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Safety Contributions, Events and Operating Context as Criteria in Safety Awards: A Case Study from a Large Organisation

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Abstract: Although the value and impact of safety award programmes (SAPs) have been criticised in literature, various programmes still operate within and across industries to recognise safety achievements, motivate employees and organisations, promote participation in safety improvements and raise the overall profile of nominees. In our study, following the request of a large aviation organisation (LAO) already implementing a SAP based merely on rates of safety events and occurrences, we introduced an award scheme by including and balancing safety positives and negatives as per the suggestions of contemporary safety thinking. The new SAP was based on the existing safety management system of the organisation and the data already available, included contributions to safety and considered differences in the context nominees operated along with lagging indicators. The pilot implementation of the new programme resulted in remarkable differences from the results obtained via the previous award scheme, a finding that satisfied management. Nonetheless, difficulties relating to the inadequate understanding of the new SAP by the targeted nominees and inconsistencies in the recording of data across the organisation led to the suspension of the programme after its first launch. Due to its limitations, this study does not recommend a safety awards standard for the industry. However, its methodological approach, the concepts embraced and the difficulties encountered could be considered by any organisation.

Keywords: safety awards; safety initiatives sustainability; safety contributions; safety management

1. Introduction

Sustainability of health and safety initiatives has attracted little attention in the literature, although several studies indicate its importance across diverse settings. For example, Nilsen et al. [1] examined ten Swedish community-based injury prevention programmes to identify factors relating to sustainability. Their findings suggested that financial, human and relational resources were influential on the operation of the programme, and dependency on a few persons could compromise sustainability. In the healthcare sector, employee participation and the development of skills and habits were shown to be determinative in ensuring a sustainable programme on teaching quality improvement and patient safety [2]. In the same sector, Stuijt et al. [3] identified education, standardised protocols and consultation with patients as critical to the sustainability of a medication safety programme.

In the public sector, Merad et al. [4] highlighted the essential role of internal and external aspects of the critical capital of organisations including their functioning, execution of their mission to meet public and common needs, and organisational memory. Walker et al. [5] dealt with the sustainability of training programmes focused on child passenger safety across six countries. They found positive effects of gradual approaches to change, identification of key stakeholders, provision of awareness training, and encouragement of participants to enrol in the programmes. Large-scale initiatives, such as the foundation of the Center for Safety and Health Sustainability (https://www.centershs.org/), acknowledge sustainable development must be part of health and safety activities through consideration of internal parameters (e.g., workforce and staffing, budget allocation, organisational objectives), as well the community, customers and the environment [6].

Although the concept of safety awards has been discussed in academic and professional literature for decades, there is not yet a uniform picture of the utility and impact of safety awards in terms of their sustainability. Tam and Fung [7] identified safety awards as a means to reduce accident rates to the lowest level and promote safety awareness within an organisation. Interestingly, the authors above found that safety award campaigns designed for senior managers, project managers, and safety officers were more effective as these roles are the most influential in implementing and promoting a safety culture within enterprises. However, Geller [8] argued that although recognising an individual via safety awards and incentives does not guarantee the individual's behaviour will be influenced or improved directly, there are other benefits attributed to safety rewards. For example, interpersonal recognition and positive feedback would reveal unseen aspects of individuals or groups, thereby indirectly improving safety-related behaviours.

According to the literature cited by Vredenburgh [9], a well-designed safety-incentive programme encourages the reporting of workplace hazards. Such programmes must run in parallel with safety education and training, and a successful safety-incentive programme must be recognised and well-received within an organisation. Romano [10] cited perspectives of healthcare professionals who believed safety awards motivate employees and organisations to promote safety and help recognise organisations "walking the extra mile" to improve and promote health and safety. Besides, safety awards can contribute to a positive safety culture within an organisation, building a safety mindset and encouraging employees to get involved in safety improvement strategies and processes [11–13].

Moreover, Ghasemi et al. [14] highlighted that, amongst other preconditions, safety awards and incentives could be used to enhance safety performance and encourage employees to participate in safety programmes. Nevertheless, the authors above urged organisations to review and modify their safety award/incentive programmes as they found the value of incentives dwindles over time. Similarly, McSween [15] purports that varying safety awards and criteria " . . . keeps the awards novel and help keep employees interested and thinking about safety." Even more recent viewpoints suggest the potential of safety awards to motivate employees to perform operational work safely, promote "safety work" within an organisation and reinforce safety norms and values [16].

Tait and Walker [17] found the motivation for safety awards can move beyond improving workplace health and safety standards to acknowledging the achievement of safety standards. Therefore, safety awards can be used to enhance company reputation, especially for organisations in high-risk industries. Additionally, Tait and Walker [17] claim a safety award provides a benchmark against industry standards which can drive additional investments in health and safety initiatives. A safety award can also indicate high safety performance within the award-winning organisation and reflect a commitment to allocation of safety resources [18].

However, safety award programmes come with limitations and criticism. For example, Geller [8] noted that offering awards and incentives for fewer injuries and/or incidents can lead to under-reporting and under-recording of workplace safety events. This could encourage organisations to cover up injuries and incidents, which, in turn, leaves little or no room for investigating and correcting causal and contributory factors. On the individual level, rewarding safety incentives can impose pressure

on employees and emphasise rewards and incentives rather than the overall goal of promoting and improving safety, thus driving staff to under-report and not document workplace incidents [19,20].

Furthermore, Gerard [21] argued safety awards do not recognise the key people actively involved in introducing and improving process safety management to eliminate workplace catastrophes. According to Gerard [21], safety awards promote workplace complacency, thereby subtly encouraging employees not to report workplace injuries. Further, such awards might lead current and potential employees to perceive an organisation with several safety awards is a safe or risk-free employer [21], which might not be true [22]. Caponnechia [23] revealed that since incentive schemes tend to reward certain behaviours, they can lead to possible manipulation of performance measures, especially if a safety scheme or award is based on a scoring system. Moreover, scoring schemes can stifle involvement in safety promotion or improvement processes as they could be perceived as assessments of individuals [24].

Accordingly, Gerard [21] urged the US Occupational Safety and Health Administration (OSHA) to review the standards and criteria for safety awards. Similarly, Romano [10] highlighted the necessity to ensure objectivity within organisations running safety award schemes. As the UK Health & Safety Executive [25] suggests, if workers are not rewarded equally or any scheme does not identify and reward those who have been seen to promote safety, employee motivation to comply with an organisation's health and safety strategies might be reduced.

To obtain a representative picture of the safety award schemes over time, we consulted various sources on the types and targeted industries of such programmes and the criteria involved. Although we did not perform a systematic or scoping review on this topic, the information collected was deemed adequate to understand the degree of implementation of safety award programmes and their basic characteristics. The results of this review are presented in Appendix A, where Table A1 reports examples of award types (i.e., organisational, team/department and individual), Table A2 includes examples of past and current award schemes, and Table A3 mentions the safety award criteria in the publications reviewed.

