

**SOUTH AMERICA AIG REGIONAL COOPERATION MECHANISM (ARCM)
THIRD MEETING OF AIG AUTHORITIES**
(Lima, Peru, 07 through 09 March 2016)

Agenda Item 5: Revision of the ARCM AIG training programme

- Proposal of amendment to the ARCM AIG training programme

(Working paper presented by Peru)

Summary

This working paper presents - to the Third Meeting of South American AIG authorities (AIG-SAM/3) - the proposal of amendment to the AIG training programme of the South American AIG Regional Cooperation Mechanism (ARCM).

References

- Report of the Second Meeting of AIG Authorities of the SAM Region (AIG-SAM/2), Buenos Aires, Argentina, 09 through 11 June 2015.
- AIG Regulation of the ARCM.
- Annex 13 – Aircraft Accident and Incident Investigation.
- Doc 9946 - Manual on Regional Accident and Incident Investigation Organization.
- Doc 9683 – Human Factors Training Manual.
- Circular 298 – Training Guidelines for Aircraft Accident Investigators.
- ARCM Training Programme.
- State Training Programme/Manual.

Specialists in charge of the task

Mr. Pedro Avila y Tello (relator) - Peru
Mr. Gustavo Iriarte - Colombia
Mr. Eunides Pérez - Panamá
Mr. Clifford Themen - Suriname
Mr. Kyhummel Ponte Soteldo - Venezuela

1. Introduction

1.1. In accordance with the last results obtained in the scope of activities of the ICAO Universal Safety Oversight Programme (USOAP), one of the audit areas with less effective implementation (EI) in relation to the safety oversight capabilities of the SAM States is still aircraft accident and incident investigation (AIG).

1.2. In this area, it is possible to observe that the subgroups of investigation policies and procedures; final report development, completion and publication; organization, provision of personnel and training by the accident investigation authority; development, release and registry of safety

recommendations and accident/incident data reporting (ADREP) procedures, are the ones which have the greatest number of protocol questions (PQ) not satisfactory as a general average among the SAM States.

1.3. In this respect, the Second Meeting of AIG Authorities learned that one of the subgroups with the least effective application in the AIG area is the one of organization, provision and training of personnel.

1.4. In this sense, the Meeting observed that, for the development of objective, well conducted investigations, and with high impact in the resulting recommendations, the States shall count on competent persons for this purpose. However, it is a fact that many States do not have professionals exclusively dedicated to the investigation of accidents, and in this case it is convenient to choose qualified personnel to be trained in the accident investigation methods before they are designated for the conduction of a real investigation.

1.5. A concern for accident investigators and their organizations refers to the initial and recurrent training aimed at the continuous updating of knowledge and skills for the full compliance with the designated tasks. The investigators on the ground must receive basic aircraft accident investigation training, initial training (indoctrination), as well as on-the-job training at various levels (basic, advanced, periodical, and specialized) with the purpose of maintaining and refining their skills.

1.6. The availability of a common training program for all the member States facilitating the harmonization of knowledge and skills is of vital importance. Such harmonization of knowledge and skills will allow the SAM Region to have a selected group of investigators capable of participating on request in aircraft accident investigations in any State of the Region.

1.7. During the Second Meeting of AIG Authorities (AIG-SAM/2), the first edition of the ARCM harmonized training programme was presented.

1.8. In this respect, the Meeting agreed to approve the First edition of the programme aforementioned, and asked the secretariat to circulate it so that the ARCM States could issue their comments and differences. The Meeting also requested the Technical Committee to analyze the pertinence of including comments sent by the States, and that the modified training programme be circulated again for the approval of the amendments considered.

2. **Definition of the problem**

2.1 Based on the conclusion adopted by the AIG-SAM/2, the First edition of the ARCM training programme was circulated to the States for the issuance of their comments. In this respect, two (2) States forwarded their comments on the ARCM training programme. The comments were analyzed by the ARCM Technical Committee (see **Appendix A** for the content of the comments sent by each State). After analyzing the comments sent by each State, the ARCM Technical Committee accepted some of them, which are presented in the **Appendix B** of this document.

2.2 In Appendix A, the comments sent by Argentina and Colombia were included in two tables, together with the analysis of the referred comments carried out by the Technical Committee.

2.3 In Appendix B, the ARCM training programme is presented together with the amendments accepted by the Technical Committee (paragraphs highlighted).

2.4 Based on Appendices A and B, the meeting may validate the comments accepted by the Technical Committee, or, if necessary, include new changes to the analysis performed.

3. **Actions suggested**

3.1 The AIG authorities of the Region are invited to:

- a) Study and comment the information provided by this working paper in the **Appendixes A and B**; and
- b) Approve the proposal of amendment to the AIG Training Programme of the ARCM Appendix B Revision N° 1 within the South America AIG Regional Cooperation Mechanism (ARCM).

– END –

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
<p>Chapter 3 Reference 3.3 Patern</p>	<p>Chapter 3 – TRAINING GUIDELINES</p> <p>3.1 PHASE 1 – INITIAL TRAINING</p> <p>3.1.4 The aim of the initial training is to familiarize new investigators with the legislation applicable in the ARCM member States and with the procedures and requirements of the accident investigation authority. The following subjects should be included in the initial training or indoctrination:</p> <p>a) Administrative arrangements:</p> <p>(i) Applicable legislation</p> <p>(ii) International agreements (including Annex 13 – Aircraft Accident and Incident Investigation)</p> <p>(iii) Memorandum of understanding with other organizations (if applicable)</p>	<p>In 3.3, the State suggests replacing the term “new investigators” to “aspirants” and delete paragraph a) Administrative arrangements, fully and paragraph b) Investigation procedures, fully to avoid redundancy because these points are shown in the table of subjects in Chapter 4 COURSE GUIDELINES - paragraph 4.1.7.</p> <p>The aim of the initial training is to familiarize new investigators with the legislation applicable in the ARCM member States and with the procedures and requirements of the accident investigation authority. The following subjects should be included in the initial training or indoctrination:</p> <p>a) Administrative arrangements:</p> <p>(i) Applicable legislation</p> <p>(ii) International agreements (including Annex 13 – Aircraft Accident and Incident Investigation)</p> <p>(iii) Memorandum of understanding with other organizations (if applicable)</p> <p>(iv) Liaison arrangements with local and national authorities</p> <p>(v) Structure of the AIG Authority</p> <p>(vi) Aircraft accident investigation manuals,</p>	<p>Cir 298 AN/172 - Training Guidelines for Aircraft Accident Investigators - recommends that items listed by the State of Section 3.3 are included in the initial training.</p> <p>The CT after analyzing the State's proposal recommends keeping the term new investigator because it is the term most used in development of training programs. The “aspirants” is a very general term therefore its inclusion is not recommended.</p> <p>About the letters a) and b) of paragraph 3.1.4, the CT agrees with the State because these literals are included in Paragraph 4.1.7 of Chapter 4, so their removal is recommended.</p>

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
	(iv) Liaison arrangements with local and national authorities (v) Structure of the AIG Authority (vi) Aircraft accident investigation manuals, policies and procedures (vii) Definitions and accident classification (viii) Equipment and tools (ix) Transport arrangements (x) Ethics and conduct b) Investigation procedures (i) On-call procedures (on-call investigator) (ii) Securing of records, recordings and samples (iii) Accident site jurisdiction and security (iv) Investigator safety including	policies and procedures (vii) Definitions and accident classification (viii) Equipment and tools (ix) Transport arrangements (x) Ethics and conduct b) Investigation procedures (i) On-call procedures (on-call investigator) (ii) Securing of records, recordings and samples (iii) Accident site jurisdiction and security (iv) Investigator safety including psychological stress (v) Cooperation in the recovery human remains (vi) Requests for autopsies (vii) Family assistance (viii) Authority and responsibility	

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
	<p>psychological stress</p> <p>(v) Cooperation in the recovery human remains</p> <p>(vi) Requests for autopsies</p> <p>(vii) Family assistance</p> <p>(viii) Authority and responsibility</p> <p>(ix) Investigation management</p> <p>(x) Use of specialists</p> <p>(xi) Parties to the investigation, accredited representatives, advisers and observers</p> <p>(xii) Release of information to the news media</p> <p>(xiii) SMS applied to the investigation - SSP</p>	<p>(ix) Investigation management</p> <p>(x) Use of specialists</p> <p>(xi) Parties to the investigation, accredited representatives, advisers and observers</p> <p>(xii) Release of information to the news media</p> <p>(xiii) SMS applied to the investigation - SSP</p>	
<p>Chapter 3 Reference</p> <p>Patern Phase 5</p>	<p>Chapter 3 – TRAINING GUIDELINES</p> <p>PHASE 5 – PERIODIC ACCIDENT INVESTIGATION COURSE (new)</p>	<p>Chapter 3 – TRAINING GUIDELINES</p> <p>PHASE 5 – PERIODIC ACCIDENT INVESTIGATION COURSE</p> <p>Periodic courses are a tool in the training of investigation because the same is continuous</p>	<p>The fundament indicated by the State agrees with the PQ 6.125: Does the investigation authority develop a periodic training plan detailing and prioritizing the type of training to be provided during the established period?</p> <p>State comments have technical support and CT qualifies as appropriate to produce an amendment to</p>

