

# **The Washington State Ferries Risk Assessment**



## **Executive Summary**

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**Prepared for:**

**Blue Ribbon Panel on Washington State Ferry Safety**

**and**

**Washington State Transportation Commission  
Olympia, Washington**

**By:**

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# WASHINGTON STATE FERRIES RISK ASSESSMENT EXECUTIVE SUMMARY

The Washington State Transportation Commission, at the request of the State Legislature, established an independent Blue Ribbon Panel to assess the adequacy of provisions for passenger and crew safety aboard the Washington State Ferries (WSF). On July 9, 1998, the Blue Ribbon Panel engaged a consultant team from The George Washington University Institute for Crisis, Disaster, and Risk Management and Rensselaer Polytechnic Institute/Le Moyne College. The team provides a unique combination of maritime operational experience and a record of successful maritime risk assessment projects. During the last five years, this team has completed formal risk assessments in Prince William Sound Alaska and the lower Mississippi River developing and testing the methodologies used in this study, and has provided risk management support to the U.S. Coast Guard, the Washington State Office of Marine Safety, the Port of Houston, and The Government of Argentina. The tasks assigned to the consultant team were:

- to assess the adequacy of passenger and crew safety on the Washington State Ferries,
- to evaluate the level of risk present in the Washington State Ferry system, and
- to develop recommendations for prioritized risk reduction measures, which, once implemented, can improve the level of safety in the Washington State Ferry system.

The report provides a description of the consultant team's approach, the results of the risk analysis, conclusions and recommendations. In addition, the report provides discussion of fundamental changes occurring in and around the Washington State Ferries (WSF), which are occasioning new organizational, technical, and management requirements, and the impact of these changes on the level of risk in the WSF. The report provides an evaluation of risk in the current system and the risk under potential future scenarios. Risk may be defined as the product of the probability (likelihood) of unwanted events and the consequences of these events. The approach to risk management developed in this report is to provide guidance for reducing accident likelihood (safety management) and minimizing accident consequences.

The report is structured to take the reader from the general to the specific, with full detail provided in technical appendices. Section I provides a summary of the survival craft issue that led to the commissioning of this study, an overview of the risk factors inherently present in the WSF and a brief description of the WSF operational environment. Section II contains the general conclusions and policy recommendations developed by the project team based on risk models, data analysis, and observations of the operations of the WSF system. Section III provides a framework for the characterization of maritime risk and an overview of the risk assessment methodology used. Section IV provides specific findings as well as important detailed results that support the conclusions and recommendations in Section II. These findings stem from the analysis using modeling tools developed under the framework in Section III, specifically the dynamic simulation risk model and the historical data analysis. Three technical appendices contain the detailed documentation required to support the more descriptive discussion presented in this report.

## **General Conclusions**

Based on their expertise, analysis, and observations throughout the study, the consultant team arrived at the following general conclusions:

1. The Washington State Ferries has a historical safety record that compares favorably with other maritime and non-maritime surface transportation modes.
2. There is inherent risk in managing a complex, large scale system such as the Washington State Ferries.
3. The Washington State Ferries must operate in a changing environment and this suggests that systems, practices, and procedures, that have provided an adequate level of safety in the past, will not be adequate to meet the demands of the system in the future.
4. The regulatory environment affecting auto ferries has changed significantly with the implementation of 46CFR199 (Sub Chapter W) which requires that the WSF address the response to potential catastrophic accidents and ensure that passengers could survive such accidents
5. Accident prevention in the WSF can be improved by enhanced safety procedures, improved organizational and management systems, and the development of an enhanced safety culture within the Washington State Ferries. This safety culture must be consistently expressed both in the leadership and policies of shoreside operations and management and in the leadership of ferry deck and engineering officers.
6. Accident response and consequence management in the WSF can be improved by developing an effective, coordinated emergency and crisis response system, which is necessary to minimize the consequences of a potentially catastrophic accident.
7. Despite the need for effective accident response and consequence management, neither the Washington State Ferries nor public safety agencies, including the Coast Guard, have developed and exercised the plans and procedures required for an effective, immediate and coordinated response a catastrophic event.
8. Several initiatives within the Washington State Ferries have already begun to enhance safety and address prevention and response needs.
9. To some extent, questions about the need for additional survival craft in part occasioned the WSF Risk Assessment. However, analysis of potential collision scenarios demonstrates that in less than ten percent of these scenarios additional survival craft are one of the viable alternatives to provide additional time for response and prevent further injuries or casualties.
10. The results of the WSF Risk Assessment can be an effective risk mitigation tool in the years to come.

## **Specific Recommendations**

Sixteen specific risk reduction recommendations are cited in the report. Recommendations derived from the analysis were divided into three categories: (1) general risk management recommendations for the Washington State Ferries to manage risk in the system, (2) recommendations for reducing the likelihood of accidents, and (3) recommendations for minimizing the potential consequences of accidents. In addition, four areas for additional study and analysis were identified by the consultant team.