The information in Table A1 indicates that safety awards are discussed as a safety management aspect used to recognise individual, team and organisational performance despite the caution needed and the respective limitations, as outlined in the literature reviewed above. As shown in Table A2, various industry sectors have adopted a mixture of award types, and these are still part of safety promotion initiatives. Hence, safety awards programmes still operate in the industry despite the criticism. Last, the criteria of safety awards concerned, Table A3 includes a mixture of parameters relating to the rate of adverse safety events and contributions to safety improvements.

Although the information shown in Table A3 is not exhaustive, it seems that criteria relevant to incident/injury rates have been widely included in safety awards without neglecting to recognise safety contributions. Nonetheless, several award schemes refer to safety targets and performance without specifying whether these correspond to lagging or leading safety metrics, or combinations of those. Notably, too, the publications reviewed do not detail the assessment and ranking parameters for qualitative aspects such as "team safety thinking performance," "risk management improvement," "safety ideas and innovations," etc. Thus, despite intentions to improve such programmes, the lack of publication of assessment standards and data might threaten the credibility of the awards, generate doubts about their integrity and create resistance to participating.

To examine the extent to which the introduction of additional or different criteria for safety awards could be applied to organisations and what enabling factors or obstacles could emerge from their implementation, we conducted a respective study in a large aviation organisation (LAO). The specific organisation organises a "safety week" annually to promote safety through dedicated activities and events. During the particular week, amongst other items, the organisation runs its safety awards programme to recognise the safety achievements of operating subdivisions and individuals. The organisational expectations from the safety promotion week and the awards are the cultivation of safety culture and improvement of safety records.

Following an agreement with LAO to investigate the feasibility of a new programme, this study examined how an award scheme could be enriched with criteria reflecting the contribution of operating subdivisions to various safety initiatives as well as their operating context. Upon request from the organisation, our research excluded awards presented to individuals. After the design and a pilot study, we introduced a new safety awards scheme which was initially accepted by LAO but suspended after its first launch. In the following sections, we present the context and methodology of our study, the results and insights gained during the pilot phase and the first implementation of the new programme.

2. Study Context

The aviation organisation under study operates in Europe and, apart from flying capabilities, maintains ground operations, engineering/maintenance and logistics functions. The authors were not allowed to disclose any further information that could lead to the identification of the organisation. According to the policy published internally by LAO, the goals of its safety management system are to identify and mitigate hazards and risks; ensure a safe and healthy working environment for everyone; investigate safety events to implement measures and avoid similar issues in the future; minimise the effects of its operations on the society and the environment; promote a positive safety culture through communication and education that fosters active contributions to improving safety programmes and performance. The organisation achieves the operationalisation of its safety policy summarised above through the following programmes.

Local accidents/incidents prevention registry: this programme roughly resembles the concept of risk registry applied broadly to many industries. LAO requires operating subdivisions to maintain records of their identified hazards/risks along with planned and finalised mitigation measures. These records are updated periodically following inputs from local activities (e.g., inspections, observations) and organisation-wide instructions, directives, etc.

Hazard reporting: personnel are encouraged to report any condition that could influence safety negatively and are prompted to state relevant recommendations. Participation is voluntary and offers a channel for staff to share safety observations and concerns, anonymously or not, without the fear of repercussions.

Operational risk assessment: according to LAO's procedures, before each flight, major ground service/maintenance activity and ground transportation outside the geographical boundaries of subdivisions, the end-users (individuals or teams) must assess the overall safety risk level of their specific activity. This procedure aims to raise awareness of personnel about cumulative risks deriving from separate hazards/risks, which in isolation are within predefined thresholds (e.g., weather minima, rest hours, state of equipment) but jointly might lead to high risk levels. The organisation has defined four cumulative risk levels, where "1" is the minimum level and "4" the highest. Depending on the risk level, the authority to proceed with the activity is delegated either to individuals/teams involved in risk level "1" activities or supervisors, managers, etc. for the rest of the risk levels.

Defect reporting: this item captures unusual behaviours of technical systems not described in technical documentation. In addition to the implementation of respective corrective actions, data from this programme can inform safety investigation committees in case of events attributed to technical failures.

Safety training and education: in addition to the safety training provided during inductions and periodically at operating subdivisions, the organisation runs various courses to educate staff with safety responsibilities (e.g., accident/incident prevention, safety investigations, safety inspections and audits, operational risk management and crew/team resource management).

Safety magazine: the particular quarterly publication is distributed across all staff. It includes various articles about safety developments internally and externally to the organisation, as well as articles authored by employees who want to share useful safety cases as well as positions, reviews and ideas.

Bird strike prevention: this item aims to minimise collisions between birds and aircraft during any flight phase. Flight operation subdivisions are expected to analyse, consider and address related factors such as bird concentration areas around host and destination airports and along flying routes. This necessitates collaboration with local airport services and authorities.

Foreign Object Damage (FOD) avoidance: the particular initiative has a focus on controlling conditions that could lead to FOD to aircraft surfaces and engines. Although flight operations subdivisions are not the only parties responsible for avoiding FOD events, they are expected to collaborate with all related agents per airport (e.g., ground services, airport authorities).

The organisation was operating a safety awards programme (SAP) as part of its endeavours to promote safety, improve its safety performance and, through the latter, yield overall benefits for the organisation. As per its written policies, the LAO expects that a SAP motivates personnel to maintain and increase safety levels, intensify their efforts to prevent incidents and accidents and set the example for others. During its annual safety week, amongst other safety promotional activities, the organisation rewarded flight operations subdivisions based on the rate and severity of their safety events. According to the previous programme, any operating subdivision with an accident, as defined by ICAO [26], in the last calendar year was excluded from the list of award candidates. For the flight operations subdivisions eligible to nominate for the SAP, the award was presented to the one with the lowest score "S" according to the following formula and Table 1.

$$S = \{[(A1 * W1) + (A2 * W2) + (A3 * W3) + (A4 * W4)] * 1000\}/FH$$

where FH represents the total flight hours in the previous calendar year.

Table 1. Event severity categories.

Severity Code (A)	Severity Criteria	Weighing Factor (W)
A1	Serious incident as per the definition of ICAO [26]	W1 = 30
A2	Incident as per the definition of ICAO [26]	W2 = 20
A3	Any other safety occurrences not falling under the accident and (serious) incident definitions	W3 = 15
A4	Any safety event inflicting damages on third parties without direct implications and costs for the organisation	W3 = 10

Similar safety awards were presented to operating subdivisions with transportation activities as their primary function; the difference was that instead of flight hours, the denominator used was the kilometres driven. No other award was foreseen for operating subdivisions with ground activities only, such as maintenance, engineering and logistics. Furthermore, ground and road safety events were not considered in the scores of flight operating subdivisions with considerable ground services and transport capabilities.

