Analysis of labour risks in the Spanish industrial aerospace sector

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ABSTRACT

Labour risk prevention is an activity integrated within Safety and Hygiene at Work in Spain. In 2003, the Electronic Declaration for Accidents at Work, Delt@ (DELTA) was introduced. The industrial aerospace sector is subject to various risks. Our objective is to analyse the Spanish Industrial Aerospace Sector (SIAS) using the ACSOM methodology to assess its labour risks and to prioritise preventive actions. The SIAS and the Services Subsector (SS) were created and the relevant accident rate data were obtained. The ACSOM method was applied through double contrast (deviation and translocation) of the SIAS or SS risk polygon with the considered pattern, accidents from all sectors (ACSOM G) or the SIAS. A list of risks was obtained, ordered by action phases. In the SIAS vs. ACSOM G analysis, radiation risks were the worst, followed by overstrains. Accidents caused by living beings were also significant in the SS vs. SIAE, which will be able to be used to improve Risk Prevention. Radiation is the most significant risk in the SIAS and the SS. Preventive actions will be primary and secondary. ACSOM has shown itself to be a valid tool for the analysis of labour risks.

Key words: ACSOM, labour risks, workplace prevention, aerospace industrial sector.

INTRODUCTION

For many years, accidents in the workplace were considered an inevitable consequence of work. In the 19th century a series of active policies was introduced to protect workers. Initially this protection was aimed at the most vulnerable of workers, children, as reflected in legislation passed in the United Kingdom (The Factory Act 1833, Lee WR 1973) and France (Gaumy and Protea 1982). In the same century, Prussia introduced factory inspections by doctors.

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The year 1900 marked the introduction of the first Spanish Labour Accidents Law, to which new regulations have since been progressively added. The Health and Safety Act of 1995 represented a milestone. The addition of the Electronic Declaration of Accidents at Work, (Delt@) in 2003, led to the creation of a database (DELTA), which has allowed more precise epidemiological studies to be carried out, given the greater capacity for statistical analysis.

The 2009 National Classification of Economic Activities (CNAE 2009) was approved by Royal Decree 475/2007 of 13th April. The CNAE assigns a four-digit code to each economic activity that can

be carried out, and allows the selection of codes relating to all economic activities that comprise a given economic sector.

Conte et al. (2007a) developed a theory of accidents in populations, in which the conceptual considerations of accidents in the workplace point towards non-deterministic phenomena, breaking with the Domino Theory of Heinrich (Melia et al. 1998). This theory considers accidents as dynamic events composed of risks and injuries that, when represented in a contingency table, can be studied mathematically. The theory posits that events can be explained after their occurrence. Accordingly, accident rates represent the frequency with which an accident occurs.

A new paradigm, the Accident Soma (ACSOM), arose from this conceptual basis (Conte 2004, Conte et al. 2005, 2011a, Conte and Rubio 2006). This method is based on two hypotheses: the first concerns infection schemes (the probability of suffering an accident is higher in populations that have suffered one before), while the second concerns an empirical application of the law of large numbers (very rare events occur very rarely).

Using a historical record of accidents (Chiara et al. 2009), the objective of ACSOM is to identify the real risk and determine the criteria required for their assessment and prioritisation (Conte et al. 2011a, b), thus allowing preventative actions to be formulated.

A risk-injury binomial is identified for each recorded accident. The list of risks and injuries identified by the International Labour Organisation (ILO) and the area codes for Spain are published in Ministerial Order of 16-12-1987 and are divided into 19 categories each, resulting in the risk-injury (R×I) matrix (19 × 19) used by ACSOM.

The ACSOM method is thus based on the processing of the R×I matrix using statistical techniques (segmentation, multidimensional scaling, factorial analysis, correspondence analysis, cluster analysis and comparison of proportions)

(Conte and Rubio 2005, Conte et al. 2007b, 2011a, b, García et al. 2009). The ACSOM of a country, region, branch of activity, or business will thus be based on the data that comprise the R×L matrix, (García et al. 2009, Rubio et al. 2012). ACSOM G (ACSOM General) is defined as the highest level ACSOM (record of accident rates of the general population of the study) which will later be used as a reference pattern.

A bespoke computer programme, BIOIN (developed specifically for use with the ACSOM method), translates the data from the DELTA or ILO databases, runs comparisons with the aforementioned pattern, and produces the corresponding report (Rubio et al. 2008a, b).

