



**International Civil Aviation Organization**

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**Air Navigation Bureau**

# **GLOBAL AVIATION SAFETY OVERSIGHT SYSTEM (GASOS)**

## **COST-BENEFIT ANALYSIS**

12 September 2019

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## 1. EXECUTIVE SUMMARY

1.1 The responsibility for aviation safety oversight lies with States under the provisions of the Chicago Convention. Some States however are currently not able to fulfill all their aviation safety oversight obligations adequately. As a result, ICAO has encouraged States to come together on regional levels through Regional Safety Oversight Organizations (RSOOs) including Cooperative Development of Operational Safety and Continuing Airworthiness Programme (COSCAPs) to pool their limited resources in order to implement their safety oversight more effectively.

1.2 For over a decade, ICAO has been providing support and guidance to the establishment and strengthening of RSOOs. However, even with the establishment of RSOOs and COSCAPs, States still have difficulty implementing their safety oversight responsibilities. As a result, in order to provide assistance to RSOOs and their member States, ICAO has proposed to establish the Global Aviation Safety Oversight System (GASOS). GASOS is a voluntary, standardized assessment and recognition mechanism for safety oversight organizations (SOOs)<sup>1</sup> and accident investigation organizations (AIOs) that facilitates the provision of safety functions and activities and ultimately strengthens State safety oversight capabilities. GASOS will strengthen a State's safety oversight, safety management and accident investigation capabilities by facilitating the provision of safety functions and activities, where needed, for States by capable and qualified SOOs and AIOs.

1.3 The 13th Air Navigation Conference held in October 2018, in Montreal, Canada, noted the need to conduct a Cost-Benefit Analysis (CBA) of GASOS before presenting GASOS at the 40th ICAO Assembly in 2019. Thus, the purpose of this document is to provide information on the results of the CBA undertaken to identify and quantify the costs and benefits for SOOs and States.

1.4 The CBA has confirmed positive results for States being members of a regional safety oversight organization capable to provide certain safety functions and activities. From the data herein, there is a **positive benefit/cost ratio of between 2.0 to 3.29** depending on different SOOs, therefore showing the viability and positive benefit of the relationship. Furthermore, with the completion of a successful GASOS assessment, States may expand their activities with the SOO, further strengthening their safety oversight capability and ultimately improving their Effective Implementation (EI) level. With the increase of EI, it is envisioned that air traffic volume will increase with a positive impact on Gross Domestic Product (GDP)<sup>2</sup>.

1.5 Further to the 5th meeting of the GASOS Study Group (SG) held 2-4 July 2019, the SG members acknowledged the difficulty of building a CBA due to the limited data available. It was agreed that ICAO would work with RSOOs to gather data and information regarding costs and benefits as the GASOS programme moves forward. ICAO will request RSOOs to share any information and costs associated with their preparations and participation in GASOS. This information will then be used to update the CBA as required.

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<sup>1</sup> Definition of SOO from A/40 WP on GASOS: An SOO is an RSOO or any other intergovernmental regional or sub-regional aviation safety oversight body that supports a State or group of States in carrying out their safety functions and activities.

<sup>2</sup> ATB study (1% increase in EI → 0,18% increase in air traffic → GDP increase)

## 2. BACKGROUND

2.1 After nearly two decades of USOAP assessments, many States continue to struggle to comply with international aviation safety standards because they lack the required resources and technical capacity. To address this issue, ICAO has promoted regional collaborative mechanisms, including the establishment of RSOOs which—although varied in terms of structure, level of integration, and/or delegation of authority—essentially pool the efforts of their individual members into a regional entity. RSOOs can be an effective mechanism for enhancing safety and strengthening the safety oversight capabilities of their member States. Despite the actions taken and the assistance provided to resolve the deficiencies identified through such regional organizations, many States are still unable to comply with ICAO SARPs.

2.2 Recommendation 3/1 of the Second High-Level Safety Conference and Assembly Resolution A39-14 encourage the strengthening and furtherance of regional aviation safety, and safety oversight mechanisms, including RSOOs. As a result, to further support and assist States in meeting their safety oversight functions, ICAO has developed the Global Aviation Safety Oversight System (GASOS).

2.3 Since March 2017, ICAO has been developing GASOS with the goal of launching the system in early 2020. ICAO, along with the GASOS Study Group of Experts, composed of members from States and other stakeholders, has completed the planning work and documented the necessary processes and procedures to meet this goal. Furthermore, ICAO has conducted one pilot assessment of a State CAA and three RSOOs, which have been instrumental for testing and enhancing the GASOS assessment mechanisms.

2.4 To further support the work and promote the feasibility of GASOS, ICAO completed two surveys (April 2018 and November 2018). The target audience of the first survey was limited to 33 organizations comprised of RSOOs, GASOS Study Group Members and other potential GASOS stakeholders. Fifteen organizations (7 RSOOs, 6 CAAs, and 2 international organizations/stakeholders) responded to the first survey and the results showed that 89% of respondents would be interested in being assessed under GASOS and 100% of respondents perceived value in being part of the GASOS programme. The second survey had a larger and more diverse audience and was answered by 64 organizations, including 46 State CAAs, eight RSOOs and ten AIOs. The results of the survey demonstrated support for GASOS: 67% responded that they would be interested in being assessed and recognized under GASOS; 38% responded that they would be ready for recognition at the launch of GASOS in early 2020; and 46% of respondent States indicated that they would be willing to delegate safety functions to ICAO recognized SOOs or AIOs. As a result of the two surveys, ICAO received feedback from 11 out of the 15 regional safety oversight organizations (RSOOs and COSCAPs) showing positive support for GASOS, including their participation in the GASOS programme.

