
SOUTH AMERICAN AIG REGIONAL COOPERATION MECHANISM (ARCM)

FIFTH AIG AUTHORITIES MEETING
(Medellín, Colombia, 03 to 05 October 2018)

Agenda item 7: Study and analysis of the regulatory and operational framework, and of the recommendations drawn from investigations of accidents or incidents during agricultural aviation flights occurred in the SAM region (ARCM States)

(Working paper presented by the AIG - GRIAA, Colombia)

Summary

This Working Paper, to be presented in the Fifth AIG South American Authorities Meeting (AIGSAM/5), shall show the partial results of the analysis conducted on the accident rate in agricultural aviation in the SAM region from the year 2015 to 2017. Further, it will provide an overview of the state of the Regulation of each State in relation to agricultural aviation activities. A proposal for a mitigation plan will be presented that will allow the South American States to address the deficiencies in the agricultural aviation sector.

References

- Annex 13 – Aircraft accident and incident investigation.
- ECCAIRS database of agricultural aviation accidents and serious incidents in the SAM region from the years 2015, 2016 and 2017
- Aeronautical Regulation of the SAM States
- Working Paper AIG-SAM/RE of November 2nd, 2016
- Survey of Australian Agricultural Aviation Accidents – Information Paper – Bureau of Air Safety Investigations - BASI - SAB/IP97/01
- Aerial Application Safety 2015 – 2016, ATSB – AS-2016-022
- Special Investigation Report on the Safety of Agricultural Aircraft Operations, NTSB 2014, NTSB/SIR-14/01
- Commercial Aviation Safety Team/ICAO Common Taxonomy Team CICTT, CAST/OACI, 2013 edition

1 Introduction

The South American AIG regional cooperation mechanism (ARCM) was established with the purpose of supporting the States in aspects associated with aviation accidents and incidents investigation in an environment of regional cooperation.

In the different meetings that the ARCM has had, several concerns have been identified in some aviation activities that present an increase in the accident rate and that maintain common causal factors between the States of the Region and worldwide. Some Working Papers developed by the States have allowed different action plans to be addressed in different topics related to accident rate in the SAM Region, such as the Working Paper issued on August 14, 2017, TASK AIG-SAM/5-01 in which Runway Excursions (RE) in the SAM Region were addressed.

The final objective will be to find strategic solutions to the causal factors that have been identified in accidents related to agricultural aviation in the SAM Region and to propose mitigation measures that are extensive worldwide.

2 Background

2.1 Accidents and serious incidents in Agricultural Aviation

With the aim of collecting information related to the agricultural aviation occurrences and the applicable regulation, a direct request was made to the AIG Authorities in order to quantify the occurrences (Accidents and serious incidents) of agricultural aircraft and to conduct a regulatory census applicable to this type of aviation in the States of the SAM Region.

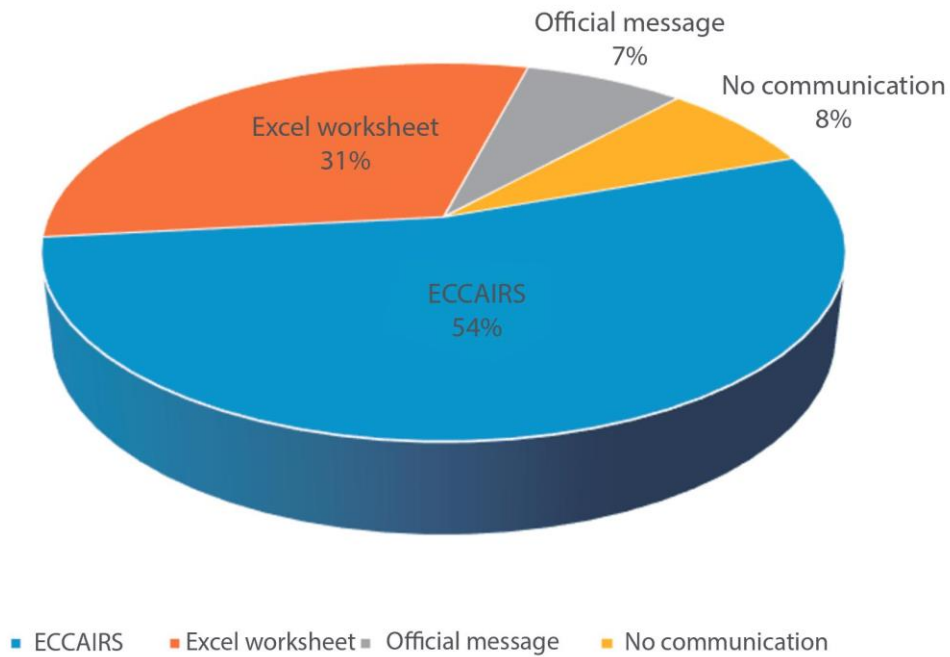
The reception of the information would provide material to develop the following requirements of the WP:

