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**The application of the New Zealand Civil
Aviation Rule Part 115 for the regulation of
adventure aviation activities**

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Master of Aviation Management**

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(i) Abstract

Research was undertaken to examine the implementation requirements of a proposed rule, NZCAR Part 115, which has been developed with the intention to regulate “adventure aviation” activities in New Zealand. The regulation applies to a wide range of tourism focused airborne operations including the use of ex-military and aerobatic aircraft for joyriding, passenger flights in balloons, gliders, tandem parachuting and hang-gliding operations.

The rule was considered necessary as there has been a lack of any recognized safety standards applicable to these activities when they are conducted beyond a purely recreational purpose. An increasing number of operators commercialise their activities by focusing on taking passengers for rides as opposed to conducting training or “trial flights” (which are assumed to be for the purpose of introducing people to the sport). Many of these operations use non-certified aircraft which have not been intended for the carriage passengers on a commercial scale. Where paying passengers are carried, safety is assumed to require a greater level of management. The regulator – the New Zealand Civil Aviation Authority - considers that a formal system that applies standards similar to those of small airline would be more appropriate. A new rule was required due to the novel and diverse nature of activities, and the various types of aircraft used. Specialist legislation for adventure aviation would also open up the sector for further commercial opportunities and would provide the ability to regulate such activities within the civil aviation system.

The thesis includes a review of literature which examines the basis of the legislative requirements and defines the rationale for the rule-making standard, as well as introducing notions for defining and assessing risk within aviation. The review also looks at published industry reaction to the development of the Rule. A part of the research, the survey of operators, elicits their opinion as to the workability of the new legislation. The survey also tests the current level of each operator’s compliance according to a 72 point checklist of operational items and ascertains what modifications to the systems and practices are required in order to comply.

The research outcomes identified two groups of operators - one of which has standards and systems that are close to compliance with the new legislation and the other for which compliance would be difficult due to deficient systems and practices. Analysis of the differences highlighted a cultural separation of the groups in terms of their connection with mainstream general aviation and their understanding of the risk management concepts and practices required for commercial operations.

The discussion of the results of the research highlights problems with the application of the proposed regulation, particularly to the non-compliant group. Issues include the recreational origins of the sector, a lack of acceptance of the Rule by operators, and on-going problems with the consultation and collaboration in the rule-development process.

Workable compliance strategies and processes are discussed, including developing an ecological approach to managing safety as part of best practice. Recommendations look at possible strategies for implementation including the requirement for more pro-active education and enculturation processes, and the formation of a national representative body.

(ii) Attestation

I understand the nature of plagiarism, and I am aware of the University's policy on this.

I certify that this dissertation reports original work by myself

Signature

Date

(iii) Acknowledgements

I would like to acknowledge the generous contributions of

The Participants in the Survey

Monique Day – for her invaluable assistance and advice with processing of data for statistical analysis.

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(v) List of abbreviations

AC	Advisory Circular
CAA	The (New Zealand) Civil Aviation Authority
CAR	Civil Aviation Rule
GA	General Aviation
ICAO	International Civil Aviation Organisation
NZCAR	see CAR
NPRM	Notice of Proposed Rule Making
NZHGPA	New Zealand Hang gliding and Paragliding Association
NZPIA	New Zealand Parachute Industry Association
QA	Quality Assurance – see glossary
RAANZ	Recreational Aircraft Association of New Zealand
SAC	Sport Aviation Corps
SMS	Safety Management System
VOSL	Value of a Statistical Human Life

(vi) Glossary

Acceptable means of compliance - The practices and processes by which a certificate holder achieves compliance with a Civil Aviation Rule (CAR), as assessed by the regulatory authority in the certification process.

Advisory Circular (AC) - Advisory information produced by the CAA which is subordinate, and in reference to, a Civil Aviation Rule, and which contains information on methods and practices to enable an acceptable means of compliance.

Best practice – Current practice expressed as a technique or methodology that, through experience and research, has proven to reliably lead to a desired result. Best practice is implemented according to defined technical standards and benchmarks as being the most appropriate to achieving the required outcomes. Operational best practice relates to all parts of the operation including policies and procedures, the health and safety of individuals, environmental and economic sustainability, compliance with regulatory requirements, and the promotion of continuous improvement.

Exposition - The term used by the New Zealand CAA for a written description of the organisational and operational systems for achieving an acceptable means of compliance for certification under any relevant CAR. It includes a company's operations manual.

General Aviation (GA) - The category of civil aviation that refers to flights other than military flights, or scheduled airline and regular cargo flights in aircraft greater than 5700kgs. It includes commercial and private flying.

Microlight - An category of powered aircraft having a take-off weight of less than 540kg, which are not certified under the normal airworthiness category for light aircraft. The maximum weight restriction, and a limit to no more than two occupants, allows a range of experimental light aircraft to operate without the higher specification of larger aircraft. The category was instigated to allow suitable regulatory flexibility for amateur design and construction. It further allows piloting qualifications to be issued by recreational organisations certificated under CAR Part 149.

Micro-organisations - Independent Organisations having a low work force and low level of resourcing. Micro-organisations usually have less than 5 members or employees and may have—as little as one individual member (see Appendix 3 for a description of micro-organisations as they apply to Adventure Aviation)

NZCAR Part 1 - New Zealand Civil Aviation Rule that specifies Definitions and Abbreviations

NZCAR Part 115 - the New Zealand Civil Aviation Rule currently under development that specifies requirements for the certification of commercial activities carrying out Adventure Aviation

NZCAR Part 135 - The New Zealand Civil Aviation Rule that specifies requirements for the certification of commercial activities in small aircraft (less than 5700kgs and a passenger capacity of 9 seats or less) and helicopters.

NZCAR Part 141 - New Zealand Civil Aviation Rule that specifies requirements for the certification of flight training operations.

NZCAR Part 149 - New Zealand Civil Aviation Rule that specifies requirements for the certification of recreational aviation organisations. Current 149 certificate holders are;

- Gliding New Zealand Incorporated
- New Zealand Hang Gliding and Paragliding Association (NZHGPA)
- New Zealand Parachute Industry Association (NZPIA)
- NZ Skydiving Association
- Recreational Aircraft Association of New Zealand (RAANZ)
- Sport Aviation Corp limited (SAC)
- Royal New Zealand Aero Clubs (RNZAC)
- The New Zealand Warbirds Association

Quality Assurance (QA)- The monitoring and evaluation of the various aspects of a product or service to maximize the probability that minimum standards of quality are being attained. QA cannot absolutely guarantee *quality* but is a systematic process to eliminate the obstacles to improving quality as they arise. A monitoring system may utilise testing for quality, sampling to enable quality profiling, statistical process control, and continuous improvement processes

Safety Management System (SMS) - An internationally recognised best-practice approach to managing safety and risk including the necessary systemic organisational structures, accountabilities, policies and procedures

Safety Target Outcome - Under the assumption that, in aviation, safety is outcome based, *safety target outcomes* are expressed in terms of social costs (including deaths) either over a targeted period or per seat hour

Ultrasafe - In aviation terms, “ultrasafe” describes a safety level near or beyond 10^{-6} accidents per hours flown.

Chapter 1. Introduction

1.1 Context

The New Zealand Civil Aviation Rule (NZCAR) Part 115 is a rule that is intended to regulate “adventure aviation” activities in New Zealand. At the time of writing the rule remains under development and is intended to be promulgated in November 2011. The regulation is intended to apply to operations ranging from the use of large ex-military aircraft for joyriding, through to tourist focused tandem parachuting and hang-gliding. Prior to the development of the Rule there was a clear a lack of any recognized safety standards applicable to adventure aviation activities when they are conducted beyond a purely recreational purpose.

Regulation governing adventure aviation was called for both by the aviation industry – voicing the desire for a Rule that would allow the operation of non-standard category aircraft for carrying passengers on joy-ride type operations on a commercial basis, and by the regulator which saw a need for increased standards of safety and wished to have the ability to regulate such activities within the civil aviation system.

The following research analyses the process of development and design of the new regulation. The regulation is viewed as problematic because many of the activities for which it is targeted have been operated by individuals on a basis that is outside of the regulatory control mechanisms applicable to commercial aviation. Many of the operators have risk concepts and employ safety management practices that are different to that of mainstream aviation as these elements relate more to the activity as a recreational pursuit. Many of the operators had little experience of the well-developed mechanisms and regulation applicable to air transport.

1.2 Scope and objectives

The research was carried out in order to define the rationale for the rule-making standards specific to adventure aviation activities, and to ascertain what modifications to the operator's systems and practices were required in order to comply. It was also intended to achieve a general understanding of the issues in the application of regulation upon all activities that have a recreational origin and that have extended in to commercialised operations. The research sets out to identify the specific issues and obstacles in the application of the new regulation which is being developed and applied by the New Zealand Civil Aviation Authority.

The research consists of two components; a review of literature, and a survey of operators. The review of literature looks at the background and development of adventure aviation activities in New Zealand. It looks at the existing applicable legislation and the issue of defining the required standards for commercial operations over private flying in order to effectively analyse the sufficiency of present operations. It reviews the safety mechanisms and philosophies currently applied to adventure aviation in comparison to concepts of safety in commercial aviation, and looks at the specifications contained within the existing rules that govern operational processes. The survey of operators gauges the opinion, attitudes, and actual compliance levels of operators. The findings and analysis of both the literature review and the survey relate directly to the issues, highlight the obstacles and allow the identification of strategies for improvement.

Forty one current or potential adventure aviation operators were interviewed in order to gauge their perception and knowledge of the requirements of the new Rule and examined the sufficiency of their present systems. The survey used a questionnaire to elicit opinion, and a checklist to measure the current state of each operator according to a 72 point compliance scale. This checklist was developed from key best-practice compliance elements. Data analysis plotted the comparative achievement of each operator and identified two groups - one of which had standards and systems that were close to those required by the new legislation and one which employed

standards that differed considerably from the standards of the mainstream commercial aviation industry, and from best practice.

1.3 Outcomes

Analysis of the operator responses in the light of the problems highlighted by the review of literature indicated a distinct differentiation between the preparedness of one group of operators in comparison to the other. The analysis highlights a cultural separation of the mainstream aviation community from the operators of activities such as hang-gliding and paragliding. The examination of possible reasons for the differences indicated that the separation was exacerbated by a lack of recognition of the cultural differences of the separate communities by the regulators. Deficiencies in consultation and collaboration regarding the design of the new legislation appears to have occurred at an early stage in the development of the new Rule. The analysis also highlights the lack of knowledge and understanding by some operators of the requirements of the proposed regulation. It perceives some difficulty in establishing a universal compliance with the Rule due to their current distance from achieving best-practice standards. The low level of sophistication of the practices of these operators, coupled with the lack of resources, knowledge, and expertise for the required changes, puts them considerably short of the specifications of the Rule and so, under these considerations, compliance is expected to be difficult.

The discussion of the research results puts forward the primary reasons for the cultural differentiation as being the recreational origins of parts of the adventure aviation sector – which itself is made up of diverse groups undertaking a range of activities - coupled with isolation from the regulated environment. The discussion also considers issues with the consultation process. Compliance strategies are then discussed, including developing an ecological approach to managing safety as part of best practice.

The research emphasises the problem of applying well evolved best-practice systems that originate in industrial environments upon simple and personalised organisational structures. The concept of a micro-organisation is considered whereby organisationally best practice safety standards, as they are currently defined, may not be appropriate. In large organisations safety culture is consciously developed and ingrained at the organisational level. Best practice standards dictate that there is a hierarchy of responsibility with cultural norms set at the top of the organisational pyramid and which are enculturated in a pro-active manner. However within the adventure aviation environment the safety culture is adapted from the recreational origins of each pursuit. Any common organisational structure may be poorly connected to all individuals involved in the operational process and will have evolved horizontally without a defined authoritative process. As a result, best-practice processes and a unifying safety culture are not well disseminated, and the definitions of safety are nebulous. Safety practices tended to be developed in isolation by individuals with simple notions of personal protection as an ad hoc risk management process. In the final analysis, the current specifications for best-practice standards indicate a need some alteration as they appear irrelevant to operations that consist of, in some cases, a singular individual.

The recommendations in Chapter 6 look at possible strategies for implementation and the improvement of the processes that support implementation, including the formation of a national representative body to integrate practices and foster cultural norms, and for more pro-active education and informational processes. Further research is also recommended and it is hoped the outcomes of the research will be useful to regulators, industry participants and other researchers.

At the time of completion of this thesis, the regulation had, in fact, been passed in to law. Compliance with NZCAR Part 115 is now a mandatory requirement for all operators.

Chapter 2: Review of literature

2.0 Summary of sections

This chapter covers the origins and process of the development of the new Rule Part 115 with reference to published theoretical and informational sources. It also reviews the current and proposed legislative framework and regulatory requirements for adventure aviation activities in New Zealand as of October 2011 (this is just prior to the passing of the new Rule Part 115 legislation in to law).

Each topic is reviewed in sections as follows:

- 2.1 The background of recreational flying in New Zealand.
- 2.2 The development of current industry regulations and monitoring.
- 2.3 Issues regarding the present regulatory standards.
- 2.4 Rule-making for adventure aviation and commercialised recreational flying.
- 2.5 A global view of the basis of rule-making for aviation – how the new regulation may fit.
- 2.6 The local view of adventure aviation regulation.
- 2.7 The demand for adventure aviation regulation.
- 2.8 Reactive and relative safety standards.
- 2.9 Safety performance indicators – What the new Rule is expected to achieve.
- 2.10 SMS – a recognised formal standard for aviation.
- 2.11 The application of the new Rule Part 115 upon businesses – regulatory intention and operator perceptions.

2.1 The background of recreational flying in New Zealand

The legal and regulatory basis of aircraft usage in New Zealand is established by the New Zealand Civil Aviation Act (Civil Aviation Act, 1990¹) and its associated Rules (each Civil Aviation Rule is referred to as an NZCAR or Rule Part) and Advisory Circulars (ACs)². These rules cover commercial and private flying practices as well as training requirements and airworthiness standards.

Recreational flying has evolved under this system using a range of flying machines which, historically, have been industrially produced aircraft of a traditional design used for both private flying and also for the transport of passengers on a small scale. When passengers are carried for a financial return the flight is deemed to be “air transport” which is defined under the Rule Part 1 as meaning an operation for the carriage of passengers or goods by air for hire or reward (NZCAR Part 1).

The NZCARS set out standards for both private and commercial operations whereby air transport has elevated standards for operations and pilot qualification compared to those of private operations, although the standard of machinery and the maintenance are essentially the same. The aircraft are certificated under the standard category specified in NZCAR Part 21 (Certification of Products and Parts). This certification process aligns to standards set by ICAO (the International Civil Aviation Organization), the American FAR (Federal Airworthiness Regulations), and the European JAR (Joint Airworthiness Requirements) standards³. Maintenance is required to be carried out by licenced aircraft maintenance engineers whose qualification is prescribed under NZCAR Part 63 (Flight Engineer Licences and Ratings).

¹ Cited regulation is referenced in the References on page 166

² All current NZ civil aviation Rules and Advisory Circulars are available at: www.caa.govt.nz

³ FAR airworthiness standards are available online at http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgFinalRule.nsf/Frameset?OpenPage. JAR standards are available online at <http://www.jaa.nl/publications/section1.html>

Alongside this level of control has been the growth of airborne activities in non-standard category aircraft such as microlights and paragliders. These aircraft have not received any type certification and are not subject to such rigorous categories of airworthiness because their use has been considered to be recreational or experimental (CAA, 2011d). The number of these aircraft has been allowed to burgeon under a less regulated set of guidelines applied largely independent of the greater civil aviation regulatory structure and has enabled the freedom for recreational flyers to pursue their sport.

The history of the control, monitoring and regulation of the recreational flying sector extends to changes in the way civil aviation has been managed by the New Zealand authorities. In the 1980s a consulting firm was engaged by the New Zealand government to look at modernising and streamlining the regulatory environment for aviation. The resulting Swedavia-McGregor Report (Swedavia-McGregor, 1992) recognised the emergence of novel types of flying such as in micro-light aircraft or using hang gliders and paragliders. It recommended better consultation with industry sectors and more self-regulation outside of commercial airline operations. The recommendation was for a system “allowing the industry to accept more responsibility, placing the responsibility on the industry to be more self-regulating, disciplining itself wherever practicable (e.g. sports and recreational activities).” (Swedavia-McGregor, 1992, page 91). In May 1990 the old Air Transport Division of the Ministry of Transport published a notice of intention to carry out a complete review of the aviation regulatory system (CAA, 1997). Subsequent restructuring led to the implementation of a rule to allow the unfettered development of recreational aviation outside that of standard category aircraft by allowing recreational organisations to manage the flight activities and qualification requirements of pilots, and the construction and airworthiness of aircraft under NZCAR Part 149 (Aviation Recreation Organisations – certification).

Thus the activities of recreational flying have been developing on the basis that it is a pursuit carried out by keen enthusiasts, and so an expansion in the range of activities has continued from

those origins. Most of the aircraft used have not been conceived for commercial purpose and many designs stem from radical or minimalist concepts. Micro-light flying gives a pertinent example. In this case there is a bloom of affordable flying due to a plethora of new designs, materials, power plants, and construction techniques available. The original and most basic models presently available are simple, light weight, and often produced as a kitset with amateur construction and maintenance in mind. Standards of advancing technology and sophistication are recognised by industry publications of this era (RAANZ, 2005) and such information indicates the increasing performance and payload of these types of aircraft. A general review of a range of sport aviation literature through this period shows an increased departure from the mainstream aviation fraternity and specialisation of knowledge and technology base⁴. The range of types, performance, and levels of sophistication of these aircraft has been counterbalanced by limitations in their use as they remain lightweight craft of limited structural strength. These deficiencies have been highlighted in a recent accident report by the Transport Accident Investigation Commission (TAIC, 2010).

Increasing demand for higher performance and the accompanying technological advances mean there is little difference in the apparent standard and performance of some of the more sophisticated aircraft available in the microlight category compared to normal certified general aviation (or “GA”) aircraft. Presently, many fast and technologically advanced aircraft remain classified as “microlights” and are accompanied by the lower airworthiness and piloting standards applicable for that class (NZCAR, Part 103; NZCAR Part 43).

The performance levels coupled with modern construction and simple maintenance allow these aircraft to carry a pilot and passenger in relative comfort at a very low cost and there has been, inevitably, growing demand for these types to be available for uses beyond the original concept of

⁴ For databased publications of microlight and paraglider aircraft see the Recreational Aircraft Association of New Zealand website, view at <http://raanz.org.nz/wiki/pmwiki.php?n=Main.RecPilot>; The Sport Aircraft Association website, view at <http://www.saa.org.nz/cms/members/sportflying>; and The New Zealand Hangglider and Paraglider Association website, view at www.nzhgpa.org.nz/airborn.php

enjoyment by the individual owners or club members. This has been clearly demonstrated by the advent of some commercialisation of operations whereby recreational flights have been increasingly aimed at the tourist market (Jamieson, 2006). For hang gliders and paragliders, the increase in performance and the invention of tandem harness systems allow a comfortable and relatively safe experience to be delivered to paying passengers. Paragliding “schools” have subsequently developed into busy tourist-based operations providing one-off flights for thrill-seekers (ibid.).

Similarly, the preservation and reconstruction of vintage and “warbird” aircraft (which have been designed for military use as opposed to air transport) has led to calls to allow joyride operations to paying passengers in these types of aircraft. The emergence of a range of new airborne activities was recognised in a review of adventure aviation by O’Day & Murray (1995) and by the CAA in its revised policy on the development of an adventure aviation rule (Northover, 2005). These reviews deal with the issue of commercial operations in non-standard category aircraft that are perceived as having a heightened level of risk to that of current air transport operations due to the environment they operate within, the type of operations, the limitations of the airworthiness requirements, and the limitations of the amateur pilot qualification presently required for the operation (Northover, 2005).

2.2 The development of current industry regulation and monitoring

Recommendations for the restructuring of civil aviation in New Zealand from the Swedavia-McGregor Report (Swedavia-McGregor, 1992) were accepted by the New Zealand government leading to the establishment of the New Zealand Civil Aviation Authority in 1992. A revised system of certification of operators and surveillance was also established. The report (ibid.) indicated that standards for civil aviation safety should comply with internationally accepted levels as specified by the conventions of the International Civil Aviation Organisation (ICAO). It

was suggested that the new authority encourage increased self-regulation for private operations. A recommendation to this effect led to the development of Rule Part 149 whereby the individual aviation recreation organisations would be certified to develop and regulate their own standards for pilot qualification and airworthiness standards (CAA, 1997). Several organisations subsequently gained certification under Part 149 including various microlight associations and parachute organisations, as well as the New Zealand Hang Gliding and Paragliding Association (the NZHGPA - which represents all hang gliding and paragliding operations in New Zealand), and the New Zealand Warbirds Association (which supports vintage ex-military aircraft operators). These organisations act as independent controlling authorities or “umbrella organisations” with a mandate to oversee each sector of recreational flying that they represent.

The current Part 149 organisations have developed a range of guidelines stipulating the minimum safety standards for their activity. Membership of a Part 149 organisation is usually (but not always) a mandatory requirement for those individuals partaking in each specific aviation activity. This arrangement has allowed recognition of the separate realms of recreational and commercial flying and has enabled the former to evolve organically. The Part 149 framework was specifically developed in regard to the novel and specialised nature of the various activities and so allows a large degree of self-governance with the input of requisite expertise sourced from within each sector. The arrangement has also provided a degree of flexibility that has been reflected by the considerable change and innovation in the wider recreational flying sector in recent years.

Part 149 further stipulates requirements for safety management for the certificate holder. This includes a requirement for the holder to have an operational exposition formalising the structure of the organisation and the standards for operational procedures (CAA, 1997). The formalised exposition of the organisation does not necessarily extend to each member/operator as a standard operations manual, however it does provide guidance and sets rudimentary standards for generic operations by which all members should comply. The Part 149 organisations have variable resources and systems for monitoring or controlling their codes. Current commercial operations

by individual members tend to fall outside of any formal system for regulation extended by the organisations (CAA, 2007a). Monitoring and safety improvement therefore rely on the initiative of each individual enterprise either utilising Part 149 resources or by independent means.

Under the Part 149 system, the instructional aspects of sport aviation have also been used to enable pseudo-commercial operations. Activities such as paragliding have burgeoned in tourist centres, originally operating as training flights but now have become increasingly commodified for the tourist market. Tandem flights have allowed a more passive customer experience – usually as a one-off flight as opposed to a training program. The use of other non-standard category aircraft such as gliders or aerobatic aircraft have operated adventure-aviation style enterprises using either Part 149 specifications or NZCAR Part 61 (the rule defining pilots licences and ratings) as the regulatory basis. Part 61 is not itself a certification standard for safety and does not provide formal regulation or processes for the monitoring of organisations, but rather prescribes the requirements to hold pilot licences and ratings. Under the banner of flight training, operators should be able to demonstrate that any “trial flight” has been on an instructional basis and so are not under the definition of “air transport” (NZCAR Part 1 - Definitions; NZCAR Part 61). The rules for training flights were not intended to be applied to a one-off products aimed at tourists.

The carriage of passengers in small aircraft as a commercial operation would be normally expected to be carried out under NZCAR Part 135 (Air Operations – Helicopters and Small Aeroplanes) which requires the use of professionally maintained, type certified (i.e. standard category) aircraft. Part 135 certification places responsibility upon the ‘aviation document holder’ to effectively manage the safety of the operation, train their personnel and adequately resource the operation. It is this system of certifying organisations (i.e. awarding the ‘document’ of certification) that allows the entry, surveillance and exit procedures for each commercial operation. Crucially, the specifications of Part 135 conform to a set framework, reflect airline industry standards, and do not allow the use of un-certified or non-standard category aircraft.

The framework of any rules controlling operational practices, such as Part 135, are specified by an additional rule - Part 119 (Air Operator Certification). This prescription balances the provisions of statutory requirements with specific operational requirements by allowing system components to be developed by each company according to the needs of their operations. Certification requires that the exposition states an organisational structure to administer safety. This includes having a risk identification and management program, and a program to provide quality assurance (QA) (NZCAR Part 119, para. 119.79). It also specifies compliance with minimum personnel qualification and training standards as well as practical operational restrictions in regard to equipment, environment, and human limitations (NZCAR Part 135; *ibid*). The CAA can then carry out safety audits upon the system of each operator, in reference to their exposition, for entry and on-going continuance. Such audits allow the development of risk profiles for each company and sector of operation (CAA, 2009b).

2.3 Issues regarding the present regulatory standards

Existing outside the requirements for certification, the various sport flying sectors have had little motivation to develop similarly enhanced standards for commercial operations. They are unable to devise any universal commercial adventure aviation accreditation or regulatory standard due to the lack of applicable licencing or certification arrangements. Regulatory restrictions specify the carrying of passengers for hire only in standard category aircraft (NZCAR Part 9, para. 91.105 Certification). Most “sport” aircraft operate in the non-standard or special airworthiness category and as such have not been seen as fit for the purpose of carrying paying passengers due to differing airworthiness requirements for their design, construction, initial testing and maintenance. Also, most Part 149 organisation do not issue any formally defined “commercial” licence or competency certificate, and there are clear statements from many of these organisations that commercial operations are presently prohibited (RAANZ, 2004; SAC: 2011). Any commercial operations would therefore be operating outside official sanctions, although pseudo-commercial activities have continued to operate. In 2005 the CAA said “The prohibition of hire or

reward operations using special category aircraft has resulted in some operators disguising commercial operations as private operations with consequent safety implications” (Park, 2005). Alongside such statements are indications that the CAA are prepared to be flexible on this problem and actually allow some de facto commercial services to exist in spite of the current rules – presumably in light of the future promulgation of newly developed applicable regulation such as Part 115. A stipulation for one such operation using weight-shift type microlight aircraft was that the pilots hold CAA Commercial Pilots Licences issued for standard category aeroplanes. This qualification is not required for microlight aircraft but could be considered to supply a higher level of skill and knowledge than any present microlight piloting certificates. This stipulation complies with NZCAR Part 61 requiring a commercial licence for the use of an “aircraft being operated for hire or reward” (NZCAR Part 61, para. 61.107).

Currently promulgated CAA rules and associated background development documents and reports indicate the basis of the current framework as it relates to adventure aviation. They show an awareness of inconsistencies between regulation and practice, and the perceived problems from the point of view of the regulator⁵. A policy review for the introduction of new adventure aviation regulation by the CAA (CAA, 2007a) highlights concern for the situation whereby current adventure aviation operations are not appropriately certified for operation and the CAA has no formalised means of monitoring or any mechanism to control entry into these activities.

The CAA further indicated it did not consider NZCAR Part 149 as a certification system appropriate to commercial operations (CAA, 2007a) as not all activities come under the umbrella of such organisations and it was recognised that the organisational systems of each may not be appropriate to the activities carried out by individual operators. The reliance on Part 149 as an applicable regulatory framework to any commercial adventure aviation operation presents a range of problematic issues. The exposition of each Part 149 organisation of a particular recreational activity means that these organisations set their own requirements which may not extend equivalent or universally recognised standards for safety. The individual operators are not

⁵ the CAA *Rules Development* website; www.caa.govt.nz/rules/rules_and_more.htm, has lists and links to the applicable documents

themselves certified and are reliant on an extension of that organisation's safety commitment and related documentation to provide guidance. The operators are assumed to abide by the basic rules of the air as a minimum standard. Those organisations that do set standards that may be applicable for commercial operations are not required to maintain sufficient levels of resourcing to extend their responsibility to the activities of the individual operators. Their role is considered merely to be as a mechanism for advising standards and as a conduit for information.

In the enforcement of safety standards, due to the absence of individual operator certification, the CAA are unable to invoke normal sanctions, such as the suspension of the operating certificate, against operators whose pilots are seen to be conducting unsafe or illegal flights (Northover, 2005; CAA, 2007a). However, where regulation does apply, the CAA is not considered to have sufficiently specialised expertise to oversee the industry and assumes oversight by the industry members themselves (Jamieson, 2006). Any enforcement action under this arrangement will be the responsibility of the umbrella organisations and so will be assumed to be monitored through a system of the subordinate local branches or clubs. However, these may well be operated on an occasional and reactive basis using part-time or volunteer staff. Clubs tend to operate at varying levels of activity unrelated to the level of flying that they administer and are also highly dependent on the motivation of their officers. Club members, and particularly the club's executive members, may well be operators of adventure aviation businesses themselves, which leads to a potential for a conflict of interest in enforcement scenarios (Northover, 2005).

2.4 Rule making for Adventure Aviation as commercialised recreational flying

The term “adventure aviation” is itself problematic. It is applied to the use of several types of operations whereby flying activities that are normally (or formerly) recreational have become commercialised or have the potential to be developed into a commercial operation. As it refers to the *use* as opposed to the *class* of aircraft it can include a huge range of non-standard category aircraft such as aerobatic aircraft and vintage or ex-military aeroplanes. The term encompasses the use of resurrected fast-jet aircraft, through to parachutes and hang gliders as well as standard category aircraft, for purposes that previously excluded passengers.

The assumption is that adventure aviation flights operate for experiential purpose as opposed to transportation – and therefore flights would, in the case of powered aircraft, be returning to the start point and not be for the movement of people from one place to another. It is also assumed to exclude flight instruction – and so not apply to similar operations that are intended to train pilots, impart a skill, or necessarily to introduce individuals to pursue the activity as a sport. It is therefore not assumed to include instructional “trial flights” such as offered by aeroclubs and flying schools (Northover, 2005) which are considered to be conducted under a separate regime of regulation developed specifically for training operations⁶. A recent report on adventure tourism by the New Zealand Department of Labour (2010a) considered adventure aviation to be “those operations carrying passengers for hire or reward where the object of the operation is for the passenger’s recreational experience of participating in the flight, or engaging in the aerial activity.” (Department of Labour, 2010a, p 55). With the specific exclusion of a training purpose in further definitions, such as those from the CAA (Northover, 2005) it encompasses a range of activities, evolving over the past few years, that have been providing a service to paying clients and that are of a commercial or pseudo-commercial basis – with the focus on providing a one-off thrill. The range of operations currently under way are run either on a seasonal and part-time basis

⁶ This is; NZCAR part 141- training Organisation – Certification ; and NZCAR Part 61 – Pilots Licences and ratings

by one individual or are conducted as a permanent large scale enterprise with many employees (Farrel, 2006; Mohelnitzky 2010; Jameison, 2006). These activities have been undertaken utilising the raft of current regulations with an assumption of authorisation under one or other, or a combination thereof.

The new Rule Part 115 is designed specifically to regulate all such activities under one banner and is now in the final stages of implementation after a protracted development process. The CAA's second Notice of Proposed Rule Making (NPRM) for a new Rule Part 115⁷ takes into account recent changes in categorisation procedures for aircraft to better enable recognition of types of aircraft that may be suitable for adventure aviation according to their construction and maintenance standards. A wider range of standards is considered suitable. The NPRM specifies that operations may include passengers flights in standard category aircraft flying from A to A, aircraft conducting formation and aerobatic flights in close proximity (i.e. aerobatic flights or pseudo-military operations such as simulated dog fights), A to A flights in microlights and certain special category aircraft – to allow joy-riding in vintage or light sports category (LSA) aircraft, and non-powered passenger flights (such as balloon, glider, tandem hang glider and parachute descents). As a final addition to the definition of adventure aviation the response to submissions to the NPRM (CAA, 2010a) specifically states that “the CAA considers that adventure aviation activities are operations conducted for hire or reward that fall outside the definition of an air transport operation” (Mohelnitzky, 2010). This statement casts an exceptionally broad net to capture all and any commodified commercial activities aside from training, air charter and airline operations. The expectation, once the rule comes in to force, is that operators will seek certification forthwith. The CAA has proposed a transitional process based on the estimated level of safety risk for each activity (Mohelnitzky, 2010).

⁷ The first NPRM came out in 1999 – see; CAA (2010a) and CAA (1999).

2.5 A global view of the basis of rule-making for aviation

The advent of the new Rule reconsiders the risk elements within the notion of passenger operations because the class of aircraft that may be used may not have been considered for such purposes when originally developed. The universality of the application of the Rule – being applied to all “*operations conducted for hire or reward that fall outside the definition of an air transport operation*” means the basis of rule-making, the risk elements it seeks to address, and the implementation strategies need to be examined in detail. In order to look at the applicability of the proposed Rule and the validity of the policy behind it, it is necessary to identify its scope and rationale, and to review the basis of formal regulatory control as it applies to the management of risk. Adventure aviation, alongside any activity carrying passengers for hire, would be expected to provide a reasonable standard of protection for the user – particularly if they are paying passengers. Past compliance with the current rules for operational management that are applicable to commercial passenger transport, such as that achieved by airlines, was tenuous. These rules have a basis in either recreational activities or flight training, in which case there is no requirement for a stated or formalised safety system specific to each operation as there is with, for instance, small airlines offering scenic flights.

As adventure aviation activities straddle a dichotomy between the commercial and recreational sectors, the crossover presents the task of setting standards for safety as well as managing and controlling them. The basis of the new regulation may not be assumed to be the same as that applicable to airline operations because any requisite legislation prompted by international convention and modeled on overseas examples is usually formulated in consideration of public air transport. In which case the experiential nature of activity, and any resulting increase in risk, has not been a consideration. Where the “thrill-seeking” nature of adventure aviation sits somewhat outside that of the air transport environment, and the regulatory applications for such activities assume an increased inherent risk, these activities would, arguably, have a basis in more fundamental standards.