3. Materials and Methods

3.1. Methodology

The design and pilot application of the new safety awards programme was based on the stepped approach presented in Table 2 and explained further in the following (sub)sections. The design of the new SAP was based on discussions between the researchers and one staff member who was responsible for LAO's safety statistics and promotion and was appointed as the liaison point between the team and the organisation. Therefore, all references to meetings and discussions with LAO in Table 2 and from this point onwards in the paper represent the information, requirements and perspectives the staff member shared with the researchers. The development of the programme described hereafter was the result of continuous cooperation with the organisation as the end user and the product of

several exchanges between the researchers and the appointed staff member. The latter informed the researchers he was coordinating the progress and deliverables of this project with other stakeholders across the organisation. However, the research team did not directly contact any other staff from LAO, and we expected that the appointed representative was expressing the collective perspectives and ideas of the organisation.

Table 2. Methodological approach.

Step	Persons Involved	Activities	Outcomes
S1	Research team	Literature review on advantages and disadvantages of SAPs and respective recommendations. Literature review on contemporary approaches to safety management.	Comprehensive summary of literature (*see Section 1 above and Section 3.2 below*).
S2	LAO and researchers	Kick-off meeting with LAO's representative; explanations about LAO's safety management system; discussion of expectations from the new SAP; presentation of literature review results.	Collection of information for the rationale and implementation of the previous SAP; reception of copy of current safety management activities (*see Section 2 above*). * Initial agreement on the concept of new SAP (*see Section 3.2 below*).
S3	Research team	Connections of current SAP and safety management activities with literature suggestions based on the concept agreed with LAO.	Mapping of connections and preparation of a draft concept for the new SAP.
S4	LAO and researchers	Presentation of the draft concept; discussions about inclusion and exclusion of factors in the new SAP.	* List of parameters to be considered in the SAP (*see Section 3.3 below*).
S5	Research team	Design of SAP factors to reflect the parameters agreed with LAO; desk-based tests of SAP with use of random numbers to ensure avoidance of biases from effects of specific factors in the final score.	Draft version of SAP.
S6	LAO and researchers	Presentation of draft SAP; demonstration of application through fictious but realistic numbers provided by LAO; discussions about adjustments.	* Final version of SAP (*see Section 3.4 below*).
S7	LAO (the research team was kept informed about the progress)	Collection of data and pilot application of new SAP.	Comparison of scores between previous and new SAP; LAO's satisfaction from the results (*see Section 3.5 and 4.1 below*).
S8	LAO (the research team was kept informed about the progress)	Official launch of the new SAP across the organisation.	Suspension of SAP due to difficulties and resistance to collect necessary data from all nominees; overall cancelation of collective safety awards (*see Section 4.2 below*).
S9	LAO and researcher	Administration of survey to collect perceptions and comments about the new SAP and revise/modify the programme accordingly.	Not realised due to the suspension of the new SAP.

* Following periods of internal discussions between the appointed staff member and other LAO stakeholders.

3.2. Initial Discussions (Steps 1 and 2)

The overall aim stated by the organisation at the beginning of the project was to suggest a safety awards scheme fairer than the existing one, relatively simple to deploy, sustainable and based on data LAO was already collecting. At the same time, the researchers shared with the organisation contemporary safety approaches, such as Safety II [27], the importance of promoting leading safety indicators [28] as well as literature suggestions about safety awards [15]. Considering that Erickson and Farmer [29] advocated a tailored scoring system to allow accurate and realistic performance measurement and encourage employee participation in safety improvements, it was agreed that the development of the new SAP should account for safety contributions and the operating context without excluding lagging safety metrics such as rates of safety events and occurrences.

The organisation agreed that the new programme should communicate that, within a collective, organised, functional and participatory safety management system, all factors are equally reflective of the achievement of its objectives. Hence, the mutually accepted approach was that positives and negatives are equally important and should be accounted for in the safety awards. The underpinning rationale was that positives could indicate interest in promoting safety, whereas negatives can mirror decreased effectiveness of the implementation of existing safety programmes within a given environment. However, instead of adopting a deterministic approach to the severity of events, since a low severity occurrence could be the result of pure lack and not the outcome of full control over the unfolding situation [30], we proposed all adverse safety events would be counted as one category.

Nonetheless, LAO insisted that subdivisions involved in an accident the year before should not be considered as nominees for safety awards. This requirement was respected by the researchers based on two parameters. First, as the staff member explained, the prevalent organisational culture suggested that extremely adverse events must have had extremely bad causes. Although we shared some of the criticisms on this approach [22], LAO decided it would be inappropriate to consider subdivisions who were involved in an accident the year before. Second, the investigation of accidents was taking a relatively long time to complete, about 1.5 years on average. Therefore, according to the feedback received from LAO, it would be awkward to nominate an operating subdivision involved in an on-going safety investigation. Nevertheless, considering accidents were extremely rare, we agreed that their exclusion would not distort the results significantly.

3.3. SAP Paremeters and Criteria (Steps 3 and 4)

Table 3 reports the criteria and parameters considered for the new safety awards programme and related to the subdivision profiles and safety aspects. The rationale for the inclusion of those criteria/parameters was based on the discussions with the organisation and is reported in the last column of the particular table. The different criteria applied to the various types of subdivisions as per their principal activity/function are outlined. Station-type subdivisions with flight operations, ground service activities and transport/logistics functions represented the cases where the full set of criteria applied. Additionally, the corresponding data referred to the previous calendar year. All data were available to the safety department of LAO and could be verified through a cross-reference with the data recorded by the respective subdivisions.

The "Local accidents/incidents prevention registry" element of the safety programme was not included in the list of criteria because it is partially retrofitted with information from other programmes and there was no quantified metric associated with it. Besides, the "Defect reporting" element was not considered as it was mainly associated with equipment design and manufacturing problems outside the control of LAO's subdivisions.

Table 3. Criteria and parameters considered for the new safety award programme (SAP).

Code	Criterion/Parameter	Flight Subdivisions *	Ground Service Subdivisions	Transport Subdivisions	Rationale
	Operating and Subdivision Profile Parameters and Criteria				
NFL	Number of flights **	X			More flying hours correspond to higher chances of risk exposure
NFH	Number of flying hours **	X			More flights correspond to higher chances of risk exposure
NKM	Number of kilometres driven **	X	X	X	More kilometres correspond to higher chances of risk exposure
FTE	Number of full-time equivalent staff **	X	X	X	More staff increase operational capacity of the subdivision and offer more chances for contributions to safety initiatives
ORA	Results from Operational Risk Assessments	X	X	X	Higher number of high-risk ORAs represent operations in more adverse conditions
AAV	Average service availability of aircraft fleet (%)	X			The higher the aircraft availability, the more advantageous for the subdivision
AAG	Average age of aircraft fleet	X			The younger the aircraft fleet, the more advantageous for the subdivision
VAV	Average service availability of vehicle fleet (%)	X		X	The higher the vehicle fleet availability, the more advantageous for the subdivision
VAG	Average age of vehicle fleet	X	X	X	The younger the vehicle fleet, the more advantageous for the subdivision
BAG	Average age of buildings/infrastructure own or leased by LAO	X	X	X	The younger the infrastructure, the more advantageous for the subdivision
YSE	Average years of working experience of staff	X	X	X	The higher the working experience, the more advantageous for the subdivision
PSC	Percentage of staffing coverage	X	X	X	The higher the staffing coverage, the more advantageous for the subdivision