1. Number of occurrences in the SAM region related to agricultural aviation.
2. Identification of common problems related to this activity in the SAM region.
3. Survey on the regulatory framework of each SAM State related to agricultural aviation.
4. Analysis of the most important recommendations, of regional applicability, issued by each AIG organization during the last 3 years. Recommendation proposal at the regional level for the ARCM.
5. Analysis of the regulatory framework at the State and regional levels (LAR), and verifying whether a modification through the ARCM is appropriate.

After the virtual meeting held on June 25, 2018, a direct contact was made with the AIG Authorities to request information on the number of Accidents and Serious Incidents, the preliminary taxonomy of occurrence, basic regulations and the investigations completed, the relevant recommendations developed in agricultural aviation in the years 2015 and 2017. Gradually, the States of the Region sent the requirements to the Colombian AIG Authority that was responsible for the development of the WP.

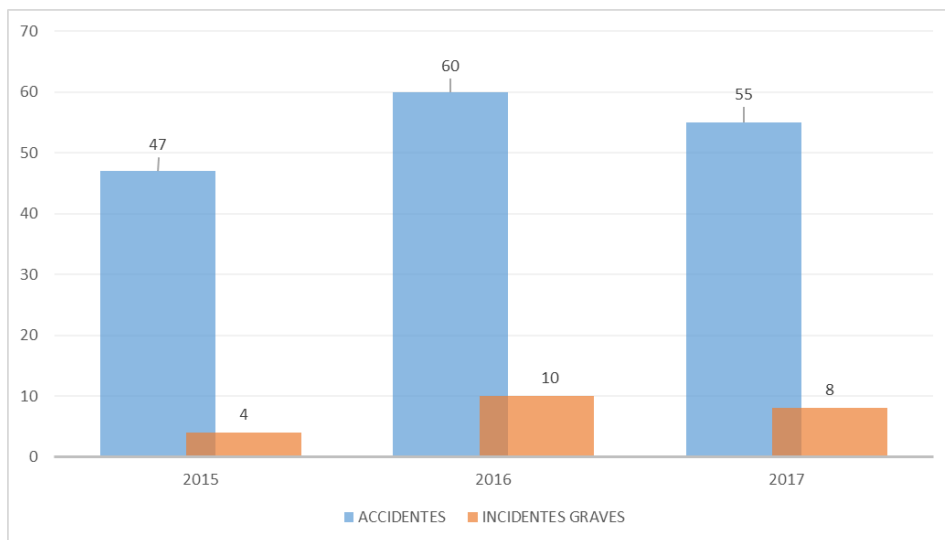
Of the 13 States of the SAM Region, information was collected from 12 AIG Authorities. As part of the work of collecting the information, communication with the AIG Authority of the State of Suriname was not obtained. The information collected came in different formats that included a file in Excel format, an official message by email detailing the events, and a file type ECCAIRS.

54% of the AIG Authorities sent the information in the ECCAIRS format and 31% sent their database in Excel format. This increase in the forwarding of information through the ECCAIRS tool is a clear sign that the AIG Authorities are using and making the tool efficient.



