

**PARLIAMENT OF AUSTRALIA  
HOUSE OF REPRESENTATIVES STANDING  
COMMITTEE ON COMMUNICATIONS,  
TRANSPORT AND THE ARTS**

**INQUIRY INTO MANAGING FATIGUE IN  
TRANSPORT**

**SUBMISSION BY**

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**June 1999**

## EXECUTIVE SUMMARY - INQUIRY INTO MANAGING FATIGUE IN TRANSPORT

### Marine Pilotage

The prime reason for pilotage is safety. Marine pilots manage a high-risk operation in a hazardous environment. The public interest is served by the safe manoeuvring of ships in confined harbours. Protection of valuable port infrastructure and sensitive environmental coastal areas is paramount. A collision or blocking of a channel in the approaches to capital city, strategic bulk export or crude oil import ports, arguably could be just as catastrophic as an incident on the Barrier Reef.

### Fremantle Pilots

Fremantle Pilots provide exclusive pilotage to the Port of Fremantle. Significant benefits for port users and pilots ensued when the service was privatized. However, this necessitated changing to twelve-hour shifts and working the port on a twenty four-hour basis. Jobs at all levels of the skill spectrum are now performed when a pilot's circadian rhythm is at its lowest ebb. Two more pilots have been employed to help reduce the risk of fatigue and counter the significant growth in pilotage movements, unforeseen when the original agreement was being negotiated. Obtaining agreement amongst the parties without mutually agreed fatigue guidelines has been difficult.

### Factors Affecting Fatigue

Potential fatigue related harbour pilotage incidents can be attributed to the following:

- **National Competition Policy and 'Economic Rationalism'**  
The advent of the National Competition Policy, 'Economic Rationalism' and 'privatization' of many pilotage services has highlighted a number of fatigue related shortcomings.
- **Lack of Minimum Standards or Guidelines**  
Fatigue within the pilotage profession has not received enough attention. There has been an ad hoc, piecemeal and highly subjective individual approach to manning, the number of jobs per pilot per shift, length of shifts, number of days off, type of piloting and allowances for the cyclical nature of shipping. Minimum standards need to be developed. The process should be consultative and mutually acceptable to all stakeholders.
- **Privatization of Pilotage Services - Consequences**  
The lack of industry fatigue standards allows undesirable disagreements between private providers of pilotage and port authorities. Without clear ground rules and adequate growth arrangements, pilot companies may not be willing to employ extra pilots.
- **Time-On-Task**  
Different interpretations of 'time-on-task' have caused significant problems. Port authorities routinely quote the time between 'pilot on board' and 'time off the ship'.

For fatigue management purposes the definition should be:

***'Time on task begins when a pilot is called to service and ends when he or she is relieved of all pilot-related responsibilities.'***

### **Standards of Training Certification and Watchkeeping Hours of Work Regulations (STCW)**

Some pilotage providers use parts of the STCW Convention as a guide. The hours are 'prescriptive' and do not recognize the 'time of day' effects. As a result they are not really suited to harbour pilotage and could compromise safe fatigue management.

### **Centre For Sleep Research (CFSR) - Computer Software for Fatigue Management**

The CFSR work on a computer fatigue software programme became available about fifteen months ago. It became obvious that prior to its implementation, whatever means had been used before had been inaccurate and crude. At times pilotage organizations had albeit unknowingly, probably been exceeding acceptable fatigue score levels.

### **Conclusion**

Harbour Marine Pilotage is an essential public service. The very serious implications of fatigue related accidents in approaches or harbours warrant specific research and attention.

Workable, independent and scientifically validated fatigue management systems, mutually acceptable to all stakeholders, are considered essential for successful outcomes.

### **Recommendations**

- 1. Prescriptive hours of work regulations be re-stated as a singular Occupational Health and Safety (OH&S) issue.**
- 2. Work related fatigue to be managed under OH&S legislation directed toward managing 'identified workplace hazards'.**
- 3. The National OH&S Commission (Work Safe Australia) should form a working party to create minimum standards and a draft code of practice.**
- 4. Develop a coordinated National Awareness Programme.**
- 5. Establish a National Co-operative Research Centre in Fatigue Management.**
- 6. Implement practical and safe fatigue management guidelines specifically for the pilotage profession.**
- 7. Further develop the CFSR computer fatigue management software programme and tailor it for the specific needs of the pilotage profession.**
- 8. Determine and adopt a realistic definition of 'Time-On-Task' as a national standard.**
- 9. Instigate a study into the long-term effects of shift work on pilots' health and reduction of life expectancy.**

10. **Research into fatigue to be conducted within the marine pilotage profession and not extrapolated from other areas of the transport industry.**
11. **Conduct a feasibility study into developing a model incorporating all the human factors involved in the management of a pilotage service.**
12. **The Standing Committee examine the following papers related to fatigue:**
  - **IMO Maritime Safety Committee Document MSC 70/13 - 9 June 1998**
  - **A Predictive Model of Work Related Fatigue Based on Hours-of-Work - Drew Dawson**
  - **Human Factors in Marine Pilot Operations - Vincent Cantwell**

## **INQUIRY INTO MANAGING FATIGUE IN TRANSPORT**

### **Marine Pilotage Background**

Compulsory marine pilotage has evolved over 2500 years. The prime reason for pilotage is safety and includes:

- efficient and expeditious movement of ships in and out of harbours for the strategic benefit of the port and customers
- safety and protection of port infrastructure and assets
- prevention of collisions and groundings
- protection of the environment
- prevention of marine pollution.

