Marine Risk Assessment and its Role in Port Management.

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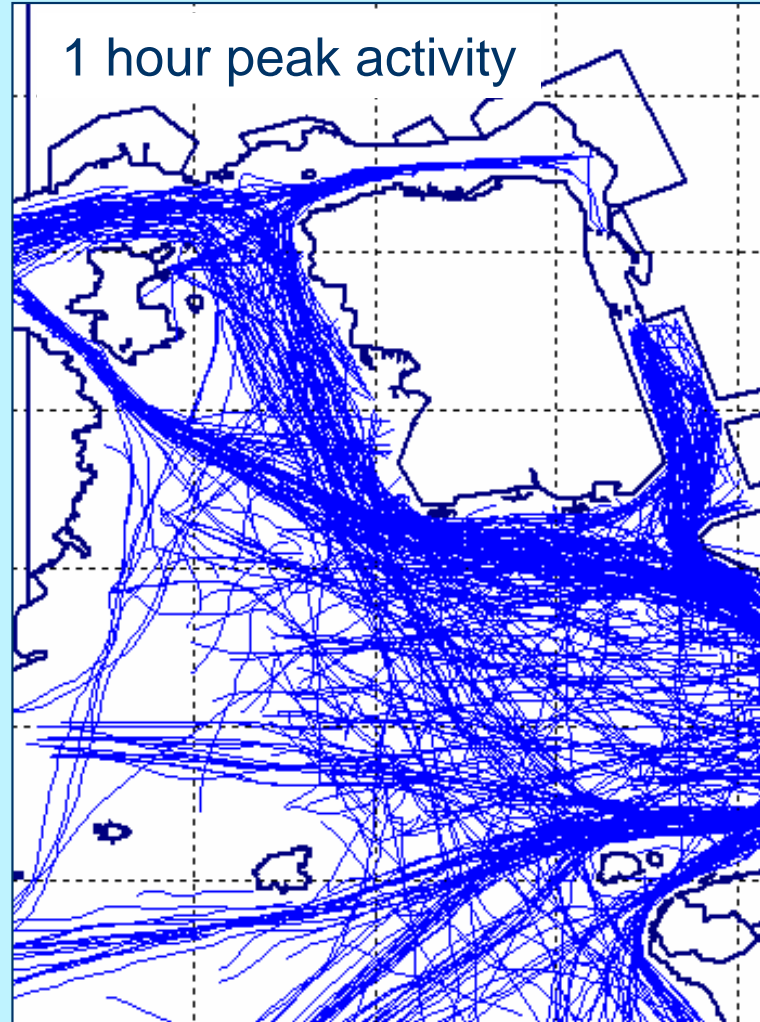# BACKGROUND - Marine Risk Drivers

- Constrained waterspace

- High (or increasing) marine traffic levels

- Stakeholder concern

=

Marine Impact Assessment

Typical Harbour Activity

1 hour peak activity

OBJECTIVE - Limit Impacts on:

Life\People

Injury

Death

Environment

Amenity

Environment / Ecology

Port Operations

Port Restrictions

Negative Publicity

Reputation

Balance Sheet

Port Users

Delays\Consequential Loss

Vessel

Cargo

Port Facility

Typical Projects

Project	Impact Level		Key Issues
	Waterspace Constraints	**Traffic Levels**	
Development of New Container Terminal	Varies	High	Safety & port efficiency (berthing and manoeuvring limitations)
Reclamation	Varies	Low	Construction and operational phase impacts on traffic & navigation
Dangerous Goods transit	Low	Low	Key concern of safety and environmental consequences of cargo release
New Fast Ferry Route	Low	Varies	Key concern of safety due to high consequences of collision
Development of Offshore Wind Farms	High	Low	Significant redistribution of traffic

Key Issues

- Access - Can it be done?

- Safety - Can it be done safely?

- Efficiency - Can it be done more cheaply?

Key Stakeholders:

- Terminal Operators
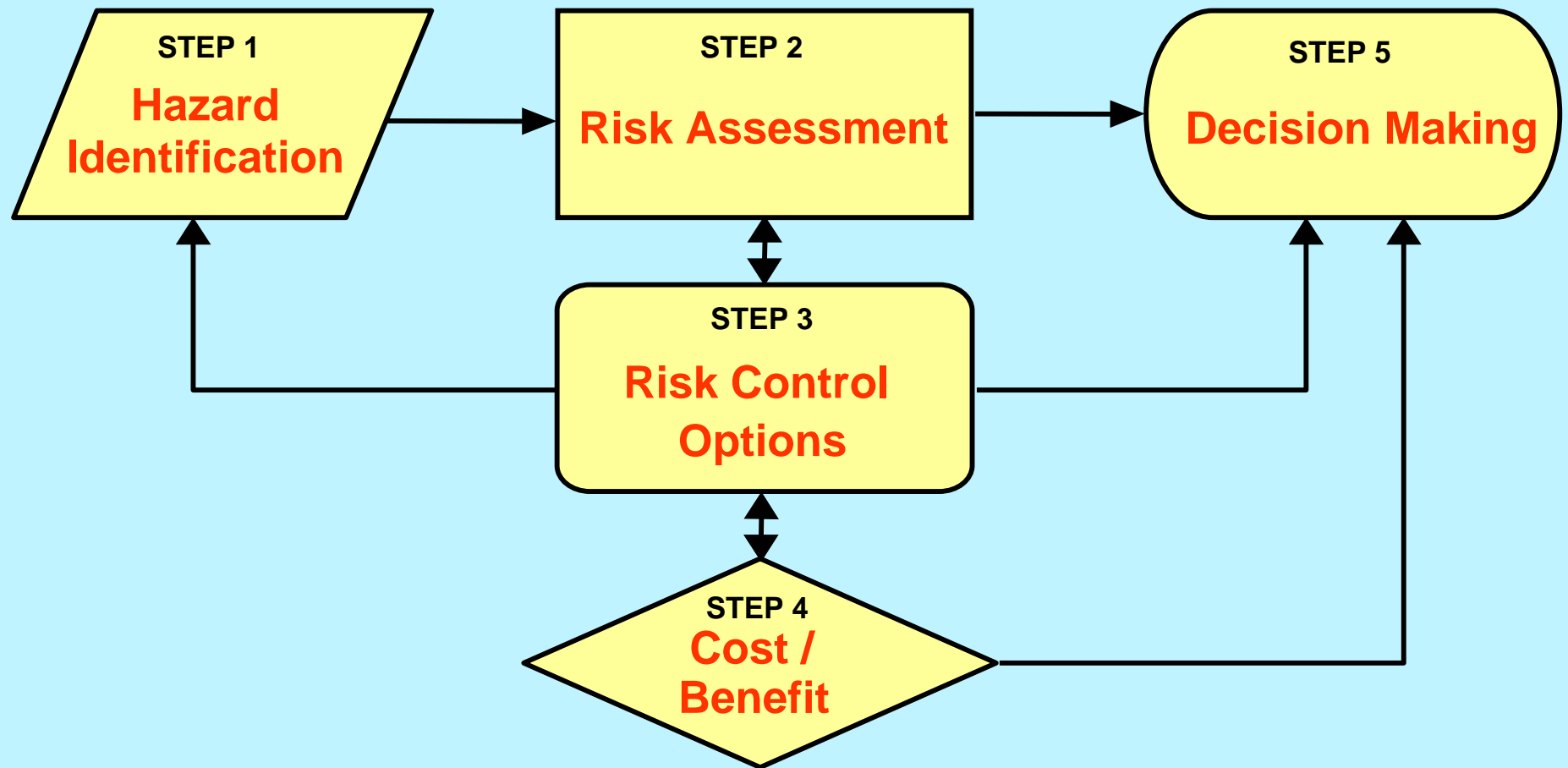
- Port Regulatory Bodies

- Shippers

SAFETY - Risks

- Grounding

- Ship-ship collision

- Ship-structure contact
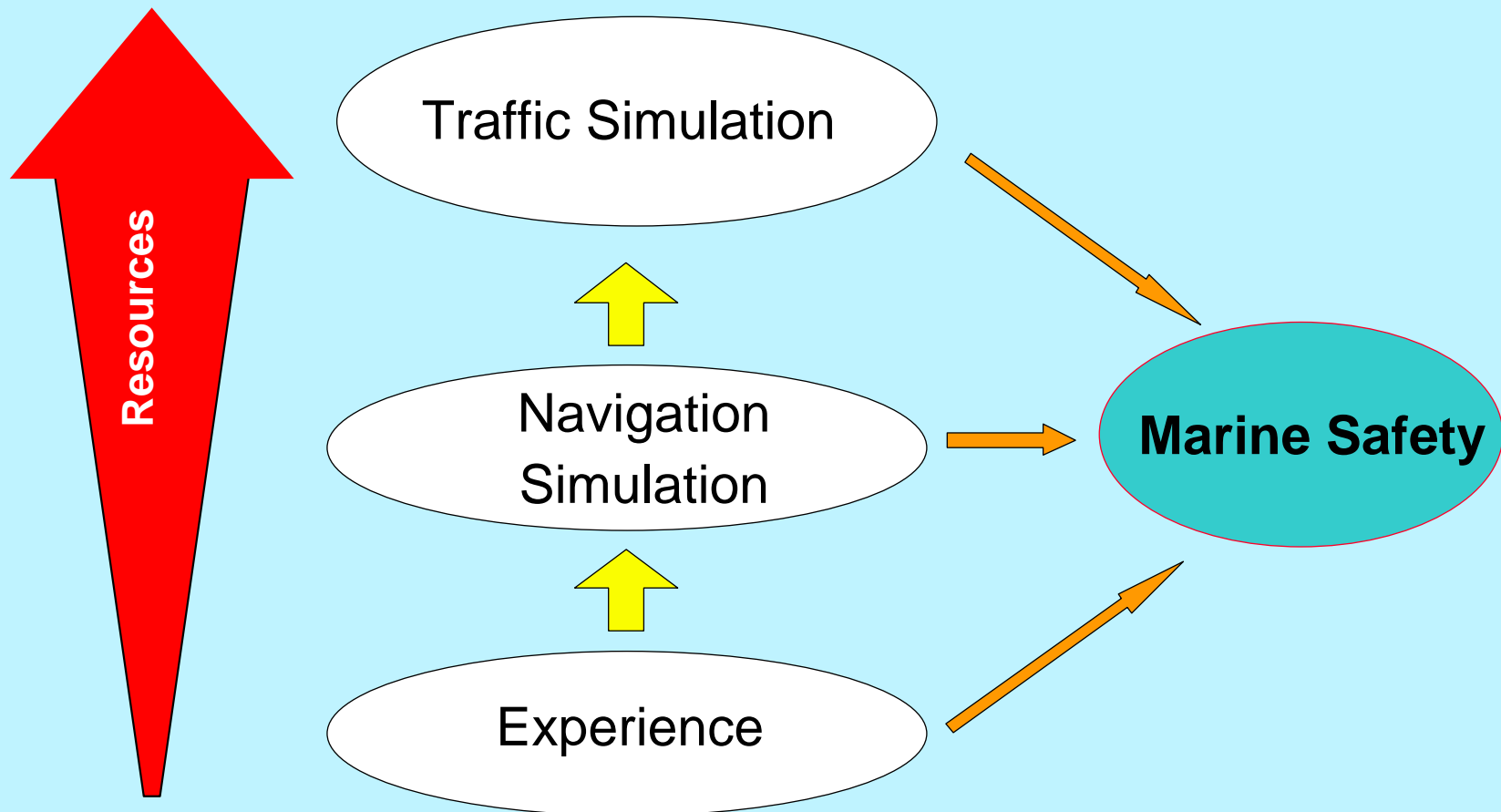
} Port Specific

- Fire & Explosion

- Structural Failure etc.