Table 3. *Cont.*

Code	Criterion/Parameter	Flight Subdivisions *	Ground Service Subdivisions	Transport Subdivisions	Rationale
		Safety Contribution Criteria			
HRP	Number of voluntary hazard/risk reports	X	X	X	Recognition of contributions to safety improvements
SIR	Number of flight reports sharing safety-critical information directly with other subdivisions	X			Recognition of contributions to flight safety
ASU	Number of articles submitted to the LAO safety magazine	X	X	X	Recognition of sharing knowledge and experiences
APU	Number of articles published in the LAO safety magazine	X	X	X	Recognition of quality and expected impact of articles submitted
SCO	Number of staff commendations for safety achievements	X	X	X	Recognition of individual contributions to safety
SED	Number of staff recommended to attend safety courses	X	X	X	Recognition of interest in developing further skills in safety
CAI	Percentage of implementation of safety corrective actions	X	X	X	Recognition of commitment to agreed safety improvements
		Safety Events Criteria			
FOD	Percentage of increase/decrease Foreign Object Damage events attributed to factors under the (partial) control of the subdivision	X			Higher or lower rates of FOD events correspond to less effective or more effective management of FOD hazards, respectively
BST	Percentage of increase/decrease of Bird Strike events attributed to factors under the (partial) control of the subdivision	X			Higher or lower rates of Bird Strikes events correspond to less effective or more effective management of relevant hazards respectively
ASF	Number of adverse flight safety events investigated with attribution to human performance issues of any subdivision employee, excluding FOD, BST and technical defects	X			Adverse flight safety events attributed to Bird Strikes and Foreign Object Debris were included above. Technical defects and events outside the control of subdivision staff not to be counted as subdivision's contribution

Table 3. *Cont.*

Code	Criterion/Parameter	Flight Subdivisions *	Ground Service Subdivisions	Transport Subdivisions	Rationale
ASR	Number of adverse road safety events investigated with attribution to human performance issues of any subdivision employee, excluding technical defects	X	X	X	Adverse road safety events attributed to technical defects or outside the control of subdivision staff not to be counted as subdivision's contribution
ASG	Number of adverse ground safety events investigated with attribution to human performance issues of any subdivision employee, excluding technical defects	X	X		Adverse ground safety events attributed to technical defects or outside the control of subdivision staff not to be counted as subdivision's contribution

* Subdivisions with additional ground services and transportation/logistic capabilities; ** Used as a denominator in other criteria.

3.4. Final Version of the New SAP (Steps 5 and 6)

After agreeing on the criteria and parameters presented in Table 3 above, we contemplated how those could influence positively or negatively the score per operating subdivision and how we could incorporate adjustments to the operational parameters and relatively to the whole set of nominated subdivisions. To achieve the above, each of the SAP scoring factors would range between (−1) to 0 (i.e., negative influence) or 0 to (+1) (i.e., positive influence) without weighting as more or less critical. The latter decision was made considering that within systems all components and processes contribute collectively to outcomes. Thus, LAO adopted a holistic approach that accounted for the joint effect of various safety initiatives in the achievement of safety objectives. A higher influence of one safety activity over other safety initiatives locally (e.g., specific individuals, teams or units) could not be normalised as a standard case across the whole organisation due to the effects of various confounding factors (e.g., diverse workforce characteristics and subdivision profiles).

Furthermore, the final version of the new SAP incorporated the concept that quantitative results should reflect relative scores across the nominees and should not be interpreted as representative of their overall safety performance. Hence, addressing the concerns of The Keil Centre [24], a negative score of one subdivision and a positive score of another should not be considered as negative and positive safety performance of the subdivisions correspondingly, but merely as a relative result.

Table 4 presents the final set of factors for the flight subdivisions. The same factors were used for the other two types of subdivisions as applicable per criterion shown in Table 3. The final score per operating subdivision "X'" would be the sum of the scores of the factors, and the awardee would be the subdivision with the highest score. All factors regarding safety contributions were assigned a positive sign. Additionally, the factors relating to adverse events attributed to Foreign Object Damage and/or Bird Strike could take a positive sign (i.e., decrease of events) or negative sign (i.e., increase of events) relative to the number of these types of events the year before. This accommodated the fact those programmes were not parts of the Local Accidents/Incidents Prevention Registry mentioned in Section 2 above and were systematically controlled and monitored over time. On the other hand, all other events attributed to the human performance of subdivision employees would take a negative sign. The relative increase/decrease was not considered in those event types as above due to the considerable variability of human performance. Moreover, LAO's perspective was that human performance is influenced to a larger extent by local subdivision practices than broader organisational issues regardless of the latter also being contributory.

For the operating/environmental criteria concerned, the more advantageous the context in which the subdivision was operating, the lower its overall score in the safety programme. The organisation acknowledged that those factors were not under the control of each subdivision as they were based on broader business and organisational plans and priorities. Therefore, this scoring approach would address any possible "inequality" across the nominees and would also balance the fact that, due to human performance problems, safety events were considered as more of local influence, as mentioned above. Therefore, the criteria whose absolute scores reflected a relative advantage would receive negative signs (i.e., aircraft and vehicle availability, staffing coverage and experience). In contrast, the criteria whose absolute values represented a relative disadvantage were assigned positive signs to increase the overall score (i.e., age of aircraft, vehicles and infrastructure). Regarding the Operational Risk Assessments, the rationale was that subdivisions approved to operate in environments and profiles of higher risk should be recognised with a positive sign in the score.

Table 4. Factors included in the calculation of the score per subdivision.

Equation Factor	Positive/Negative Sign	Calculation
Safety Contributions		
HRP_x (Voluntary hazard/risk reports)	Positive	$(HRP_x/FTE^*_x)/[(HRP_1/FTE_1) + (HRP_2/FTE_2) + \ldots + (HRP_n/FTE_n)]$
SIR_x (Flight reports sharing safety-critical information)	Positive	$(SIR_x/NFL^{**}_x)/[(SIR_1/NFL_1) + (SIR_2/NFL_2) + \ldots + (SIR_n/NFL_n)]$
SCO_x (Staff commendations for safety achievements)	Positive	$(SCO_x/FTE_x)/[(SCO_1/FTE_1) + (SCO_2/FTE_2) + \ldots + (SCO_n/FTE_n)]$
ASU_x (Articles submitted to the LAO safety magazine)	Positive	$(ASU_x/FTE_x)/[(ASU_1/FTE_1) + (ASU_2/FTE_2) + \ldots + (ASU_n/FTE_n)]$
APU_x (Articles published in the LAO safety magazine)	Positive	APU_x/ASU_x
SED_x (Staff recommended to attend safety courses)	Positive	$(SED_x/FTE_x)/[(SED_1/FTE_1) + (SED_2/FTE_2) + \ldots + (SED_n/FTE_n)]$
CAI_x (Safety corrective actions implementation)	Positive	%/100
Adverse Safety Events		
ASF_x (Adverse flight safety events)	Negative	$(ASF_x/NFH^{***}_x)/[(ASF_1/NFH_1) + (ASF_2/NFH_2) + \ldots + (ASF_n/NFH_n)]$
ASR_x (Adverse road safety events)	Negative	$(ASR_x/NKM^{****}_x)/[(ASR_1/NKM_1) + (ASR_2/NKM_2) + \ldots + (ASR_n/NKM_n)]$
ASG_x (Adverse ground safety events)	Negative	$(ASG_x/FTE_x)/[(ASG_1/FTE_1) + (ASG_2/FTE_2) + \ldots + (ASG_n/FTE_n)]$
BST_x (Events due to Bird Strikes)	Positive for decrease/ Negative for increase	± (%/100)
FOD_x (Events due to Foreign Object Debris)	Positive for decrease/ Negative for increase	± (%/100)
Operating Environment		
AAV_x (Service availability of aircraft fleet)	Negative	%/100
VAV_x (Service availability of vehicle fleet)	Negative	%/100
PSC_x (Staffing coverage)	Negative	%/100
YSE_x (Years of working experience of staff)	Negative	$YSE_x/(YSE_1 + YSE_2 + \ldots + YSE_n)$