There is an assumption, with outdoor recreational activities, that participants make their own informed assessment of the risks (Creyer, Ross & Evers, 2003; Tweeddale, 1998) and that risk management of any activity stems from the recognition of actual hazards. Where there is an increased duty of care, such as in commercialised activities offered to the public, then additional risk management processes are required to take in to account the trust that the client puts in to an operator to provide the appropriate protection (Wickens & Holland, 1999). The basis for this notion of protection of the client naturally extends beyond aviation in to myriad of other outdoor recreational sectors. There is a range of commentary on the drivers of risk management in outdoor recreation generally: Portinga & Pidgeon (2003) review the holistic inputs into risk management beyond the primary users, including the public perceptions of risk and therefore the public acceptability considerations that may drive the call for regulation; Tweeddale (1998), Creyer et al. (2003), and Maroc (2002) indicate that where the exposure to danger in certain environments are higher than more sedate activities, the risks should be expected to be sufficiently well managed if it is a commercialised activity; Waring & Glendon (1998) looking at industrial risk management, point out that if improvement in safety standards is prompted by public demand, then the level of public acceptability must be considered. These authors reiterate that there is both a perception of hazards – by the prime users and also by the spectators (i.e., the public), and there is the expectation of sufficient management of the exposure to those hazards across the board.

Public perceptions of safety within the adventure aviation environment also reflect a further dichotomy whereby there is a need to prescribe clear and obvious safety standards and also feed an additional demand for challenging and “thrilling” situations (Maroc, 2002). Conducting a commercial operation extends the responsibility to apply additional risk management further in order to allay external negative perceptions. Public tolerance to the risks may be represented by the uptake of the activity and by the repercussions of accidents or incidents within the sector (Waring & Glendon, 1998; HSE, 1999). In the case of serious and well publicised accidents there is an emotive element, and tolerance may waver according to the media profile. There is a recognisable increase in public reaction and calls for change when high profile accidents are reported (Waring & Glendon, 1998; HSE, 1999; Hunter & Baker, 2000). The level of safety of an

activity then becomes a question of maintaining public confidence regardless of whether the activity is private or commercial, as the differentiation is not greatly indicated by the media or perceived by the public. This has put adventure aviation in a situation where – in the case of any accident or incident that is vigorously reported or where liability outcomes are publicly confronted - any existing regulatory standards are exposed and are likely to be challenged regardless of the actual systems in place. Public confidence is recognised as being stabilised only if there are sufficient controlling mechanisms to provide the assurance that preventable accidents will not occur (Hunter, 2002; Department of Labour, 2010b). Maintaining the safety level to that of the “preventable” standard would need a risk management process that encompasses all conceivable possibilities (Kritzinger, 2006). The resulting requirement is for sophisticated hazard analysis and mitigation procedures to the extent that these are becoming regarded as a highly specialised area of input that may not be readily accessed by all operators without the development of adequate systems and support structures (Kritzinger, 2006).

Ideally, sufficient support structures are developed and implemented within the industry, according to demand. However, in situations where voluntary and self-managed standards have not proven effective then some regulatory structure is generally called for. A number of American and European authors identify the advantage of formal regulation in both aviation and other outdoor risk prone activities (Goodrich, LaFrance & Rosenthal, 2007; Kritzinger, 2006; Amalberti, 2001b). As well as encouraging best practice in risk management, formal regulatory structures allow the collection and reporting of statistical information. Safety is increased by setting clearly defined standards, implementing targets for operators, and also having a visibly demonstrated public and governmental commitment to safety. Hence safety is perceived as a top-down process which spawns a total safety management process (ICAO, 2006c; Hernandez, 2005). Whether this total safety philosophy extends sufficient regulatory authority to all activities depends on factors such as the extent and application of the legislation, the perceived exposure of risk, the volume of activity and the number of participants involved, and also whether the activities are considered to be run as commercial operations or not.

Globally, aviation safety regulators dealing with commercial operations lean towards mainstream air transport and construct legislation suiting larger businesses that have good accountability and reporting, and that have the resources and formal structures that can effectively support the regulatory requirements. This is clearly indicated in safety oversight and safety management information publications from America and Europe. Examples are the documents from EASA (the European Aviation Safety Agency) by Clark, Gray & Sorensen (2009), ICAO (Hernandez, 2005), and the US Government Accountability Office (GAO, 2005). These examples invariably provide reference to well developed and appropriately resourced organisations. Very small businesses using non-certified aircraft are left out of the regulatory safety net and so their operations in other countries, in terms of commercial activity, tend to be restricted in practice. Whereas, in New Zealand, a mix of adventurous and independent cultural attitudes and non-punitive civil liability structures tend to encourage such activities. The activities continue to operate, up to the present time, with little reference to best practice systems because there is little incentive to comply (Department of Labour, 2010b; Gill & Shergill 2004). These activities have tended to emerge on a small scale and so have not drawn a large amount of attention, until now.

Available literature on the strategies that other national jurisdictions use for managing adventure aviation activities is sparse. In regard to adventure aviation using microlight aircraft, a recent report by the Transport Accident Investigation Commission looked at overseas regulatory requirements (TAIC, 2010) and indicated a general lack of development beyond any existing legislation pertaining to amateur operations and flight instruction. In the cases of British and Canadian authorities, referral to the use of microlight aircraft for commercial operations cited airworthiness limitations, including those stipulated by the manufacturer, as precluding commercial activities beyond flight training. In South Africa, their DCA specifically limits remunerated microlight flying to training only (Directorate of Civil Aviation, 2010) and warbird operations in that country emphasise the training and “essential crew” classification of participants (Thunderjets, 2009). Overseas regulators tend to invoke policies that avoid confronting those flights aimed as one-off experiences for the tourist market while these activities have a low media profile.

Many overseas authorities face issues around the management of risk in tourist based adventure activities generally, but the aviation sector is invariably left out of consideration. For instance, the UK recently invoked legislation to licence adventure activities in response to growing safety concerns over several accidents that occurred outside the field of aviation (HSE, 2007). In that case, no aviation activities were recognised for inclusion in the scheme. It is also suspected that commercialised activities are limited by stringent insurance and liability requirements which may not be present in New Zealand. As the overseas standards for commercial airborne adventure activities invariably appear to focus primarily on the instructional aspect, New Zealand's foray in to a dedicated adventure aviation rule appears to be breaking new ground.

In Australia, the civil aviation regulatory authority, CASA, states the development of a dedicated adventure aviation rule is underway (also known as Part 115) - but CASA has been equally slow in progressing it - with little development since 2006 (CASA 2010). The Australian focus is squarely on the practical risk implications. Current Australian rules attempt to find a balance between the extremes of self-managed risk (i.e informed consent) and overriding regulation. Australian authorities have gone as far as delineated additional classes of users depending on the level of understanding and acceptance of risk that they possess (CASA, 2009). This includes defining "participants" as a separate class from "passengers" (CASA, 2009). CASA attempts to state the priorities of safety legislation in order to contextualise the risk assumptions for participants, and also to outline the limits for adventure aviation under those rules. This policy allows the present operation of a range of ex-military, historic and replica aircraft in adventure-style flights - but makes available a published guide for people considering taking adventure flights in an effort to ensure the risks are understood by all participants (CASA, 2011). This aligns with the stated intention, by CASA, to focus resources on educating participants and potential participants so that they are aware of the risks they face rather than simply limiting activities (CASA, 2009). Whether the risks are really fully understood by paying participants is presently unknown.

In New Zealand the requirement for more systemic control of adventure aviation activities is facing increased pressure from the higher profile of accidents and incidents in the broader tourism sector, compared with that overseas. The problem is referred to in the 2010 Department of Labour report on adventure tourism (Department of Labour, 2010) where a range of options was considered for adventure tourism activities generally - from self-regulation through to accreditation and certification. Regarding the methods of control of recreational outdoor activities, Priest & Gass (1997) look closer at the issues in choosing a certification path over mere accreditation. They indicate that the self-evaluation and peer review components of accreditation would not be able to be satisfactorily administered by a regulatory authority. McDonald (2003) highlights issues with voluntary guidelines, accreditation, and the problems that voluntary organisations have in resourcing for the national oversight of disparate and fragmented activities. Meanwhile, the progress of development of Rule Part 115 indicates the intention to legislate for safety by requiring organisationally based quality management systems as a specific requirement (CAA, 2010). As the application of such systems to very small organisations is untested, and the dissimilarity of many adventure aviation companies to other mainstream aviation enterprises sets them further apart from the formal developments of safety management, the success of the implementation of the new regulation requires a closer look at how risk management for such activities is presently considered in the New Zealand context.

2.6 The local view of adventure aviation regulation and safety management

In this country, the growth of commercial adventure aviation activities has evolved in tandem with other related outdoor activities that provide a ‘thrill-seeking’ element. It sits in an uneasy coexistence with activities such as bungy-jumping and white-water rafting because safety perceptions of risk are almost entirely subjective. Bungy-jumping – although appearing to challenge notions of self-preservation - remains exceptionally safe, being carefully monitored and with the risk parameters able to be controlled in absolute terms. As a result it has an impressive safety record (CAA, 2005). White-water rafting however presents variable hazards that are often difficult to predict and the activity applies mitigation strategies that limit the risk - rather than control it. White-water rafting has an extremely poor safety record in relation to bungy-jumping or even parachuting (Maroc, 2002) - although all these activities are often seen together as presenting similar mental and physical challenges and therefore an assumption of similar risks in the minds of the tourists that try them (Cryer et al., 2003). A further common assumption is that proper controls are in place regardless of the exposure to danger. There are indications that the users of the activities - the client participants - have little understanding of the measure of risk and cannot be reasonably expected to properly consider them (Hersey, 2010). From the operator’s point of view, reports indicate the client’s motivation to indulge must be carefully managed against the variable levels of risk as well as in consideration of commercial pressure (Heather, 2009; Jamieson, 2006).

Much of the attraction of these activities is the emphasis on notions of individual freedom and choice (whether real or not), and informed personal-risk taking which is coincidentally attractive to the burgeoning F.I.T.⁸ tourist market. Enterprising operators regard this market as open to commercial exploitation and its growth has been remarkable. There is a parallel growth in adventure aviation activities. Some sectors, such as paragliding and skydiving, feature very strongly in numerous tourism centres around the country. The clientèle, particularly international tourists, do not tend to differentiate between a range of thrill-seeking activities but tend to think of

⁸ F.I.T - Free Independent Traveller

them as part of New Zealand's overall tourism product that is commodified under the 'thrill-seeking' banner. In terms of the commercialisation of an experiential product, there is little difference between aviation, water or ground based activities (Maroc, 2002; Hersey, 2010). Recently a number of fatal accidents, including jet-boating, rafting, alpine guiding, canyoning, ridge swinging, paragliding, and ballooning, have highlighted deficiencies in the levels of risk management – and indeed have exposed the wide range of methods of dealing with risk in each of the activities (Hersey, 2010; Maroc, 2002.; Forbes, 2011). The fact that it has encompassed such a wide range of activities implies the deficiencies in risk management are endemic.

The range of adventure tourism activities whether airborne, water or land based are presently reliant on a plethora of existing regulatory control with a wide range of applicable standards that may or may not be appropriate and do not provide a recognisable standard. In some cases they are reliant on ad hoc regulation born out of immediate needs – and which is often driven by an historical event such as an accident or serious incident. Others utilise standards applied by less-than-suitable existing regulation such as the Health and Safety in Employment Act (1992). Industry oversight of operations is similarly fragmented. The 2010 Department of Labour report on the review of adventure tourism (Department of Labour, 2010a) deals with the issue of risk management. The report states: “there are gaps in the safety management framework which allow businesses to operate at different standards than those generally accepted”. It further stated that “while these gaps remain there is insufficient assurance that preventable accidents will not occur” (ibid. page 6). This situation echoes the earlier findings that led to the development of Rule Part 115. It also indicates parallel strategies in the way the management of risk in operations is presently conducted. If developmental paths are to converge then the standardisation of best practice systems is highly desirable, with the common goal of ensuring protection from preventable accidents for any enterprise that conducts activities in the outdoor environment.

As it stands there is no encouragement for a common certification or accreditation standard by operators. Cross-activity representation is also lacking. Currently, the fostering of safety standards

in sport aviation rests largely with the Part 149 certificated umbrella organisations, Their focus is on the recreational participation with little or no emphasis on the professional activities carried out by some of their membership. The gearing of these organisations does not support the commercialisation currently in progress – partly due to philosophical stance and partly due to insufficient resources. A current example is the NZHGPA – the New Zealand Hang Gliding and Paragliding Association. This association is a Part 149 certificated organisation having a part-time, voluntary executive and part-time administration team. Its operations and procedures manual provides a regulatory conduit for all hang gliding and paragliding pilots throughout New Zealand enabling a minimum compliance standard (NZHGPA, 2010a). It's organisation, associated website, and publications give technical support and provide advocacy (see www.nzhgpa.org.nz/). The Association has the scope to approve launch sites, provide standards for pilot safety equipment, issue hang-glider and paraglider warrants of fitness, provide piloting certificates and set operational standards for hang glider and paraglider pilots in accordance with the specific requirement of the activity. The published exposition of the NZHGPA is focused on the recreational aspects and has little applicability to commercial operations other than the issue of a “Hang Glider Tandem Professional Certificate” which is a single step above an initial passenger carrying rating (NZHGPA, 2010b, p 17). The few directives that apply to passengers are mostly advisory and their implementation is dependent on the initiative of individual pilots. The safety mechanisms provided by the exposition are reliant on the commitment of individual clubs and the compliance of their membership⁹. There is no requirement for a specific operational risk assessment other than, for instance, the suitability of conditions and launch sites as perceived by individual operators (NZHGPA, 2010a). This function rests on the operator and exists without any formal supervision or checks. The system remains reliant on the experience of the pilot via the achieved level of that person's pilot certificate with no further test of competency. It also relies on that person's commitment, skill and knowledge to extend the Part 149 standards as an operational specification for their commercial activity. Similarly, one of the Part 149 certificated organisations applicable to microlight flying, RAANZ (the Recreational Aircraft Association of New Zealand), removes involvement in commercial activities by restricting commercial

⁹ At present there are fourteen NZHGPA affiliated regional clubs around New Zealand who must appoint a least one safety officer each.

operations through explicit statement (RAANZ, 2004). Another such Part 149 organisation for microlights, SAC (the Sport Aviation Corp)¹⁰, perhaps in anticipation of Part 115, state in their documentation; “No person shall operate a Microlight Aircraft for Hire or Reward unless that person: Is the holder of a valid Commercial Microlight Pilot Licence issued under (NZCAR) Part 61.” (SAC, 2011, Section 5.3 para. 1.3). At present there is no such thing as a “Commercial Microlight Pilot Licence” issued under Part 61 (the Civil Aviation rule encompassing flight crew licensing) and no commercial microlight ratings are available for pilots from any Part 149 microlight organisation¹¹.

In spite of this situation, some sectors - such as skydiving - have demonstrated growth within a highly effective safety framework successfully implemented under their umbrella organisations. Parachuting is a particularly well-developed sector working within the system. The New Zealand Parachute Industry Association (NZPIA) is an example of an organisation with a Part 149 derived mandate to control operations by providing guidance, standards and technical support for commercial operators as well as individual sports people. It implements a requirement of compulsory membership of all participants allowing it to set skill and experience levels by the issue of certificates limiting the carrying of paying passengers to holders of “tandem masters” ratings. Commercial tandem skydiving operations are continuing to grow at up to twenty percent per year and it is estimated that three operators at one aerodrome alone (Taupo) are able to provide around 50,000 jumps annually (Northover, 2005).

In contrast, paragliding has a less successful safety record, having had some high-profile accidents in recent times and a relatively poor safety image in spite of having similar systems in place. The reasons for the differences are unclear although the paragliding industry is more fragmented and the relationship of commercial operators to the umbrella organisations is more

¹⁰ The SAC is one of two other alternatives to RAANZ. One of the respondents in the research used multiple Part 149 organisations for differing activities (microlight flying for towing a hang-glider and hang-gliding itself) – each with their own set of standards and philosophical approaches.

¹¹ According to personal communication with CEO of one of the operators canvassed for the research, the possession of a Commercial Pilot's Licence [CPL] under Rule Part 61 [for aeroplanes] was a requirement stipulated [verbally] by the CAA in order to carry out present commercial operations – which have proceeded since 2005. In a further inconsistency, parachute jump pilots have not been required to possess commercial qualifications unless they are to receive a payment.

distant. Parachuting also has a close connection to mainstream aviation due to the use of normally certificated aircraft and pilots for delivery of the experience (i.e. the jump plane). Whereas paragliding has an entirely separate and distinct sub-culture. The overall picture is that the relationship of each Part 149 organisation to the individual operators can be highly variable in its level of interaction or formality, and it may well be remote, occasional, and dependent on voluntary reporting.

2.7 The demand for adventure aviation regulation

In 1995, the O'Day & Murray report recommended fixed safety levels to be applied to a range of aviation sectors in New Zealand and specified the introduction of controls to tourist aviation activities including what is now classed as adventure aviation (O'Day & Murray, 1995). By 1999 a CAA working group, which included the participation of various recreational flying representatives, developed proposals for regulation, and a notice of proposed rule-making (NPRM) was published in late 1999 (CAA, 1999). Further rule-making progress was then stalled due to competing priorities and limited resources within the CAA (CAA, 2010a; RAANZ, 2010).

Significant growth of adventure sectors of the industry was continuing throughout the period while available statistics recognised an increase in the numbers of sport aircraft and hang-gliders (CAA, 2010d). Although overall safety standards improved proportionally, there was an increasing trend in fatal accidents (CAA, 2010e). The interim period saw continued development of commercial activities, particularly in the hang-glider and paragliding sector, and a desire for some type of internationally recognised standard for operators of adventure tourism enterprises - both in the aviation and the marine and land based sectors (CAA, 2007a; Department of Labour, 2010a). However, recreational organisations, agencies, and individual companies showed an inability to act in a unified manner for self-regulation. Due to the diverse range of activities and

the number of certificated organisations that operated entirely independently, standard guidelines across the whole recreational flying sector were not universally enforced, or even agreed. The actual sufficiency of the safety mechanisms as they apply to the operations of individual members was not formalised according to any common standard. Historical acceptability was due to the small scale of operations and, in many cases, a recreational presumption assumed no involvement in direct public risk or perceived the existence of a commercial contract. The risks were assumed to be informed and able to be managed directly by the individuals involved.

Parallel to this was an increasing examination of safety culture and safety issues within mainstream aviation by the regulator (Gill, 2005; CAA, 2001). And, broader still, the Department of Labour report in to adventure tourism (Department of Labour 2010a) identified variable standards of safety that had been emerging historically throughout the wider tourism sector. It highlighted calls for stronger control of adventure tourism operators generally. A driver for this report was the fear of the negative impact of a poor safety performance on New Zealand's international reputation and a resulting reduction in the value of tourism expenditure. In the police report of a fatal hang-glider accident O'Hare (2003) summarizes a number of related accidents and incidents, and indicates the emerging safety issues that are becoming relevant to busy operations by well established operators – including such elements as pilot distraction and deficiencies in training. Meanwhile, the CAA, wishing to move adventure aviation regulation forward from its stalled position, instigated further consultation with industry regarding the finalisation of the new rule (CAA, 2010a).

The lack of formal regulation stipulating a certified standard was also recognised by the adventure aviation industry participants themselves (Hersey, 2010; CAA, 2004a; S. Kartsens, personal communication, 13 October 2008; A. Charles, personal communication, 1 November 2006;). There was further demand for extending commercial operations to a range of other types of activity – such as flights in ex-military and vintage aircraft - but action was stifled due to uncertainty regarding appropriate regulation and a lack of resources. Less developed sectors throughout the adventure tourism industry voiced a desire to enlarge their markets if they could

show inbound tour operators that they are working under a common, government-mandated code (Northover, 2005).

Subsequent development was driven by a series of increasingly high profile incidents and accidents, along with an overall review of outdoor safety by Sport and Recreation New Zealand which commented on the insufficiency of current health and safety in employment and accident compensation legislation in regard to safety or qualification standards (SPARC, 2008). Further media reporting of the concerns of general public were particularly apparent in the wake of subsequent incidents or accidents. Articles by Bryant (2010), Hersey (2008) and Jameson (2006) give pertinent examples of public re-action to adventure aviation incidents – with immediate calls for regulatory controls. Further reaction was the exasperation of some overseas tourists, who were involved in accidents, over the lack of mandated safety standards and the lack of legal recourse (Edens & Morgan, 2011). The Department of Labour report (Department of Labour, 2010a) cites the broad issues of safety in adventure tourism, liability and administrative control. The report mentions the development of NZCAR Part 115 with an assumption that it would ameliorate the negative public and media reaction – at least in the field of aviation.

The latest Notice of Proposed Rulemaking was issued in September 2010. The NPRM lays out the shape of the new Rule by applying the stylised format of other aviation regulation, and indicates that the new Rule would adhere closely to a Part 135 template. It also refers to the required alteration of related regulation which would be affected by general changes brought about by the new Rule (CAA, 2010a). For a period, the NPRM was open to a submission process whereby any concerned party could make comments. The call for submissions closed on 19 November 2010. A summary of the submissions was published in February 2011 (CAA, 2011c) and some relevant elements regarding the required standards of safety are discussed in the next section. The CAA final Rule Part 115 is to be in force in November 2011 (CAA, 2010f).

2.8 Reactive and relative safety standards

The current prescription for aviation safety standards in New Zealand is for a defined scale that is publicly recognised and accepted. Public confidence in the safety of an activity is an indicator of the level of safety as a form of social acceptance. In economic terms, the cost of providing safety is measured in the social cost of accidents. This cost value is achieved as part of safety monitoring (carried out by the CAA) by gauging the public willingness to pay to reduce the risk of harm or loss. It considers a range of factors such as aircraft damage, search and rescue costs, the cost of treating injuries and the costs of accident investigation (CAA, 2005c). A component of the total social cost of accidents is the value of a statistical human life (VOSL). This figure is an official estimation of the cost to the nation of the loss of a human life and is presently set at \$2.842 million dollars (*ibid.*)¹². These figures are useful when estimating the economic input required for implementing safety systems. Interestingly, these values, which were derived from land transport studies, were considerably lower prior to 1991 when the basis of appraisal was reviewed in the light of public and political pressure occurring in the wake of a series of highly visible road accidents (Barnett, Clough & McWha, 1999). This point highlights the subjectivity of such values according to public acceptability. Subjective standards can influence the perception of safety levels to a point that may not reflect any realistically objective measurement. In a further assessment of the costs, and by applying the social cost of accidents to the actual level of flying activity, the CAA estimates the average social cost for adventure aviation activities was approximately \$65.00 per person per hour of exposure (as of September 2009). In comparison, the average social cost for air transport operations is approximately \$0.10c per person per hour of exposure (Campbell, 2004a). The gap is, of course, in part due to scale factors in the level of activity – but does effectively produce palpable figures for real and actual costs. Given that this is the price of accidents within a sector then it could be argued that the additional cost of safety must reflect similar financial input. Of course any strategy for the improvement of safety towards set targets must go beyond such a simplistic view and consider practical factors such as the scale of operations, the volume of users, the resources available and time period envisaged for

¹². Note: Serious injury is set at \$299,100

achievement (CAA, 2004a). Under the CAA's Project Scope Statement for Rule Part 115, a statement of intent indicates a level of consultation with the industry to formulate methods and standards to achieve an "acceptable level of safety" and enable the industry to move forward (Farrell, 2006). This statement implies a commitment to a collaborative approach in defining new standards aside from those that already exist in other certificated sectors.

A common recognition of definable safety standards would be expected - including a measurement mechanism. The recognition of safety has historically been achieved by recording the acute effects of any unsafe conditions – i.e., providing the statistics of accidents, serious injury and deaths. Common perceptions of operational safety may therefore be reflected by measurement of the number of serious accidents and/or deaths in a specified period of time. Certainly, fatal accidents are an obvious failure of safety but tend to set a reactive standard rather than a relativistic one. Fatal accidents are usually well publicised and invariably succeed in attracting public attention. Any increase, or localised concentration, of such incidents decreases the perceived safety level (Pidgeon, Kasperson, & Slavic, 2003). Civil aviation safety standards have a basis in commercial purpose with a critical requirement to provide a recognisably safe and comfortable environment in order to encourage the public to fly and so reducing these extreme indicators is one of the ultimate goals of safety programs.

In the history of the aviation industry the reactive evolution of safety has shown an upward trend towards a safer environment as the number of aircraft and the level of passenger numbers have increased - although public confidence may not necessarily reflect this. Duane Kritzing (2006) points out that around the world over 13,000 large jets fly a total of 50 million hours annually whilst averaging around 50 fatal accidents in that period. This level of accident occurrence has, in actuality, decreased markedly in recent decades, by proportion, as the number of flights increases. The present accident rate presents an average fatal accident probability of one in a million (i.e. 1: 1,000,000 hours of flying) (NTSB, 2006). Relatively speaking, in comparison with any other mode of transportation, aviation is by far the safest way to go. But, ironically, that level of safety still presents the possibility of around one large jet airliner crash per week - which is approaching

the limit of public acceptability - whilst simultaneously being considered “ultrasafe” (Amalberti, 2001a).

In New Zealand, public perceptions of overall aviation safety generally remain stable with very few airliner accidents. These perceptions may occasionally be lowered due to some high profile accidents within smaller sub-sectors of the airline of the industry¹³. The expectation of standards will also be subjective to a particular sector. The public are used to high levels of safety in airline operations whereas such expectations are not present in the same degree in adventure aviation and therefore public perceptions as to any common requirement for safety may not apply. In spite of relativity (i.e. the “relatively safe” aspect), the other consideration, that of acceptability, presents itself as a more palpable, albeit subjective, standard to be applied to adventure aviation.

It is considered that the aviation industry itself should provide input in to defining safety targets. Presently, Safety Outcome Targets – developed for use by industry operators - are set for each year by a process that includes aviation community consultation (CAA, 2005c). This consultation process focusses on achievable targets – and may only partly consider reactive concepts of safety. It supports the stated policy to bring standards of safety for all small aircraft private operations in line with transport by private land transport (i.e. motor cars) as a recognizable minimum (CAA, 2010d). As such, these targets circumvent comparisons with airline transport. However, in regard to what standard should be applied by the implementation of Rule Part 115 for commercial operations, the stated goal, by the CAA, remains that of equivalence with normal air passenger transport operations in small aircraft (CAA, 2010a). The setting of such a standard for adventure aviation would be valid, from an acceptability point of view, only if driven by broader considerations of risk perceptions within the wider tourism industry. This is indicated in the recent report on adventure tourism (Department of Labour, 2010a) and indicates that inputs external to aviation may affect the required standards for safety

¹³ Media reports do not necessarily reflect public attitudes but do influence attitudes and perceptions. For relevant media commentary on this topic see Ray, (2006); The Nelson Mail (2006).

The overall result of these considerations is a varied and nebulous set of standards from which the operator would be expected to extract a set of target indicators - with industry consultation focused on relative aspects, and progress towards developing regulation focused primarily on reactive aspects. The identification of specific safety performance indicators, which are how safety is measured and how the New Zealand Civil Aviation Authority would be expected to measure the safety of adventure aviation under the new regulation, is addressed below.

2.9 Safety performance indicators: what the new Rule is expected to achieve

Having developed the rule making process and issuing the NPRM, a defined standard for the level of management of risk and clear performance indicators would be expected to be defined. The requirement for palpable and realistic performance indicators is necessary to allow operators to understand the extent of safety requirements, to introduce the importance of risk recognition beyond concepts of a safe/unsafe scenarios (i.e. that incidents are forewarnings of unsafe conditions), and, accordingly, to encourage reporting and information sharing. Setting performance targets also allows a starting point for the purpose of the regulation and conforms with a key element of best practice in safety management. However, measurements for such performance indicators proves to be difficult. A low level of incidence of accident occurrences has traditionally been used as an indicator of safety in the greater aviation industry. An accident is officially defined as where a person is fatally or seriously injured or the aircraft requires major repair (NZCAR Part 1 – Definitions and Abbreviations). However it may be as applicable to include incidents that do not result in direct harm or to apply a weighted bias to non-fatal accidents as well. Many adventure aviation activities (for example, paragliding) are accepted as having relatively high chance of injury but a low chance of fatality. This makes extreme indicators, such as deaths and serious injury, less applicable to gauge actual safety performance, or to understand what level of control is actually needed to be applied. Notions of safety aside from death or serious injury remain subjective and, in recreational activities, that subjectivity rests

largely with the participants. Many are prepared to indulge in certain relatively risky pursuits that may well involve some level of injury – the public enthusiasm for mountain biking, or for skiing and snowboarding are obvious examples; individuals take part because the chance of fatality or serious injury is low. However the reaction to relatively minor injuries can be large if they involve paying clients (Edens & Morgan, 2011).

From a practical point of view, and particularly when setting indicators of the performance of the safety systems that are in place, the level of incident occurrence (as opposed to accidents) is a strong indicator of safety and is related to proactive improvement measures. Indeed an incident; a near miss or close shave, is a negative safety performance indicator demonstrating possible weaknesses in the system. The understanding of such weaknesses can lead to a direct improvement in safety. The reporting of such incidents is an indicator that safety issues are being identified and addressed¹⁴.

The recognition and reporting of incidents is itself problematic. Within the aviation sector there is some doubt as to the effectiveness of incident reporting. A lack of acceptable reporting channels and commercial and competitive pressures means that the majority of incidents go unreported and therefore many potential safety issues remain concealed (Jamieson, 2006; Department of Labour, 2010b). Recent consultation undertaken for the CAA's Safety Target Outcome Reports indicates a resistance amongst operators in reporting incidents due to the perceived negativity and repercussive effects (CAA 2004b; *ibid.*). In any case, it is difficult to ascertain even the present accident rate in terms of flying hours for the adventure aviation category as there is no requirement for records to be lodged by unregistered aircraft operators (i.e. sport and recreational aircraft such as paragliders) and this is viewed as highly problematic for setting performance indicators (Campbell, 2004b). The available statistics for light aircraft in New Zealand (i.e., those below 2,721 kgs) over 12 months in 2003/2004 indicated two fatal accidents within 300,000 total hours flown - giving a fatality rate of about 1:150,000 (CAA 2005b). During the same period "sport" aircraft including hang/paragliders (which are unregistered aircraft - with no statistics for

¹⁴ *incident* means "any occurrence, other than an accident, that affects or could affect the safety of operation" (NZCAR Part 1, p.38).

the level of activity) had five fatal accidents. More recent statistics reflect similar levels of fatalities; in the three years July 2007 to June 2010 – for all (registered) sport aircraft there have been 14 fatal, and 22 serious injuries recorded for private operations in this sector (CAA, 2010d).

Following a broad analysis of safety concerns and consultation with various aviation industry sectors the CAA produced safety targets in a Safety Outcome Targets document (CAA, 2005c). These safety targets set the tracking indicators for safety using actual available accident or incident statistics. That document considered adventure aviation under the new category of “sport transport” being part of public air transport (ibid. p18) and developed a target standard for the future based on an estimation of social cost per hour of exposure. These targets were publicised throughout the industry (CAA, 2005c). Regular updates track the trends and a recent example highlights the increasing trend in actual social cost of the sport sector due to the recent rise in the accident rate (CAA 2011e). Having an established risk baseline allows operators to build safety management systems. Ideally such systems will track adverse events or conditions before injuries or fatalities occurs. Safety management Systems (SMS) is the present best practice framework, applicable to wide range of industries including aviation, for the establishment of such systems.

2.10 SMS – a recognised formal standard for aviation

Certainly, the tracking of all risk indicators invokes accepted procedures for best practice that are internationally recognised. The ICAO Aims and Objectives for Safety in Article 44 of the Convention on International Civil Aviation (ICAO, 2006a)¹⁵ led to the publication of best practice standards for safety in aviation (ICAO, 2006b). Such standards specify industry practice which define the ideal structure. Practices include fostering a safety conscious organisational culture, as well as stipulating formalised procedures for operators. The specific best practice standard for operational safety within organisations is referred to as a Safety Management System (SMS).

¹⁵ ICAO documents are available online, view at; www.icao.int/icaonet/dcs/7300.html

Accordingly, the New Zealand Civil Aviation Act reflects a commitment to the ICAO standards “Every participant shall ... establish and follow a management system that will ensure compliance with the relevant prescribed safety standards.” (Civil Aviation Act 1990. Section 12 [4]). The New Zealand CAA has stated the desire to “raise the bar” by implementing SMS requirements within all new regulation that specifies operational procedures. Under the requirements of ICAO Annexes 6, 11 and 14¹⁶, to which New Zealand is a signatory, all regulation for operational activities currently under development by the New Zealand Civil Aviation Authority should embody formal safety management systems (CAA, 2011a).

SMS has been described by the CAA as a cornerstone of regulatory philosophy (CAA, 2011a) and there is an assumption that it is a workable system to achieve safety targets. The CAA’s current SMS standard, being performance based, provides a mechanism for measurement by the specification of quality assurance (QA) elements in the exposition of each certificated operator. Accordingly, a quality management system that ensures the sufficiency of purpose, processes and systems, and maintains continuous improvement currently defines best practice. Components include organisationally based reporting systems (which would be expected to include incident reporting), procedures for audit and review, and an applicable documentation system (Woodcock, 2010). An additional fundamental element of SMS that enables it to function as a standard for operational safety is requirement for the implementation of procedures based on a comprehensive risk identification and mitigation process which must consider the range of elements that affect the conduct of an operation. This includes the processes for the control and monitoring of personnel, equipment and environmental conditions.

In summary SMS stipulates:

- Clearly stated principles of safety management as well as objectives and performance indicators which are integrated in to operational procedures, and which are documented
- An organisational approach to safety with accountability at the top of the management pyramid
- A risk assessment and management process

¹⁶ ICAO annexes available on the ICAO website: http://www.icao.int/eshop/annexes_list.htm. A useful summary of Annex 6 regarding SMS application for GA operations is available at the U.S. National business Aviation association’s website: www.nbaa.org/admin/sms/icao-annex-6.php

- Reporting systems
- Sufficiency in skills and roles (including training), and quality and standard control methods.
- Documentation and audit procedures.

