UPDATING

The prevention report taxonomy impact in flight safety activities

El impacto de la taxonomía del informe de prevención en las actividades de seguridad de vuelo

O impacto da taxonomia do relatório de prevenção nas atividades de segurança de voo

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ABSTRACT

The research objective was analyzing the Flight Safety Officers (FSO) perception on the use of Prevention Reports taxonomy in Flight Safety activities in Air Corps and Air Bases of Air Operations General Command, from January to May, 2013. In order to carry out the research, the Prevention Reports (RELPREV) and the Aviation Safety Reporting System taxonomy concepts and characteristics were presented. Then, Fleishman and Quaintance work and its taxonomy assessment criteria were approached. The methodology employed included documental research, qualitative comparison of taxonomies and preparation of a questionnaire based on usefulness criterion, addressed to Flight Safety Officers form Air Corps and Air Bases. The results obtained have appointed, according to Fleishman and Quaintance usefulness criterion, that the Prevention Reports taxonomy has improved the flow of information, has created a source of significant information and has contributed to identify dangers and develop prevention actions. It was concluded that the FSO perception on Prevention Reports taxonomy in Flight Safety activities developed by the Links of the Aeronautical Accidents Investigation and Prevention System (SIPAER), which has, as central body, the Aeronautical Accidents Investigation and Prevention Center (CENIPA), was positive. However, it is suggested that a specific training should be provided in the adequate use and management of time in order not to prejudice other prevention activities.

Keywords: CENIPA. Flight safety. Prevention report. Taxonomy.

RESUMEN

La investigación tuvo como objetivo analizar la percepción de los Oficiales de Seguridad de Vuelo (OSV) sobre el uso de la taxonomía de los Informes de Prevención (RELPREV) en las actividades de Seguridad de Vuelo en las Unidades Aéreas y Bases Aéreas del Comando-General de Operaciones Aéreas, en el período de enero a mayo de 2013. Para realizar la investigación, se presentaron los conceptos y las características de la taxonomía del RELPREV y del Aviation Safety Reporting System. En seguida, se abordó la obra de Fleishman y Quaintance y sus criterios de evaluación de taxonomía. La metodología empleada incluyó investigación documental, comparación cualitativa entre taxonomías y elaboración de un cuestionario, basado en el criterio utilidad, dirigido a los Oficiales de Seguridad de Vuelo de las Unidades Aéreas y Bases Aéreas. Los resultados obtenidos indicaron, en consonancia con el criterio de utilidad de Fleishman y Quaintance, que la taxonomía de RELPREV mejoró el flujo de informaciones, creó una fuente de informaciones significativas y contribuyó para la identificación de peligros y desarrollo de acciones de prevención. Se concluyó que fue positiva la percepción de los OSV sobre el uso de la taxonomía de RELPREV en las actividades de Seguridad de Vuelo desarrolladas por los Elos del Sistema de Investigación y Prevención de Accidentes Aeronáuticos (SIPAER), que tiene como órgano central el Centro de Investigación y Prevención de Accidentes Aeronáuticos (CENIPA). Sin embargo, se sugiere un entrenamiento específico para su uso y una administración adecuada del tiempo para no perjudicar otras actividades de prevención.