2.5 Taking into consideration that presently there are 15 regional safety oversight organizations (including RSOOs and COSCAPs) globally, regional safety oversight organizations are working with approximately 160 ICAO Member States to assist them effectively implement their safety

oversight responsibilities. However, these organizations and States are still facing challenges. This is evident as the average global EI rate remains at approximately 68%. The below tables provide the EI average regionally and per RSOO.

Regions	Average of EI
WACAF	54.06%
ESAF	52.86%
APAC	63.51%
NACC	71.7%
MID	75.23%
EUR/NAT	77.16%
SAM	79.93%
<b>Global Average EI</b>	<b>68.22%</b>
<b>Total States</b>	<b>185</b>

Table 1: USOAP Safety EI Score in ICAO Regions (June 2019)

RSOO	Average EI 2009	Average EI 2019	Increase (pp)
<b>AAMAC</b>	31.86%	55.10%	23.24
<b>ACSA</b>	69.87%	86.19%	16.32
<b>ASSA-AC</b>	18.19%	44.93%	26.74
<b>BAGASOO</b>	53.40%	49.93%	-3.47
<b>CASSOA</b>	48.11%	61.14%	13.03
<b>CASSOS</b>	51.28%	56.76%	5.48
<b>COSCAP-NA</b>	87.65%	88.33%	0.68
<b>COSCAP-SA</b>	47.36%	72.91%	25.55
<b>COSCAP-SEA</b>	65.37%	67.00%	1.63
<b>COSCAP- UEMOA</b>	38.77%	64.66%	25.89
<b>EASA</b>	77.51%	83.02%	5.51
<b>IAC</b>	68.95%	66.89%	-2.06
<b>iSASO</b>	37.64%	56.95%	19.31
<b>PASO</b>	53.38%	50.13%	-3.25
<b>SRVSOP</b>	71.60%	83.40%	11.80
<b>Benchmark: World</b>	59.25%	68.22%	8.97

Table 2: Shows the evolution of average EI of States, members of RSOOs and COSCAPs between 2009 and 2019, compared with the corresponding figures for all ICAO States (world benchmark). (source: iSTARS June 2019)

2.6 ICAO has developed GASOS as a tool to assess, recognize, and monitor the qualifications and capabilities of SOOs/AIOs (RSOOs and RAIOS) to perform certain safety functions, as defined in the GASOS scope of recognition (safety functions and levels). As a result, ICAO will publish and maintain a directory of SOOs/AIOs that have successfully completed a GASOS assessment, including their scope of recognition (safety functions and activities) for use by their

member States who may wish to request the provision of additional functions and activities from that GASOs recognized SOO/AIO.

2.7 The main objective of GASOS is to strengthen State safety oversight, accident and incident investigation and safety management capabilities by:

- a) assessing existing SOOs and AIOs to make them more effective and efficient in supporting States; and
- b) facilitating the provision of safety functions and activities, where needed, for States by capable and qualified SOOs and AIOs.

2.8 The expected benefits of GASOS include:

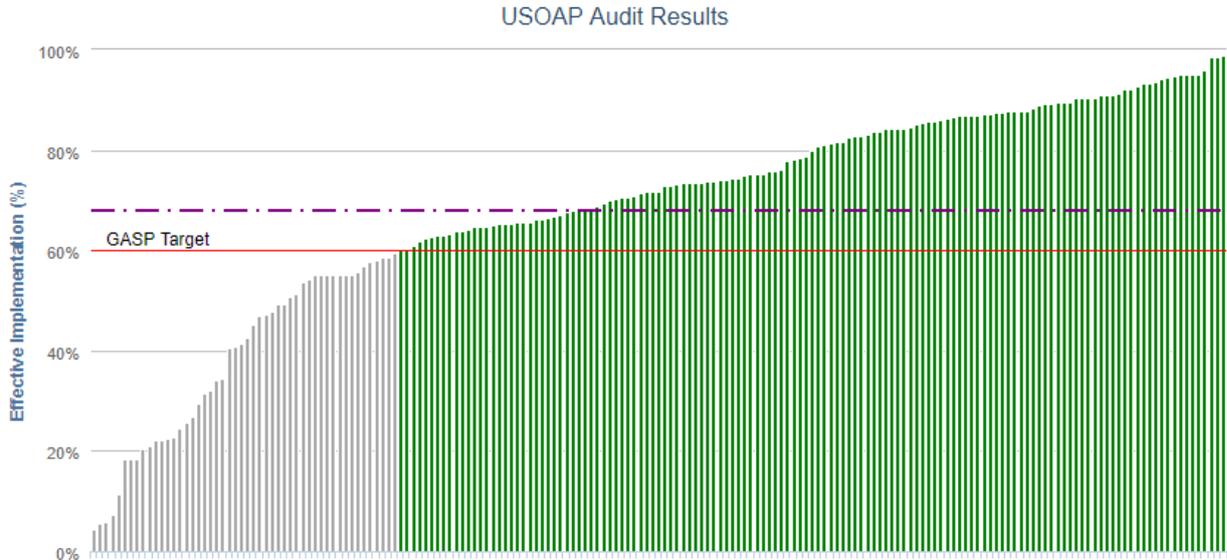
- a) increased safety oversight capabilities for States by facilitating the provision of safety functions and activities, where appropriate, by recognized SOOs and AIOs;
- b) the empowerment and strengthening of RSOOs and other existing regional mechanisms in effectively carrying out safety functions and activities; and
- c) increased overall safety performance resulting from improved safety oversight and safety management capabilities on a global scale.

