

## Aviation safety in the undergraduate curriculum: aviation students' perceptions

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**ABSTRACT:** Safety has been significantly improved in the aviation industry through advanced aircraft technology and human factors training for flight operations. This study used a survey questionnaire to investigate whether the undergraduate pilot training curriculum at the University of South Australia (UniSA) can improve aviation students' perceptions and knowledge of aviation safety issues. A class of third-year undergraduate aviation students was surveyed using a questionnaire of 14 aviation safety-related questions. The majority of students agreed that safety management system training and education in the classroom can significantly improve their ability to identify and mitigate the risks and hazards inherent with flying training, and in the aviation industry as a whole. Furthermore, more than 80% supported the notion that field studies of aviation organisations' safety management systems would enhance their proficiency, incorporating risk assessment and mitigation techniques through exposure to real-world safety investigations.

### INTRODUCTION

In recent years, risk and public safety have always been important considerations in civil aviation [1]. The increasing numbers of aviation accidents and incidents have prompted the development of safety management system (SMS) to improve the overall safety record of aviation organisations. In Australia, the Civil Aviation Safety Authority (CASA) has required air service providers to implement an SMS to improve their safety record.

Aviation safety has emerged as an important aviation training principle in universities emphasising hazard identification and risk mitigation. Arguably, undergraduate pilot training (UPT) plays a significant role in disseminating correct perceptions and knowledge about aviation safety issues, together with the required skills for identifying and mitigating hazards and risks. Importantly, aviation students are now encouraged to be conversant with the principles of aviation safety; these principles have already become a core subject of the undergraduate curriculum in many universities worldwide that provide flying training.

At UniSA, an aviation safety training and education programme has been introduced in the three-year aviation course. To better define and design the new undergraduate aviation programme for implementation in 2015, and to fulfil the requirement of the Australian Qualifications Framework (AQF), this study examined the results of a questionnaire survey of the existing third-year aviation students, who have a minimum of two years' exposure to university aviation safety training and education.

The study aimed to investigate whether the University's curriculum could improve the undergraduate aviation students' perceptions and knowledge of aviation safety issues, and their attitudes towards the introduction of the new undergraduate programme specialising in safety management and human factors.

### RESEARCH METHOD

A voluntary questionnaire survey was conducted on the third-year aviation students at UniSA. The survey consisted of 14 questions in three sections. Section 1 (attitude items) had four Likert scale questions to grasp students' perceptions of aviation safety after completing their first two years of university education. Section 2 (knowledge items) had three Likert scale questions to understand students' knowledge of aviation safety and related issues.

Section 3 (teaching of aviation safety) had seven Likert scale questions that sought to discover students' attitudes towards the teaching of aviation safety and their thoughts about new training methods and a new undergraduate aviation programme.

## RESULTS

A total of 52 third-year aviation students were surveyed, 26 of these students completed the questionnaire, equalling a response rate of 50%. In the following summary of the findings, the term *majority* was defined as *greater than 50% of respondents*. The term *supported* meant that the students either *agree* or *strongly agree* with a question; the term *objected* meant that the students either *disagree* or *strongly disagree* with a question; the term *improved* indicated that the students thought their aviation safety knowledge was *improved* or *very much improved*; and the term *deteriorated* meant that the students perceived that their aviation safety knowledge had *deteriorated* or *very much deteriorated*.

Table 1 shows the first four questions under *attitude items* that addressed the students' perceptions of aviation safety. The majority of students supported the idea that *safety is important to aviation operations*, and more than 84% of the students objected to the notion that there is no need to address risks and hazards when there are no aviation accidents or incidents (Question 2). In addition, approximately 25% of the students objected to the proposition that *aviation accidents and incidents cannot be avoided* (Question 3). Also, at least 88% of the students supported the idea that *aviation safety is an important subject for their university learning* (Question 4).

Table 1: Aviation students' responses to attitude items.

Question	Attitude items	Strongly disagree	Disagree	No opinion	Agree	Strongly agree
1	Safety is an important part of aviation operations.	0%	2%	0%	20%	79%
2	If there are no aviation accidents or incidents, there is no need to address risks and hazards.	42%	42%	16%	0%	0%
3	Aviation accidents and incidents cannot be avoided.	1%	24%	4%	42%	29%
4	Aviation safety is an important subject for university learning.	2%	4%	6%	48%	40%

Questions 5 to 7 (Table 2) were designed to assess the knowledge of aviation safety among aviation students; these three questions aimed to provide at least a generalised understanding with regards to the extent of the aviation safety knowledge that aviation students had obtained from safety education and training at the University. In this respect, 69% and 49% of the students were assessed as *very good* at naming aircraft accidents or incidents associated with insufficient safety measures and at listing the characteristics of a good aviation safety reporting system (Questions 5 and 7). However, a combined total of 21% of the students were rated *poor* or *very poor* when they were asked to define a basic concept of aviation safety (Question 6).

Table 2: Aviation students' response to knowledge items.

Question	Knowledge items	Very poor	Poor	Fair	Good	Very good
5	Naming two aircraft accidents or incidents resulted from insufficient safety measures.	7%	7%	17%	0%	69%
6	Definition of aviation safety risks.	15%	6%	14%	55%	11%
7	Listing two characteristics of aviation safety reporting system.	6%	12%	18%	15%	49%

Questions 8 to 12 investigated students' attitudes towards how effective the teaching of UniSA's aviation safety was and their opinion of the undergraduate aviation programme (see Table 3). The majority of students (at least 84%) supported the proposition that the University's SMS training had improved their knowledge of hazard identification and risk mitigation inherent during flight training and in the aviation industry as a whole. However, around 10% of the students were found to have *no opinion* as to whether they could have benefited from the University's SMS education and training (Questions 8 and 9).

