in the new updated Master Plan.

The recommendation will focus on establishing an ATM SDM function in the long term that will achieve the ATM Community's expectations according to Appendix D in the GATMOC.

CHAPTER 8: CONSTRAINING AND FACILITATING FACTORS

8.1 INTRODUCTION

The ATM planning review should, according to the ToR Item 3, identify facilitation and constraining factors for Indonesian ATM planning and project. During our review of documents and meeting with staff at AP1, AP2 and DGCA, a number of issues were identified.

Items listed below will also be included in the update of the ATM Master Plan as part of issues to be solved in the short term.

8.2 CONSTRAINING FACTORS

There is, today, a requirement, according to the Law no. 1/2009 on Aviation, to merge AP1/AP2 and the parts of DGCA providing ANS, to one single ANSP and to maintain the remaining part of DGCA as a regulator. This shall be in force not later than January 2012.

This reorganisational work has started and is currently ongoing, with a special taskforce managed by DG of DGCA.

In order to not lose valuable time and resources during the time for the reorganisational process, the following factors could be considered for the future ATM Planning and Project implementation.

The LFV ACT is proposing an establishment of a temporary independent (inter-department) body with a clear mandate to run dedicated necessary projects. Participation of Indonesian operational and technical experts is of vital importance. If found necessary consultancy support could be added to run such a huge project in a cooperative way, including the main stakeholders. This should be seen as an extraordinary action caused by the existing and forecasted traffic demand.

It is of utmost importance for the state of Indonesia to cater for undisturbed and safe domestic and international air traffic in the region as well as facilitating for the international transit traffic over Indonesia, according to the First Freedom Right of Chicago Convention (ICAO).

The Traffic Analysis Report (deliverable 1) shows that there has been a great increase of domestic, international and transit traffic and an implementation of the Asean Open Sky Policy will emphasise the need of ATM development even further.

It is the opinion of the LFV ACT that the DGCA should consider the benefit of establishing a common civil/military strategic group on a regulatory level. Such a group could delegate the tactical cooperation to a civil/military body such as an Airspace Management Cell (AMC). The objective of an AMC is to plan, on a pre-tactical level, the most efficient allocation of airspace based on capacity. An FMP function will, on a tactical level, balance the requirement from civilian and military airspace users. (See FMP also in the next chapter). All this together should be seen as a first and interim step of ATFM implementation.

8.3 FACILITATING FACTORS

Our team is of the opinion that it will facilitate the development of ATM in Indonesia if, during the process of reorganising the ATM in Indonesia into a provider and regulator organisation, the follow factors are considered.

Recruitment and training of ATC controllers and Flight Plan specialists must be increased. Our team understands there is currently a lack of approximately 800 ATC controllers in Indonesia out of a total amount currently of around 1,100. In order to cope with all the challenges that the increasing demand of ANS is bringing, it is crucial that the recruitment process as well as the training process is emphasised. It takes a long time from recruitment of operational staff until they are authorised as operational staff in the different ATC units.

The infrastructure requirement to support ANS should follow "best practices" based on ICAO Annex and documents and compatible with adjacent units.

Harmonisation of en route charges with other states in the region could facilitate funding of the increasing investments and operational costs.

CHAPTER 9: PRIORITY PROGRAMS (QUICK-WINS)

9.1 INTRODUCTION

The ATM planning review should, according to the ToR Item 4, identify priority programs to address immediate safety and/or efficiency shortfalls. During our review of documents and meeting with staff at AP1, AP2 and DGCA a number of issues were identified. They are, in many cases, already mentioned earlier in the document but is compiled here in a list for easy access.

Most of the listed issues should be given a high priority in order to start the process of implementing. Many but not all, of the items below are possible to implement before the commissioning of a new Jakarta- ATM system.

These items will be elaborated in detail in the next phase of the study; the update of the ATM Master Plan.

