

1996

High growth maritime industries: Recent successes and major opportunities for Western Australia

Edith Cowan University

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Maritime Industries Seminar
**HIGH GROWTH MARITIME
INDUSTRIES:
RECENT SUCCESSES AND
MAJOR OPPORTUNITIES
FOR WESTERN AUSTRALIA**

14 March 1996



EDITH COWAN
UNIVERSITY

PERTH WESTERN AUSTRALIA

Maritime Industries Seminar

Notes of Proceedings

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ISBN 0-7298-0254-X



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PREAMBLE

There are indications that the maritime industry in Western Australia is currently insufficiently serviced by the tertiary sector in terms of its educational needs. Thus, in May 1995 a Maritime Industry Taskforce was formed to investigate opportunities for further development of maritime industries in Western Australia and around the Indian Ocean Rim. Following months of discussion with government agencies, industry and tertiary education providers, it was considered opportune to conduct a seminar to bring these areas together to openly explore key issues in building upon successes already achieved.

The seminar included speakers from each of the areas of government, industry and education in Western Australia as well as the Fisheries and Marine Institute of Memorial University, Newfoundland, Canada, and the Australian Maritime College, Launceston, who identified some international and national maritime industry successes.

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OPENING ADDRESS TO THE SEMINAR ON HIGH GROWTH MARITIME INDUSTRIES: RECENT SUCCESSES AND MAJOR OPPORTUNITIES FOR WESTERN AUSTRALIA

**Hon Hendy Cowan, MLA
Deputy Premier and Minister for Commerce and Trade**

With over 7,000 km of coastline, Western Australia has a fundamental interest in all things maritime. Coastal transport was critical to the very foundation of the state and the early economy was sustained by maritime trade in agricultural products and gold.

Today, Western Australia continues to lead the nation in economic growth with total trade valued at \$22.3 billion per annum, some 74% in exports. Significantly, from a maritime perspective, trade levels have increased dramatically over the past decade to the current annual rate of 176 million tonnes with strong prospects for future growth.

While maintaining traditional markets in Europe, the bulk of the trade has shifted over the past twenty years to Asian markets. More recently, the government's trade and investment strategies have focussed on emerging opportunities in the Indian Ocean region.

Edith Cowan University is to be congratulated for convening this seminar. It is an opportune time to review our maritime activities. Eminent speakers from industry and the tertiary institutions will outline the State's successes in the high value added sectors of the industry such as shipbuilding, food processing and the offshore oil/gas developments. New areas of opportunity in mariculture, biotechnology and environmental sciences will also be identified.

This success is due to the expertise and competitiveness of existing WA companies and the progressive integration of new players and technologies under the government's investment attraction and Locate West programmes. Equally important is the strong research, educational and training roles of the state's tertiary institutions.

The government actively supports these activities through its export, quality and technology oriented assistance programmes and through investments in technology parks with specialized streams in biotechnology, materials processing and food technology.

Major expansions are also planned at the dedicated marine industrial area at Jervoise Bay:

- new protected harbour developments;
- the amalgamation of shorefront sites for advanced large ship production facilities;
- additional areas and berths for heavy marine fabrication and maintenance; and
- a proposed marine technology park including university research annexes and a TAFE marine training centre.

Marine research is also being established in former defence facilities at the Cape Range national park near Exmouth and the need for an expanded marine service industrial area at Dampier, in support of the oil industry, is currently being evaluated.

However, as Professor Lawrence will detail later, this will not be enough to meet the new maritime industry challenges. There has to be a change in attitude and approach from the traditional sectoral bases. Much closer collaboration is required, sectoral boundaries must be crossed and new frontiers established.

The outcome of this seminar will be measured by the degree of agreement on a coordinated and cooperative way forward which builds on the successes already achieved and addresses the new opportunities and challenges facing the maritime industries.

BUILDING KNOWLEDGE INSTITUTIONS FOR THE OCEAN SECTOR

Mr Les O'Reilly, Executive Director, Fisheries and Marine Institute
Mr Roger Pearson, Director, MI International
Memorial University, Newfoundland, Canada

Notes to support overhead slide presentation.

Fisheries and Marine Institute Memorial University of Newfoundland

Context and History

Newfoundland in the Northwest Atlantic

- Located approximately 55° W and 50° N in the Northwest Atlantic.
- Created as a result of continental drift.
- Comprises part of Africa, part Europe, part North America.
- Wide continental shelf.

1497 Discovery

- “New Found Isle” of Jean Cabot Sailing Westward from Bristol England in 1497.
- Landfall at Cape Bonavista.
- Britain’s first overseas colony claimed in the name of Henry VII.
- Sir Humphrey Gilbert reaffirms the right of British ownership on Kings Beach, St John’s and in the name of Elizabeth I, sets up Britain’s first colonial government overseas.

Resource Based Economy

- Province settled by fishermen, fish traders, and merchants.
- As with other new territories in the western Atlantic, Newfoundland was fought over by the French and English.
- Early 18th century, sees British domination.
- Economy grows around three primary resources: minerals, forest products, and fish.

Grand Banks Fishery

- Newfoundland located at confluence of two major ocean currents — Gulf Stream and Labrador Current.
- Resultant mixing creates nutrient rich upwellings.
- Home of one of the world’s great fish stocks — the northern cod.
- Fished by schooner fleets and dories from Europe particularly Portugal and Spain.
- Also fished from the shores of Newfoundland providing the raw material for a major salt fish industry.
- Salt fish exported to Europe and Caribbean.

Post WWII Expansion of Offshore Fishing

- Minesweeper technology adapted to create the stern trawler.
- Building of distant water fishing fleets in Europe.
- Vessels from East Germany, West Germany, UK, Russia, Spain and Portugal arrive on the Grand Banks.
- In 1949 Newfoundland joins the Confederation of Canada.
- Fifteen years later the Premier of the Province recognizes the need to build human resources to take advantage of marine sector opportunities.

College of Fisheries, Navigation, Marine Engineering and Electronics established to undertake education, training and applied research for the fishing and allied marine industries

- Programmes offered in nautical science, marine engineering, naval architecture, food technology, electrical and electronic engineering.
- Diploma levels offered in St. John's. Island wide offering of extension courses.

Fisheries Sector Growth

- Establishment of Newfoundland owned offshore harvesting sector. 60 Stern Trawlers.
- Development of middle distance fleet of longliners. 1000 vessels.
- Continuance of inshore fleet of 15,000 vessels.
- Development of new fisheries.
 - Redfish in Gulf of St. Lawrence
 - Shrimp in Labrador and Greenland
 - Salmon
 - Queen Crab
- Parallel expansion of processing capacity.
- College builds partnerships and trains personnel for harvesting, processing, shipbuilding, product development, fisheries technology, etc.

Offshore Hydrocarbons

- Seismic work on Grand Banks and Labrador Coast begins in late 60s.
- Gas discoveries off Labrador.
- Oil discoveries on Grand Banks.
- Ocean Ranger disaster.
- Unique problems of iceberg alley — collision and scouring.
- Delineation of Hibernia field and decision to build GBS.
- Bull Arm site/Hibernia Platform.
- College and later the Institute involved in training supply vessel operators, electrical/electronic technicians, all offshore safety training, ballast control operators, etc.

Activity in the Arctic

- Arctic ocean as one of Canada's three oceans.
- Newfoundland the home of early Arctic navigators.
- Early 70s expectation of oil in the Beaufort Sea, minerals in the eastern Arctic islands.
- Investments in cold ocean research and exploration.
- Establishment of Tuktoyuktuk supply base.
- College provides crews, officers, participates in research ice capable vessel design.
- Expectations of northern development unfulfilled due to low oil prices, but much learned.

1976 Declaration of Exclusive Economic Zone

- Late 1960s sees first indicators of serious overfishing on Grand Banks.
- Canada a major proponent in the development of UNCLOS.
- Canada establishes 200 mile Exclusive Economic Zone.
- Increased levels of economic activity and rapid technological growth encourages investment in oceans capability in Newfoundland.
- Ocean Science Centre at Logy Bay, CERR, C-CORE, IMD. (IMD undertakes performance analysis for "Australia" Americas Cup Challenger).

1984 Establishment of Newfoundland and Labrador Institute of Fisheries and Marine Technology

- College moves into new facilities with new mandate.
- Creates Mission Statement which continues to guide today.
- Builds Long-Term Development Plan and designs mechanisms to pursue different aspects of mission.

Changing Context

- Late 80s collapse of northern cod stock.
- Declining support for social spending.
- Imperative to become entrepreneurial.
- Impact of technology.
- Change in funding base: 85% Core, 15% revenue in 1985.
45% Core, 55% revenue in 1995.

Affiliation with Memorial University

- Result of government proposal to seek triple E post secondary education system.
- Institute holds out for principles to protect what it perceives to be its essential contribution to Newfoundland society and economy.

Governance Structure

- Unique Elements.
 - Institute not Faculty.
 - Executive Director not Dean.
 - Sectoral Advisory Board advising the President and Board of Regents on oceans related programming.
 - Autonomy of budget.
 - Autonomy of some administrative support functions.
- Unique identity/structure protects
 - Entrepreneurship
 - Responsiveness
 - Flexibility
 - Relevance

Fisheries and Marine Institute Memorial University of Newfoundland

School of Maritime Studies

Context

- Marine transportation as a global industry facing many challenges.
 - Overcapacity in 80s.
 - Low freight rates.
 - Aging fleet.
 - Increasing regulatory requirements.
 - Manpower shortages.
 - Flagging issues.
 - Demise of traditional fleet ownership patterns.
 - Radical shift of axis from Western Europe and N. America to Asia in fleet ownership, management, insurance, construction and marine technology.

Constituencies

- School of Maritime Studies has local and global constituencies.
 - Local
 - Canadian marine transportation sector, eg., Algoma, Puddester, Canada Steamship Lines.
 - DND
 - Canada Coast Guard.
 - Global
 - Maersk IOM Limited
 - Hanseatic Shipping Co. Cyprus

- Royal Caribbean Cruise Line
- Wallem Ship Management
- Kent Lines.

Programming

- Programming offered at all levels required by the marine transportation industry.

Bachelor of Maritime Studies

- Prerequisite Diploma in Nautical Science or Marine Engineering.
- Adds course work in humanities, management, economics, etc., to expand graduate capabilities and employment options.

Cadet Training

- Institute based diploma programmes coupled with sea experience leading to graduation as watchkeeping mate or third engineers.
- Courses fully accredited by Transport Canada with candidates receiving remission of sea time.
- Programmes also recognized by Canadian Armed Forces with graduates eligible for entry as Commissioned Officers in the Naval Operations Branch.

MOT Certification

- Objective to prepare seagoing personnel for upgrading certificates of competency.
- Courses tutorial in nature.
- Courses offered on ongoing basis for candidates at all levels.

Engineering Education in Naval Architecture and Marine Systems Design

- Diploma level courses with bridging mechanisms to professional engineering degree programmes.

Environmental Education

- Reflecting mankind's expanding understanding of the place of the oceans in the sustainability of planetary ecosystems, the Institute is placing increasing emphasis on ocean environmental programming.
- Diploma and advanced diploma programmes being offered this year for Marine Environmental Technicians and in Coastal Zone Management.

School of Maritime Studies Industry Focus Centres

Offshore Safety and Survival Centre

Facilities and Staff

- Mission, to prepare marine and onshore personnel to handle a wide variety of emergency situations.
- Separate campus 30 km from St. John's.
- Survival tank with emergency procedures escape trainer.
- Simulated ship structure for firefighting evacuation and escape.
- Southside base with fast rescue craft lifeboats and launching systems.

Clients

- Shipping companies worldwide.
- All personnel working in the offshore hydrocarbon industry.
- Provincial firefighters.

Programmes

- Marine Emergency Duties.
- Helicopter emergency procedures.
- Rig rescue training.
- Carriage of dangerous goods.

School of Maritime Studies

Centre for Marine Simulation

Facilities and Staff

- CMS mission is training and research in marine operations through the medium of simulation.
- Suite of simulation facilities including four own ship blind pilotage simulator, marine engine simulator, ballast control simulator, and a full mission bridge simulator with motion platform and 360° visual scene.
- Team lead by an internationally renowned hydrodynamicist and ocean engineer with a staff of mariners, software support specialists and simulation trainers.

Clients

- Canadian shipping operators.
- Department of National Defence.
- St. Lawrence Seaway Pilots.

Programmes

- Client specific. Software allows simulation of any ship type, sea state, geographic location, traffic or port interaction.
- Bridge Resource Management.
- Piloting.
- Advanced Manoeuvring.
- GMDSS.

Fisheries and Marine Institute Memorial University of Newfoundland

School of Fisheries

Context

Cod Moratorium

- Globally publicized.
- Reasons complex but having a similar genesis to the issues facing fisheries worldwide.
- Result: displacement of 30,000 individuals drawing all or part of their income from the fishery; sale of offshore fleet; closure of many plants.