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
		<p>throughout his career, so it becomes necessary to plan regular training for staff investigators stay current with new procedures and / or reinforce those aspects of the investigation that AIG Authority considers necessary. Besides this type of course is a requirement in 6.125 PQ protocol.</p> <p>PHASE 5 – PERIODIC ACCIDENT INVESTIGATION COURSE</p> <p>3.7.1 After completing basic accident investigation course, the investigator must continue their training through periodic courses, the structure is the basic course in a biased manner and whose subjects can be combined according to the diagnosis internal conducted by the organization through quality control processes in the investigations and/or deficiencies identified through various methods such as assessments, interviews with investigators etc.</p> <p>These recurrent courses are held every 2 years calendars and workload should not exceed 50% over the basic accident investigation course. The same may be performed in a time period of 30 days, adjusting the number of hours weekly according to the activities and staff of investigators.</p>	the ARCM AIG training programme.
Chapter 4 Reference 4.1.1 Patern	Chapter 4 ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.1.1 Goals: a) Knowing the INITIAL concepts of the methodology established	Chapter 4 - ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.1.1 Goals: a) Knowing the INITIAL concepts of the methodology established by the Accident Investigation Board for the civil aviation accident and	The CT considers the use of the term "investigation organization" supports the idea of the Accident investigation Board but broadly and does not affect the ICAO documents, so the CT suggests making changes indicated by the state of the manual in the Spanish version.

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
	by the Accident Investigation Board for the civil aviation accident and incident investigations, in accordance with the standards of the Annexes to the Convention of Civil Aviation related.	incident investigations, in accordance with the standards of the Annexes to the Convention of Civil Aviation related. The State requests include the term "the Accident investigation organization".	
Chapter 4 Reference 4.1.1 Patern	Chapter 4 ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.1.1 Goals: b) Knowing the initial procedures to conduct an investigation in such a way that the student can start the OJT in the field investigation (being part of a FIELD INVESTIGATION TEAM – ETIC).	Chapter 4 - ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.1.1 Goals: a) Knowing the initial procedures to conduct an investigation in such a way that the student can start the OJT in the field investigation (being part of a FIELD INVESTIGATION TEAM – ETIC). The State requests the correction of the abbreviation (ETIC) in the spanish manual.	The acronym is incorrect. The letter T must be eliminated. The state review is appropriate and, therefore, the CT will make the suggested change.
Chapter 4 Reference 4.1.7 Definicions	Chapter 4 ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.1 INITIAL AIRCRAFT ACCIDENT INVESTIGATION COURSE 4.1.7 Subjects	The State requests to remove the SSP acronym of the subjects. x) SMS applied to the investigation - SSP.	The change suggested by the State is not appropriate because in protocol question, PQ 6.124, indicates that the staff of the investigating authority must receive instruction in SSP and SMS. In being an important component of the reactive elements set out in the SMS and SSP framework, accident investigations contribute to the continuous

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
	4.1.7.1 The initial aircraft accident investigation course must cover at least the following subjects: x) SMS applied to the investigation - SSP		<p>improvement of the aviation system to provide the cause of the origins of accidents and incidents and also provide the lessons learned from occurrences.</p> <p>This can support decisions about development of corrective measures and the corresponding assignment resources; also you can identify the necessary improvements to the aviation system, such as SMS, SSP, as well as accident investigation process conducted by State.</p> <p>Although, in the States, the mandatory of occurrences investigations are limited to investigation of accidents and serious incident, a mature environment about operational safety can provide the investigation of low-impact occurrences.</p> <p>Because of the importance that the concepts of SMS and SSP bring together the training program should include the aforementioned concepts in the subjects of the initial aircraft accident investigation course.</p>
Chapter 4 Reference 4.2 Patern	4.2 – BASIC AIRCRAFT ACCIDENT INVESTIGATION COURSE	<p>Chapter 4 - ACCIDENT INVESTIGATION – COURSE GUIDELINES</p> <p>4.2 BASIC AIRCRAFT ACCIDENT INVESTIGATION COURSE</p> <p>Incorporate in the subject box, in the letter w) ECCAIRS/ADREP notification system; and incorporate in 4.2.6.1 (Detailed breakdown of the topics that must be covered) in the letter w): Introduction to the ECCAIRS reporting system under the ADREP taxonomy, so that each investigator will</p>	<p>The format of the notification of the investigation should clearly provide that the hazards and discovered threats are documented during the investigation process, understanding the language ADREP and ECCAIRS system is important for decision-making based on data from safety management.</p> <p>The investigators should be aware of this tool to generate the necessary countermeasures in an investigation in order to prevent recurrence.</p> <p>State comments have technical support and CT</p>

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
		<p>use this tool to upload the details of the investigation being conducted in the ECCAIRS system, using the ADREP taxonomy.</p> <p>Incorporate in 4.4.4 - Learning the use of ECCAIRS / ADREP system tool is important to the investigator, as this is an essential tool for reporting events and feed the AIG organization database, the integration with other databases and ARCM the database.</p>	<p>qualifies as appropriate to produce an amendment to the ARCM AIG training programme.</p>
<p>Chapter 4</p> <p>Reference 4.3.2 Patern</p>	<p>4.3.2 In addition to the review of the organization of a major investigation, topics that should be discussed include:</p> <p>a) the provision of family assistance to those involved in an accident;</p> <p>b) relations with the media;</p> <p>c) an introduction to methods for cataloguing a large number of fragments of wreckage;</p> <p>d) management of a large accident site for security, safety and protection of the personnel;</p> <p>e) preparation of briefings and answers to formal questions for members of government;</p> <p>f) the methods of undertaking investigations that involve both civil and military aircraft, and</p> <p>g) liaison with the law enforcement authorities in</p>	<p>f) the methods of undertaking investigations that involve both civil and military aircraft, and</p>	<p>Circular 298 ICAO recommends maintaining the theme with military aircraft, however it submitted for the consideration the task group's decision to keep or delete the comment from the State.</p>

Appendix A -1

Differences checklist - Argentina

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Argentina	ARCM CT analysis and evaluation
	accidents involving unlawful interference.		
Chapter 4 Reference 4.5 Patern	Chapter 4 – ACCIDENT INVESTIGATION – COURSE GUIDELINES	Chapter 4 ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.5 PERIODIC ACCIDENT INVESTIGATION COURSE Incorporate point 4.5 in Chapter 4. Periodic courses are a tool in the training of the investigator because is continuous throughout his career, so it becomes necessary to plan periodic training for staff investigators stay current with new procedures and / or reinforce those aspects of the investigation that the AIG Authority considers necessary. In addition, this type of course is a requirement in question the protocol question - PQ 6.125.	The theoretical foundation of the state agrees with the PQ 6.125, indicating: Does the investigation authority develop a periodic training plan detailing and prioritizing the type of training to be provided during the established period? State comments have technical support and CT qualifies as appropriate to produce an amendment to the ARCM AIG training programme.
Attachment C Reference Patern	Attachment C Individual Development Plan Form AIG Authority (ARCM) – Aircraft accident investigator	Attachment C Attachment C - Individual Development Plan Form Release of information to the news media (change only Spanish manual)	The CT considered appropriate to change so it shall include the amendment, but only in the manual in Spanish.