(Kritzinger, 2006)

Present regulations for mainstream operators achieve safety standards by setting out common control systems based on SMS by way of a standard template for the operational exposition in conformance with each element of the relevant regulation. The certification requirements in aviation adhere to the format by requiring the above elements be contained within each certificate holders formal operational guidelines (i.e. their exposition). These are essentially philosophical elements that are codified as part of their specific operation. This system also defines a structure for documentation which enables effective surveillance of safety by auditors – including the CAA. A key to SMS is that it exists as a total integrated operational system which embodies risk management as normal practice and not as a separate consideration.

Regarding adventure aviation, the commitment to SMS is already embodied in the safety and structural requirements for Part 149 certified organisations - which are expected to provide a basis of a safety culture to the activities they represent. Although not specifically stated as such, the new Rule stipulates all the elements of SMS (CAA, 2011f). The remaining problem is the extension of relatively formal structures to small and independent operators who have previously used basic, self-evolved and informal systems. SMS has historically been applied to large and well-resourced organisations within an established industrial sector. The application to micro-organisations has been untested. At present, there is limited resource material for the application of SMS or QA to operations run by singular individuals or by any very small organization. There are also indications that small operators tend to adopt risk management techniques on an ad hoc basis and develop individual-centred, as opposed to organisationally based, safety cultures (Cherrington, 1994; Hopfl, 1993) which would need to undergo considerable change management to align with the certification requirements of Rule Part 115. In Australia, the Civil Aviation

Safety Authority (CASA) recognises this issue in small aviation enterprises and has advanced the development of implementation systems to enable an extension of SMS driven safety culture to small organisations (Byron, 2007; CASA, 2008). Most examples of available resource material for the application of SMS consider small enterprises as those having less than 20 employees (CASA, 2008; Cherrington, 1994) and universally assume organisational characteristics common to corporate business; i.e., those having a chain of command, defined roles, and a fundamental structure for the overlay of SMS. The successful application of such a framework to the class of micro-organisations currently undertaking commercialised activities in New Zealand may well require considerable adaptation.

2.11 The application of Part 115; regulatory intention, operator perceptions

Regarding assumed standards for small commercial operations in general aviation, it is currently Part 135 – the rule for certification of air transport operations for small aircraft - that prescribes a standard layout for compliance which allows “entry” (the initial certification), continuance (the operations specifications), and surveillance (audit specifications)¹⁷. The new Part 115 rule emulates Part 135 but with some standards adapted to facilitate the entry of a range of airborne activities (CAA, 2010a). Under the proposed Rule, operators that wish to engage in commercial adventure aviation (i.e. carrying passengers for “hire or reward”) will be required to comply with the new, formal regulatory framework by producing an exposition that specifies structural, operational, safety, and quality systems (ibid.) – effectively SMS elements. One stated aim for these safety levels is to be “not significantly below other operations” (Northover, 2005)¹⁸. The NPRM clearly states the acceptance of a higher level of risk than that applicable to a conventional air transport operation – and that this will be offset by the requirement for operators to implement SMS type procedures. Part 115 is an attempt to extend safety standards to the whole sector using a

¹⁷ NZCAR Part 135 provides certification standards for for small aircraft (less than 10 seats) currently engaging in commercial transport.

¹⁸ This quote was in the context of comparison with small airlines operating under NZCAR Part 135 certification.

common format for risk control upon a range of activities. The idea is that a paying customer would be able to assume that any flight provides a safe and relatively risk free experience that is managed according to a common standard. A certified operator would then have organisational safety structures and systematic risk management that would establish an index of safety through process, documentation and reporting. This system would enable the official recording and follow-up of incidents (as well as actual accidents) and of the recognition of hazards. The incident/accident analysis would then track any altered risk factors – thus maintaining, and indeed increasing, safety. Entry standards – i.e. predicted safety indicators in terms of accidents, incidents or other factors (such as customer feedback) – would likely be set at the start. The targets, and indicators of their achievement, may be idealised – according to what the operator would expect - during an initial entry risk analysis, or according to targets set by the CAA (but which have yet to be notified). Arguably, the implementation of SMS and the certification process under the new rules is itself a performance indicator. According to such a system, the processes required under the new rule would effectively control perceived and actual risks.

Available information indicates varied commitment, by umbrella organisations and operators, to the implementation of Part 115. There are conflicting policies regarding the role or level of participation of 149 agencies. The paragliding sector voiced an expectation of increased levels of co-operation with the CAA in the future and accepted that considerable involvement was inevitable and desirable (Gray, 2007). Whereas the Recreational Aircraft Association of New Zealand (A Part149 organisation representing microlights) considered Part 115 would separate commercial operators from the recreational base provided by the Association, as the organisation only considered recreational activity to be their level of responsibility (RAANZ, 2010).

Individual operators tended to lack information regarding the proposed legislation. Although initial effort was made to inform users, there appeared to be little response to information supplied or requests for comment prior to the publishing of the NPRM in 2010. An examination of the publications and communication channels of many organisation up to the issue of the NPRM shows the relative inactivity and lack of consideration of the impact of the proposed

regulation. An example of this being the forum of NZHGPA website, where a CAA representative posted information, comments and links to regulatory planning process as far back as July 2007 (Northover, 2007). In that case, the forum drew a sparse amount of comment. It was only when the NPRM was tabled in 2011 that submissions of many individual operators were formally presented.

Full recognition of issues and opinions of the individual operators became clearer in the submissions to CAA following the NPRM. The CAA summarized the submissions in Summary of Public Submissions document (CAA, 2011c). In this document a number of common (although not universal) themes, emerging from the response of operators and other interested parties, have been identified. These themes indicate some resistance to the wholehearted acceptance of the new Rule and point to number of obstacles to the compliance process. These themes were:

- A lack of familiarity, by some submitters, with the current aviation rules and the procedural requirements that are common to mainstream general aviation - particularly those requirements relating to commercial operations.
- A lack of familiarity with best practice risk and safety management procedures.
- Perceived issues with the scope of the proposed Rule and the resistance of some submitters to have their activity considered as adventure aviation – in some cases the “adventure” descriptor was perceived as synonymous with thrill-seeking and therefore argued as not necessarily applicable.
- The assumption that the present standards of safety are sufficient enough. The current practices utilising standards common to recreational flying – i.e. where certain elements of risk are accepted as being inherent within the activity and therefore unavoidable – was considered by some submitters to be equally applicable to commercialised flying.
- An assumption that the present procedures for risk management and safety were sufficient and adequate.

- The assumption that those risks were managed effectively in each case by utilising the skill and knowledge of each operator.
- Submitters thought the new regulations would not improve safety in any effective way but would add a layer of regulatory bureaucracy.
- A resistance to some of the novel requirements of best practice safety management. An example of this is the requirements for an accountable organisational management structure. The organisational management requirement appeared to confound a number of submitters. Some were clearly perplexed at the concept of the application of organisational management to singular individuals. The stipulation for formalised training requirements also appeared to surprise submitters who considered their qualifications were sufficient, aside from any currency and competency considerations. The application of training regimes within single person operations was also difficult for many submitters to understand.
- Cynicism over the motives of the CAA – some submitters implied the new regulation was an attempt to limit the growth of adventure aviation or to provide further source of revenue for the Authority.
- Doubt as to the ability of the CAA to properly administer the regulation due to lack of expertise in each field.
- A level of cynicism at the perceived lack of sufficient consultation and gaps in knowledge of the nature of each individual activity, by the Authority. An example is the apparent lack of delineation between paragliding and hang-gliding which were stated by some submitters as having entirely different requirements for equipment and operational specifications. A further example was the exasperation, by one submitter, over the requirement for balloon operators to carry emergency locator transmitters given the high visibility of balloons and the presence of chase and recovery vehicles as a normal part of those operations (CAA, 2011c). For that submitter, this appeared to indicate the Authority ignored the individual aspects of each activity to apply a one-size-fits-all approach.

- Resistance to the relatively high level of compliance cost, which were seen by submitters as greatly in excess of present requirements.

There was also considerable misunderstanding or misinterpretation of the wording of the proposed Rule coupled with lack of knowledge of other related regulatory requirements, which has led to mistaken assumptions as to what was being specified.

Although there appeared to be little positive feedback, the submissions were also constructive, with the CAA indicating required changes in the light of some of the submissions. Counter-themes emerge from the CAA responses to the submission and there are indications of some flexibility and an increased consideration of the individual requirements of operators (CAA, 2011c). Many of the required changes relate to aligning the standards currently set by Part 149 agencies. Regarding implementation, the CAA clearly state that the regulation will be backed up by surveillance and that appropriate resources will be made available (CAA, 2011c). Implementation strategies, the process by which operators will achieve compliance, and the provision of support material have yet to be addressed.

The themes highlight the need for additional research – a survey of operators - in order to explore the challenges of the proposed Rule on the broad range of prospective adventure aviation participants, and also to more accurately gauge the workability of the new Rule.

Chapter 3. Survey Research Outline

3.1. Research Goals

This study sought to map out the processes and issues by which the new standards provided by NZCAR Rule Part 115 could be implemented, and to identify the specific obstacles to achieving the desired level of compliance. There four key goals of the research were:

1. To define the rationale for the rule making on which Rule Part 115 is based, including the application of the regulatory standards.
2. To ascertain what were the required standards to be achieved by operators.
3. To ascertain how those standards were to be applied.
4. To identify obstacles to that application, and to isolate core problems at an operator level.

3.2 Study outline

A methodology for research was required to both understand the range of issues at all levels and to ascertain the perspective of the proposed legislation at an operator level. The methodology for the research uses both a *review of literature* and *field research* by way of a survey of potential operators.

The research process was;

1. Establishment of the historical and theoretical basis of the proposed rule.
2. Identification of the format and compliance elements required by the rule.
3. Testing the application of the Rule standard to current or proposed adventure aviation activities.
4. Gauging the acceptance of the new Rule standard by operators.
5. Analysis of the compliance deficiencies of operational systems in the case of each operator or operational activity sector or group, and ascertaining what level of compliance

is currently being achieved.

6. Identification of any obstacles to compliance.
7. Defining possible solution strategies (if required).

3.3 Research: Background analysis of risk management in aviation

The literature review accesses a range of governmental legislation, policy and information to ascertain the basis of the proposed Part 115 Rule including the latest Notice of Proposed Rule Making (NPRM) issued 17 November 2010 (CAA, 2010a). The Literature Review explored the issues relevant to the proposed legislation in Chapter 2 under the following section headings:

- 2.1 The background of recreational flying in New Zealand.
- 2.2 The development of current industry regulations and monitoring.
- 2.3 Issues regarding the present regulatory standards.
- 2.4 Rule-making for adventure aviation and commercialised recreational flying.
- 2.5 A global view of the basis of rule-making for aviation – how the new regulation may fit.
- 2.6 The local view of adventure aviation regulation.
- 2.7 The demand for adventure aviation regulation.
- 2.8 Reactive and relative safety standards.
- 2.9 Safety performance indicators – What the new Rule is expected to achieve.
- 2.10 SMS – a recognised formal standard for aviation.
- 2.11 The application of the new Rule Part 115 upon businesses – regulatory intention and operator perceptions.

See Chapter 2 of this thesis (above)

3.4 The requirement for field research

The issues identified in the literature review indicated a need to quantify the additional requirements that operators would have to put in place to achieve compliance with the Rule, and to isolate any further issues in order to develop compliance strategies. Preliminary research was carried out by the author as part of earlier post-graduate work (Marriott, 2006). It looked at on-site risk management processes in selected adventure aviation operations in a local area including paragliding and microlighting activities. The observations included the examination of equipment and the operational methods of the companies scrutinised and used informal interviews with operators regarding compliance with regulatory requirements to ascertain possible issues with the planned future regulation. This research was limited by a small sample, the seasonal nature of operations, the need to fit with the operator's schedule, and on-going developments in the subject matter. The opinions of operators gleaned during the period were diverse, and there was a clear indication of resistance to the legislation in some quarters. There was also an indication of a lack of knowledge or understanding, by the operators, as to the proposed requirements of Part 115 as formal aviation regulation, or much understanding of the best practice stipulations it invoked. Further research of greater depth and spectrum, utilising a cross-sectional survey of all Part 115 relevant operational activities within New Zealand, was considered necessary and that research has formed the basis of this paper.

The broadening of the field research was also considered necessary because, although there was industry consultation regarding the development of Part 115, the initial contact with potential respondents indicated that the inclusion of operators in the rule development process was localised and a proper examination of their attitudes and interests was not necessarily achieved by the outcomes of the CAA consultation process. A retrospective survey of the regular CAA bulletin on rule development, *CARRIL*, shows a progression of consultation meetings regarding NZCAR Part 115 was underway during a period from February to May 2007 (CAA,2007b). However, many of the respondents of the survey of operators carried out in this research (outlined below) reported no direct contact with the CAA and felt they had little representation and that the policy had been finalised in isolation. One respondent indicated they took part in a consultation process

“over ten years ago”¹⁹. This comment probably referred to an earlier push for the development of the first NPRM for Rule Part 115 (CAA, 1999) which was subsequently shelved.

3.5 Expectation of the survey design

The most appropriate method to achieve the third and fourth goals of the research was the collection of a full sample of information from operators as to their attitudes towards the new Rule and their perceived ability to reflect the standards for compliance in their current systems and processes. A survey of the all individual operators who would be expected to subscribe to the Rule should provide quantitative statistical information of their present compliance and indicate what they would need to have in place in order to comply. The survey would also enable the collection of qualitative data such as the operator’s opinions regarding the philosophy of the Rule, its requirements, and the acceptance by the operators themselves. The information gained would be expected to isolate and quantify the impact of expected and novel issues upon the implementation of the Rule and to point to the causes and possible solutions.

3.6 Specific Issues identified

The issues identified from the literature review and also via contact with some operators at the commencement of the survey program, concerning Rule application, were:

- Resistance to the extension of regulation into what had previously been considered to be amateur recreational activities;
- The implementation of a single standard applicable to a very wide range of aerial activities;
- The variable level of acceptance of the need for additional regulation amongst a wide range of operators and stakeholders carrying out different and distinct activities;

¹⁹ Anonymity of survey participants precludes referencing the source of this information

- The definition of the requisite and common safety standards;
- The implementation of complete best-practice systems by micro-organisations²⁰;
- The practical identification of risk criteria in each case;
- The varying levels of expertise in risk management procedures.

²⁰ For a definition of micro organisations see Appendix 3

4.0 Methodology

4.1 Design of the Survey

A survey to reveal both qualitative and quantitative information required separate components to be devised in order to reflect opinion and comments from the operators and to provide usable data to gauge their current compliance achievement levels. The survey was therefore split in to two parts:

1. A *Questionnaire*
2. A compliance *Checklist*

The *Questionnaire* included a mix of broad questions to elicit opinion or generate a discussion with the interviewer and specific questions using YES or NO answers or *Likert scale* responses. This process gauged the operator's perspective of the applicability of the Rule to their operation, their intentions regarding compliance, and also attempted to identify their intended process for compliance. The idea was to develop themes and to isolate any additional issues that may emerge and apply a qualitative interpretation to that information by matching the responses and comments. The enquiry questions followed an open format and encompassed the following elements:

- The basis of the operation;
- The operator's perception and understanding of topical safety issues;
- Current safety practices applied by the operator;
- The operator's knowledge of current best practice systems;
- The operator's knowledge of the proposed Rule;
- Any general systems in place that reflected the expected SMS/Best practice components of the legislation.

The *Checklist* followed a narrow format of inquiry being aimed directly at each operator's current procedural standards and practices in order to ascertain their present levels of compliance. It provided a template reflecting the specific best practice components of the current NPRM along

with generic SMS requirements, thus allowing the analysis of the actual compliance levels being achieved by using quantitative data. The template represents 72 individual elements as check items which the operators currently would or would not comply with the proposed standard. The key elements identified for analysis from the Checklist concerned practical operational issues such as:

- How the organisational systems of the operators were presently constructed and how roles were defined;
- The specification of equipment;
- Operations specifications - such as for aerodromes and take-off sites, aircraft performance, and the scope of permitted activities - including any limitations that are developed from an active risk management process;
- How the operator's human resources were managed, including; personnel training; qualification, currency, and fatigue monitoring systems;
- Emergency and safety planning, including; flight following, reporting systems;
- What quality systems and risk management processes were in place and how they worked.

During the interview, the Checklist items were matched to each operator's understanding of the systems they had in place. The proportion of the total elements in existence in each operation, and the level of adherence to them, effectively provided a quantitative measure of a "compliance gap". It measured what operators were doing compared to what they would need to do under the proposed Rule.

In each case the adherence to every specific element was considered in relation to whether compliance is enabled by formal stipulation within their published operations procedures manual (OPM) *or* that was achieved anyway in normal practice - but not necessarily formalised. Ideally, a form of quality assurance (QA) would be required to support standard operational procedures in order to reflect best practice processes - which includes sufficient risk management, a monitoring process, and methods to ensure on-going improvements are carried out. Relevant data was extracted according to whether there was an OPM that reflected QA elements, or if there were any

stand-alone QA elements that were employed by the operation. Although QA implies formal processes, any *informal state of compliance* could be enabled by sufficient local informal practices, or by externally sourced input, aside from that contained within an OPM. An example in the latter case would be the adapting of certain specifications of the Part 149 umbrella organisation – such as their audit system or training program. Where informal systems were present, the research used further discussional inquiry to gauge whether an operational process could be easily formalised in its current state - for insertion in to an OPM, and whether it also possessed sufficient validity for compliance. This gave an effective indication that a process may count towards the achievement of a compliance element and so reduce the overall input required to achieve Rule certification. An example of the survey is contained within Appendix 2.

4.2 The interview process

The survey participants were all current operators of adventure aviation activities and other operators possessing aircraft and who had stated intentions regarding operational activities that could be considered applicable to Part 115 certification. The expected number of participants was based on information supplied in policy documents issued by the CAA which was indicated to be around 30 to 40 in number (Farrell, 2006; Northover, 2006, Northover, 2005). A database of operator contacts and information was compiled, initially by carrying out a media search of promotional material using various advertising media related to aviation and tourism activities – including periodical publications, brochures and internet searches, and also by checking visitor information networks, and by word-of-mouth. Initial contact with operators regarding the survey was commenced from October 2010. Once the survey interviews commenced, information on other operators was forthcoming. The actual survey process was conducted from March 16, 2011 to May 30, 2011.

A total of 48 operators were interviewed, mainly by telephone. The interviews lasting between 30 and 90 minutes, resulting in 41 completed surveys. Three operators gave in-person interviews. Seven of the operators initially were excluded either because the respondents were not sufficiently co-operative to achieve a completed survey, or stated that they did not wish their information to be included, or were of the opinion that they conducted operations that were unlikely to be applicable to the Part 115 framework.

The activities were subdivided in to class-of-activity sub-groups in accordance with the divisions applied by the CAA in their policy document on the development of the Rule (Northover, 2006). This allowed the sub-groupings to be considered separately in the analysis of the research results. The numbers and activities of operators surveyed is as follows

Hang Gliders and Paragliders	n = 18
Balloons	n = 3
Microlight scenic flights	n = 3
Glider flights	n = 4
Tandem Skydiving	n = 5
Vintage aircraft and Aerobatic	n = 8

It is considered that total numbers surveyed are likely to reflect a majority of the total number of operators due to the broad scope of the search. Some activity numbers are small, reflecting the small number of operators in that sector. During the survey the identification of new potential respondents continued at a pace that slowed progressively and fell to zero towards the close of the survey period indicating that all available potential respondents had been interviewed

4.3 Privacy and Confidentiality

The ethics of the research, the need to ask questions regarding regulatory compliance issues, and the need to elicit candid opinion or subjective information required a high degree of confidentiality. The respondents were advised of the research goals and purpose, and were provided with information regarding the human ethics requirement by way of an emailed information sheet. They subsequently gave their consent for the interviews – normally by email prior to the each interview. The identification of individual operations was limited to the statement of the activity and tracked by a participant code. Contact was ceased immediately for those that stated they did not wish to be interviewed, or that Part 115 was not relevant for their operation.

4.4 Limiting factors

A number of limiting factors were identified as follows

The research is not a complete population of participants in the industry: A complete population would not be a realistic expectation for the research due to problems identifying specific enterprises as well as dynamic changes within the industry regarding the ownership, initiation and cessation of operations. There was further uncertainty regarding the classification where some operators considered their activities to be instructional and therefore not adventure aviation by definition. Some of these operators excluded themselves from the survey.

There was self-selection: Participants either agreed or did not agree to take part in the survey. Of the small number approached who did not agree to take part it was not possible to confirm whether they would indeed be eligible for certification under the Rule.

Compliance assumptions: The actual requirements of the Rule was unknown at the time of the design of the survey and therefore an assumption of a compliance standard was used. This assumption refers to the standards of best practice, SMS and quality assurance. The analysis of compliance levels was carried out in reference to these. The Rule itself, as represented by the NPRM, appears to also embody these standards.

Reporting bias & subjectivity: The information supplied by operators during the survey was necessarily subjective to the interpretation and opinion of each operator - as it was not possible, or appropriate, to examine their systems or published manuals in detail to verify the information. The information supplied in response to survey questions was trusted and accepted at face value. Many interview subjects were not aware of the publication of the NPRM or the Response to Submissions (CAA, 2010a, CAA, 2011b), or had not actually read these documents (which were both available on the CAA's website at the time of the interviews). As a result, the knowledge regarding the actual requirements of the Rule as set out in the NPRM (CAA, 2010a) was highly variable from operator to operator. Respondents were, usually, very forthcoming and firm in their opinions and the information supplied was considered on a prima facie basis.

Seasonal bias: A number of operators - particularly in the ballooning, skydiving and paragliding sectors operated on a seasonal basis and many key individuals spent part of the year overseas. The researcher was unable to contact at least three targeted enterprises due to this factor.

The need to maintain confidentiality: This consideration limited the gathering of information and limited the extent of statistical processing. Unattributed quoted comments and opinions that were extracted from the interview notes to highlight and reinforce findings and conclusions, were edited where necessary to exclude the identification of operators. This method was considered appropriate for much of the sampling of the data from the *Questionnaire*.

Activity sub-groupings: The requirement of the proposed legislation to apply a single standard gave an expectation of homogeneity to the operational processes across the range of activities. Therefore, the survey design reflects this by basing the questions on general operational requirements. However, common sets of procedures were not necessarily present within all classes of activities. There is, for example, a clear difference between the operation of a large ex-military jet plane and a paraglider in terms of the operational processes. It was not feasible to analyse each class of activity in the context of its own specific procedural requirements, although the impact of operational requirements as it affects certain classes of activity is emphasised in the statistical processing and the final analysis. The total analysis here is considered to provide a simple cross section or “snap-shot” of the present “adventure aviation industry” as a whole.

4.5 Statistical analysis processes

The research produced a range of data from the survey of operators; the *Questionnaire*, *Checklist*, interview notes and observations. Data was entered manually onto raw data check sheets for each operator and then transferred to electronic collation sheets. Comments were also noted manually and collated into a comment-review database. Checklist items and numerical data were entered from the collation sheets into a series of templates using the Microsoft *Excel* spreadsheet program for numerical recording and statistical processing. Collation of the results provided nominal and ordinal data as a cross-section of the whole adventure aviation industry and for each activity sector. The representation of the data yielded trends and groupings that, under statistical analysis, provided additional themes for further investigation. The analysis in Chapter 4 (below) summarises and makes comment on each key element of the *Questionnaire*. The analysis of the compliance *Checklist* summarises the 72 elements, it presents a statistical analysis of the results, and uses trend data and interview notes to comment on the level of achievement and the profile of the activity groups.

A set of the data was used to represent the intention of operators regarding compliance and their perception of the cost and workload involved. The frequency of existing compliance mechanisms was tallied to reflect the expected requirements of the Rule in order to give an overall indication of a “compliance gap”.

The data measurement applied further statistical processing including tests for statistical fit on the raw data derived from the 72 point compliance scale achievement level. In this case an indication of two separate groupings along the compliance scale was apparent. A “double-peak” indication showed that one group of operators were markedly closer to compliance achievement than another group. The reasons for the apparent differentiation and possible relationships were further investigated. This included an analysis of the 72 point compliance scores according to each activity. The six activity sub-groups were then considered individually and the results indicated the segregating of these sub-groups into either the higher compliance achievement range or into the lower range to fit the double-peaked trend. Higher compliance achievement was termed

Group 1 and included skydiving, aerobatic and vintage aircraft, and glider operations. The middle-of-the-scale compliance achievement was termed Group 2 and comprised hang gliders & paragliders, microlight and ballooning operations.

A sub-analysis of the groupings using available data was conducted in order to check for possible relationships or causation. The following additional factors were considered:

- The proportion of operators using effective quality assurance processes.
- The number of personnel – being the size of the operation, in terms of the maximum number of individual personnel employed at one time for each operation.
- The possession of a CAA aircrew licence issues under NZCAR Part 61.

The influence of these factors was tested by applying statistical analysis.

The T-test was considered the most amenable method to indicate whether the plotted data peaks did not represent a true differentiation. The t-test compares group differences within group variables (Cozby, 2004) and so was seen as the most appropriate. Certain outliers and exceptions are identified in the analysis and explained in accordance with expectations that the groupings were unexpected during the initial research and certainly not assumed to be homogeneous or conform to a normal distribution. No assumption of normality of the sample is considered. The transformation of data for representation is considered to be valid as only in cases where there is a very skewed distribution would there be a marked effect on the significance level (Zar, 1996).

The testing of further causation possibilities such as the age of the business, the background of the operators and the structure of the management of the operators was not carried out due to the lack of available, useable data.

Chapter 5 Results of the Survey

5.1 Summary of the data presentation

Key data is summarised in the pie-chart series below, as follows:

- Figure 1: The intention of operators regarding certification under the Rule.
- Figure 2: The perceived difficulties of compliance in terms of the effort operators would need to make.
- Figure 3: The perceived difficulties of compliance in terms of cost to the operators.
- Figure 4: The operator's own opinions as to the level of replication of their current systems to those required by the Rule.
- Figures 5 & 6: The number of operators that utilise a formal written operations procedures manual (OPM).

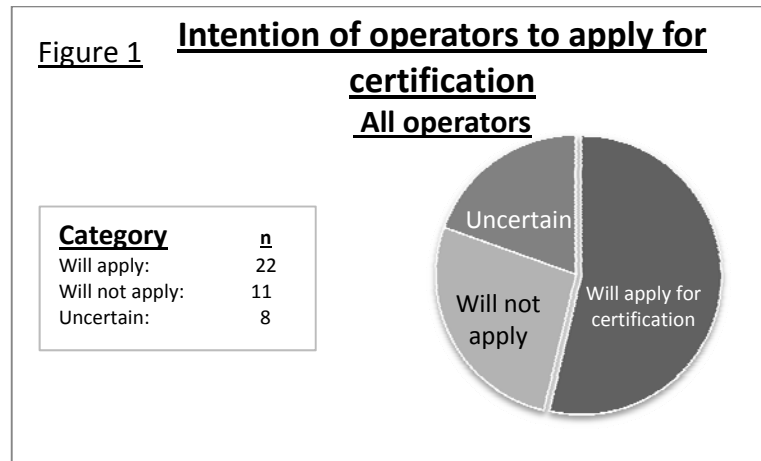
The effect of the division into activity groupings indicated a group of operator (termed Group 2) who have a larger compliance gap and therefore have more to achieve in terms of changes or modification to their systems. The parameters of the pie-charts represented in Figures 1 through to 5 was then applied specifically to Group 2 to highlight the compliance gap in comparison to the whole sample. This is represented in Figures 1b to 6b.

The actual compliance levels – according to the 72 item checklist - and the analysis of groupings is presented in Figures 7, 8 and 9. Tables 1 to 4 and Figure 10 show the statistical tests applied to the data.

Qualitative analysis is then provided in Sections 4.10 – 4.12. Key elements of the *Checklist* items are reviewed under a qualitative analysis with comments on the nature of each element and the research findings. Lastly, the results of the *Questionnaire* part of the survey is reviewed in a qualitative analysis presenting emerging issues for discussion.

5.2 Operator’s intentions to apply for certification

The number of operators who indicated they will apply for certification under the rule requirements was 22 out of the total of 41. The number of operators who indicated they would not apply was 11. Eight were uncertain. The proportions are represented below in Figure 1.



The indication here is that just over half of the total operators surveyed indicated they would apply for certification under the requirements of the Rule. The operators who were uncertain whether they would apply indicated that their indecision was due to one or more of the following factors:

- They did not have sufficient information regarding the requirements for certification or were doubtful whether their operational status required certification.
- They were unsure of the viability of their business due to the cost and/or workload required for compliance and certification and so did not express certainty either way.

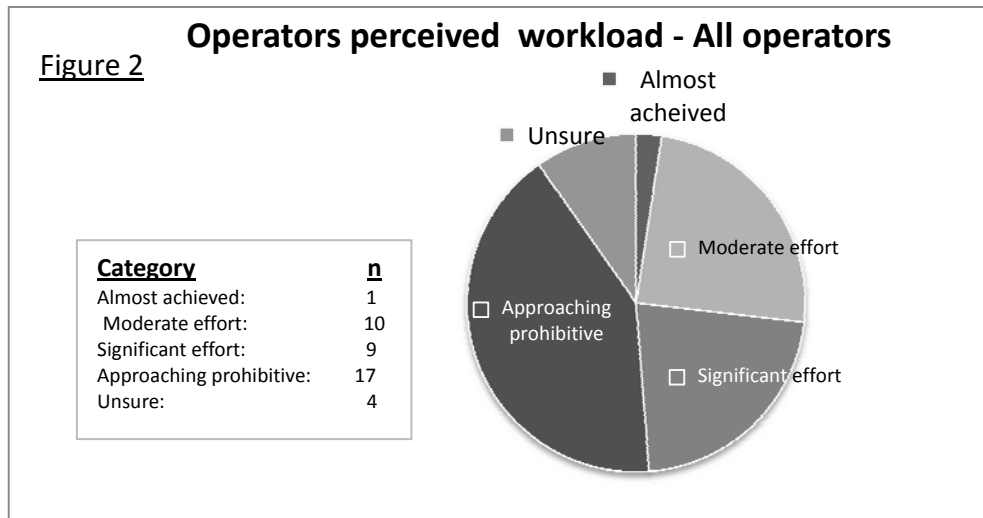
19.5% of operators responded as uncertain and 27% stated that they would not apply for certification under the Rule.

The operators who stated their intention not to apply for certification under the Rule indicated that it was due to one or more of the following factors:

- They could rely on other certification standards such as Part 135 to enable their activities.
- They doubted whether their operational status required any specific certification.
- The workload or cost required for compliance and certification would adversely affect the viability of their commercial enterprise making certification unfeasible from a business point of view.

5.3 Workload and the cost of compliance

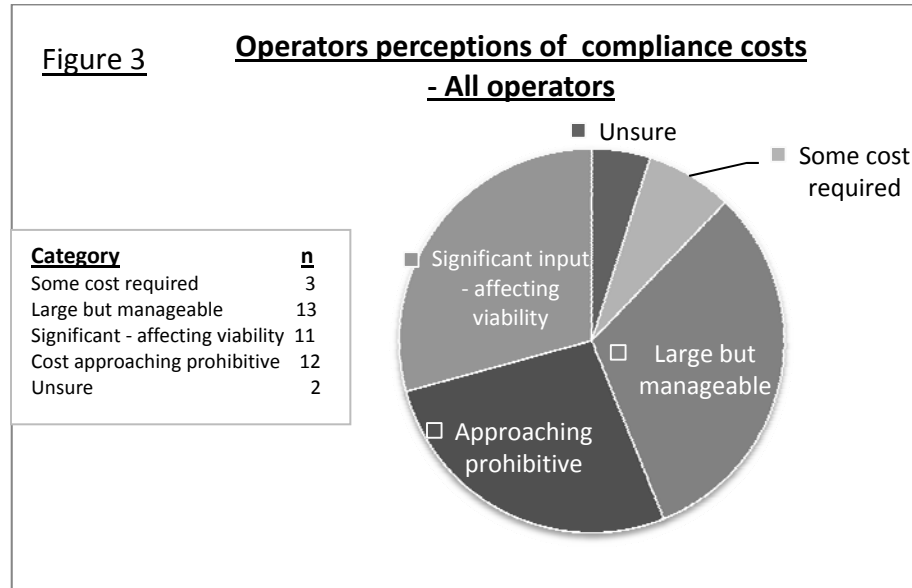
Operators were asked to gauge the difficulty of complying with the requirements of the Rule as they presently understood it, in terms of effort, workload or other required input. The measure was according to a Likert scale response. Figure 2 (below) represents the proportions.



A majority of operators of operators considered the workload to achieve compliance represented a significant effort or was approaching prohibitive.

Operators were similarly asked to gauge the difficulty of compliance, in terms of monetary cost.

Their responses were matched to a Likert scale and represented below in Figure 3.