### **3. INTRODUCTION**

#### **3.1 Problem statement**

3.1.1 Under the provisions of the Chicago Convention and its annexes, States have extensive safety oversight responsibilities. Today many States already rely on regional organizations, such as RSOOs and Regional Accident and Incident Investigation Organizations (RAIOs) to perform certain safety functions and activities.

3.1.2 Through the efforts and collaborative work of States, industry, international organizations and other stakeholders, the global aviation accident rate in recent years has remained low and stable. However, the aviation industry is changing and becoming more complex; new technologies are emerging and air traffic is forecast to double over the next fifteen years. Some States are not able to fulfil all their aviation safety oversight obligations effectively. The gap between the insufficient development of State safety oversight capabilities and the constant evolution of the industry will increase and may negatively impact aviation safety. States need effective, reliable and flexible alternatives to develop capacity for all safety functions in order to close this gap.



*Table 3: Global Effective Implementation Levels; iSTARS (June 2019)*

3.1.3 Whereas it is expected that RSOOs, RAIOS and other regional or sub-regional organizations would provide tangible improvements, many of them face specific challenges that do not enable them to deliver the expected results. The strengthening of safety oversight capability can be achieved through GASOS by facilitating the provision of safety functions and activities to capable and qualified SOOs and also by reinforcing existing SOOs/AIOs. This can be achieved by conducting objective and standardized assessments to determine if an SOO/AIO is qualified to carry out these functions or activities. GASOS may increase confidence of States to call upon these qualified SOOs/AIOs to perform specific safety functions and activities.

#### 4. OBJECTIVE

4.1 In response to recommendation 6.1.3/1 of the AN-Conf/13, ICAO has undertaken this CBA in order to evaluate the costs and benefits for SOOs to participate in GASOS. In order to complete this CBA, it was necessary to determine a GASOS assessment and recognition fee schedule to use as an example of costs for an SOO to participate in the GASOS assessment process. Furthermore, as GASOS is not currently being implemented, it was necessary to make various assumptions, which are noted below in 6.1. As the GASOS programme is implemented, ICAO will request RSOOs and States to provide additional information and data in order to update the CBA, as required.

#### 5. BASE CASE (DO-NOTHING OPTION)

5.1 The base case scenario is that, in the absence of GASOS recognition of SOOs by ICAO, it would be necessary for either the member States to maintain or increase the necessary resources in order to implement their safety oversight obligations on their own in a context of traffic growth and new technological challenges or try to achieve the same outcomes using SOOs that are not subject to any objective external evaluation.

## 6. ASSUMPTIONS

6.1 The assumptions below are considered the baseline criteria in carrying out the cost-benefit analysis.

Assumption 1: Information was provided by different regional organizations to show the costs and benefits of implementation by an individual State vs. regional cooperative activities.

Assumption 2: Accident and Incident Investigation Organizations (AIOs), including Regional Accident and Incident Investigation Organizations (RAIOs) are also to be assessed and recognized under GASOS, however, no data was made available with regard to their costs and benefits. It is assumed that RAIOs will achieve the same economies of scale as in the case of RSOOs by pooling very specialized resources. Therefore, only SOOs will be mentioned further in this document; certain benefits will nevertheless be applicable also to AIOs.

Assumption 3: In the absence of an SOO, a member State would have to achieve the same outcomes on their own or from the open market. Thus, the benefit for States amounts to the savings that the SOO provides each member State for performing a defined set of functions or activities in order to meet safety oversight requirements.

Assumption 4: By using a GASOS assessed and recognized SOO, it is expected that member States' effective implementation will increase in the areas where the SOO has successfully completed a GASOS assessment. Furthermore, it may also lead to the growth of air traffic volume and bring economic benefit, including more job opportunities.

Assumption 5: Known and quantifiable benefits of regional cooperation in the form of existing COSCAPs and/or RSOOs (now referred to as SOOs) already exist, such as the sharing of technical experts, harmonization of regulations, etc.<sup>3</sup>).

Assumption 6: GASOS assessments, recognition and continuous monitoring will strengthen the capability of SOOs, which may encourage member States to request additional safety functions to be performed by the SOOs.

Assumption 7: GASOS 'market base' for the initial phase is limited to 15 existing SOOs.

## 7. DATA BACKGROUND AND ANALYTICAL APPROACH OF EXISTING SOOS (RSOOS/COSCAPS)

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<sup>3</sup>Report on the ICAO Evaluation of Regional Safety Oversight Organizations (November 2017).

7.1 Benefit Cost Ratio (BCR) is an indicator used in a cost-benefit analysis that attempts to summarize the overall value for money of a project. A BCR takes into account the amount of monetary gain realized by performing a project versus the amount it costs to execute the project. The higher the BCR, the better the investment. The general rule is that if the benefit is higher than the cost the project, it is a good investment.