Appendix A-2

Differences checklist -Colombia

OCTOBER 2015

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Colombia	ARCM CT analysis and evaluation
Chapter 3 Reference Pattern	Chapter 3 – TRAINING GUIDELINES	Chapter 3 – TRAINING GUIDELINES It proposes to add to the periodic accident investigation course periods for staff investigators, if possible each (2) years.	The CT considers appropriate to comment the State so will be added in the ARCM AIG training Programme of recurrence 2 years for periodic instruction.
Chapter 4 Reference 4.4 Pattern	Chapter 4– ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.4 SPECIALITY COURSES 4.4.1 Specialty courses may be introduced to an investigator at any stage after a basic course. The courses would augment the skills and knowledge acquired by the inspector in order to meet the needs of a particular area of accident investigation that is relevant to his assigned duties. 4.4.2 For topics such as helicopter accident investigation, gas turbine engine accident investigation, accident survival aspects, fires and explosions, Human Factor investigation, family assistance and media relations, they are generally extensive enough to warrant a short course of their own with a specialized syllabus. 4.4.3 Description of the systems	Chapter 4 – ACCIDENT INVESTIGATION – COURSE GUIDELINES 4.4 – Specialty Courses In 4.4 - Specialized courses, Colombia AIG Authority – GRIAA proposes to study the feasibility of including instruction lines to staff of investigators, considering their expertise and training in aviation. The intention is addressed primarily to take advantage and link the different aeronautical specialties, in this way training specialized investigators in the SAM Region in different specialized areas. Colombia proposes to develop a training program of advanced courses considering not only specialties, but also academic tools that provide a SAM region and at an internationally level. Taking advantage of the large variability of organizations offering specialized courses in Accident Investigation, could include a training plan split into five (5) areas of specialties for investigators: investigation specialist of airworthiness, specialist at operations investigation, specialist at flight data investigation, survival factors specialist and Human Factors Specialist.	One of the objectives of the ARCM is to cooperate to enhance the qualifications and experience of accident investigators in all members State. The investigators represent the ARCM and as such, it is necessary that their knowledge and skills in relation to their responsibilities remain in continuous development. Circular 298, Training guidelines for aircraft accident investigator, provides at one of the four phases of instruction the advanced accident investigation courses and additional training. Since most of the staff (pilots, mechanics, air traffic controllers, etc.) involved in the civil aviation system operation must meet stringent requirements for training and checking, it is essential to require comparable requirements of accident investigators. State comments have technical support and CT qualifies as appropriate to produce an amendment to the ARCM AIG training programme. It is suggested that the working group, together with the State, develop a course guidelines containing the specialized courses, according to the experience and formation in aviation, to include in the ARCM AIG

Appendix A-2

OCTOBER 2015

Differences checklist -Colombia

ARCM AIG Training Programme

ARCM AIG Training Programme reference	Accidents and incidents investigation Requirement	Comments and differences of Colombia	ARCM CT analysis and evaluation
	<p>involving specialized technologies (such as glass cockpit, fly-by-wire systems, GPS, electronic flight instrument system (EFIS) and EGPWS) is usually provided during aircraft type courses. However, aircraft type courses do not include the investigation aspects nor the investigation techniques of such complex systems. Extensive information can be obtained from memory chips and other solid state electronic circuits used in new technology systems. Increasingly, the investigation techniques for solid state electronic circuits are covered in accident investigation courses. Nevertheless, aircraft accident investigation authorities should contact the manufacturers of such systems for specialty courses, since most manufacturers have accident investigators and support personnel that are familiar with the systems and the investigation techniques required to extract the information stored in the systems.</p>		<p>Training Programme.</p>

AIG Regional Cooperation Mechanism (ARCM) of South America

**ARCM
AIG training programme of South
America**

**First edition
June 2015**

Amendments to AIG training programme			
Amendment	Origin	Subjects	JG ARCM approved
First edition	AIG-SAM/2	Training programme base on ICAO documents	June 2015
No 01	Proposals of Argentina and Colombia	Cap. 3 Training guidelines Cap. 4 Accident investigation – Course guidelines	March 2016

List of effective pages			
Detail	Pages	Amendment	Dates
Foreword		Original	June 2015
List of abbreviations		Original	June 2015
Chapter 1 Terminology		Original	June 2015
Chapter 2 Background of experience for investigators		Original	June 2015
Chapter 3 Training guidelines		01	March 2016
Chapter 4 Accident investigation – Course guidelines		01	March 2016
Attachment A SAM regional centres for aircraft accident investigation training		Original	June 2015
Attachment B Courses available in the CENIPA		Original	June 2015
Attachment C Individual development form		Original	June 2015

TABLE OF CONTENT

		Page
Record of amendments.....		i
Amendment to the AIG training programme		ii
List of effective pages		iii
Table of content		iv
Foreword		v
List of abbreviations		vi
Chapter 1	Terminology	1-7
Chapter 2	Background of experience for investigators.....	2-8
Chapter 3	Training guidelines.....	3-10
	3.1 General	3-10
	3.2 Requirement.....	3-10
	3.3 Phase 1 – Initial training.....	3-10
	3.4 Phase 2 – On-the-job training (OJT).....	3-11
	3.5 Phase 3 – Basic accident investigation course	3-11
	3.6 Phase 4 – Advanced accident investigation course and additional training.....	3-11
	3.7 Phase 5 – Periodic accident investigation course	3-11
Chapter 4	Accident investigation – Course guidelines	4-13
	4.1 Initial accident investigation course	4-13
	4.2 Basic accident investigation course	4-15
	4.3 Advanced courses	4-23
	4.4 Specialized courses	4-24
	4.5 Periodic accident investigation course.....	4-25
Attachment A	SAM regional centers for aircraft accident investigation training.....	Adj-B-25
Attachment B	Training of ARCM AIG personnel	Adj-B-26
Attachment C	Individual development form	Adj.C-28
Bibliography		vii

FOREWORD

The investigation of an aircraft accident is a task that can be almost unlimited in scope. Therefore, some investigations will be curtailed by the resources available, unless proper management of the investigations is exercised. The AIG Authority is responsible for ensuring that the expenditure of the resources available results in an investigation that extracts the maximum benefit to the safety of aviation and not squandered on irrelevant lines of inquiry. At the same time, the AIG Authority must also ensure, as much as is practicable, that relevant lines of inquiry are terminated as soon as they have achieved the level beyond which further expenditure of resources will be uneconomical in terms of enhancing safety.

As more occurrences are investigated, besides the new technologies in the industry, higher is the need to increase the knowledge and upgrade the skills in a continuing process. While training is essential, the optimization of an investigator's capabilities generally depends upon a personal commitment to excellence.

During the First Meeting of AIG Authorities of the SAM Region, Lima, Peru, in March 2014, the States of South America expressed the view that there was a need to develop common standards for the training of investigators. The training standards were to be compiled in such a way that they would be adaptable to a variety of cultures and operational requirements. Based on the discussion, the meeting agreed that the AIG regional cooperation mechanism (ARCM) would develop guidelines for the training of investigators.

In response to the recommendation, the ARCM developed the harmonized AIG training programme with the training guidelines contained in these guidelines. This training programme discusses the experience and employment background required for training as an aircraft accident investigation. It also outlines the progressive training that is considered necessary to qualify a person for the various investigation roles, including appointment as the *investigato-in-charge (IIC)* of an investigation into a major accident involving a large transport category aircraft. The ARCM, in compliance with what ICAO suggests, acknowledges that training guidelines are evolutionary in nature and may need to be updated periodically. .

Throughout this proposal, with the exception of the definitions in Chapter 1, the use of the male gender should be understood to include male and female persons and the term "accident" should be understood to include "serious incident and incident".

In order to keep this text relevant and updated guidance, suggestions to improve them in terms of format, content or presentation are welcome. Any recommendation or suggestion shall be examined, and, if convenient, it shall be included in the next edition of this document.

LIST OF ABBREVIATIONS

AAC	Civil Aviation Authority
AASANA	Administration of Airports and Services of Air Navigation
ACCID	Accident
ADREP	Accident/Incident Data Reporting System
AIG	Accident/Incident Investigation
ARCM	AIG Regional Cooperation Mechanism (South America)
ATC	Air Traffic Control
ATS	Air Traffic Services
AVSEC	Aviation Security
DGAC	Directorate General of Civil Aviation (AAC)
DS	Supreme Decree
ECCAIRS	European Coordination Centre for Aviation Incident Reporting Systems
IIC	Investigator-in-charge (IIC)
INCID	Incident
MoU	Memorandum of Understanding
ICAO	International Civil Aviation Organization
OJT	On-the-job Training
PDI	Individual development Plan of the Accident Investigator
SAR	Search and Rescue
SARPs	Standards and Recommended Practices
SSP	State Safety Programme
SMS	Safety Management Systems
USOAP	Universal Safety Oversight Audit Programme

Chapter 1

TERMINOLOGY

When the terms listed below appear in the training programme, they will mean the following:

Accident investigation authority. The State organization responsible for conducting aircraft accident investigations.

Accident investigator. A person, specifically trained, engaged in the investigation of civil aviation accidents, serious incidents and incidents.

Accredited representative. A person designated by a State, on the basis of his or her qualifications, for the purpose of participating in an investigation conducted by another State.

Adviser. A person appointed by a State, on the basis of his or her qualifications, for the purpose of assisting its accredited representative in an investigation.

Expert/Specialist. A person invited to participate in an investigation, on the basis of his or her specialized knowledge, skills or experience.

Investigation. A process conducted for the purpose of accident prevention. It includes the gathering and analysis of information, the drawing of conclusions, the determination of causes and the making of safety recommendations.

Investigator-in-charge (IIC). A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation.

Observer. A person permitted to be present in an investigation for the purpose of observing the investigation process.

