International
Specialised
Skills
Institute Inc

Victoria
The Place To Be

Education and Training for Boatbuilders in New Zealand, United States of America and United Kingdom

Rick Mitchell
ISS Institute/TAFE Fellowship

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1.0 Acknowledgments

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2.0 Introduction

2.1 International Specialised Skills Institute (ISS Institute)

Since 1990, ISS Institute, an independent, national, innovative organisation, has provided opportunities for Australian industry and commerce, learning institutions and public authorities to gain best-in-the-world skills and experience in traditional and leading-edge technology, design, innovation and management.

ISS Institute offers a broad array of services to upgrade Australia's capabilities in areas that lead to commercial and industrial capacity and, in turn, return direct benefits to Australia's metropolitan, rural and regional businesses and communities.

Our core service lines are identifying capabilities (knowledge, skills and insights) to fill skill gaps (skill deficiencies), which are not available in accredited university or TAFE courses; acquiring those capabilities from overseas (Overseas Skills Acquisition Plan - Fellowship Program); then placing those capabilities into firms, industry and commerce, learning institutions and public authorities through the ISS Research Institute.

Skill Deficiency
This is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas. This is the key area targeted by ISS Institute.

Overseas Skills Acquisition Plan - Fellowship Program

Importantly, fellows must pass on what they have learnt through a report and ISS Institute education and training activities and events such as workshops, lectures, seminars, forums, demonstrations, showcases and conferences. The activities place these capabilities, plus insights (attitudinal change), into the minds and hands of those that use them - trades and professional people alike - the multiplier effect.

ISS Research Institute
At ISS Institute we have significant human capital resources. We draw upon our staff, industry partners, specialists in their field and Fellows, here and around the world.

Based on our experience and acute insights gained over the past fifteen years, we have demonstrated our capabilities in identifying and filling skill deficiencies and delivering practical solutions.

Our holistic approach takes us to working across occupations and industry sectors and

building bridges along the way:

- Filling skill deficiencies and skill shortages,
- Valuing the trades as equal, but different to professional disciplines,
- Using ‘design’ as a critical factor in all aspects of work.
- Working in collaboration and enhancing communication (trades and professional),
- Learning from the past and other contemporary cultures, then transposing those skills, knowledge and insights, where appropriate, into today’s businesses.

The result has been highly effective in the creation of new business, the development of existing business and the return of lost skills and knowledge to our workforce, thus creating jobs.

We have no vested interest other that to see Australian talent flourish and, in turn, business succeed in local and global markets.

Carolynne Bourne AM, ISS Institute’s CEO formula is “skills + knowledge + good design + innovation + collaboration = competitive edge • good business”.

Individuals gain; industry and business gain; the Australian community gains economically, educationally and culturally.

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2.2 Australian organisations which have influence over training for the Boatbuilding Industry

- Department of Education Science & Training (Federal Government)
- Australian Marine Industry Federation - peak national body for the Boating Industry Associations
- Mersitab - Metal & Engineering Package managers
- Office of Training & Technical Education (Victorian Government) – manages apprentice training in Victoria
- Engineering Skills Training Board (VIC) – manages Metals & Engineering Training package in Victoria
- Boating Industry Association (Victoria) – peak body for boating industry in Victoria
- Victoria University (TAFE sector) – delivers training to boatbuilding apprentices in Victoria
- Marine cluster group (SE Melbourne) – alliance of marine businesses in SE Melbourne
- Gold Coast Marine Industry Group – alliance of marine businesses in SE Queensland
- various other Registered Training Organisations around Australia that deliver training to boatbuilders
- Boatbuilding employers
- Boatbuilding apprentices

2.3 The Australian Context

2.3.1 The Past

How a trade, or industry maintains enough skilled workers to be able to service its needs has been an issue since workshops expanded beyond a tradesperson's immediate family. Apprenticeship training, where employers undertake to train junior staff in all the skills and 'mysteries' of their trade in return for the labour of the apprentice for a fixed period is the model that western societies have used from the middle ages until the late 20th century.

The standards that apprentices had to reach to be considered a tradesperson were controlled by guilds, which were politically powerful alliances of trade specific tradespeople. These guilds played a significant role in the hierarchical social/political structure of local communities and often found themselves in conflict with their aristocratic rulers. Because of their position in the social structure and the willingness of their members to act collectively the guilds become a powerful shaping force in their local community.

The authority and power of these guilds grew out of their members' trade skills, and their ability to control the education of apprentices (both numerically, and qualitatively).

Initially, these guilds were based in individual towns and cities. But as economies became integrated nationally, so the guilds became national institutions. (In the United Kingdom, these guilds still to some extent, control the standards which tradespeople must reach to be certified.)

The Australian apprenticeship system grew out of the European model, and the colonial apprenticeship legislation of the mid-nineteenth century reflected British legislation.

Up until the 1960s, apprenticeship training was often delivered entirely in the workplace, and was the responsibility of the master (who was usually the employer). There were technical colleges that taught apprentices, (at night and on the weekends), but there was no compulsion for employers to send apprentices to them.

In the 1960s compulsory technical training was introduced (off the job), and this was to take place during daylight hours (thereby reducing the potential productivity of the apprentice to the employer).

This began the shift of responsibility for training apprentices from the master, (or employer), to educational institutions. This shift is one of the major issues currently facing the non-regulated trades in Australia. (Regulated trades are trades where the tradesperson requires a license to practice their trade. The training of regulated trade apprentices is still controlled by an organisation similar to the guilds).

Now if an employer feels that his/her apprentice should receive all their training at a registered training organisation (RTO) the apprentice's training period is effectively reduced from 4 years to 24 weeks (the amount of time an apprentice attends trade school). This enables the employer to consider his/her apprentice(s) as lesser skilled employees, able to be paid less than other employees.

2.3.2 The Present

Boat building has adopted the attitudes and technologies of the car manufacturing industry

The last 40 years has seen rapid change in the boatbuilding industry. Prior to the 1960s nearly all boats were built of wood, and were built as one offs- each boat being largely custom built. With the development of the fibre reinforced plastics (FRP) industry much of boatbuilding changed from being a bespoke craft process to a multiple copy production line process. This change is continuing today as many workplaces adopt more and more of the attitudes and technologies of the car manufacturing industry. This transformation has significant implications for the training of boatbuilders.

Consequences

2.3.3 Skills

One consequence of this shift in manufacturing method has been the apparent de-skilling of large sections of the boatbuilding workforce. In the past a boatbuilder would have been expected to exercise a large range of skills across a diverse set of materials (wood, metals, plant fibres for caulking hulls, paints and coatings, engineering for installing engines and shafts, etc).

2.3.4 Problem Solving

And in addition to all this knowledge boatbuilders were expected to solve most, if not all problems, they might encounter.
Now someone can work in a boatbuilding workshop and only spray and roll out fibreglass, for example. While physical aspects of this process appear simple, when compared to the spiling and fitting of planks when building wooden boats, the materials that are used when building fibre reinforced plastic (fibreglass) boats are extremely complex. They are chemically based and require sensitivity in use.

2.3.5 Lack of FRP industry recognition of skills
The machinery used in the building of production fibreglass boats is also complex, and needs to be operated by a tradesperson with a detailed understanding of both the physical and chemical processes s/he is facilitating. While the range of skills needed to make boats may have reduced when compared to more traditional timber boats, the actual skill level required is comparable.
These new skills are, at the moment, under appreciated in the boatbuilding industry.

Tradespeople with specialised skills are in extremely short supply
The production of boats from moulds is only the last step in the boatbuilding process. Before a boat can be laid in up and pulled from a mould, a plug, and then the mould must be made. This process is a one off customised one, and requires many of the skills of the traditional boatbuilder, as well as an understanding of the materials and processes used in fibreglass boatbuilding. Tradespeople with these skills are in extremely short supply. This has significant implications for the future of the Australian boatbuilding industry.

2.3.6 New materials and processes
New materials and processes (eg exotic fibres & closed moulding) are being constantly adopted by the boatbuilding industry. The lack of tradespeople with a sophisticated understanding of these new technologies has forced industry to rely heavily on material and equipment suppliers for training, and problem solving. In order to maximise the effectiveness of the implementation of these new technologies, partnerships between skilled boatbuilders and suppliers need to be developed. Currently, these partnerships are not systemic throughout industry and are largely dependant on personal relationships.