By extrapolating the analysis to any cause-consequence relationship we can obtain individual, specific "ACSOMs" for the areas analysed. The use of the ACSOM method to analyse complications that arise during anaesthesiology and resuscitation (Rubio García et al. 2013) and its inclusion in analytical studies of the seriousness of risks and injuries associated with the accident rate of the Spanish working population (Adesanya et al. 2014) represent new applications of the ACSOM paradigm. Analysis of the seriousness of risks and injuries is performed based on the number of days leave associated with each registered accident.

In Spain, the birth of the aerospace industry was firmly linked to the metallurgical industry, specifically the automotive sector, as exemplified by "Talleres Hereter" and Hispano Suiza (Utrilla 2007) and the railroad sector, the best example of which is the Escoriaza workshops of Zaragoza (Barragán 2005).

Since then, aviation and industry have been closely linked and, as a consequence, the former has shared the risks of the latter. Aviation is also exposed to the generic risks of commercial activity and management, as well as the specific risks associated with flying activities, both "inside" and "outside" the atmosphere (Garcia and Gartman 1998, Patterson and Rayman 1998).

New industrial processes, the addition of new structural materials (Pellet 2001, Brocal 2012), the use of new chemical compounds, highly resistant but demonstrably toxic metal alloys (Falcy 2010), electrical components and procedures needed to achieve ergonomic stability pose major challenges in terms of the prevention of associated risks. Noise as an etiologic agent is a feature of both in-flight and terrestrial activities within the aerospace industry (Normand 2010).

Several authors have highlighted the reduction in the thickness of the atmospheric gas layer and the attendant risk posed by "cosmic" ionising radiation during flight phases (Seigneuric 1991, INSHT NTP-728, Gaona 2010), which has led to most companies classifying air crews as professionally exposed workers (Griffiths and Powell 2012).

The reappearance of forgotten infectious pathologies is a stark reality in developed countries, and is linked to migratory movements and tourism, among other factors (Gestal 1997). Air transport, and by extension aircraft crew, play important roles in both phenomena (legislation exists regarding insect eradication in aircraft cabins) (WHO 2012, Rayman 2006). Passenger attacks on aircraft crews are not a new phenomenon (Rojas and Solano 2007).

Problems associated with carrying out prolonged complex tasks are well documented, particularly in the case of aircraft crews (Lyons and Nace 2007). Connecting risks to injuries in the aeronautic sector, whether associated with specific tasks or not, is a key objective of preventative action. However, even the most exhaustive attempts to achieve this goal are limited to relating risks to injuries in a non-quantitative manner (Briggs 1998, Bourcier 1998). The incorporation of the ACSOM method into the analysis of accident rate (Conte 2004, Conte and Rubio 2005, Conte et al. 2011a, b) overcomes this problem and allows the quantification of risks (Conte et al. 2007b).

This work initiates the study of the aerospace sector, specifically focusing on risks as triggers of accidents. Further studies will address the relationship of risks with specific injuries and the severity thereof.

As such, our aim is to analyse accidents in the aerospace sector using the ACSOM methodology in order to determine the associated specific risks and to prioritise preventative actions.

MATERIALS AND METHODS

MATERIALS

Data were obtained from the DELTA database of the Ministry of Employment, provided by the Spanish Institute of Health and Safety at Work. The data were gathered within the first three years of the creation of the database and relate to all declared accidents in the workplace (TAS - Employment and Social Affairs - Order 2926/2002 of 19th November). The date, risk and the Economic Activity Classification code of the company were extracted from the recorded data.

DELTA uses the new nomenclature of the ILO (Ministerial Order of 19-11-2002); Type of Contact and Injury. It was thus essential to translate this data into risks and injuries, respectively (Rubio et al. 2008a). As mentioned above, this is one of the features of the BIOIN programme (Rubio et al. 2012a). The 19 risks and injuries are listed in Table I.

The Spanish Industrial Aerospace Sector (SIAS) was created based on the 2009 National Classification of Economic Activities (CNAE 2009), and consists of three subsectors (Table II). Within the SIAS, the working population that carries out its activity in businesses directly related to transport and education (instruction) is assigned to a subpopulation (or subsector) known as the Services Subsector (SS). The associated activities are known as Services. The SIAS has recorded 64,562 cases of accidents, of which 18,157 relate to the SS. The total number of accidents recorded in DELTA over the same period was 2,585,539 (see Table III).