7.2 As mentioned above, the results of a CBA can be represented by the BCR as an indicator of a project's worth. If the  $BCR > 1.0$ , it means the benefits exceed the costs, and the project should be allowed to proceed, vice versa, when  $BCR = 1.0$ , the project may proceed, but with little viability. It also means the higher the BCR, the more worthwhile the project.

7.3 There is currently no data to show the costs and benefits to States and SOOs in regards to GASOS, as the GASOS programme is not currently in place. Therefore in order to determine a baseline of costs and benefits of SOOs, ICAO has collected data from 2 existing SOOs (SRVSOP<sup>4</sup> and COSCAP-SA<sup>5</sup>). This data shows the costs for States to implement their safety oversight obligations on their own, as well as under an SOO. The difference between the two is the net benefit of the SOO. From that baseline, further assumptions were made regarding the impact of the GASOS programme on States and SOOs, including the link between increase in EI, which may lead to increase in traffic, as well as GDP. Further information regarding this can be found at 9.3.

7.4 The cost-benefit analysis was based on existing studies regarding the costs and benefits of States as members of an SOO. It is assumed that with GASOS, the benefits will be further amplified for States. Additionally, as it is difficult to quantify some aviation benefits (i.e. political will, trust, harmonization and standardization of laws and regulations) the CBA is further supported with a cost-effectiveness analysis<sup>6</sup> (CEA) for GASOS.

## 7.5 Existing or estimated benefits of SOOs for States

7.5.1 The following case studies are based on information provided by SRVSOP<sup>7</sup>, and COSCAP-SA<sup>8</sup> (2018). Additional information was considered taking into consideration reports on EASA (2015, 2016)<sup>9</sup>, as well as State information provided by Costa Rica. The ultimate result of these case studies and the additional information shows that there are significant benefits for States to join SOOs.

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<sup>4</sup> SRVSOP, Latin American Regional Safety Oversight Cooperation System, was formed by 12 Member States: Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, Panama, Paraguay, Peru, Uruguay, and Venezuela.

<sup>5</sup> COSCAP-SA, Cooperative Development of Operational Safety and Continuing Airworthiness Programme, was formed by 7 Member States: Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka.

<sup>6</sup> When benefits cannot be expressed in monetary values in a meaningful way, a cost-effectiveness analysis (CEA) should be carried out to assist in making effective decisions. A CEA calculates cost-effectiveness ratios of different alternative policy options and then compares the resulting ratios so that the most efficient option is chosen. In a sense, a CEA ensures technical efficiency in the process of achieving a desired outcome. Source: Government of Canada <https://www.tbs-sct.gc.ca/trap-parfa/analys/analys-eng.pdf>

<sup>7</sup> Report on the Update to the Cost-Benefit Analysis of the Regional Safety Oversight Cooperation System (2015).

<sup>8</sup> Feasibility Study Examining the Case for COSCAP-SA's Development into a Regional Safety Oversight Organisation (RSOO)

<sup>9</sup> Study on the resources deployed in the area of European aviation safety before and after the creation of EASA: <https://ec.europa.eu/transport/sites/transport/files/2015-04-23-study-on-resources-deployed-in-eur-aviation-safety-before-and-after-creation-easa.pdf>

Analytical Study on the 'Cost of Non-Agencies' with Relevance to the Internal Market, European Parliament 2016 [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/572702/IPOL\\_STU\(2016\)572702\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/572702/IPOL_STU(2016)572702_EN.pdf)

## 7.6 Case Study of SRVSOP

7.6.1 In 2009, SRVSOP completed a CBA of the services provided to its member States from 2001 to 2008. The purpose of the analysis was to advise the CAAs of the benefits of belonging to a regional organization. The quantitative results of the analysis revealed savings for member States during this period of US\$13.7 million dollars.

7.6.2 Due to the level of success of working on a regional level, in 2015 it was agreed to incorporate new sets of regulations in the areas of Aerodromes and Ground Aids (AGA), Air Navigation Services (ANS) and Dangerous Goods. By increasing the scope of work under SRVSOP, it was envisioned that there would be an increase in the development of air transport in the region. Therefore, the 2009 CBA report was updated in 2015 in order to present the benefits brought by the increased scope of activity, as well as to justify the increase of State contributions to SRVSOP.

7.6.3 According to the summary of the SRVSOP CBA report (2001-2015), without SRVSOP, its member States would have had to achieve the same result on their own or through the utilization of services on the market. For example, if the SRVSOP did not provide technical assistance or training events, the alternative for States would have been to obtain it in the open market or to develop it at their own cost. The difference between the market price and the State contribution to SRVSOP amounts to the benefit of each product.

7.6.4 The report shows that the benefit obtained from the use of SRVSOP over a period of 15 years between 2001 and 2015 is over USD \$35 million; resulting in the **benefit-cost ratio of 3.24** (see Appendix 2, Table 1). As the benefit-cost ratio is greater than 1, this demonstrates that the project is viable and cost effective, therefore it is worth proceeding. It is important to note that this analysis does not consider new products that are currently being provided by SRVSOP, such as the Ramp Safety Inspections Data Exchange Program (IDISR), the dangerous goods programme and the certification of training centers. As a result, the benefits that have been quantified above are undervalued.