9.2 QUICK WINS

Below is a list of priority programs to address immediate safety and/or efficiency shortfalls:

- Introduction of a first step of ATFM by establishing a FMP at Jakarta and Ujung Pandang ACC/APP. This is a necessary action in order to protect operational staff from overload. This action will also create environmental benefits as well as cost reductions for airspace users.
- Regulation of traffic at peak hours at Jakarta SH airport after coordination with Airport and Airlines (CDM) in order to facilitate for a more efficient and cost-effective operation. Also, airport environment will benefit from this action.
- Make a safety assessment of procedures for landing/departing traffic at Jakarta SH airport. Recently, there was an incident between arriving and departing traffic.
- Increased manning in the Jakarta SH ADC should be considered to facilitate for safe monitoring and operations on the two parallel runways, followed, as soon as practicable, by installation of A-SMGCS for increased safety and capacity in low visibility situations. This requirement will also be assessed for other major airports.
- Realistic traffic capacity figures for sectors to be declared in Jakarta and Ujung Pandang ACC should be assessed as a prerequisite for further AFTM measures.
- Procedures to attain ADS-B operational approval should be prioritised initially at Ujung Pandang ACC but as soon as practicable, also in Jakarta ACC. This is a safety and capacity issue and will also benefit the environment and economy for stakeholders. Operational use of already invested money.
- Development of data communication between Ujung Pandang ACC and other units (AIDC) is a major contribution for increased ATC capacity. This must, however, be an evolutionary process pending the capabilities of adjacent units.
- The procedure to replace the present JAATS is urgent and should have a top priority in order to cope with the future growth of traffic.
- Investigate the possibility of an interim solution in order to secure a safe and reliable ATM production in Jakarta FIR.

- Installation of CPDLC should be prioritised also in Jakarta ACC to support communication and increase safety over oceanic areas.
- In order to increase capacity before new technology is being introduced, more standardised procedures and working methods should be implemented. Implementation and increased use of segregated SID/STAR with separated entry and exit points to/from major TMA in order to enhance safety and environmental outcomes.
- Increased automation of data exchange for coordination, including "silent transfer" of radar service between some sectors/units, to be considered in an update of Letter of Agreement (LoA).
- Additional RNAV-routes for en route and in major terminal areas are needed for many different reasons.
- Additional ATS route between Jakarta and Bali separated from the route Jakarta-Surabaya. In a first step it could be as a CDR to be used only when there is no military need for that airspace.
- There is a need to implement an increased segregated one-way route structure at congested routes in order to gain capacity and environmental benefits when facilitating for continuous climb and descent, for both domestic and international traffic (Reference Airspace and Air Route Review).

ANNEXES

ANNEX 1: LAW NO. 1/2009 ARTICLES

Following is a list of articles with a direct impact on ATM and the update of Master Plan, from the Law No. 1/2009 on Aviation. Promulgated in Jakarta, January 12, 2009.

Table 9: Law no. 1/2009 Articles

Chapter	Article	Subject	Elucidation
II	3	Operating objectives	
III	4,	Law validity	
IV	5-8	Sovereignty	5, 6,7, 8
V	10- 11	Supervision	10
XI	217	Airport Operations	
XII	261- 262	Flight Navigation/ Airspace Served	262
	263- 264	Airspace Served	264
	265	Airspace classification	265
	266-268	Flight Routes	267
	269- 270	Objectives and types of Flight Navigation Services	
	271	Flight navigation Service Operation	271
	272-307	ATM, frequency and charge related	
			275,282, 284 287-305
XIII	308-313	Aviation Safety	308-312
	314-317	ANSP Safety Management System	314,315, 317
	318-322	Aviation Safety Culture	318
XV	352-356	Search And Rescue (SAR)	
XIX	381-387	Human Resources	381
	388-392	Competency Certificate and License	388
	393-394	Contribution of Aviation Service Providers	
	395	Working Hours Arrangement	
XXIII	445	Transitional Provisions	
XXIV	452	Closing Provisions	
	458	Delegation of navigation service	
	460	Flight navigation service agency	

Source: Law no. 1/2009 on Aviation

ANNEX 2: LIST OF NEW/REPLACEMENT NAVIGATION EQUIPMENT 2007-2010

NO	EQUIPMENT	STATUS	LOCATION	TIME INSTALATION
1	MSSR	NEW	SENTANI – JAYAPURA	2007
2	PSR	NEW	SENTANI – JAYAPURA	2008
3	AUTOMATION	NEW	SENTANI – JAYAPURA	2007
4	DVOR/DME	NEW	PUTUSIBAU	2008
5	DVOR/DME	NEW	NUNUKAN	2008
6	DVOR	REPLACEMENT	TARAKAN	2008
7	DME	REPLACEMENT	TARAKAN	2009
8	DVOR/DME	NEW	KAO - HALMAHERA	2008
9	ILS	NEW	CURUG – TANGERANG	2009
10	ILS	NEW	SEMARANG	2009
11	ILS	NEW	GORONTALO	2007
12	ILS	REPLACEMENT	BATAM	2008
13	ILS	REPLACEMENT	SENTANI – JAYAPURA	2008
14	DVOR/DME	REPLACEMENT	SENTANI – JAYAPURA	2008
15	ILS	NEW	TIMIKA	2008
16	ILS	NEW	KENDARI	2007
17	MSSR	REPLACEMENT	BANDA ACEH	2009
18	DVOR	REPLACEMENT	BATAM	2010
19	PSR	REPLACEMENT	MAKASSAR	2008
20	MSSR	REPLACEMENT	MAKASSAR	2008
21	MSSR	REPLACEMENT	SURABAYA	2009
22	MSSR	REPLACEMENT	BALIK PAPAN	2008
23	MSSR	REPLACEMENT	BANJARMASIN	2008
24	DVOR	REPLACEMENT	CILACAP	2007
25	ADS-B	NEW	BANDA ACEH	2008
26	ADS-B	NEW	MEDAN	2008