} General

SAFETY - Typical Collision Casual Factors

- Mechanical failure

- Communication system failure

- Poor visibility

- Metocean (wind/wave/tide)
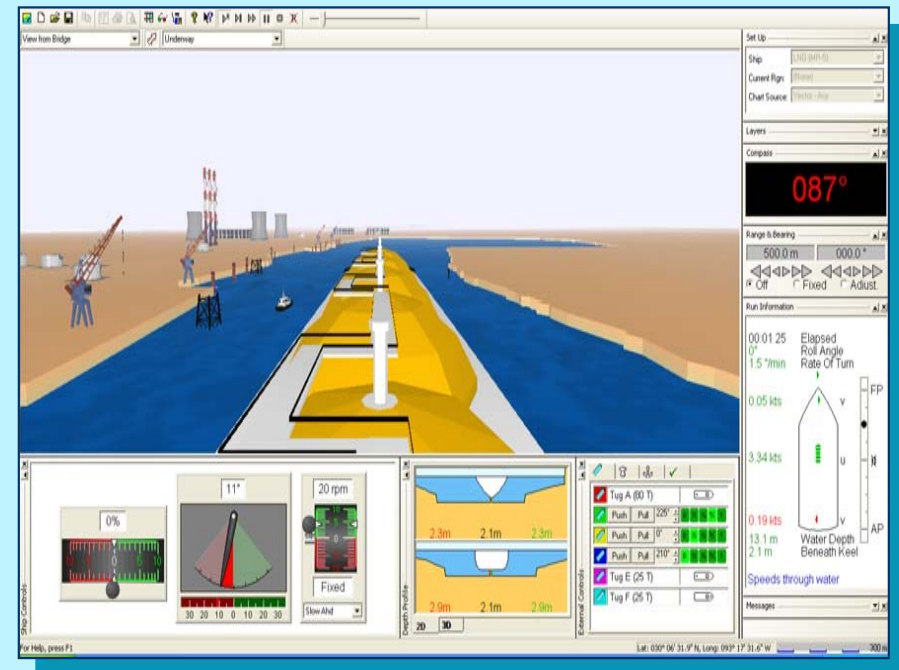
- Human error

Formal Safety Assessments

Risk Tools

ACCESS - Width by Simulation
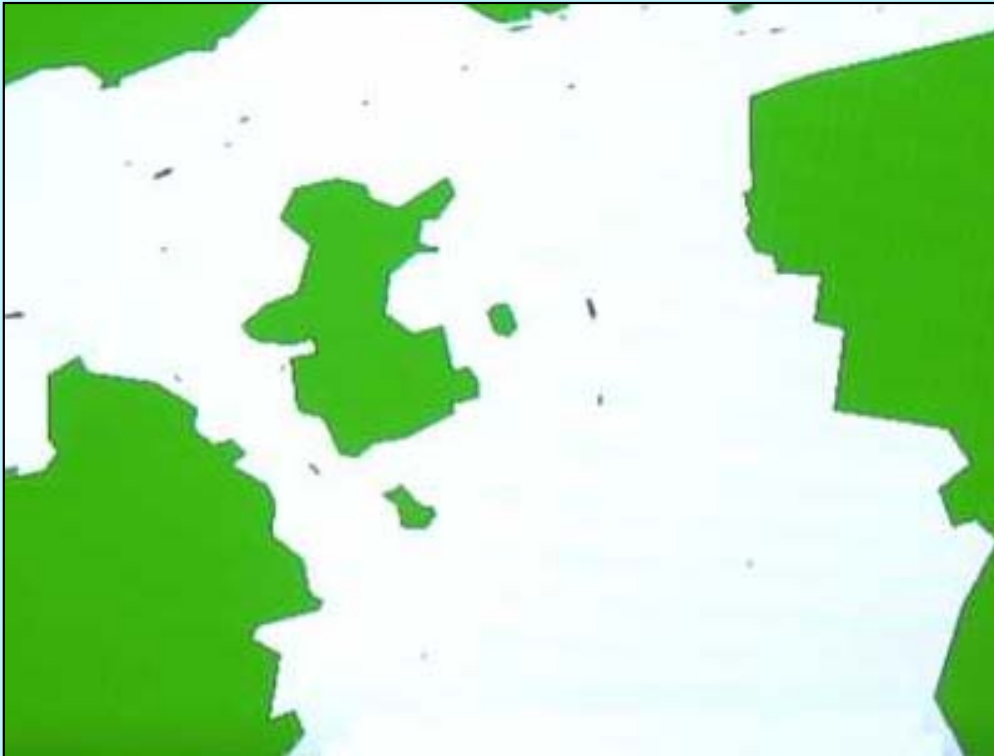
- PC Desktop

  (fast & cheap)