7.6.5 Additionally, the costs and benefits data reported to ICAO by SRVSOP has been used in the ICAO Cost Benefit Application that has been developed by the Air Transport Bureau (ATB). The results of the application (Appendix 3 refers) indicates that the net benefits from the SRVSOP for the period between 2020 and 2034 at present value (NPV) are estimated at USD \$11,681,673, which translates to an average net benefit of USD \$970,000 for each SRVSOP Member State. The internal rate of return for the project is estimated at 48% which is a significant spread from the discount rate of 9%. The spread indicates that even if the benefits, as reported to ICAO by the SRVSOP are taken at a more conservative levels, the net present value (NPV) will continue to be positive (see Appendix 3).

7.6.6 The below table provides additional information for SRVSOP regarding the costs and benefits as undertaken without a project (situation in which States must individually develop or purchase services in the market), versus with a project (services provided by SRVSOP)<sup>10</sup>.

WITHOUT A PROJECT	WITH A PROJECT
<p>Training: The State must cover the following relevant costs per person:</p> <ul style="list-style-type: none"> <li>• Daily per diem cost</li> <li>• Daily course cost</li> </ul>	<p>Training: Consider as a State cost the cost of the time spent by the person in the training course.</p>
<p>Assistance to the States: The State must cover the professional fees of the international experts, amounting to USD \$6,500 per expert, per week. (Approximate reference value of ICAO TCB).</p>	<p>Assistance to the States: Consider the cost of the assistance provided by the System's experts.</p>
<p>Production of LARs: Each State must cover the relevant cost of having a team of professionals and of the equipment, systems and infrastructure, which has been valued at an average of USD \$ 60,000 per LAR for a 5-year period.</p>	<p>Production of LARs: Consider the cost of the assistance of System experts, the preparation of the documentation and the general expenses involved in attending meetings, panels and courses.</p>
<p>Certification of AMOs: Each State must commission at least two airworthiness inspectors to certify each maintenance shop in each country, with a commission cost per MO.</p>	<p>Certification of AMOs: Consider the cost of the activities involved in the certification and oversight of maintenance organizations.</p>

7.6.7 The report<sup>11</sup> concludes by noting the following:

- Since its creation, SRVSOP has produced sizeable savings in costs for its member States;
- Training, assistance to the States, multinational activities, implementation, seminars and other activities that without the System would not have been performed or whose cost would have been prohibitive for most of the States, continue to be performed; and
- The roster of top-level aeronautical professionals with training and experience standardized at the regional level continues to grow.

## 7.7 Case Study of COSCAP-SA

7.7.1 The purpose of the CBA that was conducted on behalf of COSCAP-SA was to assist decision-makers by providing them with information regarding the benefits of sharing resources and achieving economies of scale in areas where individual member States require assistance. The basic assumption was that in the absence of the COSCAP, the member States would have to achieve the same outcomes on their own or through obtaining services from the market. The report noted that total contributions of the member States during Phase I and II (1999-2008) amounted to USD \$1.6 million, whereas it was estimated that they received USD \$6.7 million in measurable savings. The overall net benefit for Phases I and II amounts to USD \$5.1 million, which means the **general benefit/cost ratio is 4.32**. More specific information regarding the costs

<sup>10</sup> Report on the Update to the Cost-Benefit Analysis of the Regional Safety Oversight Cooperation System (2015), page. 3.

<sup>11</sup> Report on the Update to the Cost-Benefit Analysis of the Regional Safety Oversight Cooperation System (2015), page 6

for each member State for specific services versus their contributions to COSCAP-SA and the overall cost benefit ratio can be found in Appendix 2, Table 2.

7.7.2 The report further notes that with the continued development of COSCAP-SA, the benefits to its member States in phase IV (2018) amounted to USD \$1.44 million with the total contributions of USD \$0.71 million, the **benefit/cost ratio thus resulting in 2.0**. This means that the member States in COSCAP-SA were able to save twice the amount of the contributions. The report goes on to further note that there are services/activities that are not possible to put a reasonable monetary valuation on, as a result, the “qualitative benefits” are of far greater value. The table<sup>12</sup> below provides additional information on these qualitative benefits.

Activity	Savings for COSCAP-SA	Qualitative Valuation
Meetings, conferences and documentation	Not measurable	<ul style="list-style-type: none"> <li>• Opportunity for aviation leaders to share common concerns, pursue common solutions and share resources</li> <li>• COSCAP-SA developed and maintains manuals and guidance material for the member States</li> </ul>
Courses, Seminars and Workshops	USD \$1 million	<ul style="list-style-type: none"> <li>• COSCAP-SA provides training to its member States</li> </ul>
Audit Training and Preparations	USD \$90,000	<ul style="list-style-type: none"> <li>• Some States are already above the global average, but not all states have achieved this.</li> </ul>
Technical Assistance	USD \$350,000	<ul style="list-style-type: none"> <li>• Difficult to directly measure the benefits, but can be counted in terms of improved career opportunities and the foundation for building even stronger regional cooperative programmes</li> </ul>

## 7.8 Additional Information from EASA Report

7.8.1 The benefits of EASA and a common European aviation safety system were identified in a 2015 study by ECORYS<sup>13</sup> and are as follows:

- Safety benefit due to increased safety standards:
- Industry gain and promotion of the common market due to centralization of certification:
- Efficiency gain due to centralization of certification: and
- Simplified regulatory process.