Graph No. 1 - Tools used by the AIG SAM Authorities to forward information

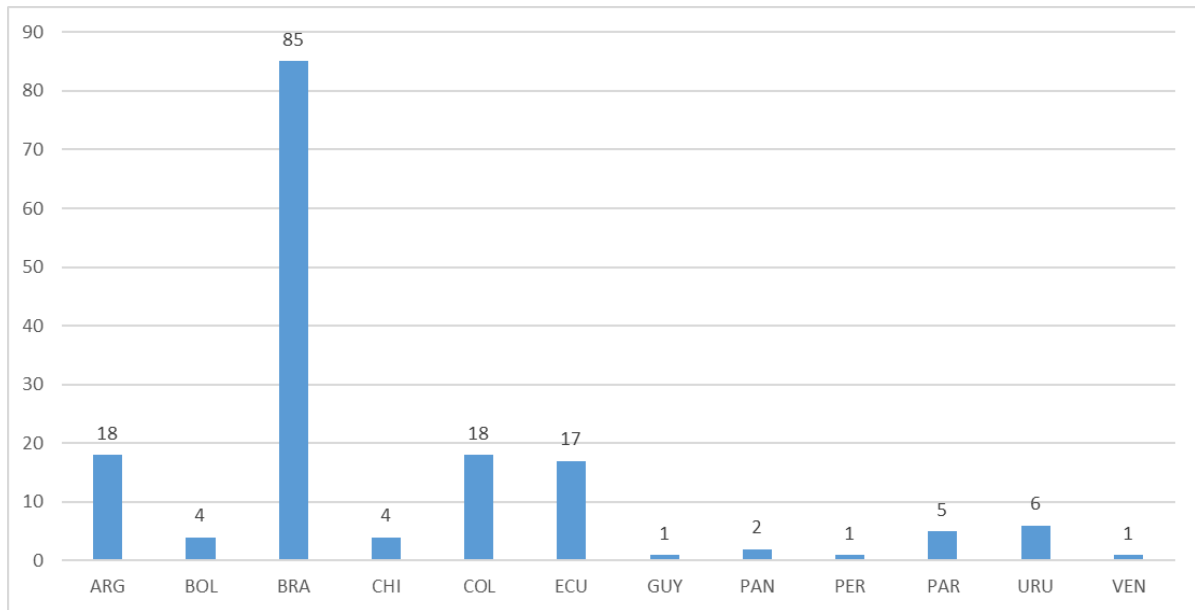
The information received resulted in a total of 184 occurrences that included Accidents and Serious Incidents, of which 162 corresponded to Accidents and 22 to Serious Incidents. The proportion of accidents and serious incidents was compared during the years 2015, 2016 and 2017, showing an average of 54 accidents and 7.3 serious incidents.



Graph No. 2 - Number of Accidents and Serious Incidents in Agricultural Aviation in the SAM States, 2015 - 2017

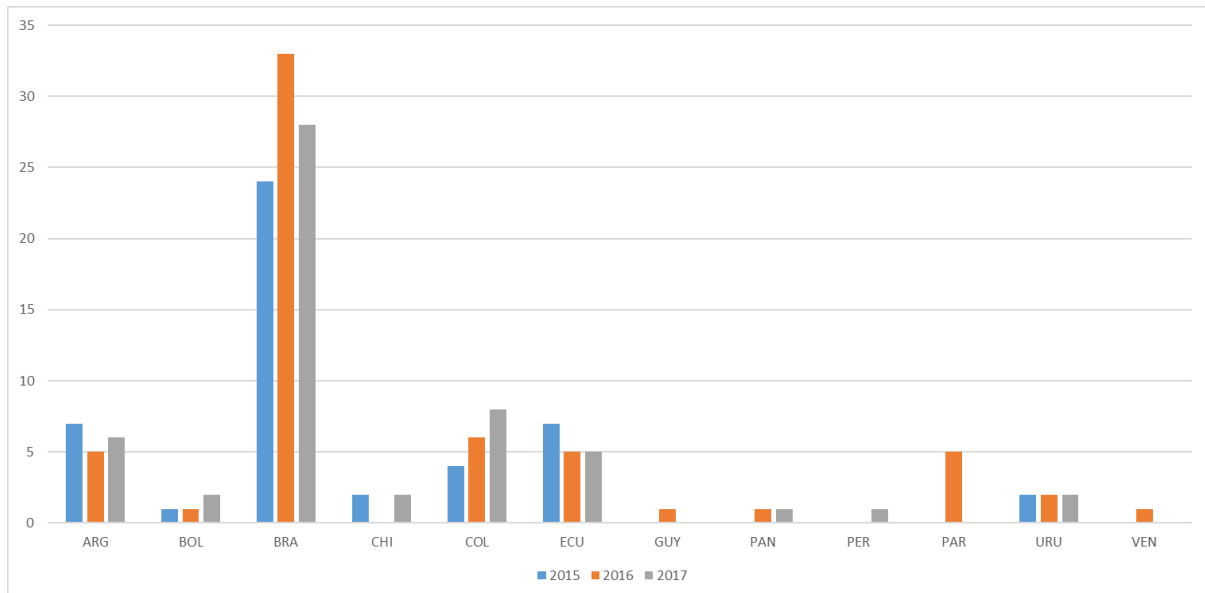
When making a discrimination of the information reported by the States, the accident of agricultural aircraft, the identification of a significant number of accidents in the States of Argentina, Brazil, Colombia, and Ecuador was notorious.

