Aviation Policy and Regulatory Systems in New Zealand
(뉴질랜드 항공정책과 규제제도)

Professor Graham J F Hunt
School of Aviation
Massey University
New Zealand

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Introduction

Regulation and the organization of groups of people with convergent interests in some shared area of practice have come to be seen as co-dependant activities. In the 20th Century the increased complexity of rules as prescriptive criteria for entry to a group, or the maintenance of membership within a group, might bare some correlation to the status accorded to the group and the privileges, which might be accorded to membership. The collective membership has often been described as representing a profession . The articulation of the regulatory processes provide the sanctions for agreed or appropriate performance. New Zealands regulatory development reflects the critical importance that this country places on aviation and mirrors the waypoints of social and political influences in this society.

Early Aviation Examples

The knowledge system which supports pilot performance has evolved dramatically in only a few short decades. For centuries the human race's fascination for flight was expressed in many artistic and ingenious attempts to emulate the bird. Perhaps the genesis of aviation professionalism is probably found in the first hot air balloon of Joseph and Etienne Montgolfier when on November 21, 1783, two French aristocrats, Pilâtre de Rozier and the Marquis dArlandes made the first manned balloon flight from the Bois de Boulogne in Paris, climbing to an altitude of 3,000 feet before landing twenty-five minutes later 5 miles from their take-off point. Later, on December 1, 1783 a young physicist, Professor Jacques Charles made the first flight in a hydrogen-filled balloon travelling a distance of 27 miles. On January 7th 1785 a Frenchman, Jean-Pierre Blanchard and an American Dr John Jeffries made the first

crossing of the English Channel and thereby launched the first international flight .

It would take another 118 years before a recluse New Zealand inventor, Richard William Pearse would take off and become airborne in a high-wing monoplane he designed powered by an ingenious petrol engine, which he too designed and built. This flight which took place on or about 31st March 1903 on an isolated farm at Waitohi in South Canturbury, New Zealand. This event took place nine months before the much more publicised Wright brothers Flier 1 flight of 120 feet which lasted for 12 seconds at their camp near Kill Devil Hills in North Carolina on 17th December 1903. These two events culminated from a crude understanding of knowledge in related dimensions such as aerodynamics and the requisites of power-to-weight ratios.

New Zealands Love of Aviation

New Zealand is one of the most aviation focused countries in the world. With only a population of 3.8 million people, 1.2 million of whom live in one city Auckland, it might be thought surprising that 131 percent of the nation flies domestically each year. This figure compares with approximately 32 percent for Europe.

The reason for New Zealands love affair with aviation is probably found in the geography of the country and its land transportation system. With a surface area of 265,150 square kilometres (8.3 percent larger than the United Kingdom) and mountain ranges traversing both major islands, the interacting effects of a small population and difficult topography has made the development of land transportation difficult. Although New Zealand has had an extensive national rail and road network for most of

the past 100 years, rail systems have increasingly struggled to compete with air, especially in the provision of passenger and fast freight services.

Two major airlines compete for domestic services, *Air New Zealand* and *ANSETT New Zealand* (soon to be re-branded as *South Pacific Airlines of New Zealand SPANZ*). Both carriers offer jet (Boeing 737, *Air New Zealand* and BAE 146, *ANSETT New Zealand*) and turbo- prop services covering all cities of 50,000 people or more. In 1998 *Air New Zealand* acquired 50 percent of Australias News Corporations holding in *ANSETT Australia.* In May this year this figure will become 100 percent when the Australian and New Zealand governments finally approve the New Zealand acquisition.

New Zealands love affair with aviation continues on the international front. Each year more than 79 percent of the population fly internationally to destinations as diverse as Europe, Asia, North and South America. In terms of light aircraft, including homebuilts and mircrolights, one aircraft is owned by every 1,100 people in the population. This is the highest per capita figure in the world.

The New Zealand Regulatory System

The Nature of Rules

Rules and the management of rules have been used to define the framework and standards under which a professional activity might operate. In the majority of cases, regulatory systems are constructed in order to protect individuals, groups or societies from the negative consequences that actions and activities created by the practices might create. The most dramatic negative consequences and therefore the most

likely to be regulated, are those which lead to injury and death. These rules are designed to restrict unsafe acts and to provide defences against hazards and dangerous situations. Excessive speed in automobile driving has traditionally been designated as a dangerous situation. In the United States (and primarily as a reaction to the oil crisis of 1974), the reduction of the maximum speed limit from 70 mph to 55 mph saw road fatalities reduce by 34%.