Because of the lack of formal transfer of information between the boatbuilding industry and the FRP material manufacturers many boatbuilders are unaware of new technologies and production methods. This is a significant factor limiting the potential growth of the Australian boatbuilding industry.

2.3.7 The economic context
A significant limiting factor in understanding the size, and predicting the future needs of the boatbuilding industry is the lack of accurate and reliable statistical information collected about it. Marine manufacturing is not recognised by the Australian Bureau of Statistics (ABS) as an identifiable industry sector, consequently available industry statistics are gathered from a variety of, sometimes non-compatible, sources.

The Final Report of the Marine Industries Action Agenda published by the Australian Government's Department of Industry, Tourism and Resources in 2005 puts the turnover of the Australian marine industry in 2002-03 at $5.5 billion, employing 29,000 people.

It identifies the industry as one almost entirely composed of small to medium sized companies. It contributed $750 million worth of exports to the Australian economy in that year.

The boatbuilding sector of the marine industry, in 2002-03 turned over $1,138 million, exported $293 million and employed 5,230 people in 495 enterprises.

The most recent figures available (1999-2000) suggest that between 16-18% of Australia's boatbuilding activity takes place in Victoria, employing in excess of 700 people (The Marine Manufacturing Industry in Victoria: A Vision for the Future. Report to the Victorian Marine Manufacturing Taskforce to the Minister for Manufacturing & Export, April 2005).

2.4 Current training system for boatbuilders

Prior to November 2002, training for boatbuilding apprentices, was controlled by State authorities. There was no unified Australia wide curriculum. In 2003 boatbuilding was added to the national Metals and Engineering Training Package. This meant the same qualifications were offered in all around Australia. This was largely welcomed by the boatbuilding industry.

However this shift from state based curriculum based learning to a competency based system has meant there has been a reduction in the amount of theoretical underpinning knowledge that has to be learnt for an apprentice to complete their qualification.

Coupled with this shift form curriculum to competency system has come a shift in who controls the curriculum. The curriculum is managed (set) by organisations that that are nominally controlled by employers, but are in reality controlled by engineering skills boards whose members have minimal experience in, or exposure to the marine manufacturing industry.

The current training system encourages employers to customise the subjects apprentices study to suit their business' needs. This can result in apprentices successfully completing their qualification but only having a limited range of boatbuilding skills, thus minimising their ability to work across the breadth of the industry.

2.5 Australia boatbuilding industry's training needs.

In 2004 the Australian marine industry and government formed a partnership to identify and address the industry's growth opportunities and the issues that

might impede its development. The Marine Action Agenda produced four Issues Papers one of which focussed on education and skills.

" The marine industry has been increasing production and exports. For example, exports of boats have increased from $103 million in 1996-7 to $294 million in 2001-2 while wages and salaries have increased from $92 million to $167 million over the same period. Other areas of the marine industry are experiencing strong growth. For the marine industry to maintain or improve on its recent performance employment levels must increase. This will be achieved through attracting more entry level staff (apprentices) and through recruiting skilled and semi-skilled staff from other industry sectors…….

" **Upskilling of present employees**

New technology and global competition has reshaped the skills (sic) demands of firms, helping to explain an industry's skill shortages even where overall demand for skills is static or declining. It is difficult for firms to upskill workers quickly enough to meet these new skill requirements. Furthermore, the changing work environment has changed the focus of the skill set required. This skill set is more team based, IT, literacy and business skills. Many existing employees and recently qualified workers do not possess the required skills and personal attributes although they have formal qualifications. …….

…… With the changing of technology and work processes there is an expectation that employers and employees will undertake lifelong learning. " …….

page 4 (emphasis added)

I have further expanded the technological changes currently occurring in the marine industry in **2.6 Skills/Knowledge Gap**

2.5 Aim of Fellowship

1. To travel overseas and examine various systems of training for boatbuilders;
2. To assess the strengths and weaknesses of these systems;
3. To report on how the Australian boatbuilding industry could use these strengths to improve its own training systems.

2.6 Skills/Knowledge Gap

2.6.1
The rapid technological change (in both production methods, and materials) that has occurred in the boatbuilding in the last 40 years has almost completely transformed the industry. The move away from the one-off craft based building process (mostly in timber) to the production line engineering multiple copy process (fibre re-inforced plastics) has resulted in the deskilling of a large portion of the boatbuilding workforce. A division has developed in many boatbuilding workshops between tradespeople who are involved in layout, mould and jig design, and manufacture, and those tradespeople who actually make the boats. The introduction of more sophisticated closed moulding techniques requires that the skills a boatbuilder needs to learn are of a higher level. These new techniques, which because of both environmental concerns, and the improved quality of finished product will become the dominant manufacturing process in the FRP boatbuilding industry in the future, will require the retraining of large sections of the current workforce, and extended training periods for new employees.

2.6.2
The division of the boatbuilding workforce outlined in point one, and the consequent deskilling of much of boatbuilding workforce has meant that much of the underlying knowledge once considered essential to a boatbuilder is now no longer taught to new tradespeople. A generational shift is occurring, and those boatbuilders who made the transition from timber construction to FRP are leaving the industry. These tradespeople were trained in this underlying knowledge, and the pool of tradespeople able to exercise this knowledge is shrinking.

2.6.3
<u>Vocational education issues</u>

- What form of selection process is the most effective when selecting new employees
  for the boatbuilding industry?

- What form of pre employment education, if any, is best for boatbuilders?

- What form of early educational (apprenticeship or other) is appropriate for boatbuilders
  as they enter the workforce to build their skill to a basic level?

- What forms of post apprenticeship training are best for boatbuilders to undertake in order to maintain and improve their skills/knowledge?

- Who should establish and maintain the curriculum used to train boatbuilders?

- What level of accreditation is appropriate for boatbuilders, and who should bear the cost of establishing and maintaining accreditation?

- What is this most efficient incentive program to encourage both employers, and employees to undertake training?

- Who should fund this training? (government, employers, employees, industry associations), and where is it best delivered?

- Is there a training model being used overseas both at trade entry, and post trade that could be adapted and implemented in Australia to address these issues?

3.0 FELLOWSHIP PROGRAMME

3.1 Introduction

3.2.1 Host Organisations (Educational)

- Marine Industry Association (NZ) – peak industry body for the marine industry in NZ
- Boating Industry Training Organisation (NZ)-responsible for developing and co-ordinating all training in the boatbuilding industry.
- Unitec (Auckland, NZ) – offers pre & post employment training to boatbuilders.
- Northland Polytechnic (Whangarei, NZ) – offers pre & post employment training to boatbuilders, is particularly responsive to industry needs.
- American Boat & Yacht Council (peak body for the marine industry in USA) – responsible for the USA marine standards in both education & construction, offers on line and on the job training for employed boatbuilders.
- International Yacht Restoration School (Newport, RI, USA) – the premier training institution for restoration of yachts, students work entirely on commercial projects. Currently developing new courses in response to industry need.
- The Landing School (Kennebunkport, Maine, USA) – offers a wide-ranging number of full time courses from design & construction to installing engineering and electrical systems, with an emphasis on combining practical and theoretical knowledge. Currently developing new courses in response to industry need.
- Falmouth Marine School (Falmouth UK), a government funded college with an extensive range of training programs, with good linkage at a variety of levels into the local boatbuilding/repair industry.
- International Boat Training College (Lowestoft, UK) – one of the oldest boatbuilding training organisations in the UK, recently has diversified into training for the fibre reinforced plastic boatbuilders.

3.2.1 Host Organisations (Businesses)

- New Zealand Yachting Developments, Auckland, New Zealand- builders of one-off epoxy luxury yachts and powerboats.
- McDell Marine, Auckland, NZ-builders of high end luxury yachts (mostly polyester and multiple copy)
- Austral Yachts, Whangarei, NZ-yacht construction, maintenance and refit
- Northland Contract Boatbuilding, Whangarei, NZ-resin infusion Specialists, mostly producing parts for other boatbuilders, very interested in R&D.
- Pearson Composites, Rhode Island, USA-production high end yacht and power boat builder, inventor and patent holder of SCRIMP resin infusion process.
- Hinkley's, Portsmouth Rhode Island, USA-extremely large, multi site boatbuilder and vessel maintaining/refitting company.