TABLE I
The 19 selected Risks and Injuries from the ILO classification.

	CODES OF RISKS			CODES OF INJURIES
R1	Falls of persons from a height (at different level)		L1	Fractures
R2	Slips, trips, falls of persons (at one or same level)		L2	Luxations
R3	Falls of objects on persons by collapse		L3	Twists, strains and sprains
R4	Falls of objects on persons by handling		L4	Back pain (lumbago etc.)
R5	Falls of objects on persons by detachment		L5	Slipped disk
R6	Treading on objects, piercing, cuts, etc		L6	Contusions and internal traumatism
R7	Collision with stationary objects		L7	Amputations and loss of the eyeball
R8	Collision with moving object		L8	Other injuries (piercing, cutting, etc.)
R9	Being struck by objects or tools		L9	Superficial traumatism
R10	Projections of fragments or particles		L10	Bruises, contusions and crushing
R11	Entrapment by or between objects		L11	Objects in the eyes (particles, etc.)
R12	Accidents involving mobile machinery and traffic		L12	Conjunctivitis
R13	Overstrain		L13	Poisoning and intoxications
R14	Thermal contact/exposure		L14	Burns
R15	Exposure to electrical contact		L15	Environmental hazard
R16	Exposure to chemical substances		L16	Suffocation
R17	Exposure to radiation		L17	Electrical effects (shock, etc)
R18	Explosions and fires		L18	Radiation poisoning
R19	Accidents caused by living beings		L19	Multiple injuries

TABLE II
Creation of the Spanish Industrial Aerospace Sector (SIAS).

1. Industrial and Commercial Activities (manufacturing, repair and trade), which includes the following activities

    30.- THE MANUFACTURE OF OTHER TRANSPORT MATERIAL.

        303.- Aeronautic and space construction and relevant machinery

            3030.- Aeronautic and space construction and relevant machinery

    33.- THE REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT

        331.- Repair of metallic products, machinery and equipment

            3316.- Aeronautic and space repair and maintenance

    46.- WHOLESALE TRADE AND TRADE INTERMEDIARIES, EXCEPT FOR MOTOR VEHICLES AND MOTORCYCLES

        461.- Trade intermediaries

            4614.- Trade intermediaries for machinery, industrial equipment, ships and aircraft

2. Service Activities (transport and education) consisting of the following activities:

    51.- AIR TRANSPORT:

        511.- Passenger air transport

            5110.- Passenger air transport

        512.- Air transport of goods and space transport

            5121.- Air transport of goods

    85.- EDUCATION including

        855.- Other education

            8553.- Driving and flying school activities

3. Leisure Activities that include

    93.- SPORTING, RECREATIONAL AND ENTERTAINMENT ACTIVITIES

        931.- Sporting activities

            9312.- Sports club activities

TABLE III
Absolute and relative values of risks in ACSOM-G, SIAS and SS.

RISK	ACSOM G	fr ACSOM G	SIAS	fr SIAS	SS	fr SS
R1	164876	0.06377	2931	0.04540	979	0.05392
R2	216417	0.08370	4510	0.06986	1386	0.07633
R3	100272	0.03878	1970	0.03051	481	0.02649
R4	125423	0.04851	3256	0.05043	523	0.02880
R5	73184	0.02831	1492	0.02311	292	0.01608
R6	8920	0.00345	94	0.00146	23	0.00127
R7	280689	0.10856	7759	0.12018	2320	0.12777
R8	99825	0.03861	2880	0.04461	676	0.03723
R9	168052	0.06500	3813	0.05906	441	0.02429
R10	67890	0.02626	1238	0.01918	208	0.01146
R11	50513	0.01954	1248	0.01933	457	0.02517
R12	180538	0.06983	4719	0.07309	1580	0.08702
R13	923718	0.35726	26017	0.40298	7888	0.43443
R14	5211	0.00202	77	0.00119	32	0.00176
R15	6460	0.00250	86	0.00133	16	0.00088
R16	64424	0.02492	1116	0.01729	207	0.01140
R17	1256	0.00049	263	0.00407	253	0.01393
R18	4803	0.00186	75	0.00116	13	0.00072
R19	43068	0.01666	1018	0.01577	382	0.02104
TOTAL	2585539	1.0000	64562	1.0000	18157	1.000

METHODS

The ACSOM method was used, given its utility for the comprehensive processing of data related to accidents in the workplace based on the comparison of the sectors to be analysed with the reference pattern (García et al. 2007, Rubio et al. 2012). In this case, the relevant comparisons were SIAS vs ACSOM G and SS vs SIAS.