Other Fisheries

- Non cod fisheries continue to be an important economic contributor.
- Snow Crab/Queen Crab replacing Alaska King Crab in the marketplace.
- Turbot, shrimp, capelin, lobster.
- Economic contribution in 1995, 70% of best year ever.
- Capacity being reduced in both harvesting and processing with a focus on professionalization, economic viability and resource sustainability.

Education and Training

- Will provide a brief overview of different levels of education and training provided by the School of Fisheries.

Community-Based Courses

- Skill development, skill maintenance, enterprise management courses offered in the community in partnership with the Provincial network of community colleges.
- Courses such as engine repair, fishing masters, record keeping and taxation, etc.

Industrial Response

- Contract training undertaken for specific companies in any fisheries related area.
- International Fisheries Observer.
- Aquaculture Net Manufacturing.
- Sea Urchin Handling and Processing.
- Capelin Processing.

Certificate Level Training

- In-house training programmes for the harvesting, processing, and aquaculture sectors.
- Courses include: Salmonoid Farm Worker; Maintenance Supervision; Inshore Fisheries Resource Assessment.

Diploma Level Training

- Three year in-house training programmes.
- Food Production Quality.
- Seafood processing.

Advanced Diplomas

- These are essentially post graduate diplomas where the entry requirement is a first degree in a related field.
- Programmes include: Aquaculture, Fisheries Development, Food Technology and Food Safety.

Post Graduate Degrees

- Post graduate degrees build on the Advance Diplomas. An example would be the MSc in Aquaculture.

Chair of Fisheries Conservation

- Funded by FPI/Province/NSERC.
- To undertake research leading to new understandings of the place of fisheries within complex marine ecosystems.

School of Fisheries

Industry Focus Centres

- Centres established to use the physical and intellectual resources of the Institute in partnership with private sector or government to capture incremental economic benefit from fisheries related activity.

Seafood Development Unit

- Works with seafood processing sector in the development of new value added products.

- **Facilities and Staff**
 - Fully equipped fish plant with product development laboratory, food engineering lab and test kitchen.
 - Lead by a centre Director with a dedicated staff of food scientists and technologists.
- **Clients and Projects**
 - Shishamo workshop: surimi based product development: crab meat recovery enhancement: canned seal product development.
- **Costs and Revenues**
 - All projects undertaken on a full cost recovery basis with industrial partners.

Fishing Technology Unit

- Originally established to work with the harvesting sector to increase effectiveness/efficiency of harvesting operations.
- Now dedicated to conservation oriented fishing technology development.
- **Facilities and Staff**
 - Uses world's largest fisheries flume tank with a 20m working section.
 - Draws on all other engineering capability of the Institute.
- **Clients and Projects**
 - Some examples include: Testing mid-water trawls for Dutch interests: testing a marine growth preventer for Malaysia company; development of an Arctic char trap or Rov observations of a surf clam dredge.
- **Costs and Revenues**
 - All projects undertaken on a contract cost recovery basis.
 - The Institute also operates an Aquaculture Unit on a similar basis to the two already described.

Fisheries and Marine Institute Memorial University of Newfoundland

Sectoral Focus Centres

- Centres established to pursue particular dimensions of the Institute's knowledge capital/economic development mission.
- We have four centres, each structured and financed differently. I will speak briefly to two of them.

Canadian Centre for Marine Communications

Established to assist Canadian industry in the development of products and services using advanced marine communications, navigation and information technology to establish partnerships between industry, research centres academic and government. The commercial success of the partners is the ultimate objective.

- **Corporate Structure**
 - CCMC established as a not-for-profit company incorporated under the Canada Corporations Act.

- Board of Directors drawn from industry, government and research agencies across the country.
 - Functions as a membership organization with approximately 120 member companies.
 - Lead by a President and CEO with a staff of professionals.
 - Operates by seed funding linking and leveraging to identify and develop new products.
- **Project Examples**
 - Development of electronic chart products.
 - Radar overlay on electronic charts.
 - On-board contingency planning software products.
 - Arctic Ocean communication support.
 - Mobile earth station data terminals.
 - **Costs and Benefits**
 - CCMC seed funded by ACOA.
 - Independent consultant evaluation in 1995 shows revenues generated from sales equivalent to introducing \$31 million into Canadian economy.

MI International

- Established to bring an international dimension to the work of the Institute.
- **Structure**
 - Non incorporated, wholly owned activity centre lead by a Director with an international programme support staff.
- **Project Activity**
 - Consulting work, technical assistance projects, institutional linkages.
 - Clients: World Bank, Asian Development Bank, CIDA, UN Agencies, private sector companies.
 - Countries of operation include: Philippines, Vietnam, Malaysia, Sri Lanka, Yemen, Gaza, Thailand and others in the Indian Ocean, Southeast Asia, Indochina regions.
- **Costs and Benefits**
 - Centre wholly funded from project revenues.
 - Project revenues provide challenge for staff and students to work and demonstrate relevance in the multi-dimensional complexities of international activity.
 - Creates working linkages with international agencies thinkers and researchers.
 - Enriches and provides insights into appropriate future orientations for the Institute.

Fisheries and Marine Institute Memorial University of Newfoundland

Future Directions

- Strengthening the Oceans Focus of Memorial University
- Expanding Industry and Community Alliances
- Engaging in Organizational Development for an Emerging New Future

REMOTE COMPUTER ACCESS TO UNIVERSITY FACILITIES

Ms Marie Corrigan, Manager, Virtual Campus
Edith Cowan University

Edith Cowan University has been a major provider of tertiary level distance education for nearly two decades. During this period the delivery mechanisms have moved from traditional approaches to incorporate new options based on advanced systems technology. In 1992, Edith Cowan University established a computer based communication facility for their external (distance education) students. Its purpose is to provide students with the "electronic" equivalent of a campus, with the aim of reducing the isolation of the distance education student and improving communication between students and tutors. Thus students with a computer, a telephone line and modem can perform much of their University interaction electronically from home, from work or elsewhere.

There are now two methods of remote computer access to the University: terminal emulation and TCP/IP via PPP (point-to-point protocol). This session will concentrate on, and demonstrate, the first access method, terminal emulation, which is the most basic: a dial-up connection, using standard communication software, to a computer called **Echidna**. It provides only text-based information delivery but is available from anywhere in Australia (or overseas) and with any type of computer: IBM & compatibles, MAC, Amiga, Commodore — in fact, any computer which is capable of VT100 emulation. This type of access can be used with low-speed modems, 2400 baud, or higher.

The following services and facilities are currently available on the Virtual Campus:

E-mail

Students can exchange electronic mail (e-mail) messages with tutors, other students, administrative staff and anyone with an Internet e-mail address. Everyone has their own mailbox address on the system which ensures that mail is private. This improves the communication between distance education students and their tutors, being far more efficient and effective than telephone communication or postal mail ("snail mail"!). It also makes it more feasible for students to maintain contact with each other even though they may be vast distances apart.

Chat

This is an open forum for real-time interactive talk, the virtual equivalent of the on-campus coffee shop or the discussion group area. Specific sessions or "channels" can be established by tutors for student tutorials or to discuss particular issues. Students can set up their own channels for socializing at any time. Any number of channels can be created to become the virtual equivalent of board rooms, class rooms and common rooms.

Talk

Private conversations between two people are possible using the talk facility. Tutors may use this facility to counsel students or to give additional private tuition. Individuals may get together to discuss a shared work assignment or simply to provide mutual support. Any number of private talk sessions can be running simultaneously.

Library

The Edith Cowan University library catalogue system is available to enable students to search for books and materials. External students of the university will be able to reserve and request books and materials on-line. Access to the other Perth universities' library catalogue systems and other general libraries, for example the Australian National Library, is also provided. It is also possible to access international databases which index articles from numerous journals. Many of these databases provide abstracts of articles and, in some cases, the complete article can be delivered directly to the user via fax, e-mail or postal mail.

News Groups/Bulletin Boards

These are established to provide a public posting area for items of general and group interest. Lecturers are able to set up news groups for particular courses or units or topics and post notices to them for the students to read. Students are also able to post notices to some groups. The groups are organized within topic areas such as general information, faculty information, course information, special interest groups, social notes and other topics as the need arises.

Send and Receive Files (up-load/down-load)

Students are able to send files to tutors or the External Studies department. These files may be assignments or portions of work for which feedback or assistance is required. Students can also down-load files that are stored on the system. These may be returned assignments, an article of interest, an update to a technical manual, or a sample program from a tutor.

Internet

Users have access to the world wide resources of the Internet through the AARNet link of the Virtual Campus system. These resources include World Wide Web (WWW), telnet, ftp, gopher, Network News and Hytelnet. These provide facilities such as database browsing and searching, document retrieval and communication with other Internet users.

Other connections

Students who need to use other specialist UNIX computers at the University (for example an ADA compiler or SQL) are able to access the relevant computers via Echidna.

The Virtual Campus provides an additional communication method which increases the flexibility available for the delivery and management of quality instructional material. It provides "just-in-time" contact and support for students, and, currently, is used in conjunction with traditional printed materials. Students can "enter" the campus at any time, day or night, seven days a week and avail themselves of the many services provided for them. It thus provides a vehicle which facilitates an increased versatility for users in choosing how, when and where to learn.

SUCCESSSES IN THE HIGH VALUE ADDED HIGH SPEED CRAFT SECTOR AND THE NEXT GENERATION OF CRAFT

Mr Chris Normans, Director
Austal Ships

Introduction

In 1988 Austal employed 200 people for the construction of cray boats. In 1996 Austal employed 650 people for the construction of the most sophisticated fast ferries world wide into the most sophisticated markets. The company currently has a turnover of well over A\$100,000,000.

Export Focus

Austal has focussed on the export market from its very beginnings. The first sale was targeted at China in 1989. Since then we have sold a total of 26 vessels to China — biggest fleet. Hong Kong — China route carrying almost 4,000,000 passengers per annum.

There has been a total of thirty-five passenger vessels constructed. Overseas markets include Indonesia, Singapore, Tahiti, Turkey, and Japan.

Car Ferries

Ferries Australia is a joint venture between Austal Ships and Oceanfast. Vessels are designed and constructed at Austal Ships. Three vessels have been contracted to date. All will be delivered this year with a total value of A\$150,000,000.

What We Did Right:

Selected the best people;
All round ownership team;
Concentrated and invested in efficiency;
Customized the product to suit the operator;
Stayed close to the market;
Incorporated new technology quickly; and
Cooperated with learned institutions AMECRC.

What We Did Wrong:

Slow to recognize Chinese cultural differences;
Meetings/misunderstandings; and
Too kind to big boys.

Future Trends

Larger car ferries; and
Fast freight vessels — more expensive than conventional shipping but much cheaper than airfreight
Austrade/industry market research study currently underway — significant opportunities:

- own wharfs/facilities break the union stronghold
- overnight delivery up to 1000 Nm (1800 km)

Conclusion

We are able to be a world competitive manufacturer in Western Australia. We are:

- efficient
- clever
- determined to succeed

THE VALUE ADDED CHALLENGE

Mr Harry Rogers, formerly General Manager
Kailis and France Group of Companies

1. Introduction

The words “value added” are self explanatory and are particularly pertinent in the food industry because of the variety demanded by customers. Variety for manufacturers brings with it risk and innovation and a diversity of products and processes. In the maritime context value added products can be as varied as holding and transporting live lobster, using fish heads for fish stock, coating fish with crumb or batter or using fish in a complex convenience prepared meal.

The development of every value added product presents its own unique challenge which is not governed by originating the product or process but also by the idiosyncrasies of the market.

In order to frame a picture for this presentation I have decided to select the challenge of formulating a complex frozen product for the export market. By systematically following the new product procedure with which I have some familiarity, I shall try to encompass the most important factors that I see as being of paramount importance to quality assured, reliable and profitable value added food manufacturers if they are to be world competitive.

2. Product Selection

The precedents to product selection are market research of relationships with potential customers both of which are time consuming exercises and generally necessitate a long term commitment in funds and resources. Both of these issues are subjects on their own and beyond the scope of this presentation. Consequently I have taken a short cut in assuming that a contract manufacturer has identified a product for a potential customer in a particular market niche. I have also assumed for the purposes of the presentation, that the product is to be produced initially using existing plant and equipment.

3. Product Brief

Prior to developing the prototype of the product for the customer’s evaluation, it is prudent to compile a comprehensive product brief, that is a composite of all of the available information of relevance to the customer’s expectations for the product.

In some instances but more usually once a business relationship has been well established, a customer may provide detailed specifications for a product in which they are interested and even direct the product development and follow it through to the scale up for production. However, because of the difficulty in sourcing all of the stipulated raw materials and the absence of suitable equipment critical to the advised process, the brief from an overseas customer generally falls well short of the ideal.