- Full Bridge

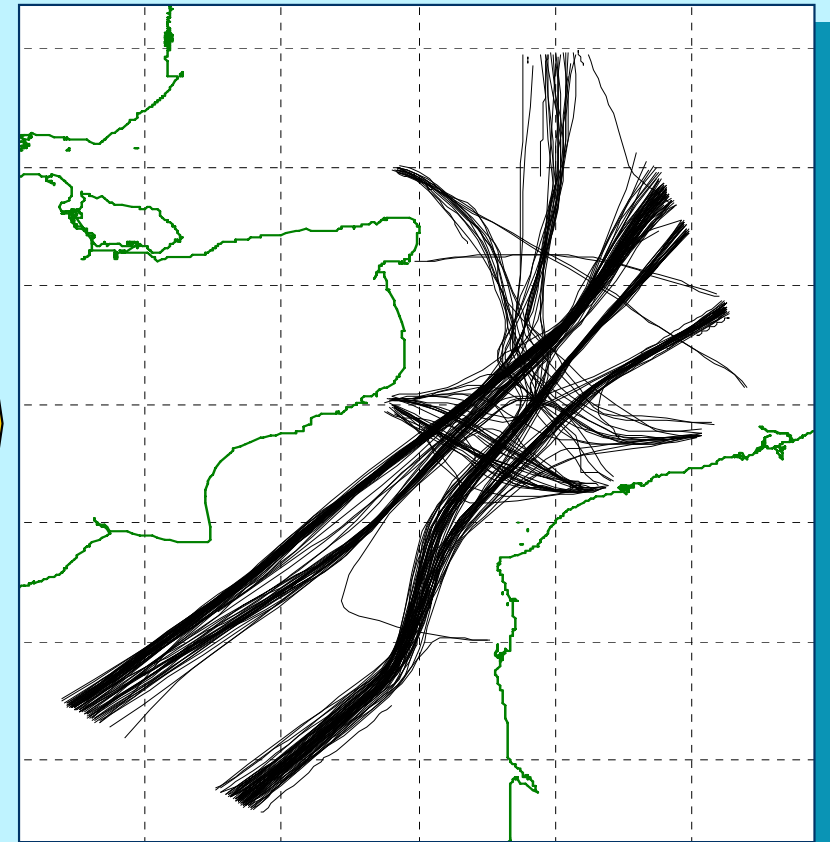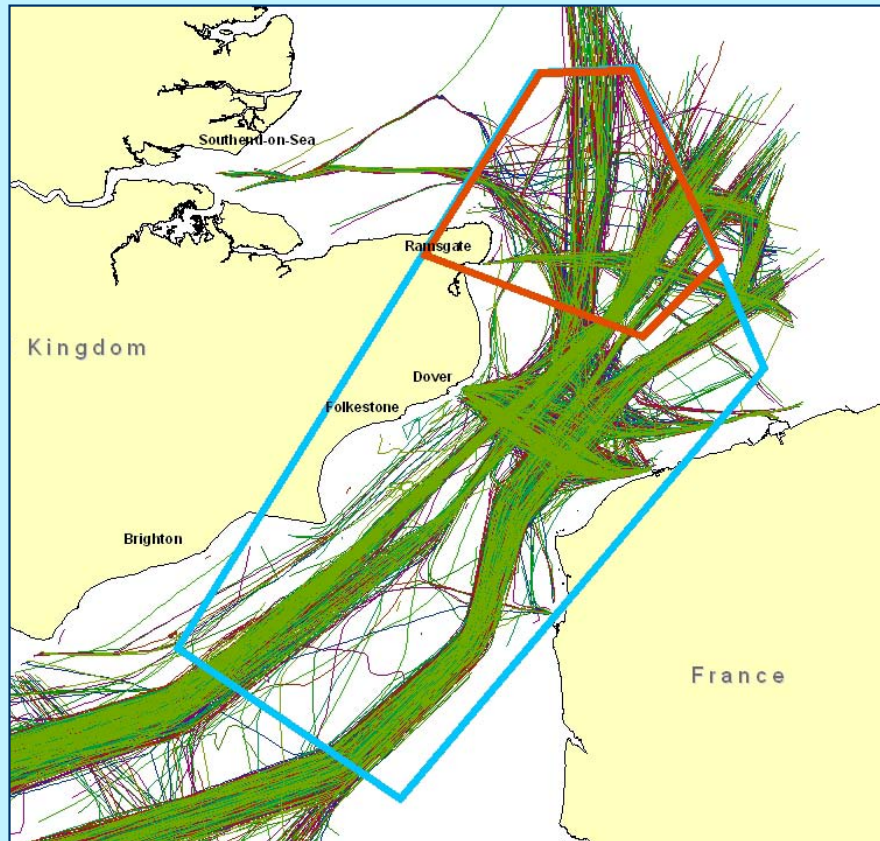 (better human responses)