3.2.4 Program Content

New Zealand

Overview

The dominant training model for training boatbuilders in New Zealand is the apprenticeship with its traditional mixture of employment, on the job and off the job training. While substantial government funding is provided to facilitate this training, the boatbuilding industry (via the Boating Industry Training Organisation) itself controls curriculum development and delivery. In parallel to this system there is a certain amount of pre-employment training offered by stand alone tertiary educational organisations, (polytechnics).

3.2.4.1 **Boating Industry Training Organisation (BITO)**

The BITO was established in 2000 in response to a change of government legislation, and the establishment of the Modern Apprenticeship system. The BITO is the training division of the Marine Industry Association of New Zealand (NZ), which is the marine industry's peak representative body.

The NZ Modern Apprenticeship system places responsibility for training apprentices with the employer and his/her apprentice, but the BITO provides substantial support to facilitate training and ensure that it is appropriate, and of a suitable standard.

The BITO supports this training by

a. making sure the curriculum and qualifications are in line current industry skill requirements
b. arranging “off the job” training including block courses, correspondence or night school (at a polytechnic, university, etc)
c. supporting the chief educator/trainer in the workplace
d. supporting the apprentice/trainee through all stages of the training programme
e. providing assessment services to the apprentice/trainee
f. advising the NZ Government of the apprentice/trainee qualifications achieved and the awarding of the National Certificate

The BITO maintain the following qualifications:

i Composite boatbuilding (Level 4)
ii Wooden Boatbuilding “
iii Alloy Boatbuilding “
iv Steel Boatbuilding “
v Marine Cabinetmaking “
vi Marine Systems Engineering “
vii Sparmaking:Metal/Sparmaking: Composites “
viii Marine Rigging “
ix Marine Painting “
x Marine Electrical & Electronic Installation (Level 3)
xi Marine Retailing (Level 2)
xii Boat Sales and Brokerage (Level 4)
xiii BITO National Certificate in First Line Management (Level 4)
xiv BITO National Diploma in Business (Level 5)

Further qualifications under development:

xv Marine Electrician (Level 4 &5)
xvi Marine Electronic Technician “

While there are no fixed length for these qualifications, it is anticipated that Level 2 qualifications will take 1 year to complete, Level 3 will take 18 months to 2 years, Level 4 between 3 and 5 years.

These courses are all endorsed by the New Zealand Qualifications Authority.

The BITO employs a number of Field Officers who have responsibility co-ordinating training for about 100 apprentices each. They visit each apprentice 3 times per year to ensure the continuing progress of each apprentice. The Field Officer also negotiates with the designated trainer in each workplace the most appropriate Training Agreement for the apprentice. The Training Agreement details which qualification the apprentice is undertaking, where training for each unit will be delivered, whether on the job with the employer, off the job at a polytechnic, or at another employer's workplace. The Field Officer is also responsible for assessing apprentices. Assessment records are held in a Log Book which is maintained by the Field Officer.

Each workplace that wishes to employ apprentices must be approved, and must have an employee who is responsible for the training that takes place in the workplace. In both of the workplaces visited in Auckland the designated trainer was also the company's operations manager, reinforcing the importance the marine industry in NZ places on training.

The BITO has developed a sophisticated and detailed set of learning resources for apprentices to use. These cost the apprentice $12.50 per booklet. The BITO employs industry experts to write these resources at the rate of about $NZ90 per hour which is funded by the government, and it is usual for these experts to take up to 100 hours to complete one learning resource.

Funding for training apprentices comes from a variety of sources, some is provided to the BITO by the NZ Government. Employers pay between $NZ1000 and $NZ1500 per year per apprentice, some employers levy this back off their apprentices at $NZ0.20 per hour worked. Where apprentices must attend off the job training the cost is split between the BITO and the apprentice with the BITO picking up about 60% of the cost. (The cost of a 2 week block course is about $NZ1100).

The BITO has a number of office support staff that enable the Field Officers to concentrate on their relationships with the apprentices whose training they supervise.

Since the establishment of the Modern Apprentice system in New Zealand boatbuilding apprentice numbers have increased from 50 to over 500. In 2004 alone, 78 apprentices completed their

qualifications, a number of whom qualified in both Composite and Wooden Boat Building.

Drivers for Success

- Employers embrace their responsibility for training staff
- Field Officers are the keys to the success of Modern Apprentice system, and they are adequately resourced
- Clearly delineated roles for all involved in the training process
- Government funded the change to the Modern Apprenticeships & and the development of support material (eg. learning resources)
- Marine Industry Association is strongly committed to training

3.2.4.2 Unitec, Auckland

Applied Technology Institute (Unitec) is a large post secondary training educational organisation situated in the suburbs of Auckland. It offers a number of pre-employment courses to prospective booatbuilders up to degree level. While these courses are independent of the BITO courses listed above, they do map onto the BITO courses and students may obtain credits towards BITO qualifications by completing the Unitec courses. Unitec also subcontracts to the BITO to deliver night courses and block release training for boatbuilding apprentices.

As a training organisation Unitec predates the BITO and the focus of its training is on full time study. While some of the courses it delivers encourage students to work part time in the boatbuilding industry while studying, work placements are not compulsory.

Unitika is responsible for the development and maintenance of its course curriculums, programs offering qualifications above certificate level are also assessed by the New Zealand Qualifications Authority.

Unitec offers the following self contained courses:

i) Bachelor of Applied Technology
ii) Diploma of Applied Technology (Marine)
iii) Certificate in Applied Technology (Boatbuilding)
iv) Certificate in Applied Technology (Marine Engineering Systems)
v) Short courses in
Small Craft Design
Portfolio Development for Tradespeople

The certificate courses are considered to be full time at 3 days attendance per week, and run for one year. The degree course

runs for 3 years post certificate and requires 3 day a week attendance at Unitec and 2 days a week non compulsory work placement. Students who exit the degree course after 2 years may receive a diploma.

Student numbers in the certificate courses vary between 25 and 80 with 25 students currently (2005) completing the degree course. The degree course is largely designed to produce designers and people to work in naval architect's offices, albeit with a solid foundation in the materials and methods used to build boats and larger vessels.

Annual fees for the full time courses are between $NZ3,800 and $NZ4,000.

Unitec Marine Technology has 9 staff.

Class sizes for the certificate are 16, although Unitec may run multiple groups. The degree course has capacity of 25.

A number of students studying in the certificate courses are full fee paying overseas students.

Unitec staff are responsible for writing learning resources but are released from their teaching duties to do so.

Unitec subcontracts to the BITO to deliver evening classes and block release classes to the BITO's apprentices. This relationship is not without it's difficulties. Unitec receives funding from the BITO to deliver this training. However, there seems to be some disparity between the number of students booked into training by the BITO and the number who actually attend classes, particularly the week long block release classes where employers may hold apprentices back due to pressure of work. Non attendance of apprentices reduces the income Unitec receives from BITO. This seems indicative of a somewhat strained relationship between Unitec and the BITO who, given the restructuring of the training system for boatbuilders in New Zealand, have largely replaced the stand alone educational facilities.

Unitec would appear to have decided to maintain its stand-alone status and begin to redirect its focus to a more 'academic', senior tradesperson with design training (see Bachelor of Applied Technology).

Facilities:

- Workshop, 16m by 22m
- Lofting floor, 12m by 10m
- Small boat workshop 8m by 10m
- Machine shop,
  Docking saw

Table saw
Bandsaw
Buzzer
Thicknesser
Linisher

- Fibre re-inforced workshop
  Chopper gun
  Autoclave
  Wet out machine
  Grinding booth
  Spray booth (with heating)
  Engineering testing facilities
- Drawing facilities
  28 Drawing boards
  24 computers

Drivers for success:

- Extensive facilities
- Long history of training boatbuilders

Difficulties:

- Problematic relationship with BITO which drives most training for boatbuilders in NZ
- Seems to be less engaged with industry, when compared to BITO

3.2.4.3. Northland Polytechnic, Whangarei

Whangarei has long been a centre for the marine construction industry in New Zealand. The Northland Polytechnic Marine Technology Centre was established in response to the establishment of a large boatbuilding company in the town and the shortage of skilled labour to staff that business. Initially, a 5 week short course was developed to provide the initial low skilled labour force for the company. After this need was met, 6 months later, a longer, 10 week, course was developed that was customised to the new needs of the company for more skilled workers.