Let us take the more common situation where available information on the product for a particular market is scant. This being the case, guidance on product development must nevertheless be definitive and the brief must be sufficiently comprehensive to provide clear direction. This may necessitate making assumptions but assumptions do not mean guesses. It means that any detail contained in the brief should be considered carefully with due deference to experience and market research.

When setting the foundations for product development it should always be kept in mind that if the original brief leads to a product being approved that brief may structure the final specification which is in fact the anatomy of the product. Without adequate care and judgement in compiling the brief information could be omitted and replicating the product in full scale production may then become an impossibility. Also one should always be conscious of the fact that not meeting a customer’s expectation will have a negative impact on the manufacturer’s credibility.

The main items for inclusion in the product development brief are product description, unit weight, user preparation eg., heating or cooking method, packaging, shelf life and an indicative cost point.

(a) Product Description

This should commence with a general description e.g., Seafood Lasagne or Lobster Thermidor, followed by more detailed supplementary information peculiar to the product. This could include shape, dimensions, ingredient details, nutritional guidelines and organoleptic features such as flavour, texture, appearance and smell. It may also be desirable to note ingredients such as additives which may not be acceptable to the market or the customer.

(b) Unit Weight

This should include advice on any tolerances imposed by the customer and should take into account available packaging and relevant constraints such as filling and sealing equipment.

(c) Preparation

It is essential to provide advice on preparation by the end user such as thaw and eat cold, heat in oven (conventional or microwave to be stipulated), heat from frozen, thaw prior to heating, hot hold in bain marie, thaw then add water prior to heating or boiling in bag.

(d) Packaging

Packaging is principally used to protect the product against improper handling or contamination from the environment. With that in mind selection of the primary container that is the container of first contact with the product, can sometimes present a much greater obstacle than may be envisaged. It is governed by the product preparation, weight, dimensions, aesthetics, integrity, suitability to the process of filling and compiling the product, artwork and any other provisos of the customer or the market.

At this stage the inner carton, that is the one holding the primary container and the outer carton or shipper are of lesser concern but require some consideration for costing purposes.

(e) Shelf Life

The expected minimum freezer storage life for the export product cited would usually be twelve months provided that it is held at the regulatory requirement of -18C or less. This places a strong reliance on effective transportation and transit storage. In addition to freezer storage it may be necessary to take into account the likely period of holding in chilled storage by the user after thawing.

(f) Cost

If the product is particularly unique it may not be possible to provide a guide on cost. However, if the product is to compete in a known price structure of the targeted market segment, it is essential to provide a cost point derived from the target price. It will also provide a guide if it is necessary to modify the recipe or the manufacturing process for the product to be competitively priced from the customer's view point. In any case it is in the interest of the manufacturer to make an early assessment of the potential economic viability of producing the product.

4. Product Development Planning

The first task in product development is to study the brief and fill in the gaps. Invariably this involves research to compile a suitable recipe for the prototype, taking into account all the requirements of the brief and the availability and suitability of the primary container options, such as a tray or pouch.

When developing the prototype in the kitchen or the laboratory thought must also be given to the issues of factory compatibility, availability of raw materials, properties of ingredients, regulatory requirements, production costs and labour skills.

(a) Factory Compatibility

The production process must be compatible with the manufacturing lines and/or equipment and available floor space in the factory. The requirements for some minor equipment modifications or tools may be identified but the decision to invest in high capital alternative equipment would generally depend on potential sales and would be independent of any product development initiative.

(b) Availability of Raw Materials

It is impossible to ascertain the availability of raw materials, taking account of volume or weight requirements, lead times to delivery, season availability, price fluctuations and associated packaging including unit weight or volume. The unit weight or volume should ideally optimize economic efficiency in the factory. This will usually equate with the largest unit size available that suits the handling requirements but with very small volume ingredients this may not be practicable or economic.

There may also be a need for an ingredient to be developed externally, specifically for the new product, in which case there will be a need to coordinate its development with the supplier.

(c) Properties of Ingredients

In the selection of ingredients consideration must be given as to how ingredients react with one another and how they behave individually in various conditions such as variations in temperature, pH and mixing and pumping actions. Their reaction to freezing and presentation when thawed or heated are of particular importance.

(d) Statutory Requirements

An appreciation of all relevant Australian export requirements together with those of the importing country is essential so as to ensure that in selecting a formulation there will be no legal impediments en route to the customer.

(e) Production Cost

The indicative production costing is more appropriately calculated once the prototype has been assessed internally and prior to submission to the customer. Consequently the initial selection of the ingredients and the process are very important in that the cost of ingredients and the cost of the intended process should be kept to a minimum without compromising the quality target for the product.

(f) Labour Skills

In the development of any process it must be ascertained whether the line operators have the requisite skills to effect an acceptable quality assured economic production run. If the operators are not trained for the intended process it may be necessary to provide appropriate training or the intended process may have to be restructured.

5. Product Development

The critical discipline in product development is record keeping, commencing with the specifications for all of the ingredients used. In the case of manufactured or branded ingredients this should include the brand and manufacturer's name and as much detail on the primary ingredients as possible. It may prove useful to evaluate the ingredients against their specifications on the basis of physical, chemical or organoleptic properties. This detail could be of importance on four counts:

- (i) checking the acceptability of all primary ingredients;
- (ii) assisting in sourcing an alternative supplier if necessary;
- (iii) reinforcing specifications and tolerances with the existing supplier; and
- (iv) preparing a declaration on the primary ingredients as may be required by the customer or the Customs Department of the importing country.

Raw materials must be as specific as possible. For example, in the case of vegetables such details as the variety, trimming requirements such as broccoli floret (no stems), size criteria, whether fresh or frozen and if fresh, the minimum time between processing and delivery should be stipulated. The significance of this is that the suppliers cannot be blamed for providing an ingredient with an incorrect specification if they are not properly informed in the first place.

The preparatory formulation and process having been decided, weights, mixing, chopping, blanching, cooling, draining or thawing methods, times, temperatures and yields must all, where appropriate, be accurately recorded. If required by the customer, it may also be necessary to undertake a nutritional analysis of the product in order to confirm the parameters that have been prescribed.

In the export scenario it is better to use experienced people rather than random selection for a formalized taste panel to attest or not the product is organoleptically acceptable for presentation to the customer.

It is important to present the product to the customer in the best possible way including neat labelling and user preparation instructions. It should also be ensured that sufficient control samples are held for future comparative purposes. Realistically modifications to the original submission may still ensue on the road to final acceptance, a destination sometimes never reached.

6. Indicative Costing

Experience has shown that particularly in the export market, customers will expect an indicative price to be provided. This should be calculated with great care because if the prototype is found to be acceptable, the customer may well be adamant that the indicative price is the highest price that can be accepted for the product or more often than not, argue the price and expect details justifying the price submitted.

In the case of a line trial, many assumptions may have to be made, particularly if the product is a new innovation for the factory. These assumptions derived from the basis of a brief and a kitchen prototype, generally require research and experience when it comes to assessing yield, labour, throughput rate and hence overheads, packaging, freight and amortization of any new equipment required.

Outer carton dimensions will impact directly on the freight component of the costing and yet it is often not given the consideration that it should either because of the time demand of the customer or because the customer dictates the number of inner cartons to the outer carton irrespective of cost implications. If circumstances permit, a number of inner per outer carton configurations should be checked to optimize the FCL load. It should be noted that the thickness of the inner or outer carton board can significantly alter the load pattern and the maximum number of outer cartons that may be accommodated in a FCL.

It is not uncommon to lose \$1,000 in revenue through poor stowage. This equates with one dollar or more being added to the C&F price per carton which is of little help to either the manufacturer or the customer.

Another often overlooked trap in costing is the currency in which the product is priced. Australian dollars will keep the playing field level but it is prudent to ask the customer what currency is to be used in the quote otherwise the exchange rate could be left to the customer's discretion.

A final cautionary note is to fix the terms of payment to best advantage and whenever possible entrench the terms of payment as a matter of policy so that they do not become an argumentative point. The price offered is then presented as conditional on acceptance of the terms stated.

7. Raw Material Specifications

It is imperative that accurate raw material specifications are firmly in place prior to compiling the finished product specifications and for future ordering purposes. If they are not the final product at best they are likely to be compromised and also likely to fall short of the customer's expectation. In the case of raw or primary processed ingredients such as fish and vegetables a quality check or audit of a supplier may be desirable as contamination at that level is common and if undetected before the final product is dispatched to the customer the whole business may be put at risk. A worthwhile specification safeguard to include is to prohibit glass in any form including containers, from the factory and bags or wrapping used in packing raw materials should when possible, be in a distinguishable colour rather than clear where even large segments are difficult to detect as a contaminant.

8. Finished Product Specifications

Following acceptance of the product and its price by the customer, the finished product specifications should now be drafted. Irrespective of the possibility of future amendments to the specifications during the factory scale up or line trial it is important at this stage that they be sufficiently detailed with no room for interpretation.

Details to be incorporated in the specifications should include the product description in the frozen and prepared states, organoleptic guidelines, sizes and weights of components, cooking/handling information, storage details, nutritional information, ingredient listing, critical component breakdown, additive information, defect descriptions and tolerances, chemical analysis where applicable, and microbiological tolerances. Specifications on artwork, labelling and packaging should now be confirmed and included.

Surprisingly, colour is a very difficult indicator to describe when it comes to food. Experience has shown that even the standardized pantone colour cards seldom provide the desired accuracy. This sometimes makes communication on product colour with an export customer very difficult. It is possibly a research project worth pursuing.

9. Line Trial Planning

The factory scale up is performed as a line trial from which the process flow chart for full scale production is confirmed. Ideally this should be conducted in a pilot plant however, many factories do not have this facility.

To prelude to line planning calls for intuition and experience in translating the product development in the laboratory or the kitchen into the factory environment. It should be based on producing the minimum quantity of the product that will as closely as possible represent the process for full scale production. Anybody who believes that to increase the size or quantity of a value added food unit all that is required is to maintain the percentage of each ingredient as per the control sample should experiment with a product containing cayenne pepper. I can assure you that the scale up product will certainly provide a hot argument.

In scaling up, account must be taken of the limitations of the factory equipment and when applied to the weight of each ingredient the objective is not only to replicate the control sample but also optimize production and cost efficiency in terms of general handling and equipment capacity.

Line trial planning should be formalized collaboratively between the Product Development, Manufacturing and Quality Assurance units of the operation. Its purpose is to develop the process flow chart. In so doing Manufacturing assuming it incorporates engineering, should assist in ascertaining the equipment or the modification of existing equipment that will be required for factory production.

Unlike some modern systems protagonists, I believe that Quality Assurance is primarily an agent of Product Development in that if all raw materials including packaging, meet the quality assured specifications, the factory has a quality assured environment and there is strict adherence to the

process flow chart, quality assurance on the production line becomes a matter of course. However, whilst the perfect world of value added food manufacturing is an aspiration of all manufacturers, attaining and maintaining it is akin to lowering ones golf handicap and then expecting to successively shoot the same score ad infinitum irrespective of the conditions. Hence, the role of Quality Assurance is likely to continue as an integral part of the proverbial fire triangle that is the interdependence of Product Development, Quality Assurance and Manufacturing in the production process.

The attention of Quality Assurance in line trial planning should be focused on the hazard analysis and critical control points in relation to the process flow. In other words potential impediments to quality assurance should be identified and check points and procedures for corrective action should be established. The main areas of concern are likely to be regulatory requirements, raw material specifications, process checks such as temperature, times and weights, hygiene and contamination risks.

10. Line Trial

Prior to the conduct of the line trial, the manufacturing team should be properly attired, briefed and their functions outlined. Apart from normal practices, it should be emphasized that being properly attired is critical not just to the manufacturing team but for all persons entering the factory as contaminants such as hair, jewellery and micro-organisms potentially injurious to public health must be avoided at all cost.

Advice and direction to the manufacturing team must be explicit and consistent and management should evoke a sense of ownership and accountability for the task or tasks he or she has to perform. Without the commitment of every person involved either directly or indirectly in the process flow, quality assurance cannot be pursued with confidence.

Machinery and equipment should be fully checked for the correct settings of components, efficient operation and the security of parts, that is no leaks, rust or loose nuts or pins. It should be ensured that gauges and instruments are properly calibrated. This responsibility applies equally to Product Development and Quality Assurance when it comes to gauges and instruments under their control.

Assuming that the raw material requirements are on hand as per specifications and any pre-trial preparation such as spice blending or thawing has been completed, the line trial should commence at a predetermined time and be guided by a predetermined schedule. If possible the correct packaging should be used to avoid holding the product in bulk and subsequent repackaging.

Any fine tuning that takes place during the line or trials, if more than one is necessary, will then be incorporated in the process flow chart and that and the final product specifications should then be confirmed by Product Development for future production runs. It may now be presumed that Product Development is satisfied that the product accepted by the customer can be replicated both organoleptically and analytically, in the factory. At this time a supplementary costing should be undertaken which will more accurately reflect the standard for the product and check the accuracy of the original costing.

