International Civil Aviation Organization
Fifth Meeting of the Regional Aviation Safety Group – Pan America (RASG-PA/5)
Santiago, Chile, 22 – 24 October 2012

Agenda Item 5: Other RASG-PA Activities
5.1 Cost Benefit Analysis for On-Board Technology to Mitigate Runway Excursions (REs)

COST/BENEFIT STUDY TO MITIGATE RUNWAY EXCURSIONS

(Presented by the Secretariat)

SUMMARY

This working paper presents the results of a Cost/Benefit Study for the implementation of aircraft on-board technology to mitigate runway excursions. The study results show a positive cost/benefit relationship. RASG-PA is encouraged to take note of future actions regarding implementation of new technology as a flight safety risk mitigation measure.

References:

- ICAO Global Aviation Safety Plan (GASP)
- ISSG Global Aviation Safety Roadmap (GASR)

Strategic Objective(s)	*This working paper is related to Strategic Objective A – Safety*

1. Introduction

1.1 Considering the three most common accident categories indicated in the last version of the RASG-PA Annual Safety Report, the only occurrence showing an increased tendency is runway excursions (RE).

1.2 The Global Aviation Safety Roadmap (GASR) and the Global Aviation Safety Plan (GASP) mention within area No. 12 the use of this technology as a form to mitigate flight safety risks. Throughout aviation history, technological advances have significantly contributed to the improvement of flight safety. It is also true that modern technology in the cockpit has contributed to improving flight safety in the two last decades, and technological advances have improved flight safety maintenance methods, airport operations, and air traffic management, as well as flight safety information processing and integration. The adoption of these technologies should be considered in order to improve flight safety

in the region. The planned use of these technologies offers improvement opportunities, considering existing fleets as well as new installations and aircraft.

1.3 It is important to note that the cost demanded by the purchase, installation and maintenance of technology may be substantial. Likewise, unless this is well planned and analyzed, benefits could be limited and below expectations. This may happen especially if while planning the purchase, the specific regional requirements and obstacles are not being considered. Due to limited financial and human resources existing in developing countries, the GASR recommends basing the purchase decision of any new technology in the analysis of the benefit in terms of flight safety assets throughout the life period of technology to be implemented. The best way to cover for implications is using a certified risk evaluation process.

1.4 The need to ensure economic benefits of technological implementation is mentioned in different parts of Global Safety Initiative GSI # 12.

2. Analysis

2.1. Based on the GASR indications, RASG-PA supported the initiative of developing a Cost-Benefit Study of on-board technology implementation for runway excursion (RE) mitigation. This study has two objectives:

- ✓ develop regional competencies on how to develop a cost/benefit study; and
- ✓ develop a Business Case for the referred technology.

2.2. ICAO and the Regional Safety Oversight Cooperation System (SRVSOP) provided financial support for this project, hiring a management instruction specialist who delivered the course and provided coaching sessions to the SRVSOP technical committee to conclude the study. The course was held from 2 to 4 May 2012, and counted with the participation of three States from the SAM Region and two service providers (LAN and TAM). AVIANCA/TACA was also invited but their participation was not possible.

2.3. During the development of the business case, costs and benefits were evaluated within a theoretical framework, which according to conclusions of evaluated scenarios, backs the initiative of implementing this system to avoid aircrafts runway excursions. This would also support the challenge of decreasing even further the already reduced accident rate. As in any business case, the study is based on different assumptions to be considered by the interested parties while making their own analysis before deciding on the investment.

3. Conclusion

3.1. The implementation of this technology offers to support accidents/incidents mitigation through three types of benefits: direct, indirect monetary and indirect non-monetary.

3.2. As a direct benefit, the system offers advice to the crew (visual and hearing) regarding the decision to land or go-around in high complexity situations (information and environment saturation, personal and organizational influences).

3.3. As an indirect monetary benefit, and due to decreasing incidents and accidents, the consequent decrease of insurance fees and aircraft repairs, as well as profit from having aircraft and airports available.

3.4. Finally, indirect non-monetary costs can be obtained in association with high flight safety levels. The cost-benefit analysis developed is being included as the **Appendix** to this working paper.

4. Suggested action

4.1. The meeting is invited to:

a) take note of the preliminary results of the convenient implementation of a factor validation project; and

b) discuss and decide on future actions to be considered for the implementation of on-board technology as a risk mitigation action:

i. request the industry to develop cost-benefit studies to consider the possibility of equipping aircraft with on-board technology to support RE mitigation;

ii. consider the incorporation of other scenarios in the study, and continue consideration of on-board technology as a risk mitigation strategy to avoid runway excursions; and

iii. consider the incorporation of a regional requirement for this type of technology.