Northland Polytechnic also delivers a Certificate in Composite Boatbuilding (at Level 2) of their own design. This is a one year full time (3 days a week, with the other 2 days set a aside for work experience). This course costs $NZ850, and potentially leads on to the National Certificate in Composite Boatbuilding (see BITO above). In 2005, 7 students were enrolled in this course.

Alongside this customised delivery, Northland Polytechnic also delivers night course and block release training for the BITO. By mid September 2005 Northland Polytechnic had delivered 10 block courses on behalf of the BITO with an average of 14 students attending each course, and had 18 students enrolled in BITO night courses.

Northland Polytechnic is currently planning to implement the new Marine Cabinetmaking Course (see BITO above), and is developing a new Boatbuilding Composite Technician Course.

There are two full time staff at Northland Polytechnic, who have a close relationship with many of the local boatbuilding companies.

Facilities:

- Workshop 8m by 22m
- Wood machine shop (medium sized industrial machines)
- Composite construction booth 5m by 6m
- 2 classrooms shared by other subject areas

Drivers for success:

- quality and commitment of staff to both their students and local employers
- close and responsive relationship to local industry
- willingness to develop and deliver training in response to local industry needs both directly and with the BITO

3.2.4.4 New Zealand Yachting Developments, Auckland

New Zealand Yachting Developments has about 60 employees and produces multiple copy polyester high end super and racing yachts.
They are currently building a number of Oyster yachts.

The company is strongly committed to apprenticeship training, the company representative responsible for supervising apprentices training is the Operations Manager.

Interestingly NZ Yachting Developments did not appear to interested in adopting closed moulding building techniques, because of the level of retraining that that would involve.

3.2.4.5 McDell Marine, Auckland

McDell Marine employs 70 staff is builds one off high end luxury yachts.

The company is strongly committed to apprenticeship training, the company representative responsible for supervising apprentices training is the Operations Manager.

The boats built by McDell Marine have a very sophisticated electronic, and electrical systems installed.

3.2.4.6 Northland Contract Boatbuilding Whangarei

Northland Contract Boatbuilding is a small company that specialises in manufacturing parts for other boat and yacht builders. They are one of New Zealand's leading company's in resin infusion, and are heavily committed to research and development, and training. Fraser Foote, Managing Director is very clear about what kind of tradesperson, and training is needed to run an infusion workshop.

The company has a 10m by 20m infusion table in a temperature controlled room.

The company employs a number of apprentices and recent graduates of Northland Polytechnic.

3.2.4.7 Austral Yachts Whangarei

Austral Yachts is a 25 year old company that builds, refits and maintains all kinds of vessels, as well as running a slipway/travel lift facility. The company employs a number of apprentices and

recent graduates in a number of roles. One recent graduate is now a team leader.

This company works in a wide variety of mediums, timber, polyester, epoxy, aluminium and steel, and expects it's tradespeople to be multi-skilled.

Craig Thompson, Director, emphasises the 'family' nature of the marine industry in Whangarei. In Whangarei this attitude has contributed to the dynamic role Northland Polytechnic plays in training the local workforce.

3.2.4.8 Specialist Marine Interiors Whangarei

Specialist Marine Interiors manufactures interiors of luxury vessels. The company's main client is in New Orleans, USA. Northland Polytechnic is currently implementing the Marine Cabinetmaking course (see above) to meet this company's needs.

3.3 United States of America

Overview

There is no one dominant model for training boatbuilders in the United States of America. Much of the boatbuilding workforce is trained on the job, with training being delivered in an *ad hoc* way by employers. This training is usually specific to the needs of the employing company. The American Boat & Yacht Council (the marine industry's peak body) has identified the training of boatbuilders as a major issue for the industry and is playing an increasing role in workplace training through its on site delivery and accreditation program. The ABYC is also developing a training program that it is attempting to sell into the Community College (post secondary) system. The ABYC also sets many of the construction and system standards for the boatbuilding industry, and uses these standards as the framework for its training and accreditation. There is some concern in the industry about the multiple roles the ABYC plays in the industry (educator, standard setter and accreditor), and the potential these multiple roles raise for the development of conflict of interest.

Alongside the ABYC (and some other smaller providers of on site and on Line training) there are a number of private education facilities providing full time pre-employment for boatbuilders. These private providers are currently expanding the number of full time courses they offer, and moving into the provision of continuing education for those already in the workforce via on site short courses.

3.3.1 International Yacht Restoration School Newport Rhode Island

The International Yacht Restoration School (IRYS) was founded in 1993 by Elizabeth Meyers to ensure that the skills necessary for the preservation and restoration of America's maritime heritage. The schools statement of purpose is:

> "To teach the skill, history, science and art of restoring maintaining and building classic boats
>
> To preserve the knowledge, heritage, craftsmanship and aesthetic genius inherent in these boats
>
> To safeguard our site of historic buildings as an important part of America's working waterfront
>
> To show that honest work, integrity and mastery of a craft are among life's greatest achievements"

IYRS is the only school in America that focuses entirely on the restoration of timber boats.

The school offers a 2 year full time course for fee paying students. The course has an international reputation and attracts overseas students. The students have a variety of backgrounds prior to beginning the course, (no woodworking experience is required), and have an average age of about 28. There are sixteen students in each year and 3 and a half effective full time instructors, (although Clark Poston, IYRS Program Director, maintains that a class size of 12 is ideal.) Instructors do not need to have a teaching qualification.

At IRYS, the structure of course projects dictate the staff/student ratios. For example, two additional students in the second year group would necessitate that an extra restoration be undertaken, as there is not enough work for 7 students per boat. This would require an extra staff member, who could not be financially supported by just the 2 extra students. Each teacher teaches 35 hours per week, but the staff/student ratio does allow teachers time to prepare for future classes and complete administrative tasks.

Each year of the course focuses on the restoration of a specific boat. The first year boat is a 12 foot Beetle Catboat which the students restore in pairs The second year projects vary from year to year, but are larger than the Beetle Cats and are worked on by groups of 6 or so. All the boats that are restored have been donated to the school, in order to allow the school to completely control the restoration, thereby maximising the potential educational outcomes for the students.

(Donors are given first right of refusal to purchase the restored boat. The catboats sell for $US10,000, having consumed about $US7,000 of materials.)

The course is entirely practical. Any theory that is taught is taught in direct relation to practical tasks of restoring and building boats. Learning resources are developed by the staff, although much use is made of articles from magazines and extracts from books.

Assessment is based on the both the gaining of skills and the ability to apply those skills independently, and grading is done by all the teaching staff in consultation with the students.

The course costs $US10, 000 per year, and the students must Purchase about $US600 worth of tools prior to commencing. Students must also pay their own living costs while studying.

The course curriculum is accredited by the Accrediting Commission of Career Schools & Colleges of Technology (ACCSCT), which is a federal government authority. This accreditation means that low income students can receive some means tested assistance to pay their fees. The accreditation process is a complicated one that takes a number of years to complete and begins with an application to state education authorities for 2 years state accreditation for the course specific curriculum. (Curriculums are written by individual teaching institutions.) If this is successful, ACCSCT accreditation can be sought. The ACCSCT accreditation process focuses less on the actual curriculum and more on the organisation's corporate governance and links with industry via its advisory committee, 50% of whom must be from the relevant industry.
(IRYS must also track the employment outcomes of graduates for at least 12 months post graduation as a part of ACCSCT accreditation.)

In addition to this committee, IYRS has a number of program development groups that review and develop curriculum. The members of these groups have relevant industry expertise and meet twice a year to systematically review both the curriculum and its delivery. Members of these groups are a 'who's who' of the marine industry in north eastern USA, which is indicative of the commitment the higher end of the boatbuilding industry has to training. These advisory committee members are selected by the staff and board of IYRS.