This situation of high accident rate is a factor that shows a high volume of air operations related to agricultural aviation.



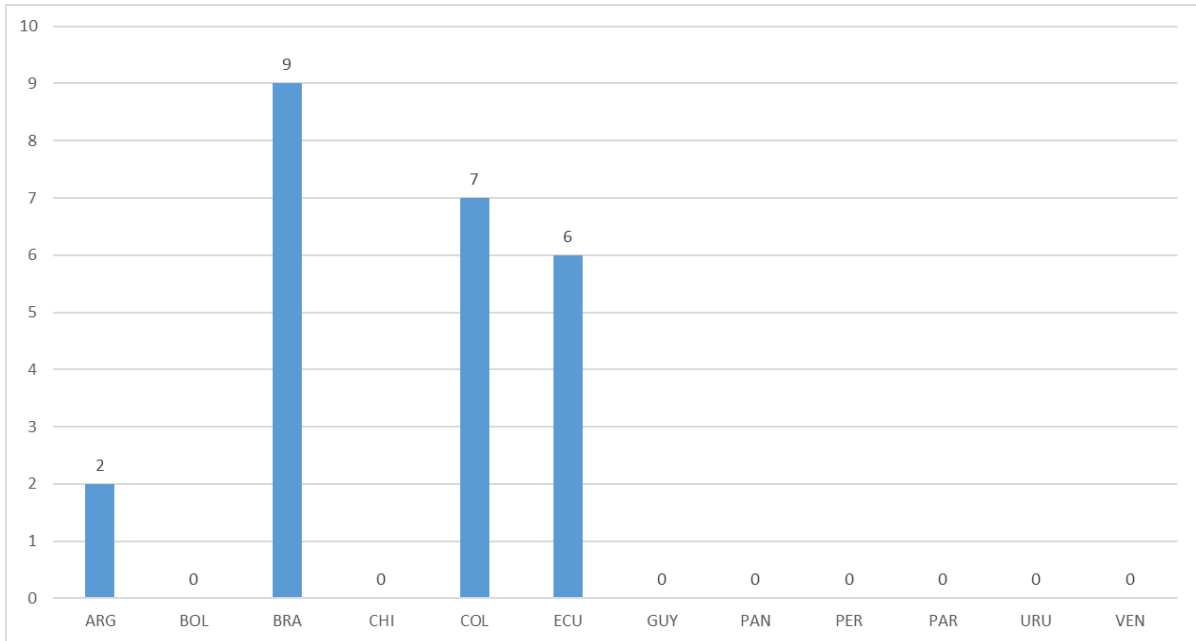
Graph No. 3 - Number of Accidents in Agricultural Aviation segregated by SAM States, 2015 - 2017

Segregating the years and the SAM States, the same accident rate tendency was found in such States, and the State of Uruguay was identified as the source of agricultural accident rate in the region, with a behavior similar to one of those States that present significant agricultural operations.