11. Full Scale Production

Optimum efficiency should not be expected during the first full scale production run. Where possible the first production should be confined to a short run as some fine tuning may still be required, particularly to remove bottlenecks and coordinate a smooth flowing operation. Whilst this may be perceived as a negative attitude because of the adverse effect on contribution and profit it should be kept in mind that throughput rate should never be set at the expense of quality.

Improvements in production efficiency in general and throughput rate in particular are the rewards of proficiency which is mainly a function of time and experience. Other areas of cost

saving which should be given continuous attention are waste disposal, use of water and optimization of refrigeration plant.

As Manufacturing takes on full responsibility for the execution of the process flow so do the audit responsibilities of Quality Assurance increase. In addition to the line trail responsibilities previously enunciated, the process flow must now be carefully monitored. This entails more attention to issues as temperature, net weight, labelling, packaging, the chemical, physical and microbiological properties of the finished product, finished product parameters and trace back data.

With all the systems now in place, a quality product and a satisfied customer should follow. This is not meant to infer that improvements cannot be achieved and revisiting the total process is highly recommended.

12. Conclusion

The foregoing is nothing more than an overview of what I believe are the most important prerequisites to world class value added food manufacturing. To present the meticulous detail for the full story would take volumes and a much more qualified approach than mine. Although I cannot take credit for a technical dissertation I trust that my presentation has provoked sufficient interest in the subject so as to encourage rather than discourage a worthwhile challenge.

SAFETY — A SUCCESSFUL LINK BETWEEN THE OFFSHORE PETROLEUM AND MARINE SUPPORT INDUSTRIES

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The views expressed in this paper are the views of the writer and
not necessarily those of WAPET or its Participant companies.

Overview of Northwest Shelf Operations

To set the scene I will provide a brief presentation of the offshore petroleum facilities in production and under development offshore Western Australia.

Currently there are 23 offshore facilities ranging in size from 45,000 tonnes fixed platforms in 130 metres of water with up to 100 people on board to "not normally manned" monopods in relatively shallow water which are visited occasionally for maintenance purposes.

The Woodside Petroleum Joint Venture has a major presence in the area with the development of the first gas/condensate production platform, North Rankin "A", in 1983.

The second Woodside Petroleum Joint Venture gas/condensate platform, Goodwyn "A", commenced production in February 1995. The North Rankin, Goodwyn LNG complex total development is estimated to cost A\$12 billion involving long term sales contracts covering 12 trillion cubic feet of gas. This was followed by Woodside's first oil development at Wanaea/Cossack which started up earlier this year.

Production from Harriet, Rosette, and Tanami fields commenced in 1986 and was followed by Sinbad and Cambell fields with the start-up, in September 1992, of the Harriet Gas Gathering Project, operated formerly by Hadson Energy and now by Apache Energy. It was the first offshore natural gas development of the domestic market in Western Australia since the first stage of the North West Shelf Venture was completed in 1993.

South Pepper, North Herald and Chervil fields, which came on stream between 1987 and 1989, are operated by Western Mining Corporation utilizing a combined jack-up rig and monopods with a crude export trunkline to nearby Airlie Island. The new East Spar project is now under development and is expected to deliver gas through a 1,380 kilometres pipeline to the Goldfields by August 1996.

WAPET's existing Saladin, Yammaderry and Cowle operations were phased in between 1989 and 1991 and were followed by the Roller and Skate fields which started first production in 1994. LNG marketing opportunities for the giant Gorgon gas field are currently being pursued.

The Wandoo discovery, drilled by Ampolex, has been producing as an extended production test and is now entering full field development phase with a concrete jacket being built in Bunbury for startup later this year.

The Griffin, Chinook and Scindian fields development by BHPP is producing at a rate of approximately 80,000 barrels of oil per day, with first oil produced in early 1994 using a purpose-built, disconnectable Floating Production, Storage and Offloading (FPSO) facility. Natural gas transported via a 68 kilometres offshore pipeline from the FPSO to an onshore gas treatment plant near Onslow.

Western Australia continues to be a principal area of interest to oil companies attracted largely from the fact that as a relatively new hydrocarbon province, opportunities to newcomers are still available. Most of the major international oil companies hold licences in the area and the favourable tax regime and political stability have attracted a number of new companies. Whilst oil production has recently exceeded that from Bass Strait, making Western Australia the premier producer, the real future lies in

the vast quantities of gas awaiting favourable market conditions. Offshore exploration and drilling activities are expected to remain high in the next few years.

The interfaces between the Petroleum and Maritime Industries

There is of course a strong linkage between the two industries. The petroleum industry relies on a range of support vessels throughout the life cycle of its hydrocarbon assets. Initially it uses marine vessels to carry out its seismic operations, followed by mobile offshore drilling units (MODUs) to conduct its exploration and appraisal drilling. The latter operation is usually accompanied by standby vessels and supply vessels for logistical and emergency response support. Once it has been decided to go into the field development phase there is further drilling of production wells, and the use of diving support vessels where appropriate, and construction barges to install the offshore fixed platform. Sub sea pipelines are installed with pipelaying barges. If the operator selects a floating production concept then there is a marine vessel installed at the site which may or may not be self propelled. Finally during the abandonment phase, there is again a high degree of marine support required. Currently many of the specialist vessels are brought into Western Australia from overseas although it is encouraging to see that there are some moves towards Australian owned vessels where the economics can be justified and this may rely on optimizing utilization through developing markets in Southeast Asia and elsewhere.

Safety — an Important Link between the Industries

The Piper Alpha offshore production platform disaster in the North Sea was a catalyst for a significant rethink on safety in the offshore petroleum environment.

As a result of a public inquiry into the disaster there has been a global change from prescriptive safety legislation to objective setting legislation which requires the offshore petroleum operator to identify and assess the risks associated with his operation, and to demonstrate to the Government that he has a safety management system that will reduce those risks to as low as reasonably practicable. These requirements are embodied in a document prepared by the operator and known as the "Safety Case".

Since the Pipe "A" tragedy seven years ago, the British offshore oil industry has spent US\$ 7.8 billion on safety initiatives.

In respect to the maritime industry the major impact of the new safety regime comes from the interface between marine and petroleum operations in areas mentioned earlier such as supply vessels, standby craft, construction barges, diving support vessels, MODUs, FPSOs and shuttle tankers. Where these vessels are operating on petroleum sites, the operator as title holder is responsible for including the operational safety interfaces in his Safety Case. As an example, if a MODU is to be located alongside a production platform for a workover then new potential hazards are being introduced, and more people are being exposed to them. This scenario will require the MODU operator to prepare a vessel Safety Case, and the production operator to prepare a bridging document which links the two operations together and demonstrates that risk has been reduced to as low as reasonably practicable.

The maritime industry is responding well to the new safety concept and the International Maritime Organization (IMO) has introduced its own Safety Case through the implementation of the International Safety Management (ISM) code. This will become mandatory for offshore support vessels by 2002, but is being introduced on a voluntary basis by a number of Australian marine support companies. In summary the safety linkage between the petroleum and maritime industries in Australia is well established but there are considerable opportunities for improvement which can capitalize on the synergy between the two industries.

Opportunities

So what form should these opportunities take and to what extent are they uniquely Western Australian rather than national?

First and foremost the availability of specialist vessels to meet the growing demands of the petroleum industry would seem essential. As mentioned before there is of course an important question of scale and economic viability, but given the drive into Southeast Asian markets it can be possible for Western Australia to build, supply and crew some specialist vessels that can service this region. Why should we rely on chartering North Sea and Gulf of Mexico vessels, some with questionable standards, when we have the technical capability to deliver our own?

The recent launch of Total Marine's "Total Resource" is a classic example of what can be done to offer our local petroleum industry state-of-the-art marine capability. Alliance contracts between marine and petroleum operators are the likely vehicles for creating more of these successes.

In line with this approach there may be a need for marine regulators to also move from prescriptive regulation to objective legislation so that the marine industry has more scope for entrepreneurial design which is safe, cost effective and better meets the needs of the petroleum industry.

The second most significant opportunity is in the area of competency based training. There is a strong need for the marine industry to recognize the specialist skills required to operate safely and efficiently in the petroleum industry and vice versa. Whilst this is a national problem, the reality is that it affects Western Australia more than any other State given the size of our offshore operations and the interface between the two industries. So whilst I am not suggesting we subvert any national initiatives in this area I am suggesting that Western Australia should have a strong say in its direction.

I see the problem of a lack of training and experience at every level of the hierarchy.

Firstly, marine crews receive no specialized training in offshore petroleum operations and are rostered onto offshore petroleum operations vessels in the same manner as they may be rostered onto a passenger ferry or general cargo vessel. From a safety perspective this situation is far from satisfactory.

At the ships' master level there is frequently confusion between their marine role as the "person in command" and their need for technical competency in such areas as drilling and production. This often results in a dual command situation which once again has dubious safety qualities.

In the area of specialist skills such as seismic crews, drilling crews, barge engineers, ROV operators, etc., Western Australia's ability to supply people has been limited by the spasmodic demand characteristic of a developing industry. Locally trained people often find their way overseas when the local market dries up and are then replaced by ex patriates when the need arises. How do we retain the specialists who help to put Western Australia on the map as a provider of specialist marine support services?

At the management level I believe there has developed a far greater level of understanding between the industries but again there is room for improvement. One of the initiatives adopted by WAPET and other operators has been to hold "best practices" workshops with our marine and other contractors. These are aimed at using controversial issues to heighten lively debate and so bring out better ways of enhancing safety performance. The results are published and freely issued to industry. Personally, I believe there is a lot of merit in extending this type of forum to other important management issues including technology and cost reduction initiatives.

It would be challenging to reverse the trend of overseas companies setting up in Western Australia to provide safety training and consultancy to the petroleum industry. The services provided by many of these very competent organizations are services that could have been provided locally if Western Australians were more attuned to the needs of their hydrocarbon industry. When overseas expertise is required it would be more proactive to take the initiative of negotiating alliance agreements rather than encouraging overseas companies to start up in their own right, sometimes with government financial incentives. This is an opportunity that shouldn't be missed by the marine industry.

The third opportunity is in the area of management systems and technology. The petroleum industry has been faced with low oil prices since the heady days of the late 1970s. For the industry to survive it must continue to implement more cost effective and cost efficient ways of finding and developing new reserves, but at the same time maintain its high safety standards. New innovative technology, risk sharing through alliances, total quality management, standardization of equipment and the rationalization of regulations, codes and standards are all initiatives that are contributing to a more efficient and safe petroleum industry. Can these initiatives be successfully integrated with the marine industry? Again this is not a uniquely Western Australian problem but for our State to maintain its success rate in hydrocarbon exploration and production the marine industry must recognize its contribution to cost reduction initiatives whilst maintaining safety standards.

An interesting quote from a recent “Bulletin” columnist — “to help win the global learning race, knowledge needs to be transferred from universities to the corporate sector”. Universities in Western Australia are already providing a wide range of services to the petroleum and marine industries. UWA has its Master Degree in Offshore Engineering, Murdoch provides environmental research, Curtin offers its health and safety services and Edith Cowan is offering multi-media packages to name but a few. Could we get smarter at this? How well are we plugged into UK universities that have provided support to the North Sea industry over the last 25 years or more? Is there an opportunity for more alliancing between our WA universities? I have to confess that the image I have is of well intentioned but largely uncoordinated efforts that may or may not focus on the important issues. To use an example — Quantitative Risk Assessment (QRA) has become a key tool in the assessment of safety risk, and is rapidly gaining favour in the environmental area. It is a complex mathematically based science that is equally applicable to petroleum and marine design and operations. Where are the experts from the Western Australian universities? Why do we have to consult with University of NSW or Monash for the expertise when we have the major slice of energy production right here in WA? The petroleum industry has spent several million dollars over the last few years on QRA using mainly overseas consultants!

The Future

It is an undeniable fact that Western Australia is poised on the brink of a further massive development of its offshore petroleum energy resources. In line with this development there will be an increasing demand on marine support services. These services will take the form of hardware (vessels), software (management systems and technology) and liveware (competent people).

To maximize Western Australia’s opportunities there are some paradigms to overcome not least of all the view that is often portrayed that if it comes from the US or UK it has to be better!

The safety links which have been established between the petroleum and marine industries as a result of the Piper “A” accident have provided a foundation for exploring other opportunities that could benefit both parties. The opportunities must be able to demonstrate that they can add value to our industries through the application of new technology, risk sharing alliances, total quality management, standardization of equipment and rationalization of regulations and standards. I think we should remind ourselves that the Gulf of Mexico, and more recently the North Sea, were once fledgling industries that provided opportunities not just for the oil majors but also for a wide range of service organizations. In Western Australia we also have the opportunity to capitalize on the development of secondary and tertiary industries to support what has become economically the most important industry in our state.