IYRS is currently developing two new full time training programs, one in yacht joinery, the other in systems/installations. Both of these programs are being developed in response to industry skill shortages. The systems/installations course is being developed in response to the increasing complexity of the electrical, electronic and hydraulic systems being installed in boats. The

joinery course is being developed in response to a lack of skilled tradespeople. It is anticipated that both of these courses will be 9 months long, and be accredited with ACCSCT.

IYRS has also begun offering some continuing education programs for those working in the boatbuilding industry. Financially this program is not used to sponsor the full time training programs, but must be self funding. The cost of these programs to participants includes a percentage to cover administration and support staff. Part of this continuing education program is a series of evening lectures by a variety of experts covering an extensive range of marine topics. These lectures are open to the general public and are intended to raise educational standards for both those working in the boatbuilding industry and also interested amateurs. They also raise the profile of IRYS in the local Newport community.

IYRS also runs a small after school program for secondary school students. This program is not directly vocational, but is seen by IYRS as part of its responsibility to its local community. It also ensures that secondary students are aware of the possibility of taking up a trade. The secondary school system in USA is partially funded on the number of its graduates that go onto college. Only a tiny percentage of colleges offer trade training. Therefore careers guidance teacher in secondary schools are not encouraged to direct their students towards the trades, as to do so would reduce their school's level of funding.

IYRS employs 16 staff, and has an extensive sponsorship and Donor program. Currently tuition fees and boat sales amount to approximately 30% of IYRS' income. It is projected that this will rise to 60% by 2007.

Facilities:

- Boatshop two storey building 33m by 33m (downstairs, half restoration shop, half machine shop and office, upstairs classroom and lofting floor)
- wharfage
- Nineteenth century three storey mill (to be restored, currently a store)
- Substantial office space off site
- Full set of static wood machines

Drivers for success:

- Very clearly articulated mission statement that is driven into and drives all of IRYS' activities
- Length of course (2 years full time)
- Course structure which allows students to repeat critical tasks (eg, lofting, and planking) a number of times

- Extensive administrative structure that enables IRYS to engage fully with the boating community and raise funds while allowing the education staff to focus on curriculum development and teaching
- Active contribution of industry experts for curriculum development and review
- Access to a community of boat owners who willingly donate their boats for restoration and support and value the wider activities of IYRS

Difficulties:

- Finding teaching staff. IRYS has begun to employ graduates (with industry experience) as teachers. This is not seen as ideal.

3.3.2 Landing School of Boatbuilding & Design (Kennebunkport, Maine)

The Landing School of Boatbuilding & Design is located 5 miles upstream from the old port of Kennebunkport. It was founded in 1978 as the Kennebunkport School of Wooden Boatbuilding. Over the years the school has regularly expanded its educational programmes and in about 1983 the school changed its name to The Landing School of Boatbuilding and Design to reflect this diversification of its educational programmes.

The Landing School now runs three programmes in house with a fourth under development. The three programmes currently

being offered are for boatbuilders, designers, and marine systems technicians.

The programme under development is in composite construction.

Each of these courses has been developed in response to skilled labour shortages in the boatbuilding industry, as the needs of the boatbuilding industry have changed The Landing School has developed new courses to satisfy these shortages.

All the long term courses are ACCSCT accredited, and all curriculums are developed by the Landing School staff after detailed consultation with industry. Each of the courses is overseen by a committee of industry experts who review both the curriculum, its delivery and assessment in a formal and regular way. The members of these committees are appointed by The Landing School and are all highly respected members of the industry marine industry.

The Landing School has also just established a Centre for Continuing Education which will provide short course off campus training for those already working in the industry. Initially the Centre for Continuing Education is providing training in marine systems as it is clear that there is a great shortage of skilled marine technicians on the east coast of USA, but it is envisaged that this Centre will expand into consulting with businesses in order to offer solutions to training shortfalls.

Boatbuilding Program:

The Landing School offers 2 separate boatbuilding courses. A Graduate of either of these courses "…understands the interrelationship and interdependency of the various structural elements of a boat as well as the importance of a systematic approach to the boatbuilding process…"
and has the ability to work to a schedule as the course stimulates "…the work atmosphere a builder will encounter in a boat shop."

The first, and oldest course, is the Small Boats Course. During the 10 months of this course students will loft and build, in groups of three or four, a glued clinker ply beach peapod and a solid timber plank on frame New Haven 12'. This course tends to attract students who are idealistic and focussed on building traditional wooden boats. A graduate of this course "…will have the skill and craftsmanship to find entry level employment in a boat shop specialising in the construction or repair of traditional small craft." These graduates should also be capable of applying their skills to modern boat construction.

The second course offered as part of the boat building program is the Cruising Boat Course. During the 10 months of this course students, in groups of seven, will loft and build a cruising motor boat up to 30 feet in length using modern timber construction methods. A student completing this course "…understands the construction process of boats up to thirty feet in length, is familiar with simple electrical and mechanical systems, including propulsion, and will execute interior joinery with a high level of confidence". A graduate of this course "…will have the skill and experience to find entry level employment as a boat carpenter, interior joiner, or finish worker".

Each of the boatbuilding courses has 14 students and a dedicated staff member.

Design Program:

"The Design Program offers an intensive, full-time classroom approach to the study of boat design as a technical subject spanning a forty week period."

During the course students will complete three major design projects, the first two of which will be for aluminium boats to reduce the complexity of the design process by minimising the selection of scantlings. "As a final project, each student will prepare a set of plans and calculations which meet all aspects of a set of selected design criteria for a sailboat, powerboat, or commercial craft."

All design drawings are initially draw by hand but the curriculum includes tuition in computer aided yacht design. The course includes a compulsory week of placement in a design office or boatyard.

The course covers design for both power and sail (about 50/50, which is a similar ratio to work in industry).

The course has 18 students and is taught by two staff. (The boats currently being built by the Cruising Boat students were designed by Stephen M Dalzell who teaches the Design Program.)

Graduating students of the Design Program "…will have the drafting, CAD and technical skills as well as the basic knowledge of small craft design to confidently seek entry level employment in a naval architect's office, production shop, sail loft, brokerage firm or other technical marine business."

Marine Systems Technician Program:
This program was developed in response to the increasing technical complexity of systems being installed in marine vessels. It is designed to prepare students to install, maintain and repair contemporary boat systems to established standards. These systems are the ones typically installed and maintained by a boatyard and cover electrical (both AC & DC), plumbing, refrigeration, engineering, and simple composite repair.
The course does not cover those areas for which skilled technicians already exist (eg diesel mechanics, outboard mechanics).

Each subject has a three step learning process: classroom (for theory), bench, (for proper assembly techniques and developing proficiency) and installation, (for the application of this know ledge and skills in an actual boat). Students are able to be tested for some nationally recognised certificates while undertaking this course.

There are maximum of 24 students in this course who are taught by 2 teachers supported by a technician.

Graduates of the Marine Systems Technician Program will "…have the skill to find employment as entry level systems technicians and will be able to confidently take certification exams offered by American Boat & Yacht Council."

Centre for Continuing Education:
This is a recent development for The Landing School and is an attempt to allow those already working in the industry to upgrade their skills without having to undertake lengthy periods of study. It is a kind of training delivery that is becoming increasing popular in the American marine industry.

As an example, in September 2005 The Landing School ran a five day course, Introduction to Direct Current (DC) Electrical Systems, in Augusta, Maine. The course was designed for "…marine

technicians interested in gaining experience with the Direct Current (DC) Electrical Systems installed on boats, commercial vessels and yachts. It (was) designed for entry level and intermediate level technicians and combine(d) both theoretical and practical elements. The course (was) a foundation for additional course work leading up to an American Boat and Yacht Council (ABYC) certification exam preparation course."

The course ran from 8am to 5pm daily and cost $US995.

Composites Program:
The Landing School is currently developing a Composites Program, which will train students who wish to build composite boats. The curriculum is still under development by both Landing School staff and industry experts, but it will be a comprehensive course, including composite design and production methods, repair, materials engineering, and tooling. This is an extremely wide ranging curriculum and it is intended that graduates of this course will, after suitable industry experience, become foremen and production managers in composite boatshops.

