



WORKING PAPER

THIRTEENTH AIR NAVIGATION CONFERENCE

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COMMITTEE A

Agenda Item 1: Air navigation global strategy

1.4: Air navigation business cases

**COST-BENEFIT ANALYSIS AS PART OF A BUSINESS CASE IN SUPPORT OF ASSETS
DEPLOYMENT**

(Presented by the Secretariat)

EXECUTIVE SUMMARY

This paper presents a cost-benefit analysis (CBA) checklist to support the development of air navigation infrastructure through the aviation system block upgrade (ASBU) framework and to assist in securing funding and financing for asset deployment.

Action: The Conference is invited to agree to Recommendation 1.4/x – Cost-benefit analysis in support of assets deployment, in paragraph 3.

<i>Strategic Objectives:</i>	This working paper relates to the Air Navigation Capacity and Efficiency Strategic Objectives.
<i>Financial implications:</i>	<i>Impact for the aviation community:</i> Nil. <i>Impact for ICAO (relative to the current Regular Programme Budget resource levels):</i> Since ICAO's current provisions development and implementation roll-out will continue over the next triennia, additional resources are required, both financial and human, to support ICAO's efforts in global air navigation planning.
<i>References:</i>	Doc 9161, <i>Manual on Air Navigation Services Economics</i> Doc 9562, <i>Airport Economics Manual</i> Doc 9750, <i>Global Air Navigation Plan</i> AN-Conf/13-WP/11

1. INTRODUCTION

1.1 One of the main aspects to be analysed during the selection of an asset for deployment that will bring operational improvements to the air navigation system is the relationship between the benefit it brings to the aviation community and its associated costs for the involved stakeholders.

1.2 In general, this analysis involves data collection and assumptions to estimate the performance benefits of an asset to be deployed.

1.3 This paper presents, for States and other stakeholders without a cost-benefit analysis (CBA) process already in place, a simplified checklist that can support a decision-making process. The simplified checklist supports CBA in defining optimum operational solutions through the deployment of the elements described in the aviation system block upgrade (ASBU) framework as described in AN-Conf/13-WP/11 . The appendix to this paper describes a proposed process.

2. DISCUSSION

2.1 A business case describes the rationale for undertaking – or not – a programme or group of projects. Its purpose is to facilitate coordination with all parties involved in the investment decision and to provide supporting information to secure funding and financing for assets deployment. A major part of the business case is the financial analysis, or evaluation. A business case often includes, among other components, a CBA and an economic impact analysis (EIA).

2.2 A CBA may be defined as a methodology that reflects both the public and private benefits and costs of a project. A CBA identifies the investment option that best meets the economic goal of maximizing net benefits. These benefits include the positive impact of aviation infrastructure investments, such as increased economic activity generated by infrastructure expansion.

2.3 An EIA may be defined as a methodology aimed at identifying the cumulative economic impact of a project. The EIA results are often used in determining the economic viability of an investment in aviation infrastructure.

2.4 Every major decision taken by a State, airport or air navigation service provider (ANSP) should be supported by analyses to demonstrate the costs and benefits accruing from investment in aviation infrastructure. Aviation service providers, aviation service users and, beyond aviation, the wider global community would greatly benefit from these analyses.

2.5 There is a need though for States to strengthen their capacity to analyse high-quality, disaggregated aviation data which can be used to accurately estimate the requirements (financial and otherwise) for identified projects, reduce investment risks and uncertainty, and evaluate the return on investments (ROI).

2.6 Cost-benefit analysis provides a basic analytical tool to assist in decision-making. There are many sources of information on the development of CBA, both general and specific to aviation sectors. The process presented in this paper is based on existing examples and is presented in the form of a checklist for cost-benefit analysis of infrastructure investment projects.

2.7 Guidance on business cases, CBA and EIA is available in the *Manual on Air Navigation Services Economics* (Doc 9161) and the *Airport Economics Manual* (Doc 9562).

2.8 Additionally, the Secretariat developed the communications, navigation, and surveillance (CNS)/air traffic management (ATM) Database and Financial Analysis Computer System (DFACS), an interactive and analytical decision-making tool to assist ANSPs and airspace users to build, evaluate and compare the economic case for alternative options or scenarios for the implementation of air navigation systems. DFACS is being enhanced to serve as a business case evaluation tool encompassing both airport and air navigation services infrastructure. The enhanced DFACS application and user manual will be available, at no cost, for download by States.

3. CONCLUSION

3.1 All organizations are faced with decisions on how best to pursue their objectives. To guide their investment decisions, organizations use evaluation techniques to examine options and to select the solution that maximizes net benefits. Every major infrastructure investment decision should be supported by analyses to demonstrate the expected costs and benefits to providers, users and as appropriate, the wider community.