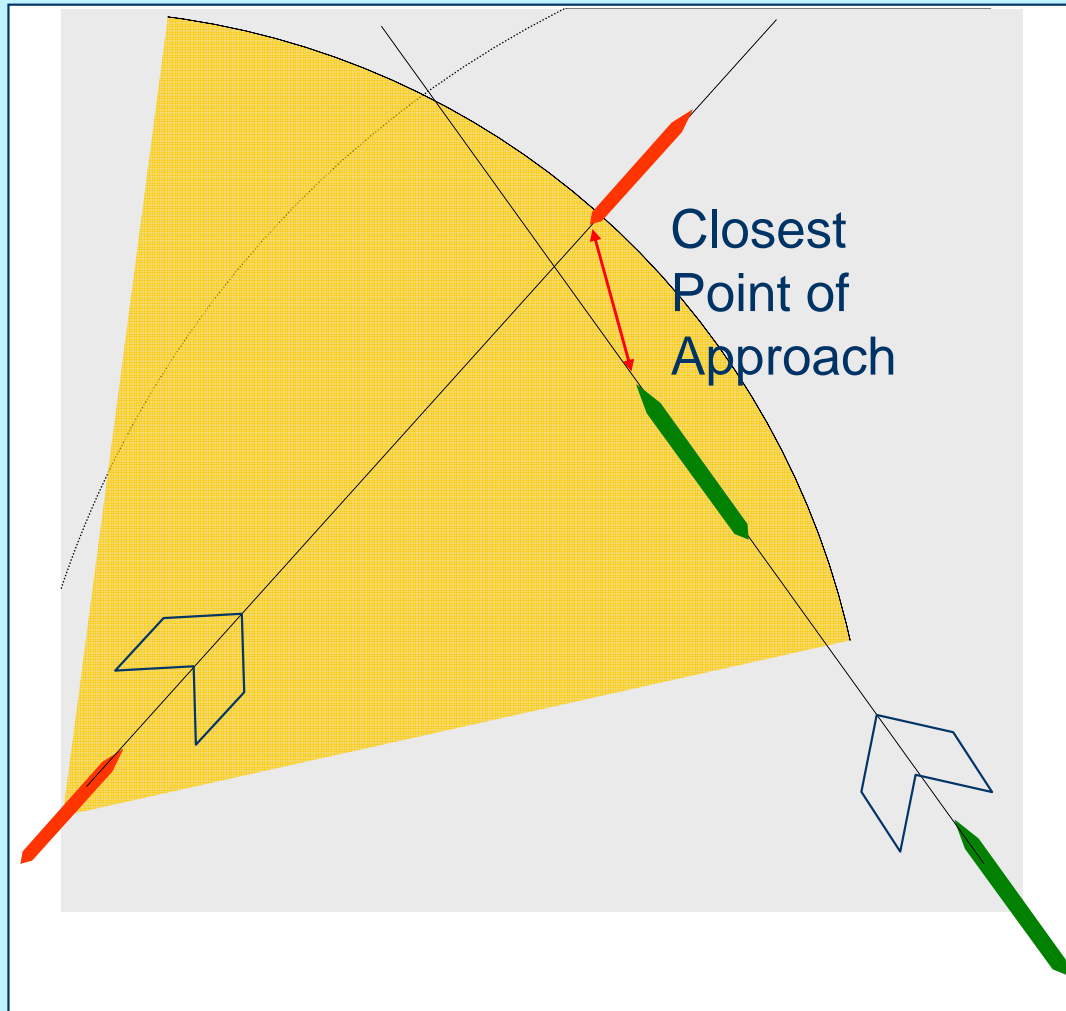# RISK - Traffic Simulation

- Basic inputs
  - Coastline Geometry
  - Traffic Volume & Type
  - Vessel Routes
  - Navigation Characteristics

Traffic Streams in Port Approaches

- Condense Traffic into Routes

DYMITRI - Dynamic Marine Traffic Simulation
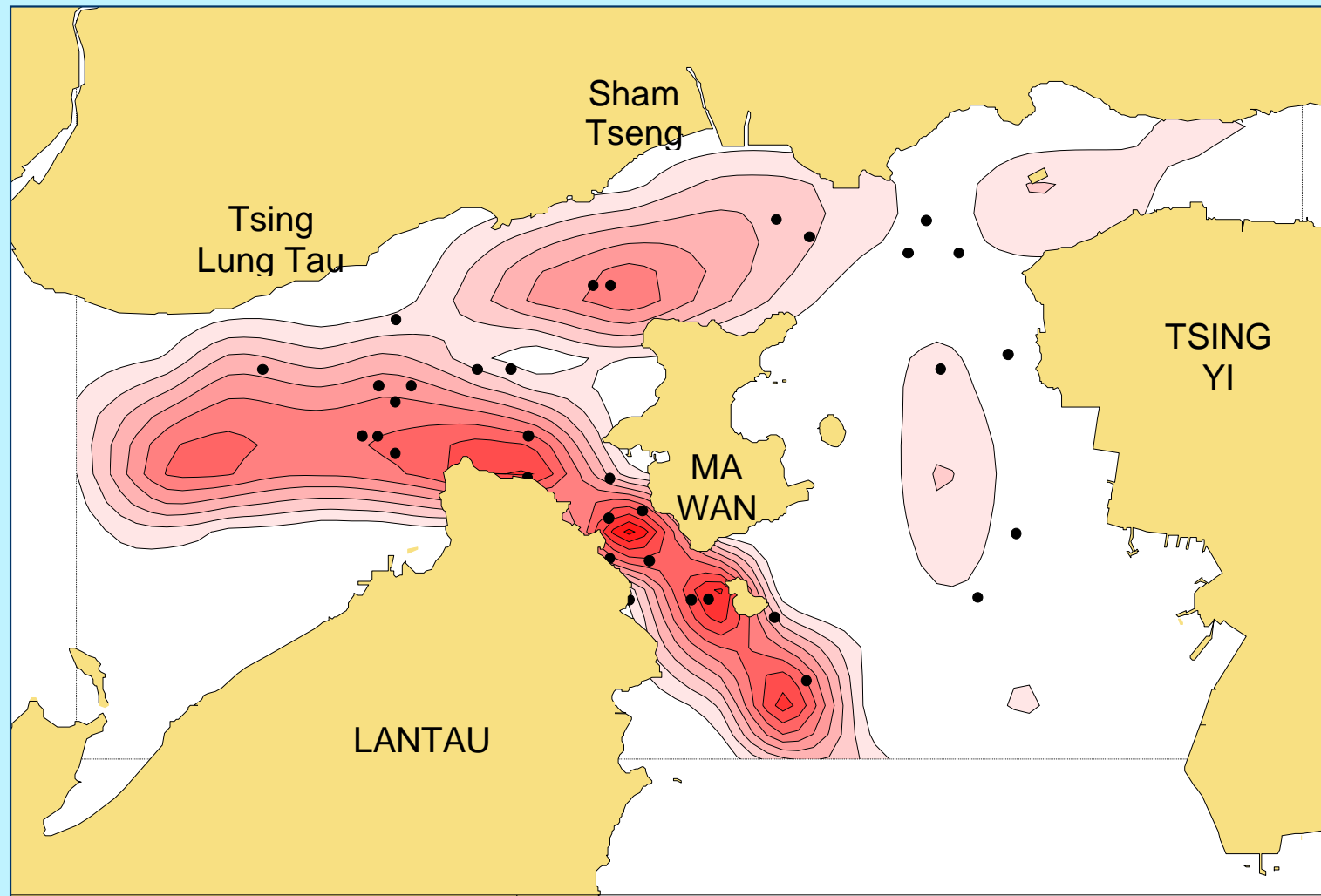
Closest Point of Approach

- If a Close Quarters Situation may exist?

