Case study: driving safety culture in small enterprises – an industry-led initiative

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Abstract

This paper presents a case study describing an industry-led integrated accreditation programme aimed at improving safety outcomes across an industry. The programme aims to promote an effective safety culture within an integrated programme which covers safety, quality and environmental impacts.

Culture has been long recognised as a critical factor in safety. However regulators often have little impact on organisational culture. This paper describes how industry-led initiatives are leading to culture change for small aviation operators working in a series of highly fragmented and dispersed sectors – agriculture, tourism, flight training and emergency services.

This paper outlines the key learning to date from establishing and operating the AIRCARE™ programme. The programme is also assessed against the principles and framework of ISO 31000 (Risk Management).
Keywords: safety, SMS, safety management system, aviation, SME, risk, risk analysis, risk management.

1 Introduction

New Zealand is a beautiful but rugged country lying across the Roaring Forties trade winds. The population of only 4 million people is mainly concentrated into small cities and towns around the coast of the two main islands, with much of the rugged interior given over to national parks and "high country" farming operations. These "Crown" lands are administered by the Department of Conservation (DoC) and include scenic tourist attractions of world renown, such as Milford Sound.

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Consequently the country has relatively few roads and is unusually dependent on aviation. Rates of civilian aircraft ownership are very high and helicopter usage is exceptionally so (Table 1). Aircraft are used for a wide range of low-altitude activities – from fire fighting to aerial spraying (Figure 1). These *general aviation* operators are typically small and the industry is widely dispersed, with many companies operating just one or two aircraft from remote locations.

Table 1: Civilian aircraft counts.

Country	Aeroplanes	Helicopters	Population (m)	Aeroplanes per m population	Helicopters per m population
New Zealand	1,842	796	4	419	199
United States	176,300	10,100	309	571	33
Australia	9,772	1,322	20	491	66
United Kingdom	10,151	1,299	63	161	21

Figure 1: Low level aerial spraying by helicopter.

While New Zealand lies in the South Pacific at a similar latitude to Italy, the climate is cooler and the weather is much more changeable. As such pilots face a highly dynamic hazard profile due to rapid changes in terrain and weather conditions. Past safety initiatives have gradually reduced the number of fatalities (Figure 2), but the fatal accident rate remains high.

The unique dependence of New Zealand on aviation, the complex terrain and large number of small operators create a challenging safety management environment, but the situation provides an imperative to develop effective and practical safety regimes.

In the aviation context organisations which own and operate aircraft are known as *operators*. A typical operator may consist of an owner and partner, with one piloting the aircraft and the other conducting the bookwork. As the organisation grows additional aircraft may be bought and additional pilots and

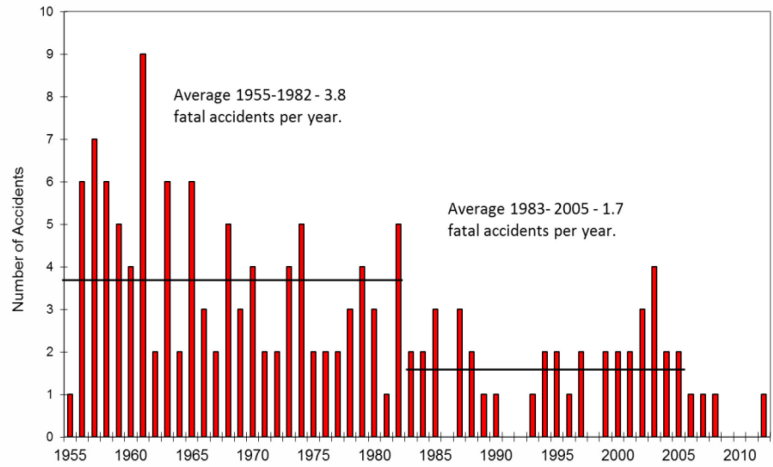

Figure 2: Agricultural aviation – fatal accident rate.

ground staff hired, but the operations typically remain small, with between 1 and 5 employees.

A recent development, enabled by the internet, is a franchise system, where a single operator gains the regulatory approvals and provides all the back-office systems required for franchises to operate. The franchise model typically attracts younger operators who are more internet savvy, and is presenting a different model of ownership and service delivery. Such developments are typical of technological change in industries and can lead to industry consolidation [1, 2].