TRAINING FOR PRACTICAL SKILLS IN THE MARITIME INDUSTRIES

**Mr Anthony Tate, Managing Director
South Metropolitan College of TAFE**

The principal objective of the Vocational Education and Training, or more commonly the VET sector, is to provide a highly skilled workforce to meet the labour market demands of industry, through programmes that allow for through life skills development and enhancement.

To this end, the broad spectrum of activities covered by the term “maritime industry” in Western Australia are primarily serviced in the VET sector by the publicly funded Technical and Further Education (or TAFE) Colleges, especially South Metro TAFE. Our College covers the coastal strip from Fremantle south to almost Bunbury and so it is not by accident that we have developed a maritime focus.

Other TAFE Colleges also provide aspects of maritime training and in fact, later in this talk, we will cross live to the Geraldton Regional College of TAFE to allow us to hear of their activities in this area.

The training opportunities provided by South Metro TAFE are almost as diverse as the industry itself and so today I intend to focus on those areas that directly service the maritime industry, recognizing that many other training activities can result in employment within the industry.

Our activities fall into a number of major segments, namely:

- Shipbuilding;
- Vessel Operations;
- Fishing;
- Aquaculture; and
- Maritime Business

and the theoretical and practical training in these areas is provided in a number of modes, including:

- classroom;
- self paced learning;
- off campus studies;
- on the job training; and
- workplace based training.

Let me briefly elaborate on the modes of training before we move onto the range of opportunities available, but before doing so I must tell you that I am very proud of the fact that our College is the only TAFE VET facility in Western Australia where all training has been quality accredited to ISO9002.

It has always been our aim to provide training when and where it is most appropriate to meet our students’ needs. Bearing this in mind, our most common delivery is still the traditional classes, held either day or evening on any day of the week.

These classes are now provided at a variety of sites between Fremantle and Rockingham, but once our current building programme has been completed in June this year, they will focus on the Maritime Centre at Fleet Street in Fremantle for all activities except shipbuilding. The Marine Training Centre at Henderson will remain the focus for those activities.

However, as our system moves to competency based training, that is, assessing the skills acquired rather than examining the knowledge, we find that self paced learning, or flexible delivery, in the jargon, is growing in popularity. This allows a lecturer to supervise a class of students who are

working at their own pace through a given course, using computer based learning and practical assignments to guide them through the development of the appropriate competencies.

Off campus studies, the old correspondence course, targets those who for reasons of circumstance are unable to attend regular classes. The study packages are being expanded from the traditional written word to video and computer based training.

“On the job” training, when guided by our lecturers, complements the college based training in the development of the desired competencies.

Finally, we are not tied to a particular location for training delivery, there is a growing demand for workplace based training delivery. Within our College, for example, we provide training to the Royal Australian Navy’s submariners at the submarine training school located within HMAS Stirling.

Let me now turn to the range of vocational training available within TAFE that specifically targets the maritime industry.

The shipbuilding sector is primarily serviced from the Marine Training Centre at Henderson. Within this Centre, we provide training in aluminium welding and shipwrighting, including the fitout of a vessel.

Shipwrighting is both the traditional wood based competencies to service the leisure boat industry and the emerging skills in fibre reinforced plastics and aluminium to service the developing high speed vessel market that is growing up in the Henderson area. This centre at Henderson was only opened in February 1995 and now boasts twelve lecturing staff. The more traditional steel welding and metal trades are also available within the College.

Training in vessel operations falls into two distinct categories, navigation and marine engineering. Currently this training is provided from our facility in South Terrace, Fremantle, but will be relocating to the Maritime Centre at Fleet Street in May.

At the navigation school we train all levels of vessel operator from a coxswain certificate — for vessels under 12 metres — through to master class 1 — captain of a foreign going vessel greater than 80 metres. To enhance this training we are exploring ways in which we can acquire a two to four ship bridge simulator to allow us to undertake all this training on site at Fleet Street.

To complement the training we also cover areas such as GMDSS (global maritime distress and safety system) and petroleum tanker safety.

The navigation school is serviced by nine lecturing staff, mostly master 1s.

Similarly, within marine engineering, we cover all levels of training from a marine engine driver 2 — coastal fishing and ferry engineers — through to a 1st class certificate of competency in both motor and steam — for chief engineer on a foreign going vessel.

These courses are complemented by short courses in areas such as survival at sea and firefighting.

There are a total of five lecturers in this area with a 1st class certificate of competency as a minimum qualification.

It is of interest to note that there is considerable networking between Colleges offering navigation and marine engineering in the TAFE sector across Australia. Our College has close contacts with groups in most other states, including the Australian Maritime College in Launceston, and we are currently participating in a national curriculum development project in small craft navigation and marine engineering as part of that network.

Within the Fishing school we have developed four major streams of training. These are:

- Commercial Fishing — to master class 5 qualification for the trawling, cray fishing and pearling industries;
- Fisheries management — for selection and promotion in fisheries and CALM and to gain entry into marine science courses at university level;
- Nautical Science — to preparing students to gain selection as cadet officers in the merchant navy; and
- Commercial Yachtmaster — for charter boat operators and yacht deliveries.

These training courses are supplemented by a small craft handling course targeting the offshore leisure boat operator and courses leading to the Australian Yachting Federation qualifications.

We also provide direct labour market training, especially targeting the long term unemployed, in areas such as:

- seafood processing;
- trawler deck hand training;
- mariculture; and
- marine entry training

To support this training we have ten full time lecturers and a fleet of vessels including:

- 18.3m training vessel (under construction);
- 13m tug boat;
- 7.9m catamaran research centre (a joint project with the marine engineering cooperative research centre under construction);
- 2 x 6.1m small craft;
- 5m life boat; and
- various small craft.

Within the aquaculture area, we provide both training and an applied research/industry development capability.

Our Aquaculture Development Unit at Fleet Street operates as a development hatchery allowing us to establish techniques appropriate to the development of new aquaculture industries within Western Australia.

We have already had success with the marine fin fish Black Bream and Snapper and are now tackling an ambitious project to look at developing techniques to breed and farm the Western Australian Dhufish.

Other projects involve crustaceans and molluscs, as well as supporting areas such as food production and domestication of broodstock.

This centre has four professionals and six technicians.

We also provide training in most areas of mariculture including:

- saltwater fin fish;
- aquarium fish;
- crustaceans; and
- molluscs

The Maritime Centre and other TAFE Colleges provide training to support on farm aquaculture activities within the agricultural areas of Western Australia.

This area is serviced by two full time lecturers.

To complement this practical training we offer a range of courses in maritime business including training for shore side operators such as ships' agents, wharf operators, stevedores and more recently techniques for bridge team management.

Before looking ahead and setting this wide area of training within the context of today's meeting perhaps we could now cross to Sean Larby at Geraldton.

Cross Over to the Geraldton Regional College of TAFE

Good afternoon Geraldton TAFE, would you like to introduce yourself to our audience?

Sean Larby, Lecturer Marine/Aquaculture Studies

Thank you Sean, could I now ask you to briefly outline the maritime training you provide at Geraldton.

*They are Certificate II of Aquaculture;
Certificate of Nautical Fishing;
Support Marine entry level courses at Carnarvon campus;
Vessel Operations for Professional Fishers;
Marine Engine Driving;
Elements of Shipboard Safety;
Radio Operations tickets, and
Small Craft Proficiency courses.*

And what facilities do you have to support your programmes?

The "Lady TAFE", a full fitting training vessel equipped with echo sounders, radar, satellite navigation systems and radio.

A fish net and craypot workshop

A fourteen foot dinghy and trailer

we are negotiating the use of a fish processing facility for training in aquaculture.

Do you have any plans for expansion into new areas of training?

In May we intend to procure a sea cage for research and development and training purposes.

A research and development centre for both aquaculture and mariculture including:

- a) Recirculation systems,*
- b) Mollusc and crustacean research, and*
- c) Northern finfish species research*

Seafood processing trainee ships similar to that being developing in Tasmania.

Whatever expansion takes place it will compliment and not duplicate the programmes already in existence at other TAFE Colleges.

Thanks for your input.

Looking ahead, we at South Metro TAFE will be expanding our maritime vocational training over the next few years to broaden our maritime business activities and to move into the areas of horticulture for shore protection (sand dune restoration) and marine environmental science, especially for training of laboratory technicians to service the area.

Naturally, we will also be expanding our currently low level of activity targeting the maritime ecotourism market.

We will, of course, also do everything we can to build on the current training programmes conducted for the Royal Australian Navy in both submarine training and advanced technical training in the electrical/electronics area.

Where then, do we see ourselves fitting within the framework of today's meeting.

Firstly, I believe that the VET training, in Western Australia, that is, the technician and operator training, is well serviced by a range of TAFE and private providers that there is no large unmet demand in this area.

I am also firmly of the belief that the training we provide is a very solid basis for anyone who wishes to move into the university sector to pursue higher education in their chosen maritime field.

To this end we will be looking to enhancing those opportunities through enhanced articulation and a growing diversity of university offering. We estimate about 10% of our graduates would be interested in exploring this option.

We are currently looking at ways of exporting training services and any mechanisms that will improve those prospects would be welcome.

Finally, we bring to Western Australia a first class facility with highly skilled staff who are both capable and willing to provide their expertise to the development of a maritime service industry targeting our Asian neighbours.

I thank you for the opportunity to participate in today's meeting.

ACADEMIC COLLABORATION — BRIDGING GAPS BETWEEN INDUSTRY AND HIGHER EDUCATION

Dr Peter Quantick, Associate Dean,
Research, University of Humberside, UK

Nowadays in the UK, there is emphasis on the process of technology transfer and collaboration between Higher Education Institutions (HEIs) and industry, increasingly targeting Small to Medium Enterprises (SMEs). This is a recognition of the fact that there is a vast amount of potential wealth creating knowledge inside university walls, much of which is publicly funded but going nowhere. Traditionally, universities are seen as isolated from industry with little or no transfer of knowledge between universities or other HEIs and “UK Ltd”. Exceptions do exist, for example, the Polytechnics (many of which are now “new” universities) have probably been more accessible and universities in certain discipline areas such as engineering, aeronautics have had a good record of collaboration. Collaboration also implies two way communication and not just a draining of knowledge in one direction. So what do HEIs have that could benefit industry and business?

- People — with expertise and know-how
- Facilities — equipment, libraries, etc.

It is not surprising that these are the very things that business also want, the facilities aspect re-emphasized to meet the two way element since use of facilities can imply a movement of business people into the HEI environment in order to make use of it.

However business/industry also often want other things. They often want good communication skills in the people they are talking to; value for money and a professional approach. These last are often problem areas, or have been in the past.

EUROPEAN UNION/GOVERNMENT INITIATIVES

Recognizing that, a number of government initiatives and European Union (EU) programmes are in action to provide opportunities for academic-industrial collaboration. These are listed below:

UK Government

LINK Programmes
CASE Awards
Teaching Company Schemes — TC Centres
Technology Transfer Centres
e.g., Food T.T. Centres

European Union

Training and Mobility for Research
ESPRIT
CRAFT
ERDF — Postgraduate Courses
— Infrastructure e.g., Technopole,
EPICentre
TEMPUS

However, there are other local, institute centred initiatives which may be used to establish a contact between HEIs and industry e.g., private R&D Research/Consultancy projects; privately funded studentships; postgraduate courses including MSc/MA by learning contract. Such programmes and initiatives, then, provide a framework for collaboration and an important element of all of them is that all participants are seen to benefit. Experience has shown that such schemes have a greater degree of success when there is an organization or body which acts as a bridge or conduit between the industrial and the academic world. More of this will be discussed later.

CULTURAL PROBLEMS

A number of problems though can beset academic/industrial collaboration, these are listed below:

- Reluctance of companies to get involved for various reasons;
- Cultural differences/communication problems;
- Unrealistic expectations — time; cost etc.;

- Confidentiality/IPR; and
- Finding funding to match proposed projects.

TECHNOLOGY TRANSFER CONDUITS

In the UK, the Ministry of Agriculture, Fisheries and Food has recognized the enormous potential in HEIs and has established a number of Food Technology Transfer Centres. The first of these, the Food Innovation Centre (FIC), was established in the University of Humerside in 1994. The School of Applied Science and Technology was chosen as the first centre because of an important combination of characteristics. Firstly, a centre for food education and training, secondly, extensive industrial centred development over a number of years through industrial training and other contacts and lastly a centre of applied food research. This combination seemed to provide excellent opportunities for a centre which could provide an effective technology transfer channel for the food industry.

The staff of the FIC identifies industrial need and assists in establishing contacts between companies and HEIs and possible means by which that collaboration might be supported. Personal contacts with companies by staff of the FIC helps to break down barriers between industry and HEIs of the type described above.

In conclusion, an example of collaboration between our university and a local company might serve as a case study to illustrate some of these issues.