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APPENDIX

Cost-Benefit analysis of on-board technology implementation as runway excursion (RE) mitigation

SCENARIO 1	PERIOD										
	CASH FLOW (1000 US$)										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	TOTAL
BENEFIT SUMMARY											
Reduce Insurance Costs	$108.31	$110.48	$112.69	$114.94	$117.24	$119.58	$121.98	$124.42	$126.90	$129.44	$ 1,185.98
Incident/accident reduction	$50.85	$54.31	$58.00	$61.95	$66.16	$70.66	$75.46	$80.59	$86.07	$91.93	$ 695.97
Reduce liability	$375.94	$401.50	$428.80	$457.96	$489.10	$522.36	$801.95	$856.49	$1,193.12	$1,274.26	$ 6,801.48
Improve airport use/availability	$4.42	$4.51	$4.60	$4.69	$4.78	$4.88	$4.97	$5.07	$5.18	$5.28	$ 48.37
Reduce investigation cost	$0.07	$0.07	$0.08	$0.08	$0.08	$0.08	$0.08	$0.08	$0.09	$0.09	$ 0.80
Reduce repair cost	$30.60	$31.21	$31.84	$32.47	$33.12	$33.78	$34.46	$35.15	$35.85	$36.57	$ 335.06
TOTAL BENEFIT FLOW	$ 570.19	$ 602.08	$ 636.00	$ 672.09	$ 710.48	$ 751.34	$ 1,038.91	$ 1,101.80	$ 1,447.21	$ 1,537.56	$ 9,067.66
COSTS SUMMARY											
HARWARE											
Acquisition											
Equipment purchase (stand change)	$320.00	$336.00	$352.80	$370.44	$388.96	$408.41	$643.25	$675.41	$856.92	$899.77	$ 5,251.96
Transport and customs	$5.20	$5.46	$5.73	$6.02	$6.32	$6.64	$10.45	$10.98	$13.44	$14.12	$ 84.36
Activities											
Instalation	$1.92	$1.92	$1.92	$1.92	$1.92	$1.92	$2.88	$2.88	$3.52	$3.52	$ 24.32
TOTAL COST FLOW	$ 327.12	$ 343.38	$ 360.45	$ 378.38	$ 397.20	$ 416.97	$ 656.58	$ 689.26	$ 873.89	$ 917.41	$ 5,360.64
CASH FLOW	$ 243.07	$ 258.70	$ 275.55	$ 293.71	$ 313.28	$ 334.38	$ 382.33	$ 412.54	$ 573.33	$ 620.15	$ 3,707.02
Discount Rate	10%	12%	15%								
NPV	$2,096.56	$1,899.20	$1,651.26								
ROI	69%										

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SCENARIO 2	PERIOD CASH FLOW (1000K$)					
	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
BENEFIT SUMMARY						
Reduce Insurance Costs	$216.62	$220.96	$225.38	$229.88	$234.48	$1,127.32
Incident/accident reduction	$101.70	$108.62	$116.00	$123.89	$132.32	$582.53
Reduce liability	$563.90	$853.19	$1,179.20	$1,259.39	$1,345.03	$5,200.71
Improve airport use/availability	$8.83	$9.01	$9.19	$9.38	$9.56	$45.98
Reduce investigation cost	$0.15	$0.15	$0.15	$0.15	$0.00	$0.60
Reduce repair cost	$61.20	$62.42	$63.67	$64.95	$66.24	$318.49
TOTAL BENEFIC FLOW	$ 952.41	$ 1,254.34	$ 1,593.60	$ 1,687.64	$ 1,787.63	$ 7,275.63
COSTS SUMMARY						
HARWARE						
Acquisition						
Equipment purchase (stand change)	$240.00	$399.00	$418.95	$532.51	$559.13	$ 2,149.59
Transport and customs	$7.80	$13.65	$14.33	$18.06	$18.96	$ 72.80
Activities						
Instalatation	$2.88	$4.48	$4.48	$5.44	$5.44	$ 22.72
TOTAL COST FLOW	$ 250.68	$ 417.13	$ 437.76	$ 556.01	$ 583.53	$ 2,245.11
CASH FLOW	701.73	837.21	1,155.84	1,131.63	1,204.10	5,030.51
Discount Rate	10%	12%	15%			
NPV	**$3,718.82**	**$3,519.08**	**$3,248.90**			
SROI	**224%**					

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