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## Incident reporting culture in recreational hot air ballooning

Ashleigh J Filtness<sup>a,\*</sup>, Natassia Goode<sup>b</sup>, Robert Cook<sup>c</sup>

<sup>a</sup>Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Queensland University of Technology, QLD 4059, Australia

<sup>b</sup>Centre for Human Factors and Sociotechnical Systems, Faculty of Arts and Business, School of Social Sciences, Maroochydore, QLD 4558, Australia

<sup>c</sup>Australian Ballooning Federation, PO Box 402 Emerald, VIC 3782, Australia

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### Abstract

Hot air ballooning incidents are relatively rare; however, they have a high potential to be fatal. In order to inform appropriate safety interventions it is first necessary to understand the causal factors which lead to incidents and near-misses, which requires a formal incident report database. The Australian Balloon Federation (ABF) advocates the reporting of recreational hot air ballooning incidents, by reporting directly to the ABF safety officer or by completing an online incident report form. The objective of this paper is to understand how widely used the reporting system is and whether there are any perceived barriers to reporting. Sixty-nine balloonists participated in an online survey about their experience of incident reporting. Survey respondents were mostly male (11 female), experienced balloonists (mean years' experience ballooning 19.51y with a SD 11.19). Sixty respondents (87%) held a pilot license. The majority (82.6%) of respondents were aware of the ABF incident reporting system. Over half (62.3%) had been involved in a ballooning incident or near-miss in Australia. However, 40% of those who had an incident or near-miss did not report it to the ABF and only 15.9% of all those surveyed had used the online incident report form. There was some disagreement regarding when it was appropriate to report an incident or near miss. Some respondents felt an incident or near miss should only be reported if it resulted in injury or damage, while others said near-misses should also be reported. The most frequent barriers identified were: a lack of understanding of when to report to the ABF; trivializing of incidents; and concerns about the system itself. Steps should be taken to increase understanding of the system purpose and long term benefits. Specifically, reporting near-misses should be encouraged. This study is significant because it is the first to examine reporting practices in non-motorised recreational aviation.

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\* Corresponding author. Tel.: +61-7- 3138-7717; fax: +61-7- 3138-0111.

E-mail address: [ashleigh.filtness@qut.edu.au](mailto:ashleigh.filtness@qut.edu.au)

## 1. Introduction

Hot air ballooning incidents are relatively rare; however, they have a high potential to be fatal. For example, a recent review found that 83% of hot air balloon crashes reported to the U.S. National Transport Safety Board (NTSB) resulted in a fatality or serious injury [1]. This is in contrast to general aviation crashes of which only 4% result in injury [2]. The nature of hot air ballooning means that there is high potential for serious injury during a ballooning incident. Hot air balloon baskets are not enclosed and serious injuries may result from blunt trauma as a result of a fall, or burns/electrocution resulting from collision with power lines of fuel leaks [3,4,5].

In Australia, the Australian Ballooning Federation (ABF) administrates and manages recreational hot air ballooning, under guidance and support from the Civil Aviation Safety Authority (CASA). All Australian hot air balloon pilots are required to be a member of the ABF; additionally, anyone involved in ballooning is eligible to join. While major incidents in Australia are extremely rare [6], the ABF is committed to continuously improving the safety of ballooning operations.

As part of this commitment, the ABF encourages members to voluntarily report any incident resulting in an adverse outcome (i.e., loss of control, collisions, or injury) and serious errors or mishaps that have the potential to cause an adverse outcome but fail to do so because of chance or because it is intercepted (near misses). Incidents can be reported directly to the ABF or by completing an online incident report form. The potential benefits of reporting near misses, as well as incidents associated with adverse outcomes (e.g. injuries and fatalities), are widely discussed [7,8]. In domains such as hot air ballooning where major incidents are relatively rare, near misses are a critical source of information [7]. A single near miss can provide insights into potential weaknesses in the safety management system without damage to the system of work. The analysis of large numbers of near misses can reveal patterns of interactions that are difficult to identify from single case study of a major incident [7]. As such, the ABF reporting system is intended to support a culture of learning from incidents within the hot air ballooning community. However, the number of reported incidents is extremely low. Only 22 incidents were reported between March 2009 and October 2012 [6]. Currently, it is unknown how many ballooning incidents go unreported [6], or why incidents are likely to be unreported. Under reporting is critical problem for injury prevention in most outdoor recreational and sporting contexts, where reporting is not mandatory. While there is a large body of research aimed at understanding the contextual factors influencing reporting, the majority have focused on settings where reporting is mandatory [9]. Findings from a recent study in a community football setting, demonstrate that the challenges incident reporting systems in non-mandatory recreational contexts are quite unique [10].