This collaboration was between my department and The Pasta Company.

CASE STUDY — The Pasta Company and the University of Humberside

The Pasta Company was founded in 1987 by a group who had previously worked in a large multi-national company in the Sales and Marketing area. They identified a niche in the fresh pasta market and established a company to meet the needs of this net. Initially, a small industrial unit was established producing, in the first instance, whatever fresh pasta colour, texture and flavour customers wanted. This included supplying into the industrial and food service sectors.

Today, the company, as part of Geest Foods, now boasts a 50,000 sq.ft. state of the art factory which manufactures a massive variety of sheet, extruded and filled pasta products.

During this time, a close partnership has developed between the university and the Company and a variety of means of collaboration has been used to assist in the developments which have taken place. Providing consultants to advise on the development of quality management systems, access to pilot plant and analytical facilities, student projects and industrial training placements are all ways in which a culture of trust and co-operation has been fostered and developed. The personal contact side of this process cannot be too heavily emphasized.

More recently, a Teaching Company Scheme between the university and The Pasta Company has provided yet another means of collaboration and technology transfer.

Throughout, the emphasis has been on enabling the company to underpin developments with the specialist knowledge and excellent facilities which the School possess. The management of quality and safety is one area where the know-how of staff in Quality Assurance has been utilized; technology issues relating to packaging, pasta texture, microbiology issues and so on have been investigated.

Both partners believe that their close involvement has benefited both organizations. The ability to jointly identify the needs of the company at any given time and to find appropriate solutions to problems leads both organizations to look forward to a continuing period of collaboration.

ECOLOGICAL SUSTAINABILITY FOR THE WEST AUSTRALIAN TUNA INDUSTRY — A FISHY TALE?

Ms Gail Lugten, Legal Studies Course Coordinator
Edith Cowan University

A. Introduction

In February, 1995 an Offshore Constitutional Settlement (OCS) was concluded between the Commonwealth Government and the States.¹ The OCS was a series of agreements whereby the State(s), or the Commonwealth, (or in some cases a Joint Authority)² was given jurisdictional control over a certain fishery. Where no OCS agreement could be reached, the normal constitutional arrangements would remain whereby the state has jurisdiction for the fishery out to three nautical miles, and the Commonwealth from three to two hundred nautical miles.³ In the case of Western Australia, jurisdiction for almost all fisheries was transferred from the Commonwealth to Western Australian control. The exceptions to this statement are tuna and tuna-like fisheries. For these stocks, the Commonwealth of Australia (and the Australian Fisheries Management Authority [AFMA]), has retained control.⁴

The tuna, and tuna-like fisheries (particularly yellowfin tuna, bigeye tuna, albacore tuna and broadbill swordfish), are identified in international fisheries law as Highly Migratory Species (HMS). They are so described within Annex 1 of the *Law of the Sea Convention* (LOSC) — an international treaty which came into effect as international law on 16th November, 1994.⁵

This paper will suggest that the fishing activity for HMS within Australia's Indian Ocean exclusive economic zone has only a low level of domestic fishing activity, but a high level of potential domestic activity.⁶ However, before such potential fishing activity should be developed, it is necessary for Australia to adopt a three-pronged programme of international, regional and domestic management of the highly migratory species. Problems in other global regions have revealed the necessity for such a comprehensive approach to resource management and there are numerous instances of overexploitation of stocks where parties have disregarded the regulations of the three-pronged management approach.⁷ This paper examines the three pronged approach relevant to developing the West Australian tuna fisheries. In keeping with the principles of international environmental law, any exploitation of the tuna must be done in accordance with the principles of ecological sustainability.⁸ It will be argued that there are problems with both the regional and international fisheries legal regimes that threaten the effectiveness of a tuna management programme which is ecologically sustainable.

¹ The Offshore Constitutional Settlement refers to *An Arrangement Between the Commonwealth of Australia and the State of Western Australia in Relation to Fish and Other Aquatic Biological Resources*. See Commonwealth of Australia Gazette, No. GN4 of 1st February, 1995.

² An example of a Joint Authority would be the west coast shark fishery which is jointly managed by the Commonwealth and Western Australia, but administered in accordance with WA state law.

³ *Australian Fisheries Management Authority Annual Report 1994-95*, (Forrest, ACT), p.127.

⁴ *An Arrangement Between the Commonwealth of Australia and the State of Western Australia in Relation to the Fishery for Tuna and Tuna Like Fish*. See Commonwealth of Australia Gazette, No. GN4 of 1st February, 1995. The Commonwealth handed over to Western Australia the jurisdiction for all fish except tuna, billfish, pomfrets, and certain other specific classifications such as fish taken as bait by a person who is authorized to fish by the Commonwealth, etc.

⁵ Annex I of the *LOSC* provides the following list of those species which are described as Highly Migratory Species. They are: 1. Albacore tuna; 2. Bluefin tuna; 3. Bigeye tuna; 4. Skipjack tuna; 5. Yellowfin tuna; 6. Blackfin tuna; 7. Little tuna; 8. Southern bluefin tuna; 9. Frigate mackerel; 10. Pomfrets; 11. Marlins; 12. Sail-fishes; 13. Swordfish; 14. Sauries; 15. Dolphin; 16. Oceanic Sharks; 17. Cetaceans.

⁶ This argument is based on data contained in the 1994-5 AFMA Annual Report, *supra*, fn.3, pp.38-40.

⁷ Note for example that in 1990 a review of the state of the world's fishery resources published by the United Nations Food and Agriculture Organization found that almost every commercial fish species was classified as depleted, fully exploited or over exploited.

⁸ "Ecologically sustainable development" (ESD) is the central pivot around which all aspects of environmental law are henceforth to be resolved. It is based on the Report of the World Commission on Environment and Development, *Our Common Future*, (also known as the Brundtland Report) which refers to development which meets the needs of present generations while not compromising the ability of future generations to also meet their needs. See Bates, G.M., (1995) *Environmental Law in Australia*, Butterworths, Sydney.

B. The Domestic Regime for Fishing HMS.

The LOSC provisions governing fisheries within the two hundred mile EEZ are described in Article 55 to 75 of the Convention. In keeping with the LOSC, the Western Australian tuna resources are primarily harvested by domestic and Japanese fishers. Japanese access is via bilateral tuna fishing treaties. There are two significant fishing zones. The first, north of the 34 degree latitude is the Western Tuna and Billfish Fishery (WTBF) and south of the 34 degree latitude is the Southern Tuna Fishery (STF). The WTBF extends north of Perth along the West Australian and Northern Australian coastlines to Cape York Peninsula, 142 degrees, 30 minutes east of Queensland. The STF extends along the southern coastline to 146 degrees east off Victoria and Tasmania. Principal species found in the WTBF include yellowfin tuna, skipjack tuna, longtail tuna and broadbill swordfish. In the STF, bigeye tuna, skipjack tuna and to a lesser extent albacore tuna and broadbill swordfish are the dominant HMS.

It is apparent that both the WTBF and the STF hold only a low level of actual domestic fishing activity, but a potentially high level of fishing activity, when one examines the data provided by the Australian Fisheries Management Authority for the catch figures of 1995.⁹ The figures are:

Number of boats as at June, 1995:

278 domestic permits in various areas of the WTBF and STF;
39 Japanese longliners operating under a joint venture arrangement in the STF;
17 Japanese longliners operating under a bilateral access agreement in the WTBF.

Total Reported Catch October 1994 — October 1995:

Japanese Catch:

809 tonnes yellowfin
77 tonnes bigeye
63 tonnes albacore
44 tonnes broadbill swordfish.

Australian Catch:

60 tonnes of yellowfin
45 tonnes of bigeye
15 tonnes of broadbill swordfish.¹⁰

Estimated Value of Catch

Domestic: approximately \$2.0 million
Japanese: approximately \$7.8 million¹¹

Japanese fishing vessels and techniques are advanced and effective. They employ pelagic longlining methods of catch, which have an advantage over pole and rod, or purse-seining techniques in that the latter techniques will badly damage the fish, making catch that is more appropriate for canning than for the delicate, highly prized and lucrative sashimi market in Japan.

In an attempt to develop the potential fishing activity that exists in the WTBF and STF, Australian fishers must endeavour to access Japanese equipment, techniques, and most importantly, their markets. To maintain such a fishery, it is necessary for Australia to participate in regional and international attempts to manage all HMS in accordance with the principles of ecological sustainability.

⁹ AFMA Annual Report, *supra*, fn.3, p.38. A difficulty exists with precisely comparing Australian and Japanese catch figures when the fishing years run between different months in the two countries.

¹⁰ The Australian Catch Figures are not listed in the abovementioned AFMA Annual Report. These figures are based on Aggregate Domestic Log Book Catch, and were passed on to this writer by officers at AFMA.

¹¹ The AFMA reports that the estimated value of the Japanese Catch is highly conservative.

C. The Regional Regime for Fishing HMS.

With regard to tuna fisheries in the Indian Ocean, the relevant regional organization is the Indo Pacific Tuna Development and Management Programme which is based in Colombo, Sri Lanka. This was only ever intended to be an interim tuna programme, and it will soon be superseded by the Indian Ocean Tuna Commission (IOTC). The IOTC will come into existence when the Agreement establishing the Commission has ten acceptances.¹² At the time of presenting this paper, (March, 1996), there are nine acceptances. These are: Eritrea, Pakistan, the United Kingdom, India, Mauritius, the Seychelles, the European Union, and Madagascar. Neither Australia nor Japan have accepted the IOTC Agreement. Clearly, for the sake of effective regional management of the Indian Ocean tuna, both States should accede to the Agreement.¹³

An obligation to participate in regional and subregional fishery organizations, such as the IOTC is placed upon States by both the LOSC, and the recently produced "*Draft Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December, 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*" (the Draft Agreement).¹⁴ In the case of the LOSC, Article 63 provides that where stocks occur within the EEZ of two or more coastal states, or within an EEZ and in an area beyond and adjacent to it, (such as the high seas), the relevant States should ensure conservation and development of the stock via "appropriate subregional or regional organizations."¹⁵ Similarly, in the case of the Draft Agreement, Articles 9, 10, 12, 13, and 21 make reference to these regional and sub-regional organizations. Article 13 relates particularly to the issue of Australia acceding to the IOTC Agreement when it says:

States shall co-operate to strengthen existing subregional and regional fisheries management organizations and arrangements in order to improve their effectiveness in establishing and implementing conservation and management measures for straddling fish stocks and highly migratory fish stocks.

Any criticisms that Australia might have of the IOTC would best be addressed from inside the organization as a full and equal participant.

The Indian Ocean Tuna Commission Agreement describes in Article 5 the objectives, functions and responsibilities of the Commission. Paragraph 1 enhances this subject heading by noting that the Commission shall promote:

cooperation among its members with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks ...

This objective is to be carried out by means of eight functions which may be summarized as:

1. reviewing conditions and trends of stocks;
2. encouraging research;
3. adopting conservation measures;
4. considering the economic and social aspects of fisheries;
5. budget;
6. reporting to the Director-General of the Food and Agricultural Organization;
7. administration; and
8. carrying out such other activities as are necessary to fulfil its objectives.¹⁶

¹² *Agreement for the Establishment of the Indian Ocean Tuna Commission*, Article 18, p.11.

¹³ It is interesting to note that Japan has a history of support for, and involvement in, the Indo-Pacific Tuna Development and Management Programme. This included cost-sharing financial support for the second phase of the IOTP's project - *Tuna Development and Management in the Indian Ocean and Southeast Asian Region*; as well as the Japan Trust Fund Project titled "*Investigation on Indian Ocean and Western Pacific Small Tuna Resources*". Funding for this latter project extended until March, 1996.

¹⁴ United Nations General Assembly A/CONF.164/33 3rd August, 1995.

¹⁵ The reference to regional and subregional organizations is also repeated in Articles 116 to 120 dealing with conservation and management of the living resources of the high seas.

¹⁶ Article 5, paragraph 2, sub-paragraphs (a) - (h).

This provision does not explain whether a function of the IOTC will include the allocation of catches and the distribution of fishing quotas amongst competing users. There are obvious difficulties in obtaining State compliance with such allocation figures, but the extent of difficulty cannot be used as an excuse for not attempting allocation of resources. Ultimately, both Australia and Japan will be effected by the number of tuna which are reaching the Australian EEZ. It is therefore desirable for both parties to be involved in the IOTC and to press for clearly defined catch quotas amongst the competing fishers.