Aviation is a highly regulated industry. The earliest international aviation regulatory convention was that which was convened in Paris in 1919. Although the origins of aviation in New Zealand might be trace to a date sometime around 31st March 1903 and the flying activities of a recluse inventor by the name of Richard Pearce few civil regulations were operative until after the Second World War. Prior to this war there was no official flying until the first aero club was established in 1927. By 1948 23 of these clubs had become federated into the Royal New Zealand Aero Club.

Early History

In 1935 the first commercial air services started in the South Island and two years later in 1937 Cook Straight Airways began operating DH89s between Wellington, Blenheim and Nelson. Shortly after, Union Airways based in Palmerston North commenced a trunk service between Auckland, Palmerston North, Wellington, Blenheim, Christchurch and Dunedin using Lockheed 10A aircraft. This was followed on 1 April 1940 with the commencement of Trans Tasman operations between Auckland and Sydney by Tasman Empire Airways Limited (TEAL) flying Short Empire Class flying boats. In 1945, Union Airways became the National Airways Corporation by an Act in Parliament. The Labour Government of the time resolved to nationalise air transport and provide a domestic trunk service using primarily ex New Zealand Air Force DC3 aircraft.

In 1937 the Air Force Act created the Royal New Zealand Air Force and an Air Department charged with the administration of both military and civilian aviation. In 1948 the New Zealand Parliament established the Civil Aviation Act and the post of a Director of Civil Aviation. However, the powers and responsibilities of this position were never defined, even in broad terms, suffice that the incumbent was to be an officer of the Air Department and presumably subordinate to its permanent head, the Air Secretary.

In December 1947 a Sandringham flying board operated by TEAL a New Zealand registered company now owned jointly by Britain(38% BOAC) ; Australia(23% QANTAS) and New Zealand(20% Government and 19% Union Airways) lost an engine on departure out of Sydney to New Zealand. The aircraft managed to jettison freight and luggage and limped back to Sydney. The resulting commission of inquiry declared that the state of civil aviation in New Zealand was unsatisfactory. A British Civil Aviation Mission under the leadership of Sir Frederic Tymms, was invited to New Zealand the following year to recommend the way ahead Notes of the Record of Meetings, reported in Johnston E A(1995). To Organize the Air. The evolution of civil aviation and the role of Sir Frederick Tymms, the flying civil servant. Cranfield University Press, Lincolnshire.

The report of the mission stressed the need to clearly define the responsibilities of the various departments and organizations involved in civil aviation and to separate the role of the regulator from that of a commercial participant in the process the head gamekeeper should not also be a senior member of the gang of poachers! However, the report made it clear that the intricate task of devising and administering aeronautical legislation could only be done satisfactorily if it was regarded

as a joint responsibility of the rule-makers and those who were bound by the rules. Although no immediate legislative action was taken from the report, the Civil Aviation Regulations of 1953 have their genesis in this report.

Regulations and rules

The articulation of the regulatory process is enshrined in that processs rules. Rules may be classified in many ways and established for many purposes. Some rules may be created to protect individuals or organizations from perceived or actual unfair competitive practices. These might be examples of *trade rules.* Others may be established to protect against known or defined hazards and dangers *safety rules.* Some have been established to protect entrance to and the maintenance of social or professional privilege *professional entry rules.* Still others may be established to protect the public against the reckless or incompetent performance of an occupational group or professional body *public good rules.* It is the purposes behind the last three types of context that have become enshrined in international personnel licensing conventions and the regulatory prescriptions of national governments.

Prior to the Civil Aviation Act of 1990, regulatory prescriptions were either made by regulations or orders . Regulations could only be promulgated by the authority of the Governor General on advise from Parliament. Regulations were therefore difficult to amend or change. On the other hand, orders could be promulgated by the Director of Civil Aviation and in contrast were easy to amend and change. This led Swedavia-McGregor in 1988 to observe that the system was governed by an overly complex patchwork of legislation, regulations, and supporting tertiary requirements which was often out of date, onerous, and difficult to comprehend or enforce Swedavia-McGregor Report. Review of Civil

Aviation Safety Regulations and the Resources, Structure and Function of the Ministry of Transport Civil Aviation Division. Wellington, April 1988. The document, which came to be known as the Swedavia-McGregor Report, proposed amongst a number of recommendations:

▶ a clear set of rules developed in consultation with the industry specifying minimum standards to be met and allowing greater flexibility for operators to determine how they should be met.