- If an avoidance required?

- What rudder/ speed change needed?

- Is action sufficient?
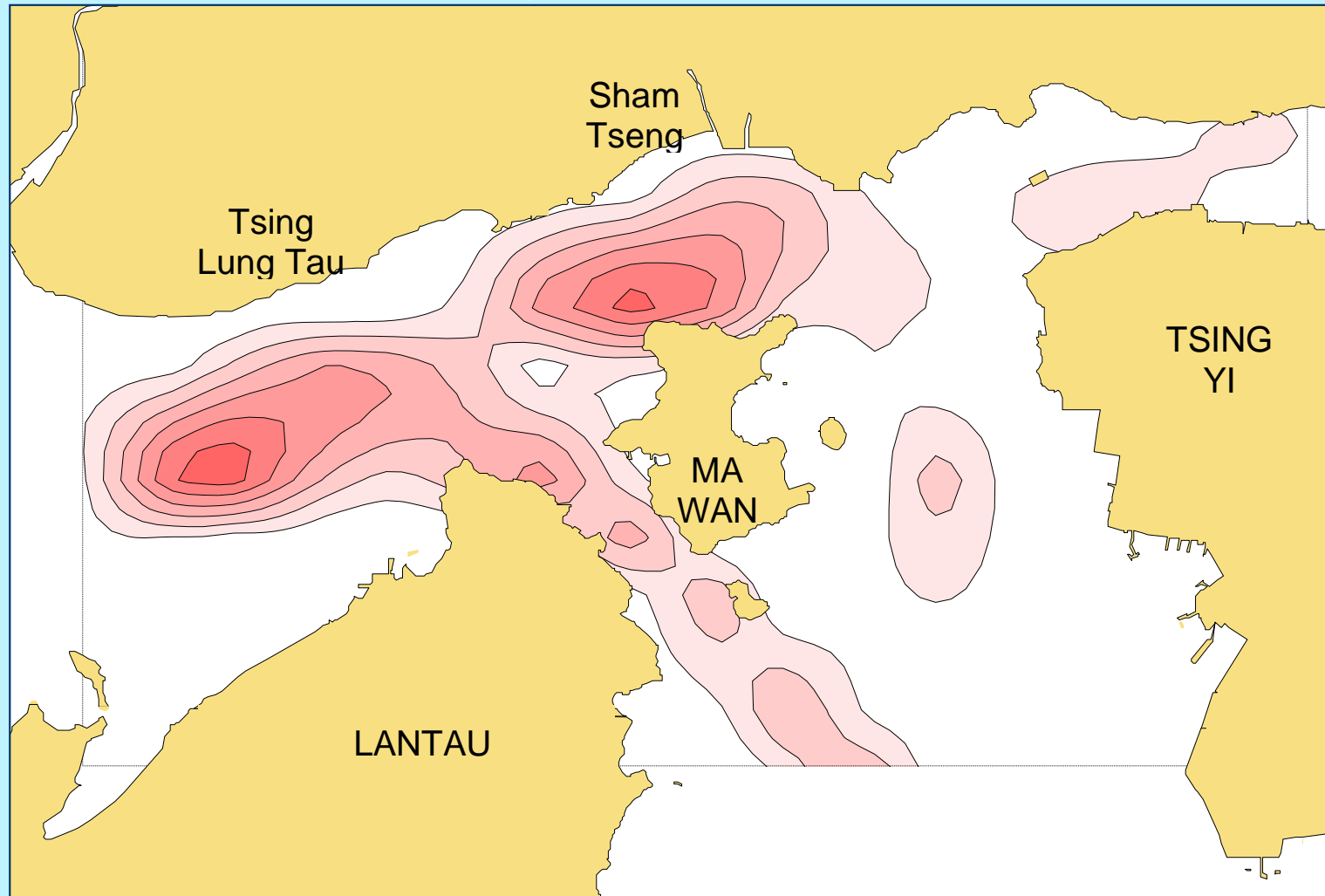
- If not, continue manoeuvre

Output of Planning Simulations

- Outputs
  - Traffic density and delays
  - Trends and distributions of incidents
  - Quantitative forecasts of risk
  - Measurable parameters that drive risk