Graph No. 4 - Number of Accidents in Agricultural Aviation segregated by years and SAM States

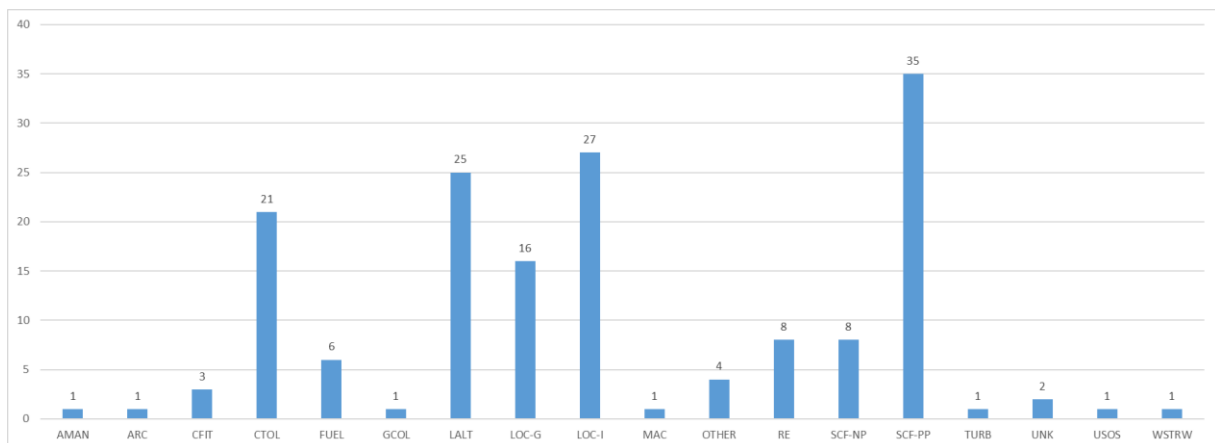
In the area of Serious Incidents, the occurrence of events prevailed in the States initially identified as having high accident rates in the SAM Region, such as Argentina, Brazil, Colombia, and Ecuador.



Graph No. 5 - Number of Serious Incidents in Agricultural Aviation segregated by SAM States, 2015 - 2017

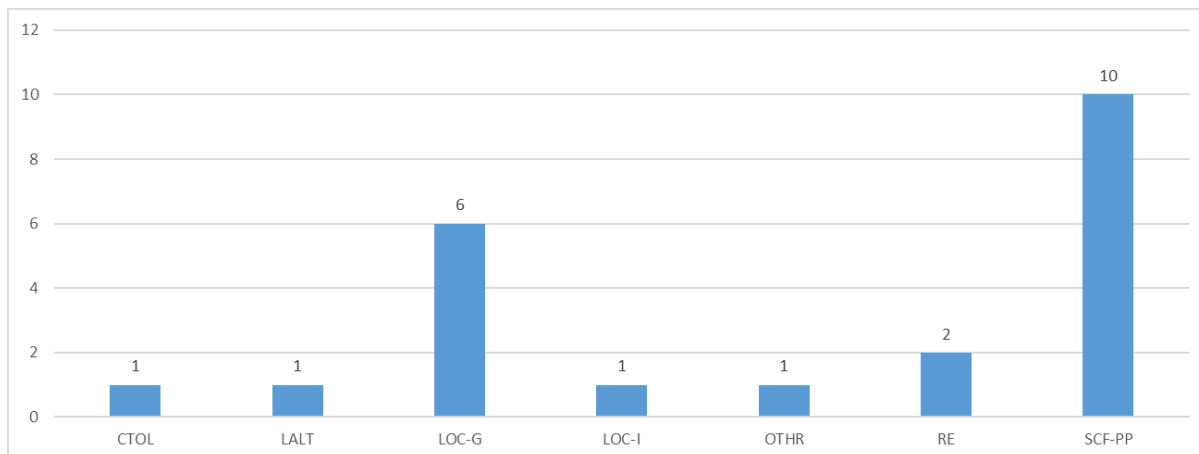
While the preliminary occurrence categories in the agricultural aviation accidents, several important aspects were identified that are interesting for subsequent analyzes to be carried out in the future. Among the most noteworthy categories, 22% of accidents were found to be attributable to a failure or malfunction of the power plant (SCF-PP), followed by loss of control in flight (LOC- I), with 17%, then the events related to operations at low altitude, with 15%, next the collisions during takeoff and landing with 13%, and finally the control losses on land, with 10%.