The BIOIN programme was used to process already-translated data, present results and to draft the phased planning report on the risks for which preventative action will be developed (Rubio et al. 2008a, b, 2012, Torner et al. 2008).

The General ACSOM (ACSOM G) or accident pattern for the entire Spanish working population during the period studied is represented by a descending polygonal line. The ordinate axis shows the frequency with which a certain risk causes an accident and the abscissa shows the risks ordered from lowest to highest frequency.

The corresponding polygonal line was also calculated for the SIAS, for comparison with ACSOM G. Subsequently, the SIAS was used as a pattern or ACSOM of the sector for comparison with the Services Subsector, for which the polygonal line was also calculated.

Comparison of the ACSOM pattern with the relevant sector or subsector allows analysis of the accident scenarios within the sector of interest. This is a dual comparison, given that it involves statistical comparison of proportions and comparison of the order of each series.

Haberman's adjusted residuals, which are generally referred to as Adjusted Residuals (AR), were used for the statistical comparison of proportions (although Freeman-Tukey's residual was used for risks whose expected frequency was less than 5). AR values higher or lower than +/-1.96 were considered significant deviations. Values greater than +1.96 and less than -1.96 are

considered excess deviation and default deviation. Values lying between each of these limits are considered equal deviation.

The second comparison compared the order of the risks in each series. Risks were ordered from highest to the lowest in each series according to their frequency. Differences in the order of risks in the analysed sector with respect to that of the reference pattern are known as translocations (García et al. 2009). A positive number (number of steps forward) or a negative number (number of steps back) is assigned depending on how far up or down the series each risk moves relative to the ACSOM. Values greater than 1 are deemed advanced translocations and values less than -1 backward translocations. Values between +1 and -1 are termed equal translocations.

The ACSOM method generates a risk diagram, which consists of the polygonal line of the reference pattern (in the first case ACSOM G and in the second SIAS) and the polygonal line of that with which is to be compared (in the first case SIAS and in the second the Services Subsector). A second diagram that includes the calculated statistics (Deviations and Translocations) is also created. Each risk is assigned two columns in this diagram with the relevant values; the first column relates to translocations and the second to deviations.

Through the BIOIN programme, which combines both statistics, the ACSOM method produces reports that include the risks ordered by activity phases.

Initially, if we consider all possible combinations of both statistics, there can only be 9 phases.

The first phase includes the risks that perform worst result relative to the reference pattern: excess deviation and advanced translocation. These are ordered within each phase according to the corresponding deviation value. In the event of two or more identical deviation values risks are ordered based on the corresponding translocation. The final phase includes the risks that show the best results,

TABLE IV
Generation of Phases by BIOIN.

DEVIATION	TRANSLOCATION	PHASES
Excess	Advanced	1
	Equal	2
	Backward	3
Equal	Advanced	4
	Equal	5
	Backward	6
Defect	Advanced	7
	Equal	8
	Backward	9

i.e., those that perform better than the pattern: defect deviation and backward translocation (Torner et al. 2008, García et al. 2009). If a given risk is placed first in the frequency order in both series, and the deviation value is significant (excess deviation), the programme considers this an advanced translocation and moves on to Phase 1 (Table IV).

The risks that perform the worst are considered "weaker". This weakness represents vulnerability, as these are risks whose prevention could be made more effective and efficient, given that the corresponding values are higher than those of the reference pattern in both comparisons (deviations and translocations). These risks are deemed Priority Action. Conversely, "stronger" risks are less vulnerable.

The severity of each risk is classified in accordance with the method described by Adesanya et al. (2014). Those authors used data mining methods, specifically Cart and CHAID classification trees, to classify severity at the national level based on the number of days leave associated with a given accident.