Palabras-clave: *CENIPA. Seguridad de vuelo. Informe de prevención. Taxonomía.*

RESUMO

A pesquisa teve como objetivo analisar a percepção dos Oficiais de Segurança de Voo (OSV) sobre o uso da taxonomia dos Relatórios de Prevenção (RELPREV) nas atividades de Segurança de Voo nas Unidades Aéreas e Bases Aéreas do Comando-Geral de Operações Aéreas, no período de janeiro a maio de 2013. Para realizar a pesquisa, apresentaram-se os conceitos e as características da taxonomia do RELPREV e do Aviation Safety Reporting System. Em seguida, abordou-se a obra de Fleishman e Quaintance e seus critérios de avaliação de taxonomia. A metodologia empregada incluiu pesquisa documental, comparação qualitativa entre taxonomias e elaboração de um questionário, baseado no critério utilidade, endereçado aos Oficiais de Segurança de Voo das Unidades Aéreas e Bases Aéreas. Os resultados obtidos indicaram, de acordo com o critério de utilidade de Fleishman e Quaintance, que a taxonomia de RELPREV melhorou o fluxo de informações, criou uma fonte de informações significativas e contribuiu para a identificação de perigos e desenvolvimento de ações de prevenção. Concluiu-se que foi positiva a percepção dos OSV sobre o uso da taxonomia de RELPREV nas atividades de Segurança de Voo desenvolvidas pelos Elos do Sistema de Investigação e Prevenção de Acidentes Aeronáuticos (SIPAER), que tem como órgão central o Centro de Investigação e Prevenção de Acidentes Aeronáuticos (CENIPA). Entretanto, sugere-se que seja providenciado um treinamento específico para seu uso e um gerenciamento adequado do tempo para não prejudicar outras atividades de prevenção.

Palavras-chave: *CENIPA. Segurança de voo. Relatório de prevenção. Taxonomia.*

1 INTRODUCTION

In December 1974, the TWA 514 flight was approximating Dulles Airport, in Washington, when it collided against the ground at 25 miles from the aerodrome. All the 92 occupants of the Boeing 727 died in the accident. Six weeks earlier, one United Airlines flight had gone through the same situation, but the crew could correct the mistake in time to avoid the accident. Unfortunately, this information was not divulged to the other airline companies, resulting in one air disaster (STOLZER; HALFORD; GOGLIA, 2008).

The start of world aviation was marked by tragedies of this type, with high frequency of aeronautical accidents. At that time, Flight Safety activities were focused only on the investigation of technical factors involved. Later, issues related to human and organizational areas that might contribute to accidents were also focused. These initiatives have resulted in advances that transformed aviation into a highly safe means of transportation (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2013).

Many of these aviation advances were stimulated by the International Civil Aviation Organization (ICAO), organization responsible for the development of international civil aviation. Lately, ICAO started to foment the implantation of the Safety Management Systems (SMS) in order to improve yet more aviation safety (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2013).

The Aeronautical Accidents Investigation and Prevention Center (CENIPA) and the National Civil Aviation Agency of Brazil (ANAC), following orientation issued by ICAO, incorporated several SMS concepts, since 2008, to increase Flight Safety (BRASIL, 2008).

In 2012, CENIPA approved a review of the Prevention Report (RELPREV) introducing taxonomy for classification of reported danger situations. This taxonomy was conceived to be used as basis for a Prevention Report data bank to Brazilian Air Force (FAB), promoting the development of statistical

indicators and making prevention actions more precise (BRASIL, 2013b).

However, the taxonomy implantation has caused changes in Flight Safety Officers (FSO) with the introduction of new procedures in the Prevention Report process. Due to these changes, frenzy arose associated to the assessment of the consequences of such measures for accident prevention in FAB.

So, this scientific research aims to analyze the FSOs perception on the use of Prevention Report taxonomy in Flight Safety activities in Air Corps and Air Bases of the Air Operation General Command, from January to May 2013.

The research at issue is intended to provide contribution to the Aeronautics Command (COMAER) and, particularly, to CENIPA, by studying one of the most significant changes in Prevention Reports, occurred recently. This tool is used in all organizations that have airships in FAB and with high potential to improve prevention actions, reducing the loss of airships and saving lives.

2 THEORETICAL CONTRUCT

This item presents a literature review, approaching norms, authors and theories related to the proposed theme and which guide this study. Later, the system used by the American Agency for Aviation Hazards Classification and adopted for Prevention Report classification, concluding with Fleishman e Quaintance (1984) approach to taxonomies, with emphasis on the usefulness criterion.

2.1 SMS concepts and CENIPA norms

According to Wood (2003), SMS arose in the 50s with the development of safety systems for American space programs and missiles. Little by little these systems evolved, eventually becoming the current Flight Safety Management Systems, called SMS. It's about a systematic and comprehensive process for managing risks inherent to aviation activities. The SMS is dynamic, and requires a continuous process of danger identification and risk management (STOLZER; HALFORD; GOGLIA, 2008).