▶ much more emphasis on operators demonstrating their ability to control their own operations through the setting of internal standards and operating procedures, coupled with the procedures for self-checking, correction and performance evaluation.

▶ less involvement by the regulatory authority in detailed inspection and more in verifying operators compliance with their own systems.

▶ greater focus by the regulatory authority on monitoring the performance of the overall aviation system and providing feedback information and support to the industry.

▶ more rigorous control of entry to(and exit from) the civil aviation system with adequate sanctions available for dealing with poor performance.

These principles became enunciated in legislation through of the Civil Aviation Act, which was to follow in 1990.

A critical difference between the new rules-based system and that of the old regulatory process was that the Minister was now made responsible on advise from the Director of Civil Aviation and through a process of due consideration and public consultation to write rules which were outcomes-based, stable and innovative. Instead of inspectorally managed regulations, rules were to be developed which required adherents to develop expositions of systems and practices which would be acceptable means for compliance with these rules. It was expected that over time new or

alternative means of compliance might be added. An assumption behind these propositions was that rules would be competency-based, clearly detailing operational outcomes expressed in performances, conditions and standards. To date, little progress has been made in developing these competency-based rules.

A Regulatory Innovation Equivalence

In 1992 the New Zealand Civil Aviation Authority agreed to a major regulatory innovation by recognizing Massey Universitys Bachelor of Aviation Flight Crew degree as achieving an equivalent means of complying with Civil Aviation Rule Part 61, flight crew licensing. The equivalence process has been defined as a moderation and surveillance system between the regulator and tertiary institution such that the achievement outcomes from an agreed curriculum, with integrated flight practicum components, are recognised as meeting the requirements for the issuance of aviation documents.

History may judge that the New Zealand Civil Aviation Authority Agreement with Massey University provided the foundations for a new tertiary-based licensing system, the Bachelor of Aviation, Basic Air Transport Pilot Licence .

Entrance Requirements to the Aviation System

In most countries the procedure for entrance to a particular component of the aviation system is through the issuance of an aviation document (licence, certificate or rating) which is granted on the basis of meeting the prescribed qualification and experience requirements of the document and is a fit and proper person to hold such a licence, certificate or rating.

For flight crew the entrance is via meeting the requirements for a Private and Commercial Pilot Licence under Part 61 or equivalent national Civil Aviation Rules.

In general, only minor variations to this prescription(table 1) occur from State to State. The syllabus requires a minimum of 150 hours flight experience with 100 hours as pilot-in-command(PIC). Optionally, a further 20 hours might be added for the issue of a single-engine instrument rating. In many cases the implementation of part 61 requires that the examination of theoretical content should be completed prior to the commencement of flight instruction. There is no legal requirement for the delivery of a formal course of ground instruction. However, in many countries flight schools have been encouraged to offer what has been termed an integrated course of training in which theory and its flight practicum components are sequenced in some sort of linear manner. Within this training concept some countries have legislated for a full 150 hours of integrated flight training, while for others no more than 50 hours are required. These variations, including a lack of extensive and relevant academic and technical knowledge; non standardized flight experiences which poorly transfer learning to the much more sophisticated demands of air transport operations, suggest the need for a more adequately specified set entry education and training experiences which would more effectively facilitate the transition from ab initio behaviours to air transport operations. The gap between the entrance qualification for air transport operations the Commercial Pilot Licence and the realities of sophisticated operations systems remains high.

ICAO Annex 1

Annex 1 identifies the standards and recommended practices(SARPS) for the licensing of flight crew, air traffic controllers and maintenance engi-

neers. From time to time amendments are proposed to the Annexes. The process of creating amendments is long and difficult.

