Summary of RNAV Roadmap for Japan

1. Background

1.1 It is forecasted that aviation demands in Japan, both international and domestic, will continue growing. In order to accommodate the growing demands, the Civil Aviation Bureau Japan (JCAB) has decided to construct a fourth runway at Tokyo International Airport (Haneda). The construction of the fourth runway is expected to be completed by the end of 2009. Construction of a second runway at Kansai International Airport is also being conducted with a target of completion in 2007. With the constructions of these additional runways, it is expected that flights will significantly increase. JCAB should, therefore ensure that the air transport system will adequately accommodate the increasing traffic.

1.2 In order to cope with the increasing traffic, JCAB reviewed the current air traffic systems in Japan, and considered that new capabilities shall be introduced to manage increasing traffic, while maintaining the efficiency but not compromising the air safety. New capabilities will employ a combination of procedures and systems, such as restructured ATS routes/airspace, and new decision support tools, which would reduce controller workload. Since RNAV enables ATS routes closely separated and not anchored to the position of ground-based navigational aids, RNAV will contribute to increasing airspace capacity, enhancing safety and improving efficiency.

1.3 JCAB has noted that RNAV capable aircraft with high navigation performance are increasing. Airspace users have requested to introduce procedures fully reflecting navigation performance and functions for improving efficiency.

2. Current RNAV operation in Japan

2.1 The first RNAV route in Japan was established in 1992, and currently 49 RNAV routes have been implemented for enroute operation. The RNAV routes are established within airspace where position determination could be achieved within 4 miles or smaller using DME/DME or DME/VOR by aircraft systems certified to FAA AC 90-45A. RNP type or navigation accuracy is not specified. RNAV routes are only established within radar airspace, and radar separation minimum is applied. Some 90 percent of aircraft operating in Japan meet operational requirements for the current RNAV routes in Japan.

2.2 An RNAV arrival route was established at Tokyo (Haneda) International Airport in 1999 with the aim of studying the feasibility of RNAV operation in a terminal control area using FMS. RNAV arrival routes were then implemented at 5 airports in 2004. Only aircraft registered in Japan and equipped with FMSs certified to appropriate FAA circulars are permitted to operate on the arrival routes. These RNAV arrival routes were established in airspace only where DME/DME can be received. RNP type or navigation accuracy is not specified, and radar monitoring is provided.

2.3 Since the RNAV routes in Japan have been established with minimum requirements, they do not provide users with full benefits obtained from RNAV operation. In order to evolve the implementation of RNAV routes for Japan and to provide more benefits, JCAB, together with the aviation industries, developed an RNAV Roadmap for Japan in early 2005.

3. RNAV Roadmap

3.1 Three timetables

3.1.1 The RNAV Roadmap divides the implementation schedules into three phases, taking into account the user needs, traffic forecast and future vision.

- Early introduction of procedures that could improve operational efficiency;
- Implementation of procedures that could accommodate the increasing traffic in future: and
- Future vision for the RNAV system for Japan.

Short-Term (2005-2007)

JCAB will implement RNAV procedures focusing on improving efficiency and cost saving for the operators.

3.2 Enroute

3.2.1 The RNAV routes in Japan have currently been established in conjunction with conventional VOR routes. The establishment of RNAV routes and VOR routes in the same airspace may lead controllers to more complex workload, in particular during busy traffic periods. Increased ATC workload in busy hours, may lead to reduced capacity and decreased efficiency of operation. In order to minimize ATC complexity and improve operation, JCAB will consider implementing RNAV operations segregated from conventional operations (i.e., aircraft flying on VOR routes.)

3.2.2 JCAB will implement RNAV routes in air space at or above FL290 with the current requirements. Non-RNAV capable aircraft will need to request flight levels below FL290, however clearances for these aircraft operating at or above FL290 will be issued on an operational basis when traffic permits. RNAV capability at or above FL290 will not be mandated. This semi-segregated operation will come into force in late 2007.

3.3 Terminal

3.3.1 RNAV routes in terminal airspace, specifying navigation performance (navigation accuracy of 1NM with 95% track keeping accuracy) and functionalities, will be implemented during the 2005-2007 timeframe. Operational requirements will be developed taking into account the requirements detailed in JAA TGL-10 and FAA AC 90-100. JCAB will establish RNAV routes that overlay radar vectored tracks.