Chapter 2

BACKGROUND EXPERIENCE FOR INVESTIGATORS

2.1 Aircraft accident investigation is a specialized task which should only be undertaken by qualified investigators. Many States establish an accident investigation authority manned by qualified and experienced investigators. Some States have both an independent accident investigation authority and an accident investigation unit within the regulatory authority; others rely on investigation by the regulatory authority alone. Some States do not have any personnel employed solely for aircraft accident investigation. Such States should train appropriately qualified personnel in the accident investigation techniques required to participate in or to conduct an aircraft accident investigation. When assigned to an accident investigation, such personnel should be relieved of their regular duties for the duration of the investigation.

2.2 Accident investigators must have considerable practical experience in aviation as a foundation on which to build their investigation skills. This experience can be acquired from civil or military qualification as a pilot, aeronautical engineer or aircraft maintenance engineer. Personnel qualified in flight operations, airworthiness, air traffic management, or aviation related management might also be suitable for accident investigator training.

2.3 Normally, a small team or even a single investigator conducts the investigation of an accident involving a general aviation or small commuter aircraft. However, two investigators are advisable to conduct the investigation: an operations investigator (OPS) and an airworthiness investigator (AIR). In addition, the investigators should have a comprehensive understanding of the interrelationship of each of the supporting services that are necessary to operate an aircraft in the aviation environment.

2.4 Since the outcome of an accident investigation is largely dependent upon the aviation knowledge, skills and experience of the assigned aircraft accident investigators, they should have:

- a) an understanding of the depth of investigation that is necessary in order for the investigation to conform with the legislation, regulations and other requirements of the State for which they are conducting the investigation;
- b) a knowledge of aircraft accident investigation techniques;
- c) an understanding of aircraft operations and the relevant technical areas of aviation;
- d) the ability to obtain and manage the relevant technical assistance and resources required to support the investigation;
- e) the ability to collect, document and preserve evidence;
- f) the ability to identify and analyse pertinent evidence in order to determine the causes and, if appropriate, make safety recommendations; and
- g) the ability to write a final report that meets the requirements of the accident investigation authority of the State conducting the investigation.

2.5 In addition to technical skills and experience, an accident investigator requires certain personal attributes. These attributes include integrity and impartiality in the recording of facts; ability to analyse facts in a logical manner; perseverance in pursuing inquiries, often under difficult or trying conditions; and tact in dealing with a wide range of people who have been involved in the traumatic experience of an aircraft accident.

Chapter 3

TRAINING GUIDELINES

3.1 GENERAL

3.1.1 Aircraft accident investigators require different levels of experience, knowledge and training according to the particular role to which they are assigned. Aircraft accident investigators should receive training commensurate with their responsibilities as an accident investigator, group leader, investigator-in-charge, accredited representative, adviser or expert/specialist. The training guidelines and course syllabi should be planned in such a way that the investigators receive appropriate levels of training that will enable them to perform efficiently in any of the roles assigned to them by the AIG Authority.

3.1.2 Training a person for aircraft accident investigation involves several phases. These phases include initial training, on-the-job training, a basic accident investigation course and an advanced accident investigation course supplemented by specialized courses. While on-the-job training is an ongoing process that continues for many years, there should be sufficient time intervals between each formal course to allow the investigator to consolidate the information and the techniques learned.

3.2 REQUIREMENT

Formal courses are designed to complement on-the-job training by exposing trainee investigators to a cadre of experts who can pass on the details of their specialties to their students. The experts are usually recruited from those with experiences in a particular area of accident investigation. They include experienced investigators, aviation medicine physicians, psychologists, aeronautical engineers and manufacturers' representatives.

3.3 PHASE 1 – INITIAL TRAINING

~~3.3.3~~ The aim of the initial training is to familiarize new investigators with the legislation applicable in the ARCM member States and with the procedures and requirements of the accident investigation authority. ~~The following subjects should be included in the initial training or indoctrination:~~

- ~~a) Administrative arrangements:~~
 - ~~(i) Applicable legislation~~
 - ~~(ii) International agreements (including Annex 13 – Aircraft Accident and Incident Investigation)~~
 - ~~(iii) Memorandum of understanding with other organizations (if applicable)~~
 - ~~(iv) Liaison arrangements with local and national authorities~~
 - ~~(v) Structure of the AIG Authority~~
 - ~~(vi) Aircraft accident investigation manuals, policies and procedures~~
 - ~~(vii) Definitions and accident classification~~
 - ~~(viii) Equipment and tools~~
 - ~~(ix) Transport arrangements~~

- ~~(x) — Ethics and conduct~~
- ~~b) — Investigation procedures~~
 - ~~(i) — On-call procedures (on-call investigator)~~
 - ~~(ii) — Securing of records, recordings and samples~~
 - ~~(iii) — Accident site jurisdiction and security~~
 - ~~(iv) — Investigator safety including psychological stress~~
 - ~~(v) — Cooperation in the recovery human remains~~
 - ~~(vi) — Requests for autopsies~~
 - ~~(vii) — Family assistance~~
 - ~~(viii) — Authority and responsibility~~
 - ~~(ix) — Investigation management~~
 - ~~(x) — Use of specialists~~
 - ~~(xi) — Parties to the investigation, accredited representatives, advisers and observers~~
 - ~~(xii) — Release of information to the news media~~
 - ~~(xiii) — SMS applied to the investigation — SSP~~

3.4 **PHASE 2 – ON-THE-JOB TRAINING (OJT)**

Following the initial training, the AIG Authority should provide on-the-job training for a new investigator. During this second phase, the new investigator will practice the procedures and tasks covered in the initial training, and gain familiarity with investigation techniques. This training will also familiarize him with the investigation tasks at the accident site, the collection of factual information, the analysis of the factual information and the development of the final report. The conduct of on-the-job training often involves more than one experienced investigator and is not limited to investigations within the State that employs the trainee/investigator.

3.5 **PHASE 3 – BASIC ACCIDENT INVESTIGATION COURSE**

After completing the initial familiarization training, the aircraft accident investigator who is under training should attend a basic accident investigation course as soon as is practicable, preferably within the first year of training. A basic course should have a syllabus that includes the subjects discussed in Chapter 4.

3.6 **PHASE 4 – ADVANCED ACCIDENT INVESTIGATION COURSE AND ADDITIONAL TRAINING**

3.6.1 Advanced accident investigation courses. As a trained investigator gains experience, he should be enrolled for an advanced accident investigation course where he can update his knowledge of the basic techniques and increase his knowledge in special areas relevant to accident

investigations. Additional training, investigators may be called upon to investigate accidents involving a variety of aircraft types. It is impracticable to train an investigator on each of the aircraft types that he may encounter. Nevertheless, investigators should have a basic knowledge of most of the major air transport aircraft types that are operated in the ARCM member States or of the Region. It is therefore recommended that investigators attend aircraft type courses on the most common aircraft types used by the airlines in their State. Preferably, such aircraft type courses should include specialized technology transport category aircraft (i.e. aircraft equipped with a glass cockpit, fly-by-wire systems and aircraft which contain composite materials in their structure). There is no need for each investigator to attend type courses on all the large aircraft types used. Training on the various aircraft types can be shared equitably among the investigators. For example, one investigator could be trained on one or two large aircraft types and another investigator on other aircraft types. Investigators with a technical or engineering background could attend the aircraft type courses for technical/maintenance personnel. Similarly, investigators with a pilot background could attend the aircraft type courses for pilots, which could include introductory flight training in a flight simulator.

3.6.2 In accordance with Annex 13, the State of Design and the State of Manufacture participate as accredited representatives in investigations involving the type of aircraft that are designed or manufactured in their State. Although the accredited representatives of the State of Design and the State of Manufacture are usually accompanied by expert advisers from the designer organization and the manufacturer, it is essential that the investigators, who are appointed as accredited representatives of the State of Design and the State of Manufacture, have a basic knowledge of the aircraft designed or manufactured in their State.

3.6.3 Other additional training can be obtained by attending conferences and seminars conducted by aircraft accident investigation organizations, by reading related material, such as aircraft accident magazines and aircraft accident reports issued by other States.

3.7 PHASE 5 – PERIODIC ACCIDENT INVESTIGATION COURSE

3.7.1 After completing basic accident investigation course, the investigator must continue their training through periodic courses, the structure is the basic course in a biased manner and whose subjects can be combined according to the diagnosis internal conducted by the organization through quality control processes in the investigations and/or deficiencies identified through various methods such as assessments, interviews with investigators etc.

These recurrent courses are held every 2 years calendars and workload should not exceed 50% over the basic accident investigation course. The same may be performed in a time period of 30 days, adjusting the number of hours weekly according to the activities and staff of investigators.