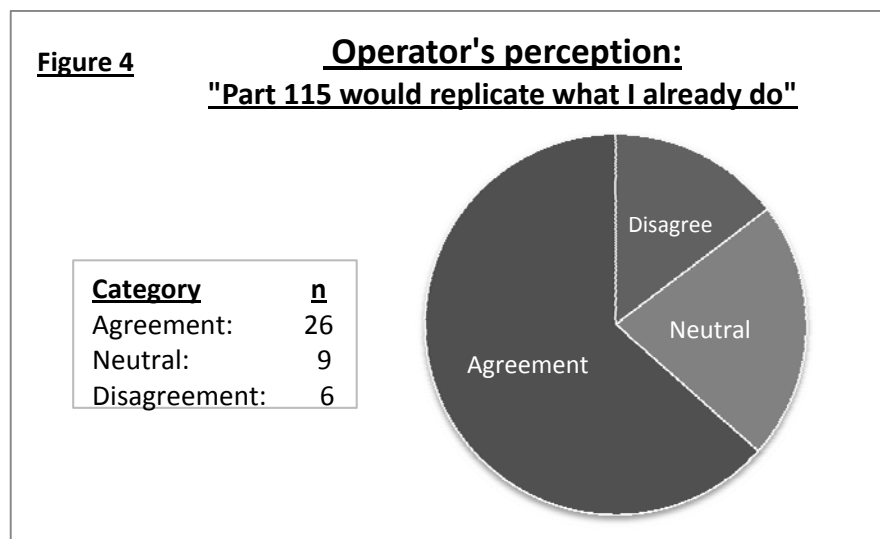


Just over half of operators considered the cost to achieve compliance represented a significant input affecting commercial viability or was approaching prohibitive. A minority considered the costs manageable. Operators were also asked to estimate the increase in direct operational costs of achieving and maintaining the certification standard as a percentage increase in operational costs. Responses to this question were less definite and, where they were stated, ranged from 0% to 500%.

5.4 Replication Scale

Operators were asked to what extent they agreed with the statement “Part 115 requirements would merely replicate what I already do”. Responses were measured against a 1-5 Likert scale of disagreement (1) through to total agreement (5).

The proportions are represented in Figure 4. below.

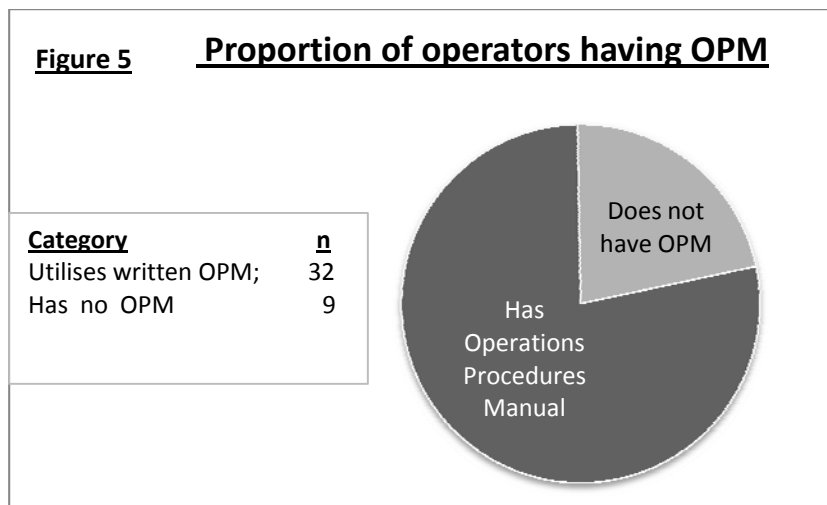


Considering the assumptions for replication against the cost and the workload, operators tended to resist any justification for the Rule as providing sufficient benefit against the high cost and work involved on the grounds that they already carried sufficient safety processes.

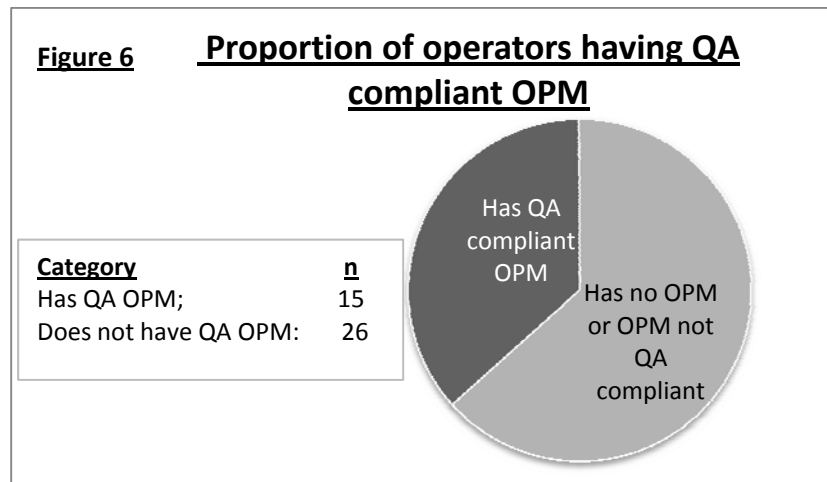
5.5 Utilisation of an operations procedures manual

Operators opinions of the degree of replication of their methods and systems were matched against their utilisation of an operations procedures manual (OPM) as well as the use of OPMs that were compliant – i.e. that were sufficient for their intended purpose of guiding the operational processes in order to provide the requisite safety levels and to provide quality assurance (QA).

It could be assumed that these systems would also reflect the requirements of the proposed regulation. A QA process is considered to be a crucial component as it supports the sufficiency of the OPM. The proportions of operators who stated they were utilising OPMs in their normal operations and also those utilising QA compliant OPMs are represented below in Figures 5 and 6.



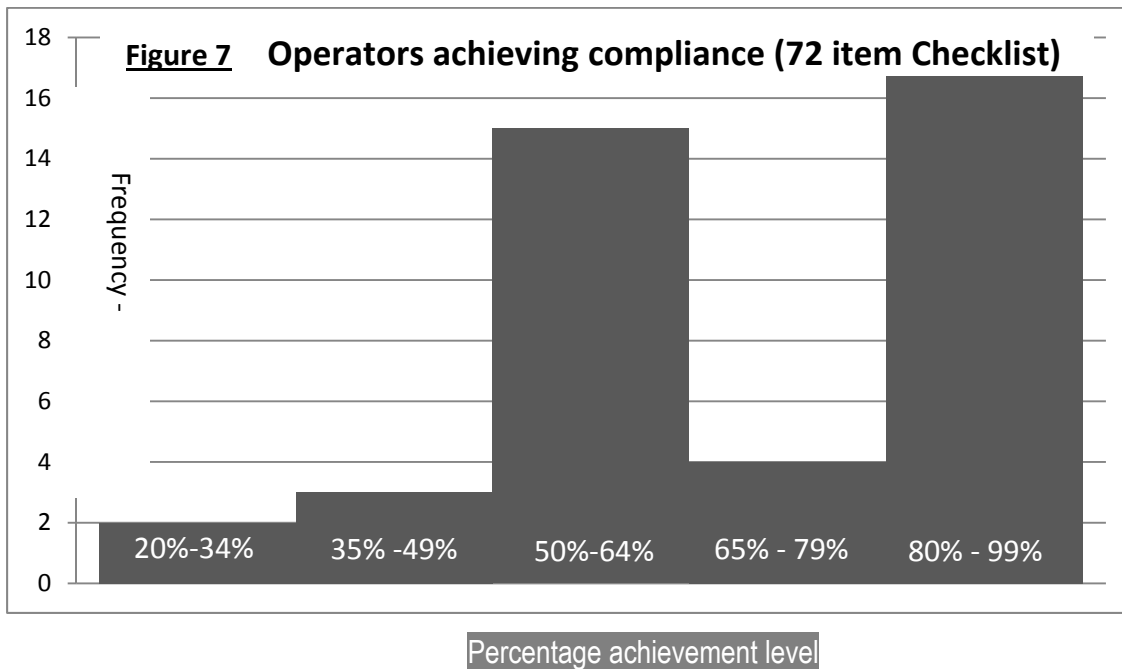
The proportion above (figure 5) is compared with the proportion of operators having a compliant manual:



The overall picture indicated by the proportional analysis of the data (above) is of the inconsistency of operator’s perceptions of their compliance levels when compared with their actual compliance levels. Coupled with the levels of workload and cost for compliance (that are generally stated as unacceptable), the indication is that a universal implementation of the Rule will be problematic. Both the assumptions, by operators, regarding standards and the actual compliance gap will need to be resolved.

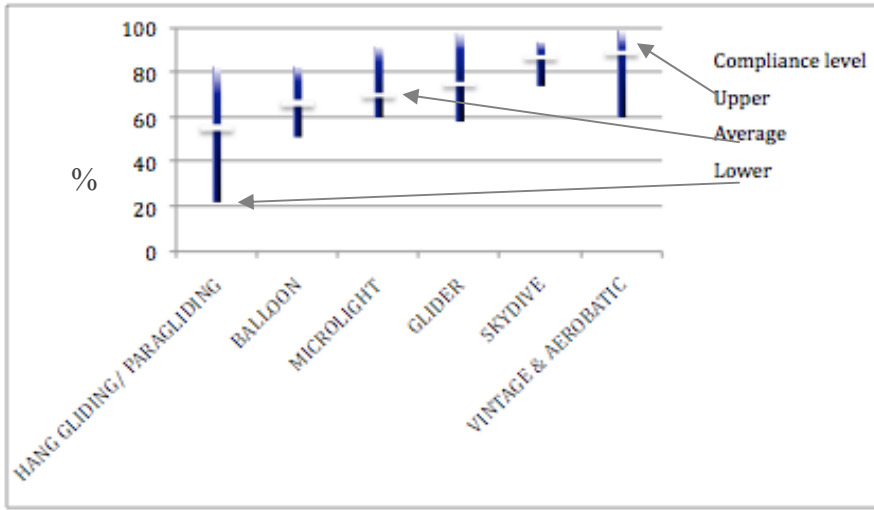
5.6 Compliance with Part 115 Rule standards – 72 item checklist

The average actual compliance level was measured according to number of elements achieved in the 72 point Checklist. The frequency (number of operators) is represented in the vertical axis and the compliance level in terms of percentage achieved is represented in the horizontal. Figure 7, indicates the range and distribution.



This representation of data in this case provides a clear indication of the two separate and delineated groupings along the compliance scale. A large group of operators has 80% to 90% achievement on the 72 point scale. Whereas another sizeable grouping of operators exists in the middle of the achievement scale with only 50% - 64% compliance. The level of compliance was further plotted using a bar and whisker chart representation in order to represent the range and average achievement for each class of activity to produce the following; (Figure 8).

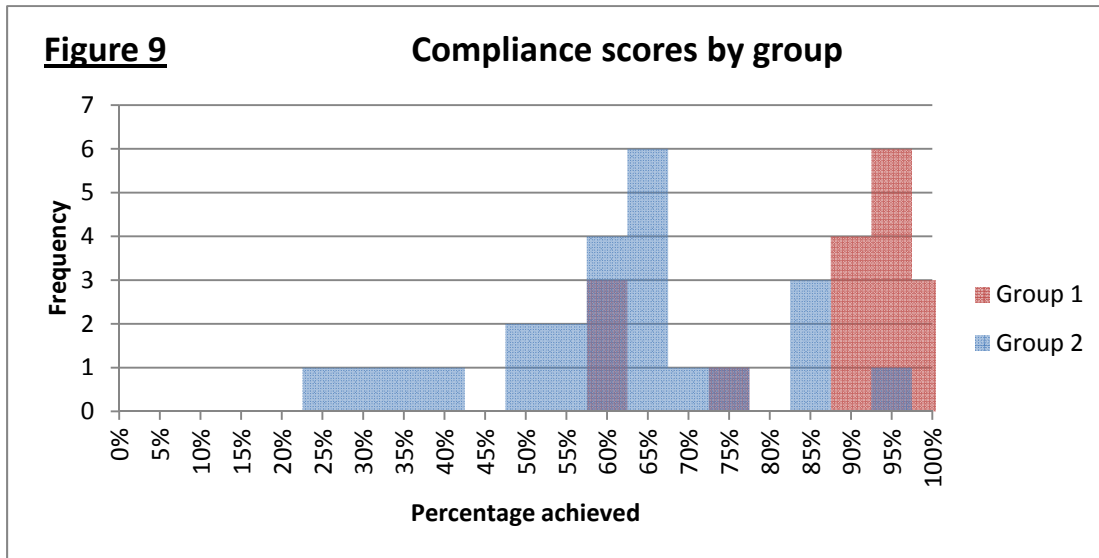
Figure 8 Compliance Achievement and Range



The range and average compliance levels indicate considerable variation from activity to activity. In consideration of this information, an 80% achievement cut-off was considered to be a viable point for segregation into the two groups. This matched the separation of the double peaks and allowed further data analysis in order to isolate themes and relate them to any emerging issues.

5.7 Compliance scores by grouping the activities: Group1, Group 2

Figure 9 is a revised histogram, constructed to show a narrower range of percentage scores and to indicate further the nature of the double peaked outcome. The compliance level is again represented as a percentage scale with 100% meaning that all 72 out of the 72 elements were present. The frequency is the number of operators that scored in each range. As the rankings, according to the degree of compliance, confirm the separation of the classes of activity in to a high end and mid-scale range, colour coding was applied to better define the groups. The high achievers (Group 1) are represented as pink and midscale (Group 2) as blue.



Group 1 - the high achievers group (n=17) comprises; Skydiving operations, aerobatic and vintage aircraft operations, and Glider operations. These activities largely achieved greater than 80% compliance on the 72 point scale. There are 4 exceptions - 1 each from the Skydiving and Vintage/Aerobatic sectors, and 2 from Glider operations - here operators scored below the criteria. These 4 operators tended to focus primarily on the training and sport participation aspects of their activities and so their systems reflected amateur, as opposed to professional standards.

Group 2 - the mid-scale group (n=24) largely comprises hang-glidors & paraglidors, microlight operations, & ballooners. These activities achieved less than 80% compliance on the 72 point scale, with one exception from each activity where individual operations achieved a score of greater than 80%. In these case, the operators had had, or continued to have, involvement in small airline (Part 135) operations and therefore had been able to transfer their knowledge of commercial certification standards to their current practices which had the effect of maintaining a higher score on the compliance achievement scale.

It is accepted that the categorisation of the two Groups applies a generalisation for the activity sectors, but also shows that the two groupings are strongly related to the class of activity. The key

assumption is that the Group 1 classes of activity are represented primarily in the high-achievers and Group 2 are being represented in the mid-scale group. The null hypothesis is that there is no difference in compliance level between those activity groups that make up Group 1 and those activity groups that make up Group 2. Under formal statistical analysis, the null hypothesis was rejected at well below the 5% level ($p=0.0000016$) which show there is a significant difference between Group 1 and Group 2.

The t-test of fit assuming unequal variance confirms the statistical validity of this hypothesis. The grouping data was processed using *MS Excel* providing the information in Table 1 below

Table 1 Compliance scores by Group

	<i>Group 1</i>	<i>Group 2</i>
Mean	61.5294118	42.33333333
Variance	106.7647059	147.0144928
Observations	17	24
Hypothesized Mean Difference = 0		
Df	38	
t Stat	5.4500278	
P(T<=t) one-tail	0.0000016	
t Critical one-tail	1.6859545	

5.8 Compliance level influential factors

Further statistical processing was used to identify the validity of possible influences from available data. The possible influential factors that were considered were;

- The existence of valid *quality assurance* processes
- The possession of *CAA licences* (engineering or flight crew) by personnel
- The *number of personnel* employed by the operation

This processing was conducted according to the following rationale:

Quality Assurance

Quality assurance needed to be isolated as an individual factor. The proportion of operators having QA compliant OPMs that were utilised in normal practice was assumed to be an indicator of the preparedness to achieve compliance. This is based on the assumption that an effective OPM would encapsulate a broad range of compliance element (the “Checklist responses – Comments and research findings” section below [Section 4.10] elaborates on this assumption). Operators in Group 1 had a higher indication of possessing such OPMs. The specific compliance elements that would demonstrate elemental quality assurance processes would be even more appropriate for a test of correlation. That is, the existence of a range of specific QA elements correlate to the level of compliance of the operators. It was further considered that these processes may indeed exist outside of an OPM. Conversely, a proportion of operators possessed written OPMs with standards that were not integrated into normal procedures, that were not regularly referred to in practice, and/or had no integral QA system incorporated within them. A practical and effective QA system would be assumed to reflect the best-practice standards incorporated within the new Rule. With this in mind, a test for QA systems that exist aside from an OPM was extracted from surveyed data according to 5 specific sub-elements; (1) a stated QA system (whether sufficient or not), (2) official communications and reporting channels, (3) active risk management processes, (4) a training program, and (5) documentation for auditing and performance indicators. The existence of three or more out of five of these items was accepted as indicating an effective (though perhaps rudimentary) QA compliant system. The compliance scale achievement and the existence of effective QA components (whether contained within or outside an OPM) was then compared. The average compliance for operators with a QA standard by this analysis was 64/72 or 89% whereas those without have only 42/72 or 59% compliance.

The two sample t-test rejects the null hypothesis that there is no difference between the compliance level score of those with, compared to those without the QA standard. The following chart gives the results for the one-tailed hypothesis that those with a QA standard had

significantly higher compliance at the 5% level ($p = 0.000001$).

Table 2 **Compliance with Quality Assurance standards**

	<i>Has QA standards</i>	<i>Has not QA standards</i>
Mean	63.866667	42.4615385
Variance	30.266667	158.978462
Observations	15	26
Hypothesized Mean Difference	0	
df	37	
t Stat	7.50603	
P(T<=t) one-tail	0.00000	
t Critical one-tail	1.68709	

As a further consideration, the level of QA compliance by Group was considered: 3% of Group 1 operators fitted in the “*Has QA standards*” category whereas only 16.7% of Group 2 operators achieved such standards.

CAA licences

Whether individuals in the organisations possessed CAA flight crew or engineering licences also yielded indications of strength according to the 72 point score. The average compliance for operators having a CAA licence was 57/72 or 79% and for those who did not possess a CAA licence it was 38.5/72 or 53%. The assumption is that the possession of CAA licences reflects the observed compliance levels. A t-test assuming unequal variance was again the most appropriate indicator of the statistical significance of this difference. The low P-value. ($p\text{-value} = 0.00003$) rejects the null hypothesis that there is no difference between those operators holding a

CAA licence and their compliance level.

Table 3 Compliance score by CAA licence

	<i>CAA licence</i>	<i>NO CAA licence</i>
Mean	57.07692	38.53333
Variance	131.6738	156.6952
Observations	26	15
Hypothesized Mean Difference	0	
df	27	
t Stat	4.70845	
P(T<=t) one-tail	0.00003	
t Critical one-tail	1.70329	

The indication is that the compliance score of operators who hold CAA licences are significantly higher than those who do not. In relation to the groupings; 100% of Group 1 operators and 35% of Group 2 operators possessed CAA licences.

So far the overall indication is that compliance is enabled by being a member of the Group 1 type operator sector and disabled by being in Group 2 primarily because Group 1 operators possess solid quality assurance systems in tandem with mainstream aviation licences.

CAA licences and QA

Exploring this avenue further to enable reasonable assumptions to be extracted, the association between operators having effective QA standards (see above) and also possessing CAA licences was analysed using a chi squared goodness of fit test (Table 4, below). The null hypothesis was that there was no association between holding a CAA licence and possessing effective Q/A standards.

Table 4 Comparison of CAA Licence and QA standard

Count	CAA licence	NO CAA licence	Total
Has QA standard OPM	13	2	15
Has not QA standard OPM	13	13	26
	26	15	41

Expected	CAA licence	NO CAA licence	
Has QA standard OPM	9.51	5.49	15
Has not QA standard OPM	16.49	9.51	26
	26	15	41

Chi Stat: $\chi = 5.51222$.

The null hypothesis was rejected at the 5% level and shows there is an association between having a CAA licence and QA ($p = 0.01884$). This reiterates the association that exists between formal structures (QA) and mainstream aviation qualifications (the CAA licence).

Conversely, this finding provides an indication that non-mainstream aviation piloting qualifications used in some sectors of adventure aviation (i.e. those issued by recreational organisations as opposed to the CAA) are not supported by the existence of formal QA processes.

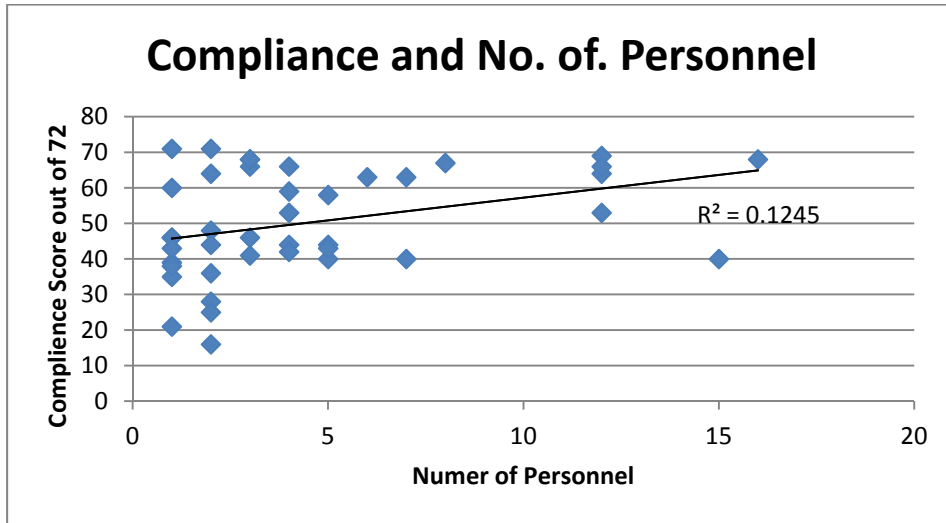
The number of personnel

The number of personnel – being the size of the operation, in terms of the maximum number of individual personnel employed at one time by each operator was considered as a possible driver for implementing compliant processes and systems. The survey did not question operators on the volume of the activity in terms of hours or number of flights however data on the maximum staffing numbers at any one time were an indication of the volume of commercial activity or complexity of an operation. The increasing size of the operation would possibly indicate a practical need for more formal systems and therefore a higher rating on the compliance scale.

The assumption is that scoring high on the 72 point scale achievement level was related to a

requirement to have organisational systems in order to manage increasing numbers of staff and to specify operational tasks. A scatter plot representation (figure10 below) shows the number of personnel against the compliance scale - indicating a wide spread of scores particularly in the smaller operations.

Figure 10 Compliance and number of personnel relationship



A linear regression analysis was applied to this data in relation to the ratings on the compliance scale. It indicated a low correlation (correlation coefficient, $r = 0.352846$). Therefore, the size of the operation was indicated to have little influence on the achievement of a compliance standard. Figure 10 indicates more variation in compliance scores for smaller businesses, but little else. The reasons for different levels of compliance are likely to be related to factors other than size of the business.

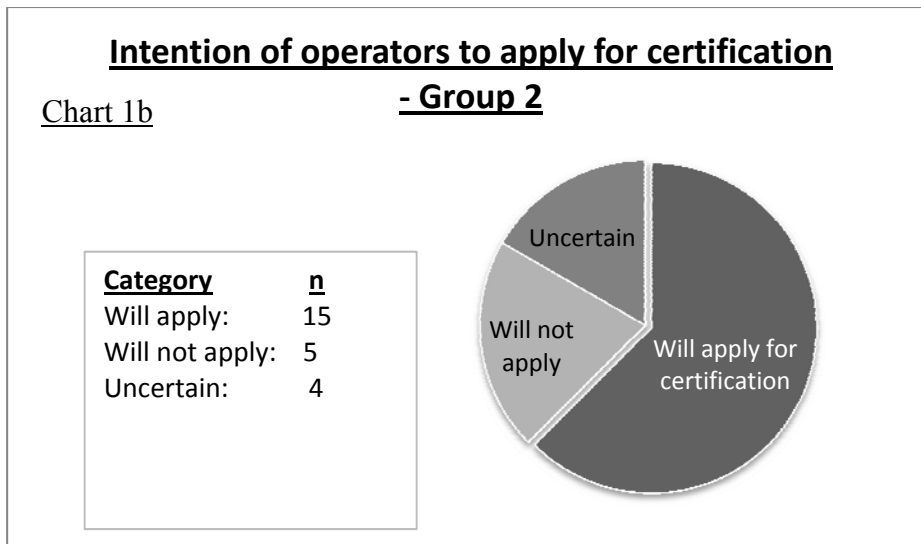
5.9 Indications from the statistical analysis

Operators tended to assume (rightly or wrongly) that their current processes reflect the requirement of the Rule and, that any additional requirements to achieve best practice was an overlay of additional administration upon what they already had in place. However the analysis of the information from the research indicates some difference of those assumptions from the reality. Note that the results of Figures 5 and 6 indicate supports evidence of the discrepancy, in comparison, between the existence of an OPM and the ability of that OPM to reflect a QA standard. This indicates a deficiency of many of the operator's OPMs as far as meeting current best practice. It also indicates a possible lack of understanding of the actual requirements for best practice.

The analysis of the 72 point compliance scale indicated two compliance groupings that could be separated according to the classes of activity - with skydiving, aerobatic and vintage aircraft, and glider operations being near to the upper level of compliance achievement and hang-gliders & paragliders, microlight, & ballooning operations being mid-scale and therefore having some way to go to achieve a certification standard. Further to this, the indication is that the existence of QA standards and the possession of CAA licences provide a foundation for achieving a better compliance score. In contrast, Group 2 operators lack of compliance standards by the non-utilisation of OPMs or the lack of quality assurance processes that are invoked in normal practice. The further influence - being the lack of a CAA flight crew qualification – indicates a separation from mainstream aviation that reflects the differing cultural elements from those within and those outside of the mainstream.

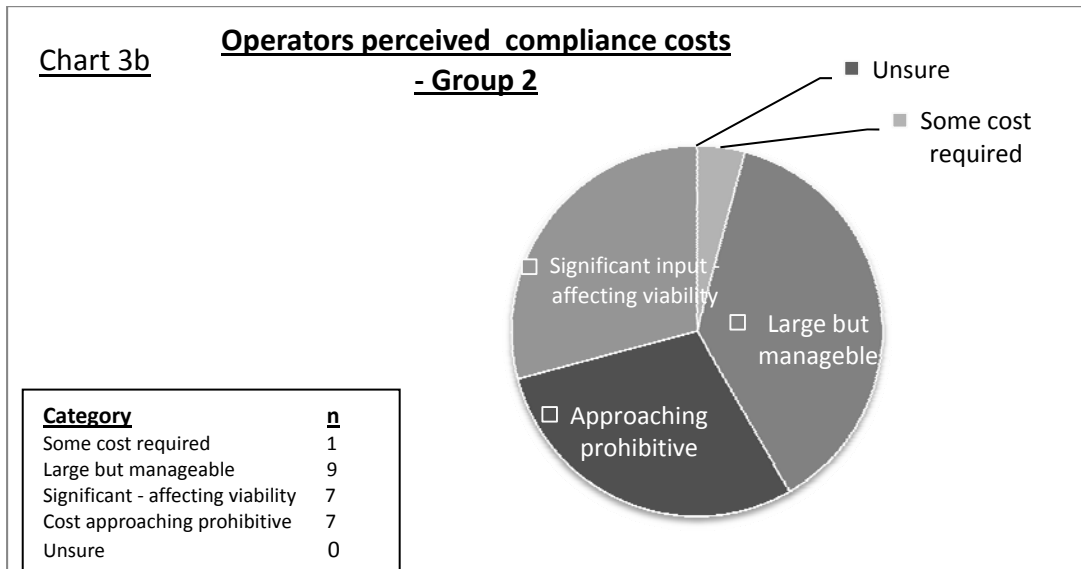
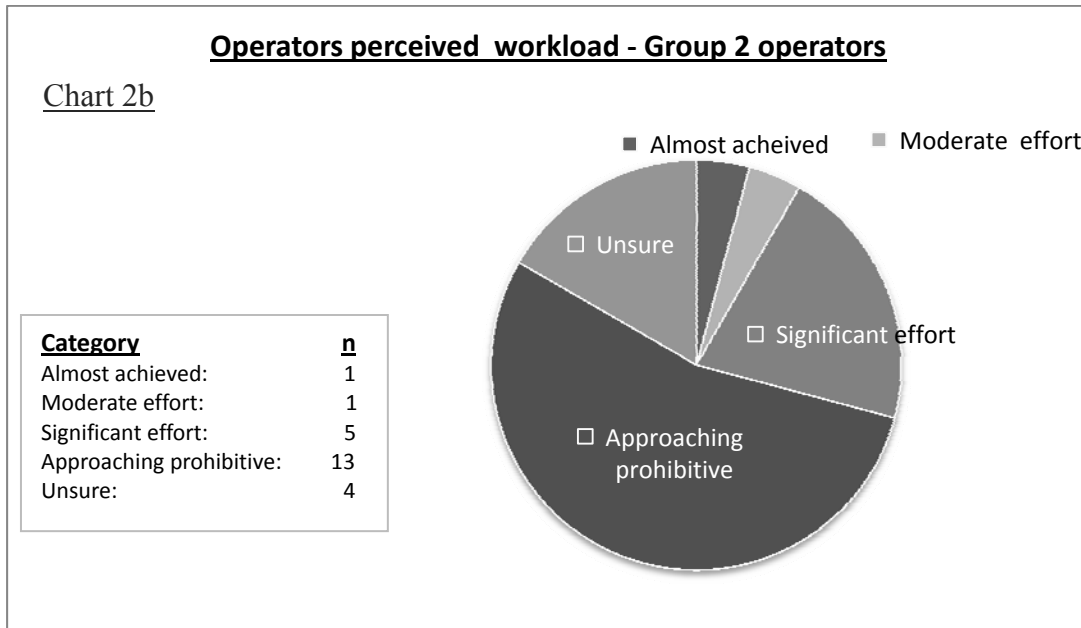
A critical implication from the statistics is the separation of the two groupings in terms of the goal of achieving certification under the new Rule. Group 2 operators tended to have assumptions of their own position regarding compliance which do not match actual compliance achievement levels. This factor may be problematic for facilitating compliance within the time scale and cost indicated in the NPRM (CAA, 2010a). To better understand this issue, the raw data

representations of Charts 1 through to 6 was applied specifically to group 2 operators as follows:

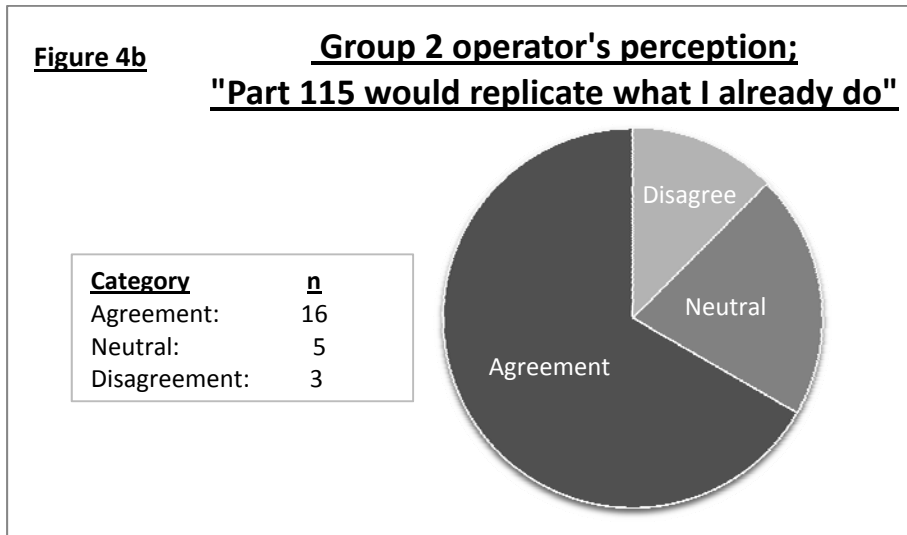


Of the Group 2 operators a larger proportion than the total sample of operators expected to apply for certification. This is due to many of the operators stating that they understood the rule was developed largely to regulate their sector of the industry and that they had little choice. This was especially the case with hang gliding and paragliding respondents.

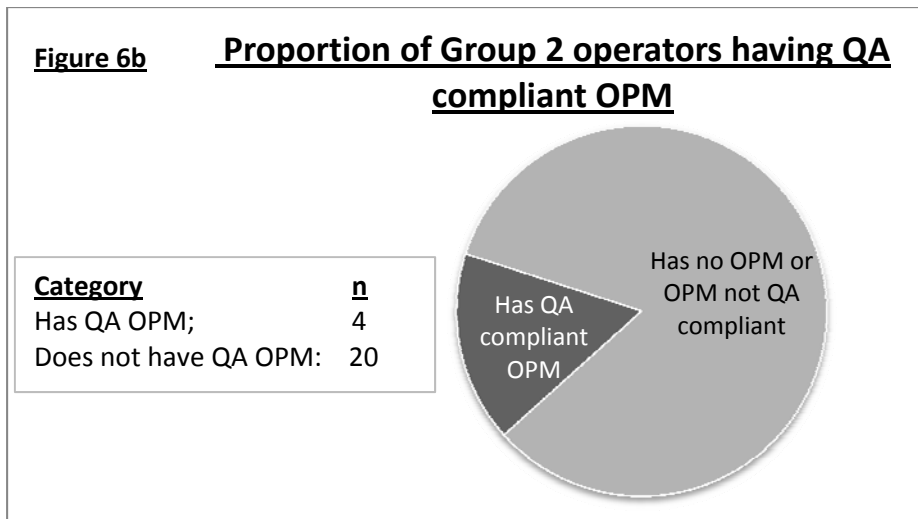
Of the workload and compliance costs of the Group 2 operators, the following information applies (charts 2b & 3b);

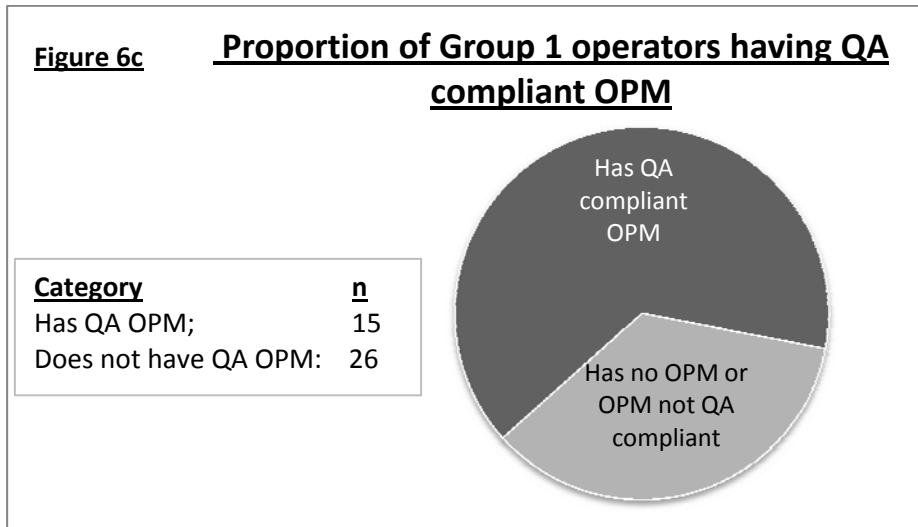


Workload and compliance costs were similar across the whole of the adventure aviation operator sample in comparison to only the Group 2 operators. This was also the case with operators perceptions of replication to the standards implied by the Rule as indicated in Figure 4b (below).



