

MID RVSM TF/3
Report on Agenda Item 5

REPORT ON AGENDA ITEM 5: SOURCES OF OUTSIDE EXPERTISE AND FUNDING

5.1 Under this agenda item the meeting recalled that the RVSM TF/1 and TF/2 meetings did address the possibility of seeking outside expertise and resort to some funding mechanism if the need arises, for ensuring the safe and timely implementation of RVSM in the MID Region. For planning purposes, a budgetary estimate for the different elements (safety assessment, GMU monitoring, establishment of Regional Monitoring Agency etc...) was provided by CSSI Inc.

5.2 The meeting, noted that RVSM implementation was a complex programme requiring major investments by operators, equipment manufacturers, providers of air navigation services and regulators of airworthiness, flight operations and air traffic control. Two possibilities were considered by the meeting; namely seeking resort to outside funding or making internal budgetary provisions for the funding of the requisites for the implementation of RVSM. Funding may be required for:

- purchase of new or upgrading of ATC equipment;
- New or upgrading of aircraft;
- Development of regulatory material;
- Training of operational staff;(pilots and controllers)
- Training of regulatory staff
- Travel/communications
- Development and maintenance of database;
- Monitoring of aircraft
- Investigation, documentation, and reporting of altitude deviations and operational errors; etc...

5.3 With a view to ensure the timely and safe implementation of the MID RVSM programme the meeting framed the following conclusions:

CONCLUSION 3/12 - OUTSIDE EXPERTISE FOR THE IMPLEMENTATION OF RVSM PROGRAMME

That, States having difficulties in implementing RVSM implementation programme in time to meet the RVSM implementation target date of 27 November 2003, may either individually or in-group explore the possibility of seeking outside expertise.

CONCLUSION 3/13 - FUNDING OF THE RVSM IMPLEMENTATION PROGRAMME

That, regulatory bodies, operators, service providers, and other stakeholders be granted budgetary allocations during fiscal year 2002 and 2003 for acquisitions and other activities necessary for safe implementation of RVSM on 27 November 2003;

5.4 The meeting was also apprised of budgetary cost estimates for the implementation of the different elements of RVSM programme which was provided by CSSI Inc. To assist States in the planning process, the proposed cost-estimates is indicated at **Appendix A** to the report of this agenda item.

MID RVSM TF/3
Appendix 5A to the Report on Agenda Item 5

APPENDIX 5A

BUDGETARY COST ESTIMATES FOR CSSI, INC. SUPPORT OF RVSM IMPLEMENTATION IN THE MIDDLE EAST REGION (Note: to be used as guidance/planning purposes)

1. Background

1.1 CSSI's work on RVSM has included:

- Development of the ICAO Asia-Pacific RVSM Task Force's Program Plan and aircraft fleet upgrade estimate
- Providing technical expertise to RVSM Task Force Work Groups
- Establishment of the Asia/Pacific Approvals Registry and Monitoring Organization (APARMO) database, source documentation and website
- Analysis of traffic data and fleet equipage to assess system readiness and simulate ATC environment
- Development of aircraft operations and airworthiness approval documentation
- Technical assistance to States and aircraft operators on approval process activity and monitoring procedures
- Development of cost-benefit analysis and State regulatory documentation
- Planning and presenting technical presentations at eight RVSM seminars associated with North Atlantic and Asia/Pacific RVSM implementation

1.2 CSSI's RVSM Team has also been part of the North Atlantic and ICAO groups that developed RVSM standards and planned and implemented RVSM in the North Atlantic. In addition, CSSI personnel have scheduled, coordinated and conducted over 2,000 monitoring flights. At present, CSSI is developing the Enhanced GPS-based Monitoring Unit (EGMU) for the Federal Aviation Administration.

2. Introduction

2.1 It is prudent to mention that the safety assessment cannot be performed in isolation. That is, it is assumed that, for the airspace under consideration, there is a plan for RVSM implementation that includes the cooperation of specialist bodies consistent with the 5-step implementation strategy outlined in ICAO DOC 9574. In addition, it is assumed that:

- a) A regional monitoring agency is established,
- b) An aircraft height-keeping monitoring system is committed to the airspace,
- c) Monitoring goals consistent with the guidance material are selected,
- d) A State approval process is in place,
- e) Cooperation with other RVSM Regional monitoring agencies where RVSM is currently implemented,
- f) Specialist bodies include ATC procedures, State approval authorities and aircraft operators,
- g) Guidance material similar to that in ICAO DOC 9574 is adopted and
- h) The Target Level of Safety and collision risk model outlined in the guidance material is adopted for this airspace.

2.2 Some, but not all, cooperative efforts requiring gathering of data relevant to the safety assessment will be identified within this proposal.

2.3 The safety assessment for RVSM implementation is divided into 4 parts. They are:

1. Safety case,
2. Monitoring goals,
3. Risk assessment before RVSM implementation,
4. Risk assessment after RVSM implementation.