Marine pilots are highly trained expert shiphandlers with extensive local knowledge and experience who manage a high-risk operation in confined and hazardous waters, when ships are most vulnerable to accidents. Pilots are not advisers and have navigational 'conduct of the ship.'

There is a very strong public service interest element in pilotage. This has been well articulated, especially in the United States:

***Pilotage is a 'unique institution and must be judged as such'.  
United States Supreme Court 1947***

***'Piloting is an essential service of such paramount importance  
that its continued existence must be secured by the state and may  
not be left to market forces.'  
State of Florida Legislature 1997***

The importance of marine pilotage is also highlighted by the statements of the Secretary General of the International Maritime Organization (IMO) Mr. William A. O'Neil:

***'There are few members of the shipping industry who are so vital to safety as pilots.'***

***'Pilots are at the apex of the professionals in the industry when it comes to navigational skills, knowledge, experience and shiphandling'.***

Management of fatigue within the marine pilotage profession is considered essential. Mr. Paul Neville MP in his call for submissions mentions lack of community attention for the marine segment and the consequences of a fatigue related maritime accident on the Great Barrier Reef. The human, environmental and economic cost of collision, stranding or blocking of channels in harbour approaches to capital city ports, strategic bulk export ports and crude oil import refinery facilities arguably could be just as catastrophic than an incident on the Barrier Reef. Whilst AMSA has been taking a keen interest in coastal pilotage fatigue related matters, until recently, little attention has been paid to fatigue for harbour marine pilots.

### **Fremantle Pilots**

Fremantle Pilots is a group of twelve pilots providing exclusive pilotage to the Port of Fremantle by way of a five year Pilotage Agreement (PA) with the Fremantle Port Authority (FPA). Ten of the pilots were former employees of the FPA and formed a private company in 1994 after negotiating an employee 'buy-out'. The pilot company became Quality Assured under ISO 9002 in May 1999. Maintenance of high professional standards and skills are high company priorities. To this end, continuation training, professional development and representation at international and national pilotage and marine related conferences and seminars has been undertaken assiduously since the company was formed.

With the advent of 'privatization' significant benefits for the port users, the port authority and the pilots ensued. Inflexible shift hours and protracted industrial award negotiations were a thing of the past and the port benefited from a 50% increase in pilot availability. Pilots had more control over their affairs and received better remuneration.

However, the downside was changing from eight-hour shifts to twelve-hour shifts and the provision of pilots to work shifts on a twenty four-hour basis. Prior to the 'buy-out' it was most uncommon for ships to be moved between midnight and four in the morning. Now jobs at all levels of the skill spectrum are performed when a pilot's circadian rhythm is at its lowest ebb, particularly between 0200 and 0500.

The Pilotage Agreement was based on shipping levels not exceeding 3% per annum for the duration of the Agreement. Growth far exceeded the forecast and reached about 18 % within eight months of the 'buy-out'. The growth continued unabated and an eleventh pilot was employed. The number of pilotage movements per annum exceeds 4000 to 29 different berths in an Inner and Outer Harbour. The length of the pilotage varies between thirty minutes and four hours for a 23-mile transit of a

large deep draft tanker using a Dynamic Under Keel Clearance (DUKC) Computer program.

Within the last six months the Pilotage Agreement has been extended for another twelve months and a twelfth pilot employed to help counter growth in pilotage movements and reduce the risk of fatigue. The pilot company has not been able to reach agreement about the levels of pilotage, which should trigger additional pilots on shift to share the workload. This has been mainly due to a lack of formal industry standards and guidelines for the management of pilotage, coupled with contractual and financial constraints. The commercial pressures to reduce costs are, we believe, tending to drive down safety standards.

The issue is not a simple one and there are a number of inextricably linked factors affecting fatigue. The main reasons for the difficulties identified above and the potential for fatigue related incidents occurring within harbour pilotage can be attributed to the following points.

### **National Competition Policy and 'Economic Rationalism'**

The advent of the National Competition Policy, 'Economic Rationalism' and 'privatization' of many marine pilotage services has highlighted a number of shortcomings of the management and organization of pilotage services specifically relating to fatigue.