RESULTS

RESULTS OF THE ANALYSIS OF RISKS IN THE INDUSTRIAL AEROSPACE SECTOR (SIAS) AS COMPARED WITH THE ACSOM OF THE SPANISH WORKING POPULATION (ACSOM-G)

The SIAS vs ACSOM G comparison is shown in Figure 1, and the dual comparison between the two sectors in Figure 2.
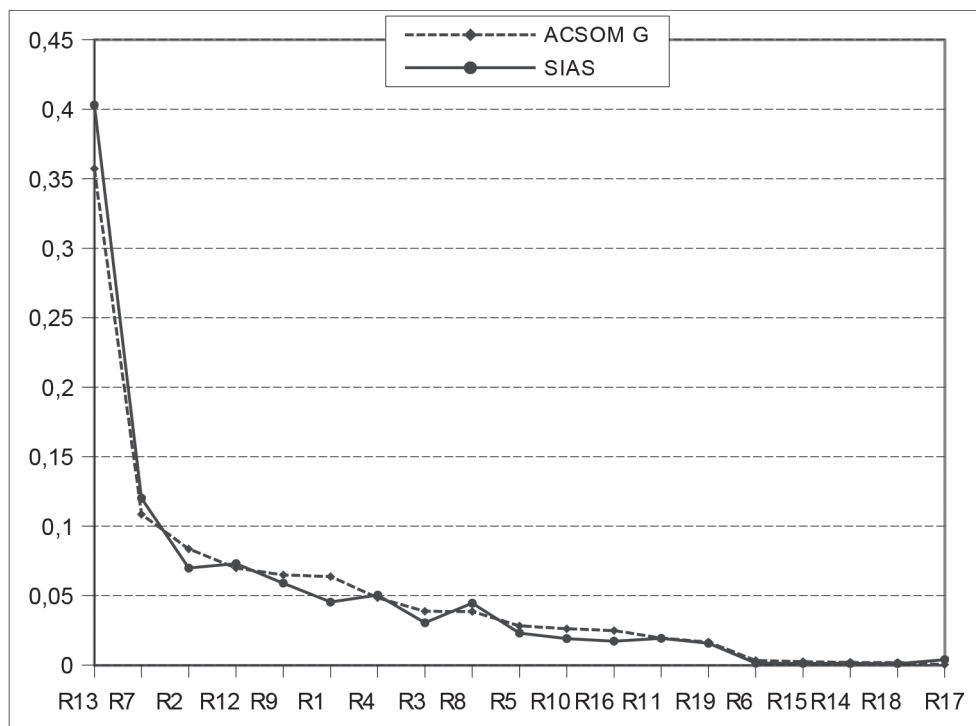
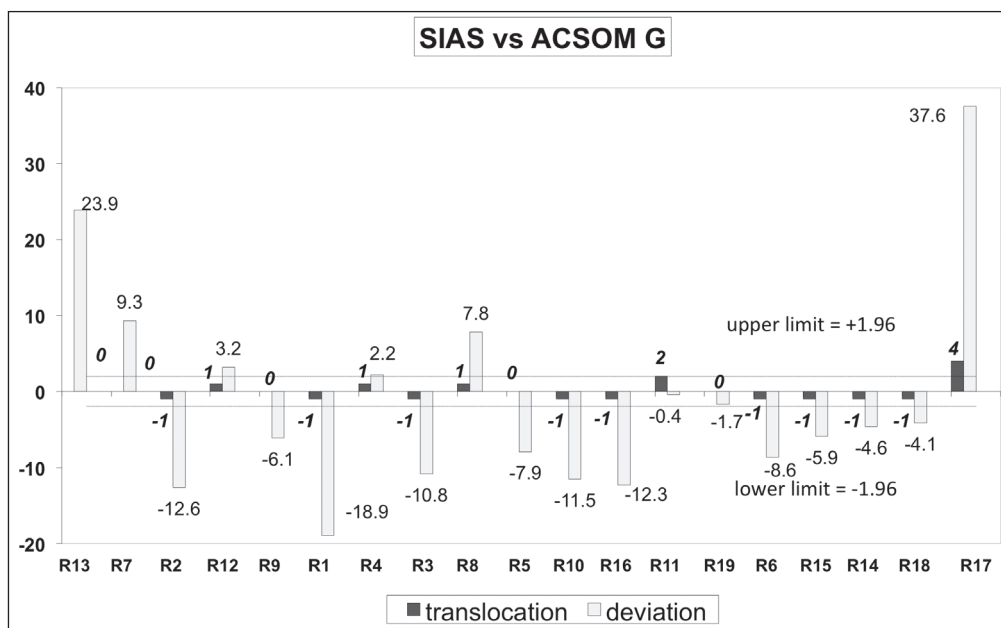**Figure 1** - SIAS vs ACSOM G Polygonal Lines.