ICAO has incentivized all Chicago Convention Member States to implant SMS (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2013). In Brazil, CENIPA considered that many SMS concepts have high potential to modernize and improve the Brazilian Air Force Flight Safety tools. In 2008, several of these concepts were incorporated to the Aeronautical Accidents Investigation and Prevention System (SIPAER) (BRASIL, 2013a).

SIPAER carries out aeronautic accidents investigation and prevention activities in Brazil. The central agency of this system is CENIPA and the executive elements are known as SIPAER links (Elos SIPAER), responsible for executing the activities committed to it, according to norms prepared by CENIPA (BRASIL, 1982).

2.2 Prevention Reports and their taxonomy

According to SIPAER (MCA 3-3) Prevention Handbook, the Prevention Reports purpose is "provide information so that SIPAER links can adopt adequate mitigating actions in face of a potential risk situation [...]" (BRASIL, 2013b, p. 36). Thus, the Prevention Report is a communication channel through where any person can communicate a risk situation to the aviation, multiplying the Commander and the Flight Safety Officer observation capacity.

Another significant aspect of the Prevention Reports (RELPREV) is associated to the amount of information generated. Accidents and incidents in aviation are relatively rare events. The investigation of these occurrences, even though bringing important teachings, is insufficient to develop opportune prevention actions (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2013). On the other hand, prevention reports are daily completed in Air Corps, resulting in a large source of information to improve Flight Safety.

SMS central issue, as emphasized by Stolzer, Halford and Goglia (2008), is risk management. This is also the Prevention Reports (RELPREV) objective, making possible the use of many SMS concepts. In 2008, CENIPA started to introduce SMS concepts in SIPAER norms. In Prevention Reports process risk assessment was introduced, based on a probability and severity matrix, which has provided a better prioritization of prevention actions developed by FSOs (BRASIL, 2013a).

Later, in 2012, new SMS concepts were inserted in MCA 3-3. The most significant change was the inclusion, in Prevention Reports (RELPREV), of one stage for reports classification. This classification in just one in a total of fifteen stages included in Prevention Reports (BRASIL, 2013b).

According to MCA 3-3, RELPREV classification is intended to "categorize the information received to posterior trend analysis, which will promote the continuous improvement of Flight Safety" (BRASIL, 2013b, p. 42). Thus, categorization shall be understood as a required step to extract meaning from reported information (STOLZER; HALFORD; GOGLIA, 2008).

MCA 3-3 also establishes that this categorization shall be made following a specific taxonomy contained in Annex B of the handbook (BRASIL, 2013b). Traditionally, taxonomies are intended to classify botany and zoology species. In a broader sense, taxonomy may be understood as a systematic classification. However, for

the purposes of this study, RELPREV taxonomy should be understood as a standardized classification system for danger situations in aviation, within FAB ambit.

It is up to the FSO the execution of classification of hazardous situations, observing that an incorrect classification "may disguise a trend or point to a wrong trend, generating inadequate prevention actions" (BRASIL, 2013b, p. 42).

2.3 ASRS and RELPREV taxonomies

The accident with flight TWA 514, mentioned in this research introduction, has resulted in deep changes in aviation in the United States and in the world. After the accident, the Federal Aviation Administration (FAA), agency responsible for the American civil aviation, has established the Aviation Safety Reporting System (ASRS), a national report system for hazardous situations in aviation (WELLS; RODRIGUES, 2003).

According to Stolzer, Halford and Goglia (2008), ASRS is known in world aviation as one of the most important report programs in place. With an average that exceeds 5000 reports per month, ASRS is considered one of the largest sources of information on Flight Safety and human factors (NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, 2011).

In addition to generating a series of alerts to aviation, online searches can be made in ASRS data bank. The ASRS success has made many country develop their own volunteer report systems, including Brazil (NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, 2011).