In consideration of the level of compliant systems that were actually in place, the proportion of operators of each Group having QA compliant OPMs is indicated below in Figures 6b and 6c





The above charts (6b & 6c) show a large difference in the compliance achievement level of present systems between the two groups.

To summarise: The majority operators state the intention to achieve compliance, but within this there are stated issues regarding commercial viability in terms of cost and workload. Current systems generally do not meet best practice standards although operators tended to consider their present systems replicate the requirements of the Rule in a practical way. Group 2 operators, in particular, indicate non-compliant systems. The discrepancies in actual compliance levels and the assumed compliance levels indicate issues with the understanding of the requirements for best practice as indicated by the components of present CAA rule design. The indications highlight problems with the overall acceptance of the Rule Part 115 as proposed. They further reflect issues with the required processes for compliance with the proposed regulation.

5.10 Qualitative Analysis - *Checklist* responses

Operators were asked questions to ascertain to degree their operating manual incorporated SMS components and the level their operational systems complied with Part 115 requirements. The formal processes required by SMS was a concept novel to many of the operators and guidance notes were provided outlining the basis of each checklist item and elaborated upon, as required, during the interviews.

The results of this *compliance checklist* indicate the degree to which either formal or de facto standards for compliance with Part 115 exist – as represented by the 72 point compliance scale. The *Checklist* itemised the minimum requirements of safety systems according to best practice and reflect the present protection that certification requirements provide for light aircraft engaged in public transport. Core elements relate to structure, the standardisation of systems and procedures, risk management, training and competency, quality assurance, and documentation. The scoring process required some discussion with operators and elicited additional responses that provide qualitative elements. The following review of the checklist items serves to add an explanatory layer on to the statistical findings and to demonstrate support for the assumptions made from the statistical data. Not all the 72 Checklist items are reviewed individually and specifically. Instead, a general review of the key components that relate to the core of SMS and operational best practices, that were apparent during the interview process, are covered.

A particular element, within best practice, is the expectation of specific statements of system requirements and procedures which are to be controlled and available for reference. The system is required to stand as a working document with the intention that it is able to be reviewed and updated, and that it is transferable and dynamic; i.e. it is a statement of the current operational processes that evolve organically as the situation changes. It would respond to changes in key personnel, ownership, equipment or operational environment. Any process for achieving the system requirements should therefore be formally represented (i.e. contained within an operations manual). However, in many cases compliance was considered to be achieved in a very general

manner whereby the assumption of SMS elements was appropriate - but the actual practices remained informal and not clearly stated. This was invariably due to the small size of the operation and the direct involvement of the owner/operator in day to day operations. In these cases the practices could not be presented as being controlled in a formal manner. If there was an indication that compliance standards were represented, and enabled, by normal practices that were essentially sound, well established and only required formalisation by way of a written prescription in an operations manual, then the practices were assumed to have been achieved by local informal protocol. This situation is indicated by an “ABLIP” annotation. (i.e. achieved by local informal protocol). “ABLIP” indicates that current procedures are likely to be recognised as satisfactorily compliant and could easily be integrated in to an operations manual in the future.

5.10.1 Organisational systems

Comment: The representation of organisational systems in a formal system is critical for compliance. The basis of SMS is to provide a robust format for operational systems and therefore the structure of organisational systems should be explicit. This includes statements of scope, roles and responsibilities. This system should be transferable in the case of a change of key personnel or a change of ownership of the organization.

Findings: The working operations manuals of the surveyed respondents were of varying standard and usually existed as guidance for standard operating procedures only. Without structures linking the activities to an assurance program, compliance standards, procedures for the use of equipment, and the personnel requirements for the operations would also need to be stated. There was partial compliance in most of the operations by way of the practice of matching or duplicating Part 149 specifications. In most cases that there was no on-going monitoring or update process to adapt to organizational changes.

5.10.2 List of nominated Personnel & Statement of Roles

Comment: This element directly reflects the organisational structure.

Findings: An “ABLIP” standard was widely applicable to all operations. One comment was that they “didn't need to state the obvious”. In the case of micro-organisations it would also be accepted that a principal individual may assume multiple roles. For micro-organisations operating in a static environment this would seem a reasonable assumption, however, there was no consideration of the expansion or extension of operations. There was also no consideration of succession management in any of the operations surveyed as the business enterprise was invariably seated in the individual founder/owner.

5.10.3 Equipment specifications

Comment: Processes for assurance of the efficiency and sufficiency of equipment would be a specific requirement for SMS compliance. This would include the type and class of aircraft to be used. This requirement exists in order to state the suitability of the equipment for the purpose. Ideally the suitability would be confirmed by risk management analysis. It is also to state how any modifications are accepted. Many of the aircraft used had cameras and other additional equipment installed and so documentation, directives etc. (applicable to whole exposition - but particularly relevant to maintenance procedures) would need to be controlled according to date, applicability, currency, and an update or cancellation process.

Findings: In many cases the decision as to the type and use of equipment was ad hoc and often limited by availability. In the case of paragliders and hang-gliders, the expected high utilisation and intensive use within tourist based activities required a high standard of equipment at initial acquisition. However the indications of the survey of operators was that on-going maintenance was ad hoc and scheduled integrity checks were on an annual or seasonal basis (usually according to Part 149 specifications) regardless of the level of use. Only in the case of CAA certificated aircraft – such as balloons, and vintage aircraft was maintenance universally required to be carried out by Licenced Aircraft Maintenance Engineers (LAMEs) - with the associated modification and

maintenance directive control mechanism that such systems possess.

Each 149 organisation used recommended maintenance systems but had varying levels of monitoring. Most disseminated advice either informally or incidentally and were reliant on active monitoring of information by the operators. The manufacturers of the aircraft, and related equipment also had variable standards of information sharing - with most requiring monitoring and feedback generated by the operator. Most operators believed they received the requisite information by way of their relationship with either the manufacturer or their umbrella organisation. No Group 2 operators had formalised procedures for the active monitoring of maintenance programs and, in many cases, information on maintenance directives was found to be purely reactive. Microlights and paragliders had requirements for annual inspections by nominated personnel designated by the Part 149 organisation. In the case of non-certificated aircraft, there was a general assumption that the maintenance specifications of manufacturer was sufficient if carried out correctly. In all cases a single individual oversaw the maintenance program of equipment within the organization – in this respect maintenance process were ABLIP. Formal co-ordination of maintenance requirements within the organisation was usually not stipulated. There was no consideration of the conditions in the case of modifications or additional equipment. The informality of systems was invariably due to the small scale of the operation.

5.10.4 *Minimum equipment requirements*

Comment: A key system in risk management is the specification of minimum equipment – i.e. what is required to be present and in working order for an operation. An advisory circular for Part 135 - AC-135 states “All instruments and equipment installed in the aircraft to be in an operable condition, unless covered by specifications of the provisions of a Minimum Equipment List (MEL)”. Part of the pathology of critical situations (or of an element that forces a normal situation to a critical status) is when an item of equipment is absent or in an abnormal condition. Some adventure aviation operations utilise ground equipment which may equally require specifications. An MEL – although not necessarily assumed to be part of the new Rule - facilitates conditional

operations when certain non-essential items are defective. This process effectively entails the application of a risk analysis process in advance.

Findings: All operators stated the existence of minimum equipment requirements as part of the aircraft type. In other words, the aircraft was operated according to its manufacturer's operating requirements and so existing equipment for the basic aircraft type as initially supplied was the effectively the very minimum. Any additional equipment (such as cameras mounted to record the flight experience for the client participants) were not considered in any specification for either standard equipment or as a modification. Ground support equipment, was invariably overlooked under stated specifications. In the case of on site first-aid, this was carried either as part of normal equipment in aircraft or was present in the operator's base or vehicle. There were no specifications as to the sufficiency or standards of these kits except in the case of conformity with Health and Safety requirements for the commercial premises of the operator (and this was present in one case only).

5.10.5 Operations procedures specifications

Comment: Operators are required to utilize Standard Operational Procedures (SOPs) that are developed for each individual operation. These are a structured procedure of checks to align pilot with equipment according to best operating practice. Additional checks should be included to provide threat and error management and risk mitigation factors. Such checklists would be specific to the operations and so, ideally, be developed by the operator. These checks consist of standards for three aspects of the flight:

- The Critical Flight phase: - specific checklist requirements for pre-takeoff, takeoff, prelanding, landing.
- Normal operations: - specifications for the limits of environmental operations and for routine in-flight tasks.
- Emergency procedures: - risk management for worst case scenarios entailing standard procedures is usually to be memorised as part of normal practice and backed up with on-hand quick reference guides. This aspect would also include a passenger emergency brief

as standard, and procedures will specify the dissemination of information regarding emergency procedures.

SOPs are generally considered sufficient if utilised solely by memory in appropriate situations however the complete procedures would be required to be published in the exposition for reference and to establish a common standard subject to review and audit. These would also need to be included into the training and competency assessment programs.

Findings: All operators interviewed had SOPs in place – In most cases standard operating procedures were well versed and performed by memory and published documentation was not referred to. This practice was invariably stated as due to the operators experience and their familiarity with operations. In the case of the ex-military aircraft, the complexity required a much more formal system of checklist use and all such organisations had very high standards of operational practice. Critical situations and emergencies were usually adapted from the initial training procedures common for all pilots experienced on the type of aircraft. All the operators stated having an established verbal briefing for passengers which often consisted of a formalised script. All operators used SOPs which were referenced in some kind of published material – either in the Operations Manual or as specified by the manufacturer of the aircraft. Formal systems for controlling this documentation were only present for operators that had certification under a current alternative CAA rule – such as Part 135 or Part 141. In many cases there was some referral to the training and flight instruction component in activities; and in this case would indicate a requirement for the control of this activity to be restricted to appropriately qualified individuals.

5.10.6. Operational range and minimum height specifications

Comment: All operators canvassed had standard routes that tended to be limited by commercial considerations. In some cases low-level operations were indicated as the norm in publicity material. Flight at low level brings increased risks due to the presence of mechanical turbulence, obstacles, limited visibility, and restrictions in manoeuvring. NZCAR Part 91 (the overriding legislation regarding rules of the air) specifies a minimum height of 500 feet above surface unless

in a take-off or landing phase of flight (NZCAR Part 91, 91.331). There is an exception for “ridge soaring” for gliding aircraft (NZCAR Part 104, 104.59; NZCAR Part 106, 106.55). Any planned operation below the 500 foot level requires specific risk analysis and should specify restrictions and limitations as well as reference to the appropriate CAR. For non-powered aircraft the risk analysis would presumably require an operator to specify assessed areas and flight paths for low level operations.

Findings: Only the operators conducting aerobatic flight had any formal systems in place to assess the risks of low level operations. Informal systems were occasional and ad hoc and relied on the assessment of the pilot at the time. Paragliding operators indicated normal use of an exception to Rule Part 91 regarding low level flights. One operator of microlight flights publicised operations at low level as part of the company's promotional profile. Microlight aircraft have a number of loop-hole provisions in the particular CAA Rule applying to their class allowing instructional flights as low as 200 feet above ground level (NZCAR Part 103, 103.153) – although these are for specific circumstances within an aerodrome circuit. No risk management assessment in regards to these low-level operations was stated or apparent in these cases. One balloon operator indicated that the development of procedures concerning all standard operational procedures were underway.

5.10.7 Aerodromes/landing and takeoff sites; suitability, performance statements

Comment: This is a general consideration of suitability encompassing limiting factors and risk parameters. Aircraft under Part 135 require the operator develop a procedure to assess aerodromes and landing areas including the approach and take-off areas, for the type and characteristics of the aircraft used. Considerations of suitability relate directly to aircraft performance data in reference to physical characteristics such as width, slope, surface and approach and departure paths accounting for obstacles and required manoeuvring. There is also a requirement for wind indicators. The performance analysis would need a process for assessment of takeoff/launch & landing sites would therefore need to be nominated. A proper compliant

procedure would incorporate suitability and performance matching for every proposed site as a general assessment and also as an SOP for each flight. The assessment would take in to account environmental and geographical considerations including weight/altitude/temperature (WAT) limits. Weight and airframe centre of gravity calculations would thus need to consider actual passenger weights, loading procedures and limitations.

Findings: Formal process such as weighing passengers, carrying out WAT performance analysis, or referral to prepared performance standards was stated as normal practice in only five of the 41 operators – and this was primarily the skydiving operations. In spite of this, all operators stated that they possessed a working knowledge of limits due to their experience including the ability to estimate the WAT considerations on any particular day. Operators used informal methods of assessing weights and stated verbally that a proper weight assessment would be carried out if the situation was judged to warrant it on the day. In the response to submissions (CAA, 2011c) some operator comments indicated resistance to any requirement to have weighing scales on site to determine actual passenger weights. All operators surveyed stated compliance with the limitations of the aircraft as per the manufacturers requirements. The paragliding operators interviewed used standard take-off and landing sites and applied practical risk management assessments to ensure wide safety margins and to facilitate ease of access. Performance processes were judged to be ABLIP in the majority of cases.

5.10.8 Meteorological information

Comment: This requirement indicates that meteorological information is to be obtained and conditions for local operations assessed each day and at any time when conditions alter significantly. Part 135 requires a minimum provision of meteorological information to be specified and be available to a pilot (e.g. official sites, local anemometers, reports, techniques, mechanisms and sources for gathering as well as interpreting information). The source of meteorological information should be suitable to the type of operation. There should be statements of limitations according to conditions (equipment, personnel, environmental).

Findings: Many operators had a standard procedure for assessing meteorological information - often from official aviation sources. Within the hang-glider and paraglider sector the meteorological information and assessment was carried out on an ad hoc basis usually by local observation by the operator. Paragliding operators at a number of locations had an automated anemometer installed at their primary launch site – with readings accessible by a cellular telephone link. This was chiefly for commercial expediency – to gauge whether operations could proceed at all on the day. Due to the local and short nature of the operations this would seem a reasonable method for weather assessment according to set limits, however recognition or analysis of marginal or changeable conditions was not stipulated in a formal way in these operations. In all cases the performance was stated to be achieved as per the aircraft's published operating requirement and further limited by the assessment of the pilot during the operation. Two of the operators interviewed sustained fatal accidents during the research period. On one occasion it was likely in part to be due to local weather conditions in the vicinity of the crash site and it is possible that low-level operations were being carried out. Whether the conditions would have been predicted by a more formal system of assessment and limitation is not clear.

5.10.9 *Emergency planning*

Comment: Emergency planning within any operation is to prepare for the repercussions of an emergency by way of specified procedures for a crisis situation on the ground or in flight. It would be expected to include statements of procedures in the event of any of a range of critical occurrences. Conditions for declaring an emergency would need to be specified. Emergencies include flight following procedures whereby overdue flights or the failing to make contact at a pre-arranged time elicits a follow-up response. Procedures should include items such as; immediate actions, contacts, a list of survival and communications equipment carried. There should be an explicit statement of the authority to suspend operations from the CEO. Specifications of communications and emergency planning should be lodged for every flight according to SOPs. containing a pre-activity briefing to all parties involved in the activity as well as flight following information to a ground station. Emergency planning would also include a

ground safety plan. The NPRM (CAA, 2010a) indicates specifications for Part 115 that refer to issues with passenger control and possible behavioural characteristics likely to endanger the safety of the aircraft or occupants. Guidance instructions should be given as to methods of assessment and refusal.

Findings: A range of emergency plans were utilised. One microlight operation had a well prepared emergency plan – although this was revised with a number of alterations to flight following systems following a fatal accident. One balloon operator had prepared protocols for different possibilities and a system of codewords for communication with ground stations (so as not to alarm passengers). Most operations used systems that limited the emergency response to the immediate actions. All considered only the required survival equipment specified by the type of aircraft or by the directives from their 149 organisation. All operators delivered basic instructions or emergency briefs to passengers prior to flight. Passenger details were recorded in most cases but not all the time. This was usually stated as due to time pressures and/or informality of style of delivery of much of the product.

5.10.10 *Post-flight procedures*

Comment: A procedure for cancelling the flight following service, recording flight statistics, recording defects and incidents, sharing critical information (a definition of critical information to be specified), channels for sharing suggestion or information for improvements.

Findings: In most cases the post flight procedures were ad hoc. Critical information such as flight time recording was dealt with as required for commercial considerations rather than in compliance with goals for safety improvement. Many operators indicated the presence of an informal culture of discussion and information sharing amongst staff members. One balloon operator stated an informal and highly practical debriefing of all staff including a discussion on operational safety and strategies for improvement. Incident reporting and information sharing between operators was limited and not according to any official process.

5.10.11 *Qualification, medical standards, and currency monitoring system*

Comment: A qualification and currency monitoring system – to be in place and workable. Checklist items for pilots proficiency, currency and wellness would be appropriate. This requirement comprises the statement of names and training requirements for all personnel in specialist roles i.e. pilots/operators, senior individuals, contracted individuals and also persons charged with flight following. It would include a statement of minimum experience (experience should align with requirement of commercial licences and ratings stated in Part 61 or Part 141) and the minimum requirements for induction training and initial training and currency monitoring system (e.g. whiteboard).

Findings: In operations where CAA flight crew licences were not required such as microlight and hang-glider/paraglider operations, no formal system was indicated. For qualification, pilots were all required to have minimum piloting qualifications as part of the specifications of their employment. In the case of single-person operations the minimum were achieved as a requirement at start of operation but not formalised within documentation. No currency procedures beyond those stipulated for the holding of the qualification validity were stated.

5.10.12 *Personnel training*

Comment: This component includes induction and on-going training in procedures. Normal operational procedures and emergency training would be expected to be included as induction and re-currency training according to a formalised process. An Advisory Circular Part 135 recommends “An emergency situation action plan could be contained within an exposition or in a separate manual for convenience and comprise a list of procedures to be followed which may be reproduced as a handbook for personnel. If it is to be a separate manual, then it should be referenced in an operator’s hierarchy of manuals that form the complete exposition and that competency checks related to it be included as part of the training program”²¹. Any related training manual should include the nomination of training personnel, induction and initial training

²¹ NZCAR, advisory circular; AC 119.3 revision 4, p. 15

requirements, competency training, performance assessments, recurrency training. It should also include records; of qualification and training history of all personnel. Training should address risk assessment, threat and error management, human factor limitations, safety pathogen indicators etc.

Findings: Operators using a Part 149 agency adhered to the minimum specified qualification and currency requirements and the applicable CAA or Part 149 regulations. The NZHGPA have a specific training program as part of that organisation’s operations and procedures manual in regard to a specific qualification (a “hang glider tow certificate”). This program which was adopted directly by one company carrying out those operations. All operators stated that they had rigorous training requirements, although none had any statement of the process or formalised delivery and monitoring system. For example, one operator stated he would “ensure all pilots are up to speed” but had no written specifications on how this was assessed. One balloon operator – although within the least regulated activity sector – took great steps to ensure good standards of training including providing annual first-aid, fire-fighting and emergency scenario training for staff. It is expected that Part 115 compliance would require a level of development of such systems with the need to present more formal standards and specific training for type of operation and some additional extension to include SMS considerations. All operators would need to demonstrate a monitoring system for qualification and a training program over and above standards for recreational pilots.

5.10.13 Safety advisories and communications

Comment: This refers to externally or internally generated information on safety issues. They include limits to operational practices and their indicators. The exposition should establish a method of internal notification as well as a notification system to affected external entities.

Findings: Formal systems of processing safety information was observed or reported in only three cases: Most operators had an ad hoc system of advice to personnel. Many stated that the size

of the operation rendered formalisation unnecessary or unworkable. Whether the informal systems utilised were sufficient to be ABLIP is doubtful given the requirement for traceability of information, advice and directives. The present situation could be said to provide no corporate memory and does little to encourage information sharing within the organisations or throughout each activity sector.

5.10.14 *Fatigue management*

Comment: The current Civil Aviation Rules for operational certification stipulate a scheme for the regulation of flight and duty times relating to the fatigue of flight crew. An operator would be expected to consider the needs of flight scheduling and implement methods of grading contributing factors that lead to fatigue. For Part 115 the limitations would likely relate to work load, total time on duty and requirements for rest and recovery within a certain time period, and would apply to all qualified personnel. The limitations would also need to apply to contractors with specialist roles. Such limits would be expected to be pertinent to the commercial environment – which may be seasonal and weather dependent.

Findings: No formal system was found. Two operators stated the need to cater for a seasonal customer flow and also the need to utilize available weather and day-light opportunities. The problems of flight crew fatigue and the associated risks appear to be present but generally unrecognised.

5.10.14. *Quality Assurance systems*

Comment: QA is inherent within best practice and SMS reflects an overall quality management systems approach. Requirements stipulate a series of quality control and auditing methods. This includes the incorporation of systematic safety practices with the expectation of continuous improvement.

These can be listed as follows

- A CEO as the centre of responsibility and designated safety personnel with defined roles.

- A hazard identification/ and Risk management process with a recognised identification and evaluation process.
- Safety performance targets and an associated monitoring system.
- Safety education and/or information sharing procedures.
- An associated documentation system. This would specify the required documents, operational sub-parts (operational checklists), document control procedures (such as access, change notification and retention periods).
- Emergency response procedures: as previously outlined.
- Review procedures: internal and external audit procedures would need to be demonstrated.

Findings: Other than those operators who utilized alternative certification standards (two operations surveyed were also certified under Part 135, another had *Outdoorsmark* certification²²), no formal systems specific to each operation were observed, no safety or operational performance indicators beyond that of increasing business activity or other commercial reward were indicated. Most operators had ad hoc systems in place for process improvement. A few of the operators were unaware of auditing services available from their umbrella organisations and a small minority of the operators interviewed had utilised formal external audit. Internal audit tended to be unscheduled and ad hoc.

²² Outdoorsmark is a national outdoor safety audit program offered by the Register of Outdoor Safety Auditors (ROSA)

5.11 Qualitative analysis - the *Questionnaire*

The *Checklist* items stand as a compliance template and allowed both quantitative and qualitative analysis. The final processing of information from the survey used a qualitative method to review responses to the *Questionnaire* in order to underline three key issues that provide an indication of the obstacles to operator compliance. These three closely parallel the assumptions from the statistical analysis and the qualitative analysis of the checklist responses.

The three essential issues are

1. Understanding - the level of understanding of safety concepts applicable to the industry
2. Acceptance - differing concepts of safety, accreditation and compliance requirements affect the level of acceptance of the proposed safety standards set by Part 115.
3. Compliance processes - This relates to the present compliance standards, the degree each operators systems enable (or don't enable) compliance, and operator's compliance strategies. The results of the research so far give indications of the required additional input the operators may need to make and the resources that will be needed. This is backed up by the specific elements identified by the *Checklist*. The *Questionnaire* had the advantage of generating a degree of informal discussion during the interviews which yielded possible strategies for operator compliance.

The issues are reviewed separately below.

4.11.1 *Understanding of the new Rule standard*

The perception of a number of operators that their present systems reflected sufficiency for compliance with the Rule standard indicates a degree of lack of knowledge of the requirements of the Rule and some of the reasoning for the lack of acceptance. The Rule is viewed as a being mere replication of current processes. Many of the Group 2 operators gained their skill and knowledge outside the mainstream aviation industry and stated uncertainty as to the requirements of the new Rule. A level of resistance was due to some doubt as to the applicability of regulatory controls. These were feared to be akin to airline standards and therefore over-complicated,

bureaucratic, and unnecessary.

The understanding of best-practice and SMS as an applicable standard was limited. Quality assurance processes were, where used, primarily reactive. A frequent comment – particularly among the Group 2 operators, was that such formal systems did not apply to small operations such as theirs and would, if adopted, restrict effective safety management due to the level of additional effort and paper work being a distraction. Most operators commented on the presence of the current safety culture that pervaded their sector as being of high value and critical to providing the necessary safety levels. This culture was indicated as having been a natural result of the commitment of the operators – being developed through the recreational origins of each pursuit and therefore suitable for recreational and commercial operations.

5.11.2 Acceptance of regulation as a suitable standard for commercial operations

Regarding the provision of safety as a duty of care, not all operators agreed that there should be a higher level of safety management for commercial operations than for the purely recreational or non-profit pursuits. However all operators indicated they delivered safety levels above that of normal recreational standards. Safety levels were often cited as stemming from the skill and experience of the operator and the emphasis of this feature was indicated to play a key role in marketing.

Any need for specialist regulation was accepted primarily for its value as certification standard, and as a recognition of those standards, but not necessarily to improve the current practices. Such regulation was also perceived to be a device to limit the entry of less prepared, temporary and/or seasonal operators which were generally viewed as having a lower standard of safety than themselves. Some operators gave anecdotal reports of particular enterprises (many of whom were also the subject of this research) as having lower standards. The possibility exists that comments of this nature reflected economic competition.

The operator of a ballooning business commented on the lack of a controlling body for their

activity and was uncertain whether CAA should fill that role under Part 115. Most operators did not wholly accept Part 115 to be the way forward and considered other alternatives were available and viable. Comments supported the notion that other sectors of adventure aviation had Part 149 organisations providing good support and that this maybe similarly appropriate for ballooning and therefore consideration should be given to ways to increase the roles of these organisations as opposed to providing a new raft of legislation.

5.11.3 Compliance processes and strategies

Many operators did not state any strategies for compliance as they did not consider the rule-making process had progressed far enough for such a consideration. Most respondents stated the assumption that the Rule development process was far from complete even at the NPRM stage and would need to undergo significant changes before it is accepted by the industry. There was some degree of cynicism regarding the progression of the proposed Rule to actually become law.

However, many operators had been prompted to review their own systems over the recent period due to increased information being made available regarding the progress of the Rule. A subset of operators of hang-gliding and paragliding operations had had more active contact with the CAA following a spate of accidents in their area and were more aware of the pending legislation. Some of these operators had merged, or stated the intention to combine resources, in light of the impending regulatory requirements. Others stated an intention to formalise their present systems without any additional modification or, if faced with additional hurdles due to compulsory certification, to retrench to a training only operation. Many expected a template would be issued (either by their Part 149 umbrella organization, or by the CAA) for facilitating the production of a standardised compliant exposition.

There was considerable variation in the level of recognition of compliance standards and procedures. None of the operators felt they complied totally with SMS requirements and some questioned the philosophy behind SMS - stating it may be counter to the adventure factor and was aimed at limiting, as opposed to mitigating, risk. One operator hinted that risks could actually be

over-managed and therefore detract from the overall experience.

Operators were also asked whether active risk management systems and safety improvement processes were currently utilized and what strategies they thought were required to enable compliance. A majority of operators had undertaken hazard identification and risk management procedures although these were usually applied at the initial commencement of the operation and were not referred to further, save in ad hoc situations, when a hazard presented itself at an overt and critical level. Risk management and hazard identification invariably stemmed from Part 149 or manufacturer guidelines. Other safety processes that were indicated as being used at present were often adapted from OSH or other outdoor safety standards. No operator had formal reporting systems or review processes beyond those required by external agencies. Most operators stated they had an informal reporting system suitable for their operation – whereby safety issues were expected to be raised. In the case of micro-organisations, the owner operator was invariably present and directly involved in all operational practices.

Opinions of the amount of work required for certification under Rule Part 115 varied considerably. Interestingly, those who were in process of developing a formal procedures manual recognised a greater requirement for input in the development process whereas those who were not developing manuals considered certification to merely entail the formal description of what they already did. In other words, there was an essential split in attitudes between those who recognised changing and dynamic attitudes to safety and safety management, and those who believed that their present operation comprised a sufficient or adequate process.

The umbrella organisations and other supporting bodies were generally recognised as being either under-resourced for the purposes of providing operational services relevant to commercial activities, or were considered to be not appropriate for the purposes. The advocacy role of these organisations was, in some cases, seen as counter to the goals of commercial operators. Information sharing and communication systems were not seen as relevant for the commercial operators and not well developed as they referred primarily to recreational issues. They were therefore unsuitable for assisting compliance or adapting for operational purposes.

Chapter 6. Discussion

6.1 Key findings

The review of literature indicated problematic elements inherent in the application of a formal regulatory structure on a set of recreational activities. Resistance from some quarters was apparent at the start of the field research. The review of literature highlighted possible causal factors such as the varied concepts of safety standards and the lack of any specific statements of safety targets or performance indicators and methods of achieving that safety. This has allowed operators to develop their own separate notions of what good practice is. The history and current state of the adventure aviation industry shows that operator's perceptions and the regulatory intent are unmatched and also unclear. Umbrella organisations were indicated to be unprepared to support commercial operations. The response by many of the operators to the issue of the NPRM for Rule Part 115 indicated a lack of any collective understanding of the requirements for compliance with the Rule.

The survey of operators established, by way of the 72 point compliance checklist, that operational processes (according to assumptions of best-practice) were deficient in many operations. This was indicated by the failure of a large subsector of the industry to achieve more than 80% on the compliance scale. The double peaked trend showed an obvious separation of sub-sectors which was also shown to match the split of operators into Groups 1 and 2. That the separation of the groups indicated a differentiation that can be considered "cultural" (in terms of a professional culture) was indicated by the available data regarding the possession of CAA licences, and of having formalized QA systems. The low level of compliance of the Group 2 sub-set was further indicated by the low overall average score for this group (42.3% - see Table 1). This factor alone indicates some difficulty in the simple application of Rule Part 115 to all players across the adventure aviation industry and the requirement for some development of practices to enable systems that are sufficiently compliant with the requirements of Part 115.

A further obstacle to the application of the Rule is the indication of discrepancies between what the operator's thought they achieved (in terms of good operational practices) to what they actually achieved. This is indicated by the low proportion of operators having good quality assurance systems (as charted in Figures 5 and 6). The discrepancy is perpetuated in consideration of the number of operators agreeing with the statement that "Part 115 would replicate what I already do". It is of particular concern that this statement had a high level of agreement amongst Group 2 operators (67% for Group 2s versus 63% for all operators). This reflects the cynical opinions as to the benefits of the Rule to provide improvements to the systems already in use and underlines the resistance to the Rule that was apparent with many operators canvassed in the survey.

The qualitative review of the responses to the checklist component of the survey confirmed the unfamiliarity, to many operators, of the best practice safety management systems contained within current regulatory requirements for commercial operations. Although workable practical systems are presently in place, they remain under-developed in terms of best practice. For many operators, their personal specifications for safety management tended to be represented by an accordance with the minimum required standard for simply the recreational standards of their activity, and did not consider the additional responsibility of commercial operations. The additional qualitative analysis of the comments and opinions of operators provided further evidence for a separation of operator's processes and standards from the requirements of the Rule. A root cause appears to be a fundamental lack of understanding of the best practice systems that the regulation is intending to invoke. This lack of understanding generates a resistance to acceptance which in turn affects the ability for operators to work towards compliance.

6.2. Gap analysis

The issues that have emerged from the research are reflected as deficiencies endemic within the industry as surveyed. The findings indicate the division between the actual state of industry at present and the desired outcomes of new Rule. There is a general lack of awareness of the requirements for risk management, and the sufficiency of the actual processes that are in place to achieve it. To better deal with the origins and solutions to this division, the issues are expanded further into four thematic elements for the purposes of developing a gap analysis - i.e. the gap between what is currently in place, and what needs to be in place for universal compliance. Analysis of these elements applies the information from the survey to extract the causal problems. It is intended that the understanding of the root causes will allow strategies to be identified in order to bridge the deficiencies of these three elements. This will greatly assist removing the obstacles to the implementation of the new Rule. The elements are; *understanding*, *acceptance*, and *compliance strategies*.

The gap in *understanding* of safety concepts applicable to the industry is particularly apparent in regard to the structural concepts of safety management – using organisational systems to provide the operational support. This deficiency feeds in to the poor *acceptance* of the Rule as presenting the most appropriate applicable standard or method of achieving higher standards. The resistance to acceptance also exists as a barrier to improving the levels of understanding. The research has further shown that the gap in practical *compliance strategies* extend to operational procedures, equipment standards, how risks are perceived, identified and managed, and the management of the human resources. A proper analysis of each deficiency would also be expected to provide the strategies - or *required processes* that bridge the gap and minimise these differences.

6.3 Emerging themes

The results of the research prompt a number of propositions that have emerged from the research data and statistical analysis regarding the implementation processes for Rule Part 115. These propositions are:

1. That there is an inherent cultural separation within the adventure aviation industry, under the current definitions, between those individuals that have previously operated within the aviation regulatory structure and those who have not;
2. That this separation is indicated by the gaps that exist in the understanding, acceptance and compliance standards required by the new Rule;
3. That this separation will be problematic for the universal implementation of the Rule across a range of operators.