This paper presents a case study of AIRCARE™, which is an advanced quality, safety and environmental accreditation programme. The programme has been developed and is owned by the Aviation Industry Association of New Zealand (AIA) which is a peak industry body. AIA members include 80% of aviation operators in New Zealand and represent over 95% of aviation capacity.

2 The regulatory approach

The New Zealand aviation regulator, the Civil Aviation Authority (CAA), operates under the International Civil Aviation Organisation (ICAO) model [3]. A relatively recent ICAO initiative is the requirement for risk-based safety management. At the same time the New Zealand government auditor, the Office of the Auditor General has recommended that the CAA accelerates the implementation of a risk-based approach [4].

The CAA is currently working through how to formally implement risk based approach in practice [4, 5], but actions of the regulator over the last several years can be viewed within a risk-based framework (Figure 3).

This conceptual model is consistent with the Braithwaite model of a more flexible approach to regulation. In this model a range of tools are used by the regulator – ranging from heavy enforcement of strict rules through to enforced self-regulation [6].

Consequence	High	**Maintain.** Focus regulatory oversight and resources to maintain or improve.	**Act.** For example recent regulation of adventure aviation following a series of fatalities involving overseas tourists.
	Low	**Monitor.**	**Delegate.** Encourage industry to develop systems and standards where regulatory partnerships are possible.
		Low	High
		Likelihood	

Figure 3: Regulatory framework – conceptual model.

Major industry players already have Safety Management Systems (SMS) in place. However there has been little work on developing SMS for smaller operators and consequently there is little understanding of SMS in the small enterprises who dominate the general aviation sector.

3 An industry-led accreditation programme

The motivation for an industry-led accreditation programme emerged from the recognition of four risks, each of which had the potential of negative impact on the industry:

1. tighter regulations on aerial application of agro-chemicals – which have effectively shut down parts of the sector in Britain and other European countries;
2. a continued high rate of accidents and fatalities could lead to heavy regulatory intervention, potentially threatening the viability of the industry;
3. reduced public tolerance of amenity effects such as noise and spray drift;
4. potential of losing access to the crown estate for aviation tourism activities.

The industry decided to take a proactive approach to these threats by building a credible system of industry-led initiatives. The key design features of the programme were consistent with research on the essential features of voluntary health and safety certification programmes for small enterprises: that it be of low cost, easy to maintain and tailored to suit sector needs [7]. A primary objective was to take the lead in safety. The resulting system has evolved over time (Figure 4).

As a first step, industry participants developed Codes of Practice (COP), for example the COP for Aerial Application of Vertebrate Toxic Agents [8], which responsible operators committed to implement. Independent audits were introduced from the outset to provide credibility. This requirement recognised

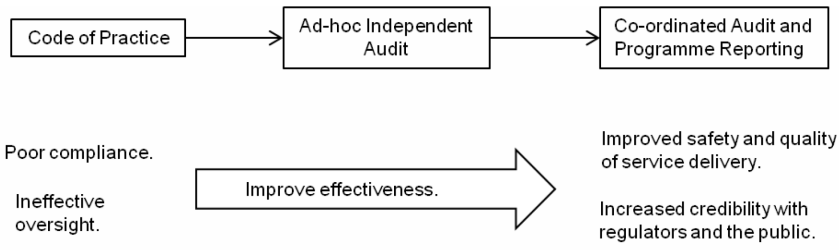

Figure 4: Evolution of AIRCARE™ system.

that the small operators who characterise the sector, do not have the *capacity* in terms of skills and resources to effectively implement such systems without independent oversight.

Initially the independent audits were undertaken by a non-specialist ISO9001 quality auditor operating on an ad-hoc basis. Despite the resulting compliance improvements, the quality of audit experiences was variable and the ad-hoc nature of the audits provided limited oversight on the level of compliance.

As such it was difficult to define and measure any meaningful metrics of success, other than accident statistics. While accident statistics are the ultimate measure of success, accidents tend to be sporadic, which makes it difficult to discern trends. Also fatalities are a classic lagging indicator.