The aim of this paper is to understand attitudes towards reporting and identify perceived barriers to reporting to the ABF. The findings will be used to inform strategies to encourage reporting within the ABF, and potentially have implications for other sporting and recreational contexts where incident reporting systems have been introduced.

## 2. Method

### 2.1. Survey

Data was collected using an online survey designed to take approximately 20 minutes to complete. Only one response could be submitted per computer, as the host website placed a cookie on the respondent's browser at survey completion. Firstly, the survey asked for basic demographic information and details of respondent's involvement in ballooning. Respondent were then asked, if they had ever had an incident while ballooning in Australia, if they had reported an incident to the ABF, when incidents should be reported to the ABF and if they were aware of the ABF online incident reporting database. Those who had reported an incident were questioned about their experience and those who had not were asked why this was. In addition, respondents were asked to rate the frequency of occurrence and potential for impact of a range of causal factors in hot air ballooning incident (reported in [6]). The protocol was approved by Monash University Ethics Committee.

## 2.2. Protocol

All 242 ABF members received an email invite to participate in the survey. This included the overall aims of the study, contact details of the lead investigator and a hyperlink to the online survey location. A reminder email was sent one month later. ABF members were asked to pass the survey link to non-ABF crew members. The survey remained open for three months in 2013.

## 2.3. Analysis

The demographics of survey respondents are reported as mean, standard deviation and range. These are compared to the overall ABF membership. Quantitative results to survey questions are reported as percentage and frequency of respondents. One researcher read through all qualitative responses and assigned descriptive codes. Each descriptive code had to be explicitly stated in the text, the researcher was not permitted to draw any inferences from the responses. The same researcher collated all the descriptive codes identified from the data and ordered them into categories based on key themes.

## 3. Results

### 3.1. Respondents

Seventy respondents started the survey; one respondent was excluded for failing to answer any questions. Of the 69 respondents, the majority were males ( $n = 58$ ; 84%) with an average of 44.16h flying in the past 12 months (SD 52.05, range 0 – 215h). On average, respondents had been involved in ballooning for a mean of 19.51 years (SD 11.19, range 1y – 47y). Most of the survey respondents (75.3%) were aged between 35 and 64 years.

The survey respondents were generally representative of the ABF membership. Eighty five percent of the ABF membership is male. For the calendar year 2013, ABF pilot members flew a mean of 49.51 hours (SD 61.6, range 0 – 266h). The ABF does not keep records of how long members have been involved in ballooning. Seventy-four percent of ABF members are aged between 35 to 64 years. The distribution of ballooning role within survey respondents and the ABF is shown in Table 1. More pilots and instructors completed the survey than would be expected from their proportion of ABF membership.

Table 1. Distribution of ballooning role.

Ballooning role	Proportion of survey respondents	Proportion of ABF membership
Student pilot	13%	15%
Pilot	87%	79%
Commercial pilot	43%	28%
Instructor	34%	12%
Examiner	9%	9%

### 3.2. Experience and reporting of incidents

The majority (62.3%,  $n = 43$ ) of respondents had been involved in an incident in Australia. More than half of respondents said that they had reported the incident directly to the ABF (60.5%,  $n = 26$ ). However, 39.5% of participants ( $n=17$ ) who had had an incident had not reported it. While the majority of survey respondents (82.6%,  $n=57$ ) said they were aware of the ABF online incident reporting database, few had used it (15.9%,  $n = 11$ ), see Fig. 1.