The Landing School will undertake a substantial capital works expenditure program as it implements this new course.

The Maine composites trade association has already indicated that it will be able to place the 15 graduates into immediate employment such is the demand for skilled composite technicians.

General:
The Landing School courses cost students $US14, 000 in fees. It costs students about $US10, 000 for the 40 weeks duration of the courses in living expenses. In addition to the fees and living costs boatbuilding students are required to purchase about $US2, 500 worth of tools prior to commencing the course, and the systems technicians are also expected to provide their own tool kit.

The students ages range from 18 to 50years old with an average age of about 26, and most graduates end up working in the marine industry.

While there is not a lot of interplay between courses, once a year The design students are taken out of their studio and put into the workshops to learn a little of how boats are actually built, and how their systems are installed, and the building students are taken into the design studio to learn a little of what goes into designing a boat.

Once a year the school has an open day for employers who come to offer graduating students jobs, on the understanding that students must complete their qualification before taking up the

offer. Demand for graduates usually outstrips supply, and so the school runs a page on its website, accessible to students and graduates only, where employers can post staff wanted advertisements.

Facilities:

- Small boat workshop 23m by 17m
- Cruising boat workshop 16m by 23m
- Loft 23m by 34m
- Marine systems workshop 15m by 20m,
  includes 12 benches 2m by 3m
- Design studio 18 drawing boards and 9 computers
- Machine shop 21m by 8m
  - 2 by table saws
  - 2 by drill presses
  - 1 by docking saw
  - 1 by surface planer
  - 2 by thicknesser
  - 1 by sander/linisher
  - 1 by bandsaw, 3 additional bandsaws in boatshops
- Clean room (store for resins and reinforcements) 4m by 10m
- Offices for administrative staff

Drivers for success:

- The length of the courses, (10 months), which is shorter than many equivalent courses is attractive to students.
- The industry demand for graduating students, which often exceeds supply
- The clear vision and philosophy that drives The Landing School
- The industry linkages and the school's responsiveness to changing industry needs. The willingness of the School to drive new technology into industry through training
- The research and resources that are allocated for the implementation of new courses and delivery methods
- The excellent facilities
- The Landing School's location, just outside a small coastal town with a history of boatbuilding
- The quality and longevity of the staff
- The 30 year history of The Landing School

3.3.4 American Boat and Yacht Council (ABYC)

The American Boat and Yacht Council (ABYC) is a not-for profit Membership organisation that has been developing safety standards for the American marine industry for over 50 years. ABYC's members include boatbuilders, marine surveyors, boat yards, trade associations, marinas, government agencies, educational institutions among others.

Some of the areas covered by the small boat standards are Lightning Protection, AC & DC Electrical Systems on Boats, Boat Load Capacity, Gasoline Fuel Systems, Seacocks Thru Hull Connections and Drain Plugs, Reboarding Means Ladders Handholds Rails and Lifelines, Glavanic Isolators, Carbon Monoxide Detection Systems, among others. These standards are internationally recognised and valued, more than one Australian manufacturer has adopted them, not only to enable them to sell their boats into the American market.

In conjunction with the development and maintenance of these standards, the ABYC also runs an education program. This program is focused around the delivery of training that will enable technicians to work to ABYC standards. Running parallel with this training is a certification system. When a technician has reached a certain standard of knowledge, s/he seek certification via an assessment process. Those gaining certification will be listed on the ABYC's website directory as a Certified Technician.

The ABYC delivers training on site in the workplace, and is willing to customise courses to the specific needs of individual employers. The ABYC is also delivering training on-line, although

the kind of students likely to undertake ABYC courses are not often keen to engage with this kind of learning.

The curriculum, training programs and learning resources developed by the ABYC are only delivered by the ABYC, although the ABYC will assess students undertaking non-ABYC courses for certification. The ABYC works with some trade organisations, eg marine electrical associations, when establishing certification standards. Some of these organisations also have their own accreditation process.

Fees payable to undertake study or accreditation with ABYC are sometimes paid by individual tradespeople and sometimes by their employer. But the ABYC seems to lean towards promoting its courses to businesses as employers begin to, or continue to, upskill their workforce.

ABYC courses run for between 1 to 4 days, and are all structured to allow participants to work towards ABYC accreditation. A four day course will typically cost $US1, 000.

The ABYC is currently developing a new systems (non electronic/electrical) accreditation course which will delivered and assessed over 3 to 4 days. It is anticipated that those undertaking this course will have been working in the industry for 3 to 4 years. The ABYC has set aside $US60, 000 for the development of the curriculum, learning resources and assessment tools for this course. This budget figure was allocated after the industry had been consulted and a training needs analysis had been completed. Typically when the ABYC develops new courses , the course is developed for tradespeople who have been in the marine industry for 3 to 4 years, and then build from this course back to an industry entry level course. This is perhaps a reflection of the ABYC's emphasis on certification.

The ABYC has developed and is in the process of selling training program for the marine industry into secondary schools. This course lasts for 1100 hours and is structured so that if not completed at school it can be completed once the student is in the workforce.

The ABYC has been a key player in the establishment of the Conference on Marine Industry Technical Training.
COMITT's mission is to "…provide a forum to discuss, present and demonstrate industry support of technical workforce education, training, certification and professional development. COMITT's purpose is to become the internationally recognised leading catalyst summit to highlight the marine industry's commitment to developing and maintaining a highly skilled and technically proficient workforce."

One of the outgrowths of COMITT has been the establishment of Marine Industry Technical Education Council (MITEC) which will "…facilitate the creation and sustained availability of a technically skilled and proficient labour force for the marine industry through education, training and professional development. The supporting mission of the Council is to promote public awareness and appreciation of technical workforce career opportunities within the marine industry." MITEC was established in 2005. The ABYC will be a key player in MITEC.

Drivers for success:

- The ABYC's extensive membership base
- The diversity of backgrounds of the ABYC's membership
- The ABYC's multiple roles within the marine industry,
  - Standard development and maintenance
  - Educator
  - Peak body
  - Policy developer
  - Etc
- The ABYC's relationships with both government and other non-government organisations

Difficulties:

- The multiple roles the ABYC plays can lead to a perception of conflict of interest

3.3.5 The Hinckley Company

The Hinckley Company was founded in 1928 builds, maintains and refits boats of all sizes. It has yards and workshops all over United States of America. The yard at Portsmouth, Rhode Island employs about 100 tradespeople in a variety of trades, from ship's carpenters, painters, varnishers, electricians, marine engineers, riggers, to a number of shipwrights. It is focussed on maintenance and re-fits and works on jobs up to a value of approximately $US2, 000, 000.

The yard has employed a number of IYRS graduates and looks to do so again in the future. The current shortage of skilled ship's fit-out carpenters has meant that the Operations Manager at Hinckley's is looking at the possibility of putting a number of current employees through the new IYRS course in yacht joinery.

Management at Hinckleys has in past been reluctant to engage in training employees for fear that if they did the employees would leave the company. The electronic/electrical area of Hinckleys is an exception to this. Because of the rapid technological change in boat electronics/electrics a constant program of retraining staff is necessary. The vast majority of this training is supplied by the suppliers of the equipment that is being installed and serviced by Hinckleys.

3.3.6. Pearson Composites

Pearson Composites of Warren, Rhode Island employ about 200 staff and manufacture composite boats between 35 and 65 feet in length. They complete roughly a boat a day, and the workshop is set up as a production, where workers remain in place and the boats/components come to them. The Pearson Composite workforce is largely of Portuguese extraction and extremely loyal. The company has engaged in some ABYC training in the past, and the new engineering manager expressed some interest in the Australian apprenticeship training model.

Peasron Composites is an important player in the development of the infusion process and currently license their Scrimp® infusion process to other composite manufacturers. All of their boats are infused, and their workshop is consequently extremely clean.

The boats built by Pearson Composites are heavily engineered, and systems heavy, and much of the work done on the production is repetitious (even if workers are installing sophisticated systems). It appeared that the engineering for the assembly process had been essentially completed by the designing engineer, perhaps minimising the skill necessary on the assembly line.