NO	EQUIPMENT	STATUS	LOCATION	TIME INSTALATION
27	ADS-B	NEW	PALEMBANG	2008
28	ADS-B	NEW	PEKAN BARU	2008
29	ADS-B	NEW	SOEKARNO HATTA	2008
30	ADS-B	NEW	CILACAP	2008
31	ADS-B	NEW	PONTIANAK	2008
32	ADS-B	NEW	MAKASSAR	2008
33	ADS-B	NEW	PALU	2008
34	ADS-B	NEW	MENADO	2009
35	ADS-B	NEW	AMBON	2009
36	ADS-B	NEW	SAUMLAKE	2009
37	ADS-B	NEW	ALOR	2009
38	ADS-B	NEW	WAINGAPU	2009
39	ADS-B	NEW	KUPANG	2008
40	ADS-B	NEW	BALI	2008
41	ADS-B	NEW	BIAK	2009
42	ADS-B	NEW	SORONG	2008
43	ADS-B	NEW	MEARAUKE	2008
44	ADS-B	NEW	TIMIKA	2009
45	ADS-B	NEW	GALELA	2008
46	ADS-B	NEW	TARAKAN	2008
47	ADS-B	NEW	MATAK	2009
48	ADS-B	NEW	NATUNA	2009
49	ILS	NEW	BENGKULU	2008
50	RVR	NEW	PALANGKARAYA	2008
51	ILS	REPLACEMENT	MALANG (AIR FORCE)	2008
52	ILS	NEW	TANJUNG PANDAN	2007
53	DME	REPLACEMENT	BATAM	2008
54	AWOS	NEW	BANDA ACEH	2010

NO	EQUIPMENT	STATUS	LOCATION	TIME INSTALATION
55	RVR	NEW	TIMIKA	2009
56	RVR	NEW	KENDARI	2009
57	RVR	NEW	TARAKAN	2008
58	RVR	NEW	TERNATE	2008
59	RVR	NEW	PALANGKA RAYA	2008
60	RVR	NEW	SENTANI - JAYAPURA	2008
61	JAATS	PLANNING REPLACEMENT	JAKARTA	2011 – 2013 (Multiyear Project)
62	MAATS	UPGREAD	MAKASSAR	2007
63	MSSR	PLANNING NEW	TARAKAN	2010
64	MSSR	PLANNING REPLACEMENT	WAINGAPU	2010
65	ADS-B	PLANNING NEW	SEMARANG	2011
66	ADS-B	PLANNING NEW	BAJARMASIN	2011
67	ADS-B	PLANNING NEW	BALIK PAPAN	2011
68	ADS-B DATA SHARING	PLAANNING NEW	INDONESIA DAN SINGAPORE	2010
69	ADS-B DATA SHARING	NEW	INDONESIA DAN AUSTRALIA	2010
70	MSSR	PLANNING REPLACEMENT	SEMARANG	2010
71	MSSR	PLANNING REPLACEMENT	PALEMBANG	2010

Source: DGCA

ANNEX 3: FEEDBACK ON THE DRAFT FINAL REPORT ON INDONESIAN ATM PLANNING REVIEW

A draft report on Indonesian ATM Planning Review was prepared, on which feedback and recommendations were received from the DGCA, CATT and IATA. This feedback (provided verbally to the consultants) has been incorporated in this Draft Final Report and is listed below.