The experience of the 11 respondents who had completed an online incident report was mixed. One respondent

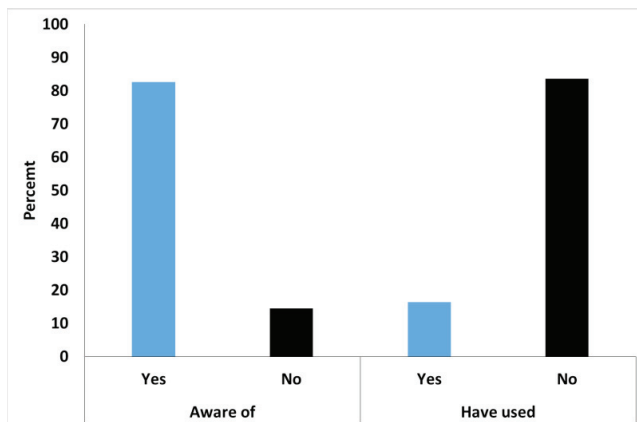


Fig. 1. Response to the questions, Are you aware of the ABF online incident reporting database? And, Have you used the ABF’s online incident reporting database?

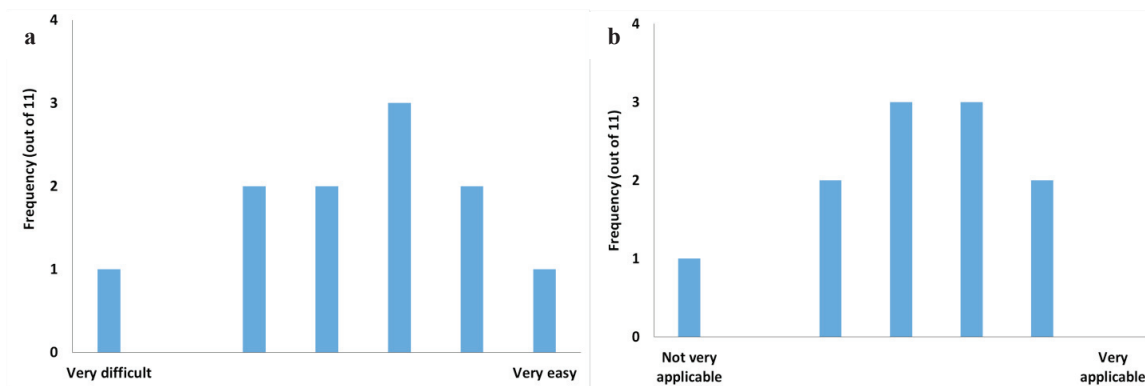


Fig. 2. Response to the questions, (a) How easy did you find the online ABF incident reporting database to use? (b) How applicable did you find the fields of the online ABF incident reporting database?

found the database was very difficult to use, while another found it very easy to use, Fig. 2a. There was no consensus as to how applicable reporting fields were although, no respondent reported them as very applicable, Fig. 2b. In total, 7 respondents (72.7%) stated that the experience had encouraged them to make future reports. Suggestions for improving the online database included: improve ease of navigation (n = 1); provide feedback on reports to those involved (n = 1); more education regarding use (n = 1); and implement strategies to encourage reporting of all incidents (n = 1).

3.3. Factors influencing the reporting of incidents to the ABF online database

A summary of the themes identified in responses to “when would you make a report to the ABF online database?” is presented in Table 2. The most frequent responses were: after an “incident” (n=13) and after an incident or near miss (n = 11); if there was a learning opportunity (n = 5); if the incident resulted in injury or damage to the balloon (n= 2). Two respondents reported choosing not to report to the ABF using the online database, one preferring to report to CASA and the other raising privacy concerns over the current reporting system. Four respondents misinterpreted the question in relation to time. There was disparity over the time period before reporting, as to whether incidents should be reported immediately (n=2) or not (n=2).

Table 2. Responses to the question, When would you make a report to the ABF online database?