Figure 2 - SIAS vs ACSOM G Dual Comparison.

The highest deviation values (AR) were detected for R17 risks (Exposure to radiation) and R13 risks (Overstrain) (37.6 and 23.9, respectively). The following risks also showed significant positive deviations: R7 (Collision with stationary objects), 9.3; R8 (Collision with moving object), 7.8; R12 (Accidents involving mobile machinery and traffic), 3.321; and R4 (Falls of objects on

persons by handling), 2.2. All other risks were non-significant or showed negative values (*i.e.,* performed better than the ACSOM G).

For translocations, generally low values were observed in the second analysis, except in the case of R17 (Exposure to radiation), which showed a positive value of 4 units. R11 showed a positive value of 2 units. All other risks showed changes of 1 (+/-1) unit, or retained their position.

R13 was the first risk in order of frequency, as also seen in the reference pattern. Accordingly, this risk showed no translocation and a significant AR,

which led to the programme placing it in the first phase (as described in the Method).

Based on the aforementioned results, the BIO-IN programme proposed a phased prioritisation (Table V).

RESULTS AND ANALYSIS OF RISKS IN THE SERVICE SUBSECTOR (SS) VERSUS THE SPANISH INDUSTRIAL AEROSPACE SECTOR (SIAS)

The Services Subsector vs. SIAS comparison is shown in Figure 3, and the dual comparison between the two sectors in Figure 4.

TABLE V
SIAS vs ACSOM Phases.

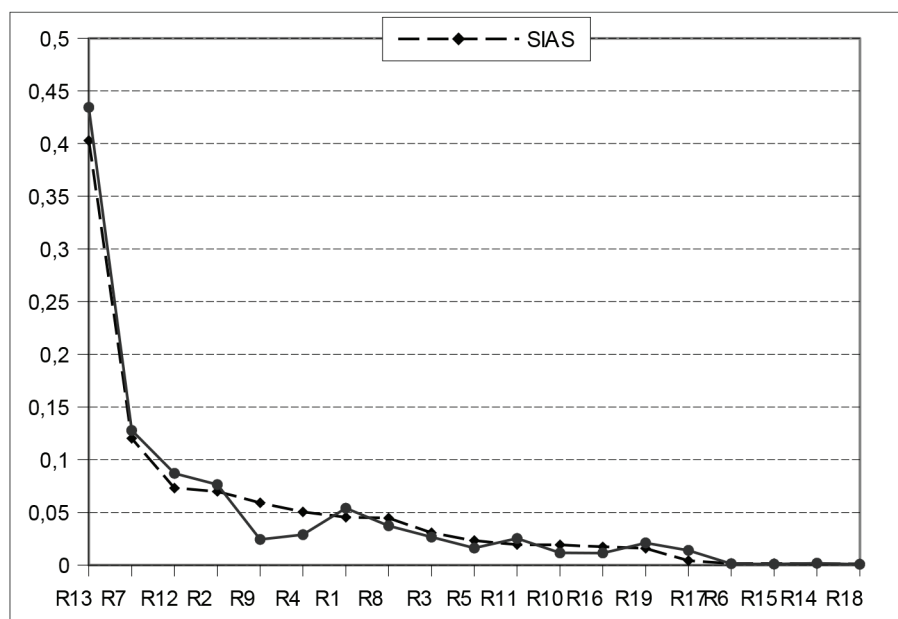| DEVIATION	TRANSLOCATION	PHASES	RISKS
	Advanced	1	R_{17}, R_{13}
Excess	Equal	2	R_7, R_8, R_{12}, R_4
	Backward		
	Advanced	3	R_{11}
Equal	Equal	4	R_{19}
	Backward		
	Advanced		
Defect	Equal		
	Backward	5	R_{18}, R_{14}, R_{15}, R_9, R_5, R_6, R_3, R_{10}, R_{16}, R_2, R_1