In February 1976 a paper was presented to the Air Navigation Commission suggesting reasons why Annex 1 should be subject to review for amending. In November 1980 the ICAO Air Navigation Commission agreed to form a Personnel Licensing and Training(PLET) panel to undertake specific studies related to personnel licensing and training, as approved by the Air Navigation Commission, with the aim of presenting to the Air Navigation Commission, within three years, recommendations for amendment of Annex 1 . Suren, Ian(former ICAO Manager Personnel Licensing) personal files. The recommendations of this panel in relation to the licensing of airplane and helicopter pilots were sent to the General Assembly of ICAO in 1987 as proposed amendments to the Annex.

It is interesting to note some of the issues raised by members of the panel or by individual States. For example, with regard to the privileges of the commercial pilot licence airplane one Commissioner felt that the level of experience required for the licence was too low to justify command privileges in commercial air transportation granted by the licence. Air Navigation Commission recommendations on amendments to Annex 1, Privileges of the commercial pilot licence(CPL-A) (paragraph 2.4.2.1 c) on page A-31. On another issue, that of flight experience, the Commission noted that specifying a set number of hours as a sensible measure of the competency of a licence applicant has always been a contentious point. Even when the specified minimum experience has been reached, there is still no guarantee that the desired level of competency will have been attained . Air Navigation Commission recommendations on amendments to Annex 1, Level of experience for the airline transport pilot licence aeroplane(ATPL) (paragraph 2.5.1.3) on page A-37. In spite of

more than a decade of deliberations, the prescriptions for professional flight crew licenses remained largely unchanged and after 56 years, virtually indistinguishable from the prescriptions tabled in Annex 1 of the Provisional International Civil Aviation Organization(PICAO) of 1944.

Commonly perceived deficiencies of the current system

The primary motive for calling the Chicago Convention was to clear the way for commercial aircraft to start flying again on international routes as soon as the war in Europe and Asia ended. The major contentious focus was the problem of the control of the so called Fifth Freedom , the right to pick up and set down traffic between states other than the state of registration of the aircraft and the state in which the service terminates. However, of equal significance but far less contentious was the work of PICOs Committee II which was charged with drafting standards and recommended practices. The outcome of this work later became the 12 technical annexes to the Convention.

The United States delegation assumed the primary responsibility for drafting the rules which were to make up the annexes. It is not surprising that in the drafting of these SARPs the technical experts reflected on their personal and national past experiences and these cumulatively provided the philosophical framework for the annexes which were to follow. For example, in the United States general aviation is the kindergarten to professional aviation. Young people who aspire to become airline pilots do so either by joining the military and gaining their qualifications and experience at the expense of the US tax payer, or increasingly today, by the more circuitous route, through general aviation from aero clubs, flying schools and air work operators. For this group of work-be air transport

pilots, the route from initial licensing to airline employment is via a long and ill-defined apprenticeship process. It is clear, that in the drafting of Annex 1, the international rule makers assumed that between the initial licence and professional air transport employment substantial additional competencies and experiences would be gained. Although legally permissive, it was not expected that a commercial pilot licence alone would embed all of the knowledge, skill and attitudes(disciplines) co-requisite for air transport operations. These additional competencies would be acquired through 3,000 to 5,000 hours of general aviation experience. In other parts of the world, especially Africa and Asia, such a general aviation infrastructure largely did not exist and therefore the assumptions of the drafting fathers could not be met.

As time has passed since the 1944 agreement much has changed in the operational realities of piloting, but little in the minimum standards as recommended by ICAO. The result is ever clearer deficiencies :

▶ there is wide spread practice of providing flight instruction sequences independent of theoretical knowledge which should underpin the practice ;

▶ no standardization of the flight experience ;

▶ single pilot orientation ;

▶ primary focus on visual navigation ;

▶ little requirement for procedural experience ;

▶ little requirement for experience in advanced flight and navigation technologies ;

▶ significant gap between the CPL entry level and competencies required for initial transition to air transport operations.

Proposed New Professional Licensing Qualifications

With these deficiencies in mind a new set of specifications is required to

transit individuals from training to air transport operations. It is hypothesized that such a prescription might exclude graduates from some types of privileges that hitherto have been taken for granted. For example, it would not be assumed that these graduates would necessarily be qualified to operate under single-pilot general aviation rules. In fact, the high frequency of accidents in single pilot IFR conditions suggests significant deficiencies in the quality of the training process even at this level. Arguably, a key variable to the improvement of safety lies in the upgrading of flight instructor knowledge and skills and the development of more professional aviation-teacher competencies.