Table 4. *Cont.*

Equation Factor	Positive/Negative Sign	Calculation
AAG_x (Age of aircraft fleet)	Positive	$AAG_x/(AAG_1 + AAG_2 + \ldots + AAG_n)$
VAG_x (Age of vehicle fleet)	Positive	$VAG_x/(VAG_1 + VAG_2 + \ldots + VAG_n)$
BAG_x (Age of buildings/infrastructure)	Positive	$BAG_x/(BAG_1 + BAG_2 + \ldots + BAG_n)$
ORA_x (Operational Risk Assessments)	Positive	$(ORA_{x(4)}/ORA_{x(ALL)})/[(ORA_{1(4)}/ORA_{1(ALL)}) + (ORA_{2(4)}/ORA_{2(ALL)}) + \ldots + (ORA_{n(4)}/ORA_{n(ALL)})]$, where subscript "4" corresponds to the highest risk level from ORAs (see Section 2 above)

* Full-time equivalent, ** Number of flights, *** Number of flying hours, **** Number of kilometres.

3.5. Data Collection and Processing (Step 7)

To test the application of the proposed safety awards scheme, the organisation asked its operating subdivisions to send data per criterion included in Table 3 by explaining to the subdivisions the reason for this request and clarifying that the submission of data was voluntary. Although all necessary data were recorded in the safety department, this enquiry aimed at their verification as well as an estimation of the necessary time for the subdivisions to collect the data and respond. The latter would offer initial insights into the feasibility of introducing the new SAP, and verification of data was central to it as a means to avoid unfair treatment of nominees. At the same time, LAO did not want to raise concerns about or expectations from the pilot programme and, when requesting the data for the pilot application, decided to not disclose to the subdivisions the scoring concept presented in Section 3.4 above.

Five (5) flight stations, four (4) ground services subdivisions and two (2) transport subdivisions submitted the data to the safety department within the one-week time allotted. To avoid the identification of LAO, we do not report the total number of its subdivisions. Nonetheless, the data collected were (a) adequate to pilot-test the new SAP, (b) verified by the safety department; (c) used to make the calculations of Table 4 and derive the total scores per subdivision and (d) compare the results with those generated by using the previous awards scheme. Furthermore, during the study, we were not informed whether other subdivisions submitted their data later than the time allotted or whether the organisation followed up on its initial request and explored reasons for possible unresponsiveness.

4. Results

4.1. Pilot Application (Step 7)

Since the aim of this paper is to illustrate the development and implementation of the new safety awards programme while avoiding the identification of the organisation or any of its operating subdivisions, we do not report the datasets collected per operating subdivision. Table 5 presents the calculated factors as per Table 4, and the total score for the flight subdivisions (FLS) as those were the ones where the whole set of criteria applied. The calculation of total scores per subdivision suggested FLS5 would be presented with the safety award as it scored highest relative to the other four subdivisions. The application of the previous SAP to the same subdivisions as described in Section 2 above resulted in the scores and ranking shown in the last rows of Table 5, according to which FLS4 would be the awardee. The comparison between the results of the two SAPs indicates an utterly different ranking order of the nominees. This is noted in light of the fact the previous awards programme considered only flight safety events attributed to any type of cause, including human performance, bird strikes, foreign object damages and technical defects.

Table 5. Results for SAP pilot application to Flight Subdivisions.

Equation Factor	FLS1	FLS2	FLS3	FLS4	FLS5
Safety Contributions					
HRP_x (Voluntary hazard/risk reports)	0.00	1.00	0.00	0.00	0.00
SIR_x (Flight reports sharing safety-critical information)	0.00	0.67	0.00	0.00	0.33
SCO_x (Staff commendations for safety achievements)	0.55	0.00	0.00	0.00	0.45
ASU_x (Articles submitted to the LAO's safety magazine)	0.00	0.00	0.00	0.00	1.00
APU_x (Articles published in the LAO's safety magazine)	0.00	0.00	0.00	0.00	1.00
SED_x (Staff recommended to attend safety courses)	0.03	0.11	0.07	0.67	0.12
CAI_x (Safety corrective actions implementation)	1.00	0.95	0.89	1.00	1.00

Table 5. *Cont.*

Equation Factor	FLS1	FLS2	FLS3	FLS4	FLS5
Adverse Safety Events					
ASF_x (Adverse flight safety events)	−0.52	−0.14	−0.20	0.00	−0.14
ASR_x (Adverse road safety events)	−0.29	0.00	−0.28	0.00	−0.43
ASG_x (Adverse ground safety events)	−0.13	−0.27	−0.21	−0.36	−0.03
BST_x (Events due to Bird Strikes)	0.50	−0.50	0.17	0.00	−0.25
FOD_x (Events due to Foreign Object Debris)	0.00	0.00	0.00	0.00	1.00
Operating Environment					
AAV_x (Service availability of aircraft fleet)	−0.70	−0.69	−0.70	−0.64	−0.34
VAV_x (Service availability of vehicle fleet)	−0.88	−0.90	−0.62	−0.87	−0.84
PSC_x (Staffing coverage)	−0.65	−0.69	−0.65	−0.65	−0.72
YSE_x (Years of working experience of staff)	−0.18	−0.19	−0.20	−0.23	−0.20
AAG_x (Age of aircraft fleet)	0.38	0.11	0.21	0.06	0.24
VAG_x (Age of vehicle fleet)	0.19	0.18	0.19	0.22	0.22
BAG_x (Age of buildings/infrastructure)	0.22	0.19	0.17	0.22	0.20
ORA_x (Operational Risk Assessments)	0.00	0.00	0.00	0.00	0.00
Total score according to the new SAP	**−0.48**	**−0.17**	**−1.16**	**−0.58**	**2.61**
Ranking according to the new SAP (awardee with the highest score)	**3**	**2**	**5**	**4**	**1**
Total score according to the previous SAP	**17.13**	**9.72**	**6.21**	**0**	**5.82**
Ranking according to the previous SAP (awardee with the lowest score)	**5**	**4**	**3**	**1**	**2**

The bold type: Total score according to the new SAP.