The different factors identified and classified in ASRS may be gathered in generic groups to facilitate its comprehension. The groups used in ASRS are: time/date, place, environmental conditions, airship and their components, personnel, type of event, consequences and assessment of the problem and contributing factors. The groups above have a variable number of descriptors, a kind of category that identifies and specifies each generic group. The total of descriptors in ASRS databank is 546. There is also one descriptive text field to record a succinct summary of the occurrence. (NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, 2013).

In its turn, the RELPREV also records a series of factors that present high similarity with those used in ASRS. The main RELPREV taxonomy groups are: SIPAER link (organization), hour/date, place, airship (includes flight phase and plan) and equipment, personnel (reporter and persons involved), type of aviation and mission, environmental conditions, type of hazard situation (event), consequences,

risk assessment, mitigating actions. The total of RELPREV descriptors is 313. There are descriptive text fields to record the occurrence and the opinion of the sector responsible for the reported problem analysis (BRASIL, 2013b).

Finally, it is important to distinguish the target public in each one of these tools. ASRS can be used to record a hazard situation with any airship in American territory. Thus, it includes national and foreign airships from all types of aviation (WELLS; RODRIGUES, 2003). RELPREV taxonomy, however, is a tool developed specifically for FAB use (BRASIL, 2013b).

2.4 Taxonomy assessment according to usefulness criterion

The use of taxonomies to classify human performance is very important to Flight Safety, for with it we can measure and follow people performance as they accomplish a certain task (STOLZER; HALFORD; GOGLIA, 2008). However, there are few studies that present a specific methodology to assess the effectiveness of classification tools related to human performance and that may be applied in Flight Safety area. One of the works most used for that purpose belongs to Fleishman and Quaintance (1984), where three chief criteria are emphasized to assess any taxonomy: internal validity, external validity and usefulness.

The internal validity criterion checks whether the classification system is logically organized, analyzing the different descriptors used. The external validity criterion checks the level of exactness of the system to reach its proposed objectives, testing it in several situations (FLEISHMAN; QUAINTANCE, 1984). These two criteria are basically used to assess the taxonomy quality in order to measure what was proposed and check whether the methodology is adequate.

The third Fleishman and Quaintance (1984) criterion assess the tool usefulness. This criterion is intended to measure, in practice, how the use of taxonomy affects a certain system, dimensioning its usefulness. Four aspects are analyzed: communication promotion, required resources, number of users and capacity to solve problems.

Communication promotion is associated to the ease to exchange information (FLEISHMAN; QUAINTANCE, 1984). Any taxonomy should favor information exchange among users. In the case of RELPREV, reported danger situations should be divulged to other SIPAER links, whenever they are relevant to theses organizations (BRASIL, 2009). So, in order to have a positive impact, the classification tool used should promote the communication among links, facilitating the sending and search of information on Flight Safety.

With regard to required resources, Fleishman and Quaintance (1984) propose analysis according to the required training, time spent and material resources that will be used in the taxonomy application. Therefore, the simpler and more objective in its formulation, or, the shorter the training, time and material resources required to use it, the lesser will be the negative impact of the tool in Flight Safety activities.

The number of the taxonomy users is another aspect that should be considered in usefulness criterion (FLEISHMAN; QUAINTANCE, 1984). A large number of users generate a significant amount of information, which are inserted in the data bank. The larger and more complex is the data bank, better prevention actions can be developed, according the the concept stated by ICAO, of actions based on statistical data (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2013).

In case of RELPREV, CENIPA elaborated one single taxonomy to all SIPAER links of the Aeronautics Command (BRASIL, 2013b). Therefore, all FAB organizations that possess airships use the same standardized form to classify hazard situations, which results in a data base too much representative of the Brazilian Air Force aeronautic risk profile.

According to Fleishman and Quaintance (1984), the last aspect to be analyzes is the extent to which taxonomy assists in solving the problems to which it was created. As seen previously, RELPREV seeks the identification of dangers and the development of prevention actions. Thus, RELPREV classification tool should help to reach these objectives, offering support to these activities.

RELPREV taxonomy presents lists with groups and descriptors to classify the different factors involving a hazard situation (BRASIL, 2013b). This form of organization may work as orientation to the FSO for him/her to identify all factors involving a certain danger situation. It can also assist in determining prevention actions since it presents some alternative mitigating actions for the FSO to analyze.