7.8.2 The report found that even though it was necessary to make revisions to the European aviation safety regulatory system and to increase the associated budgets for implementation

<sup>12</sup> Information derived from *Feasibility Study Examining the Case for COSCAP-SA's Development into a Regional Safety Oversight Organisation (RSOO)*, page 104

<sup>13</sup> *Study on the resources deployed in the area of European aviation safety before and after the creation of EASA*: <https://ec.europa.eu/transport/sites/transport/files/2015-04-23-study-on-resources-deployed-in-eur-aviation-safety-before-and-after-creation-easa.pdf>

purposes, the benefits for member States, industry and passengers significantly outweighed the costs.

7.8.3 This was further quantified in an assessment of the cost that would be borne if EASA had not existed:

Scenario 1: common regulatory framework, no EASA	Scenario 2: no common regulatory framework
The NAAs in three countries (DE, FR, UK) would probably take on most of the EASA tasks and would need to expand their capacity. We have assumed that there would be a 10% increase in net costs compared with the current EASA costs.	Instead of the current cost to industry of EUR 91 million for EASA certification and other services (2015), the cost could increase threefold to at least EUR 300 million to the aviation industry if it was necessary to certify products via at least three NAAs.

Source: *Analytical Study on the 'Cost of Non-Agencies' with Relevance to the Internal Market*, European Parliament 2016<sup>14</sup>.

## 7.9 Additional information provided by Costa Rica in respect of ACSA

7.9.1 Even though ICAO was not provided with a full study of the costs and benefits to member States of ACSA, the DGAC of Costa Rica provided an example of the costs and benefits they have experienced under ACSA. In 2018, the DGAC requested specific assistance from ACSA that resulted in a total cost of USD \$26,667 (plus ACSA membership and travel expenses for technical experts). The DGAC advised that the estimated costs of the activities that would have been purchased on the open market if there was no ACSA was USD \$2,000,000.

7.9.2 These figures lead to a calculation of an extremely high benefit/cost ratio, therefore they have been taken with caution. Nevertheless, the case of DGAC Costa Rica and ACSA provides a good case of a State belonging to an RSOO having a perception of a very high return on investment.

## 8. COSTS TO SOOs FOR GASOS RECOGNITION

8.1 The above-mentioned cases show the benefit/cost ratio of the SOOs within the range of **2.0 (COSCAP-SA for Phase IV) and 3.29 (EASA)**. Using this as a baseline, it is necessary to take into consideration costs for ICAO to conduct the assessments and monitoring of SOOs. As a result, it is necessary for ICAO to charge fees in order to recover costs for the service of conducting an assessment of an SOO and the subsequent work related to GASOS recognition and monitoring. An SOO that requests a GASOS assessment will be responsible for such fees and are the major costs to be considered as part of the CBA.

8.2 Taking into consideration that ICAO operates other cost-recovery programmes with similar recognition and assessment processes (i.e. TRAINAIR PLUS (training centres), Aviation English Language Test Service (AELTS – aviation English language tests) and currently under development specifically requested USOAP audits/activities, it has been necessary to evaluate and review these programmes in order to develop a fee structure for GASOS. Costs derived from the

<sup>14</sup> [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/572702/IPOL\\_STU\(2016\)572702\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/572702/IPOL_STU(2016)572702_EN.pdf)

initial 3 GASOS pilot assessments of RSOOs, plus a review of other ICAO programmes has resulted in the development of a fee structure to support the GASOS activities.

8.3 The initial fee structure to be established to support GASOS assessment, recognition and continuous monitoring is estimated to have a range of USD \$30,000 to USD \$50,000 per 3 year cycle, plus travel fees to conduct the assessment. The overall fees will be contingent upon the number of technical areas to be assessed, recognized and monitored. Additionally, the costs to individual member States, if any, will be dependent on several factors, including, but not limited to: the number of member States in the regional safety oversight organization and the financial arrangements for supporting that organization. In general terms, it can be assumed that the range of costs per individual member State could range from USD \$3,000 to USD \$8,000 plus shared travel expenses per 3 year cycle.

8.4 It is envisioned that as the programme is implemented and evolves, that the fee structure will need to be updated. This initial fee structure though will be used as an estimate in order to measure costs vs. benefits for States.

8.5 Study Group members at the 5th GASOS SG meeting, also noted the need to take into consideration costs borne by the RSOO in their preparations for the conduct of a GASOS assessment, as well as to develop and implement their corrective action plan, if required. As a result, it was recommended that with the launch of GASOS, ICAO considers requesting information from RSOOs regarding any costs that may be required for them to prepare for the assessment, develop and implement the action plan, and the sustainability of their GASOS recognition.

8.6 As a result of the recommendation from the 5th GASOS SG meeting, ICAO approached the RSOOs that received pilot assessments and requested that they consider sharing information regarding any costs associated with their preparations and development and implementation of their action plans. At the time of this revised CBA, ICAO had received preliminary estimates from ACSA regarding costs associated with the development and implementation of their CAP. ACSA has estimated that the required work was 428 hours for a total cost of \$17,120 (plus travel and subsistence costs) for the development and implementation of the CAP.