D. The International Legal Regime for Fishing HMS

Like that other fish type known as “straddling stocks” (SS) because they geographically straddle more than one jurisdiction, HMS and SS have long been ignored as a subject in international law. This is because at the time of drafting the LOSC most of the world’s fish resources were caught within the two hundred mile zones of various states. With the closure of these “two hundred mile” fishing grounds, the powerful distant water fishing states¹⁷ turned their attentions to the high seas and commenced the exploitation of fishery resources that were covered by “freedom of fishing”.¹⁸

As a result of the low priority given to HMS and SS by international law, an incident occurred in early 1995 that resulted in a diplomatic war between the European Union and Canada.¹⁹ On Thursday 9th March, 1995, Canadian patrol ships and aircraft of the Department of Fisheries and Oceans, chased down and fired with machine guns upon a Spanish fishing vessel, the *Estai* which they alleged was illegally fishing off the coast of Newfoundland.²⁰ The aim of the Canadians was to conserve threatened stocks of Greenland halibut, more commonly known as turbot.²¹ The relevant stocks straddled both the Canadian EEZ and the adjacent high seas, allowing for the application of international²², regional²³ and Canadian municipal law.²⁴ In all of these legal regimes, gaps, loopholes or flaws existed in the law, allowing for the overexploitation of HMS and SS resources. The Canadians aimed to bring these deficiencies to the attention of the international community.

Perhaps as a result of the Canadian efforts, the United Nations were motivated into increasing attempts to clarify the international laws dealing with HMS and SS. This was done via the *United Nations Intergovernmental Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks* (the IGC). The IGC succeeded in producing a Draft Agreement in August, 1995.²⁵ This was opened for signature on 4th December, 1995.

The Preamble to the IGC Draft Agreement emphasizes the need to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks.²⁶ This is to be done by (*inter alia*) asking States to address problems relating to over-utilization of stocks; unregulated fishing; over capitalized and over sized fleets; vessel reflagging; insufficiently selective gear; unreliable data bases; and lack of cooperation between States.²⁷

¹⁷ Such as the United States, Japan and South Korea.

¹⁸ Article 87(1)(e) of the LOSC. The freedom of fishing is subject to the high seas conservation and management measures described in Article 116-120.

¹⁹ The events and law surrounding this dispute have been discussed in an earlier article by this author, see Lugten G.L., “Fisheries War for the Halibut” (1995) 25 *Environmental Policy and Law* 223. The author argues that the Canadians are to be applauded for acting to fill the legal vacuum which surrounds the conservation and management of high seas fish stocks.

²⁰ *Ibid.*

²¹ The turbot is a bottom dwelling species of flatfish. Part of the complaint against the *Estai* was to do with its use of nets that were too close meshed resulting in the catch of immature, undersized fish. A mature turbot ranges from 60-70 centimetres in length and takes from 10-13 years to reach maturity.

²² From Customary International Law, the Canadians argued the Doctrine of Necessity. From the LOSC they argued on Articles 63, and 116-120.

²³ The relevant regional fishery organization was the Northwest Atlantic Fisheries Organization, and its Convention of the same name.

²⁴ The *Canadian Coastal Fisheries Protection Regulations* were amended to extend conservation measures over the Canadian EEZ as well as the relevant high seas.

²⁵ The IGC Draft Agreement is referred to above at fn. 14.

²⁶ United Nations General Assembly A/CONF 164/33 p.2.

²⁷ *Ibid.*

Despite the high ideals of the IGC and its Draft Agreement, this paper argues that they offer little solution for the problems of HMS and SS mis-management. A comparison of the IGC's 1994 Revised Negotiating Text²⁸, and the IGC 1995 Draft Agreement reveals the influence of political intervention by the powerful distant water fishing nations. Between 1994 and 1995, (despite incidents such as the *Estai* in Canada [or perhaps, because of such incidents]) the IGC Agreement has been clearly negotiated down. It appears that the losers will be the resource adjacent nations, and the environment.

Article 40 of the IGC Draft Agreement provides that it shall enter into force 30 days after the date of deposit of the thirtieth instrument of ratification or accession. The Agreement was opened for signature on 4th December, 1995. Australia was one of the earliest signatories. At the time of presenting this paper, there have been 32 signatures and 0 ratifications.²⁹

The Agreement is likely to take a considerable time before it achieves the thirty ratifications. In the interim period, both customary law and the LOSC regime (with their gaps, loopholes and flaws) will continue to prevail. When, or if, the Draft Agreement does come into effect, it will do so as a much weaker document than that which was promised by the earlier negotiating texts.

E. Conclusion

Overexploitation of fish stocks is the biggest problem in the contemporary regime of international fisheries law. Put simply, there are too many vessels, with too much equipment, taking too many fish, and this occurs regardless of management and conservation measures in both the EEZ and the High Seas. Considering this state of affairs, it seems almost an absurdity for Western Australia to possess a tuna fishery that is underexploited, and offers a high level of potential fishing activity. Thus, if the fishery is to be developed, it is vitally important that the development is done carefully, and in accordance with the precautionary principle (as stated in the IGC Draft Agreement) and ecological sustainability (as stated in the Brundtland Report).

Three possible legal regimes could impact upon this new fishery. At the domestic level, the Australian Fisheries Management Authority (AFMA) has a good record of managing fisheries under Commonwealth jurisdiction. The potential development of the WTBF and the STF would occur under the administration of AFMA, acting in accordance with relevant regional and international fisheries law. Such a three pronged approach to addressing the regime for HMS and SS is desirable as a safeguard against overexploitation of stock. However, the support that we might obtain from regional and international fishery law is doubtful. At the regional level, Australia chooses not to be a participant in the Indian Ocean Tuna Commission. Yet that organization is clearly the most appropriate regional fishery organization for States bordering the Indian Ocean rim. At the international level, in contrast, Australia has participated actively in the negotiations to create a regime for the conservation and management of high seas fishery resources. Unfortunately, at this level, it appears from the IGC Draft Agreement that we have been deprived of a workable solution that will effectively address the issue of overexploitation. That is, exactly what solutions the Draft Agreement offers to real abuse of high seas stocks, is not clear.

For AFMA, several questions must then be decided. First, should the WTBF and STF be developed? If so, what safeguards will operate to effectively manage and conserve stocks? Can Australia afford to develop an Indian Ocean tuna fishery in isolation from other affected tuna fishing coastal states? What technical advice can be passed by AFMA to the international law division of the Department of Primary Industry and Energy regarding application of the IGC Draft Agreement? The challenge will be to address these questions in a manner in keeping with AFMA's Mission 1995-2000:

AFMA is committed to excellence in managing fisheries resources, considering the needs of the marine ecosystems and current and future generations.³⁰

²⁸ United Nations General Assembly A/CONF.164/13/Rev.1 30th March, 1994.

²⁹ The Department of Foreign Affairs in Canberra advises that as a result of the 2nd March, 1996 change of Federal Government, there will be much greater parliamentary scrutiny of all international treaties prior to ratification. Given these policy changes, and considering that Australia is consistently slow or cautious in adopting maritime changes, it is unlikely that Australia will ratify the IGC Draft Agreement for some years.

³⁰ AFMA Annual Report, supra, fn.3., p.ii.

A NEW TRAINING AND RESEARCH INFRASTRUCTURE

Professor Brian Lawrence, Deputy Vice-Chancellor
Edith Cowan University

Prelude

In 1995 I was surprised when

1. Bernard Unwin came to see me. He spoke of EEZ, AMC and HSCs none of which at that time did I understand. He reminded me that the WA Coastline was 12.5 thousand kilometres, WA's land area was 2.5million sq.km and the EEZ's sea area was 4.6million sq.km. — The implication of which I *did* understand and so
2. I visited Rod Short and Ian Cartwright at the very fine Australian maritime College in Tasmania. But to do this I had to travel 4,000km from one coast to another, across a continent, leaving one ocean for another — and then back again. It was then that I began to subscribe to Kim Beazley's two oceans policy.

Well, that was 1995, but in a way 1994 was the more important year.

Triple T

In June, in London, I had the pleasure of talking with Michiyuki Enohara of the NEC Corporation, Japan, who reminded me that whereas he had heard said that Perth was the most isolated city in the world, this no longer mattered because we can now communicate with anyone, anywhere, anytime in the world and can travel within a day to most cities in the world. And if so then Michiyuki may have also been pointing the way in his further observation that the world is shrinking faster and faster as transportation and information technologies advance so rapidly. For we both observed that the triple Ts, TRANSPORT, TELECOMMUNICATIONS and TOURISM are to day being used to reshape various economic regions in the world.

I pursue the triple T notion by referring to Riccardo Petrella's proposal — he is head of Forecasting and Assessment in S&T at the European Commission. In reference to economic and social development Petrella believes in co-development which requires greater common understanding throughout the world's regions and that this in turn can be achieved through the application of transport technology, telecommunications and tourism related technology to promote intensive flows and exchanges of people, ideas, goods and services and so lead to a closer integration among the people and societies of the region and, hence, global co-development.

Three Waves In Economic Development

In this context of economic co-development you may have observed that there have been three waves in economic development strategies.

The first wave, typical of the 50s and 60s, saw states attempting to attract manufacturing Companies into regions through tax reduction schemes, new job concessions, training programmes, low interest loans and other government subsidies to lower the costs of business. As the 1980s unfolded a second wave of economic development began to take shape.

Development specialists began to realize that to help their existing firms and attract new investments, the production inputs in the local economy, a skilled workforce, risk capital, available technology, sophisticated management information and modern telecommunications — would have to be competitive in quality and cost. State government's new role was to ensure that these resources were available.

In the 1990s a third wave has emerged, the basis of which is a new realization that while government is responsible for assuring that its people and businesses have access to the resources necessary to

pursue economic success, it does not have to be the sole supplier of those resources. Most third wave economic development initiatives have moved away from government as sole service provider, instead using limited government finances and authority to engage other public and private institutions in meeting development needs.

Two such important institutions are the autonomous universities and the semi-autonomous TAFE Colleges.

Colleges And Universities

Colleges and universities are critical to economic development because they are major contributors to virtually all the elements of the emerging new economic infrastructure.

Industries — not just high tech, but traditional manufacturing, trade and service industries that must compete in global markets — seek well-trained managers, a more highly skilled work force and lifelong learning opportunities for renewing and expanding worker skills.

They also seek a strong research and technology base from which they can develop new products and services for the marketplace and access to highly qualified expertise and cutting-edge laboratories. Colleges and universities can develop new relationships — new strategic alliances — with industry groups in ways that benefit both parties and the overall economy. It is not that colleges and universities have never played the roles being discussed or had relationships with these groups. What is new is the need for all sides to work more closely together if they are to achieve their individual objectives. Effective alliances among industry, government and colleges and universities can give our state a competitive advantage in the global economy.

Professor Michael Porter, Harvard Business School, believes that academics have to take the initiative by researching systematically all aspects of the local economy and by bringing key people together to talk. Many of these efforts have led to permanent organizations and permanent activity. A small example is Boston University when a number of people recognized that Boston had some opto-electronic companies. It was really only a couple of professors who took the initiative and now Boston University has a Centre for Opto Electronic Research. Today, here in Perth, we are taking a more important and comprehensive initiative.

Maritime Education And The EEZ

Captain Rod Short, Chief Executive Officer of Australian Maritime College, in a 1995 address noted that:

“Not only has Australia the opportunity to derive great wealth from its own EEZ, it also has opportunity to take a leading role in the Asia Pacific region in providing assistance to its neighbours — particularly expert assistance — with the development and utilization of their EEZs. The growth of the maritime based economies of the region will bring economic and political opportunity for Australia. With the lead that Australia already enjoys, its role as a provider of maritime knowledge and skills is likely to grow, thereby enabling it to enjoy a mutually beneficial involvement in the maritime developments in neighbouring countries.”

Rod was, of course, referring to the AMC principally and the Asia Pacific region, whereas today we are referring to the Indian Ocean Rim and a WAMC.

The development I'm about to describe will require and involve educators, industry and government. Distance education by satellite will grow in importance.

The challenges, both academic and administrative, that will arise will be very exciting. In Western Australia we have the ability to meet those challenges and play an important role in the development of maritime education in the Indian Ocean Rim.

Perhaps most significantly will be the development of interactive distance education by satellite for people on board ships as well as in other remote places. Again, WA is well placed to take a leading role in this development.

In a world of fast moving technological development the need for marine technology transfer of information is more important now than in the past. Traditional seafarers roles have been influenced by other professions and sciences creating a requirement of a new breed of mariner. This change requires varying and innovative approaches to maritime training and education while maintaining the transfer of traditional methods to people in industry.

Traditionally, seafaring training and education has taken place on the job, at TAFE, or through a private provider. Universities have traditionally trained engineers and marine scientists but there has been no attempt to consider upgrading training of operations outside these specialties to a higher education or university level.

I argue for a holistic approach to maritime education in WA and for an attempt to coordinate a network of traditional and non traditional providers of education and training services to industry. With clearly defined career paths to be identified by expert advice from within each individual marine usage industry there will be more trained people available for the future.

One of the most difficult tasks to be faced is to redress the lack of university studies in WA. Entrenched views will need to be overcome and redirected once marine related higher education courses are made available.