### **Lack of Minimum Standards or Guidelines**

There has been an ad hoc, piecemeal and highly subjective individual approach to determining:

- manning levels for a particular pilotage district
- the number of pilotage jobs per pilot per shift based on the type and duration of pilotage
- the length of shifts
- the optimum number of days off to allow a pilot to return to duty not suffering from residual fatigue
- allowances for the nature of piloting - e.g., repetitious short sharp, high stress level jobs involving high skill levels when undertaking a sequence of berthing and unberthing evolutions
- adequate allowances to cater for the peaks and troughs associated with the naturally cyclical nature of shipping
- mitigation of long-term health problems.

### **Privatization of Pilotage Services - Consequences**

Lack of industry standards has the potential to allow undesirable effects, both economic and operationally, to occur when dealing with Pilotage Agreements between private providers of pilotage and either statutory port authorities or large commercial 'private port' operators. It can lead to disputation, disagreement and misunderstanding about safe manning levels and hours of work conflicting with adequate financial remuneration, when there is significant growth in shipping. Without clear ground rules mutually agreed to by both parties, there could be a tendency for pilots not to employ extra pilots because they would be financially disadvantaged.

### **Time-On-Task**

The definition of 'Time-on-Task' has historically caused significant problems between pilots and statutory port authorities. During more adversarial times when industrial award negotiations were conducted port authorities employed the tactic of denigrating pilots working hours by selectively quoting the equivalent of an airline pilots 'stick time'. They routinely quoted the times a marine pilot worked as the time between pilot on board and time off the ship. Occasionally the time would be counted between the time a pilot reported to the pilot station and the time he or she returned to the rooms on completion of the job. Neither of these methods to calculate time on task is appropriate to adequate fatigue management. For fatigue management purposes the definition should be:

***'Time on task begins when a pilot is called to service and ends when he or she is relieved of all pilot-related responsibilities.'***

Many pilotage districts are quite large involving lengthy land and water transits to and from pilotage jobs. It is therefore considered inappropriate to quote time on task figures previously used in the context of industrial relations.

### **Standards of Training Certification and Watchkeeping (STCW) Hours of Work Regulations**

As there are no industry or professional standards for marine pilots to manage fatigue some pilotage providers have used parts of the STCW Convention dealing with maximum hours of work and rest periods for seagoing watch-keeping officers and crews. Essentially they provide for a maximum work time of 14 hours in any 24-hour period, with a minimum rest period of 10 hours, which can be split into two periods with one period not to be less than 6 hours.

These have been used as a rough guide, but unfortunately are not really suited to the highly specialized and demanding nature of intensive harbour pilotage. Consequently they are regarded as having significant disadvantages and could compromise safe fatigue management on the following grounds:

- the hours are 'prescriptive' and do not recognize the 'time of day' effects
- they are designed for seagoing watch-keepers in both open sea and coastal situations, but most of the time the majority of ships are operating deep sea in a relatively unstressed state
- they do not take into account stress and skill levels, or the high degree of acute bouts of prolonged or repetitious concentration required in harbour pilotage

- ships also make provision for regular meal breaks. Whereas it is not uncommon for pilots to miss out on a meal for up to twelve hours if they are engaged in short repetitious jobs, or are engaged in long land or water transfers and arrive on board outside designated meal times
- they do not take into account travelling time to and from work.

### **University of South Australia Centre for Sleep Research - Fatigue Management Software**

During the last fifteen months a new fatigue management tool has been available to pilotage organizations. Associate Professor Drew Dawson, of the Centre for Sleep Research (CFSR), presented a paper at an international marine pilot's conference in Brisbane in March 1998. As a consequence of his work relating to fatigue effects and correlation between hours worked and a mental acuity level related to a Blood Alcohol Equivalent, a fatigue software program adapted to monitor individual marine pilots hours of shift work fatigue scores became available.

It soon became apparent to a number of pilotage service providers that whatever means had been used to regulate fatigue before had been inaccurate and crude. At times pilotage organizations had probably been exceeding acceptable fatigue score hours due to too long periods on shift and insufficient time off duty to recover adequate sleep 'credits' before returning to duty. Some adaptation to the programme has occurred to make it more marine pilot specific. But more work is needed, as presently it does not take into account the type of pilotage work involved with respect to prolonged periods of high risk, skill and stress levels associated with demanding pilotage jobs, as opposed to what may be described as 'run of the mill' harbour transits. Also, the software is primarily designed to protect the employer, rather than determine the pilot's true level of fatigue.

### **Minimum Standards, Guidelines and Code of Practice**

Fatigue within the pilotage profession has not received enough attention in the current environment of extended working hours. Statistically the rate of marine pilotage accidents in the past has been quite low. Also fatigue has only been identified as a contributing factor in a small number of cases. Despite this, it is essential that more fatigue research be done for both harbour and coastal pilotage. Because of the vital importance of marine pilotage as an essential service, with its large public interest component and highly specialized nature, it is considered the fatigue issue within the marine pilotage profession is dealt with separately.