1.	Comments from DGCA (by Mr Indra Gunawano)	
General comments		**Consultants' response**
a.	The ICAO GATMOC can be linked to the GPIs of the Global Air Navigation Plan, so that we can do away with the repetition of 'observations and recommendations'.	DGCA's opinion is taken into view. However, the structure in the report is based on the terms of reference (ToR) provided by SMEC/IndII. The report gives an indication of the current status of ATM as compared to what is described in ICAO Global Air Navigation Plan and GATMOC. Also, by repeating certain issues, we feel their importance can be emphasised.
b.	The ATM Master Plan should focus on the ATM services that should be provided in Indonesia in the short, medium and long term. DGCA and ANSP can then refer to this Master Plan to determine how these ATM services can be provided. For instance, if the report mentions that five NM separation services are required to support increasing traffic, the air navigation officials, who have knowledge of the local condition, can decide whether they should be implemented using radar, ADS-B or multilateration; and how sectors will be resized to manage the new standards.	The ATM Master Plan will focus on the ATM services in the short, medium and long term.
Structure for the report as suggested by DGCA		**Consultants' response**
	• Overview of ATM Community Expectations, Operational Concepts and GPIs. • Brief discussion of the 1994 Indonesian ATM Master Plan • Brief note on the MoT Strategic Plan for 2010-14, including what has been implemented and what is yet to be achieved. • Some factual observations of the current status of ATM service provision in Indonesia. • Discussion of which of the GPIs should be considered for implementation in Indonesia. • An overview of the next steps in the development of the ATM Master Plan.	• Overview of ATM Community Expectations, Operational Concepts and GPIs - Refer to chapter 7 and 6, respectively. • Brief discussion of 1994 Indonesian ATM Master Plan – refer to chapter 5. • MoT Strategic Plan for 2010-14, including what has been implemented and what is yet to be achieved. – Chapter 8. • Some factual observations of the current status of ATM service provision in Indonesia. – Refer to tables 2, 4, 5 and figures 3-10 and related text. • Discussion of which of the GPIs should be considered for implementation in Indonesia. - chapter 6 deals with this. • An overview of the next steps in the development of the ATM Master Plan – refer to chapters 9 and 11.

Issues that need to be dealt with		Consultants' response
a.	As for the implementation of a single ANSP, the ATM Master Plan should apply regardless of the structure of the organisation delivering the service.	The implementation of a single ANSP with new identified roles for provider, regulator and airspace users (resulting in new charges) will have a major impact on ATM. As per information received from the DG, the new ANSP has already been signed on. We agree that an ATM Master Plan should apply regardless of the structure of ANSP.
b.	The report states that an insufficient number of air traffic controllers will limit Indonesia's ability to implement the ATM Master Plan. While this may be true to an extent, surely the number of ATCs required will be based on how Indonesia chooses to implement the services described in the Master Plan.	A limited number of Air Traffic Controllers implies that the number of ACC/TMA sectors cannot be increased (if needed). A shortage of that size is a major obstacle, regardless of the chosen strategy. We agree that the ATM Master Plan must look at the availability of staff, but at the same time, it must also focus on the necessity of recruiting/training/certifying of staff, in order to carry out necessary enhancements.
c.	It would be reasonable to state that all runways at major airports should be fully monitored, rather than focusing on one airport (Jakarta SH airport).	We agree that this will also apply to other major airports and has been accordingly incorporated in the review report (in executive summary and chapter 9.2).
d.	The report also recommends that A-SMGCS is required at SH airport. However, in the short term, implementation of two Ground Control positions in the tower could well address the surface movement visibility issues at a much lower cost than A-SMGCS (which will require additional controllers anyway).	As for whether two Ground Control positions in the tower could be an interim solution, is a task for the work group to discuss. However, during low visibility, the means by which the GCs can control movements needs to be addressed.
e.	The report gives certain recommendations and it seems to suggest that these recommendations be implemented prior to the finalisation of the ATM Master Plan. Morever, these recommendations are not given in completion. For example, recommendation 1 is introduction of a Flight Management Position, although the report does not describe this position, define its role or specify training/qualification requirements.	The report includes recommendations since it is based on the terms of reference, which specifies to "identify priority programs to address immediate safety and/or efficiency shortfalls". The recommendations are concentrated on immediate safety/capacity/efficiency. The FMP recommended in the review refers to Flow Management Position, not Flight Management Position and this needs to be clarified in the ATM Master Plan. Unfortunately, this error (Flight Management Position) was printed and has been corrected in executive summary, chapter 9.2.
f.	Another recommendation is that the replacement of JAATS should be expedited. Typically, the ATM Master Plan, through defining the expected services over the life of the new system, should guide the development of the specifications for the new system, rather than rushing the DGCA into purchasing the new system before the requirements are fully defined.	Quick-wins are referred to actions to be implemented in a short term period, i.e. from zero to five years, and will be further elaborated in the ATM Master Plan .These are not intended to be implemented prior to the ATM Master Plan. The process of implementing a new replacement for JAATS could be expedited without changing the requirements in the former operational and technical specification. It has been planned for quite a long time and Ujung Pandang has already installed a sufficient system, to compare with what is required or not in the new replacement of JAATS.