Theme of response	Quoted responses
Incident (no mention of near miss) (n = 13)	Any safety related incident Any Private Accident or Incident Incident When there is an incident post incident or accident In event of an incident In the event of an incident or accident In case of an accident/incident After an incident After an incident If it was a private flight, In the case of an accident or incident Immediate reportable matter or routine reportable matter
Incident and near miss (n = 11)	Following an incident, accident, near miss. To report a hazard or anything unusual. Near miss or incident In the event of an accident, incident or near miss in private operations When any reportable incident or near miss occurs Any time I believed there was an incident of note: any potential danger to persons or property, including a near miss After a near miss or incident In the event of a near miss or an incident After an incident, accident or near miss Close calls Any near miss or incident Following any safety-related occurrence.
Learning opportunity (n=5)	Whenever I felt something required to be reported/useful to pass on and share. If there was something others could learn from it. When an incident has happened or whenever an incident that could be of use to highlight a possible safety issue After accident or incident. Also after an instance of a potential accident/incident that was averted (a 'learning moment') If an accident/incident happened, and any occurrence from which other pilots could learn something
Injury and damage (n=5)	Damage to the balloon After any incident or involving physical injury of pilot of passengers When an incident occurs relating to the operation of a hot air balloon when a person or equipment is or had the potentially to be injured/ damaged Major Damage or injury
Only if personally involved (n=4)	If I had an incident When there was an accident, incident or near miss while I was the Pilot When I have any incident that involves any damage to an aircraft or its passengers, or and near miss incident. When I was involved in an incident as per ABF documentation or an incident that did not meet those criteria but was an incident appropriate to be reported.
If observed (n=3)	When an incident has taken place or been observed. If involved in or are witness to an incident or accident Following an incident or near miss or witnessing one.
Not reporting (n=2)	Currently only report to CASA I will NEVER use the system...[due to privacy concerns]*.
Commercial (n=1)	I would usually copy any commercial incident report to CASA
Breach of rules (n=1)	An incident involving private ops that has breached the ABF code of conduct, or an incident that has breached the CASA rules
Ambiguous (n=2)	When required It is a complicated item for the occasional (once or twice in a career) report.

\* I will NEVER use the IRIS system until the ABF can guarantee the privacy of the information submitted. Furthermore I will not instruct another member of the ABF to use IRIS either. Despite several years of requests the ABF still does not have a privacy policy in place and the information provided to IRIS is too open to abuse. There are other methods available for reporting incidents and I have used these in the past to report incidents. There are also other avenues for reporting incidents than the ABF. It should also be remembered that IRIS is not a mandatory requirement

### 3.4. Reasons for not reporting to the ABF

The 17 respondents who had had an incident but not reported it to the ABF were asked why it was not reported. Fifteen respondents responded. The most common reason given was that this was a commercial flight so the incident was reported to the Civil Aviation Safety Authority (CASA) and/or the Australian Transportation Safety Bureau (ATSB) (n=7). Three of the respondents did not consider that the incident should have been reported, either because it wasn't serious enough or because it was handled by the involved parties at the time: "Wasn't too bad – silly mistake", "Could see no reason for it" and "the incident was discussed with the other pilot involved". Additional reasons provided included related to how long ago the incident occurred (n=2) or the incident having occurred before the ABF came into (n=1). One respondent commented that "long time ago didn't think it was important back then". Finally, the online reporting system itself both ease of use and privacy were of concern (n=2).

## 4. Discussion

The aim of this paper is to understand attitudes towards reporting and identify perceived barriers to reporting to the ABF. The findings suggest that few ABF members have ever used the online reporting database, despite their experience of incidents. This does not appear to be due to a lack of awareness of the ABF online reporting database. The barriers to reporting most frequently identified were: a lack of understanding of when to report to the ABF; trivializing of incidents; and concerns about the system itself.

The majority of respondents had experienced an incident during ballooning operations. This is consistent with other research that has shown that within sports aviation hot air ballooning incidents are second in frequency only to gliders [11]. The findings indicate that stories of incidents are likely being shared in an anecdotal manner. While this may encourage a safety culture within the sport, the sharing of information will be localized and will not impact on ABF safety management strategies.