3 METHODOLOGY

The method used in the elaboration of this work was the deductive method, starting from a wide view of SMS concepts until a specific analysis of RELPREV taxonomy and its influence in Flight Safety activities. For such, documental and bibliographic researches were made, and a questionnaire on SIPAER links of Air Bases and Air Corps of the Air Operations General Command (COMGAR).

First, a documental research was made through Document 9859, Safety Management Manual, of International Civil Aviation Organization and Aeronautic Command Systemic Norms (NSCA), related to Flight Safety area published by CENIPA, in order to identify SMS and SIPAER evolution until the creation of RELPREV taxonomy.

Later, a survey of Flight Safety activities related to RELPREV was made, and the changes occurred after the establishment of the classification tool were identified. Some concepts related to its purpose and objectives were discussed in this phase.

Intended to better identify its characteristics, a qualitative comparison among taxonomies used by RELPREV at FAB and by the Aviation Safety Report System (ASRS) at NASA was carried out, because the latter is acknowledged as reference to the development of similar tools in several countries.

Finally, the theoretical foundation was consolidated through Fleishman and Quaintance (1984) work, which was constituted as master line for RELPREV classification tool assessment. This work was used because it presents a complete methodology for taxonomy assessment, and is reference for many studies oriented to human performance in Flight Safety area.

Analyzing the concepts of this work, the usefulness criterion was chosen, with its four aspects (communication promotion, number of users, required resources and contribution to solve problems) for the present study. The Fleishman and Quaintance (1984) usefulness criterion has shown to be the most adequate to dimension a classification system impact, because it measures their practical effects and the required resources for its use. On the other hand, internal and external validity criteria were dismissed, which are basically used to assess internal logic and meeting of proposed objectives, which are not the purpose of the present work.

As a way to deepen the study and to identify SAPIER links perception, a questionnaire containing ten questions was prepared. The questionnaire was developed through Google Docs tool and sent by email to participants.

The universe considered comprised fifty four militaries, all of them exercising the role of FSO in COMGAR Air bases and Air Corps, with minimum desired sample of thirty six respondents. Thus, we intended to reach a confidence level of 90% and acceptable error of 8% in Cochran (1965) formula application.

The questionnaire was structured in five parts, as follows:

a) questions 1 to 3 – identify the FSOs experience regarding the use of taxonomy in the exercise of their roles;

b) questions 4 to 5 – identify perception on RELPREV taxonomy capacity to promote communication;

c) question 6 – investigate the benefits of a large number of the taxonomy users for Flight Safety;

d) questions 7 to 9 – verify the need of material resources, training and time spent to use the taxonomy in daily activities; and

e) question 10 – investigate the taxonomy capacity to assist in problems solving, identifying factors related to the occurrence and helping in the preparation of prevention actions.

Questions from 4 to 10 presented seven choices of answer. Based on Likert scale, there were three concordance options and one escape option. This number of options was used to avoid the neutral point, in order to have a clearer position of FSO about agreeing or disagreeing with the proposition. Value 1 (one) was assigned to the "fully disagree" answer and so on, until 6 (six) for "fully agree".

Before the questionnaire application, a pre-test was carried out with four militaries with Flight Safety training, with which it was possible to check whether the questions were understood by the target-public. It was verified that there was an adequate understanding of the questions, and then data collection could be started.

After receiving the FSOs answers, participants perceptions were analyzed with regard to RELPREV taxonomy impact, under Fleishman and Quaintance (1984) usefulness criterion.

As to the statistical treatment, in order to analyze question 1, only answers frequency was used. In questions 2 and 3, the average of values reported by participants was calculated. In questions 4 to 10, all of them with a Likert scale of six options, the median was calculated. Questions with median five or above (answers concentrated in "agree" and "fully agree") were considered accepted by the participants. Similarly, questions with mean two or below (answers concentrated in "disagree" and "fully disagree") were considered not accepted.