The WA Maritime Industry

Three major factors impinge upon the WA industry. Firstly, workplace reform and job restructuring have resulted in a need for a multi skilled workforce which is less in numbers than before, has reduced resources and time for training, and low levels of recruitment. Secondly, there has been rapid growth in the offshore oil and gas sector often at the expense of sound research and training. Thirdly, the industry is regional and seasonal necessitating consideration of variables peculiar to the industry.

Current Education and Training Providers

The diversity of the maritime industry is reflected in the variety of education and training programmes provided by TAFE Colleges, whereas Universities are currently involved only narrowly in marine science including aquaculture (for example, Curtin University), and naval engineering (soon at Murdoch).

TAFE and private providers have been traditionally involved with entry-level courses such as national power boat and yachtmaster certificates, national shipping code certificates of competency, short courses in shipboard safety, radar, refrigeration, marine engine driving certification, first aid and radio operators certificates of proficiency and survival at sea. The WA Fishing Industry Training Council conducts courses in induction and safety for the maritime and pearling industries.

The Australian Maritime College holds a unique position in maritime education and training as it is the only purpose-built marine education institution in Australia. Its courses are pitched at TAFE and higher education level in fishing, marine operations, nautical science, shipping, port and terminal management, maritime electronics, marine engineering, naval architecture and marine surveying.

Potential Research Areas

The EEZ has tremendous potential for research and the CSIRO has indicated that all areas of the industry can benefit from an increased research effort. As a sample, these specific research and development activities include:

- Gathering detailed information on the biological status and distribution of new and existing wild fishery resources;
- Increasing the productivity of aquaculture species;

- Developing methods for monitoring and minimizing environmental impacts of aquaculture farms and fishing activity;
- Improving gear, catching and processing techniques;
- Investigating agrochemical and animal health products as derived from marine sources;
- Developing a “ship of the future” to compete with air and land transport of goods;
- Developing a range of new vessels and equipment to aid in the exploration of the EEZ and on-sell this expertise internationally; and
- Monitoring the impact of shipping upon the environment.

Specifically Edith Cowan University

The following developments have been proposed to ECU and will be seriously considered by the University for implementation:

- 1: That the ECU ACCESS programme to include a focus on competencies needed on power and sail boats.

Comment: Given the huge usage of recreational craft in WA it appears that a significant cohort of students could be interested in developing competencies in small craft management, maintenance and transport. Such courses would include study towards the achievement of Australian Yachting Federation Instructor's Certificates of competency. Any courses provided at a higher education level would need as pre-requisites relevant TAFE level courses.

- 2: The ECU Bachelor of Science (Environmental Management) increase its emphasis upon marine and aquatic reserves.

Comment: The BSc (Environmental Management) includes two units, Coastal and Marine Management and Water and Wetlands Management, and could be expanded to include more emphasis upon marine and aquatic reserves, especially in the CSIRO-identified effects of shipping on marine environment health. Liaison with the joint CSIRO/State Government Leeuwin Centre is necessary.

- 3: That the fishing industry be examined with the view to developing a higher education top to current TAFE and privately provided courses in particular a BSc in Fisheries.

Comment: Only 3% of personnel within the fishing industry are tertiary qualified. However, it is not known whether this is a satisfactory level or not. The industry is proactive in examining its training and education needs and it is opportune for ECU to offer assistance to WAFIC in its ongoing needs analysis if required. A possible model is the AMC BSc in Fisheries.

- 4: That a watching brief be placed upon developments in the HSC industry.

Comment: The HSC industry should be viewed as “operations” and “shipbuilding”. Information indicates the ship building industry is well served at a higher education level. However, as the industry grows in size, and with increased technology, it is anticipated that demand for higher level courses will be required. This growth needs to be monitored by education providers. With regards to operations the ECU BSc (Aviation) model, which allows school leavers and experienced pilots to enrol, seems to be a good model for the operations area. The course should include technical and managerial skills and have regional and international Applications.

- 5: That further investigation should be carried out on assessing the training and education needs of the off-shore oil and gas industry.

Comment: So far, the prospects for training in this industry have not been ascertained. However, some interviews have suggested that the entire off-shore area requires unique management skills and knowledge. Often it is assumed the problems facing management on the seas are the same as those on land—they are not. This area is worthy of future investigation.

- 6: That marine tourism and ecotourism be added to the current ECU Executive and graduate courses as well as being included in the undergraduate major in Tourism.

But the above developments within ECU are in themselves insufficient. A new education, training, R&D infrastructure to support the maritime industry in WA is required.

Proposal For A New Training And Research Infrastructure

- (i) The South Metropolitan College of TAFE and ECU sign a strategic alliance to establish a maritime network in education and training, R&D and consultancy services. The alliance will utilize the experience and facilities of each organization and other future network parties from the public and private sectors to efficiently use existing and future resources. The alliance will focus on the maritime capabilities of WA including but not limited to, training, education, R&D, products and services in:

Physical marine sciences;
Biological marine sciences;
Maritime law, economics and Occupational Safety;
Maritime and ecotourism;
Maritime hospitality and tourism;
Naval Architecture;
Boat building;
Ocean engineering;
Coastal engineering; and
Marine and coastal environmental management.

The alliance will represent a “virtual maritime college” with all participating organizations maintaining their independence but recognizing the strength of the network. A small secretariat brokering the network internationally and arranging consortia for individual projects will be established.

- (ii) The strategic alliance will evolve into the establishment of a Co-operative Centre for Teaching and Research in Maritime Studies which could be established as a not-for-profit incorporated company with shareholders. The shareholders will be those parties who make a commitment to the Centre and on this basis be represented on the Board of Directors. It is expected that a number of expert groups representative of the maritime industries will emerge and while not investing directly in the company will form consultative boards and provide advice to the Board of Directors on issues related to their particular fields.

Functions of the Centre

The mission is to create a centre of excellence in Maritime studies that will serve as a catalyst for the continued expansion of a Western Australian maritime industry to a level of international prominence in quality and quantity of services.

Education and Training

The Centre's main role in education will be to facilitate maritime education in the state. It will not become a major education provider itself. Rather, it will seek to work with key providers of maritime education to ensure that an overall strategy is formed and that strategic objectives are met. Key responsibilities will be:

- Expanding the Skill Base — ensuring that the skill base of people trained in maritime occupations is expanded to meet the needs of a growing industry through increasing the number of graduates from maritime programmes, multi-skilling across relevant disciplines and upgrading of professional skills.
- Efficient and Effective Course Delivery — ensuring that courses are articulated across providers, are non duplicating and address current and future developments. Attention will be given to ensuring that components of maritime courses can be included in other courses.

- Raising and Maintaining Quality — ensuring that the quality of maritime education is of world standard by:
 - (i) assisting education providers keep abreast of leading edge developments;
 - (ii) assisting education providers through provision of state-of-the-art equipment and facilities;
 - (iii) facilitating strong feedback links between education providers and industry and other users, both corporate and individual; and
 - (iv) dissemination of techniques and knowledge developed through research.

Research

The Centre will facilitate research in maritime and related areas in that it will:

- encourage the formation of collaborative research teams involving researchers, industry and other users;
- ensure that the benefits of research flow through to industry and other users and provide a feedback link between the needs of industry and other users to research groups;
- directly link research to education through postgraduate student projects and placements and by involving research groups in course development. The Centre will also invest directly in research projects where it can be demonstrated that research results have the potential to deliver significant competitive advantage to industry in the short and medium terms.

Industry Development

The Centre's role in industry development will be focused on:

An important role of the Centre will be to act as a project broker to stimulate the production of programmes and services in Western Australia. It will assist by organizing networks or teams of specialists who will then contribute their relevant skills to facilitate the production of products. The Centre would, as a project broker, identify the potential, assemble the relevant expertise, arrange finance, oversee the completion of the project and arrange national and international distribution if appropriate. During the course of such a project, other services may also be required such as market research, marketing and legal/copyright expertise. The Centre could also provide or source these services.

- (iii) The Maritime Centre would itself evolve into the equivalent of the Fisheries and Marine Institute of Memorial University of Newfoundland, ie. the Maritime Centre could be established under statute as a constituent or affiliated body of Edith Cowan University. Current models are the WA Academy of performing Arts, established under its own statute as a part of ECU, and the Kalgoorlie College incorporating the WA School of Mines established under its own act as part of Curtin University. Both organizations provide TAFE and university programmes as does the AMC. Given the essential international nature of the maritime industry (the Triple T effect) and the objectives of the proposed organization as a network, it would be appropriate to consider establishment of the Maritime College as an International Maritime College, comprising a network of Indian Ocean Rim and other international members.

The Three Vs

Let me now explain ECU's role in this initiative —

1. The University will facilitate the establishment of a virtual WA MC system within 1-2 years.
2. This will proceed in some form either minimally within ECU or optimally as a co-operative network of providers.
3. Although ECU will be the vehicle for making the running, it will do so only on behalf of its joint venture partners.
4. ECU is a catalyst. It does not equate leadership with ownership. It currently is building a maritime industries programme. But this is insufficient, why?

5. Because ECU expects the project to be industry led and for industry to provide real support and give clear direction. Industry is the driver, ECU the vehicle. And we are today picking up passengers and paying passengers at that.
6. ECU will provide \$.25m over three years to support initial preparations and establish a secretariat.

So, we are on the starting blocks.

As we go forward with this enterprise three ingredients will be necessary — the three Vs

1. Vision — a shared Western Australian Vision.
2. Values — here I refer to standards and quality which are excellent.
Anything else will not succeed.
3. Verve — An audacity to have a go at it. We will need enthusiasm and sustained energy and vigour — and plenty of it.

And let's have a bit of fun as we work together — we'll make mistakes for sure as we go forward for I am reminded that Queen Isabella of Spain, the world's first venture capitalist, in the 16th Century funded Columbus to go to the West Indies and his mistake was that he discovered the United States — some mistake, some adventure!

SUMMARY OF FINAL SESSION — “MAKING THE FUTURE HAPPEN”

**Mr Bernard Unwin, Director
Maritime Education and Training Service**

The final session of the Maritime Industries Seminar was presented by Professor Brian Lawrence, Deputy Vice-Chancellor, Edith Cowan University and drew together the focus and direction derived from the fine presentations of the earlier speakers.

A particular feature of this final session was the live inter-active television delivery to a panel of regional representatives at Edith Cowan University’s Bunbury Campus, 120 kilometres south of Perth. The Bunbury panel represented the Port Authority, Chamber of Commerce, Department of Commerce and Trade and the local ECU campus.

Professor Lawrence’s theme “A New Training and Research Infrastructure” opened by reminding delegates of the physical size of the coastline and associated waters adjacent to the Western Australian Coastline and emphasizing the need to implement the two oceans policy into Education, Training and Research on the western side of the Australian continent.

To develop and reinforce the need for this particular Western Australian thrust, Professor Lawrence reminded the conference, by his paper, of the necessity to work co-operatively by institutions, industry and government towards creating a Western Australian Maritime College within three years, to service Western Australian and the Indian Ocean Rim maritime industries with an innovative technology transfer using the latest technological methods available.

Following the Deputy Vice-Chancellor’s paper all speakers:

Mr Les O’Reilly and Mr Roger Pearson (Memorial University, Newfoundland, Canada);
Ms Marie Corrigan (Manager, Virtual Campus, Edith Cowan University);
Mr Harry Rogers (retired General Manager, Kailis and France Group of Companies);
Mr Anthony Tate (Managing Director, South Metropolitan College of TAFE);
Ms Gail Lugten (Legal Studies Course Coordinator, Edith Cowan University); and
Professor Brian Lawrence (Deputy Vice-Chancellor, Edith Cowan University)

were assembled for a Panel Review and general question session.

For this session the Bunbury panel were displayed on the large screen behind the speakers and led the question period by directing questions to the main panel whose responses were seen live on a television monitor at Bunbury.

Having crossed to Dr P. Quantick at Humberside University in England, earlier in the sessions, this demonstration of being able to communicate — in real time — strengthened the ability for Western Australian Institutions to service remote locations for maritime and related teaching.

Most of the questions from the floor and through the TV link were addressed and perceived difficulties with costs of implementing real time studies with students at sea, and in some cases offshore rigs, as opposed to costing for the more traditional study methods. With consultation with other panel members, the Professor indicated that as the development in communications increases, cost should reduce to a viable level. However in the initial stages of setting up the facility the cost factor of delivery would be dealt with by use of the more familiar deliveries of study.

From canvassing and discussions with a cross section of the conference guests, at the conclusion of the Seminar, the consensus of the days proceedings was positive and hopeful for the continuing development of a Western Australian capability to provide all aspects of Maritime Education, Training, Development and Research.

The suggestion of outlining career paths for entry into the maritime field, together with the introduction of higher learning as a logical career path to traditional courses was observed to be a timely contribution.

Most delegates canvassed also remarked on cost savings to students from Western Australia and our near northern neighbours by not having to travel to the Eastern Australian seaboard to attend specialized marine related courses.

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