Most significantly, at least 66% of the students agreed that the University's safety education could significantly improve and strengthen their overall aviation safety knowledge (Question 12). In fact, this provides strong support for continuing the delivery of aviation safety education and training (including SMS training) in the UPT programme, even during students' early flying training stages. On the other hand, more than a quarter of the students (34%) commented that there was no improvement in their aviation safety knowledge after two years of university training - this finding needs to be cautiously interpreted as it is unclear why those students are dissatisfied with the safety training offered by the existing curriculum.

Over 81% of the students considered that a field study to investigate aviation organisations' SMS is vital, and helped to equip them with the necessary skill sets for analysing the cause of errors, as well as enhancing their proficiency in implementing risk assessment and mitigation techniques using real-world scenarios.

Moreover, more than 56% of the students welcomed the notion that *a new safety management and human factor undergraduate programme* would be introduced, giving them opportunities to receive further education specialising in aviation safety and human factors and, more importantly, educating future aviation leaders to manage safety as a system at the university level prior to their employment in the professional environment (Questions 13 and 14).

Table 3: Aviation students' responses about the teaching of aviation safety.

Question	Teaching of aviation safety items	Strongly disagree	Disagree	No opinion	Agree	Strongly agree
8	University training provides knowledge and skills to understand aviation safety issues.	2%	4%	3%	90%	0%
9	SMS training in university improves knowledge of hazard identification and risk mitigation.	2%	4%	10%	73%	11%
10	SMS education helps identify risks and hazards during flight training and a future career in the aviation industry.	2%	4%	10%	78%	5%
11	Lessons learnt in university provide a valuable means of strengthening aviation safety culture.	3%	9%	3%	73%	11%
		Very much deteriorated	Deteriorated	Unchanged	Improved	Very much improved
12	My overall aviation safety knowledge changed since the university's safety education.	0%	0%	34%	45%	21%
		Strongly disagree	Disagree	No opinion	Agree	Strongly agree
13	Field studies of aviation organisations' SMS will enhance my proficiency in incorporating risk assessment and mitigation techniques.	1%	2%	16%	81%	0%
14	Support the introduction of a new safety management and human factors undergraduate programme.	4%	10%	30%	50%	6%

## DISCUSSION AND CONCLUSIONS

In recent years, aviation safety has become one of the key principles to be taught in the UPT curriculum (not to mention in postgraduate studies). By learning how to effectively identify and mitigate aviation risks and hazards throughout university education, to a larger extent, student pilots should be able to obtain skill sets for reducing errors and improving aviation safety, thus, reducing the likelihood of accidents and incidents occurring. Moreover, studies of simulator training and laboratory safety training show that students before and after the receipt of such formal training have demonstrated an improvement in safety knowledge and awareness - in general [2][3], this can be applicable to the outcome of formal university safety training (e.g. SMS training).

One of the contributions of this study was that the survey was a successful initial analysis of aviation students' perceptions of safety (at least at UniSA), which will help the aviation discipline to refine and design the UPT programme in two ways. Firstly, the UPT programme should incorporate a field study of aviation organisations' SMS, if possible, as the majority of students supported this proposal (Question 13). Secondly, reasons why 10% of students who did not see the value of SMS training in improving their knowledge of hazard identification and risk mitigation need to be investigated more thoroughly (Questions 9 and 10).

It could possibly be inferred that some aviation students are yet to become aware of the extent to which and/or how their flight training safety could be improved with a SMS, and more broadly, what constitutes aviation risks and hazards during flying training. Strong emphasis on these issues was apparent. In addition, the findings of this study appear to be broadly consistent with prior literature regarding the importance of formal safety training and education in the university curriculum that can help improve students' aviation safety knowledge and awareness [4]. Furthermore, this survey also provides empirical data to support the internal programme review, which is planned at UniSA for 2014.

The limitation of the study was that only a cohort of third-year undergraduate aviation students was surveyed and, therefore, the findings of the survey could not provide any particular feedback regarding changes in students' aviation safety knowledge before and after receiving formal safety training (e.g. SMS training) in the UPT curriculum. Also, the relatively small sample size of the study suggested that the findings should to be interpreted cautiously.

Future research could be extended to include other cohorts of aviation students (e.g. first, second and third-year aviation students), which could provide insights on how the UPT curriculum changes and affects aviation students' perceptions of aviation safety, as students' progress through their programme. Further, it could assist to determine the best method for UniSA to incorporate SMS training and other forms of safety training into the UPT curriculum, as well as the appropriateness of the method for different year levels. In addition, open-ended questions should be included to provide an opportunity to comment further on which aspects of the UPT curriculum should be altered.

In conclusion, aviation students in UniSA believe that aviation safety is an important area to be addressed and learnt in the UPT curriculum. However, the results indicated that students had a lack of appreciation of SMS training and education with respect to the benefits of SMS for their flight training safety and future professional employment in the industry. It is believed that aviation safety training in university programmes has the ability to increase and improve the students' overall aviation safety knowledge. Furthermore, formal (or specialised) curriculum on safety management and human factors is needed, such an initiative was supported by the undergraduate students who were surveyed. The results of the study will guide the UniSA's UPT curriculum's future development.

## REFERENCES

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