To complement answers and better understand the taxonomy capacity to solve problems (question 10), a comparative analysis was made between ASRS and RELPREV taxonomies. This analysis was limited to generic groups and to the number of descriptors in each taxonomy, as well as a distinction of their target publics.

During the research, some limitations were evident. The short period of time in which the taxonomy was used, between January and May 2013, may interfere with participants' perceptions. In addition to time, the number of times that each FSO applied the taxonomy has also varied, interfering with opinions on its usefulness. Finally, for being a new tool that implies changes in FSO routine, there may be a reaction to change by users, affecting their perception on the taxonomy.

4 DATA PRESENTATION AND ANALYSIS

In order to reach this study objective, data collected in the literature review and questionnaire application are presented and analyzed. Initially, a general analysis of the questionnaire and qualification of militaries who participated in the research will be made. Later, each aspect of Fleishman and Quaintance (1984) usefulness criterion will be analyzed individually, and then a final synthesis will be made.

4.1 General analysis of questionnaire and participants' qualification

The sample obtained in this research comprised forty one participants, representing a confidence level of 90% and sample error of 6.5%, according to Cochran (1965) formula.

In question 1 the militaries academic background was asked. Among respondents, 83% had attended the Flight Safety Official course, the most complete CENIPA course, including prevention and investigation of air accidents modules. The remaining 17% were accredited elements from SIPAER, who held the prevention module only.

Question 2 approached their professional experience, measuring the time the militaries have worked in Flight Safety area. All of them had experience in the area, and answers varied between one and twelve years and the average was 4 years.

The last question of this part of the questionnaire checked how many times the participants had used RELPREV taxonomy. Only six militaries (14%) have not used the taxonomy previously, but they could study it before answering to the questionnaire. The average of use of taxonomy among the other thirty five participants was 36 times, and there was a large variation among participants; and one of them had applied the taxonomy around 400 times.

Therefore, considering the above aspects, one may infer that participants had required Flight Safety experience and knowledge to assess RELPREV taxonomy impact on their activities.

So, these militaries contribution can be considered valid and representative for the other FAB organizations.

4.2 Communication promotion aspect

In order to check whether RELPREV taxonomy promotes the exchange of information among SIPAER links, two questions were elaborated. Question 4 checked whether the taxonomy facilitated the divulgation of danger situation to other organizations. Question 5 attempted to check the reverse way, that is, whether the taxonomy facilitated the search for information from other organizations.

As seen in the theoretical fundaments, these two concepts complement each other and are both important to verify the positive impact of the taxonomy. Table 1 presents the results found.

Table 1: Communication promotion.

Question	Fully agree	Agree	Agree partially	Disagree partially	Disagree	Fully disagree	I don't know
4 - Information divulgation	12 (29%)	20 (49%)	9 (22%)	0	0	0	0
5 - Search for information	14 (34%)	18 (44%)	6 (15%)	2 (5%)	1 (2%)	0	0

Source: The author.

Analyzing Table 1, one can observe a large concentration of positive answers, with 5 as median, corresponding to the "agree" answer. A total of 78% of participants have chosen the options "agree" and "fully agree", in both questions. The answers "disagree partially" and "disagree" were few and appear only in question 5.

The result obtained indicates the acceptance of these concepts and is compatible with the literature, once one of the objectives for creating a classification tool is exactly to provide a consultation source that promotes information exchange (STOLZER; HALFORD; GOGLIA, 2008). The acceptance by the users that this tool facilitates the flow of information among SIPAER links shows that this aspect of the objective was reached, resulting in positive impact on Flight Safety.

4.3 Users amount aspect

According to Fleishman and Quaintance (1984), the larger the number of users, the more useful is the taxonomy. On the other hand, the adoption of several classification systems specific to each type of aviation would have an opposite effect, reducing their usefulness.

CENIPA opted for establishing a standard tool to all FAB organizations, in order to create a more significant data bank, due to the large number of information that such system could generate (BRASIL, 2013b). So, question 6 checked the participants' perception on this concept, stating that the fact of there being only

one RELPREV taxonomy for all FAB organizations would result in more significant information and better prevention actions.