Chapter 4

ACCIDENT INVESTIGATION – COURSE GUIDELINES

4.1 INITIAL AIRCRAFT ACCIDENT INVESTIGATION COURSE

4.1.1 Goals:

- a) Knowing the INITIAL concepts of the methodology established by the Accident Investigation Board for the civil aviation accident and incident investigations, in accordance with the standards of the Annexes to the Convention of Civil Aviation related.
- b) Knowing the initial procedures to conduct an investigation in such a way that the student can start the OJT in the field investigation (being part of a FIELD INVESTIGATION TEAM – ETIC).
- c) Identifying and using the sources to be able to obtain updated information coming from the different areas of knowledge that an accident investigation can be related with in such a way that the student can be part of interdisciplinary work teams with experienced supervision in aircraft accident and incident investigation.

4.1.2 Requirements:

- a) Having a degree in a discipline that can be related to aircraft accident/incident investigation, or demonstrable training and experience equal to aircraft operations or maintenance, air traffic management and/or related collateral disciplines.

4.1.3 Scope:

- a) For the candidates for aircraft accident investigator in AIG organizations, they shall have reached the minimum level of knowledge compatible with the requirements necessary to initiate the OJT phase with the aim of obtaining the specific knowledge to be able to conduct the tasks related to the participation as assistant to the accident investigator in the conduction of a field investigation.

Certification of course approved: Assistant in investigation.

- b) For the candidates that take the course in assistant in investigation with the intention of increasing their knowledge of safety, this course allows them to obtain appropriate information to understand the theoretical grounds that guide the conduction of the investigations with the intervention of the aeronautical authority of the State responsible of the conduction of the accident investigation (AIE) in accordance with the Convention of Chicago and its Annexes.

Certification of in-class course: Assistant in investigation

4.1.4 Methodoly:

4.1.5 The methodological concept of the course shall be the theoretical-practical integration and the use and knowledge of the documentation that has been introduced. The course shall be developed in classes with presentations with studies of cases, debates, role playing game, etc. Reflection and transference shall be promoted through team work. An interdisciplinary focus shall be applied in the course according to the proposed objective.

4.1.6 Assessment:

- a) Throughout the course, teachers shall be committed to make a continuous assessment of the knowledge learned by the students, which can be occasional and/or systemic.
- b) *Occasional* shall be the assessment made through the observation of all the actions the students take; *systemic*, is the one that shall be complemented in the planning of the course with learning verification tests in the process, that shall be made through integrating workshops with trouble-shooting and a multiple-choice questionnaire or other types.

4.1.7 Subjects

4.1.7.1 The initial aircraft accident investigation course must cover at least the following subjects:

Initial aircraft accident investigation course	
Subjects	
ADMINISTRATIVE ARRANGEMENTS	
a) Legislation applicable to the State	
b) Annex 13 – Annex 19	
c) International agreements	
d) Liaison arrangements with local and national authorities	
e) Structure of the AIG Authority	
f) Aircraft accident and incident investigation manual, policies and procedures	
g) Definitions and accident and incident classification	
h) Equipment and tools	
i) Transport arrangements	
j) Ethics and conduct	
INVESTIGATION PROCEDURES	
k) On-call procedures (on-call investigator)	
l) Securing of recordings and samples	
m) Accident site jurisdiction and security	
n) Investigator safety including psychological stress	
o) Cooperation in recovery of human remains	
p) Requests for autopsies	
q) Family assistance	
r) Authority and responsibility	
s) Size and scope of the investigation	
t) Investigation management	
u) Use of specialists	
v) Parties to the investigation, accredited representatives, advisers and observers	
w) Release of information to the news media	
x) SMS applied to the investigation - SSP	

4.1.8 Goals

- a) Department of administrative arrangements

As the development of the subjects ends, the student shall have understood the general context of the requirements of the system in such a way that he/she can initiate the OJT integrating an ETIC in a field investigation as assistant with the supervision of an expert investigator.

- b) Department of investigation procedures

As the development of the subjects ends, the student shall have known and been able to use the common documents available to contribute to the investigation in his/her specific area of expertise, with the supervision of an expert investigator at the moment of initiating the OJT integrating an ETIC in a field investigation.

4.2 BASIC AIRCRAFT ACCIDENT INVESTIGATION COURSE

4.2.1 Goals:

- a) Knowing the basic methodology and procedures to conduct the technical investigation of the occurrences in accordance with the AIG State regulations in compliance with ICAO Annex 13.
- b) Identifying the different sources where information can be obtained from and the relation between them according to the area of knowledge they belong, adapting them to integrate interdisciplinary work team.
- c) Giving the investigation staff the appropriate tools to be able to make a logical analysis of the facts and proofs with the aim of reaching demonstrable conclusions.

4.2.2 Requirements:

- a) The course aims at expert pilots, aeronautical engineers and expert aircraft maintenance engineers that have completed the initial investigation course and the OJT as assistants in the technical investigation of occurrences in the civil aviation field, with the aim of being able to effectively relate with other disciplines applying the knowledge of their area of expertise in the investigation process.
- b) However, other professionals with a degree (doctors, engineers, lawyers, etc.) that have planned to work in safety can consider their participation necessary to have general knowledge of the basic procedures in an aircraft accident/incident technical investigation with the aim of facilitating and guiding their participation.

4.2.3 Scope:

- a) For the assistants in aircraft accident investigation in AIG organizations that have reached the minimum level of knowledge compatible with the requirements needed, once the OJT is completed, with the aim of obtaining and completing the specific knowledge to be able to conduct the tasks related to the participation as aircraft accident investigator in an investigation process.

Certification of course approved: Aircraft accident investigator.

4.2.4 Methodology:

- a) The methodological concept of the course shall be the theoretical-practical integration and the use and knowledge of the documentation that has been introduced. The course shall be developed in classes with presentations with studies of cases, debates, role playing game, etc. Reflection and transference shall be promoted through team work. An interdisciplinary focus shall be applied in the course according to the proposed objective.

4.2.5 Assessment:

- a) Throughout the course, teachers shall be committed to make a continuous assessment of the knowledge learned by the students, which can be occasional and/or systemic.
- b) *Occasional* shall be the assessment made through the observation of all the actions the

students take; *systemic*, is the one that shall be complemented in the planning of the course with learning verification tests in the process, that shall be made through integrating workshops with trouble-shooting and a multiple-choice questionnaire or other types.

4.2.6 Subjects

4.2.7 The basic aircraft accident investigation course shall cover at least the following subjects:

Basic aircraft accident investigation course	
Subjects	
a) Responsibilities of the States involved	
b) Accident notification procedures	
c) Investigation management	
d) Investigators' equipment	
e) Accident site safety	
f) Protection of evidence	
g) Initial action at the accident site	
h) Information gathering techniques	
i) Communication and recording media	
j) Witness interviews	
k) Flight recorders (FDR, CVR) and ATC recordings	
l) Applied airworthiness	
m) Fires and explosions	
n) Survival aspects	
o) Structures	
p) Systems	
q) Aerodynamycs	
r) Power plants	
s) Rotary-wing aircraft	
t) Organizational and human factors (FHOs)	
Aeronautical medicine and pathology	
u) Methods of analysing the factual information gathered	
v) Report writing	
w) ECCAIRS/ADREP notification system	
x) The news media and public relations	

4.2.6.1 Detailed breakdown of the topics that must be covered

- a) Responsibilities of the States involved: The first phase of a course should introduce the investigator to the history of aircraft accident investigation, the development of the international agreements on the conduct of investigations, and the Standards and Recommended Practices (SARPs) adopted by ICAO and its Contracting States in the field of aircraft accident investigation. The applicable international agreements and SARPs are contained in Annex 13 — Aircraft Accident and Incident Investigation to the Convention on International Civil Aviation. Relevant guidance material is provided in the Manual of Aircraft Accident Investigation (Doc 6920) and Manual of Aircraft Accident and Incident Investigation (Doc 9756). A review of these documents and their salient points is required so that the investigator knows where to find the information on the relevant topics. General guidance should also be given on the investigation of accidents involving unlawful interference, both civil and military aircraft or facilities, and inaccessible aircraft.
- b) Accident notification procedures: The investigator should be introduced to the accident

notification systems and the appropriate responses to be expected from the AIG Authority and organizations that are notified. This introduction should cover the ways on how the notification of the occurrence of an accident initiates the process of an investigation. It should also cover the support to be provided to the AIG Authority in the State of Occurrence by the State of Registry, the State of the Operator, the State of Design, the State of Manufacture, and any other States that are involved by virtue of the number of their nationals involved in the accident or are involved by providing a permanent base for the investigation due to their proximity to an accident site. Accident investigators should be made aware of the requirements of Annex 13 in relation to this phase of an investigation. Preparation for overseas travel in the form of passports and visas and airport airside passes provided by the international agreements inherent in Annex 9 — Facilitation.