So, following a complete tender process, Navigatus Consulting Limited was engaged to provide a co-ordinated programme of auditing. Navigatus has been auditing the programme for 18 months.

The current structure of the programme is illustrated in Figure 5.

The typical field audit time is 5 hours. Typically around an hour of that is given over to education – discussing more advanced ways of thinking about hazards and managing risks.

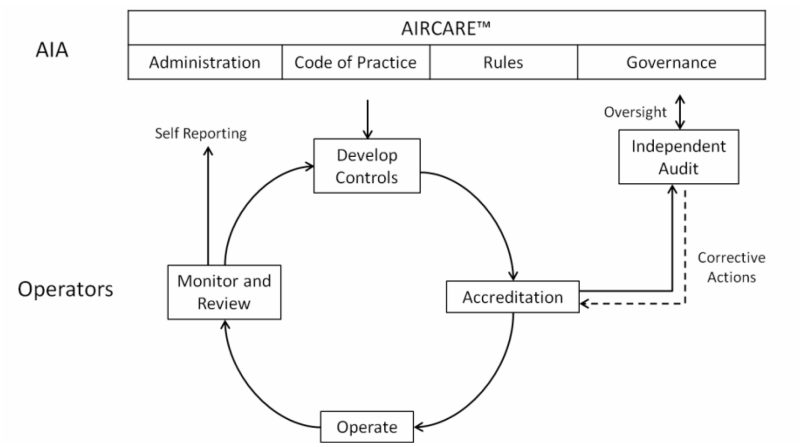

Figure 5: Conceptual structure.

An important feature of the audit programme is the requirement for corrective actions. An operator is not accredited unless all findings have been closed out. This must be completed within 6 weeks of the audit. New entrants have an extended timeframe of 3 months for corrective actions. Also new entrants are not required to demonstrate that all systems are working in practice as it is accepted that some of the newer systems, such as incident response, may not have been used at the time the audit occurred. For these reasons new entrants are restricted to a one year period of accreditation. After the first year operators can be accredited for periods of up to 3 years, depending on their audit performance.

Governance is provided by the AIRCARE™ Management Committee, which is the decision-making body for accreditations and for any changes to the Rules. Once the operator has closed out corrective actions, the auditor reports to the Committee with a recommendation for award. This process recognises that an auditor is only present at an operator's premises for a small proportion of the time, and enables other sources of information to be brought to bear on the accreditation decision. In over 50 audits Committee decisions have varied from only two audit recommendations, and then only to a minor extent.

For confidentiality reasons, detailed audit findings are not reported to the Committee, but only counts of findings against each standard. The auditor also meets annually with the Committee, to review the overall programme and performance.

Demand for accreditation is steadily growing. After an initial wave of early-adopters, demand has been driven by customers specifying that providers must be accredited. A proposed requirement of accreditation to access and operate in the Crown estate, which comprises over 30% of the land mass, is proving to be controversial amongst non-accredited operators. As of March 2013, 54 operators were accredited to the programme.

4 Compatibility with ISO31000

ISO31000:2009 is the international standard for risk management [9]. This standard is gaining wider international recognition and is replacing a host of industry-specific standards. While the system was not specifically developed to be compatible with ISO31000, it is instructive to assess the requirements against the principles and processes in the standard.

ISO 31000 can be summed up in a single diagram (Figure 6).

Compliance with ISO31000 can be evaluated at two levels: the overall system, and how it's applied by individual operators. Taking the ISO31000 principles (left hand panel of above figure), the AIRCARE™ system itself meets all of the principles of ISO31000, applies the framework, and requires that the process in the right hand panel is followed by operators.