MA WAN - "1 Way" System

Sham Tseng

Tsing Lung Tau

Ma Wan Channel

Kap Shui Mun Channel

MA WAN

TSING YI

LANTAU

Local Vessels > 10m LOA

Ocean-going Vessels

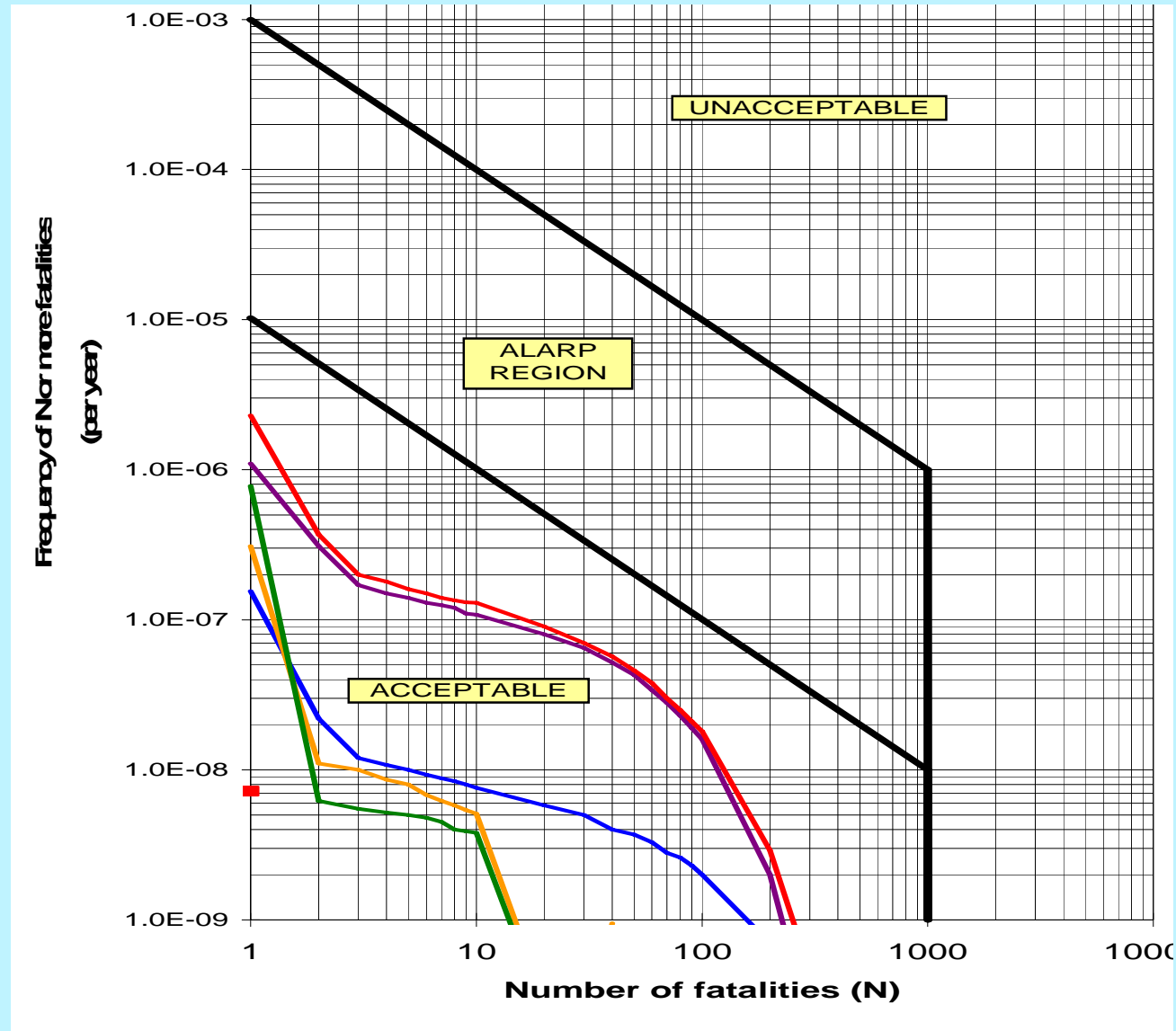# MA WAN - Initial Risk Distribution

MA WAN - Post Implementation Risk

Beaching of "Peng Yang" @ Ma Wan 2004

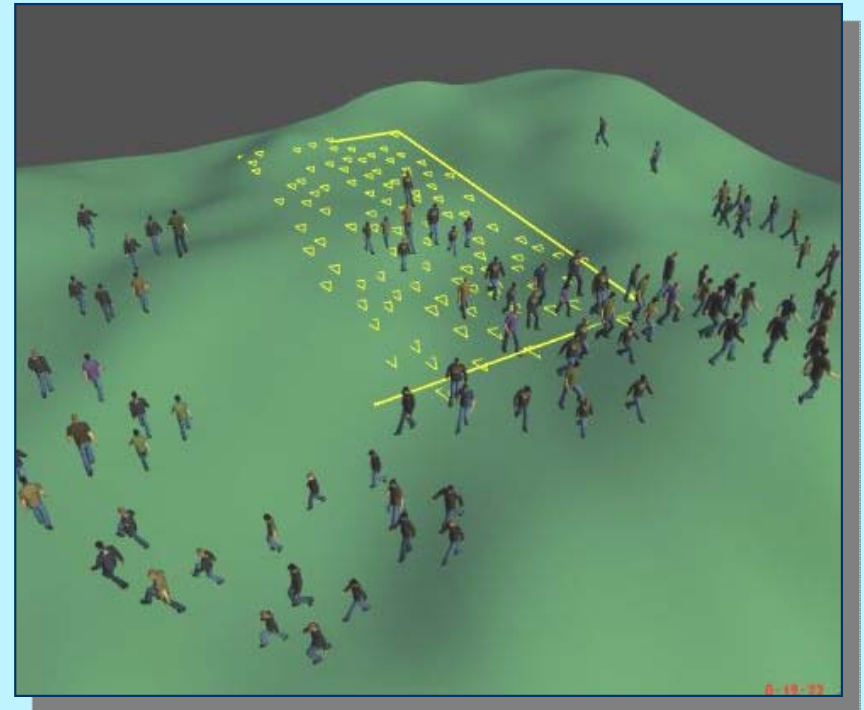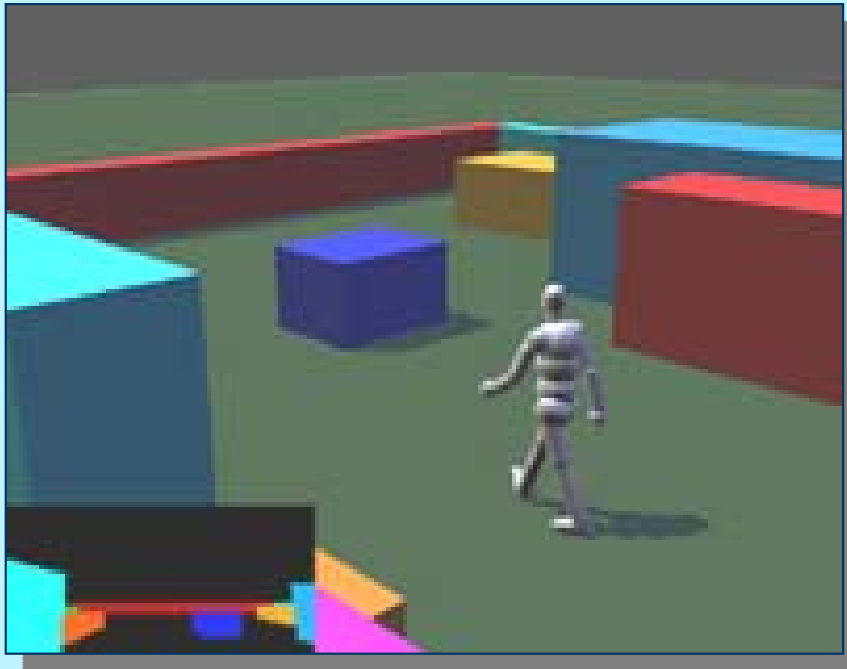# Acceptability Criteria - FN Curves?