2.4 This paper does not address the long-term safety oversight portion of RVSM implementation.

2.5 The tasks required for each of the areas outlined for the safety assessment of RVSM implementation are given within Table 1, which is presented in the following pages of this proposal. Column 1 identifies the task, column 2 provides a brief description of each task, and column 3 provides a brief description of additional assistance requirements. The additional assistance requirements are those necessary items that must be supplied to the safety assessment team in a timely manner to complete the individual tasks and the overall safety assessment.

Table 1: Tasks Proposed For RVSM Implementation Safety Assessment With Identification Of Requirements

| Task | Description | Requirements |
|--|---|--|
| Safety Case | Assurance that introduction of RVSM into the selected portion of the desired airspace will be done safely. | <ul style="list-style-type: none"> • Preliminary traffic movement data suitable to estimate aircraft-pair vertical proximity within desired airspace • Traffic flow data • Preliminary data on large-height deviations gathered from within the airspace that includes: turbulence data, loss of altitude hold data and crew response to collision-avoidance systems • Preliminary data on deviations involving whole numbers of flight levels (usually due to granting or following ATC clearances) |
| | Safety Case Report | |
| Monitoring Goals | Aid in establishing short-term monitoring goals (prior to RVSM implementation) and long-term monitoring goals (subsequent to RVSM implementation) | <ul style="list-style-type: none"> • Aircraft height-keeping monitoring system selected and in place • Identification of aircraft which have already been monitored by other airspaces where RVSM has already been implemented. |
| Risk Assessment before RVSM Implementation | Estimate risk model Parameters: <ul style="list-style-type: none"> • Vertical proximity (occupancy) • Probability of lateral overlap • Cross-track speed • Total flight time within planned RVSM airspace • Prediction of occupancy values after RVSM implementation • Remaining parameters | <ul style="list-style-type: none"> • Comprehensive traffic movement data suitable for estimating vertical proximity of aircraft-pairs and the proportion of flights by aircraft type and operator within selected airspace • Airspace area and flight levels selected for RVSM implementation • Proportion of GPS equipped aircraft flights planned for RVSM • Traffic flow data • Traffic movement data for airspaces where RVSM is currently implemented |

| | | |
|--|---|--|
| | <p>Estimation of technical risk:</p> <ul style="list-style-type: none"> • Evaluation of typical altimeter-keeping performance and typical altitude-keeping performance • Large height deviation analysis • Probability of vertical overlap for aircraft-pairs at the same flight level • Probability of vertical overlap for aircraft-pairs at adjacent flight levels <p>Estimation of risk due to all causes</p> <ul style="list-style-type: none"> • Probability of vertical overlap for aircraft-pairs at incorrect flight levels | <ul style="list-style-type: none"> • Identification of approved aircraft operator/types planning to participate in RVSM • Cooperation with aircraft operators for proportion of aircraft fleet planning to operate in RVSM airspace • Identification of approved airframes which have been monitored by other airspaces where RVSM is currently implemented • Cooperation with other regional monitoring agencies for current aircraft height-keeping performance statistics and approval data • Altitude-keeping data (usually obtained from Mode C and flight level information) • Statistics for aircraft height-keeping performance data from monitoring systems within airspace • Comprehensive data history (for at least 1-year) and scrutiny of large-height deviations gathered from within the airspace that includes: turbulence data, loss of altitude hold data and crew response to collision-avoidance systems, etc. • Comprehensive data history (for at least 1-year) and scrutiny of deviations involving whole numbers of flight levels (usually due to granting or following ATC clearances) |
| | Final Safety Assessment Report | |
| Risk Assessment after RVSM has been implemented | Estimate technical risk and risk due to all causes | <p>After RVSM implementation</p> <ul style="list-style-type: none"> • Traffic movement data • Large height deviations • Deviations due to all causes |
| | Safety Assessment Report | |
| Budgetary Cost Estimate for the Safety Analysis (USD): \$400,000.00 | | |

2.6 The establishment of all the functions of a Regional Monitoring Agency is critical to the success of RVSM implementation. CSSI continues to support the Asia-Pacific Approvals Registry and Monitoring Organization (APARMO).

Table 2: Tasks proposed for RMA Establishment and Requirements

| Task | Description | Requirements |
|--|---|---|
| Develop Approvals Processing Guidance and Procedures | Describe the process for States to submit approval data to the Regional Monitoring Agency | Task Force Work Group decision to use Asia-Pacific Approvals Registry and Monitoring Organization (APARMO) material as a basis for MID documentation |
| Develop Database | Design/tailor database to allow storage of approval and monitoring data, tracking of aircraft change information and contact tracking | APARMO database used as a starting point. |
| Provide Approvals and Monitoring Information to States and Operators | Develop additional documents and web material to assist States and operators | Task Force Work Group review of developed material |
| Establish Aircraft Height Keeping Monitoring Infrastructure | Setup process to provide information to States and operators and calculate Altimetry System Error (ASE) | <ul style="list-style-type: none"> • TF selection of GPS-based Monitoring System • ASE processing method/software obtained from FAA |
| Develop Traffic Data Collection Process | Establish method to collect and process traffic data from all FIRs | ATC providers submit traffic data |
| Develop Large Height Deviation Data Collection Process | Establish method to collect data for safety analysis | ATC providers and operators submit large height deviation reports |
| Establish Data Exchange Process With Other RMAs | Exchange approval and monitoring data with other regional monitoring agencies | Participation in ICAO data exchange discussions |
| Budgetary Cost Estimate for RMA Establishment (USD): \$100,000.00 | | |

2.7 GMUs may be acquired from other regions or procured directly for the Middle East Region. GMUs can be built for the Middle East Region by CSSI. The EGMU currently being developed by the FAA and CSSI will use current technology and be battery operated and collect Mode C data. Mode C data is required for each monitoring flight to compute altimetry system error. The EGMU is expected to be operational in late 2001 and cost less than USD \$ 10,000.