The underlying causes for the cultural separation and the gaps in the understanding, acceptance and compliance will be addressed in the discussion and compared with other research. A stated goal of the research was to ascertain how the Rule standards are to be applied for a successful and universal application of the new regulation. This goal involves defining the requisite measurement standards, support systems, and cultural re-programming requirements. The issues are particularly relevant for those operators, identified as Group 2 type operators who, from the research, have been shown to have different perceptions of the purpose of the Rule and of the path to compliance. These operators appear to lack the connection with the knowledge and expertise required for facilitating compliance in an effective and workable way. Successful compliance means looking at how risks should be managed at a practical level in order to provide best practice within such a specialised sector. Risk standards, measurement, and management systems were addressed in the literature review and will be revisited in this discussion.

The themes are developed here in order to provide comment on the findings and to analyse the origins of the issues:

1. Understanding - The level of understanding of safety concepts applicable to the industry and understanding by the regulators of the obstacles faced by the operators.
2. Acceptance - The varying levels of acceptance of the new rule as a common standard, by operators. The analysis looks at the reasons behind the acceptance issues.
3. Compliance - The gap between the current levels of compliance and those of the required regulatory standards. The differentiation in compliance achievement is indicated by the survey analysis showing an essential separation in the cultural base of mainstream aviation (i.e. the Group 1 operators within the adventure aviation sector) to that of the Group 2 operators. Compliance is therefore considered as requiring a process of change by finding a common basis to work from. Change would entail sufficient *change management* as a defined process. The commentary on the compliance theme looks at two extremes for implementing the Rule by way of managing that change. It examines compliance first as being the adoption of the basic regulatory standard for the adventure aviation and includes the minimum inputs that the operators and the regulators would be expected to make. It considers a micro-compliance perspective by identifying the scope of change needed at an individual operator level. The second view is of a macro scale – why and how adventure aviation could be integrated with the other broader adventure tourism activities that are external to aviation, and thus provide a gateway to feed well-developed best-practice standards to other touristic activities. This view considers change as an opportunity and as such would be the ideal situation to implement best practices in safety management across a full range of activities – a range which incidentally includes adventure aviation.

4. Required processes. This reviews the tasks to be carried out in order to practically instigate certification standards across the full range of operators. It considers the key components to the tasks. These processes are:
- The aligning of current practices to best practice and the formal adoption of best practice as the recognised system. This means active input to integrate sufficient risk management and quality assurance with practical processes.
 - The implementation of sufficient support structures to enable the above.
 - Methods to measure safety at operator level.
 - A way to re-program aviation culture to embrace the inherent safety concepts and practices of adventure aviators.

6.4 Understanding

A key outcome of the research process was gleaned the attitudes of operators and the acceptance of a fairly rigorous regulatory framework upon a sector of aviation that has previously remained outside the standard model. The research indicated a lack of integration of the goals and methods of the various aviation sectors towards each other and towards the regulators. Apart from the warbirds and vintage aircraft sector, the cultural elements of a large part of the adventure aviation sector tend to remain distinct from conventional commercial aviation. Although gliding and ballooning require pilot's licences issued under Part 61, members of these groups carry out their chosen activities within communities that exist entirely separate from that motorised general aviation. To some extent, the use of glider towing aircraft provided a basic connection to the compliance resources via the pilots - and that effectively placed that sector well up on the 72 point scale in comparison to balloonists. Also, many glider pilots and gliding club office holders were said to be retired professional pilots. In spite of this, the independent nature of this code was certainly emphasised in the feedback during the survey interviews. Conversely, paragliding and hang-gliding pilots largely remain unconnected to the regulated aviation system. This disconnection meant there was scant education regarding current aviation industry best practice delivered to these groups and little opportunity for individuals within these sub-sectors to develop any understanding of such.

The development of the new Rule is in accordance with formalised best practice as an international standard. That standard is based on industrial safety within organisations which is an arena unfamiliar to most of the operators of the type of activities that stem from a recreational origin. The novel and specialised nature of SMS, as well as its previous application to large organisations and complex industries, has meant an overall separation of small operators from the evolving risk management knowledge-base. This has contributed further to the general lack of understanding of compliance requirements. The distinct cultural elements and differing knowledge-base provides an obstacle to the full comprehension of the requirements of the Rule by operators, as well as to the wider recognition of the needs of operators by the regulator.

A contributory factor to this disconnection is that the safety practices of the respondents tended to be developed in isolation and have an individualistic perspective, particularly at the small operator level. The resulting attitudes as to what is sufficient as a safety management process varied widely across the operators surveyed. The differences in perceptions and attitudes have been highlighted in previous reviews of the general aviation sector. Gill (2005) refers to individualism and resignation regarding safety concepts held by New Zealand aviators. She also points out that safety is an abstract concept rather than a binary condition that would be defined by *safe* and *unsafe* conditions, and that concepts of safety at one level will not be the same as another (Gill, 2004). This is problematic in regard to the development of safety legislation derived from one level of operation and applied to another. Scholtens (2002) observed that aviation regulation in New Zealand tended to assume a mature industry and systems, and also expected that compliance would be voluntary and therefore be an accepted aspiration for operators. She pointed to a resistance to taking up collective responsibility - particularly at the general aviation end of the industry. This resistance has been further identified as stemming from components of the New Zealand culture and psyche; Gill's 2005 study (Gill, 2005) was to determine the extent to which safety and safety management systems are established, promoted, upheld, and practiced by management and employees in the various sectors of the aviation industry (although in that case adventure aviation was not included). She identified the "them and us" mentality between operators and regulators that pervaded New Zealand aviation safety and communication culture. She emphasises the complexities of the aviation industry and the inherent problems with cultural attitudes that restrict the acceptance of prescribed standards – particularly to safety management. The individualism characterised by many adventure aviation entrepreneurs reflects these problems by further acting to exacerbate the isolation of operators from integrated concepts of safety. Gill refers to the existence of a distinction between individuals and organisations and identified a need to work with individuals within the specific sectors of aviation as well as with the organisations that provide oversight. The lack of mutual understanding of the differing issues of operators and regulators gives an overall indication of a lack of common goals regarding the purpose of the Rule, and a disagreement as to how it should affect current operations.

6.5 Acceptance

6.5.1 *An acceptance gap*

Although the survey respondents voiced a level of support for the Rule, the research indicated that acceptance of the Rule as best practice - using current mainstream aviation industry standards, has not been widely taken up. Only 32% of respondents (13 out of the total of 41) considered the existing regulatory structure to be suitable for themselves and, of those that supported the uptake of some sort of improved regulatory or accreditation standard for adventure aviation operations in general, 93% (26/28) of those doubted the effectiveness of its implementation or the applicability to their own particular operation. Analysis of the available information from the research, the review of literature, and the survey responses indicate three critical deficiencies, that reflect the disconnection that was present across the range of operators, and that acts to limit the acceptance of the Rule.

1. Insufficient information and education regarding SMS and other notions of best practice safety.
2. Insufficient collaboration and consultation and a lack of common thinking between the CAA and the operators on the safety concepts and standards applicable to commercial operations.
3. Poor integration of any of the basic safety philosophies that may be considered common to the wider industry.

These deficiencies are considered in turn:

6.5.2 *Information and education regarding SMS and best practice*

Systems that either demonstrate or mirror current best practice standards are poorly evolved in a large segment of the adventure aviation industry in New Zealand at present – particularly in regard to the high profile touristic activities to which the Rule is targeted such as microlight operations, hang-gliders and paragliding. As has been indicated, there is a lack of knowledge regarding such systems by the operators, and there appears to be few examples of their practical application. Although the respondents had essential safety processes in place there was a wide

variation in what could be considered to be QA standards amongst them and many operators did not express any real knowledge of the concept of continuous improvement or could demonstrate clear indicators of safety performance. There was a further lack of education or promotion of the fundamental concepts of SMS by the CAA toward this sector. This stands in contrast to the considerable level of educational and informational support regarding the application of SMS to other aviation sectors. Information is readily available within mainstream aviation via publications and seminars which is provided to those at a higher industry level who are already aviation document holders. This acts to increase the cultural division between the mainstream GA sector and adventure aviation. There is no indication that sufficient effort is being made to extend such educational opportunities to those outside of a formal relationship with the CAA.

Similarly, support by independent representational agencies towards many of the operators is not evident. There is a recognition, by one of these agencies, of the type of deficiencies that have been encountered in this research, and that are endemic throughout the wider aviation industry: Information from the AIA (the Aviation Industry Association) highlights concern about issues that closely parallels evidence from the research: According to information on the AIA web-site, a “safety forum” that canvassed AIA members in the North and South Islands in 2001 reported the following findings; “...using the specialist skills of a risk analysis consultant the industry concluded that the primary causes of accidents were:

- Poor understanding of risk
- Poor decision-making skills
- Poor understanding of organisational safety culture”

(Aviation Industry Association, 2011).

The AIA subsequently set up a voluntary “*AirCare*” accreditation system for its membership based on these findings. Despite such efforts from the AIA, the class of adventure aviation operators which tended to possess a Group 2 type profile continue to be left out of the circle of communication due to a lack of an obvious extension of membership and participation opportunities outside of mainstream GA and commercial operations. The AIA admit they have not

greatly considered operations such as paragliding in the context of an accreditation framework. (Irene King, personal email communication, September, 2011).

A further problem is the operator's own optimistic, but not necessarily accurate, assumptions regarding the effectiveness of their safety systems and their ability to comply. A lack of dissemination of information outside of the CAA influenced network regarding the use of SMS, or its components as best practice means that smaller independent operators have relied on the occupational safety requirements and advisories, and other inconsistent standards, which are assumed to enable a regulatory standard of sorts - but which fall short of a prescription for compliance with the Rule.

6.5.3 *Insufficient collaboration and consultation*

It would be assumed that a comprehensive consultation process would have been instigated during the development of the Rule. Indeed a consultation program was put in place, although it has proved to be sporadic and appears to not have entirely communicated the processes for rule-making or the possibilities for input to all stakeholders. This was partly due to the protracted period of the development of the final NPRM and the fact that part of the consultation process also referred to the earlier NPRM for Part 115 (CAA, 1999) - which was considerably different to the final NPRM.

Included in the consultation process were the regular meetings of the Ministry of Transport sponsored Aviation Community Advisory Group (ACAG)²³. This group held two monthly meetings with the CAA and invited various aviation industry stakeholders to discuss rule-making issues (CAA, 2010c). These meetings were held to provide industry voice in rule development. Within the ACAG, representation of the adventure aviation sector was limited to national representatives of gliding and warbirds and was therefore restricted in its purpose of providing information to all stakeholders. The stated intention to consult the "aviation community" (CAA,

²³ ACAG is stated to be "a body of members drawn from the wider aviation community that provides a forum for the exchange of high level information with the Civil Aviation Authority (CAA) on rules issues". [see caa website; www.caa.govt.nz/rules/Rule_Dev_Process/ACAG/ACAG_home.htm]

2010c) was not successful as far as the new Rule Part 115 was concerned, as the “community” in this case appeared to exclude primarily those operators identified in the research as the Group 2 type operators – those who had little involvement with mainstream aviation processes and culture but to whom a great part of the regulation was to apply.

The influence by ACAG participants upon policy was clearly limited. There was an indication of a level of obstinacy in policy development by the CAA – likely borne out by a desire to push forward with the regulation. The minutes of one ACAG meeting, held in November 2006, referring explicitly to the Adventure Aviation Rule, stated “... the policy is currently available on the website, and despite continued disagreement on the policy from NZPIA, the policy will remain as is.” (ACAG, 2006, p.6). This apparent indication of finality was provided prior to some further consultation on Part 115 that was mentioned in the CARRIL documents (CAA 2007b)²⁴ and in the preamble to the published Rule (CAA, 2011f). Interestingly, the dissenting organisation referred to in the above ACAG minutes, the NZPIA (New Zealand Parachute Industry Association), had no representation on the ACAG at that time – but had made a written submission regarding its stance on the proposals (Keith Gallaher personal communication, 10 June 2011). Also, the NPRM applicable to the consultation was published over 4 years later with no record of any interim consultation, and considerable development of adventure aviation issues would be expected to have occurred over the following period. Some flexibility on policy could normally have been expected had further issues been defined. It is thus doubtful whether the real purpose of the ACAG, in this case, was to provide input into the policy or the rule design itself or merely to inform certain sectors of the adventure aviation industry of current predetermined developments. A Project Working Group was stated to have been re-engaged to provide technical input subsequent to June 2006 (CAA, 2010g; CAA 2011f) however no active consultation was evident. The CAA regularly publishes the membership and links to the minutes of meetings of the Project Working Groups relating to other rule developments (CAA, 2010g), however there is no

²⁴ CARRIL – the Civil Aviation Rules Register Information Leaflets are available on the internet at caa.govt.nz/rules/carril.htm. They provide the public with information on the applicability of rules and the progress of rule-making

indication of the membership or activities of the Part 115 Project Working Group and no publically available evidence of any meetings that may have included Group 2 type operators. There is no clear evidence that any formal consultation was carried out subsequent to November 2006.

Over the last five years of development of the Rule Part 115 there were also indications of uncertainty regarding the required level of involvement of stakeholders, the process and degree of inclusion, and what was an acceptable time frame for the development period. This uncertainty is demonstrated by the fragmented approach to consultation. It was likely born out of both a need to complete the Part 115 sign-off in tandem with the upcoming *Adventure Activities* regulation (Department of Labour, 2011) and by an on-going rethink of the overall rule-making procedures that were in place by the CAA at the time. In this case the Rule development was foreshadowed by outcomes of the Scholtens Report into the adequacy of New Zealand's aviation rule-making processes (Scholtens, 2002). The report pointed out a number of deficiencies including problems regarding the previous advisory group structure that was defined under NZCAR Part 11 (a rule on the procedures for rule-making that has since been since revoked). In this case a CIRAG (CAA/Industry Rules Advisory Group) anteceded the ACAG where, Scholtens states, the "... wider general aviation community, including the recreational sector and pilot groups, were largely suspicious of CIRAG, which members saw as being a powerful agency, captured by the commercial sector/AIA, and/or inappropriately subject to a CAA veto". (ibid. p86). The report further states; " the CIRAG is perceived as dominated by the CAA and AIA" (ibid. p 88). The report indicated the CAAs empowerment in Rule development was effectively hindered by the consultation process: Scholtens further noted; "The CAA saw the industry as having too much involvement in the detail of rule drafting, a contributing factor being the majority participation of practitioners rather than safety strategists" (ibid. p88). Scholtens also criticised the Technical Study Group (TSG) process whereby the consultation sought external input by industry specialists after an issue is already encapsulated within a process that is committed to a rule-based solution. The TSG component for rule development was then replaced by an IAG (industry assessment group) upstream of the commitment to develop a rule, and a PWG (Project Working Group)

downstream if the commitment to proceed down the rule development path was confirmed. Development for Rule Part 115 as a rule-based solution was well underway at the time of this change and never managed to back-pedal to the IAG stage.

Although a number of changes were made to rule-making processes subsequent to the production of the Scholtens Report, these changes did nothing to provide any additional openness or clarity in the consultation framework and the net result was that current Rule development procedures remain in a transitional environment where consultation requirements are ill-defined and some of the previous deficiencies and mentalities appear to be perpetuated. For Rule Part 115, this has meant the protraction and effective dilution of the process of achieving full consultation. Certainly, the large diversity of opinion regarding the shape of the latest version of Rule Part 115 has never been resolved through consultation.

A further reason for the lack of representation of many adventure aviation stakeholders is because the highly fragmented nature of the sector and independence of operators leads to an overall lack of awareness of rule development processes and a lack of awareness of the consultation channels that are available. This has led to a corresponding lack of input. In any case, the specific requirements of operators would be difficult to absorb into the policy for the Rule. As the Scholtens Report further pointed out “the rule-making process is weak because consolidated industry positions either do not exist or are not clear and consistent” (ibid. p123).

Over the Rule development period, and up to the publishing of the latest NPRM for Part 115, there was an increased expectation for legislative action – this was partly due to the publishing of the Department of Labour report into risk management within the tourism sector (Department of Labour, 2010a). The resulting legislation from that report, which governed accreditation and audit requirements for adventure activities apart from aviation, also undertook a program of consultation. A set of standards was briskly developed as an adjunct to the Health and Safety in Employment Regulations (Department of Labour, 2011). This legislation was signed in to law on October 10 2011. A day later Part 115 also received ministerial sign-off (CAA, 2011f).

In summary, it can be argued from the evidence that, following a protracted and poorly integrated development period, the final production of the Rule was accelerated, without ever establishing an inclusive communication loop. This coupled with internal processes and external political pressure to produce the final Rule meant the regulators never finalised a proper stakeholder consultation process and never achieved an understanding of the lack of alignment of the cultural concepts at the extreme ends of the aviation safety spectrum. In actuality, this situation presents further obstacles to the transfer of information and perpetuates the cultural differentiation.

The purpose of pointing out the deficiencies of these processes is not to apportion any judgement on the responsibility for short-comings, but to demonstrate the perpetuation of silo thinking, communication shortfalls, and reciprocal misunderstandings of the regulators and the sub-sectors that make up the adventure aviation industry. This view enables a consideration of the reasons for the gap in consultation and collaboration which reflect the cultural differences. It also accounts for the lack of initiatives by the industry itself. The overall result has been a lack of accessible information regarding operator's perceptions and opinions at the ground level. This consideration was apparent at the outset of the research and was a primary driver for defining and achieving the goals of this research in terms of identifying the obstacles to the universal application of the Rule. It is the understanding and bridging of these differences that is required to support its successful implementation.

In the meantime the CAA continues with a defined program to roll out SMS for all legislation relating to operational practices. The dissemination of information being focussed on present participants in mainstream aviation does not apply the necessary support for new entrants into the system. The CAA has stated the timetable for implementation of SMS systems to apply to the final "third group" of operators which are to include "all other operations affected by the policy" (CAA, 2011b). The policy being referred to is the requirement for SMS to be incorporated within "other rules currently under development needing to be transitioned to SMS" and also that "new entrants to the civil aviation system will be expected to fully comply with SMS from initial entry" (CAA, 2011a).

Whereas small operators currently within the system have a considerable period of adaptation within the timetable – up to 3 years at the present date, no extension of supporting resources is being applied to the many adventure aviation operators who will be *new entrants*.

One result of the lack of collaboration and effective distance of this sector of the industry, as well as the retarded progress of development of the Rule, has been that many operators feel side-lined or over-looked. The knowledge of the rule development process that currently exists presents some negativity across a range of operators who remain cynical as to whether the Rule will actually be promulgated, whether there will be any concerted follow through by the CAA, or whether the Rule will even be a specific requirement for their operation. Operators surveyed stated such comments as “Part 115 has been in the pipeline for some time and we can’t see it being applicable to our operation as it stands at the moment”, “Our activity has a long history of managing safety well, 115 will merely add an additional level of bureaucracy”, “...Part 115 does nothing to improve the ability and culture of pilots”.

Information on opinion sourced from news media also supports these findings. Newspaper articles on the Queenstown adventure tourism sector highlight the lack of faith, amongst those operators, in the required bureaucratic processes (Jameson, 2006; Ray, 2006).

An overall cynicism is also held by industry organisations such as the AIA. A web page summary of their *AirCare* program notes the existence of “... a shift in philosophical direction, within government agencies, away from a collaborative approach, to re-establishing regulatory salience over the industry...” and; “...the AIA indicate a lack of partnership support for their own safety initiatives which presently extend to currently certificated tourist flight operators.” (AIA, 2011).

A further confounding element regarding the acceptance of a rule standard is the role of 149 organisations. There has been varied commitment, by operators and umbrella organisations, to the acceptance of Part 115 as an overarching safety compliance standard, or as a standard that is applicable to them as support organisations of recreational activities. However, there exists a clear

indication that Part 149 organisations are aware of the issues, and the expectations of these organisations (as opposed to individual operators) tended to be more informed and positive. There remains some confusion as to their role or level of participation due to the broad cover of Part 115 over a range of activities and also due to its focus on individual operators as opposed to organisations. The requirements of achieving commercial standards set certificate-seeking operators aside from the recreational environment. The general applicability of Part 115 as a standard for commercial enterprises means that the recreational organisations have effectively excluded themselves from the scope of the Rule. In contrast to this the CAA recognise the importance of the 149 agencies as being a key element in the application of the Rule. In 2006 the Part 115 Project Scope Statement said “Most of the experience and expertise within the adventure aviation industry rests with a few specialists, mainly within the Part 149 Aviation Recreation Organisations, who are a key resource in the industry.” (Farrell, 2006). The process for the integration of this expertise and how the 149 agencies will be expected to contribute to the implementation of the Rule has not yet been identified by any party. The CAA have considered a Part 149 organisation to be suitable if it has characteristics that are “strong, mature and able to provide the industry expertise and administrative backup necessary for the delegation of the Director’s powers.” (Northover, 2005, p. 13). The CAA also pointed out problems with utilising the 149 organisations for a supporting role. It was indicated that they may not have systems and resources appropriate to commercial operations as not all activities come under the umbrella of such organisations and the organisational systems of each may not be appropriate for application to the individual operators (CAA, 2007a).

Some of the umbrella organisations have attempted to set professional standards in terms of qualification of operators within their specific activity but have resisted developing an alternative, elevated level of general operating requirements applicable to commercial enterprises. The resistance has been due to a stated desire to remain primarily supportive of the amateur side of recreational flying and not to diversify or to impose or reflect any additional restrictions such as those that may be required should they progress to the oversight of commercial flying. The implication being that this would exert additional standards on the amateur sector by a cross-flow

of information regarding best practice in safety management which will have the effect of raising requirements generally and place a greater burden on recreational flyers. Of course this philosophy does not consider that overall standards would also be suitably raised. Any move to collaboratively develop professional industry-wide standards by the 149 organisations, had it been pursued, may have provided an alternative mechanism for operators – either as a stand-alone accreditation system, or which could facilitate entry into a Part 115 regulatory environment.

Regarding accreditation as an alternative, it was generally acknowledged by respondents that the lack of coherence and lack of any leadership on the internal development of standards, and due to the recognition of recommended best practices, meant that a CAA administered system was a likely outcome and would be acceptable provided it was workable. In spite of this underlying resignation re the imposition of CAR Part 115, questions as to the individual compliance requirements and processes involved invariably remained unposed until the publishing of the NPRM in late 2010 – as is indicated by the, occasional exasperated, responses to it in the Summary of Submissions (CAA, 2011c).

6.5.4 Problems with integration of organisational safety philosophies and concepts

The SMS philosophy is founded on systemic risk management carried out within an organisational structure using a continuous improvement process (as part of QA). An overall defining risk management standard has been readily available from the New Zealand Standards authority as the AS/NZS 436 Standard for Risk Management (Standards New Zealand, 2004). As well as having risk management processes as a requirement stipulated by operational regulations, the CAA also states the adoption of the same methodology for guidance on the initial rule development whereby the understanding of differing risk concepts is considered critical to achieving stakeholder acceptance (CAA, 2006b). The AS/NZS standard clearly points out the requirement for understanding the different values of stakeholders. It says “stakeholders are likely to make judgments of the acceptability of a risk based on their perception of risk. These can vary due to differences in values, needs, assumptions, concepts and concerns as they relate to issues under discussion. Since the views of stakeholders can have a significant impact on the decisions

made, it is important that their perceptions of risk, as well as their perceptions of benefits, be identified and recorded and integrated in to the decision making process” (Standards New Zealand, 2004, para. 3.1). This consideration highlights a further question of whether such guidance practices were sufficiently invoked. It is in this light that a closer review of the stakeholder’s perceptions of safety and risk are considered here in order to understand what alternative inputs could have been integrated in to the rule-making.

With regard to the current safety standards of commercial operators at present, most respondents indicated that the safety standards were finite – that there were inherent risks and their current practices effectively managed those risks within the scope of their specific operation. Operators were asked how their operation provided safety. All enterprises that were canvassed indicated that additional safety levels were provided due to the commercial aspect of their activity and these consisted of the voluntary implementation of extra procedures or considerations beyond those required by their particular umbrella organisation, and that this was due to a high level of personal diligence based on experience and influenced by commercial expediency (i.e. the clients required an indication of extra standards). The research did not indicate the actual existence of additional procedures, however the style and regimen of the delivery of the service was presumed to reflect the assumed experience levels of the operators. Operators indicated that their safety practices tended to be inherent to their own skills and knowledge and were therefore not objective or separate from their personal involvement. Many also stated that their personal involvement in the activity and their desire for self-preservation maintained or improved those standards, alongside commercial considerations. Operators recognised that a resulting high level of personal responsibility was integral to safety and that their own experience and understanding of the operation was critical to achieving that safety. The assumption amongst operators is that their present standards are sufficient, but regulation would assist maintaining those standards across the industry primarily by limiting entry by new and less experienced operators. They also, occasionally, indicated an awareness of other operators of similar businesses who do not do enough to provide sufficient levels of safety to achieve a commercial standard, and the new regulation was seen as a way of limiting or improving those operations by providing a pathway

with a requisite level of guidance. There was little indication that, in the opinion of operators, the Part 115 standards would contribute to the improvement of their own standards of safety.

The aligning of the SMS paradigm within organisational culture is in opposition to the current focus of the operator's systemic risk management as a person-centred philosophy. The differing philosophy and the additional requirements presented by SMS that relate to formal commercial aviation are, to some degree, considered intrusive and counter to the "adventure" philosophy – as, in this case, the evaluation of risk is highly personalised. In some cases the resistance to alignment with the proposed civil aviation standards was stated as being in preference to an (undefined) industry standard developed internally, and which would be better able to incorporate the perceptions of risk inherent in adventure aviation culture. Certainly, the need for a common standard and for some system for recognition – be it accreditation or certification – was widely accepted by operators, but generally considered as suitable for that purpose only.

A further element of acceptance is the question of monetary cost. A large number of operators considered the cost of compliance to be prohibitive. Arguably, had there been better consultation and education, there would have been a better understanding of the safety requirements and the merits of introducing best practice standards to the whole industry. This could have allowed more lead-time enabling better gearing for any cost burden. Questions remain as to the strategies of operators regarding the continuing pursuit of their chosen recreational activity on a commercial level, as a profitable enterprise. There are limited options for those individual operations that are part-time and have a marginal financial return. Merger with other operators to reduce costs by pooling resources, circumvention by retrenching to a training-only regime, or contravention by continuing to operate in one guise or another are possible options. The latter having the resulting expectation of the eventual termination of operations, and of litigation or enforcement action should their status be questioned. The CAA for their part have not indicated any moves to consider the commitment to identify, record or integrate the stakeholders perceptions in to the policy-making process or to facilitate the change management processes – which may be considerable.

6.6 Compliance

6.6.1. *The reality of implementation – minimum operator requirements for Part 115*

From the regulator's point of view, the acceptance of compliance requirements by operators has been assumed in spite of the deficiencies in consultation. This is demonstrated by the initial policy statements for Part 115 (CAA, 2007a; CAA, 2006a; CAA, 2005a), the state of the current NPRM (CAA, 2010a) – including the compliance timeframe, and the replies to responses (CAA 2011c). The reality of implementation requirements means operators will need to conduct a managed transition process. A pressing question, relating to the facilitation of compliance is; who is responsible for the change? Operators tended to assume the regulator would instigate a comprehensive change program during a roll-out period. This is because, as with the best practice framework incorporated into the Rule, there are also recognised best practice standards that should be integrated within the policy and rule-development process in order to enable effective change within the proposed time-frame. The CAA indeed states a best practice methodology for its rules development as part of overall risk management guidelines (CAA, 2006b; CAA, 2004b). Further examples of policy development guidance and practice which parallel the CAA example and specify best practice are readily available and are commonly utilised by other regulatory agencies (Department of Labour, 2010c; Quality Planning New Zealand 2011; Australian Government, 2008). Such examples recommend procedures for the development and implementation of regulatory policy which invariably incorporate methods for carrying out a process according to a defined and complete set of guidelines – effectively specifying a process to manage the change. A change management process will inevitably include a sequence of stages with appropriate tasks for each. No universal model for change management exists. However one example, from Artley (2011), consists of the following practical components; *consultation, planning, defining, agreement, goal setting, commitment, implementation, and review*.

To elaborate on an idealised regulatory compliance process, one that could have been utilized for Part 115, this model will be used as an up-to-date example to examine the compliance requirements as they relate to ensuring sufficient change management.

In the context of the implementation of Rule Part 115 there are dual assumptions when using such a model in the development process. There is the assumption that the steps to achieve successful change is shared by both the regulatory authority and the individual stakeholders for which the regulation is to apply. Whether it is a parallel or serial process is a critical. Is the regulatory authority responsible for the first part of the process and the individual organisations responsible for the last set of components? Or is it meant to be a partnership process all the way through?

The research carried out, and comment so far, has not pursued any detailed analysis of these questions further, and has assumed a prima facie assumption that the CAA intended the former. This is because the Rule and its associated policy is being presented as a finite standard for compliance with the consultation, planning, and defining processes being taken as complete, and universal agreement assumed to be in place (for agreement, in many cases, substitute resignation). The remaining processes are then assumed to be the responsibility of the organisations affected, and these are the steps to which compliance may be managed at ground level.

So, for adventure aviation enterprises to be able to work towards compliance using the remaining processes within the proposed model of a change-management schedule, then the individual tasks are re-stated and defined in the rule compliance context: *Goal-setting* defines the targets and timetable for compliance; *Commitment* requires acceptance of the operator to achieving certification and the commitment of resource; *Implementation* will be defined by identifying each specific task, and *Review* is reflected by the requirement to identify performance indicators and carry out the entry and on-going audit process in accordance with them.

6.6.2 How operators might implement the change

The ordered procession of these last four elements of change management is critical to the success of the Rule at ground level. Each step is reviewed here in the light of the current situation (October 2011; where the rule has received ministerial approval for passing into law).

At the minimum the process needs to redress deficiencies in rule design downstream, at operator

level. The policy for rule development could have better utilised best practice in order to enable a complete consideration of the perceptions of all stakeholders. As this was not achieved, inconsistencies in conformity and divergent philosophies need to be taken in to account.

Goal setting will require the adoption of best practice standards as an achievement target. SMS as a developed compliance system will effectively match the requirements of Part 115 and the research has indicated the level of distance from those standards and the resistance among operators to accepting them in their totality. At present, no compromise can be expected due to the CAA's commitment to abide by international targets. SMS remains an entirely suitable model provided it can be adapted to a micro-organisational environment. To do this the best-practice philosophy of SMS should be invoked. The perceptions of best practice are assumed to be entrenched singularly within the organisational management basis of SMS, however alternative possibilities for controlling safety should be considered. The literature review looked closely at the bases and rationale of risk and the associated management systems and revisiting these considerations tends to support SMS as incorporating a universal set of assumptions. These assumptions are;

- Workable risk management strategies should reflect the user requirements and so be user defined
- The risk should be defined and clearly stated
- The risks themselves be presented to users as palpable and understandable
- Risk management should not be finite and should reflect changing environmental conditions
- Risk management should demonstrate improvements in safety

(Kritzinger, 2006; Waring and Glendon, 1999)

The interviews and individual case studies have highlighted the lack of some key elements of best practice methods by operators due primarily to the size, simplicity, and the person-centered nature of their systems reflecting gaps in knowledge and understanding. Risk management processes are highly variable from operator to operator and activity to activity depending on the notions of risk, the identification of hazards, the operational complexity, and the support base each has developed

– or would be expected to develop. The integration of a common risk management philosophy means aligning current practices with a common standard and backing it up with an industry-led support structure (Gill & Shergill, 2004). The key issue remains as to how compliance may be managed effectively by each operator from this point, and whether the resources are available to realistically match the goals. This indicates the requirement for considerable ground work including the provision of improved information sharing, forging more collaborative relationships, and better education and resources for managing the change process. The actual *commitment* by operators to instigating the compliance processes is strongly linked to the acceptance of the Rule by operators. Once again, a broader process of education and support would be assumed to be necessary to encourage the acceptance of a cross-section of operators.

Regarding *implementation*, preparation for certification will undoubtedly require a full review of the procedures of each operation. Generally, the operators that were targeted in the research, appeared to have sufficient structures in place and there appears to be little requirement for any great systemic change. However, many of the processes are presently achieved by informal protocols, and formalisation of procedures and the implementation of additional day to day tasks as an overlay on present operations would be a key strategy for achieving compliance standards within the micro-organisational framework. For SMS to be effectively adapted to a small operator, it is important that it be tailored to individual operations and not be an “off the shelf” product. As a minimum, operators will need to formalise all processes into the published exposition. Although templates would be applicable, each exposition would comprise the complete and individual operation manual for each operator and should not be generic or necessarily transferable. The risk management system will need to cover all aspects of operational control. A reduction to an analysis of the basic operational elements would simplify the process.

These elements can be considered as:

- Procedure (the activity),
- Equipment (how it is being carried out),
- The environment (what conditions affect the activity), and,
- Personnel (who is carrying out the activity).

Each component of the manual would need to remain integral to the actual day to day operation and be extractable for practical use and so is not “filed and forgotten”. The risk management would need to reflect what is already taking place *and* to enable expected changes and improvements.

There are a number of ways to manage risk that have been employed variously within civil aviation at a practical level and has incrementally increased safety to the high level that exists today. Adventure aviation produces the requirement to reconsider risk strategies. In adventure aviation the thrill element implies an increase in exposure to risk (it is the corresponding increase in risk that is assumed to provide the “thrill”). Risks may be managed by a range of strategies such as transference, avoidance, direct protection, or procedures to limit involvement according to changing levels of risk (Standards New Zealand, 2004; Curtis, 2002). Transference or limitation means implementing methods to reduce involvement in the activity itself (e.g. a cessation of operations when weather conditions fall below a predetermined level). It may also mean the limitation of injury risks by increasing user protection mechanisms or a requirement for increased safety measures of non-environmental factors – for example, the wearing of life jackets for flights over water, greater requirements for training of pilots, or increased physical protection for passengers (such as seatbelts or enhanced impact resistant seat design – as is required for tandem paragliders). An improvement in any of these factors effectively decreases the risk and increases safety. A review of current practices and the associated operational risks would be an expectation for the compliance entry requirement. Specific limits would be required to be explicitly stated – either by the regulation, or by agreed standards within the sector, or by the operators individually. The assumptions of rule-making such as in the proposed Rule Part 115 put the onus on the operator to both comply with accepted standards that are defined (such as those of the manufacturer in the case of equipment specifications) and to manage other operational risks that are not clearly defined. Further to this, any changes to operational and/or environmental conditions would be required to be linked to a predetermined risk management matrix or a renewed assessment process. This indicates the individual operators themselves should be responsible for identifying and managing risks within their specific operational context.