The results obtained were clear, with 49% of concordance, 37% of full concordance and 15% of partial concordance. The median obtained was five, which corresponds to the "agree" option, indicating acceptance of the concept. Any of the participants abstained from answering or answered negatively. So, one can conclude that the FSOs consider the adoption of one single tool as the best option, confirming the concepts presented in the literature review.

4.4 Required resources aspect

With regard to required resources to use RELPREV taxonomy, three factors were considered, according to Fleishman and Quaintance (1984) work: the time spent to classify, the required training to use the tool and material resources available in the organization.

In this case, the taxonomy usefulness is inversely proportional to resources required to use it (FLEISHMAN; QUAINTANCE, 1984). Therefore, the less time spent in classifying a report, less training required and less material resources required, the more useful is the taxonomy. In order to check the FSO perception on the subject, three questions were elaborated. Each question addressed one of the three factors related to required resources: time, training and material resources. Table 2 presents the results obtained.

Table 2: Resources required to use the taxonomy.

Question	Fully agree	Agree	Agree partially	Disagree partially	Disagree	Fully disagree	I don't know
7 - Shorter time spent	3 (7%)	11 (27%)	14 (34%)	5 (12%)	3 (7%)	4 (10%)	1 (2%)
8 - Doesn't need training	2 (5%)	10 (24%)	9 (22%)	9 (22%)	7 (17%)	4 (10%)	0
9 - Material resources available at the OM	10 (24%)	17 (41%)	7 (17%)	2 (5%)	4 (10%)	1 (2%)	0

Source: The author.

Different from previous questions, the participants answers related to these three factors vary significantly. In time factor, median was four, corresponding to the answer "agree partially", insufficient to infer the concept acceptance. The majority of participants agreed partially (34%) or agreed (27%) that short time is spent to apply the taxonomy. However, it must be recorded that a considerable portion has answered negatively to this question. Thus, due to the answers, one may consider that, in some cases, the time spent in classification phase is an obstacle to FSOs.

With regard to training, there was a very similar distribution among positive and negative answers, with a reduction at the scale extremities (fully agree and fully disagree). Again the median was four (agree partially), evidencing that training is considered desirable by many participants.

In the documental review of this work it was not found evidence of a training elaboration, by CENIPA, destined to SIPAER links, to use the taxonomy.

Finally, in terms of material resources, it may be inferred that, in most cases, these resources are available in organizations, since the median was five (agree). The most frequent answers were "agree" (41%) and "fully agree" (24%). The small percent of "agree partially" answers (17%) indicates that lack of resources to use the taxonomy can only be a punctual problem in some organizations.

4.5 Problem solving aspect

The last aspect assessed, presented in Table 3, investigated the taxonomy capacity to assist in problem solving, identifying the factors related to the occurrence and helping in the elaboration of prevention actions.

The answers were quite positive, with median five and higher concentration on option "agree" (61%) and "fully agree" (20%), from which we can infer that participants believe that classification contributes to identify dangers and elaborate prevention actions.

To further analyze the capacity to assist in problem solving, this taxonomy was qualitatively compared to ASRS, a reference in world aviation. Chart 1 displays the generic groups present in each taxonomy, grouped in order to facilitate understanding.

Chart 1: Comparison between ASRS and RELPREV taxonomies.

GROUPS	ASRS	RELPREV
Organization	No	Yes
Date, time and place	Yes	Yes
Environmental conditions	Yes	Yes
Airship and personnel (includes flight phase and plan)	Yes	Yes
Type of event	Yes	Yes
Aviation and mission	No	Yes
Consequences	Yes	Yes
Assessment of the problem and contributing factors	Yes	No
Risk assessment	No	Yes
Prevention actions	No	Yes
Text fields	Occurrence	Occurrence and opinion
Total of descriptors	546	313

Fonte: O autor.

By analyzing only the number of descriptors, one might suppose that ASRS taxonomy is more complete. However, it must be considered that ASRS target public includes all types of aviation, from all nationalities that use the American air space. On the other hand, the taxonomy contained in SIPAER Prevention Handbook (BRASIL, 2013b) was developed to be used only by FAB, resulting in a smaller number of situations to be classified, and consequently, less descriptors.