However implementation at the operator level is less advanced, being often "bolt on" in nature, at least initially. The auditors encourage operators with concrete examples and practical recommendations on how to make the process dynamic and responsive to change. Operators are required to have a continual

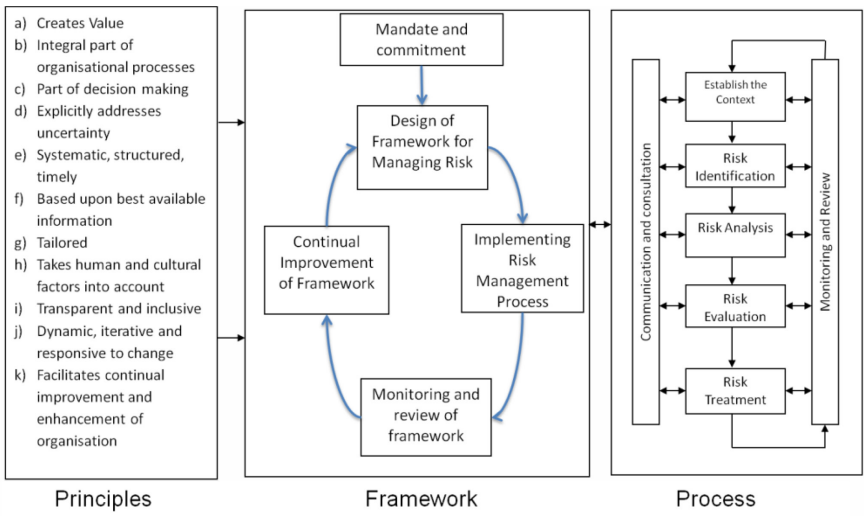

Figure 6: ISO3100:2009 Risk Management – principles and guidelines.

improvement process and to show that it is working, but the low number of incidents recorded by operators indicates that further cultural change is required. While some operators use an explicit hazard identification and treatment process that is appropriate to the context, implementation is patchy.

These issues have been recognised and the auditors actively promote the adoption of more advanced safety management, which would be fully compliant with ISO31000, and with SMS requirements. The auditor discussions and recommendations are well-received, but to date only a few leading operators have implemented the recommended practices. To help encourage take-up it is proposed to change the rules to make some basic activities compulsory and to introduce an *Elite* accreditation status of advanced SMS practice that leading operators can aspire to.

5 Results

The evidence from audits is that quality and safety systems are improving. An overall metric of quality is the term of accreditation awarded upon reaccreditation. To date around a third of audits have been reaccreditations, with the remainder being new entrants (who have a fixed term of 1 year).

Initially reaccreditation audits were for a mixture of periods, with roughly a third of operators qualifying for each of one, two or three years. Operators who had previously qualified and maintained accreditation under a prior programme, were also accepted for reaccreditation. Accreditation periods have slowly increased as quality has improved, and now 1 year accreditation periods are rare (Figure 7).

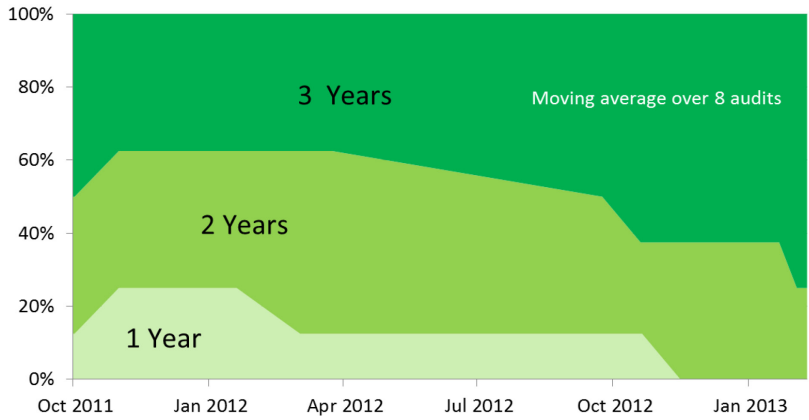

Figure 7: Reaccreditation periods.

The audit results have also been used to identify the aspects where operators are struggling to comply (Figure 8). Review of each of these problem areas takes place in a formal programme review each six months and actions are agreed to improve the ability of operators to comply.