Modern risk management theory indicates the desirability of increased operational transparency (Hofstede, 1999; Reason, 1998) and one suggestion is to increase the role of the customer in assessing the gravity of risk of an activity. The current use of disclaimers are indicators of partial achievement of this strategy although this effective transference of the risk – to the client - requires a larger level of informed decision-making by potential passengers and erodes the concept of the “duty of care” of an operator and it does not consider the ability of each individual to make informed decisions. This strategy does remain an accepted practice even in aviation; for instance, there is the requirement for an “Experimental” placard in amateur built aircraft to be visible to passengers as an obtuse indication of the less regulated standards to those of normal category aircraft (NZCAR Part 102). This requirement is presumed to provide a passenger with awareness of the increased risks. Such transference strategies do little to mitigate the risks although, when extended to commercial considerations, any requirement to better inform a client of real risks should be an incentive for operators to actively allay any fears by working towards a demonstrably good safety record. Although how this safety record is presented and publicised is also highly subjective and liable to selectivity.

Clear indicators of safety performance standards would therefore be a standard requirement. A working knowledge of current risk management methods and philosophies would also be an essential ingredient for any operator to be able to provide a best practice standard. Risks would also need to be informed – i.e. identified, acknowledged, and clearly indicated to users within a management plan. This requires the robust recognition and assessment process.

Achieving these components, alongside a process of continual review, sets a safety management system that closely parallels that currently being promoted. SMS appears to remain the most appropriate application due to its present integration within aviation and wider industrial practices. Considered simplistically, the adoption of SMS would ameliorate the problem of applying a single standard to a very wide range of activities as it has a foundation risk management which is enhanced and shored up by the supporting quality assurance structures in place.

Given the commonality of goals of operators and the fundamentals of SMS, is it workable for micro-organisations? The process of risk management itself can be complex with a range of considerations and applicable procedures. However it must be entirely relevant to the scale of operation. In the simplest case an operation will be a single person, possibly carrying out their operation on a part-time basis (according to demand). Compliance targets should be realistic to the volume of activity and resources of an operation. The responsibility for ensuring proper risk management will require considerable prior analysis and planning so that small scale operations can proceed with confidence. The direct involvement of a support agency – be it the present umbrella organisation or an alternative agency founded for the purpose - would assist conformity by providing expertise in the development of an exposition that aligns individual operators to the pre-determined common standard.

6.6.3 *Change as an opportunity*

For the Rule to succeed, compliance processes must bridge the gap in philosophies and practices. Positive elements that enhance and help facilitate compliance are;

- The general acceptance of requirements for improved and common standards among operators.
- The existence of basic safety standards on which to overlay a common safety management systems.
- A desire to integrate best practice (according to the operator's definition).

While these points are encouraging, the outcomes of the research have shown the large variance in levels of achievement of a Part 115 state of compliance and a wide range of standards and processes which will need to be addressed to enable full compliance across the industry.

It has been universally accepted (i.e. in the opinion of the operator's surveyed in the research) that certification under the Rule requires some change in operational practices – due at the very least to a formalisation of current systems. In a few cases it may mean developing a completely new set

of operational safety management procedures. The question of how that change is managed is present at all levels - so that bridging the gap should follow a universal process.

Any commonality expected by the implementation of the Rule would be based in conformity with best practice - which itself defines a set of processes to achieve the required standards. An operator-centred approach, with the onus on each enterprise to take responsibility for instigating operational risk management, and for the implementation of sufficient processes to sustain such a system, is the assumed path to successful achievement of a full implementation of the Rule. However the question of assessing the ability of each operator to successfully carry out sufficient risk analysis and ably apply appropriate mitigation steps remains difficult. Similarly, the source and level of supporting expertise and resources to assist an operator is undefined.

During the research process, single-person operators were presented with the complete set of SMS components as a recommended overlay to their operational practices. They invariably commented that many of the requirements were unrealistic and artificial. As an example, the requirements for internally defined organisational structures were seen as being not suited to the reality of field operations, and not effectively reflecting the actual day-to-day activities which had evolved their own simplified structures and methods. For many operators, SMS structures and the new Part 115 was being seen as an imposition rather than an advantage – locking in formal systems that would add an unnecessary level of rigour and requiring an arduous process of recording and follow-up that was beyond their capability and did not reflect a workable system within the present style of product. One operator stated that, in its present form “Part 115 was a sledgehammer to crack a nut”. Another said “Part 115 is a fix looking for a problem”. It was indicated that a developed workable system needed universal agreement by the operators, each sector activity and by the industry as a whole. These operators stated their normal procedures provided a balance between active back-ground safety processes and an exciting but secure experience for clients. An acceptable system would need to incorporate their current approach to operational risk management. Many operators stated they maintained a level of informality with clients that aided safety by increasing the level of trust and understanding between them and the

client, and therefore formal structures were irrelevant and not necessarily appropriate. This *expedient informality* was observed during the field research component of the study. Such informality was generally due to the small size and person-centered nature of the operation. In many cases this was considered an advantage for safety as well as for developing a saleable customer experience.

The issue of differentiation between organisational notions of safety culture – being a rigid and programmable behavior set, versus the complex, “messy reality of human behaviour” is recognized by risk experts Waring and Glendon (1999, p 201). And more recently, Finkel (2011) who looks at the separation between risk assessors and operators as problematic. These authors put forward a solution-centred risk assessment approach where the recommendation is for a more integrated assessment style focused on providing improvements and education. They are pessimistic of the success of risk strategies that treat human behaviour as another normative element, and also of the failure by management and regulators to recognise localised cultural systems that provide safety at ground level. This “ecological” approach has been recommended by Young and McNeese (1995) and more recently by Amalberti (2001b) as a way of progressing safety beyond a prescription for standard specifications and which considers the human factor within each operational environment. As the negative aspects of human performance, skill, and behaviour are considered within the risk management process, the ecological approach considers the positive aspects and the value of individuals as adaptive and skilled components with an inherent self-protective goal. The ecological approach, as it proposes solutions, is therefore one way of looking at surmounting the obstacles to implementation of Part 115 as it reflects the current systems of operators as an input in to best practice standards.

Indeed, the vast majority of the Group 2 operators tended to reject the systems proposed by Part 115 as separating operators from human-based skills, separating them from the intimate contact with their client by adding an additional, distracting, tasks for compliance, and also separating them from the information sources, knowledge and safety awareness that is being provided by the recreational base of the activity. They emphasised that these activities remain sporting pursuits.

All of these operations indicated that they relied on a person-centered safety culture founded in self-protection mechanisms – such as suggested in the ecological approach.

An ideal situation for the implementation of Rule Part 115 would be development of systems within a unified culture. Enculturation within any industry is a process that accepts and adapts to cultural differences across the spectrum of sectors (Bennet, 2003). With the advent of adventure aviation regulation, commercial aviation structures now have the potential to evolve by absorbing new cultural inputs to redefine best practice standards. Recognised best practice standards are themselves dynamic – as indicated in the continuous improvement philosophy embedded within QA. Best practice may indeed adopt some of the aspects of an alternative paradigm to improve its application and facilitate workability. Where current systems utilised by adventure aviation operators are largely based in the style, knowledge and skill of individuals, the interpretation of safety reflects simple recreational standards - which may not sufficiently incorporate additional duty of care requirements of commercial operations. However, the sporting origin of much of these activities remains to the fore, and embodies a level of enthusiasm and concepts of ownership that reflect a total immersion in the recreational nature of their activity. All the operators canvassed were passionate about their particular code. Risk management was invariably considered from a participation point of view and the active involvement by clients is considered an opportunity to demonstrate a recognition of the risks and show how they are managed for the benefit of providing informed safety.

With calls for increased safety standards and for the adoption of a formalised risk management system, a considerable positive opportunity presents itself to implement a philosophical alternative to the way safety is managed at this level. Under the introduction of an ecological paradigm the roles of individuals would essentially remain the same and the focus on a person-centred approach to risk management allows systems to remain simplified. Additional controls – that reflect best-practice – would be developed and integrated to each particular operation over time in accordance with the input of operators. The notion of a pseudo-organisation constructed to suit the current SMS organisational paradigm could be replaced by recognising the individuals

themselves as the vehicle for implementing the required level of safety in tandem a level of external support. This would be enabled by defining the role and purpose of the principal individual as a risk manager according to the ecology of their operation. Increased standards required for commercial operations could be achieved by providing practical learning opportunities and by fostering the use of active risk management processes during the initial, and ongoing, training and competency assessment. Although the definitions would be stated for each operation, it is not assumed that the processes would necessarily be made up of internal organisational components. In fact, sufficient guidance on the development of the systems and controls to suit each scenario would be expected to have degree of external input in the form of an active advisory audit process and, in some cases, externally sourced training and externally driven quality assurance. This is because individuals cannot be expected to possess all the skills and knowledge necessary for the establishment of best-practice and so a viable system also needs to value the ability of the operators themselves at ground level as well as external inputs. The mechanisms of person-centred micro-organisations could be networked within a system that co-opts expertise in the field – i.e. expertise that embody the cultural attitudes of each activity. An “organisation” could effectively be created by defining the specific skills of operators and specifying the externally resourced support inputs that would be required to supplement gaps in knowledge and ability for each operation. Experienced operators could then outsource their services to other micro-organisations. Their ability, and those of the support providers, would be further enhanced due to the higher levels of interaction, communication and sharing of resources. QA systems may also be reliant on the external input provided during the entry process and the on-going audit. An industry-wide advantage would also be gained by way of the opportunity for each operator to examine a range of threats to safety and to review procedures in place. This process would further assist the definition and application of the performance indicators. It includes the proposition that a performance rating scale could be applied to the experience and ability of individuals. The new Rule requires a qualification level of senior persons within each organisation (CAA, 2010f) and so a further step towards rating the performance of key people should not present additional difficulties.

As this opportunity clearly requires the support of external agencies, a new tier of safety management is envisaged specifically to provide for the needs of commercial adventure aviation operators. This service may be provided from a Part 149 or similar organisation currently acting as a representative body, or by way of an existing specially formed industry sector agency. Such an agency would need to operate at a national level with the role of achieving integration by providing access to common standards, templates, and expertise. The agency may also provide overall representation and advocacy for the wider adventure tourism industry and be a conduit for reporting and assessment services. Candidates for this role include the AIA and the Tourism Industry Association (TIA). The AIA have expressed some readiness to extend their accreditation and information sharing systems to adventure aviation operators – although historically they have been limited in the scope of their influence. The TIA provided input and comment to the recent Adventure Tourism Safety Review (Department of Labour 2010a) in a similar regard. The TIA has policies aligned with promoting safety and enabling accreditation of a wide range of activities as well as having significant membership and some capacity to access skills and expertise (TIA, 2011). Alternatively, a newly developed industry body may be preferable. The use of a national body will enable the effective concentration of resources, the broadening of an application base for new knowledge and practices, and also the integration of industry-wide communication channels. Some sponsorship by central government agencies would be expected in order to support the initial implementation process and to provide impetus for a universal and coordinated change. This process would also present immediate marketing opportunities for stakeholders and for integration in to global campaigns such as 100% Pure New Zealand.

The adoption of standards and processes indicated by a representative organisation would also require an extension of membership to each operator. This would be assumed to be a compulsory requirement by which the provision of links to a universal pool of expertise would enable each operator to develop specific SOPs which would be approved, under an entry audit system, and thereafter be available for periodic review, improvement and testing. The performance standards will be supplied by the combination of operational stipulations, risk management and quality assurance initially laid out in each operator's exposition. These standards would be upgradable at

any time by an operator and by being subject to modification during the audit program. In this way the development of safety standards and monitoring would be proactive, iterative and continual.

6.6.4. *The status of regulation and accreditation*

On the question of alternative standards, 63.4% of respondents (26/41) considered a range of possible alternatives, including accreditation, to be more appropriate for their operation than regulation by the CAA. The DOL report into adventure tourism (Department of Labour, 2010b) highlighted the issue of regulation over accreditation and presented the question of how far regulation, and the role of the regulator, should extend towards the implementation of new standards. Outside of aviation, non-statutory schemes were seen as preferable. A key reason was the high standards set by an accreditation structure – whereas there was an assumption that statutory regulations set minima which were implied to be lower (Department of Labour, 2010b). The report also recognised the resource problems of small operators and the inconsistencies in approaches and attitudes to risk. Accreditation allows operators to continually work towards higher standards as part of their growth process. If regulation is to be implemented, then the best practice standard it embodies should be utilised to reflect the advantages of accreditation as a means of compliance. This could be achieved by enlarging the role of national representative bodies in developing standards so that standards are industry led. The assumed aim of the regulation is to set performance standards rather than specifying system components. This supports the role of a national administrative organisation for each activity or sector as a singular and dedicated umbrella body – if not to set standards then to provide input into their development and to develop a compliance a format. It may well be appropriate for multiple organisations to rationalise or appoint a single national representative or align to a single stated standard, and for each organisation to develop the format for implementation according to the perceived requirement for participation – be it accreditation, certification, or directive. Simple but effective strategies workable for small operators could be tailored to suit a particular environment and resourcing opportunities could then be extended to a national level.

6.6.5 *Circumvention and non-compliance*

If the drive towards full implementation of regulatory certification for any and all aviation enterprises that operate for commercial purpose is continued, then some wider regulatory alignment is required. Some candidates for Part 115 certification may choose to fall back on “training” as their modus operandi and continue under a status quo that entirely circumvents the requirements and purpose of the new Rule. A third of respondents (32%, 13/41) stated they would not seek certification under the Rule. Many adventure aviation enterprises currently in operation have continued under the auspices of being a provider of training and many continue that role by integrating the touristic aspects of their product within training programs. A continuation of this state would mean no extension of the new standards. The requirement for any certification for training activities is limited within the present regulatory structure. Standards such as those included under Part 149 operations specifications do not extend their systems to the organisations or individuals that carry out the training but merely set the syllabus and authorise the unit qualification. The CAA provisions for the certification for flight training providers, Part 141 - *Aviation Training Organisations*, is not a compulsory requirement. Certification under this rule has only been adopted by a few large flight training organisations and some airlines. The majority of aircraft training operations presently continue without any mandated quality system and so the adoption of the phrase “training” as part of a company’s brand and the presentation of one-off “trial flights” as an introduction to the sport effectively provides an escape from any certification or accreditation requirements. Unless there are moves to implement Part 141 (which embodies SMS as a quality system) or another minimum standard for training in conjunction with Part 115, across the whole of the recreational aviation industry, then there may well be only minimal subscription to any regulated certification standard. Meanwhile, accreditation, as opposed to certification, would seem the most suitable path to enable a viably inclusive future.

As the research outcomes reiterate the need for a considerable resourcing to provide the education, the guidance and expertise, the issue remains as to what process and by which agency should the implementation strategies be carried out. The next section addresses part of this compliance issue by analyzing the required processes.

6.7 Required processes

6.7.1 Components

Putting the change processes in action requires both the goal setting and implementation elements. Four minimum components are assumed to achieve a workable implementation of the standards required by the new regulation. The first is a formal *adoption of SMS* as the common standard - this means instigating a process of aligning current practices to best practice. The next is to identify and activate *support* systems. The third process is the defining and application of a workable *measurement* and monitoring system. The final component is the *cultural reprogramming* required to overcome previous problems and to ensure continuance and improvement.

6.7.2 The Implementation of SMS

For the implementation of SMS compliant processes, the regulating authority (the CAA) may be best able to specify standards by encouraging the use of a template for operational design. An agreed level of commitment and the proper guidance and education to all industry participants remain the outstanding ingredients. Certainly the CAA has a commitment to implement SMS across the board and has access to the required resources. In regard to providing sufficient qualified staff members to effectively regulate adventure aviation, the response to submissions to the NPRM stated “As part of the introduction of the Part 115 rule, the CAA is aware of this need and intends to gain the appropriate resources” (CAA, 2011c). It is assumed these resources include those for the education and guidance of entrants. Regarding the prioritising of resources, in Australia, the aviation regulatory authority, CASA, has indicated a level of realism by classifying users according to their knowledge and acceptance of risk (CASA, 2009). Resources are then prioritised towards those with limited or no knowledge of the risks to which they are exposed and little or no control over the risks (ibid.). Resources for high risks activities such as adventure aviation are focussed on educating risk awareness to the users (CASA, 2011). CASA has also indicated a reliance on umbrella organisations to provide the oversight of adventure flight operations (ibid.). They do not distinguish commercial from private operations in such cases.

In New Zealand implementation (and enforcement) would be expected to be supported by proper education as a facilitation mechanism. This would include material to promote risk awareness to the users and to the public as a whole, as the public perception of risk is a critical component of acceptability. At the operator level, resources would be expected to include published guidelines and access to support material, advice and expertise. A key requirement is the structured and complete assessment of the risks for each operation - and this would be an application common to all enterprises seeking Part 115 certification. The CAA would be expected to work with Part 149 organisations and other representative agencies to define standards, levels of qualification and the facilitation mechanisms.

Along with the development of a risk matrix and mitigation procedures for identified hazards, the reporting and analysis of incidents (as well as accidents) is integral to improving safety and to demonstrating a workable quality assurance process. Open communication and reporting channels would advise other operators of current and novel hazards. Recent studies attempt to identify the key causal factors of accidents across a range of flying activities (O'Day, J. & Murray, M., 1995; Kritzinger, D., 2006). and CAA Safety Target Outcomes research (CAA, 2004b) use such classifications to identify specific causal elements within each activity in order to focus improvement strategies.

In general terms the hazards that present a risk of an accident are dependent on:

The type of activity

The type of aircraft

The area and environment of operation

The operational systems

The phase of flight

The experience and skill of the pilot

(CAA, 2004b)

It would be expected that Rule compliance would direct the establishment of systems to

encompass all of these elements and dictate a high level of standardisation of systems over the range of operations. This would bode well for the future effectiveness of Part 115 only if it manages to achieve the implementation of such common standards. An obvious issue is the acceptance, by operators, of such a standardised overlay and whether it will be perceived as being relevant to their particular operation. All the respondents surveyed had parallel systems in place but with no standardization and, in many cases, little formality. The informal protocols by which much of the safety is presently achieved exacerbates the variable standards. However, the requirement for a formalised hazard identification and active risk management is particularly applicable to a small sole-operator business as it is carried out before the operation is undertaken and allows the confidence to commence operations in consideration of known risk parameters. From the operator's point of view, hazard analysis process will have been completed largely prior to the day's operations and a risk register developed to process identified hazards. This means less information processing tasks for a pilot/operator during flight operations which allows increased vigilance for novel hazards and greater situational awareness regarding present risk. This is one example of how raised risk awareness acts to improve safety. A risk register may also be part of a review system which would be updated and modified post flight or in accordance with a regular review policy, as appropriate, according to the nature of the threat and the specific policy for mitigation.

Active risk management will be crucial in identifying and quantifying any novel risk components. A further measure relating to operational culture is protection against risk pathogens. These are elements within the operational environment that weaken the protection measures and increase exposure to risk. They may be insidious; examples are when major changes are made to an organization, or during periods of rapid growth or full capacity, or when there is a degradation system due to financial constraints. Processes should be in place to consider problematic cultural issues, systemic factors, human elements and other causal factors of accidents (Waring, A. & Glendon, 1998; Tweeddale, 1998; SNZ, 2004). A reliable data set amassed over a period would set recognition targets. An advantage of active monitoring of such factors would be the integration of heightened risk awareness. Awareness at the operator level (with appropriate

mitigation strategies stated) and an open system of risk profiling by either the support organisation or by the regulatory authority would be appropriate controlling measures. This further indicates a larger active role by external agencies.

6.7.3 Support systems

A level of external support in order to develop a workable system that embodies these measures is expected to be provided for the successful introduction of any best practice based compliance system. The very change processes from the implementation of the new standards further increases the vulnerability of operators. This means an initial period of increased external and internal resourcing requiring education, expertise, analysis and monitoring. The major obstacle for the present and future structure of regulation is to apply the best practice requirements to a fragmented, diverse and under-resourced recreational aviation environment. For the universal application across operators utilising external resources for compliance, Part 149 organisations or newly formed associations founded for the purpose of providing the requisite expertise, should be utilised. The 149 organisations themselves possess limited resources, although they generally operate exceptionally well in terms of providing support for their members so far as recreational activities. Their voluntary and part-time basis gives a range of variable standards, and provides differing levels of service. There is a degree of overlap and duplication whereby a number of 149 certificated organisations coexist in parallel promulgating a range of operational standards within a common sector. Microlight flying has three separate organisations, each with their own 149 certificate, and all prescribing various standards for microlight activities. Further to this, some adventure aviation operator utilise the code and procedures of more than one 149 organisation for a combination of activities (in one case scrutinized during the research, these were separate rules for hang-gliders and microlights whereby the former was launched by tow from the latter). This situation results in a wide variance in the ability to provide safety structures and is exasperated by limitations in the operators' scope and resources as well as uncertainty as to what exactly is required. It is important to note that some sectors – such as hot air ballooning have no Part 149 umbrella organisation and there are no specific rules available that apply to commercial operations.

Ideally, one organization that supports the commercial activities would exist for each activity. Each organisation would need to develop safety management system components that are able to be extended to and used effectively by operators. Although Part 149 appears to reflect standards of commercial certification, and applies these responsibilities to the umbrella organisation, it goes no further in specifying the relationship with individual operators. This lack of extension would not give an acceptable means of compliance under the terms of CAA policy. Although the various Part 149 organisations assume a degree of responsibility for safety, there is no specific requirement for the active monitoring or surveillance of commercial activities. The objectives of current organisations are usually stated as promoting the particular sport as a recreational activity with any focus on monitoring and the development of standards being transferred to the individual operators - and this is reflected by comments from those operators canvassed for this paper. The umbrella organisations do not presently offer any real extension to commercial operations, and the ultimate responsibility for safety is diffused through nebulous links to secondary organisations and roles. Examples of Part 149 compliance offer very generalised safety policies. The elements of this rule do not extend to specific operators – who, although maintaining membership, remain organisationally separate. As an example, the *Organisation & Procedures Manual* of the N.Z.H.G.P.A., referring to the role of regional clubs, states “safety can only be established effectively at member organisation level” (NZHGPA, 2009, p.12.). It is, however, unclear whether there are any processes in place to sufficiently identify, measure, apply or integrate individual member safety within that sector of the industry. The stated systems maintain an aloof position in regards to individual operators. As an example of the limitations of those current systems standards, the NZHGPA requires six or more incident or defect reports *of a similar nature* before the information is required to be shared with other member operators. The NZHGPA safety assessment group, the *Safety/Incident Committee*, exists as a reactive body (NZHGPA, 2010b). Furthermore, the process of such reporting for that organisation is designed to infer culpability and so effectively limits information sharing for fear of blame. The only publicly recognised open communication channel for this organisation is the monthly “Airborn” magazine. This example is for only one organisation but is indicative of the required

philosophical change for all such organisations towards a proactive and supporting safety culture.

Modifications to the umbrella organisations would be aimed at providing improved and common standards for assessment and reporting on an integrated and universal basis. They would need to actively develop adaptive systems in order to respond to the evolution of current activities of their field and to source the requisite expertise. This would require the active enhancement of present communication channels and training programs, and the development of standards for information-sharing. Ideally they should be able to provide the initial guidance, assessment and auditing services.

The expositions themselves would be expected to be developed by the practitioners and state standard procedures and identify nominated individuals with clearly defined responsibilities. It is clear that the range and scope of the requirements present an obstacle for micro-organisations. A template on which operators could base their manual would have the advantages of ensuring full compliance in terms of the scope of risk management, standardization and simplicity of interpretation and data gathering. Where resources are constrained, additional support will need to be provided by a contracted individual or agency - perhaps serving multiple operations and therefore acting as a link for information sharing. The support may logically extend to the specification of standard operational procedures. In such a case, the specifications of the 149 organisation would suffice provided that the organisation supplies procedures suitable to commercial operations. The link would need to be interactive and dynamic - requiring notification of changes to and feed-back as to the efficacy of the SOPs within each operational environment. The sufficiency of such feed-back would then be assessed by the audit process.

Regarding expertise, ensuring appropriate risk management processes are in place and being used on a daily basis will entail the provision of sufficient training for operators at ground level in order to assess and manage the risks particular to each activity and provide the systems for quality assurance. An entry program entailing a full risk audit at initiation and at regular intervals, coupled with practical education and advice would be a minimum expectation. The level of co-

operation between an operator and a Part 149 organisation or other contracted party will be according to the resource requirements of each operation. Templates and appropriately skilled auditors would need to be sourced at reasonable cost. An advantage could be realized if the direction of flow of information and expertise was multi-directional, according to specialisation - with well-developed enterprises able to contract their specialist services (such as auditing or risk assessment) to other operators.

The support organisations would effectively be the channel for recognising the ecology of each operation and the abilities of each operator. The idea would be to maximise the chances of sharing information, skill and expertise in order to increase the knowledge base of the industry and foster an ideal culture of safety. Implementing an ecological approach requires the encouragement of communication and interaction – and including it as part of an assessment process. The practical learning opportunities and fostering of risk management processes would use this external expertise during training and competency assessment, as required, in order to mentor the internally stated organisational safety policy. This arrangement may involve applying a rating to individual operators and adding a new levels of qualification to the competency of assessors and examiners. It may also identify a hierarchy of expertise for application to each activity sector.

Such mentoring opportunities exist at present within mainstream certification requirements which assume a larger and more sophisticated internal organisational base: Part 135 specifies that pilot training includes “policies and procedures applicable to the operation” (NZCAR Part 135 135.565 p 62). It is assumed the similar requirements for Part 115 would include practical application of the specifications of risk management within the organisation’s safety policy. Part 135 also includes a consolidation period for each type of aircraft for the initial training of pilots. This period is crucial in establishing the practical risk recognition and mitigation procedures specific for each type and in the expected operational environment. It also provides the opportunity to foster organisational safety culture, and it allows a trainer to impart skills to a new recruit in a variety of possible situations. As it stands the NPRM (CAA, 2010a) for the new rule and the new Rule itself (CAA, 2011f) do not include such a requirement. However its inclusion would provide

a chance to extend similar opportunities within each adventure aviation operation.

Training and qualifications specifications and a safety program may also benefit by being integrated within the umbrella organisation – providing a pool of information, personnel and expertise to draw upon. The reporting and incident investigation system may similarly be part of an open communications loop that includes incident investigation which may be established by, and resourced from, the umbrella organisation. For Quality Assurance, this may include an external audit by the umbrella organisation or other nominated agency according to specifications particular to each operation. If QA processes are contracted out the frequency of contact would need to increase accordingly.

Importantly, for such an arrangement to be effective, it must embody an active process within day to day operations and not exist merely as a passive contract. Any of those elements of additional support should not include such operational roles unless the nominated individuals are immediately available. Occasional role requirements (such as performance monitoring, auditing or maintenance controlling) would be subject to a regular review processes to ensure adequacy. The change process should also integrate risk-reporting standards including the requirement for adequate information for the public and an effective feedback system such as a client survey or suggestions facility (Gough, 1998). The communication and feedback should allow a continuous improvement process which may be validated by the achievement of stated performance indicators. The scenario indicates the requirement for a larger level of input at the outset and, as knowledge levels increase, then the demand for specialised expertise will be expected to diminish to a lower constant.

6.7.4 Measurement

The review process itself is part of the on-going change management. It relies on the assessment of the alignment of an operators' current safety with agreed industry standards. It requires a defined measurement systems which itself is directly linked to having a common and effective process of reporting. Safety improvements are themselves demonstrated by using practical performance indicators which may be defined by the gathering of statistical information and making comparisons across the industry.

Performance indicators are assumed to be developed to a set of common standards such as; the actual numbers of accidents or incidents - indicating levels of failure; risk levels – the identified consequences of unsafe conditions and the likelihood of their occurrence (or, alternatively, the levels of exposure to the unsafe conditions); assumed safety levels – the setting of initial performance standards. Which standard should be applicable is currently unknown, however the prescription is for a defined scale that is publicly recognised and accepted. It is likely that the specific standards required for adventure aviation would be strongly influenced by the bottom-line definition of the public acceptability of risk of accident or injury in addition to any user defined scale. As has been discussed in the review of literature chapter this definition is variable and the public perception element is one reason why the CAA regularly reviews safety targets. The CAA would be a contributing source of such indicators. A suggestion would be for the CAA to recommend safety targets specifically for adventure aviation based on a broader range of parameters devised with input from the industry and subject to regular review. This would require a practical process, of identifying safety issues and the current practices that achieve levels of mitigation in line with the performance targets in order to demonstrate compliance.

The performance targets themselves should balance relativistic safety indicators with perceived safety. The actual achieved safety level may end up negatively influencing the demand if it remains insufficient to prevent a perception of unmanaged danger. In this regard safety should be able to exist as a commercial consideration requiring operators to develop customer demand by presenting high, and visible, standards of safety. However, public perceptions often hinge on

information concerning the wider adventure tourism industry. The fragmented and unconnected nature of this wider sector magnifies the problem of providing a base-line for standards. Within adventure aviation, the need for differentiation from other, less controlled forms of commercial recreation, along with collecting and monitoring a solid base of safety data will be crucial.

As suggested, an analysis of all accidents and incidents that occur, and not just deaths, would present more suitable standards in which to gauge acceptability as well as allowing the indication of inherent problems. Sport aircraft, hang gliders and parachutes have averaged around 40 reported accidents per year for the last decade (CAA News, 2005). Unfortunately statistics on the number of incidents (reported or unreported) are unavailable - although a standard estimation uses the “600:1 rule” whereby it is reckoned there are around 600 incidents for every fatal accident (CAA News, 2005) and which indicates several thousand incidents of which most go unreported.

6.7.5 Cultural programming

A major obstacle is the alteration of the negative aspects of culture and attitudes across general aviation in New Zealand. The integration of the cultural concepts of adventure aviation will be a novel influence. A key component for maintaining safety and quality standards is in the fostering of good cultural values within and across organisations (Hall & Hall, 2000; Helmreich & Merrit, 1998). Cultural programming includes the inculcation of values and attitudes to risk. In this sense Part 115 may indeed fit well within New Zealand aviation from a cultural point of view as it is a rule that is specific to adventure activities and, as such, has the opportunity to introduce relevant concepts of risk management. Gill and Shergill (2004) noted that although highly individualistic cultural conditioning maybe problematic in a establishing unifying and universal safety culture, the individual tended to become the prime mover of safety initiatives and the general aviation sector relies on a high level of personal judgment and decision making. The extension of skills and knowledge beyond the level of the individual to establish a broader community has been is an obstacle due to a lack of impetus and a culture of mistrust towards

authorities (ibid). The implementation of Part 115 should extend the aviation culture towards the adventure sector rather than attempt to contain it within its previous limits.

The successful development of cultural norms that embrace best practice in safety will be an indication of buy-in by operators. Membership of an adventure aviation community that both supports the needs of each operation by the input of requisite expertise, and that recognises the safety management output of the operators themselves will assist this development. A recognition of the validity of safety management processes that are currently in place would extend best practice processes further into the ecology of the system. It would need to consider the interaction of the operator to the environmental conditions they face on a day to day and individual basis. The entry and on-going audit would evaluate the level of input of the hazard mitigation processes that are due to the experience and ability of individual operators and to reiterate this in other operations. This consideration emphasises the need for a practical strategy for the active monitoring of performance indicators at the operator level – in order to show how improvements and mitigation steps are achieved - as part of the implementation of the Rule. The proposal is to set performance standards subjective to each operator at initial entry which is modified as safety data from reporting and exchange is contributed to a pool of measurement tools. These tools are then used to update the indicators in a progressive fashion.

A focus on the continuous improvement aspect of quality assurance that is embedded within SMS, and the requirement for on-going collaboration, entails establishing a range information sharing processes. This includes the concept of a “just culture” – seeking to make improvements, as opposed to attributing blame (Flight Safety Foundation, 2005). The development of integrated communication channels has the benefit of increasing safety awareness, encouraging information and occurrence reporting, and enabling accurate quality assessment. Open and non-judgmental communication channels for incident reporting, along with non-punitive surveillance and investigation are particularly applicable to fostering a common safety culture. A culture that does not regard these values will act counter to safety by stifling the reporting of critical issues or basic safety concerns and encourage further insularity.

Recent consultation undertaken for the CAA's Safety Target Outcome Reports (CAA, 2004b) indicates a further element of resistance amongst operators in reporting incidents due to the perceived negativity and repercussive effects. An *Industry Issues Group* convened by the CAA questions the impartiality and just culture of the CAA in regard to reporting (CAA 2009a). This highlights a need to develop a better culture of reporting risk information within the CAA's own safety support structures – including incidents and accidents. Fortunately, the high degree of camaraderie that exists along with the current level of stated concern for safety should facilitate an open reporting system that may be in place alongside from CAA sponsored structures. Such a system should be consciously developed with both formal and informal components. A convenient system of open reporting would further support the availability and dissemination of knowledge and skill for the purpose of improving processes and upgrading practices. A number of communication channels exist at present by way of a range of media that is disseminated privately or individually, and also by the various support organisations – including those using Part 149. An integrative measure to combine and centralise the flow of information could be managed by a whole-of-industry agency. Such a role may be taken up by an existing agency that acts at a national level, or be newly formed.