The comparison between taxonomies shows that both are structurally very similar, but RELPREV has several extra groups, and a wider record of the hazard situation can be reported. Besides, since RELPREV taxonomy has a field to record the responsible sector

Table 3: Problem solving.

Question	Fully agree	Agree	Agree partially	Disagree partially	Disagree	Fully disagree	I don't know
10 - Taxonomy assists in identification and prevention	8 (20%)	25 (61%)	5 (12%)	2 (5%)	1 (2%)	0	0

Fonte: O autor.

opinion and a check list for prevention actions, it also facilitates the search for a solution to the problem reported. Therefore, this comparison supports the FSOs opinion, evidencing the taxonomy usefulness in problems solving aspect.

Thus, after a synthesis of data presented and analyzed, it can be concluded that the FSOs perspective on RELPREV taxonomy use was positive to prevention activities, assisting in the identification of dangers and elaboration of prevention actions. However, obstacles related to time spent in classification phase and the training required to correctly use this tool should be appropriately managed by CENIPA, leading to a maximization of the taxonomy benefits.

5 CONCLUSION

This research objective was the analysis of FSOs perception on RELPREV taxonomy use in Flight Safety activities of Air Operations General Command Air Corps and Air Bases, from January to May, 2013.

Initially a bibliographic research was made to identify fundamental concepts related to RELPREV and its classification system. Characteristics, structure and generic groups of ASRS and RELPREV taxonomies were also identified. In addition to that, Fleishman and Quaintance (1984) assessment criteria were presented, as well as the four aspects of the usefulness criterion: communication promotion, number of users, required resources and taxonomy contribution to solve problems.

Later, the methodology used in the study was presented, including the elaboration of a questionnaire sent to all SIPAER links of COMGAR Air Corps and Air Bases. Besides, Fleishman and Quaintance (1984) usefulness criterion was selected to assess the taxonomy and statistical treatments and the study limitations were described.

Finally, data presentation and analysis were made. Participants experience and technical knowledge were considered appropriate, validating the participants' contribution to the purposes of this research.

With regard to information promotion, it was observed that the use of the taxonomy facilitates information flow among SIPAER links, reaching one of the objective to which this tool was developed and resulting in a positive impact on Flight Safety activities.

Then, the influence of the number of participants in the taxonomy usefulness was assessed. Results evidenced that the option for one single RELPREV taxonomy for all FAB organizations was appropriate, resulting in more significant information and better prevention actions.

In the following aspect, resources required to use the taxonomy presented some obstacles. With regard to training, some participants have considered necessary a specific training to use the tool. This is an important aspect since an incorrect classification may generate inefficient prevention actions. Another difficulty is related to the time required to classify hazard situations, which may prejudice other Flight Safety activities. Finally, in terms of material resources, it was concluded that the problems pointed out were punctual, with no general obstacle in COMGAR Air Corps and Air Bases.

The last aspect assessed was the influence of taxonomy in problems solving. The FSOs positive perception of this matter was confirmed by qualitative comparison between ASRS and RELPREV, confirming that the tool use, with its lists of groups and descriptors assists in the identification of hazards and development of prevention actions.

Therefore, after analysis of all Fleishman and Quaintance (1984) usefulness criterion aspects, it was concluded that FSOs perception on the use of RELPREV taxonomy in Flight Safety activities developed by SIPAER links was positive.

As main contribution from the present study, we may emphasize the evidence that RELPREV taxonomy has a high potential to improve accident prevention in FAB, especially to direct prevention actions with a focus based on data, as provided in SMS. However, CENIPA and other SIPAER links should be attentive to obstacles evidenced in this research, providing opportune training and appropriately managing the time spent in hazards classification phase.

Finally, it should be emphasized that the present research does not exhaust the subject. Since RELPREV taxonomy started to be used recently, which was considered a limitation to this study, other obstacles may arise over time. So, it is suggested that new assessments should be made in the future, when the taxonomy is consolidated as an important SIPAER tool, in order to ensure the continuation of benefits emphasized in this research.

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