4.2. Launch of the New SAP (Step 8)

Although the pilot application of the new awards scheme yielded results entirely different from the scores obtained from the previously implemented SAP, the organisation did not perceive this as unfavourable and decided to endorse the new programme. After a few months, the new SAP was included in the revised safety management handbook, which also included changes in other safety programme elements. To facilitate the implementation of the newly introduced programme, the safety department designed a simple worksheet with automatically calculated scores as per Table 4 and organised information sessions with local staff per subdivision. The only requirement from the operating subdivisions was to submit to the safety department the data corresponding to the parameters shown in Table 3.

Addressing our concerns about the possible misinterpretation of the final scores if publicly announced across the organisation, LAO opted to keep them confidential and advertise only the awardee. Nonetheless, the criteria of Table 4 were transparently mentioned in the handbook, and all nominees were aware of them. However, the actual difficulties in implementing the new awards scheme were evident after its first official launch. Regardless of the expectations of the safety department, not all operating subdivisions were consistently recording all data of Table 3 or such data were not centrally collected. On several occasions, the data reporting necessitated the involvement of employees from several functions under the coordination of the local safety offices. This caused complaints from operating subdivisions as they perceived the reporting requirements for the new SAP as a burden despite the positive intentions of the organisation to introduce a more inclusive awards programme. Besides, during the request for data, the safety department discovered some subdivisions were not running safety programme elements consistently, such as the Operational Risk Assessments. Thus, the respective subdivisions felt exposed to management when they were asked to report data they were not even collecting.

Furthermore, the subdivisions struggled to comprehend the rationale behind the new awards programme, and criticised it. Although the need to revise the previous SAP and introduce an improved and more inclusive and "objective" scheme was stated organisation-wide, several subdivisions believed the factors included in the new scheme introduced inequalities. The most common reservation regarded the inclusion of factors relating to the operating/working context, which subdivisions saw as unfair because such factors were outside their control. However, as described in Section 3.4 above, this was considered in the design of the new SAP, which credited the subdivisions operating in less advantageous conditions. Still, the nominees did not fully understand this part of the scoring concept. Additional comments regarded the differences between the flight operation types or ground transportation profiles of subdivisions, which nominees thought was not captured in the new awards programme although, according to its design, this was meant to be reflected in the Operational Risk Assessments.

Overall, despite the efforts of the safety department to explain the concept of the new SAP and support the operating subdivisions in its implementation, the programme did not resonate positively across the organisation. In addition to the obstacles mentioned above, the impression of our contact person was that subdivisions perceived the new awards scheme as a threat rather than an opportunity. They felt it inconvenient to be compared against others across all the parameters the new SAP introduced. At the same time, most of the subdivisions still believed the previous safety awards programme was not fair.

The consequence of the difficulties expressed above was that the list of nominees was shorter than the one under the previous SAP version as fewer subdivisions sent their data to the safety department. Despite the principle of data cross-verification explained above, the safety department calculated scores for subdivisions that did not submit data. However, senior management saw this as an unacceptable situation as it introduced inequality; everyone should have the opportunity to nominate for the annual SAP. Subsequently, the organisation, on the one hand, decided to suspend the new SAP, but, on the other hand, did not reactivate the previous awards scheme which was based merely on event rates and severity. They opted to cancel the safety awards scheme, not to pursue the improvement of the new SAP and maintain only the individual safety awards included already in their safety management system. Subsequently, the ninth step of our methodology (Table 2) was not realised, and we were not able to collect perceptions and comments from the implementation of the new safety awards scheme across all organisational subdivisions. The latter would have offered insights into the perceived fairness of the new SAP compared to the pervious one and could have led to further adjustments and modifications.

5. Discussion

The overall project of introducing the new safety awards programme (SAP) to the large organisation under study included technical aspects, as per its design and pilot implementation explained in Sections 3.3, 3.4 and 4.1 above, and factors apparent only after its first launch across the organisation (Section 4.2). In terms of rationale and design, the new SAP incorporated the suggestions from different literature sources and attempted to address concerns about objectivity and determinism [14,15,30]. The suggested awards scheme was tailored to quantifiable elements of the organisational safety programme and appreciated both positives and negatives. Therefore, while it did not require the collection of new data, it also did not include qualitative parameters that would result from subjective evaluations.

Nevertheless, several of the criteria included in the new SAP could be the result of subjectivity at their source or could have been further detailed and more representative. For example, safety reporting depends on the perception of the staff about notifiable hazards and the chance of identification of the reporter, and staff commendations for safety achievements rely on decisions of supervisors to nominate staff, as well as the assessment of nominations at the corporate level. Similarly, the quality of the articles published in the organisation's safety magazine was assessed by the safety department, and the

results from operational risk assessment depended partially on the perception of individuals about the role of operational factors. Nevertheless, most of these parameters were generated and recorded by local teams, which could decrease subjectivity at the source, without, of course, eliminating it. Moreover, the consideration of years of working experience did not capture the richness of experience (e.g., flight hours for pilots, type of activity for ground crew). However, as explained in Section 3 above, the researchers in collaboration with the organisation tried to maintain a balance between abstraction and detail to render the new awards programme relatively easy to understand and implement.

Of the 20 factors included in the calculation of the final score per nominee, seven (7) corresponded to safety contributions, three (3) represented lagging safety performance, two (2) were about relative increase/decrease of specific types of events with a possible negative or positive influence on the score, and eight (8) factors reflected the operating context. Therefore, even in the worst-case scenario of the two (2) relative factors above contributing negatively to the score, the final result was determined more by safety positives than negatives with a 7:5 analogy, respectively. This proportion represented an adequate balance between leading and lagging indicators with preference for the former [28]. Furthermore, to the best of the knowledge of the authors, this was the first time the consideration of the operating context was visibly included in a safety award programme. As explained in Section 3 above, the concept was that safety contributions and achievements occur with diverse environments per nominee, which are typically shaped by senior management. Thus, the new safety awards scheme considered the relative (dis)advantage of each operating subdivision compared with the rest of the subdivisions.

Interestingly, but somewhat expectedly due to the inclusion of more criteria and positive aspects, the pilot application of the new SAP resulted in an almost entirely different ranking order of the five (5) operating subdivisions that participated (Table 5). None of the Flight Stations (FLS) maintained the same rank between the previous and new awards programme, the awardee of the new SAP ranked second based on the previous scheme, whereas the awardee as per the previous SAP scored fourth in the new programme. Notably, whereas FLS1 and FLS4 scored relatively close in the new SAP, they were the most distant ones in the previous programme. Although the sample was limited, those results indicate the potential of the new awards scheme to change the picture entirely by appreciating the safety efforts of operating subdivisions which were previously judged only against their lagging safety indicators and the actual severity of unfavourable events.