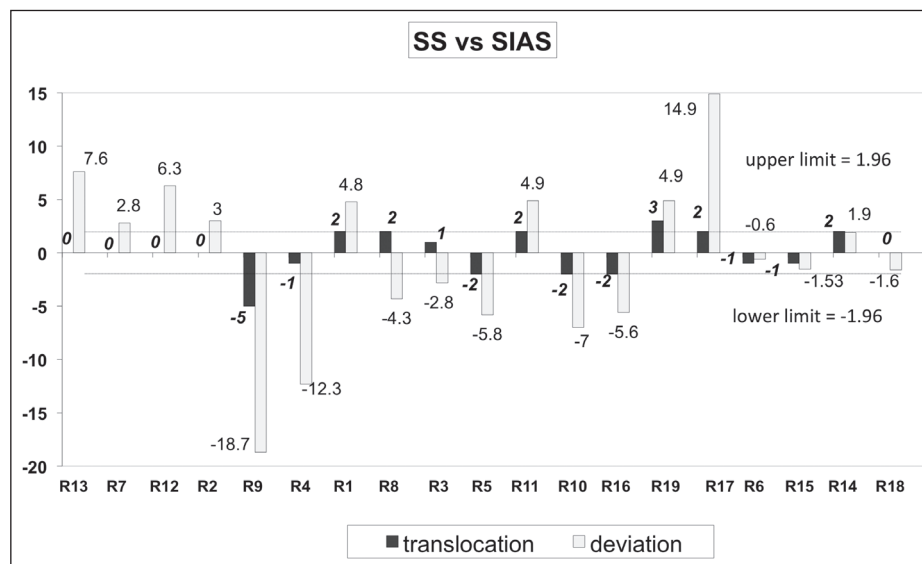**Figure 3** - Services Subsector (SS) vs SIAS Polygonal Lines.

Figure 4 - Services Subsector (SS) vs SIAS Dual Comparison.

The highest deviation was observed for R17 (Exposure to radiation, 14.9), followed by R13 (Overstrain, 7.6); R12 (Accidents involving mobile machinery and traffic, 6.3); R11 (Entrapment by or between objects, 4.9); R19 (Accidents caused by living beings, 4.9); R1 (Falls of persons from a height (at different level), 4.8); R2 (Slips, trips, falls of persons (at one or same level), 3); and R7 (Collision with stationary objects, 2.8).

Regarding translocations, positive values (advanced) were observed for R19 (3 units), R1, R8, R11, R17, and R14 (2 units), and R3 (1 unit).

Based on these data, the BIOIN programme proposed another phased order (Table VI).

DISCUSSION

Our findings emphasise the importance of the risk posed by R17 (Radiation) within the workplace. This risk was very uncommon in the reference pattern (ACSOM G), and as reported by Adesanya et al. (2014), poses very little danger to the general population. However, in both SIAS and SS a significant increase was observed in R17 (Radiation) with respect to the reference pattern, resulting in the highest deviation value for SIAS (AR= 37.6). It would be inconceivable that, given the high value of the contrast, this could pass unnoticed. Moreover, despite being a near-irrelevant risk in ACSOM G,

TABLE VI
Phases SS vs SIAS.

DEVIATION	TRANSLOCATION	PHASES	RISKS
Excess	Avanced	1	R_{17}, R_{13}, R_{19}, R_{11}, R_1
	Equal	2	R_{12}, R_2, R_7
	Backward		
Equal	Avanced	3	R_{14}
	Equal	4	R_6, R_{15}, R_{18}
	Backward		
Defect	Avanced	5	R_8,
	Equal	6	R_3, R_4
	Backward	7	R_{16}, R_5, R_{10}, R_9

in SIAS R17 (Radiation) is found in the DELTA database declarations at a higher frequency than R6 (Treading on objects, piercing, cuts, etc.), R15 (Exposure to electrical contact), R14 (Exposure to thermal contact heat strain) and R18 (Explosions and fires). This observation is in line with the concern that those working in the aerospace sector, and in aircraft maintenance and passenger control, may be exposed to ionising radiation (essentially cosmic radiation and industrial X radiation) (Garcia and Gartman 1998, Patterson and Rayman 1998, Griffiths and Powell 2012).

