FOURTH MEETING OF THE ALLPIRG/ADVISORY GROUP

(Montreal, 6 – 8 February 2001)

Agenda Item 2.1   **Interregional coordination and harmonization mechanism – Harmonization of air navigation systems**

CNS/ATM PLANNING AND EVALUATION TOOLS

(Presented by the Secretariat)

SUMMARY

It was agreed at ALLPIRG/3 that regional planning groups should perform cost/benefits analyses to validate the implementation options and develop the necessary business cases for their financing. While it is well accepted that the new technology will bring significant operational and technical benefits, it is not so clear as to which of the many technical and operational solutions should be retained, as well as what implementation options (multinational facilities and services) should be investigated. To facilitate the task of evaluating and selecting among the many different options, a set of CNS/ATM planning and evaluation tools (CNS/ATM PET) has been developed, the main element being a "Scenario Generator" which provides the capability to create, from databases, different implementation scenarios (technical, operational, regions, sub-regions, etc.) for subsequent evaluation by the Cost/Benefits Model and Sensitivity Analysis programmes. Through the use of scenarios, it will then be possible to determine the level of feasibility and viability of the proposed solutions and also assist in the establishment of optimum implementation schedules.

1.   **INTRODUCTION**

1.1   The availability of new technology (i.e. CNS/ATM) for the provision of air navigation systems makes it possible for States in the CAR/SAM Regions to improve the operational efficiency (while still, at least, maintaining the present level of safety) and reduce the costs by sharing or using different system arrangements. These new innovative opportunities for the provision of facilities and services, will require extensive operational and economic studies before an acceptable technical, operational and institutional arrangement can be selected. ALLPIRG/3 agreed that regional planning and implementation groups (PIRGs) need to perform cost/benefits analyses to validate and substantiate the different implementation options and then develop the necessary business cases to secure their financing. To assist in the determination of the best option, and considering that the implementation of CNS/ATM will not happen everywhere at the same time (evolutionary), implementation scenarios are needed to facilitate the evaluation and provide the necessary visibility in the planning and selection process.

1.2   Furthermore, considering the vast geographical area of the CAR/SAM Regions, the large number of traffic flows and the varied interests of States, ways and means of analyzing implementation options were needed to determine the feasibility and, more importantly, the viability of the different alternatives. As such, these analyses will need to be performed to cover specific areas such as region, sub-regions, States, group of States, FIR, group of FIRs, oceanic areas, or combination of the above, etc.

1.3   Having almost completed the traffic analysis on the CAR/SAM traffic flows identified by GREPECAS, it was realized that, in order to progress effectively to the next step of the planning process, tools were required to facilitate the "What If" scenarios using databases of existing and planned facilities and services.

2.   **STRUCTURE OF THE MODEL**

2.1   The CNS/ATM Planning and Evaluation Tool (CNS/ATM PET) kit consists of five main modules: the scenario generator, scenario pre-processor, databases, cost/benefits analysis (CBA) model and sensitivity analysis module. Appendix A hereto presents a schematic of these tools.

2.2   **Scenario generator**

2.2.1   As mentioned above, the ways and means of providing air navigation facilities and services are numerous and, to keep the planning process manageable, we need to be able to perform analyses at different levels. The scenario generator is the module where the parameters for the scenario to be analyzed are defined. The main parameters to be entered consist of:

- A scenario code and name to identify the scenario and provide an audit trail. In cases where variations are being made to the parameters, a version code is also added
- Area to be studied (region, sub-region, State, group of States, FIR, group of FIRs, etc.)
- Facilities and services to be considered whether it is for one facility or service, i.e. precision approach and landing systems or all of the CNS elements
- Amortization period for the facilities and services
- Implementation date
- Number of months both the conventional and new systems will run in parallel
- Interest rates.

2.3   **Scenario pre-processor**

2.3.1   Based on the parameters set in the scenario generator, the scenario pre-processor will proceed to retrieve, from the related databases, the information necessary for the evaluation. Subsequently, the pre-processor will proceed with performing a cost explosion for each of the systems selected, taking into consideration the generic cost of the system, original implementation date of existing services, amortization period, expected date of removal (including the period where the system will be operated in parallel) and ongoing cost of operation, maintenance and inspection/calibration. This cost explosion would also be performed for the new systems to be installed.

2.3.2   In cases where the implementation date of the new system is beyond the end date of the useful life of a given system (defined by the initial implementation date plus amortization period), the cost of a replacement system would be added in the cost explosion routine.

2.3.3   The same exercise will be performed for the benefits (staff reduction, reduced infrastructure requirements, etc.) and once all the costs and benefits have been detailed by systems and on a per year basis, same are summarized for presentation to the costs/benefits model, in order to determine the net present value (NPV).

2.4   **CBA model**

2.4.1   The CBA model is the module responsible for performing the net-present-value calculations and is being updated at the time being by the Air Transport Bureau at Headquarters.

2.5   **Sensitivity analysis**

2.5.1   The viability of a project depends on many factors, some of which are more critical than others. In order to bring some visibility into the planning process, the sensitivity analysis module will enable the planner to specify a range of values for each of the parameters. For example, how would the viability of the project vary if the implementation date was to be between 2005 and 2008 or the interest rate between 5% and 8%? When more than one parameter range is to be studied, it should be treated as a variation of a scenario.

2.6   **Databases**

2.6.1   The performance of accurate cost/benefit analyses relies on factual databases. Considering that the basic elements of the conventional system in operation are mostly stable and that the estimated cost for the different system elements remains the same regardless of the implementation scenarios, the data is organized into databases. The databases are based on the information contained in the regional air navigation plan and will be complemented to also include facilities and services used only for national purposes, since the use of satellite-based CNS systems will eliminate the need for many of these national systems (Benefits to National Civil Aviation Administration). Ways and means of sharing the cost of some facilities are being studied for inclusion in the planning tools (i.e. GNSS augmentation systems also being used by marine). It is understood that, from time to time, these databases will need to be updated to reflect changes in cost or system status.

2.6.2   Considering the time available and the need to keep the evaluation process at a manageable level, only the main cost/benefit elements are considered for the moment and same are or will be made up from the following:

- Inventory/cost of conventional navaids;
- Cost of new CNS system elements;
- Staffing/training including transition period and training.
- Cost of infrastructure.

     Note: The databases are still in the creation process. Once completed, the information will be sent to States for confirmation or correction.

2.6.3   In addition to the above, the necessary routines are included to create and maintain the database, as well as those to produce appropriate reports to provide an audit trail of the scenarios evaluated. The report will include the scenario definition and parameters and summary of cost/benefit explosions on a per year basis, as well as results of CBA and sensitivity analysis.

3.   **CONCLUSION**

3.1   Considering the many available technical, operational and institutional options, it would be very difficult, if not impossible, to make a thorough evaluation and selection of optimum solutions and timings without the availability of the above-mentioned planning tools. These tools have been developed but still require some validation, since all the associated databases are not yet completed. Upon request, these tools can be made available to States and other ICAO Regions.

4.   **ACTION BY ALLPIRG**

4.1   The meeting is invited to review the material and comment as necessary.

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