Nonetheless, regardless of the achievement to introduce relative scores in the new SAP to avoid connotations about "absolute safety performances", retrospectively, we recognise that negative final scores could generate impressions of negative safety performance. This would be avoided by adjusting the final score per subdivision through the addition of the same positive factor. For example, we could have added the value "10" (i.e., 9 criteria with negative influence +1) so that in the extreme scenario that a subdivision achieved the lowest score of "−9" as per Table 4, it would still be assigned a final score of "+1." Additionally, we acknowledge the linearity of the criteria and the calculated scores in the new safety awards programme. However, the goal of this study was to suggest a SAP that would be easily applied and would not need the application of sophisticated algorithms and the consideration of relative weights based on literature or subjective perspectives of personnel.

Despite its support from the organisation and the promising results from its pilot application, the new SAP proved inadequate to support an organisation-wide acceptance and implementation. The distance between WaI: Work-as-Imagined (safety department/other stakeholders and the research team) and WaD: Work-as-Done (operating subdivisions) led to the suspension of the new awards programme immediately after the first attempt to operate it in practice. Retrospectively, the principal reason for this unfavourable development was the lack of consultation with the operating subdivisions complemented by strategies that could ensure its sustainability (e.g., training and awareness campaigns). The engagement of subdivision staff could have led to an amendment of the SAP's version included in the safety management handbook as well as the generation of a sense of ownership.

Additionally, in hindsight, the organisation underestimated the capacity of its operating subdivisions to submit the necessary data within a given timeframe, discovered that such data were not consistently recorded across the whole organisation and realised their collection by safety officers would be time- and resource-consuming. Moreover, the limited communication to operating subdivisions regarding the rationale behind the new SAP deprived the organisation of gaining possible acceptance despite the difficulties to collect the required data. It can be presumed that if operating subdivisions had been adequately informed, their resistance to the new safety awards scheme would be lower and they could probably suggest improvements (e.g., replacement of criteria, longer timeframes for the collection of data, postponement of the new SAP). Thus, instead of a top-down approach which inadvertently led to more inequalities than the ones indented to address because of the limited number on nominated operating subdivisions, a bottom-up path could have resulted in the adoption of a modified version of the safety awards programme proposed.

6. Conclusions

Despite the limitations on safety award programmes (SAPs) and criticisms of their value and impact, various SAPs still operate within and across industries to recognise safety achievements, motivate employees and organisations, promote participation in safety improvements and raise the overall profile of nominees. However, except for awards presented to individuals in recognition of exceptional safety contributions, the assessment criteria for collective safety awards are not always transparent. They have traditionally focused on rates of incidents and injuries without consistently and visibly appreciating positive contributions to safety as part of the same SAP and considering differences in the contexts nominees operate. This reality might threaten the transparency and objectivity of safety award schemes and lead to opposite outcomes than those expected, such as lack of trust in the validity of the award results, low interest in nominating, and demoralisation.

During the current study, we attempted to address the issues mentioned above through the design and pilot application of a new SAP to a large aviation organisation (LAO). Following consultation with LAO, the new programme included a scoring system with clearly defined criteria to avoid highly subjective evaluations, and it hosted parameters with a balanced inclusion of safety contributions, safety events and the operating context of the subordinate subdivisions. The application of the new awards scheme to a sample of organisational subdivisions showed the ranking of nominees was considerably different to the one obtained from the previous SAP. However, the launch of the new awards programme across the whole LAO was suspended after the first attempt to implement it due to difficulties in the collection of data from operating subdivisions and the lack of communication with the latter about the changes introduced, their meaning and necessity. This situation deprived LAO and the research team of running the new programme organisation-wide, compare the scores with the previous SAP across a larger sample and sense the reactions from subdivisions and staff. Consequently, we were not sufficiently able to evaluate the perceived effect of the new safety awards programme across the various organisational subdivisions to proceed with possible improvements.

Limitations of this study include (1) its application to a single organisation and inability to generalise the proposed approach as there are different safety management activities and operational characteristics and profiles across various organisations and industries, (2) the adoption of linear/unweighted calculations in the safety awards scheme which might not reflect the variability in perceived or actual influences of the various parameters considered, and (3) lack of opportunity to run the final SAP widely and collect comments and satisfaction ratings. Hence, our study does not recommend a gold safety awards standard for the aviation or any other industry. However, its methodological approach, the concepts embraced and the difficulties encountered could be considered by any organisation.

Despite its limitations, our study demonstrates how safety awards can account for criteria beyond incidents and injuries and introduce relatively objective parameters with the potential to provide a more reliable scoring of nominees. It is an example of how a respective programme can be more inclusive of safety contributions and contextual parameters, subject to its customisation to the organisational size, complexity, current safety programmes and available data. Although this paper shares a SAP tailored to the departmental level, similar approaches can be followed for award schemes targeted to organisations within specific industries or regions.

Moreover, the unsuccessful launch of the new SAP confirmed that lack of consultation and focused change management about organisation-wide interventions can jeopardise the sustainability of similar safety initiatives even under the best of the intentions. Based on our experience from this study and literature references, the engagement of the targeted audience and avoidance of imposing extra burden to collect data for nominating are two crucial parameters to consider for the sustainability of safety award programmes. Although the more the criteria included, the higher the expected "validity" of a SAP score, at the same time, the higher the complexity of the scheme, the lower the probability of it being comprehended despite the best of intentions. Hence, consultation and relative simplicity are factors that can increase the likelihood of a SAP's acceptance and effectiveness.

Moreover, as with any quantified scheme used for comparisons, we cannot exclude cases of data manipulation and generation of false impressions across workers, teams and organisations. Thus, any awards scheme must be carefully designed to minimise over- and under-reporting of data having positive and negative contributions in the scoring system, for example, through cross-verification of data. We also recommend that a SAP reflects and communicates only comparative results across the defined set of parameters so scores are not perceived as an absolute rank of safety performance. The design of a safety awards programme based on such criteria, which consider technical and organisational aspects, increases the potential of its acceptance and sustainability.

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Appendix A

Table A1. Safety awards types mentioned in publications over time.

Award Type	Publications in Ascending Chronological Order
Individual	1998 Morrisey [31], 1998 Tam and Fung [7], 1999 Fuller [32], 20011 Geller [8], 2001 Martin and Walters [33], 2001 Erickson and Farmer [29], 2002 Roughton [34], 2002 Florczak [35], 2002 Habbel [36], 2003 The Keil Centre [24], 2003 McSween [15], 2006 Stranks [37], 2007 Stranks [38], 2012 INPO [12], 2012 Herzer et al. [39]
Team/group/department	1998 Morrisey [31], 2001 Geller [8], 2001 Erickson and Farmer [29], 2002 Florczak [35], 2003 The Keil Centre [24], 2003 McSween [15], 2006 Stranks [37], 2007 Stranks [38], 2008 Donnelly et al. [40], 2012 INPO [12], 2012 Herzer et al. [39]
Organisational	1998 Morrisey [31], 1998 Tam and Fung [7], 1998 Simon [41], 2001 Erickson and Farmer [29], 2002 Vredenburgh [9], 2002 Habbel [36], 2003 The Keil Centre [24], 2006 Stranks [37], 2008 Donnelly et al. [40], 2009 Prevette [42], 2015 Byrne [11], 2019 Safety at Sea [43], 2019 Rae and Provan [16]

Table A2. Examples of safety awards proposed and presented over time.