Using an incident database creates a formal way of sharing beyond an individual's personal social network, and is often seen as a prerequisite for preventing future incidents [12]. Overall, a little over half of respondents said that they had reported a previous incident directly to the ABF; however, use of the online reporting system was low. This implies that the majority of incidents were reported to an ABF committee member. Given that the actual number of incidents in the ABF database is low [6], this in turn implies that ABF committee members may not be recording the incidents in the online database. Therefore, one potential strategy to increase the recording of incidents would be to target ABF committee members in using the online database. However, it should be noted that the online reporting database has only been active since 2009 and survey respondents were not asked when the incident they reported occurred.

Another barrier identified was a lack of understanding of when an incident should be reported to the ABF online database. For example, some respondents reported that incidents should only be reported in cases of injury or damage, or when the ABF code of conduct had been breached. Additionally, some respondents felt that only incidents that had the potential for "lessons learnt" should be reported. While this is a valid interpretation of one of the end purposes of the incident database, this is likely to lead to under estimation of the actual number of incidents, inhibiting conclusions regarding the prevalence and severity of incidents. Moreover, determining whether "lessons" can be learnt is likely to be highly subjective.

Another related barrier identified is the perception that the incident was of minor interest. Respondents reported that they were unlikely to report "a silly mistake". Again, this is likely to bias estimates of prevalence of incidents. Moreover, such mistakes are significant enough to remember when asked about incidents suggesting that the information may be of value to other ABF members. Promisingly, one respondent commented that they did not report their incident as it was a long time ago and was not considered important at the time. This suggests a change in attitudes and intentions to report over time. These findings indicate that further education on what is appropriate to report will likely improve reporting rates.

The usability of the online system was also identified as a barrier. Difficulties in using the system were reported as a reason for not reporting in the first place and nearly 30% of those that had used the online system reported that the experience discouraged them from using it again. However, some respondents said the online system was easy to use. The variability in responses suggests that the current system does not meet the needs of all ABF members.

Future research may wish to identify specific types of user who are having difficulty with the system and implement design changes with this user group in mind. In addition, the findings suggest that the appropriateness of the fields should be reviewed, as the system is more suited to reporting certain types of incidents than others.

Concerns surrounding the outcomes of the system and privacy also need to be addressed, as these factors play a critical role in reporting in other domains [9]. After reporting, there must be analysis, decision-making, implementation and follow-up, followed by a secondary loop of learning from an aggregated sample of incidents to detect systemic issues [13]. If the data are not analyzed and findings reported to the membership, then it is unlikely that members will continue to report incidents. Social media may have a role to play in facilitating dissemination of findings. Recently an ABF member has posted their own experience of an incident on the ABF Facebook group (177 members). The response from other members has been positive. The ABF may wish to consider sharing reported incidents on social media to promote learning. However, privacy concerns also need to be addressed. One respondent said they were concerned that the ABF does not have a privacy policy; this concern could easily be addressed and potentially reporters could indicate whether they were happy for the findings to be disseminated as a case study or only in aggregate deidentified form.

The most common reason for not reporting an incident to the ABF was that it occurred during commercial operations. The physical operation of a hot air balloon remains the same regardless of commercial or recreational use. The cross reporting of commercial incidents to both CASA and the ABF may be beneficial to understand the true prevalence of hot air ballooning incidents. This would allow the ABF database to represent holistic details of incidents within this domain.

Finally, the limitations of the study should be acknowledged. The survey was limited to ABF members, who are largely pilots. The current results may contain bias towards the pilot's point of view. Further research should investigate the factors influencing crew reporting of incidents. Ground crew are vital for ballooning operations and experienced crew will work together with the pilot to minimize the risk of incidents.

In conclusion, this study identifies that the largest barriers to incident reporting in recreational hot air ballooning are: (a) belief that the incident is of minor interest, both in terms of being too trivial to report and belief that the data will not be used by the ABF; (b) disparity in understanding of what should be reported; and (c) concern around the use of the online reporting system. Steps should be taken to increase understanding of the system purpose and improve dissemination of the findings. This study is significant because it is the first to examine reporting practices in non-motorised recreational aviation.

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