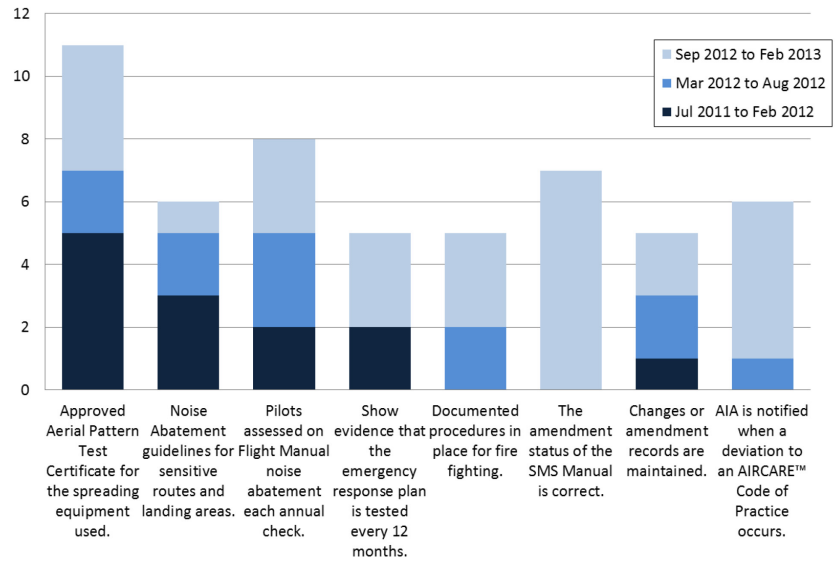

Figure 8: Count of major non compliances to Feb 2013.

It was found that operators struggled at first with novel standards, with many initially meeting only some of the requirements. This showed up immediately in the first six month review of operational intelligence.

This was thought to be due partly to the novelty of some of the standards. A multi-level communication strategy was launched including direct communication to industry participants, articles in aviation trade journals, conference presentations and direct communication to operators through tip sheets. Industry executives and staff also assisted through direct visits to operators to check that operators were adequately preparing for audit, and accredited members made themselves available to assist. However the industry is tight-knit, and once a critical mass of operators had been accredited, then most new entrants were able to access the collective learning through their existing networks. It is now rare to audit a new entrant who has not been coached by others. The sharing of good quality and safety practices between operators was unplanned, but is a beneficial outcome of the programme.

The latest six month review suggests that the interventions have been successful. However the number of audits increased over the latest period, so the rate of non-compliances has fallen substantially when evaluated on a per audit basis (Figure 9). The interventions have had a significant positive effect, which demonstrates the value of collecting, reviewing and acting on the operational intelligence at a programme level.

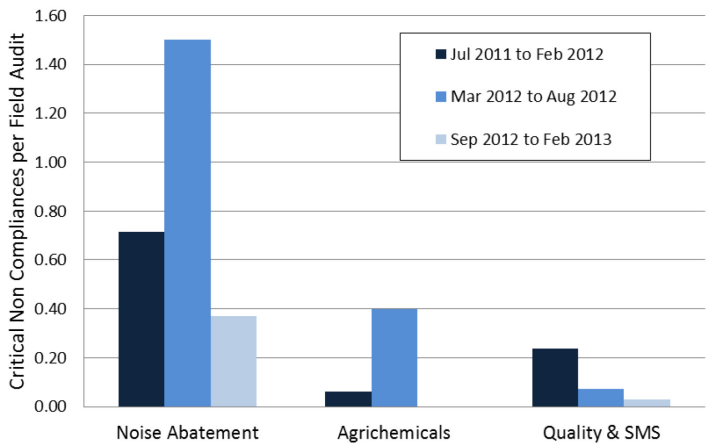

Figure 9: Rate of critical non-compliances.

An analysis of major areas of non-compliance reveals two emerging issues. One issue is simply keeping up to date with changes to the rules (third column from right in Figure 8). At first sight it seems unusual that operators should have difficulty keeping up with changes in the rules, but the regulatory rule-making process that operators are familiar with is cumbersome and slow. An advantage of an industry-led accreditation programme is that it can respond quickly as situations change and as new technologies emerge.

The other emerging area of non-compliance is self-reporting by operators of breaches in the standards (right hand column in Figure 8). It is seen by AIA to be essential, lying at the heart of a safer industry. As experienced in other

aviation sectors and other industries, such self-reporting is the pinnacle of an effective safety culture. This is expected to take some time to achieve general compliance. For small enterprises in any industry this can be a major culture change, as historically owner-managers of small enterprises have tended to view safety as the employee's responsibility [10]. As a first step towards this outcome, the current focus is to encourage operators to hold regular discussions amongst the staff, focussing on identifying and discussing hazards, recording near misses, and learning from them. It is expected that open disclosure to the industry body will follow, only once operators are comfortable with routinely discussing such matters with their colleagues.