Short to mid term fatigue issues are the subject of some work, but many pilots are also concerned about long term effects on pilots health and longevity. Very few studies have been conducted specifically into pilots and most are quite dated. The Port Phillip Sea Pilots commissioned one that is pertinent to Australia in 1984. It is titled 'An Occupation At Risk' and was written by Yossi Berger.

Development of minimum standards, guidelines and a fatigue management code of practice require a holistic approach. The process should be consultative and have the support of all stakeholders in the industry, particularly the pilots and port authorities.



Also, the end user of the service should be confident in the knowledge that the pilot attending his ship is adequately rested and able to perform at the peak of his ability. Knowing that a sophisticated, scientifically valid and credible fatigue management system was in operation would be in accordance with the latest tenets of occupational health and safety requirements, quality assurance and aspirations of world's best practice.

### **Fatigue Material and Documentation**

It is recommended the Committee examine the following documents and papers related to fatigue:

- **IMO Maritime Safety Committee Document MSC 70/13 - 9 June 1998  
Role of the Human Element in Maritime Casualties  
Formal Safety Assessment Annex 1 - FATIGUE**
- **A Predictive Model of Work Related Fatigue Based on Hours- of-Work  
Adam Fletcher and Drew Dawson  
Centre for Sleep Research, University of South Australia**
- **Human Factors in Marine Pilot Operations:  
Managing Fatigue, Alertness and Endurance in Marine Pilot  
Operations  
Vincent Cantwell, The Human Factors Group**

### **Conclusion**

Harbour Marine Pilotage is a vital and essential service of significant public interest. The very serious implications of fatigue related accidents in approaches or harbours warrant specific research and attention.

Workable and independently validated fatigue management systems mutually acceptable to pilots and ports authorities are considered essential tools for successful outcomes. Their adoption would also inculcate confidence in port customers and strengthen the quality assurance image service providers are striving to achieve.

The Standing Committee's initiative in conducting an inquiry into fatigue in the transport industry is timely and commendable. Fremantle Pilots are pleased to be able to make a submission. It is hoped tangible benefits will ensue from the Inquiry.

## Recommendations

### General

1. DOT prescriptive hours of work regulations should cease and be re-stated as a singular OH&S issue with the employer and employee having shared responsibility.
2. The National OH&S Commission (Work Safe Australia) form a working party to create minimum standards and a draft code of practice in a similar manner to other workplace hazards. Representation to come from the scientific community, industry and regulators.
3. Work-related fatigue to be managed under the global provisions of current OH&S legislation. Organizations having an 'identified workplace hazard' would be required to produce a 'demonstrable process of risk management for fatigue'.
4. Develop a coordinated National Awareness programme that increases community awareness of the dangers associated with fatigue and promotes and distributes educational and training materials.
5. Establish a National Key Centre or Co-operative Research Centre in Fatigue Management funded through the ARC Industry Collaborative programme. Research funding to be spread between basic, applied preventative and evaluative research. The Centre would:
  - better quantify the community costs of fatigue
  - develop effective counter-measures for fatigue in the transport industry
  - coordinate researchers and industry in the development of effective and practical fatigue management systems.

### Harbour Marine Pilotage - Specific Recommendations

1. Increase research significantly to enable the adoption of practical and safe fatigue management guidelines for port authorities and providers of pilotage services. The process needs to be consultative and acceptable to all sectors of the maritime industry.
2. Further develop the Centre for Sleep Research (CFSR) fatigue management software programme to make it even more specific and valid for harbour pilotage rostering systems.
3. Determine and adopt as a national standard a realistic definition of 'Time-On-Task' for use with CFSR fatigue software programme.
4. Conduct research to assess the long-term effects to pilot's health and reduction of life expectancy due to the nature of their work and life style. Quantify and monitor the adequacy of the fatigue management systems designed to overcome or mitigate the effects.

5. **Conduct research and development from within the profession. It should not be extrapolated from other areas of the transport industry.**
6. **Develop guidelines or a model for the human factors involved in the management of a pilotage service. Although harbour pilotage is very 'port specific', it should be possible to develop a model which takes into account:**
  - **the nature and type of the pilotage district e.g., if it is in effect one or two ports**
  - **the working hours of the port**
  - **the level of service required**
  - **the number of pilotage movements conducted per annum**
  - **growth factors**
  - **length of pilotage movements**
  - **the length of pilot transfers both by water and land.**

**Armed with all the relevant information the following could then be determined:**

- **number of pilots required**
- **type of roster arrangements - shift or ladder system**
- **length of shifts**
- **days rostered off duty**
- **a validated fatigue management plan.**