It is worrisome that, of the accidents presented, 22% of them had a connection with the Power Plant as a factor in the event. This factor is a very important focus to analyze in order to determine preventive strategies that impact aviation not only in the Region but also strategies that rise to a global scenario.



Graph No. 6 - Occurrence categories in Agricultural Aviation Accidents in SAM States, 2015 - 2017

In Serious Incidents, the scenario in the occurrence category was again identifiable and worrying with 45% of the events where a failure or malfunction of the power plant (SCF-PP) was connected to the event. Along with this category, loss of control on the ground (LOC-G) was identified with a 27%.



Graph No. 7 - Categories of occurrence in Serious Incidents in Agricultural Aviation in the SAM States, 2015 - 2017

By making a general pairing of the occurrence categories in the States of the SAM Region, similar categories could be correlated in some States.

The occurrences of low-altitude flight (LALT), a category that is quite common for this activity of agricultural aviation, were evident in States such as Argentina, Colombia, Peru, and Venezuela. Events such as loss of control in-flight (LOC-I) predominated in Brazil and Paraguay. The occurrences where there was a failure or malfunction of the power plant (SCF-PP) happened in the majority of the States, such as Chile, Colombia, Brazil, Bolivia, Panamá, and Uruguay. The occurrences that presented a collision with obstacles during the takeoff or landing occurred in the States of Brazil and Uruguay. Losses of control on the ground (LOC-G) occurred largely in the States of Ecuador and Guyana.



Image No. 1 - Grouping of prevailing occurrence categories in the SAM States, 2015 - 2017

One of the main aspects of the analysis was to determine those factors that affect the materialization of the occurrence category, applied to agricultural aviation. A generic study was carried out in order to determine the most conducive factors to generate the most important categories of occurrence within the accident rate in the SAM Region.

LALT

The occurrences that present a collision or near collision with obstacles/objects/terrain while intentionally operating near the surface (low-altitude operations) constitute an event that, given this type of operation, would represent the most common category in the accident rate.

Within the factors associated with this category, there is the collision with crops during spraying flights, collision with obstacles within, or near the crops. Likewise, this category is related to affectation caused by the glare of sun rays, or meteorological conditions due to fog, haze, or strong winds.

Risk management and the psychological factor in pilots are other factors that may trigger the accident rate in this category.



Image No. 2 - Typical low-altitude operation in the category LALT

SCF-PP

The occurrences related to failure or malfunction of an aircraft system or component, related to the power plant, were a factor of special importance in this study since they represent a factor in most of the accidents and serious incidents.

The factors that lead to the materialization of this category are framed within poor maintenance processes, the useful life of components, design and manufacturing factors, and breach of Airworthiness Directives (AD's) and Service Bulletins (SB's). These general factors that affect the operation of the power plant, during the operation of agricultural aviation, lead to the execution of forced landings due to engine shutdown in flight.



Image No. 3 - Agricultural aviation accident due to power plant failure in flight (SCF-PP)

LOC-I

Loss of aircraft control during intended flightpath in low-altitude flight was another category focus in agricultural aviation accidents. The main characteristic of this category, applied to agricultural aviation, is directly determined by the stall. Agricultural aviation requires the testing of the structure of the aircraft and the aerodynamic characteristics framed in maneuvers that, given the operation, can be routine, but sometimes can be excessive in the pilot's maneuverability.

Among the factors that generate the conditions to materialize this category are the maneuvers of premature rotation of the aircraft during takeoff, excessive bank angles, and deficiencies in the weighing and centering of the aircraft for the operation. Likewise, there may be a failure or malfunction of an aircraft system that in flight can lead to loss of control. Typical examples of this factor are when flight controls fail in operation.



Image No. 4 - Agricultural aviation accident due to loss of control in-flight (LOC-I)

LOC-G

Loss of aircraft control on the ground was another category of impact in accident and serious incident rates. In this category that occurs only on land, it is directly related to the controllability of the aircraft in the phases of takeoff and landing. Furthermore, this category is coupled with the capabilities and training of the pilot-in-command to maintain control of an aircraft that has special characteristics of tail landing gear that make the pilot in command struggle to maintain control of the aircraft on land. The relevant factors for this category are the lack of controllability in take-off rolling or landing, factors in the training and proficiency of the pilot-in-command, or system/component failures (SCF-NP) that trigger the loss of ground on the control. This category also includes runway excursions, which result from losses of control on the ground and that generally cause accidents.