For entrance to air transport operations new curriculum initiatives need to be developed which assumes no prior operational experience but is designed to inculcate the knowledge and performance capabilities for multi-crew operations, with air transport standard operating procedures in the context of a high speed jet type environment. Such a curriculum would most likely include the extensive use of simulation, particularly from those types of devices which emphasized a high degree of instructional(as compared to aircraft) fidelity for multi-crew and turbine operations. Similarly, students would be subjected to the use and operation of instrument procedures from an early stage in their training. Airborne sorties would maximize the role of an instructor in ways which facilitated the gaining of multi-crew command experience through the use of command practice training in which a student was encouraged to apply command instrument and advanced procedural knowledge in the presence of an instructor qualified for the particular exercise being demonstrated. Students would fly together in mutual sorties with one student exercising command on one leg and another on the next leg. The qualification programme would require a minimum of three academic years to complete the primary, advanced and pre-airline training components of the tertiary

qualification(two calendar years) with a final semester to complete the transition to Second or First Officer in airline operations. In the airline internship model these students would commence the first of an additional five trimesters of airline operations with about 1300 hours of operational flight experience.

The New Zealand Civil Aviation Authority(NZ CAA) and Massey University have agreed to a research and development programme which may become the model for a future new Basic Air Transport Pilot Licence Basic ATPL. This new programme, currently being researched (table 1) provides students with an equivalent flight experience of 248 hours(in contrast to the ICAO approved 150 programme). Although the curriculum is prescribed in competency terms and will be qualitatively assessed by measuring student performance outcomes rather than by prescribing minimum quantitative flight hours, for comparative purposes it is expected that the practicum components will reflect 159 hours of single-engine experience, 50 hours of multi-engine experience and 39 hours of airline transition experience. Within these durations, approximately 34 percent of the flight experience will be via flight training devices, fixed-based and level D simulation.

The curriculum is structured into six professional examinations. Each examination has a pre-requisite requirement for students to complete defined university courses(individual papers). Within each paper are two and often three components: academic knowledge, technical theory and flight practice(using simulation and aircraft). Each component is cross-linked: academic knowledge, which provides the application to technical skills and its relationship to the execution of practical performances. The amalgam of these elements form individual competency specifications and performance assessment tools. The academic bases for the curriculum are management studies, in relation to command and

human factors, flight operations and flight standards; social sciences (psychology and sociology) in relation to command and human factors and flight operations; aeronautical sciences in relation to navigation, meteorology, aircraft performance, aircraft systems and flight standards; and law in relation to navigation and flight operations. The six professional examinations are summarized as :

▶ Aviation Professional I : Basic Aircraft Handling Visual Navigation

▶ Aviation Professional II : Instrument Flight Navigation Management

▶ Aviation Professional III : Procedurally-Based Route and Operational Management

▶ Aviation Professional IV : Advanced Aircraft Performance & Systems Management

▶ Aviation Professional V : Pre-Airline Operational Management.

▶ Aviation Professional VI : Airline Transition Management.

Within this programme are embedded many of the characteristics of airline flight operations. For example, the development of crew resource management skills are an integral component of each examination with formal operational focus in single, multi-engine and turbo prop Line Oriented Flight Training(LOFT) activities. Similarly, the application of Line Oriented Safety Assessment(LOSA) as an integral part of multi crew sector training not only creates error management awareness for novitiate student pilots but also is part of the professional change culture for flight instructors and academic staff.

The Bachelor of Aviation Air Transport Pilot assumes quality assurance and personnel licensing structures significantly different to those specified under Annex 1. In the Massey University model, these include:

▶ An aviation industry regulated tertiary qualification programme in which the operational(licensing) and academic(degree-based) requirements are integrated ;

▶ Focus on multi-crew air transport operations;

▶ Attainment of substantial human factor knowledge base;

▶ Significantly increased flight experience.

A further(senior phase) extension to the model is the airline internship option provided within the degree. Students engaging in this option completed up to an additional five semesters with partnership airlines. Massey University developed the model originally with an airline operating Boeing 737-400 aircraft on domestic and international routes. In this programme, these students were referred to as Student First Officers. The designator student was a reflection of their educational status, rather than any degradation of their professional flight crew license status. Studies by Jean Pariès