Source in Ascending Chronological Order	Industry/Sector	Safety Award(s)
2000: Journal of the Mine Ventilation Society of South Africa (JMVSSA) [44]	Mining	The Mine Health and Safety Council Award Scheme (MHSC) of South Africa. Award divided into: • Millionaire award • The thousand fatality-free production shifts award • Safety achievement flag • Certificate of excellence
2001: Erickson and Farmer [29]	Any	• Instant Safety Awards • Monthly Team Awards • Quarterly Awards • Safety Idea System
2002: Romano [10]	Healthcare	• Quest for Quality Prize from • McKesson Corp for patient care quality, safety and commitment—Healthcare sector • The American Medical Group Association's "Acclaim Award for improved health outcomes and quality of life for patients—Healthcare sector • Premier Award for Quality—awarded for Healthcare Improvement • The Chicago-based National Patient Safety Foundation's "Solutions Awards" for patient safety • The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) "Individual Leadership in Patient Safety" Awards • The Medical Group Management Association's Fred Graham Award for Innovations in Improving Community Health • The "Medication Safety Contest"
2005: Pollitt [45]	Any	Royal Society for the Prevention of Accidents (RoSPA) awards
2009: Prevette [42]	Any	Robert W. Campbell Award
2011: Wings of Gold [46]	Navy	United States Secretary of the Navy (SecNavy) Safety Excellence Awards
2011: Professional Safety [47]	Construction	• Zero Injury Safety Awards (ZISA) • National Occupational Research Agenda (NORA) awards
2012: Conway et al. [48]	Healthcare	John M. Eisenberg Award (National Quality)
2012: Professional Safety [49]	Mining	Wyoming State Mine Inspectors Safety Excellence Award
2013: Kansas Nurse [50]	Healthcare	Patient Safety Excellence Award
2013: Professional Safety [51]	Process	American Petroleum Institute's 2012 Occupational Safety Award
2014: Safety & Health Practitioner (SHP) [52]	Manufacturing	Best factory awards—Health and safety category, awarded to UK manufacturing companies sponsored by the Institution of Occupational Safety and Health (IOSH)

Table A2. *Cont.*

Source in Ascending Chronological Order	Industry/Sector	Safety Award(s)
2015: Safety & Health Practitioner (SHP) [53]	Manufacturing	Best factory awards—Health and safety category, awarded to UK manufacturing companies sponsored by the Institution of Occupational Safety and Health (IOSH)
2016: Fabius et al. [54]	Any	Corporate Health Achievement Award (CHAA)
2017: Reinforced Plastics [55]	Any	• Perfect Record Award • A Million Work Hours Award • Occupational Excellence Achievement Award
2017: IADC [56]	Infrastructure	International Association of Dredging Companies (IADC) Safety Award
2018: Reinforced Plastics [57]	Transport	National Safety Awards (NSA) Program dedicated to truckload carriers as well as carriers in similar operations.
2020: Construction Users Roundtable (CURT) [58,59]	Construction	Construction Industry Safety Excellence (CISE) Awards program

Table A3. Examples of suggested, mentioned and/or applied criteria for safety awards.

Source in Ascending Chronological Order	Criteria
1998: Morrisey [31]	• Least amount of worktime without an injury • Team performance for thinking and acting safely as well as meeting safety goals
1999: Fuller [32]	• Number of reportable accidents/1000 employees • Number of days lost through accidents or ill health/1000 employees • Number of road traffic accidents/100 vehicles
2000: Journal of the Mine Ventilation Society of South Africa (JMVSSA) [44]	• A million-consecutive fatality-free shifts on any mine • One thousand consecutive fatality-free production shifts • Highest percentage of improvement in an organisation's risk management • Working a calendar year with a lost time injury free rate
2000: Amey Vectra [60]	Sites with the least number of accidents/incidents
2001: Erickson and Farmer [29]	• Safety related ideas/innovations to improve organisational safety management • Meeting team or company safety targets • Team awards based on cumulative safety performance
2002: Florczak [35]	• Least amount of workplace accidents/incidents. • Team members directly/indirectly involved in a safety project
2002: Roughton [34]	Recognising employees for their constructive, and positive safety efforts
2003: McSween [15]	• Reporting of unsafe conditions and suggesting safety improvement strategies • Meeting quarterly safety targets • Lost-time injury rates
2003: The Keil Centre [24]	Level of contribution to the organisation's safety improvement strategies

Table A3. *Cont.*

Source in Ascending Chronological Order	Criteria
2004: Atkinson [61]	• Point-based system where points are awarded for reporting safety observations as well as going a month without incidents or injury • No incident/accident of any kind, including property damage and environmental incidents • Observation checklist card. The more the card is completed, the more employees are qualified for safety incentives • Identification of safety issues (e.g., hazards) via preventive action i.e., solving/fixing safety issues individually or as a group within an organisation
2005: Pollitt [45]	Comprehensive and fully integrated Process Safety Management (PSM) including professional development and specific/general specialist safety training
2006: Stranks [37]	• Best health and safety performance • Most improved safety performance
2009: Prevette [42]	• Commitment to the implementation of health and safety within the organisation • Based on a scoring system: results of site visits and information provided by the organisations involved
2010: Gerard [21]	• Reduction in workplace incident rate • Low levels of lost-time injuries
2010: Safety & Health Practitioner (SHP) [62]	Health and safety related ideas/innovations to help small scale businesses improve safety at work
2010: Hollnagel [63]	Qualifications gained by employees are recorded and scored
2011: Wings of Gold [46]	Vigilance and dedication with strong focus on the well-being of staff
2011: Professional Safety [47]	• Least amount of workplace injuries/incidents in a calendar year (ZISA awards) • Collaborative research efforts and achievements toward improving and promoting occupational health and safety (NORA awards)
2012: Conway et al. [48]	Significant safety initiatives towards improving safety and healthcare quality and practices
2012: Professional Safety [49]	Lowest incident frequency rate
2012: Institute of Nuclear Power Operations (INPO) [12]	Organisation's effectiveness in promoting a safety culture
2012: Herzer et al. [39]	• Identifying and reporting workplace safety hazards • Participating in efforts to analyse and address hazards
2013: Professional Safety [51]	• Companies that demonstrate excellence in safety • Companies with the lowest OSHA recordable injury and illness incident rate
2014: Safety & Health Practitioner (SHP) [52]	• Least amount of workplace accidents/incidents • Organisations with strong focus on employee welfare
2020: Construction Users Roundtable (CURT) [58,59]	• Contractor and Craft Worker Prequalification • The Owner's Role • Pre-Bid and Bid Clarification Meetings • Contract Terms and Conditions • Monitoring Performance • Improving Safety Programs

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