## **9. COST-EFFECTIVENESS ANALYSIS**

9.1 Cost-benefit analysis has a well-established methodology and is used to evaluate infrastructure projects for economic impact. However, CBA has not yet reached the same level of maturity in assessing the benefits and costs of aviation safety oversight projects on the regional and global levels. Some aspects, such as “the benefits of harmonization and standardization of regulations” cannot be measured as a monetary value. In this case, an alternative approach, known as a cost-effectiveness analysis (CEA) should be considered in the decision-making process. Some unmeasurable benefits that can be considered for GASOS are included but not limited to those listed below.

## 9.2 Long-run average cost-effectiveness

9.2.1 SOOs provide a mechanism to allow States to share their technical resources in order to enhance safety oversight in its member States. States with different sized aviation systems, as well as human and financial resources are able to come together on a regional level to utilize technical personnel to support and enhance their oversight capabilities.

9.2.2 GASOS is a standardized tool to assess, recognize, and monitor the qualifications and capabilities of SOOs. The assessment is an objective method of identifying potential findings and observations of the SOOs, which the SOO would need to correct; eventually this will lead to an improvement of the effectiveness of such SOOs. Therefore GASOS will have a multiplier effect on the existing benefits of regional mechanisms. In addition, this will have other non-quantifiable outcomes, such as increased political will which may result in the increase in both human and financial resources in order to further strengthen and enhance the SOOs. Under GASOS, it is envisioned that member States will request the provision of additional tasks and functions from these organizations in order to conduct the necessary safety oversight.

## 9.3 Safer and more efficient air transportation

9.3.1 The regional and global economic benefit is also a very important factor to be considered. Improved member State and SOOs safety oversight ability under the GASOS programme may lead to the increase of USOAP EI of States and may thus trigger the growth of air traffic volume<sup>15</sup>, which may ultimately result in the increase of GDP and job opportunities in that region.

9.3.2 ICAO has modelled the impacts on the air traffic volume and GDP of a State by improving its EI score (%). The econometric model, projects that for every 1% improvement in the EI score, the air traffic volume expressed in number of departures will increase by 0.18% depending on the level of the State's EI vis-a-vis the region, its economic maturity and the current contribution of aviation to GDP.

## 9.4 Harmonization of regulations and procedures

9.4.1 Additionally, a significant benefit for SOOs that may be a result of the GASOS programme is the support for the harmonization of the regulations within regions, thus strengthening and improving the capability of an SOO, which is an unmeasurable benefit. After SOOs are recognized by ICAO under the GASOS programme, they can be more active and efficient and will facilitate the harmonization of safety requirements. This will also help to reduce the cost of development of regulations and facilitate compliance by State regulators, air operators, and other players in that region. Additionally, the strengthening of the SOO will stimulate the development of the aviation market in the region by facilitating the provision of services and enabling the mobility of aviation personnel. The value of uniformity of regulations and procedures not only is a key ICAO goal, but also is recognized to improve the regional and global safety oversight ability in the aviation community.

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<sup>15</sup> Assumed that 1% of the USOAP EI growth will increase by 0.18% of air traffic volume. Source: ICAO/ATB (2018)

## 10. CONCLUSION

10.1 In order to support the request from States at the ANConf/13, ICAO has undertaken a CBA to provide information to States and SOOs regarding the benefits of the ICAO GASOS programme. ICAO conducted a CBA based on data provided by SOOs in order to look at some of the quantifiable benefits. ICAO has further supported the CBA by including information of a CEA (non-quantifiable benefits). There are already existing, quantifiable benefits of cooperation in the form of established SOOs, and it is expected that GASOS will help to enhance and further expand those benefits with a benefit-cost ratio within the range from 2.0 to 3.29. Many of the benefits to be derived from SOOs and GASOS-recognized SOOs is not quantifiable (i.e. political will, harmonization of laws and regulations, etc.), as shown in the cost-effective analysis above, however they may be significant positive outcomes of the programme.

10.2 As shown above in section 8, it will be necessary for SOOs to pay fees in order to be assessed, recognized and monitored under the GASOS programme. These fees will enable ICAO to recover the costs of the GASOS assessment and recognition process. In terms of both quantifiable and unquantifiable benefits, the costs for SOOs in regards to the GASOS programme will be offset and are minimal, taking into account that by default the SOOs will be assessed every 3 years. Therefore the annual cost per Member State is minor. The GASOS programme will enable the strengthening of SOOs, in order to make them more effective and efficient in supporting their Member States. By strengthening SOOs and improving the safety oversight capacity of their Member States, the overall benefits of GASOS will expand beyond States and regions and will ultimately enhance safety oversight on a global level.

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## APPENDIX 1

### Acronyms

ACSA	Central American Agency of Aviation Safety
ANC	Air Navigation Commission
BCR	Benefit-Cost Ratio
CAA	Civil Aviation Authority
CEA	Cost-Effective Analysis
CBA	Cost-Benefit Analysis

COSCAP-SA	Cooperative Development of Operational Safety and Continuing Airworthiness Programme- South Asia
EASA	European Union Aviation Safety Agency
EI	Effective Implementation
GASOS	Global Aviation Safety Oversight System
GASP	Global Aviation Safety Plan
LAR	Latin American Regulations
NPV	Net Present Value
PV	Present Value
RAIO	Regional Accident and Incident Investigation Organization
RSOO	Regional Safety Oversight Organization
SOO	Safety Oversight Organization
SRVSOP	Latin American Regional Safety Oversight Cooperation System
TA+OJT	Technical Assistance + On-Job Training
USOAP CMA	Universal Safety Oversight Audit Program Continuous Monitoring Approach