Image No. 4 - Agricultural aviation accident due to loss of control on the ground (LOC-G)

CTOL

The collision with obstacles, during take-off or landing whilst airborne, was framed as an occurrence category in accident rates, mainly in Brazil and Uruguay. This category presents conducive factors related to deficiencies in the performance estimates during take-off, premature rotation of the aircraft and excessive weight in the operation. Many of these factors are associated with the lack of aerodynamic knowledge in the aircraft and in the study of environmental factors that directly influence the aircraft performance.



Image No. 5 – Agricultural aviation accident, collision with an obstacle during take-off (CTOL)

The study undertaken also identified secondary factors of occurrence, such as the occurrences related to fuel (FUEL), runway excursion (RE), and system/component failures or malfunction (SCF-NP).

2.2 Regulation related to Agricultural Aviation in the SAM Region

The survey done in each SAM State to determine a regulatory framework that would apply directly to agricultural aviation, showed that all the States in the Region use regulatory guidelines applicable to this type of aviation. The study still has to determine whether the regulations of each State are harmonized with the applicable LAR regulation.

ARG	RAAC 313	PAN	RACP XXXVII
BOL	RAB 133	PER	RAP 137
BRA	RBAC 137	PAR	DINAC R137
CHI	DAN 137	SUR	CARS P. 11
COL	RAC 137	URU	LAR 137
ECU	RDAC 137	VEN	RAV 130
GUY	GCAR XI		

Image No. 6 – Regulatory framework applicable to Agricultural Aviation in the SAM Region

3 Conclusions

There are unified factors in the occurrence categories of accidents and serious incidents in agricultural aviation in which efforts can be made to determine preventive strategies that allow the reduction of the accident rate in the SAM Region.

The information provided by the States was mainly forwarded through ECCAIRS. This showed a good use of the tool and how easy it is to process the data with it.

Some States showed that there are no accident rate reports done by the agricultural aviation operators when accidents and serious incidents occur.

The agricultural aviation operation varies in the States of the Region. There were States in which the accident rate was not prominent in comparison with other States of the Region. This probably shows the number of operations in agricultural aviation done by each State.

Some States maintained prevailing categories that raised the accident values (LOC-G – CTOL). There was a wide participation of the States in the preliminary study of agricultural aviation accident rate.

The analysis of the safety recommendations and regulations is underway and its results shall be disseminated through the ARCM in the following months.

Currently, there is a work plan to analyze and establish taxonomic criteria that may facilitate the identification of causal factors for the different occurrence categories.

It is probable that the States of the region have different criteria and views for the categorization of accidents, and that this has an impact on the characteristics of the event.

There are several States in which a common problem appeared in the notification of occurrences to the AIG Authority.

4 Suggested action

By means of this WP, the following activities are suggested for the successful and detailed work of this topic, which represents a framework of interest to improve Safety in the SAM Region:

1. To continue with the detailed study of the latent factors that are conducive to accidents and serious incidents in agricultural aviation.
2. To continue with the analysis of the regulatory framework of each State in order to determine differences, standardizations, and comparisons with the applicable LAR Regulations, and to develop proposals for modification through the ARCM.
3. To widen the scope of the accident rate study, including the types of aircraft, injuries, age, impact with obstacles and crops characteristics. This widening of the scope will generate more criteria to correlate the variables that influence this type of agricultural aviation accidents.
4. To conduct a study and analysis of the recommendations of each State with regard to the agricultural aviation accident rate, in order to channel the different preventive strategies and make them useful to the other States of the Region.
5. Through the use of studies done by some of the AIG Authorities of the world (NTSB, ATSB), develop and publish a document on agricultural aviation accident rate in the SAM Region.

6. To study the possibility of developing a training activity addressed to the AIG Authorities of the SAM Region on the use of the occurrence categories in events.
7. To complete the study, it is recommended that the States forward the information through the ECCAIRS system.
8. To present the results of this study in the 6th ARCM meeting.

- END -