The establishment of an adequate knowledge base is a critical success factor for systems development and application. This would include a level of informational output defining the requirement and rationale for SMS as a common and universally accepted set of safety standards, on an industry-wide scale. The source of this output would have to be the regulatory authority (the CAA) or a national representative agency to provide for the scale and diversity of operations.

Chapter 7. Conclusions & Recommendations

7.1 Conclusions

Present safety standards for adventure aviation operations are unclear and insufficient. The introduction of Rule Part 115 should establish new standards for the adventure aviation sector that are comparative to air transport operations in normal category aircraft. The Rule will bring a requirement for comprehensive best practice components and each operator will need to construct an entry risk assessment to define their own safety processes and demonstrate an effective continuance process of as part of their exposition.

However, the expectation of universal subscription to Part 115 for all qualifying operators is countered by cynicism regarding bureaucratic and cumbersome regulatory requirements. Much of this is derived from a lack of knowledge and education regarding best practice, and also by inadequate cultural alignment of components groups within the sector to the wider aviation community.

The research has shown that the connection with the culture and systems of mainstream aviation influences the level of present compliance standards as well as the ability to achieve compliance. This is because the increased familiarity with systems, the increased level of formalisation, and the exchange of information through education and reporting facilitates the acceptance and adoption of mainstream standards. Mainstream standards are more preferred by the regulator as they are generally closer to best practice – which provides the best safety protection. How culture is influenced from the top is critical to the success of the Rule and this responsibility lies with the CAA. A CAA safety forum in 2001 identified the absence of cohesive safety systems at the GA level with deficient practices in ensuring adequate training standards and in countering cultural problems (CAA, 2001). The AIA, also in 2001, indicated problems with organisational safety culture. A further independent report in 2005 indicated the longevity of this problem (Gill, 2005). The suggested solutions called for greater CAA involvement including support with reporting systems, the delivery of better education, and the development of a coaching role for CAA.

Although there is indication of some progress towards implementing these solutions for general aviation, similar moves to support the introduction of Part 115 are not apparent. The introduction of compliance processes for Part 115 will bring with it a requirement for supporting education and enculturation. Although there is some understanding of the range of problems at the regulator level, there is a lot to be learned. There is a likelihood of a deficient connection to the community it will serve should a complete range of supporting inputs not be applied.

The examination of the requirements for the new Rule and the basis of safety have highlighted the need for an improved infrastructure and some alteration to the present arrangements. The use of Part 149 specifications as a resource for standardisation will need to be addressed due to industry-wide inconsistencies. This is because the independent umbrella organisations presently certificated under Part 149 do not universally provide the appropriate support to commercial adventure aviation operators in terms of defining the responsibility for safety, or providing systemic processes and resources. Adequate support for the new Rule will require a structural change in the relationship between operators, recreational organisations and the CAA. Such changes should ideally act to bring a convergence of overall safety standards. As there is little chance of standardising the practices of individual operations independently – due to their diversity and fragmentation - the various representative organisations will need to develop convergent standards and systems in order to assume a sufficient supporting role. The most effective driver for this convergence would be a national representative body.

The recognition of ecological elements within best practice includes a possible re-interpretation of the concept of organisational structure as it applies to micro-organisations. SMS as a recognised international industry standard may support such a re-interpretation to allow a greater focus on individual decision-making and personal responsibility at ground level along with the integration of externally sourced support structures. Audit processes should also be closely related to, and possibly embed, the components of QA systems.

7.2 Recommendations

It is recommended that a four tiered approach to implementation of any such regulation would be suitable to enable effective and coordinated uptake. The recommendations are as follows:

1. The regulatory agency (in this case, the CAA) provide or sponsor sufficient services in the form of information, education and templates to support the prescription of certification. Surveillance and audit services should continue to be provided at the same level as other commercial (aviation) sectors according to risk the profile of the operators. Initial Safety targets should be set and agreed before the rule is enforced.
2. A representative agency for the whole industry should be formed at a national level in order to provide informational support, guidance and standardisation for the various sector organisations. This would be the conduit for two-way information and reporting and provide national advocacy and representation for all sub-sectors of the adventure aviation industry which may be coordinated and tailored by the umbrella organisations to suit each activity. An alternative over-arching Adventure Tourism Industry association operating at a national level may be appropriate in order to provide prescriptions specific to each sector of outdoor tourism that are based in common and consistent standards. Such a body could set accreditation standards as an alternative to certification for smaller, less commercially focused operators. It should implement audit and supporting QA systems, maintain information sharing systems, and develop and modify performance indicators.
3. Individual clubs and organisations currently in existence develop services and supporting mechanisms for commercial operators utilizing the resources of the regulatory agency under the co-ordination of the national representative body.
4. The individual adventure aviation enterprises utilise guidance and expertise for development of their own compliant standards, based on evolving best practice, and using the services and flow of resources from all levels, as appropriate. An entry audit would set

performance standards and identify support requirements which would then be updated by an internally or externally managed QA system.

An alternative approach is for the CAA to take on the coordination role – circumventing recommendation 2. However, this would forgo the opportunity to benefit from the advantages of using an independent, non-governmental body that would act as a unifying body and be able to provide the necessary skills tailored to each code and represent the commercial interests of the industry. It would also place a greater resource burden on the CAA. The CAA itself has obstacles to overcome with an indication of a lack of faith in the bureaucratic aspects of rule-making to achieve required goals. As the lack of faith is partially due to the insular development of the various sectors, any collective organisation that provides advocacy as well as coordination and informational support would be a preferred option. This would also provide a more flexible feedback system that encourage active information sharing and peer monitoring and improve the overall safety culture. The regulatory authority and the national agency would be able to share the responsibility for support and monitoring for umbrella organisations and individual businesses according to scale and risk level.

There is a further opportunity for the instigation of a single agency to co-ordinate change processes on a national level and on a universal scale in all recreational activity risk scenarios. Such a program would benefit the wider tourism industry by the focusing of skills and knowledge for a wider industry upgrade.

As it stands, much of the Part 115 process will be reliant on encouraging voluntary compliance with the higher standards. This indicates an overwhelming need for more or education and greater resourcing. The support mechanisms need to be active and their shape and the level of effort depends on the roll-out schedule of the Rule. It is hoped that education on the value of SMS/best practice implementation will solve the crucial issues. Certainly it is the risk management and QA features of SMS that are key in allowing the fundamental provision of safety to be grounded at the level of the operator and to incorporate a personalised response. It is foreseen that such

advances applied to adventure aviation have the potential to drive a change in overall standards for GA as well as extending to any and all commercial adventure activities.

7.3 Recommendations for future research

The following research topics would advance the inquiry into the effective application of Rule Part 115 and other formal regulatory requirements upon recreational pursuits:

The inclusion of ecological elements in to formal safety management systems, to take into account personalized subjective and individualistic inputs in to risk management.

The identification of cultural elements within each sub-sector activity of adventure aviation , and the origins and inputs that affect them.

The development of key performance indicators for safety relevant to adventure aviation and other outdoor activities

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Part 91, General Operating and Flight Rules

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Part 103, Microlight aircraft - Certification and Operating Rules

Part 106, Hang Gliders - Operating Rule

Part 115, The regulation of Adventure Aviation [WIP]

Part 135, Air Operations – Helicopters and Small Aeroplanes

Part 119, Air Operator — Certification

Part 141, Aviation training organisations - certification

Part 149, Aviation recreation organisations – Certification

(all NZCAA related legislation, rules & regulation is available on-line at www.caa.govt.nz/rules/)

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Appendices

APPENDIX 1: Key elements of SMS for a small aviation operator -

The elements below indicate the required components of an SMS process and was used for development of compliance matrix for the Questionnaire (in appendix 2 below).

Organisational systems:

- Statement of Scope of operations exposition
- Statement of type of activity and range of operation.
- Statement of common language
- Statement of Roles
- List of nominated personnel
- Type and class of aircraft to be used + modifications and suitability. Risk management processes to achieve this
- Documentation requirements and update process

Equipment

- Airworthiness systems:
- Pilot check – Pre-flight/ Post flight check system
- Minimum equipment list (MEL): airborne
- MEL: On-site equipment
- On-site equipment included in pre-flight check
- Specification of maintenance program: airborne, and on-site
- Specification of maintenance standards
- Certified or licenced personnel for maintenance
- Method and procedure for accessing applicable maintenance directives and advisories
- Records, review schedule & monitoring system
- A maintenance action co-ordination system

Flight Operation systems:

- Checklist – systems in place:
- Standard operations procedures specified
- Flight following system
- Operational communication procedures and method specified
- Fuel policy (operational requirements and minima)
- Personnel emergency training integrated within flight ops.
- Passenger Emergency plan/ and brief.
- Passenger management information (weighing and loading, bad pax/ manipulation of controls)
- Ground safety plan
- Minimum operational heights specified
- Operational Range statement
- Approved aerodromes/landing sites - Suitability analysis
- Performance statement and charts or workable method for pilot assessment
- Meteorological information available, access and interpretation method specified
- Minimum equipment requirements stated and checks to ensure sufficiency
- Pilot; Qualification, currency, and suitability systems in place
- Performance: weight, altitude and temperature limit assessment method
- Critical flight SOPs: Pre takeoff, launch/takeoff, pre-landing, landing
- Specifications for post-flight procedures : SAR cancellation, defects & incident, notification, information exchange system specified.
- In-flight emergency plan specified (immediate actions, checklist for decision making)
- Equipment survival equipment information available
- Contact list of all personnel
- Suspension of operations statement
- Personnel emergency training
- Post –flight record keeping system
- Safety advisories (i.e. recognition factors, pathogen checklist)
- Safety notification system and advisories (i.e. how and when to do it,)
- External peer notification system

Personnel management system:

- Names Roles: CEO, Pilots, Maintenance, Training, Standards, Safety, Flight Following
- Medical standards & currency (what are they?)
- Qualifications, flight experience recording, type ratings, medical/1st aid training requirements
- currency monitoring system
- SOPs addressing human factor issues; (e.g. management of distractions, passenger suitability)
- Training manual: Persons/Agencies, Standards statement, induction, competency, recurrency, records
- Safety and Human Factor training (sufficient content)
- Fatigue management system; directives, advisories records

Quality and Safety management systems

- CEO has prime responsibility for safety
- Nomination of dedicated safety personnel
- Hazard identification procedure
- Risk management analysis/hazard mitigation procedure & methods demonstrated relevant to all aspects of operation
- Equipment, Environment & personnel SOPs)
- Safety performance targets & monitoring
- Safety education and/or info sharing procedures
- Associated documentation system
- Emergency response procedures
- Formal specifications of and external internal QA procedures

Appendix 2: Operator Survey; Questionnaire and checklist

QUESTIONNAIRE FOR PART 149 OPERATIONS

This Survey divided in to 2 parts

1. Comments, multi-choice or rating scale questions on what is your current state of operating, your perception of Part 115 (or as you see it under the NPRM or whatever information you may have received and whether it will be a path for your operation

***2. Multi-choice or rating scale questions to gauge your current level of compliance and what you may need to do to achieve part 115 compliance. ***

Notes are provided for guidance to all questions and where there are multi-choice answers you can agree to more than one answer.

OPERATOR DETAILS:

Type of operation:

Date of interview:

SECTION A. CURRENT OPERATOR POSITION

A1 What is the nature of your operation?

A2. How many aircraft or types does your operation use? How many pilots do you use (full time)

A3 .Will you apply for 115 certification?

A4 .Why?.....

A5. (4 part multi-choice) If you choose not to apply for Part 115 certification, will it be due to:

- A. Part 115 is not applicable to my operation
- B. Part 115 certification will be too costly
- C. Part 115 certification is too difficult
- D. There are other certification standards that I can use
- E. Unsure, haven't thought about it or do not have sufficient information

A6 . (4 part multi-choice) If you choose to use Part 115 for your operation, will it be:

- A. As an independent operator
- B. Under the membership of a Part 115 certificated body (such as your part 149 organisation)
- C. By combining with other operators to form a local association
- D. By merging with a Part 115 certified operator.
- E. Unsure, haven't thought about it or do not have sufficient information

A7. Do you support 115 and/or see a need for 115 certification for other operations?

Comment:.....

A 8. Do you think there should be a different level of safety between private operations and training operations or commercially based "adventure aviation" operations?

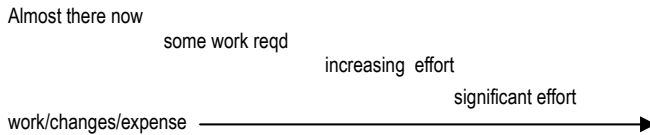
Comment:.....

A9. Do you see a need for 115 certification or some other form of accreditation for your operation in the future?

A 10. Does your organisation currently use any certification standard (e.g. Part 135, or under a Part 149 organisation, or any other activity based organisation)

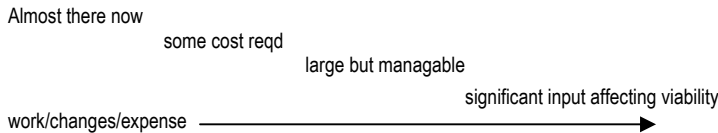
In terms of effort, workload or other required input, how easy would you say compliance will/would be for you?

'Easy as' - 1 2 3 4 5 - extremely difficult



A. 12. a. In terms of economic cost ,how easy would you say compliance will/would be for you?

'Easy as' - 1 2 3 4 5 - costs approaching prohibitive



A.12.b. How would you consider the likely increase in operational cost from the present, to meet entry and continuing certification (e.g 10%, 50%, 100%, 200%.)

- *To what level do you agree with this statement*

Part 115 requirements would merely replicate what I already do?

'Disagree' - 1 2 3 4 5 - Total agreement

E.G.

A.14. If you conduct operations under training or cost-share, what level of safety should you provide?

'Low' - 1 2 3 4 5 - Extremely safe
 Large acceptance of own risk Total duty of Care

A.26. Do you use any form of Quality Assurance program?

A.27. If "yes" - Does it include any internal or external audit schedule or management review?

A.28. Have you identified any novel potential hazards during the conduct of your aviation activities in the last year?

A.29. Do you apply practical risk management procedures, QA or standard operation procedures based on any formally recognised standards? (e.g. HSE Act specs, AS/NZS HB436:2004)?

A.30. What information do you have regarding requirements to adopt and achieve Part 115 compliance

.....
...

A31 What sources did you obtain your information from.

B. COMPLIANCE CHECKLIST

The following checklist is to gauge to what level you currently have compliance systems in place. Good compliance systems will enable easy compliance. Systems should be stated in published documentation

B.1. Organisational system:

B.1.1 Is your organisational system published as an official company document specific to your organisation?

B.1.2 Is the document controlled?

B.1.3 Is your manual available to all employees or individuals carrying out operational duties?

B.1.4 Are your Standard Operating Procedures known, recognised and carried out consistently by all staff?

B.1.5 Does your manual specify your activity, the scope and range of operation

B.1.6 Is there a Statement of Roles specifying each role ?

B.1.7 Is there a List of nominated Personnel responsible for each role?

What roles are specified?: B.1.8 Person responsible for organizational management (CEO or QA)

B.1.9 Person responsible for operational management (Ops. Manager)

B.1.10 Person responsible for controlling and scheduling maintenance

B.1.11 Person responsible for training and competency assessment

What are the experience levels and qualifications of these individuals:

B.1.12 Person responsible for organizational management :.....

B.1.13 Person responsible for operational management:.....

B.1.14 Maintenance controller:.....

B.1.15 Training and competency.....

B.2. Airworthiness systems: Do you have?...

B.2.1 A system for Pilot Pre-flight & Post flight checks of aircraft integrity and maintenance schedule

B.2.2 an MEL: for aircraft.

B.2.3 an equipment list: on-site equipment

B.2.4 a specification of each individual aircraft to be used

B.2.5 a method for identifying and tracking modifications or variances for the aircraft operated.

B.2.6 a maintenance program:

B.2.7 Statement of maintenance program: airborne equipment? + on-site equipment?

B.2.8 Standards: Which standards?.....

B.2.9 Are there Certified or Licenced personnel carrying out the maintenance?

B.2.10 A system for accessing Directives, Advisories: what system?.....

B.2.11 Records, Review schedule & monitoring system

B.3 Operational systems: Do you have?...

B.3.1. Checklist – or other systems for specifying standards operating procedures (state method.....)

Specifications for; B.3.2. SOPs – normal operational checks

B.3.3 Flight Planned route, Duration, ETD, ETA for every flight

B.3.4 Flight Following and alerting systems

B.3.5 Fuel + Minimum fuel SOP

B.3.6 Minimum Equipment requirements check

B.3.7 Loading

B.3.8 the procedure for recording weights and centre of gravity limits

B.3.9 recording pax information - data recording (weight)

B.3.10 accessing Meteorological information

B.3.11 Performance considerations calculations and a stated assessment system for the flight

B.3.12 Pax management info (bad pax/ manipulation of controls)

B.3.13 Critical flight SOPs: Pre takeoff, Launch/takeoff procedure, prelanding, landing

B.3.14 ensuring pilot fitness and qualification, currency, and medical up-to-date

B.3.15 specific requirements for Post-flight: SAR Cancel, defects, incident, info sharing systems

B.3.16 An Emergency Plan: in flight on ground.

B.3.17 An Emergency Plan: for ground operations.

Does the Emergency Plan contain any of the following elements

B.3..18 Specifications for immediate actions

B.3.19 Equipment survival equipment info

- B.3.20 Contact list
- B.3.21 Suspension of operations statement
- B.3.22 Pax Emergency plan/ brief.
- B.3.23 A Ground safety plan/ brief

B.4.Operational notification systems; DO YOU HAVE?..

- B.4.1 A statement of minimum operational heights,
- B.4.2 Operational Range statement
- B.4.3 A statement of meteorological limits: minimum visibility, wind speeds/direction, turbulence
- B.4.4 A statement of performance limits: Weight, altitude, temperature
- B.4.5 Met info availability and stated official sources
- B.4.6 A register of Approved Aerodrome/landing sites
- B.4.7 a Suitability analysis for landing and take-off sites or aerodromes
- B.4.8 Post –flight record keeping system – What.....

5. Personnel management system:

- B.5.1. Names Roles: CEO, Pilots, Maintenance, Training, Safety, Maintenance, Operations,
other.....
- B.5.2 Qualifications, flight experience, type qualifications, medical/1st aid training requirements (what are they?).....
- B.5.3. A currency monitoring system
- B.5.4 Medical standards & currency (what are they?.....)
- B.5.5 Fatigue management system; directives, advisories records
- B.5.6 Training manual: Persons/Agencies, Standards statement, Induction, competency, recurrency, and

recording

B.5.7 Personnel emergency training

B.5.8 Safety and HF training (Content: generic information such as; pilot performance, perception, health, ergonomics)

B.5.9 SOPs address HF issues; (e.g. management of distractions, pax suitability, decision-making)

B.6 GENERIC SMS/QMS SYSTEMS

B.6.1 CEO has prime responsibility for safety – a statement

B.6.2 Nomination of dedicated safety personnel

B.6.3 Risk or Hazard identification procedure

B.6.4 Safety performance targets & monitoring system

B.6.5 Safety training, advice and guidance to pilots in decision-making in marginal conditions

B.6.6 Safety notification system and advisories (i.e. how and when to do it,)

B.6.7 Industry/peer notification system

B.6.8 Associated documentation system

B.6.9 Formal internal QA and review systems procedures (e.g. scheduled audit atperiod?)

B.6.10 Formal external QA procedures

APPENDIX 3 Data sets and raw data check-sheet samples

Appendix 2.1 Graphic generation data sample (from Excel spreadsheet)

Figures 7 - 9

		72 point	72 point						
		scale as %	scale						
Hangliding & ParaGliding	H1	29.2%	21	Haves: Gs, Ss, Bs (17)					
	H2	38.9%	28	Have nots Hs, B, Ms (24)					
	H3	56.9%	41						
	H4	66.7%	48						
	H5	50.0%	36	Group 1	Group 2	Bins	<u>Bins</u> <u>roup</u> <u>roup</u>		
	H6	34.7%	25	0.5556	0.22222	0.00	0%	0	0
	H7	63.9%	46	0.5833	0.29167	0.05	5%	0	0
	H8	54.2%	39	0.5972	0.34722	0.10	10%	0	0
	H9	63.9%	46	0.74	0.38889	0.15	15%	0	0
	H10	55.6%	40	0.88	0.48611	0.20	20%	0	0
	H11	55.6%	40	0.88	0.5	0.25	25%	0	1
	H12	73.6%	53	0.8889	0.52778	0.30	30%	0	1
	H13	48.6%	35	0.8889	0.54167	0.35	35%	0	1
	H14	81.9%	59	0.9167	0.55556	0.40	40%	0	1
	H15	61.1%	44	0.9167	0.55556	0.45	45%	0	0
	H16	61.1%	44	0.93	0.56944	0.50	50%	0	2
	H17	83.3%	60	0.94	0.59722	0.55	55%	0	2
	H18	22.2%	16	0.9444	0.61111	0.60	60%	3	4
Average		55.6%	40.1	0.9444	0.61111	0.65	65%	0	6
BALLOONS	B1	80.6%	58	0.9583	0.61111	0.70	70%	0	1
	B2	52.8%	38	0.9861	0.63889	0.75	75%	1	1
	B3	63.9%	46	0.9861	0.63889	0.80	80%	0	0
Average		65.7%	47.3		0.63889	0.85	85%	0	3
MICROLIGHT	M1	61.1%	44		0.66667	0.90	90%	4	0
	M2	59.7%	43		0.73611	0.95	95%	6	1
	M3	91.7%	66		0.80556	1.00	###	3	0
Average		70.8%	51.0		0.81944				
GLIDERS	G1	98.6%	71		0.83333				
	G2	88.9%	64		0.91667				
	G3	55.6%	40						
	G4	58.3%	42						
Average		75.3%	54.3						
SKYDIVE	S1	87.5%	63						
	S2	94.4%	68						
	S3	93.1%	67						
	S4	73.6%	53						
	S5	87.5%	63						
Average		87.2%	62.8						
VINTage and AERO	V1	95.8%	69						
	V2	88.9%	64						
	V3	98.6%	71						
	V4	91.7%	66						
	V5	59.7%	43						
	V6	94.4%	68						
	V7	91.7%	66						
	V8	94.4%	68						
Average		89.4%	64.4						

Appendix 3.2 Graphic generation data sample (from Excel spreadsheet)

Figure s 1b – 6c Pie charts

		71 point scale as %	72 point scale	Will apply	work scale	Cost scale	Cost %	Rep Scale	Safety comp	Has OPM	Has docs.	Has QA	Has RM	Has comm	Has training beyond 149	Has QA OPM	CAA licence	No. of personne
Hangliding ParaGliding	H1	29.2%	21	X	4	4	100	2	5\5	X								1
	H2	38.9%	28	X	4	4	100	4	3\4	X		x						2
	H3	56.9%	41		2	5	500	5	4\5	X		x	X					3
	H4	66.7%	48	X	4	4	10	3	4\5									2
	H5	50.0%	36		5	5	200	2	4\5				x	osh				2
	n=18	H6	34.7%	25		4	5	200	3	5\5								2
	H7	63.9%	46	X	2	3.5	200	4	4\5	X		x	x					1
	H8	54.2%	39	X	4	5	?	4	4\5	X		x	x					1
	H9	63.9%	46	X	2	3.5	200	4	4\5	X		x	x				X	1
	H10	55.6%	40	X	3.5	4	50	3	4\5	X		x	x					15
	H11	55.6%	40		5	4	100	3	4\2	X		x	x	osh	X			7
	H12	73.6%	53	X	3	3	?	4	4\5	X	X	x	x		X	X	X	12
	H13	48.6%	35		4.5	5	200	3.5	5\5	X			x					1
	H14	81.9%	59	?	3	4.5	100	5	5\5	X	X	X	X	X	X	X	X	4
	H15	61.1%	44	X	4	3.5	100	4	4\5	X		x	X				X	5
	H16	61.1%	44	?	4	3.5	100	4	3\4			x	x					2
	H17	83.3%	60	X	3	3.5	?	5	4.5\5	X	X	X	X	X	X	X	X	1
	H18	22.2%	16	X	3	5	200	2	3\3									2
Average		55.6%	40.1		Proportion having OPM: ###													
achievement of compliance																		

		71 point scale as %	72 point scale	Will apply	work scale	Cost scale	Cost %	Rep Scale	Safety comp	Has OPM	Has docs.	Has QA	Has RM	Has comm	Has training beyond 149	CAA licence	No. of personne	
BALLOONS	B1	80.6%	58	?	2	2	30	4	5\5	X						X	5	
	B2	52.8%	38	X	4	4	50	4	5\5							X	1	
	N=3	B3	63.9%	46	X	2	3.5	50	4.5	4\5	X				X	X	3	
Average		65.7%	47.3		Proportion having OPM: ###													
achievement of compliance																		

		71 point scale as %	72 point scale	Will apply	work scale	Cost scale	Cost %	Rep Scale	Safety comp	Has OPM	Has docs.	Has QA	Has RM	Has comm	Has training beyond 149	CAA licence	No. of personne	
MICROLIG	M1	61.1%	44	X	4	3.5	10	4	3\4	X		x	X			X	4	
	M2	59.7%	43	?	4.5	5	50	4	5\5							X	1	
	N = 3	M3	91.7%	66	X	1	3	10	4	5\5	X	X	X		X	X	3	
Average		70.8%	51.0		Proportion having OPM: ###													
achievement of compliance																		

		71 point scale as %	72 point scale	Will apply	work scale	Cost scale	Cost %	Rep Scale	Safety comp	Has OPM	Has docs.	Has QA	Has RM	Has comm	Has training beyond 149	CAA licence	No. of personne	
GLIDERS	G1	98.6%	71	X	2	5	50	4	5\5	X	X	x	X	X	X	X	1	
	G2	88.9%	64		3	5	200+	5	5\5	X	X		X	X		X	12	
	N = 4	G3	55.6%	40	?	?	4	?	3	4\5	X	X		X	X	X	5	
	G4	58.3%	42	?	?	5	?	3	5\5	X			X	X		X	4	
Average		75.3%	54.3		Proportion having OPM: ###													
achievement of compliance																		

		71 point scale as %	72 point scale	Will apply	work scale	Cost scale	Cost %	Rep Scale	Safety comp	Has OPM	Has docs.	Has QA	Has RM	Has comm	Has training beyond 149	CAA licence	No. of personne
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Appendix 3.3 Graphic generation data (from Excel spreadsheet)

Master Collation sheet blank copy (entered manually)

	(MASTER)		OPERATOR NAME:	total collation:	TOTAL	GROUP 1	GROUP 2
		RAW STATS		Expo.?	B1.1		
	A1	Nature of ops		Controlled	B1.2		
	A2a	Number of aircraft		Available	B1.3		
	A2b	Number of Personnel		SOPs utilised	B1.4		
	A2c	Number full-time		Scope/range	B1.5		
				Roles	B1.6		
				Personel	B1.7		
	SCALAR			CEO/Ops	B1.8/bB1.9		
	DATA			Maint./Training	B1.10/B1.11		
A3	Intend to apply			CEO/Ops Qualified	B1.12/1.13		
	Yes			Maint./Training Qualified	B1.14/B1.15		
	No			Integrity check	B2.1		
				MEL	B2.2		
A5	Will not apply reasons			On-site equipment list	B2.3		
	not applicable	a		Specs for each aircraft	B2.4		
	too costly	b		Variances tracking	B2.5		
	too difficult	c		Maint. Program	B2.6		
	other standrad	d		On-site and airborne specs	B2.7		
	unsure	e		appropriate standards	B2.8		
				Qualified personnel	B2.9		
A6	Will apply reasons			AD system	B2.10		
	independent	a		Records, review schedule, monitoring	B2.11		
	Under affiliated membership	b		Checklist for SOPs	B3.1		
	Combine with other operators	c		Normal SOPs	B3.2		
	merging with another 115er	d		Planning/ route guide	B3.3		
	unsure	e		Flight following	B3.4		
				Fuel SOPs	B3.5		
A10	Current standard			Min. equipment check SOP	B3.6		
	Part 135			Loading	B3.7		
				Weighing & CoG	B3.8		
				Pax data – weight	B3.9		
				Met info access	B3.10		
A11	Workload scale			perf calcs	B3.11		
	Easy	1		Pax management procedures	B3.12		
		2		ecritical flight SOPs	B3.13		
		3		Pilot fitness, currency,etc.	B3.14		
		4		Post flight procedures	B3.15		
	Hard	5		Emergency SOPs flight	B3.16		
				Emergency SOPs ground	B3.17		
A12	Cost Scale			Emergency – immediate actions	B3.18		
	Easy	1		Survival equipment info	B3.19		
		2		Contact list	B3.20		
		3		suspension of operations statement	B3.21		
		4		Pax emergency brief & plan	B3.22		
	Hard	5		Ground safety brief/plan	B3.23		
				Min heights	B4.1		
A13	Replication scale			Range statement	B4.2		
	Lo	1		Met limits	B4.3		
		2		Perf limits	B4.4		
		3		Met sources	B4.5		
		4		Site/aerodrome register	B4.6		
	Hi	5		Suitability analysis for above	B4.7		
				Specs for post-flight recording	B4.8		
A14	private safety scale			Roles listed	B5.1		
	Lo	1		Qualification standrds recorded	B5.2		
		2		Currency monitoring	B5.3		
		3		medical standards	B5.4		
		4		Fatigue management	B5.5		

Appendix 5

Micro organisations

A micro-organisation can be defined as an entity having an independent organisational system that supports an operation having limited resources in terms of; skill, knowledge, time, or financial input. Micro-organisations usually have ample levels of at least one of the above factors but may be deficient in others to any level. The deficiencies are invariably because of their size – having less than 5 members or employees. A micro-organisation may have as little as one individual member. Often a move to increase membership will emphasise a single element (a strength) but not other elements – such as those critical administration processes that have equal importance in terms of supplying the capability for proper operational competency.

Business enterprises of this size are usually considered as a subset of SMEs (small and medium enterprises). The focus of the descriptor “micro-organisation” emphasises the nature of the organisational component beyond the commercial element. In adventure tourism it relates to the requirement for an *organisational structure* required by best-practice quality and safety management systems. The organisational structure is invariably defined in terms of roles and responsibilities. Of course, the organisation having such a structure may well comprise only a single individual – effectively rendering the “structure” ill-defined and uncertain. This state effectively renders the commitment to role definition and coherent information flow problematic. Put simply, a single operator will need to possess, and wear, many hats simultaneously.

On the positive side, such a structure (or lack of it) allows the operational processes to be fluid and cope with a dynamic business environment. On the negative side, responsibilities and performance indicators are not clearly defined and an individual operator may have difficulty reconciling roles or providing sufficient emphasis where there is a conflict of goals. In an outdoor operational environment a working compromise becomes normalised and an apparent sufficiency is maintained until a critical event or condition is reached. Such a condition may lead to a collapse in quality and safety due to the lack of proper organisational and systemic foundations.

The deficiencies of micro-organisations would require an expansion of resources to enable efficient functional management – usually an extension of roles and responsibilities either through internal growth and development or to external, contracted agencies or individuals. In reality this is not often carried out in an effective manner and the management of many micro-organisations remains dysfunctional and inefficient. Any extension to external support systems is usually temporary and ad hoc according to perceived financial constraints and with little integration in to dynamic processes. The financial constraints are indicated here as *perceived* as there is seldom any appraisal of cost and benefit and, invariably, little understanding or analysis of possible alternatives.

The concept of the micro-organisation is closely related to SMEs and the commercial processes within an operation. It has been pointed out that the vast majority of businesses in New Zealand are small enterprises which are invariably managed by their owners Cameron, A., and Massey, C.

(1999). Business compliance for micro-organisations is often problematic due to resource considerations. Many fail to ensure proper staff management processes, consents, or business planning - invariably due to failures or deficiencies in time, money, knowledge, ability, education, expertise, and systems. A large proportion of the SME business enterprises sector is in fact made up of zero-employee enterprises. An employee count of zero is typically an indicator of enterprises with a working-proprietor only (Ministry of Economic Development Manutu Ō Ohanga 2010) and these are often structured and operated very differently to businesses with employees. Adventure aviation enterprises that operate on a part-time and seasonal basis are invariably of this kind. There is a low survival rate of these firms but also a degree of transition in both directions. That is; a firm will either fail or grow to a critical size that allows sufficient resources for maturity and continuation. In other words, if an enterprise does not make the transition to a larger operation (more than 4 members) then survival in the present form is unlikely beyond 5 years

In commercial adventure activities there is a preference for continuation and longevity for businesses in order to allow the benefit of support resources and relationship-building to be realised. This is crucial in order to support the development of effective communication channels, as well as providing monitoring and developmental continuity. A reduced lifespan of micro-organisations across the sector – be it by failure, attrition, or growth, indicates a requirement for the input of good external support systems at the outset.

A worst case scenario is where a business fails, its assets are sold on (these assets are invariably the basic systems and intellectual property). A new operator effectively continues without the benefit of the development, or full utilization of previous support systems. The new operator may well have a differing skill set or operating style. A similar situation is where an individual with the some key skills and a level of motivation in one sector, initiates non-viable commercial enterprises of a temporary nature in a serial fashion. This is where resources are limited and the enterprise never achieves proper systems or business practices and so never has any organisational process to support the required safety systems. The operator will usually possess a high level of independence – partly due to resource constraints. When a critical point is reached the operator will transfer the operation to a new entity without changing the modus operandum, with the risk of continuing insularity and perpetuating any dysfunction.

In summary a micro-organisation has the following characteristics:

- A small and usually specialised workforce
- Multiple roles concentrated in few individuals
- A limited skill base
- Limited resources
- Adhoc operational support systems (such as training and emergency systems)
- Low interdependence and high independence
- Fluid organization structure – the structure is not obvious and exists in an unspecified or adhoc way.
- externally sourced business processes

END