- c) Investigation management: The introduction should cover the role of the investigator, the skills he will need to acquire, and the accident investigation process. He should be made aware of the value of assessing the availability of resources (such as funding, personnel, equipment and buildings) as well as the planning for the investigation of a major accident beforehand. He should give guidelines for determining the appropriate size and scope of an investigation, the differences between the management of large and small investigations, and the type of circumstances in which assistance from specialists will contribute to the success of the investigation. An appreciation of the realities of the limits imposed by the resources available and the optimum use of those resources should be discussed. The value of memoranda of understanding with departments and organizations that might be involved in an investigation should also be addressed.
- d) Investigators' equipment: The equipment to be used during investigations will be determined not only by availability and cost but also by the means available to transport it to the site. Information on the use of contemporary aids such as global positioning systems (GPS), satellite telephones, and data links back to base, as well as on the use of basic items such as compasses and inclinometers should be made available. Means of recording in extreme wet or cold conditions should not be overlooked. Instruction on the proper method of taking samples of aircraft fluids and the appropriate containers should also be included.
- e) Accident site safety: The safety of personnel at an aircraft accident site is of paramount importance and must be understood by participants of an investigation. An investigator is a valuable resource and it is important that he is protected and well equipped to do his work in the field with as little risk as is practicable and with the optimum efficiency. Aircraft accidents frequently occur in adverse weather conditions in areas of inhospitable terrain such as mountainsides, swamps and deserts, or in adverse climatological conditions involving snow and ice or fierce heat. The need to take appropriate measures to protect those on the site against exposure to the elements, to any hazardous cargo or dangerous materials released from the aircraft, and against injury or infection must be understood. There are medical risks and hazards from the aircraft wreckage itself and they must be explained to the investigators. Another subject that must be covered is how to deal with psychological stress of investigators and other personnel with exposure at an accident site. Disease is an ever-present risk and inoculations against such risks as hepatitis, malaria and tetanus are essential. The use of protective equipment against airborne and blood borne pathogens should be demonstrated. Utilities such as gas mains, electricity transmission lines and main transport routes require special consideration. Finally, a plan for aid and rescue in the event of an accident involving personnel at the site is required by many occupational health and safety organizations and is also dictated by common sense.
- f) Protection of evidence: To establish a suitable environment for a competent examination of the area and the accident debris, measures should be taken to protect the wreckage

from fires, meteorological hazards and souveniring. The need to give priority to recording transient evidence, securing light objects that may be lost in the wind, and recording ground scars and other site markings that may become obliterated should be addressed. The conduct of interviews with the rescue personnel should also be discussed in order to facilitate the determination of the movement of items of wreckage, which they may have caused inadvertently.

- g) Initial action at the accident site: The investigator should be given a thorough understanding of the numerous considerations that should be taken into account at the accident site. With some exceptions such as accidents involving missing aircraft or resulting in wreckage that is inaccessible, the accident site is the primary area of investigation. The methods of apportioning time effectively, prioritizing the types of information to be gathered, plotting the position of surface marks, and identifying and plotting the position of items of wreckage, as well as the preparation for the removal of any exhibits to a secure site are important considerations that the investigator should become familiar with from the outset.
- h) Information gathering techniques: The investigator under training should be introduced to the methods of gathering and reviewing relevant documentation and procedures; the interview techniques used for different types of witnesses; the transcription of air traffic services and other recordings; and the review of aerodrome facilities, emergency services responses and meteorological data.
- i) Communication and recording media: The various media available for communicating to and from an accident site and for recording the evidence at the accident site and throughout the investigation are essential elements of an investigation course. Digital video cameras and digital cameras, standard film photography, laptops and hand-held computers with connections via satellite telephones to sources of information of immediate use at the accident site, and tape recorders are all useful for recording the available information as accurately and rapidly as is practicable. As each type of equipment is evolving rapidly, it is an essential subject in the training of an investigator.
- j) Witness interviews: The range of witnesses varies with physical condition, nature of involvement, and differences in ethnic backgrounds. They will also vary in their value based on their understanding of the required information and their proximity to the scene. They may be a visual witness who saw an event or an aural witness who heard a sound or relevant conversation. The preparation for interviews, information to be gleaned from body language, the relative positioning of the interviewer and interviewee, preparation of the questions to be asked, the use of open questions, the art of listening and general conduct of the interview, the use of recorders such as video cameras and tape recorders, the value of written statements and signed transcripts must be considered. The precautions to be taken when interviewing the injured or persons in ill health, the young, the aged, and hostile witnesses as well as the use of experts in the field of inquiry should be discussed.
- k) Flight recorders (FDR, CVR) and ATS recordings: In addition to the flight recorders, there are many other forms of recorders used in the aviation industry, from the security cameras on the aerodrome perimeter fence to the maintenance recorders in the aircraft, each with potential use to an investigator. The value of each form of recorder, the methods of interpreting and downloading the information, and the sources of readout must be in the course syllabus. Equally, the value of manufacturer's expertise in recovering information from damaged recorders (such as global positioning receivers, solid-state flight recorders and inertial navigation unit components) should be explored. Another aspect of importance is the means of locating the flight recorders and recovering them from locations that are difficult to reach. Recorders at air traffic services facilities, particularly those that record radar returns, should be the subject of a separate study and

guidance regarding their potential use to an investigation.

- l) Applicable airworthiness: The maintenance history of the aircraft is established primarily from the records held by the operator. However, the investigator must learn to establish whether the maintenance, inspection procedures and servicing that are recorded as having been completed have in fact been carried out, and he must also learn to determine the adequacy of the specified maintenance procedures.
- m) Fires and explosions: The evidence available to distinguish an in-flight fire or explosion from post-accident fires forms a valuable lesson that must be passed on to the new investigator. The means of determining the ignition source and the fuel supply of a fire are important. It is necessary to teach about the effectiveness of firefighting measures available on board the aircraft and the means for preventing post-accident fires during an investigation.
- n) Survival aspects: The chances of occupants surviving an accident can be assessed and the means to do so should be given to the accident investigator. The investigator should know the formulae for impact force calculations and the various forms of attenuating impact forces. A discussion on the limits of human tolerance to heat and impact forces is worthwhile, as are the effects of toxic by-products of the accident environment. The efficiency of the rescue and firefighting services, standard pre-flight passenger briefing spiels, restraint systems, seat anchorages and aids to egress from the aircraft are items that should be studied under this heading. It is also very important to review the factors that affect the occupants' chances of surviving the accident. The means of determining the after effects of a fire on the occupants and the fire's impediment to passenger evacuation must be discussed, as must the availability of such items as smoke hoods and smoke goggles. An understanding of the methods used to protect the aircraft occupants from the impact forces and post-impact effects (such as thermal stress and water immersion) is very important for the accident investigator. He must be able to assess the effectiveness of the methods and make recommendations which will provide better protection for the occupants in the future.
- o) Structures: As the basis for the examination of the wreckage, the study of structures is an area of prime interest to the investigator. The study of structures should comprise metallurgy, fibre reinforced plastics and timber structures, stress analysis and the strength of these materials. It should also include the various modes of failure and the characteristics of such failures in the materials used in aircraft structures. The methods of failure analysis, reconstruction of areas of interest in the airframe, and the evidence of the various modes of failure are important considerations. The various types of flight controls and landing gear structures should also be studied under this heading. This section of the syllabus should cover the advanced equipment used in the study of failure mechanisms, the preparation of samples for examination by such equipment, and the methods for comparative testing of similar materials. The study of structures also provides a platform for introducing the means of wreckage trajectory analysis. Every effort should be made to provide examples of the various failure modes in materials used in aircraft construction.
- p) Systems: Aircraft systems vary from mechanical controls that are still found in general aviation aircraft to the fly-by-wire systems already extant in wide-bodied transport aircraft. There are a wide variety of systems that the investigator should become familiar with in general terms. However, the focus should be on the resources available to assist the investigator in the event of an accident involving a complex system and on common causes of system failure that might be experienced. A lead to system health can often be found in past maintenance records or on-board recorders. It is necessary to discuss, in general terms, fuel, hydraulic, pneumatic, electrical, pressurization, flight control, instruments, navigation, autopilot and instrument systems. Other topics that should be

considered include software failures in airborne computers and the adequacy of the protection against catastrophic events ensuing from such failures.