3.3.2 In order to improve the efficiency of air traffic flow control, aircraft, both RNAV capable and non-capable, will not be vectored but will be requested to fly on published departure routes. When flying on published routes, aircraft will be able to enter sectors in the ACC and terminal control areas of destination airports at estimated-arrival times calculated by the ATFM Center. Workload for both controllers and pilots will be reduced when aircraft fly on published routes.

3.3.3 RNAV departure and arrival routes for non-radar airports will be established after a safety case study is completed. It is considered that containment integrity, detailed in RTCA DO-236b, would be required for RNAV routes established in non-radar airspace.

3.4 Approach

3.4.1 RNAV approach procedures utilizing GPS have currently been established at three airports with GPS RAIM service being provided by JCAB. RNAV approaches will be expanded to other airports where airport radar is installed. RNAV approach procedures currently require ground-based navaids at destination airports in Japan. This requirement will be reviewed.

3.4.2 A study for the safety case is required for JCAB before RNAV approaches at non-radar airports is established. This study would include developing non-radar ATC procedures for aircraft that have lost position due to failure of GPS and are outside of reception areas for ground-based navaids, and no direct communication between pilot and controller is available.

Mid-Term (2008-2012)

During mid-term (2008-2012), JCAB will implement RNAV focusing on increasing the airspace capacity. RNAV will become the primary means of navigation in Japan. New procedures based on RNP concept will be established and evolved taking into account aircraft equipped with advanced navigation capabilities and benefits.

3.5 Enroute

3.5.1 In order to increase airspace capacity to accommodate the increasing traffic predicted after the opening of a fourth runway at Tokyo International Airport (Haneda), parallel RNAV route systems with a reduced track-to-track spacing will be established with 5NM navigation accuracy (95% track keeping accuracy) and some additional functional requirements. Operational requirements will be developed with the same requirements contained in EASA AMC 20-4 (former JAA TGL-2). The implementation of RNAV routes with the EASA AMC 20-4 requirements will occur in the early stages of the 2008-2012 time period.

Note: The current DME allocation in Japan does not adequately support 2NM navigation accuracy in the whole domestic airspace. Approximately 40 percent of air carriers currently equip with GPS systems certified IFR operation.

3.5.2 With specifying the 5NM navigation accuracy, the expected track-to-track spacing for RNAV routes will be reduced from 20NM to 10-15NM. Utilizing radars RNAV routes will continue being established within radar airspace.

3.6 Terminal

3.6.1 RNAV departure and arrival routes will further be implemented at noise sensitive airports and major airports. Operation at Tokyo International Airport during night hours would not be available without RNAV procedures.

3.7 Approach

3.7.1 RNAV approaches with LNAV/VNAV minima will be implemented at airports where operational benefits can be seen. RNP approaches with containment integrity, which will lower minima and narrow flight segments, will be introduced to runway ends where significant operational benefits can be seen.

Long-Term (2013-2018)

3.8 Enroute

3.8.1 RNAV routes requiring 5NM navigation accuracy will be upgraded to routes requiring 2NM navigation accuracy, taking into account DME/DME infrastructure supporting 2NM accuracy and a growing population of GPS-equipped aircraft. 2NM navigation accuracy will be mandated at or above FL290.

Note: JCAB considers that without motivation for users, installation of or upgrading to the full RNP capabilities detailed in RTCA DO-236b (such as containment integrity and RF-turns) would not be speed up. It is considered that procedural improvements based on 2NM navigation accuracy for enroute RNAV will not provide a sufficient cost benefit ratio to users. JCAB expects that benefits for users to undertake equipage are provided mainly in the approach domain, in non-radar airspace and in airspace with restrictions due to noise and mountains.

3.8.2 4D-RNAV closely coupled with ATM functions will be introduced and total traffic management with high-level performance would be implemented in certain routes/airports in future.

3.9 Terminal

3.9.1 In order to make RNAV the predominant operation in busy airspace, 1NM navigation accuracy will be mandated at major terminal areas. Arrival and departure routes defined by ground-based navaids will be maintained if required for unequipped users.

3.10 Approach

3.10.1 RNP approaches will further be implemented to airports where benefits can be seen.

*** END ***