## APPENDIX 2

### Cost-Benefit Analysis Report for States with RSOOS

#### Cost-Benefit Analysis Report Summary of States for SRVSOP

Products	Cost without the SRVSOP	Cost with the SRVSOP	Net Benefit	Net Benefit/Cost Ratio
Training	7,027,874	2,604,389	4,423,485	1.70
Assistance to the States	700,000	369,009	330,991	0.90
Production of LARs	36,737,333	7,565,212	29,172,121	3.86
Certification of AMOs	1,967,030	424,120	1,542,900	3.64
Total	46,432,237	10,962,730	35,469,497	3.24

Table 1: Summary of CBA in SRVSOP 2001-2015<sup>16</sup> (US Dollars)

#### Cost-Benefit Analysis Report Summary of States for COSCAP-SA

Member State	Benefit					Cost	Net Benefits	Benefit/Cost Ratio
	Training	Manuals	Regulations	TA+OJT	Total	Member State Contributions		
Bangladesh	416.5	150.0	48.0	58.8	673.3	172.9	500.4	3.89
Bhutan	161.3	150.0	48.0	32.2	391.5	52.8	338.7	7.41
India	1709.8	150.0	48.0	80.0	1987.8	525.0	1462.8	3.79
Maldives	355.1	150.0	48.0	71.7	624.8	155.9	468.9	4.01
Nepal	796.0	150.0	48.0	77.6	1071.6	139.9	931.7	7.66
Pakistan	895.7	150.0	48.0	40.8	1134.5	238.1	896.4	4.76
Sri Lanka	486.9	150.0	48.0	140.4	825.3	268.0	557.3	3.08
Total	4821.3	1050.0	336.0	501.5	6708.8	1552.6	5156.2	4.32

Table 2: Summary of CBA in COSCAP-SA to Nov 2008<sup>17</sup> (Thousands of US Dollars)

<sup>16</sup> Source: Report on the update to the cost-benefit analysis of the regional safety oversight cooperation system, page 5.

<sup>17</sup> Source: Feasibility Study Examining the Case for COSCAP-SA's Development into a Regional Safety Oversight Organisation (RSOO), Page 93

### APPENDIX 3

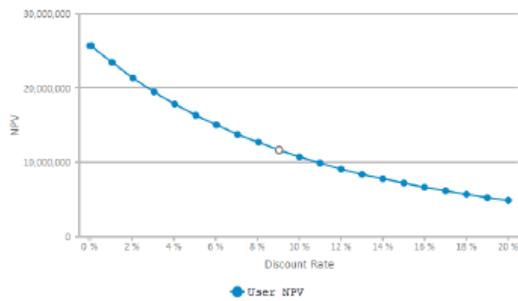
## Cost-Benefit Analysis Report for SRVSOP



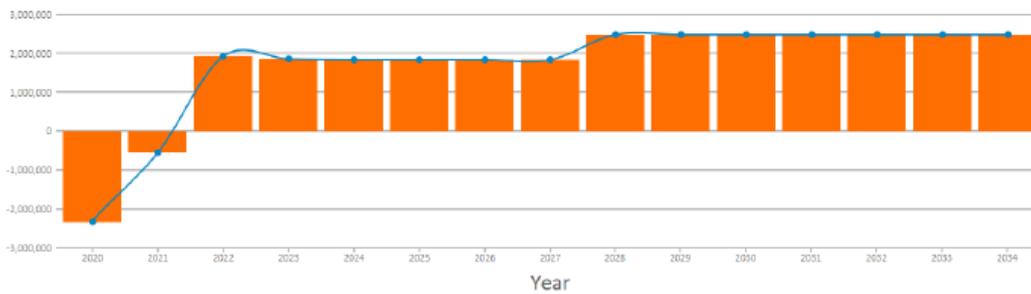
#### Cost Benefit Analysis SRVSOP

Results	User Input
Net Present Value at 9.00 %:	11,681,673.16
Internal Rate of Return:	47.929 %
Discounted Payback Period:	2.90 years

Net Present Value vs Discount Rate



Net Earnings



	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<b>Project Results</b>															
Total Cash Inflows	0	0	2,468,537	2,468,537	2,468,537	2,468,537	2,468,537	2,468,537	3,107,495	3,107,495	3,107,495	3,107,495	3,107,495	3,107,495	3,107,495
Total Cash Outflows	2,337,847	547,373	547,373	608,036	620,938	620,938	620,938	620,938	620,938	620,938	620,938	620,938	620,938	620,938	620,938
Net Cash Flow Before Tax	-2,337,847	-547,373	1,921,164	1,860,501	1,847,599	1,847,599	1,847,599	1,847,599	2,486,557	2,486,557	2,486,557	2,486,557	2,486,557	2,486,557	2,486,557
Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow After Tax	-2,337,847	-547,373	1,921,164	1,860,501	1,847,599	1,847,599	1,847,599	1,847,599	2,486,557	2,486,557	2,486,557	2,486,557	2,486,557	2,486,557	2,486,557
Total Revenue	0	0	2,468,537	2,468,537	2,468,537	2,468,537	2,468,537	2,468,537	3,107,495	3,107,495	3,107,495	3,107,495	3,107,495	3,107,495	3,107,495

\* All values are in US DOLLAR currency