Feedback on the presentation of the report		Consultants' response
a.	The sources of data, opinions and quotations (for instance the Law no. 1/2009 or the GANP) are not clearly referenced. Certain parts of the report need more clarity on whether it is an opinion of the authors, a recommendation, a requirement or a quote from another source.	The sources of data, opinions and quotations are clarified in the ATM Planning Review Report. The "How to read this document" section gives clarification. We will pay further attention to this issue in the Draft ATM Master Plan.
b.	The report has a number of inconsistencies, particularly in the description of documents.	We request DGCA to elaborate on this point, so that we can address it properly.
c.	Certain concepts (such as elaborated charging scheme, centralised regional system, flight management position, etc.) need a more detailed and adequate explanation.	The concepts that DGCA has mentioned are well known ATM concepts and hence, we feel that there is no requirement for a deeper explanation. However, if required, we can mention concepts in a more detailed manner.
d.	We suggest not to include "shortcomings" in the ATM Master Plan, since it represents a positive vision for the future rather than dwelling on past issues. However, it is important to recognise local limitations and blockages.	The "shortcomings" are nothing but reasons for enhancement implementations. The ATM Master Plan will clearly represent a positive vision for the future, with the exception of recognising local limitations and blockages.
e.	There is significant "solutioneering" in the report, whereby technology (such as AMAN or A-SMGCS) is recommended before problems or needs are adequately described. This could lead to issues such as a focus on technology rather than identifying and resolving the cause of problems first.	We understand that all enhancements cannot be done with the help of new technology alone and we will certainly bear this in mind while working on the draft ATM Master Plan.
f.	The following can be addressed while drafting the Master Plan: requirements to support Indonesian ATM; a clear vision for the ATM Master Plan; and a logically constructed argument.	We will bear this in mind while working on the draft ATM Master Plan.
2.	**Comments from Civil Aviation Transportation Team (CATT)**	
General feedback		**Consultants' response**
a.	Our comments are designed to help guide DGCA in developing the ATM Master Plan and are not intended to seek a redraft of the report, so minor errors and omissions have not been included.	CATT has addressed a list of important issues with very relevant recommendations, which we will thoroughly analyse and address for preparing the draft Master Plan.
b.	The ATM Master Plan needs to be independent of the form of the ANSPs delivering the service. Whether there will be one, two or more ANSPs isn't relevant.	We agree to this suggestion.

3.	Comments from International Air Transport Association (IATA)	
General feedback		**Consultants' response**
a.	The consultant chose a Euro-centric approach, which is not only far from being operationally applicable in Indonesia but not addressing the needs to solve existing issues.	We are following the global intention of ICAO and specifically the plans for the Asia-Pacific Region.
b.	A draft action plan could have been proposed, in order to move towards a single ANSP.	A draft action plan to move towards a single ANSP would comprise a separate detailed study, which is neither included in the terms of reference, nor would it be considered by AusAID for funding.
c.	The key enabler of the ATM Planning, which is the procurement, needs to be addressed.	In our opinion too, the procurement process for CNS/ATM Planning is a key enabler, as well as the budget process in the Indonesian ATM system in general, and is incorporated in this report in chapter six and shall be elaborated further in the Draft Master Plan.
d.	We recommend a benchmark analysis to study the different route charges in the region.	In our view, the ATM Master Plan is not directly dependent on the route charges in other regional states. Also, this analysis is beyond the scope of the terms of reference.
e.	Information on interviews conducted (including the minutes of the meeting/interview) can be shared with DGCA, since the views of the regional users could be important. We also recommend interviewing the ANSPs of the FIRs adjacent to Indonesia (such as Singapore, Australia, Malaysia, Philippines etc.)	The report provides comments retrieved from some stakeholders. Also, we will conduct interviews with relevant adjacent ANSPs via telephone/e-mail.
f.	Priority needs to be given to the implementation of GPIs, in order to support the establishment of a strategy.	The GPIs in the table 4.2 will, in the forthcoming activity with the working groups, be elaborated and be a part of the Draft ATM Master Plan, where the required activities will be segregated as short, medium or long term implementation.

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