The SS vs. SIAS comparison revealed a high deviation value for R17 (AR =14.9), which occurred at a higher frequency than R16 (Exposure to chemical substances) and R10 (Projections of fragments or particles), underscoring the importance of this risk in the Services Subsector.

Another significant risk is R13 (Overstrains), for which the second highest positive AR value was detected in both the SIAS vs. ACSOM G and SS vs. SIAS comparisons. This finding confirms the importance of R13 in aerospace activity (Gaona 2010); this risk was the most frequent in both sectors (SIAS and SS), as well as in ACSOM G. Moreover, the AR values for each "sector" with respect to the reference pattern were positive and significant. These results are in good agreement with the literature on "overstrain" (Briggs 1998). In the general population, the seriousness associated with R13 is moderate (Adesanya et al. 2014).

R19 (Accidents caused by living beings) was positioned third in terms of vulnerability, which Adesanya et al. (2014) also considers a moderate risk. Comparison of SS with SIAS revealed a translocation of 3 units and an AR of 4.9 for this risk, supporting the risk prevention measures against insects proposed by the WHO (WHO 2012). The influence of transport on the increase in infectious diseases was demonstrated by Gestal Otero (1997). Within the category of "Accidents caused by living beings" physical attacks by passengers on flight crews, mainly cabin staff, should also be considered (Rojas and Solano 2007).

Given that the importance of R17 was further highlighted in the SS vs. SIAS comparison, the following should borne in mind:

- The Services Subsector (SS) accounts for the significance of R17 in the SIAS.
- Given the difficulty in controlling exposure to ionising radiation in air transport, the "vulnerability" of this risk should be considered not as an indicator of the efficiency of controI, but rather an indication of the idiosyncrasy of the sector analysed.
- In this case, the "vulnerability" of a risk could be interpreted as the possibility of an increase in the incidence of the risk if the preventative pressure decreases, even slightly. In this sense, the maintenance of health and safety campaigns and monitoring of working conditions can help prevent increases in accident rates.

It should be emphasised that the BIOIN programme establishes a prioritisation of phases that represent the risk management recommendations made by ACSOM.

ACSOM limits itself to ordering risks from "worse" to "better" within the various action phases (without entering into technical considerations) and only provides information and guidelines to facilitate risk prevention.

It is the responsibility of health and safety officers to determine whether the "most vulnerable" risks should be subject to new actions or whether it is sufficient to continue with preventative pressure. In other words, health and safety officers should determine whether, at least in theory, all possible preventative actions are being or have been taken. If this is the case, a certification should be issued, and the next most vulnerable risk be examined.

Various conclusions can be drawn from the risk prevention point of view, depending on the level of the population with which the comparison is made.

- From the comparison of SIAS with the general pattern (ACSOM G), general conclusions can be drawn for future health and safety campaigns. In this case, primary prevention policies can be considered, such as health and labour education within the area of prevention.

- From the comparison of the Services Subsector with the SIAS, general conclusions can be drawn that will be used for future prevention campaigns, which should be more specific and should include more precise objectives. Secondary prevention policies will also be considered, including prevention campaigns addressing specific risks aimed at both for workers and companies.

- Finally, tertiary prevention techniques should be applied in cases in which a given company is compared with the subsector within which its business activity is categorised. Specific preventive action is required for any vulnerable risks identified.·

CONCLUSIONS

Our findings indicate that risks associated with radiation are significant in the industrial aerospace sector, in good agreement with empirical data from this sector. Moreover, our data show that the Services Subsector is the principal contributor to this outcome.

Overstrain was the most frequent risk in all three series analysed (ACSOM G, SIAS, and SS), and showed significant deviation values in both the SIAS vs. ACSOM G and SS vs. SIAS comparisons. As shown for radiation risks, this outcome can be attributed to the influence of the Services Subsector.

The risk of accidents caused by living beings is especially significant, given its high frequency in the Services Subsector. This risk was found to be specifically linked to the SS, rather than a feature of the overall sector (SIAS).

In summary, the ACSOM method has proved to be a valid tool for the analysis of risks in the workplace and in this particular sector, and allows for the prioritisation of the actions of health and safety officers. Given that our analysis focused on the SIAS and its SS (and not businesses), the preventative measures to be taken are primary and secondary prevention measures.

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