3.4 United Kingdom

Overview

Traditionally in the United Kingdom trade training has been Strongly based in the master/apprentice model, with some off the job training, final assessments being made by an independent body, the City & Guilds of London Institute (C&G). In the middle of the 1980s government support for this system was withdrawn and since then training for tradespeople is mostly undertaken in education institutions that are not directly linked to boatyards/builders, although the current government has re-established the apprenticeship system.

The City & Guilds examinations still exist, although opinion in educational institutions seems to be vary about their quality. One of the criticisms of the City & Guilds is that the final assessment is purely by written examination.

The new educational institution based system is the National Vocational Qualification (NVQ). This system has a number of levels that parallel the City & Guilds levels 1 to 3, and is assessed by the institution delivering the training. Recently there has been a move to re-establish a more traditional apprenticeship model in the boatbuilding industry. The apprentice is based in the

workplace but attends trade school on a regular basis. The government has weighted funding for training towards the apprenticeship model, but employers have been slow to take on apprentices.

3.4.1 Falmouth Marine School

The Falmouth Marine School located in the south west of England is part of the Cornwell College Group, which has campuses spread through the county . It offers a variety of courses up to and including Foundation Degrees. These subjects these courses cover range through boatbuilding, marine engineering, marine science, leisure & watersports, and health & social care.

The boatbuilding area has two main streams, a National Vocation Qualification (NVQ) stream and a Traditional Boatbuilding stream Which uses the City & Guilds for accreditation. The curriculum for the NVQ courses are set by national industry based reference groups, assessment for these courses is done by the training organisations which are subject to national audits. Trade specific recognition of NVQ qualifications is awarded by the British Marine Industry Federation. The curriculum for the City & Guilds is set by the City & Guilds which also set all the assessments for their qualifications. The British Marine Industry Federation recognises the City & Guilds qualification as trade specific.

Falmouth Marine School offer the following courses for boatbuilders:

In the NVQ stream are:

Boatbuilding Techniques Introduction NVQ1

Boatbuilding Techniques	NVQ2
Boat Production & Support Services	NVQ2
Boatbuilding & Maintenance	NVQ3

in the City & Guilds stream are:

Yacht & Boatbuilding & Ship Joinery	C&G1
Traditional Boatbuilding	C&G3

In addition to these courses a Foundation Degree in Boat Design and Production is offered by Falmouth Marine School.

The Traditional Boatbuilding course (City & Guilds Level 3) is a stand alone 36 week full time course, which is located at a separate campus.

The course focuses on the building of two traditional 22 foot plank on frame fishing luggers, from lofting to seatrials, (including rigging and simple sailmaking). This course also has as a requirement a research project into a specific area of marine history. The course has an extensive program of guest lecturers and organised visits to museums, traditional boatyards, and historic vessels. It has as a pre-requisite a City & Guilds Level 2, or an NVQ2 qualification. Falmouth Marine College receives £13, 800 for each student for this course and charges each student £3, 800. Each of the Cornish luggers built during the course sells for about £15, 000. The maximum number of students enrolled in this course is 18. There are two and a half effective full time staff teaching this course.

Both Boatbuilding Techniques Introduction (NVQ1) and Yacht & Boatbuilding & Ship Joinery (C&G1) are sixth month full time courses and are usually undertaken consecutively as pre-vocational training. In 2005 there were 26 students studying these courses.

Boat Production & Support Services (NVQ2) and Boatbuilding & Maintenance (NVQ3) can only be undertaken by students already employed as boatbuilders. These are, in effect, off the job training for apprentices, and are each ten weeks long. They are undertaken as block releases, ten weeks per year over two years, which is the length of an apprenticeship in the United Kingdom. There are currently six students studying each of these courses.

As mentioned above, the government offers training organisations Much more per capita funding to deliver training to apprentices than to students undertaking pre-vocational training. However since the re-establishment of apprenticeships, employers have been slow to take on apprentices. The Cornwell Marine Network, an organisation representing 120 businesses in the marine industry, have established a pilot program of group training. The Network itself has taken on two apprentices and has organised for

them to be employed at six different businesses over there two year apprenticeship. If this program is successful it will be expanded, in an effort to solve the shortage of skilled boatbuilders. (It is interesting to note that the Cornwell Marine Network has only three employees, and that one of them is a training manager. This reflects the significant need for skilled tradespeople in the local marine industry.)

Falmouth Marine School is involved in a further number of complex relationships with local industry one of which involves the operating a workshop in the National Maritime Museum Cornwell. The School is also negotiating with the local large shipyard and government to establish new training facilities on the waterfront, in a heritage listed building. These relationships which are typical of the changing British educational environment are time consuming to develop and maintain, but have the potential to bind industry to the training institutions to their mutual benefit.

In September 2004 the Learning and Skills Council, approved a joint proposal for three training organisations across the south west of , U.K. to start the development phase of establishment of a centre of vocational excellence (CoVE) in marine training. The Falmouth Marine School will use some of this funding to enhance its existing composites training. £75, 000 will be invested in this project.

Facilities:

- Workshop 6m by 25m
- Machine shop 6m by 20m
  Bandsaws (2)

Tablesaw
Surface planer
Thicknesser
Drill press

- Composite workshop 8m by 15m
  Individual bench extraction
  Vacuum pump for bagging and infusion
  (No chopper gun)
- Traditional Boatbuilding workshop (on waterfront, in building shared with National Maritime Museum)

  Bandsaw
  Surface planer
  Thicknesser
  Drill press
  Tablesaw
- Various other classrooms and storerooms
  (Workshops located at 3 separate sites)

Drivers for success:

- Relationships with local industry, and a willingness to further develop these relationships
- Commitment to flexible delivery (both in content and method)
- Location of Falmouth Marine School in traditional boating centre
- Commitment and energy of both staff and senior management to marine industry

Difficulties:

- Complexity of relationships with industry, government and Falmouth Marine School needed to sustain viable training

3.4.2 International Boatbuilding Training College (IBTC)

The International Boatbuilding Training College is located in Lowestoft on the east coats of Suffolk, U.K. It was founded in 1975 by members of the Anglian Marine Industries Association (AMIA) who were having difficulty finding tradespeople skilled in traditional wooden boatbuilding.

It was run by AMIA for12 years and then sold to John Elliot who successfully owned the College until late 2005 when he sold it to his Head of Training, Nat Wilson.

The College management have always remained heavily involved in the East Anglia section of the British Marine Industry Federation.

In 1992 IBTC was recognised by the British Marine Industries Federation as a Centre of Excellence, and in 1994 it won the National Training Award for the “exceptionally effective training” the College offers its students.

The College is perhaps the oldest and most prestigious of all the boatbuilding training institutions in the English speaking world and attracts students from all over the world, between 10 and 20% of students are not from the United Kingdom.

The College offers a number of courses:

Practical Boatbuilding	(44 weeks),
Basic Small Boatbuilding	(12 weeks)
Boat Outfitting	(12-15 weeks)
Basic Joinery	(12 weeks)
Glass Re-inforced Plastics	(4 days)
Rope and Wire Splicing	(2 days)
Yacht Surveying	(5 days)

The College currently (September 2005) has 36 students, but numbers fluctuate between 30 and 50. Interestingly numbers tend to increase in times of economic downturn as people who have been made redundant decide to invest their redundancy payments in change of career training.

The College has 3 full time teaching staff and 5 part time staff, Including a storeman. The College undertakes to have a maximum of 1 teacher for every 12 students.

The College trains its students to be able to gain both City & Guilds and NVQ qualifications, although the focus is on the City & Guilds. Students successfully completing all stages of the full boatbuilding course are awarded the College’s Diploma in Yacht and Boatbuilding. The College feels that assessment standards are slipping as the UK government attempts to raise the numbers of students both undertaking and completing training.