- q) Aerodynamics: The common areas of aerodynamics that frequently assume importance in an investigation are those related to performance and in-flight structural failure caused by overload or flutter. A review of basic aerodynamics and the means of detecting failure from aerodynamic factors should be included in the investigator's basic training. The topics of engine failure recognition speed, V1 and V2, climb gradient, over-speed, engine-out performance, icing and stability also deserve special attention.
- r) Power plants: The detailed analysis of power plants is normally the subject of a separate course and is usually carried out in conjunction with the engine manufacturer's representatives. Nevertheless, the explanation of the basic principles of reciprocating and turbine engines has a place in basic and advanced investigation courses. The same is true with regards to the analysis of damage to propellers and helicopter rotors, and a general overview of methods of evaluating damage to determine if further investigation of the particular propeller or engine is warranted. For example, propellers and turbines can give a worthwhile indication of an absence of engine power at the time of impact. This is another subject in which examples of failures and accident damage form an essential part of the course.
- s) Rotary wing aircraft: A general introduction to the principles of flight for helicopters and their control systems is relevant. However the subject of investigating helicopter and other rotary wing aircraft accidents is usually the subject of a separate speciality course.
- t) Organizational and human factors:

Organizational and management information is a section of the final report format and it concerns the organizations and the management involved in influencing the operation of the aircraft. The organizations include, for example, the operator; the air traffic services, airway, aerodrome and weather service agencies; and the regulatory authority. Conducting a review of the organizational structure and functions as well as the management policies and practices of the agencies, authorities and aircraft operator involved is a subject that should be covered. For example, an investigator should have the competence to review an aircraft operator's management functions, policies and practices in their entirety. There are many aspects of the supervisory process which may have a direct bearing on the accident, such as acceptance of inadequate flight crew qualifications; deficient guidance material; maintenance shortcuts; improper crew rostering; failure to provide proper training in aircraft type; shortcomings in crew resource management; and unreasonable pressure to complete schedules on time. The methods of investigating management and organizational aspects of an organization to determine the presence of any risk factors or other shortcomings is a requirement of a well-rounded accident investigation course. An examination of the means of supervision is very important and will include a review of orders, regulations, manuals and independent audits as well as the performance of supervisors, instructors and company management.

- (i) No accident investigation can be complete without a thorough consideration of Human Factors issues involved. The demands of the environment and the aircraft on the human often approach the physiological and psychological limits of the flight crew, maintenance and servicing crews, air traffic services personnel and other personnel required to support aircraft operations. The study of human limitations, communications, fatigue, decision-making processes, flight crew health and the information available from post-mortem examinations are vital components of this section of an investigation course. An examination of the handling of the aircraft will encompass the areas of operations and training.

- (ii) The area of operations includes the man-machine relationship and the actions or lack of actions in the events leading to the accident. The investigation in this area covers specifically how the flight crew members reacted, analysed and attempted to cope with the complexities of the flight.
- (iii) The area of training will cover the extent and adequacy of the training relevant to the accident flight. The Manual of Civil Aviation Medicine (Doc 8984), the Human Factors Training Manual (Doc 9683), the Human Factors Guidelines for Air Traffic Management (ATM) Systems (Doc 9758) and the Human Factors Guidelines for Safety Audits Manual (Doc 9806) are references which can be used in this section of the training.
- (iv) Determination of the flight crew's suitability for the flight. The flight crew members are required to meet certain licensing, training and experience requirements before conducting any flight. In addition, they must be fit for their duty and the complement of the crew must be appropriate. Familiarity with the flight crew documentation and requirements is essential. Fitness of the flight crew for the flight can be considered as part of several Human Factor considerations and should be explained in detail.
- u) Methods of analysing for the factual information gathered.
There are several structured procedures for analysing the evidence and facts determined during the investigation. Knowledge of these procedures will enable the investigator to establish whether further investigation is required in order to complete the investigation or to test any hypotheses that the investigation team is considering.
- v) Report writing.
Report writing is an integral responsibility of an accident investigator. ICAO has developed a format for writing reports that leads logically from the history of the flight to the safety recommendations. There is a minimum of duplication and a full consideration of aspects of the flight that are relevant to the improvement of safety. Knowledge of this format and process gives the investigator a sound basis for drafting the final report, including the formulation of appropriate safety recommendations.
- w) ECCAIRS/ADREP notification system
Introduction to the ECCAIRS reporting system under the ADREP taxonomy, so that each investigator will use this tool to upload the details of the investigation being conducted in the ECCAIRS system, using the ADREP taxonomy.
- x) The news media and public relations.
Almost any aircraft accident is of interest to the news media and will to some extent involve the investigator-in-charge in public relations activities. There are two aspects to this subject: the information made available to the public, and the more specialized approach to the survivors and the families of those involved in an accident. The importance of keeping others informed on the progress of an investigation, while not speculating as to causes and protecting the privacy of those who assist with sensitive information, must be explained to investigators. The Guidance on Assistance to Aircraft Accident Victims and their Families (Cir 285) is a sound basis for addressing this subject.

4.3 **ADVANCED COURSES**

4.3.1 Recommended topics

Most topics covered in the basic course will also apply to advanced courses, but the instructors are expected to vary their treatment of these topics to suit the purpose of the course and the experience level of the students. In addition to the review of the topics in the basic course, an advanced course should cover the topics deeply and expand on them. In general, an advanced course is desirable for preparing an investigator for the responsibilities of group leader or investigator-in-charge of a major investigation. Such a course should aim to give the investigator an understanding of and some competence in the organization of a major accident investigation.

4.3.2 In addition to the review of the organization of a major investigation, topics that should be discussed include:

- a) the provision of family assistance to those involved in an accident;
- b) relations with the media;
- c) an introduction to methods for cataloguing a large number of fragments of wreckage;
- d) management of a large accident site for security, safety and protection of the personnel;
- e) preparation of briefings and answers to formal questions for members of government;
- f) the methods of undertaking investigations that involve both civil and military aircraft, and
- g) liaison with the law enforcement authorities in accidents involving unlawful interference.

4.3.3 Other specific subjects which should be included in advanced courses include:

- a) techniques used to investigate accident damaged systems that involve specialized technologies such as glass cockpit, fly-by-wire systems, GPS, and enhanced ground proximity warning systems (EGPWS);
- b) reconstruction of evidence recorded in damaged solid state recorders;
- c) the use of virtual video presentations in large structural reconstructions of wreckage,
- d) the use of computer simulations and programmes for flight simulators to recreate aspects of the aircraft's flight path which are of interest to the investigation.

4.4 **SPECIALITY COURSES**

4.4.1 Specialty courses may be introduced to an investigator at any stage after a basic course. The courses would augment the skills and knowledge acquired by the inspector in order to meet the needs of a particular area of accident investigation that is relevant to his assigned duties.

4.4.2 For topics such as helicopter accident investigation, gas turbine engine accident investigation, accident survival aspects, fires and explosions, Human Factor investigation, family assistance and media relations, they are generally extensive enough to warrant a short course of their own with a specialized syllabus.

4.4.3 Description of the systems involving specialized technologies (such as glass cockpit, fly-by-wire systems, GPS, electronic flight instrument system (EFIS) and EGPWS) is usually provided

during aircraft type courses. However, aircraft type courses do not include the investigation aspects nor the investigation techniques of such complex systems. Extensive information can be obtained from memory chips and other solid state electronic circuits used in new technology systems. Increasingly, the investigation techniques for solid state electronic circuits are covered in accident investigation courses. Nevertheless, aircraft accident investigation authorities should contact the manufacturers of such systems for specialty courses, since most manufacturers have accident investigators and support personnel that are familiar with the systems and the investigation techniques required to extract the information stored in the systems.

4.4.4 Learning the use of ECCAIRS / ADREP system tool is important to the investigator, as this is an essential tool for reporting events and feed the AIG organization database, the integration with other databases and ARCM the database.

4.5 PERIODIC ACCIDENT INVESTIGATION COURSE

4.5.1 Goals:

- a) Emphasize the methodology and procedures for the technical investigation of occurrences related to AIG regulation States, in accordance with the provisions of ICAO Annex 13 and the new procedures or guidelines issued by the organization.
- b) Enhance and update the various sources from which information can be obtained and the interrelationship between them according to the area of knowledge that is engaged in investigation, adapting to integrate interdisciplinary teams.
- c) Enhance and update the team of investigators on the proper investigation tools so they can make a logical analysis of the facts and evidence in order that they arrive at verifiable conclusions.

4.5.2 Requirements:

- a) The course is aimed at staff of investigators who have completed the initial and basic training as investigators of accidents and incidents and who are working in jobs as investigators at AIG organization.

4.5.3 Scope:

- a) Review and update the concepts and knowledge acquired during the training, initial and basic, accident investigator.

Certification of course approved: periodic accident investigation course

4.5.4 Methodology:

- a) The course of the methodological approach will be theoretical and practical integration and the use and knowledge of existing documentation, with updates that were made. The same applies to the classes that combine exhibitions, case studies, debates, etc. Promote reflection and the transfer of knowledge through group work. An interdisciplinary approach will be applied throughout the course due to the proposed objective.

4.5.5 Assessment:

- a) The evaluation of the course is directed in the sense that each investigator applies their knowledge in an accident investigation that is performing.
- b) They will be evaluated in written form and the methodology of multiple choice matters relating to

AIG documents that have been updated as well as the procedures relating to the functioning of the state organism forming modified.

4.5.5 Subjects

4.5.5.1 The periodic accident investigation course should cover in combination some of the following topics. The subjects that were treated in a periodic course should not be treated again in another periodic course. The themes of the courses should be rotated so that all are covered regularly.