3.2 To support analysis by stakeholders towards the improvement of air navigation infrastructure through the ASBUs framework and to secure funding and financing for assets deployment, the Conference is invited to agree on the following recommendation:

Recommendation 1.4/X – Cost-benefit analysis (CBA) in support of assets deployment

That the Conference:

- a) urge States and air navigation service providers (ANSPs) to perform a cost-benefit analysis (CBA) when defining optimum solutions for improved performance of the air navigation system through the use of the aviation system block upgrades (ASBU) framework;
- b) encourage States and ANSPs that do not have a process already in place to use a simplified mechanism, such as the checklist available in the GANP Portal for cost-benefit analysis of air navigation infrastructure investment projects, to support improvements as described in the aviation system block upgrade (ASBU) framework; and
- c) request ICAO to support the implementation of cost-benefit analysis through dedicated workshops.

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APPENDIX**CHECKLIST FOR COST-BENEFIT ANALYSIS
FOR INFRASTRUCTURE INVESTMENT PROJECTS**

COMPONENT	DESCRIPTION	NOTES
Objective	This section should present the desired outputs of the project. For example, in the case of an investment in a new radar system, the objective of providing surveillance should be described in terms of expected improvements, including: • enhanced safety; • increased system capacity; • reduced costs; • better weather detection; and • increased traffic.	A common mistake when describing the objective is to focus on inputs required to accomplish the project rather than the desired outputs.
Scope	The scope needs to identify the following: • timescale; • geographic area; • relationship to other projects; • development stage; and • cost estimates.	This section needs to identify affected airspace users. Identification will help to avoid double counting or omission of costs and benefits. Changes in the aviation sector impact many different stakeholders. It is therefore essential that the CBA identify the impact for different stakeholders. This is particularly important as the non-quantifiable and non-financial factors may differ significantly between different stakeholders.
Assumptions	In aviation, assumptions usually cover: • aircraft fleet characteristics; • levels of aircraft activity; • equipment life; • passengers/shipment revenues; • cost of fatalities/injuries; and/or • cost of passenger time.	
Base case and alternatives	The base case provides the benchmark against which the proposed project or investment can be measured. It is the “do-nothing” or “maintain status quo” option, describing what is likely to occur in the absence of the project being evaluated.	Any option viewed as providing an improvement to the status quo should be included as a project alternative.

COMPONENT	DESCRIPTION	NOTES
Time horizon	The time horizon should cover the entire time period over which the project's costs and benefits are expected to occur.	The determination of an appropriate time horizon will be specific to each option being evaluated and will be based on factors such as: • lifespan of capital investments; • period over which relevant policy is likely to apply; and • other demographic, economic or social factors that may impact the project's objectives.
Benefits and costs (identification)	All benefits and costs must be identified for the base case and for each of the alternatives under consideration in the CBA. Once identified, they should be quantified in monetary value where possible.	Typical cost categories include: • capital infrastructure; • fleet; information technology (IT) equipment; • software; • staff costs; • maintenance and repairs; and • relevant economic and societal costs (e.g. noise or emissions). Typical benefits categories include: • access and equity; • capacity; • cost-effectiveness; • efficiency; • environment; • flexibility; • global interoperability; • participation by the air traffic management (ATM) community; • predictability; • safety; • security¹; and • relevant economic and societal benefits.
Benefits and costs (comparison)	Once all of the benefits and costs have been identified and forecast, they need to be converted into a comparable format in order to determine if the project is cost-beneficial, or to assess which options yield the greatest net benefits.	The project's payback period is determined by counting the number of years it takes before cumulative forecast cash flows equal the initial investment.

¹ See Key Performance Areas, *Manual on Air Navigation Services Economics* (Doc 9161)

COMPONENT	DESCRIPTION	NOTES
	For consistency, only incremental benefits and costs expected from the project should be compared. Future costs and benefits must be discounted to their value today or the value of the base year for the project. Once benefits and costs are in a comparable format and have been discounted, different criteria are available to establish whether or not the benefits exceed the costs. These include: • net present value (NPV), i.e. sum of discounted project benefits less discounted costs; • benefit to cost ratio (BCR), i.e. ratio of present value of benefits to present value of costs; and • internal rate of return (IRR), i.e. discount rate at which the NPV of a project is equal to zero.	
Sensitivity analysis	Sensitivity analysis examines how the NPV, total cost or other outcomes vary as individual assumptions or variables are changed.	In a CBA, the project outcome is typically influenced by one or more unknown factors. A complete picture is best presented if uncertainty is explicitly considered and decision-makers understand how “sensitive” the project outcome is to changes in these factors. Key assumptions can be updated, additional alternatives can be identified or the methodology can be revised, making the economic analysis process iterative and ultimately improving the quality of the analysis.

COMPONENT	DESCRIPTION	NOTES
Distributional aspects of benefits and costs	For many governmental investments, the recipients of the benefits are not those who bear the costs. From an overall perspective, society's welfare is improved as long as all accepted projects and regulations have benefits that exceed costs. While the potential for compensation exists between those who benefit and those who bear the costs, such compensation may require further initiatives to implement. If costs are imposed on parties who neither benefit nor are compensated, there is a potential for inequitable impact.	CBA should identify those who benefit from and those who bear the cost of governmental investments, and whether the former actually compensate the latter.
Conclusion and recommendation	The final outcome is a recommendation concerning the proposed objective. The presentation of the conclusions and recommendations is as important as the underlying analysis.	The relevant points should be highlighted in a clear and concise manner that meets the needs of decision-makers and provides them with objective guidance.

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