Typically the opinions and values of owner-managers determine the approach of small enterprises to health and safety [11]. Agricultural aviation owner-managers can be fiercely independent, resourceful people, who talk in plain language and loathe bureaucracy. Curiously some of these same operators have joined the voluntary programme accompanied by statements that they are only doing it because their clients are demanding it. Yet when audited, these same operators are well prepared, park up their planes, participate fully, and have advanced and effective safety systems. This reinforces that auditors need to retain an open mind.

6 Learning to date

The key learning to date from the development and implementation of the programme are:

1. Establishing industry Codes of Practice (COP) is only a starting point for improving industry practices;
2. Small operators don't have the capacity to reliably self-audit against COP;
3. Independent auditing at a programme level ensures consistency and enables programme level oversight;
4. Operators in highly regulated industries become used to a slow pace of regulatory change and can struggle to cope with more flexible, industry-led, requirements;
5. Maintaining an accreditation system of high integrity is a major undertaking;
6. Getting an industry mandate for the introduction of such programmes is vital;
7. Some organisations will voluntarily sign up to improve safety and implement best practice, but many will only move when customers demand it;
8. Done well, the overall process can catalyse the sharing of skills and knowledge within high hazard industries characterised by many small operators;

9. While it might be expected that small enterprises operating in a highly hazardous industry would quickly grasp and implement improved safety systems, that is not the case as small enterprises typically do not have the capacity to rapidly implement new methods;
10. While the content of implementing such accreditation programmes is technical, in reality the programme is a tool to effect culture change in an industry sector.

7 Conclusions

This paper describes the successful establishment of AIRCARE™, as an industry led voluntary quality, safety and environmental accreditation programme. The following conclusions are drawn:

1. It is possible for fragmented and dispersed industries to create and operate an advanced accreditation system of high integrity.
2. Safety and quality practices within such industries can be improved by industry initiatives.
3. Independent certification to industry standards can be a credible alternative to regulatory prohibition.
4. Industry led programmes can influence culture, something that regulators find difficult to achieve.

The programme has already achieved many objectives, but cultural change is a gradual process and there remains a long way to go. It remains to be seen whether the programme effects a radical change in culture in New Zealand general aviation, but it is evident that industry-led programmes such as AIRCARE™ can positively influence safety culture.

References

[1] R. Coase, The Nature of the Firm, vol. 4. 1937, pp. 386–405.
[2] J. Harford, What drives merger waves? *Journal of Financial economics,* May 2005.
[3] International Civil Aviation Organisation, *Doc 9859 AN/474 Safety Management Manual (SMM)*, Second Edi. Montreal: International Civil Aviation Organisation, 2009.
[4] Civil Aviation Authority of New Zealand, 2011 / 12 Annual Report Civil Aviation Authority of New Zealand, Wellington, New Zealand, 2011.
[5] Civil Aviation Authority, Request for proposal for Aviation Safety Management System (ASMS) - business process review, Wellington, New Zealand, 2013.
[6] J. Ayres and Ian Braithwaite, Responsive Regulation - Transcending the Deregulation Debate, New York, United States of America: Oxford University Press, 1992.

[7] L. Vassie and S. Cox, “Small and Medium Size Enterprises (SME) interest in voluntary certification schemes for health and safety management preliminary results,” vol. 29, pp. 67–73, 1998.
[8] AIRCARE, Code of Practice for the Aerial Application of Vertebrate Toxic Agents, Wellington, New Zealand, 2011.
[9] International Organization for Standardization, ISO 31000:2009: Risk management - Principles and guidelines, Geneva, Switzerland, 2009.
[10] D. Champoux and J.-P. Brun, “Occupational health and safety management in small size enterprises: an overview of the situation and avenues for intervention and research,” *Safety Science*, vol. 41, no. 4, pp. 301–318, Jun. 2003.
[11] P. Hasle and H. J. Limborg, “A review of the literature on preventive occupational health and safety activities in small enterprises,” *Industrial health*, vol. 44, no. 1, pp. 6–12, Jan. 2006.