The periodic accident investigation course	
Subject	
Emphasize and/or to update	
a) Responsibilities of States involved	
b) Notification procedures	
c) Management of investigations	
d) Team of investigator	
e) Security at the site of the accident	
f) Protection of evidence	
g) Initial steps in the crash	
h) Information gathering techniques	
i) Communication and recording media	
j) Witness interviews	
k) Flight recorders (FDR, CVR) and ATS recordings	
l) Airworthiness applied	
m) Fires and explosions	
n) Survival	
o) Structures	
p) Systems	
q) Aerodynamics	
r) Power plants	
s) Wing aircraft rotatory	
t) Human and organizational factors (HOFs)	
u) Aviation Medicine and Pathology	
v) Methods of analysis of the information collected on the facts	
w) Writing reports	
x) Media and public relations	

4.5.5.2 Detailed breakdown of topics should refer to Point 4.2.6.2 and should take into account the topics in the subjects to be taught can be partial according to the diagnosis made by the organization and must be strengthened and / or updated.

Attachment A

TRAINING CENTRES IN THE SAM REGION RELATED TO AIR ACCIDENTS INVESTIGATION

1. Worldwide there are state and private organizations that offer multiple alternatives for accidents investigation training. They provide not only basic training, but also they currently have academic programmes created to specialize the different aviation fields regarding investigation.
2. Argentina: Civil Aviation Accident Investigation Board (JIAAC):
 - ✓ Initial course: Aviation accidents investigation
 - ✓ Basic course: Aviation accidents investigation
 - ✓ Special course: Helicopter accidents investigation
3. Brazil: Aeronautical Accidents Investigation and Prevention Centre (CENIPA). CENIPA available courses are described in attachment B.
4. Colombia: The Aeronautical Studies Centre (CEA):
 - ✓ Basic course: Aviation accidents investigation
5. The use of these training centres in an atmosphere of cooperation among the ARCM member States of the SAM Region might facilitate the exchange of knowledge, experiences and different qualified trainers in the area, with the view to improve the level of initial investigators training and regular training for more experienced investigators.

Attachment B**TRAINING OF ARCM AIG PERSONNEL**

1. Worldwide there are state and private organizations that offer multiple alternatives for accidents investigation training. They provide not only basic training, but also they currently have academic programmes created to specialize the different aviation fields regarding investigation.
2. All the training centres aligned with the provisions established in ICAO Circular No 298 AN/172, in relation to the aviation accidents investigators instruction guidelines, could offer an adequate training to the investigator from the ARCM member States.
3. In South America, the ARCM member States could, with training purposes, have training centres from the following AIG Authorities from the Region: the Civil Aviation Accident Investigation Board (JIAAC) of Argentina; Aeronautical Accidents Investigation and Prevention Centre (CENIPA) from Brazil; and Aeronautical Studies Centre (CEA) from Colombia, which, through the AIG regional cooperation mechanism (ARCM), will be able to offer training courses harmonized in line with this programme and according to SAM State's needs.
4. CENIPA has the following courses:

Basic Aeronautical Accidents Prevention Course (CBPAA).

The course is oriented to the training of professionals to act as assistants in the aeronautical accidents prevention. CBPAA is conducted in the distance learning modality, and it is compulsory in order to sign in for some of the other AIG courses in CENIPA.

Aeronautical Accidents Investigation Course (CIAA).

The course is oriented to the training of professionals to act in the activities of aeronautical occurrences investigation.

Aeronautical Accidents Prevention Course – Human Factors (CPAA-FH).

The course is oriented to the training of professionals to act in the activities of prevention and investigation of aeronautical occurrences related to the medical aspect of the human factor or psychological aspect of the human factor in the AIG topic.

Aeronautical Accidents Prevention Course – Material Factors (CPAA-FM).

The course is oriented to the training of professionals to act in the activities of prevention and investigation of aeronautical occurrences related to the material factor that follow: investigation of issues related to the aircraft project, material handling and manufacture, backing for holding the components tests and trials, in the testing workshop or laboratory, with the objective of investigating the origin of the problem; the conduction of investigations of similar occurrences with the manufacturer and the certification authorities; evaluation of the certification process, manufacture and operation of the aircraft or the components involved.

Aeronautical Accidents Prevention Course – Aircraft Maintenance (CPAA-MA).

The course is oriented to the training of professionals to act in the activities of prevention and investigation of aeronautical occurrences related to aircraft maintenance in the IAG headings detailed as follows: conduction of detailed examinations of all systems and components, among others, the

hydraulic, electrics and electronic pneumatics systems, radio communication and navigation equipment, air conditioning and pressurisation, ice and rain protection, fire extinguishers and oxygen in the cockpit, the examinations shall cover the determination of the components condition and operational capacity; and record keeping verification to determine the aircraft maintenance history with respect to the inspection adequacy, malfunctioning that might be related to the occurrence, flying time of the aircraft, engines and components and the flying time from the equipment's checking or refurbishing.

Aeronautical Accidents Prevention Course – Airspace Control.

The course is oriented to the training of professionals to act in the prevention of occurrences related to air traffic control.

Aeronautical Accidents Prevention Course – Airport Activities.

The course is oriented to the training of professionals to act in the prevention of occurrences related to airport activities.

Advanced Aeronautical Accidents Prevention Course (CAIAA).

The course is oriented to the training of investigators to act in the investigation activities of a major accident of great complexity and/or with other States participation.

Aeronautical Accidents Prevention Course – Spanish Language (CPAA-LE).

The course is oriented to the training of foreigner, spanish-speaking, professionals in knowledge necessary for them to act in the prevention of aeronautical occurrences.

Aeronautical Accidents Prevention Course – Aero Agricultural (CPAA-AG).

The course is oriented to the training of professionals to act in the prevention of occurrences related to aero agricultural activities.

Safety Management Course – SGSO

The course is oriented to the training of professionals to act in the activities related to the management functional responsibilities in relation to safety with respect to process compliance to identify the real or potential dangers to safety and to evaluate the risks, the processes to define and apply the mitigation methods required to keep an acceptable safety level, and provisions to continually observe and regularly evaluate the adequacy and effectiveness of safety management activities.

Flight Recorders Basic Course – CBGRAV.

The course is oriented to the training of aeronautical accidents investigators in flight recorders, covering topics related to operability, investigation practical proceedings and requirements, with the aim of enabling the collection and analysis of recorded data.

Aeronautical Accidents Prevention Course – CPAA.

The course is oriented to the training of professionals to act in aeronautical accidents and incidents prevention.

The investigator's training in CENIPA, in order for it to act in the investigation, shall be conducted through the OJT and a specific programme provided by the training centre, divided in a specialized and an advanced stage.

Attachment C

Individual Development Plan Form

AIG Authority (ARCM) – Aircraft accident investigator

Name of the investigator			
Post (OPS/AIR/ATC/etc.):			
Degree or position:			
Name of supervisor:			
Knowledge, expertise and experience	Name of course	Course or training date	Observations
Initial response procedures			
On-Call procedures			
Notification of other national authorities and organizations			
Securing of records and recordings.			
Accident site jurisdiction and security			
Investigator safety – equipment and guidelines on biological hazards			
Investigator safety – including familiarization with psychological stress			
Coordination for recovery of human remains			
Requests for autopsies			
Family assistance			
Investigation procedures			

Authority and responsibility			
Size and scope of the investigation			
Investigation management (group leader and IIC) in the scene			
Use of specialists			
Parties to the investigation, accredited representatives, advisers and observers			
Release of information to the news media			
Specialists procedures (operations, airworthiness, human factors, etc.)			
Reporting			
Internal and external correspondence			
Field notes and factual report specialist			
Report and analysis specialist			
Safety recommendations			
Final reports			
Attendance at seminars and meetings			
International Society of Air Safety Investigators (ISASI)			
Flight Safety Foundation (FSF)			
Seminars related to technical specialists			

ICAO work groups			
Regional work groups			
Others			
Specialty basic or advanced courses attendance and certificates – After recruitment			
Name of course or institution	Dates	Observations (Certificates, etc.)	
Periodic training			
Name of course or institution	Dates	Observations (Certificates, etc.)	

Practical training at the workstation (OJT) (two cases minimum)			
Accidents identification	Dates	Observations	
OJT – domestic accident			
OJT – domestic accident			
Participation as an observer (OJT) at investigations conducted by other States			
Accidents identification	Dates	Observations	

BIBLIOGRAPHY

1. Annex 13, OACI – Aircraft Accident and Incident Investigation
2. Doc 9756, OACI – Manual of Aircraft Accident and Incident Investigation
3. Doc 9683, OACI – Human Factors Training Manual (Doc 9683)
4. Cir 298, OACI - Training Guidelines for Aircraft Accident Investigators
5. States Regulations