2.8 Under the direction of the Regional Monitoring Agency, the Monitoring Contractor performs the following functions:

- Schedules monitoring flights
- Conducts monitoring flights

- Provides training for operators conducting self-monitoring
- Performs post-flight differential correction of GPS data collected during monitoring flights
- Maintains GMUs

2.9 Monitoring contractor services are currently being financed in the North Atlantic and Asia/Pacific regions through an International Air Transport Association (IATA) billing and collection arrangement. Under this arrangement, the service is available to all operators and operators chose the monitoring services they will use to meet the region's monitoring requirements. IATA bills the operators for those services. A sample schedule of charges for monitoring services is contained in Attachment A. This sample schedule of charges is based on CSSI's Asia/Pacific monitoring operations. Based on different services selected by different operators, the budgetary estimate is USD \$3,000 per aircraft.

Table 3: Monitoring Services and GMU Fabrication Requirements

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|---|
| Budgetary Cost Estimate for Monitoring Per Aircraft (USD: \$3,000.00) (Note: Monitoring services will be available to all MID operators; costs are paid by operators; see Attachment A for a <u>sample</u> schedule of charges) |
| Budgetary Cost Estimate for Each Enhanced GMU: (USD): \$10,000.00 |

2.10 CSSI has supported and continues to support OPS/AIR work groups in both the Asia/Pacific Region and the North Atlantic Region.

Table 4: Tasks proposed for OPS/AIR Support and Requirements

| Task | Description | Requirements |
|---|---|---|
| Develop work program for each TF meeting | Describe the work to be accomplished for each meeting including: agenda, documents and coordination | Coordination with TF leadership and OPS/AIR participants, understanding of TF task list |
| Analyze OPS/AIR operational procedures for regional applicability | Develop technical papers addressing applicability and impact of RVSM procedures on MID region | Experience with RVSM operational procedures |
| Develop documents and procedures for OPS/AIR review | Draft and update documents that assist States and operators in seeking RVSM approval and documents that prescribe operational procedures associated with RVSM | Understanding of approval process MASPS and RVSM operational documentation |

| Task | Description | Requirements |
|---|---|--|
| Coordinate RVSM operational issues | Coordinate OPS/AIR issues and activity with ATC and SAM work groups, States not attending TF meetings and other regions | Information and communication with other work groups, States and regions |
| Report results of OPS/AIR work group meeting | Develop TF report input for OPS/AIR, track action items, update TF task list | Knowledge of OPS/AIR work program and TF task list |
| Budgetary Cost Estimate for OPS/AIR Support (USD): \$100,000.00 | | |

1.0 Recommendation

The meeting is invited to review the estimates described in this paper.

SAMPLE SCHEDULE OF CHARGES

Service Level 1: Training at CSSI for self-monitoring

Service Provided

Verification of approval status and development monitoring plan
Coordination and scheduling of training
Test and check out of GMU
Conduct training (8 Hours)

Service cost **\$1,282**

Transportation and services beyond those listed above will be additional cost

Service Level 2: Per-flight processing for self-monitoring

Service Provided

Coordination and scheduling of monitoring flight and data
Process Flight Information Form (FIF)
Send status memo
Process GPS file
Transfer file to RMA

Service cost **\$560**

Transportation and services beyond those listed above will be additional cost

Service Level 3: CSSI conducts monitoring flight (10 hours transit and monitoring time)

Service Provided

Verification of approval status and develop monitoring plan
Coordination and scheduling of monitoring flight
Test and check out of GMU
Monitor
Completion of Flight Information Form (FIF)
Transfer file to CSSI
Transit time to and from monitoring location
Process FIF
Send status memo
Process GPS file
Transfer file to RMA

Service cost **\$1,560**

Transportation and services beyond those listed above will be additional cost

**Service Level 4: CSSI conducts monitoring flight or training at operator location
(24 hours transit and monitoring or training time)**

Service Provided

- Verification of approval status and develop monitoring plan
- Coordination and scheduling of monitoring flight or training
- Test and check out of GMU
- Monitoring or conduct training (8 Hours)
- Completion of Flight Information Form (FIF)
- Transfer file to CSSI
- Transit time to and from monitoring location or training site (16 Hours)
- Process FIF
- Send status memo
- Process GPS file
- Transfer file to RMA

Service cost **\$2,465**

Transportation and services beyond those listed above will be additional cost