In terms of general risk management, it was recommended that the Washington State Ferries should improve its capabilities to detect and manage risk and to prepare for potential emergencies. This requires a continuing set of systems, capabilities, and structures in order to

be effective. Maintaining and enhancing safety in the Washington State Ferries requires management and resources devoted to risk prevention, accident response, and consequence management. Specific recommendation in the area of risk management state that the Washington State Ferries should:

1. enhance its ability to manage risk by making organizational changes and process improvements in four general areas:
  - the creation of a *system monitoring capability* that will provide a continuous ability to assess the level of risk and will detect hazardous situations and conditions,
  - the improvement of *consequence management systems* to ensure that the impacts of a crisis or disaster will be controlled and/or minimized,
  - the facilitation of the *information, planning, and leadership infrastructure* required to implement an effective risk management strategy, and
  - the creation of an *organizational culture* supported by management, operations, and shipboard personnel that will inherently mitigate risk by ensuring that small errors are not allowed to propagate into grave consequences,
2. continue to demonstrate leadership in effecting the changes to the safety and organizational culture necessary to insure safety in WSF system operations,
3. develop and maintain an information infrastructure that facilitates information sharing and communication of safety critical information,
4. actively participate in and support the Puget Sound Marine Committee (PSMC) to increase risk management communication and enhance emergency preparedness,
5. use the database and modeling capabilities developed during the Washington State Ferries Risk Assessment Project to support risk management and decision making and to assess the impact of future changes in the operating environment.
6. use this risk assessment as the system safety assessment required by Subchapter W.

It was further recommended that:

7. the Washington State Ferries and local public safety agencies and the U.S. Coast Guard should strive to meet the highest possible standards for disaster preparedness and planning for potential mass casualty events,
8. the Washington State Transportation Commission and the Washington State Legislature should provide the necessary policy and budgetary support to improve the Washington State Ferries safety infrastructure and level of emergency preparedness.

Reducing the likelihood of accidents: it was recommended that the Washington State Ferries should continue to implement safety management and training programs, provide adequate relief crews as necessary to accomplish training, and coordinate with the Coast Guard to minimize the likelihood of an accident. Specific recommendations in the area of reducing the likelihood of accidents state that the Washington State Ferries should:

9. implement the International Safety Management (ISM) system fleet wide, continue to integrate and expand its safety management, emergency preparedness, and training programs, expand the capability of its operations center,
10. investigate using simulators to support shipboard team training, and ensure that all personnel are properly trained for their fire fighting and other emergency management responsibilities,
11. develop personnel selection, certification, and re-qualification criteria, and investigate the use of proficiency and currency monitoring (e.g. check rides) for high speed ferry masters and mates.

It was further recommended that:

12. the Coast Guard should monitor increasing traffic congestion in Elliot Bay, Rich Passage, and Friday Harbor, particularly during periods of low visibility, and manage traffic as required.

Finally it was noted that since the consequences of an intentional act of destruction (sabotage or attack) aboard a ferry could be severe,

13. the Washington State Ferries should work with the Washington State Patrol and appropriate federal agencies to determine the need for additional appropriate security measures to combat the threat of intentional acts of destruction aboard ferries.

In terms of minimizing the potential consequences of accidents, it was recommended that the Washington State Ferries, the U.S. Coast Guard, and other response organizations should work collaboratively to ensure that consequences will be minimized for any accident that does occur. Specific recommendations in the area of minimizing the potential consequences state that

14. the shipboard crisis and emergency management capability of vessel crews should be improved by adopting the following measures:
  - scheduling, reporting, and evaluating meaningful shipboard emergency drills,
  - requiring periodic skill and physical qualification re-certification testing for all personnel assigned to crisis and emergency management duties,
  - improving methods for communicating with passengers during an emergency,
  - improving crew training in developing detailed emergency procedures,
  - improving the ability to account for and communicate with passengers during an emergency,
  - providing clear and visible emergency instructions and evacuation signage for passengers, and
  - providing adequate initial and re-qualification training in fire and rescue,
15. the external crisis and emergency response capability of the Washington State Ferries and the U.S. Coast Guard should be improved by:

- developing and conducting multi-organization response exercises based on defined accident scenarios,
- establishing formal agreements relative to response authority, responsibility, and organization,
- providing adequate response resources in high risk areas such as Central Puget Sound, where an immediate response may be required, and at Port Townsend/Keystone, where current resources are not sufficient to evacuate passengers in an emergency,
- improving the communication and information management infrastructure,
- improving the effectiveness of interaction with external agencies such as fire, police, and emergency medical,
- developing comprehensive contingency, crisis management, and crisis communications plans,
- establishing agreements with commercial and military marine operators to ensure a planned for and coordinated rescue response,

16. the Washington State Ferries should devise, implement, exercise, and be able to demonstrate methods of evacuating passengers from ferries to a safe haven (other vessels or survival craft) where this analysis demonstrates that such evacuation may be required (e.g. Port Townsend— Keystone).

The four areas identified as requiring additional study and analysis are

- the impact of high speed ferry collisions,
- the implications of crew continuity, current manning and watch standing policies and procedures, and the impact of fatigue on the safety and emergency preparedness of Washington State Ferries' operations,
- the implications of increasing traffic congestion (including small craft and float planes), new routes, and new technology on the safety of WSF operations,
- the need for survival craft on the Port Townsend-Keystone transit.

The report supports the currently planned and funded fleet wide implementation of the International Safety Management System. It strongly recommends that the Washington State Ferries and the U.S. Coast Guard and other public safety agencies address the problem of minimizing injury and loss of life from very low probability but potentially high consequence accidents through the planning, implementing, and exercising adequate response plans and procedures. It recognizes that the skills of the ferry crew will be crucial in any emergency situation and strongly recommends enhancing these emergency skills through training, certification, drills, and exercises. The report concludes that the most cost-effective way to minimize the risk of potential accidents, is to invest in WSF people and systems and to make improvements and changes to WSF policies, procedures, and management systems— rather than to merely invest in capital equipment. The creation of a safety culture that will enable these recommendations to be realized will require the support and leadership of Washington State Ferries management, shoreside operations, and fleet deck officers, engineers and other shipboard personnel.