The IBTC builds and restores boats for clients, effectively functioning as a working boat yard, with the limiting factor that jobs are completed not to a commercial timetable but to an educational one. For example, a client may order a new 36 foot Albert Strange designed yawl, normally a yard would expect to complete such a commission in under 8 months, but because work proceeds in accordance with the requirements of the students, it may take a number of years to complete the yacht. Each student will need to learn how to plank a carvel hull during their course, however if a student were given this boat to plank entirely, they would not have time to complete the other parts of their course. To compensate clients for this ‘delay’, clients only pay for the cost of materials and an administrative fee. As a result of this working method, students get to work on a diverse range of boats at all stages of their building and/or restoration.

When the students first arrive at the College, they spend 12 weeks in the joinery shop developing their hand tool skills. This is a significant part of the students' training, as it means that before the students begin work on a boat they have highly developed hand eye co-ordination and staff do not need to teach tool skills, only boatbuilding skills. It also enables to College to discourage those students without the necessary aptitude from continuing on with the course. (The College reserves the right to "…terminate the training of unsatisfactory students, whether for failure to meet the standards required, lack of self motivation or failure to meet the College's rules")

In an effort to ensure the timely completion of the boats under construction and restoration the College has recently set up a commercial arm which will undertake to complete projects (painting, rigging and some engineering etc) that the needs of the students and curriculum have forestalled. Students may be seconded to work with the commercial section where appropriate.

The College runs de facto on the traditional apprenticeship model, where students, once they have completed their 12 weeks in the joinery shop, only work on 'live' projects. The students are effectively 'tied to' the College rather than an individual master, and the teaching of theory is reduced to a bare minimum. The training is severely focussed on practical boatbuilding. Students are given a job, told how to do and left to their own devices; staff come back to each student regularly to offer advice and/or assistance where needed.

The boats that are built and /or restored by IBTC are competed to the highest standard.

Drivers for success:

- Being created out of direct industry need, and continuing close ties to industry
- Structure of teaching program (all live work) balanced by the work time table controlled by curriculum needs
- Lengthy history and reputation
- Standard of work demanded of students

Difficulties:

- Difficulty in finding new staff, (some ex students are now teaching which the College acknowledges is not ideal)

3.5 **Conclusion**

This Fellowship has allowed the writer to examine three very different systems of training for boatbuilders.

In New Zealand, the training is controlled by, and driven by, the industry. Employers have a very clear commitment to training which is evidenced by the increase in the number of apprentices being trained since the creation of the Boating Industry Training Organisation (BITO). Employers also now have control of the curriculum and how it is delivered through the BITO, but there is also substantial government support for the training of apprentices, and the BITO seems well resourced to carry out its role. The shift from training apprentices in polytechnics to training facilitated by BITO has forced the polytechnics to offer stand alone non apprenticeship based courses, or to tie themselves more closely to the specific training needs of their local industry. This system works well in New Zealand because of the small geographic size of the country, the commitment of the industry to training, and the willingness of the government to adequately fund the training system.

In the United States of America, there is no national training system for boatbuilders. The ABYC runs a national accreditation system, which has been directed to topping up the knowledge of those already working in the industry, and then offering accreditation, but which is now increasing directing itself towards training new entrants to the industry. The training institutions visited by the writer are nationally accredited, but teaching their own curricula. They are private organisations dependant for their survival on their students' fees and the generous donations of their patrons. Both institutions have close ties to industry and have actively responded to industry needs by setting up new courses, or modes of delivery.
It is clear that both of these institutions are providing high quality graduates that work at the top end of the boatbuilding industry. The creation of MITEC is evidence that the industry is making training a priority. This would appear to be in response to the rapid deployment of new technology through out the FRP section of the boatbuilding industry, which requires tradespeople to have a higher skill level. It will be interesting to see which organisations will offer to provide the training that MITEC identifies as needed.

In the United Kingdom there is much diversity in training for tradespeople. There are some private educational organisations offering training, there are some traditional apprenticeships (with an of the job training component), and there are government educational institutions which offer full-time courses and provide the traditional apprentices' off the job training. In addition to this diversity of delivery, there are two separate accreditation systems. The development of a group training system in Falmouth as well as the developing complex relationship between the Falmouth Marine School and the local industry is evidence that there is a clear need for expanded training opportunities for entry level boatbuilders.

3.5.1 Implications for training in Australia

It is clear that the success (and vitality) of the overseas organisations visited was related to the closeness of their relationship to their local industry. This closeness enables the institutions to respond quickly and appropriately to their local industry's

needs. In Australia the relationship between training organisations and industry can be difficult to sustain because of the national Training Packages, which control the curriculum and are managed by ITABs remote from local industry. In the case of the boatbuilding industry the curriculum is a small part of the Metals & Engineering Package and so does not receive the attention it needs to provide an appropriate framework for training for the boatbuilding industry. One way of addressing this problem would be for the Registered Training Organisations (RTOs) delivering training to boatbuilding apprentices to be more involved in curriculum development. These RTOs both public and private are closely involved in their local industry because of the role they play, providing training. This would also allow the Training Package Framework to develop in such a way to acknowledge the state by state diversity of the boatbuilding industry. The writer also believes that at the moment there are limited resources available for interstate consultation and collaboration between ITAB, employer organisations and RTOs. This consultation and collaboration, particularly in the development of learning resources, is the only thing that will enable a truly national training system to be established and maintained.

In comparison with institutions overseas, Australian RTOs are under resourced both for upgrading facilities, and learning resources and delivery development. This is particularly important if the industry is to adopt the more sophisticated manufacturing methods that are currently being rolled out overseas. The writer's research leads him to believe that the role of training organisations in driving new technology into industry should not be underestimated. However for this to occur, training organisations must be funded to purchase the equipment needed to offer training in this technology. For example, at the moment, in Australia, the only training being offered in resin infusion is being offered by companies who supply the equipment used to resin infuse. This means that proprietary companies are de facto controlling the roll out of this technology into the Australian boatbuilding industry. This is one of the limiting factors in the roll out of this technology.

One of the main differences between training in USA and UK, and in Australia is the fact that overseas students are able to study full time before they begin employment in the boatbuilding industry. The writer reserves his judgement about the efficacy of this method against the Australian system of part time off the job training. But it is an issue that deserves some examination.

In nearly all the teaching organisations the writer visited, one of the main concerns of the management was finding teaching staff with suitable experience and vision.

4.0 Recommendations

Education and Training

1. Research to be undertaken to discover what level of training apprentices in Australia receive in their workplace, and how formalised (and comprehensive) this training is, and to what standard.

Action: Rick Mitchell, Victoria University, Boating Industry Association

2. The provision of funding for the training of existing employees. This would enable RTOs to quickly establish a Certificate II qualification specifically for training FRP workers in plastics manufacture.

Action: Boating Industry Association**,** OTTE, DEST

3. The establishment of a separate Training Package for the boatbuilding/marine industry that would enable the development of a more extensive range of industry specific appropriate Units of Competence, particularly in the area of marine systems installation and maintenance, advance composite manufacture (closed moulding techniques), and traditional timber construction.

Action: Australian Marine Industry Federation, DEST, Mersitab

4. Assistance be provided to RTOs to enable the efficient development of high quality teaching resources relevant to local industry needs

Action: OTTE

Industry

5. Research to be undertaken to assess industry needs for systems installation and maintenance, (consultation with Queensland critical here as they are already developing an electrical registration program for marine electricians).

Action: Australian Marine Industry Federation

Industry Associations

6. The establishment of formal connections between the boatbuilding industry and the companies that manufacture the materials boatbuilders use (particularly in the FRP section of the industry) (see Qld Partec as model)

Action: BIA(Vic) and Composites Australia

7. Assistance should be provided to employers across the industry when selecting apprentices as currently about 25% of new apprentices abandon their apprenticeship in under 3 months (also a study as to be undertaken to discover why this ‘wastage’ occurs

Action: Boating Industry Association

8. That apprentices be formally recognised when they complete their training at an industry sponsored function and this value adds to their qualifications and they gain recognition for further study after they have completed their studies and have advanced skills

Action: Boating Industry Association and Government Bodies

9. Post trade training must be acknowledged as critical to the ongoing skill base of the industry. This training should be formalised and nationally recognised, not just left to suppliers of equipment and materials. The International Skills Institute Master Artisan program may provide a model for this training.

Action: Mersitab, AMIF, ISS