Increasing Need for Human Judgement

Autonomous Agents

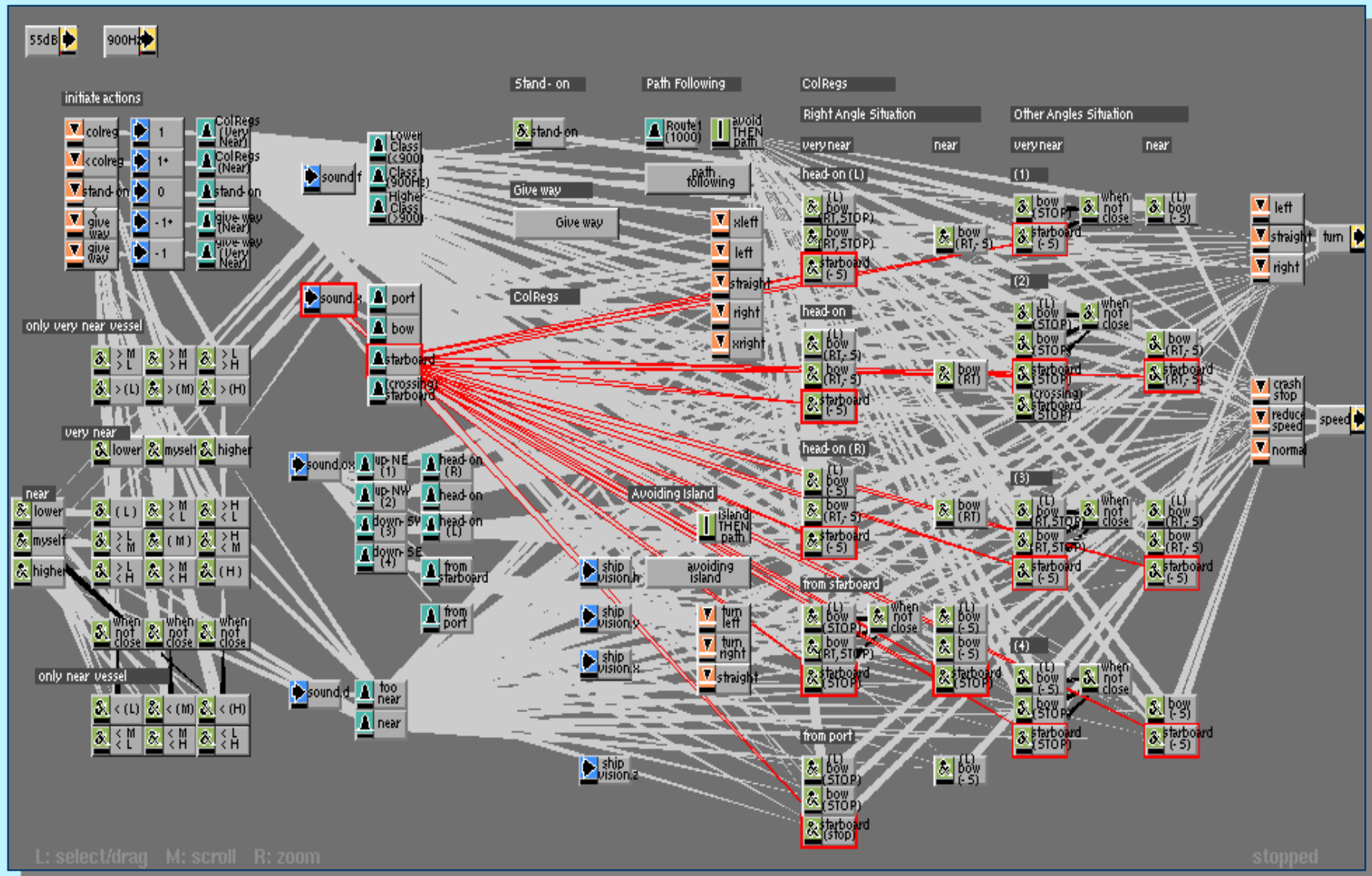- Accuracy of Navigation

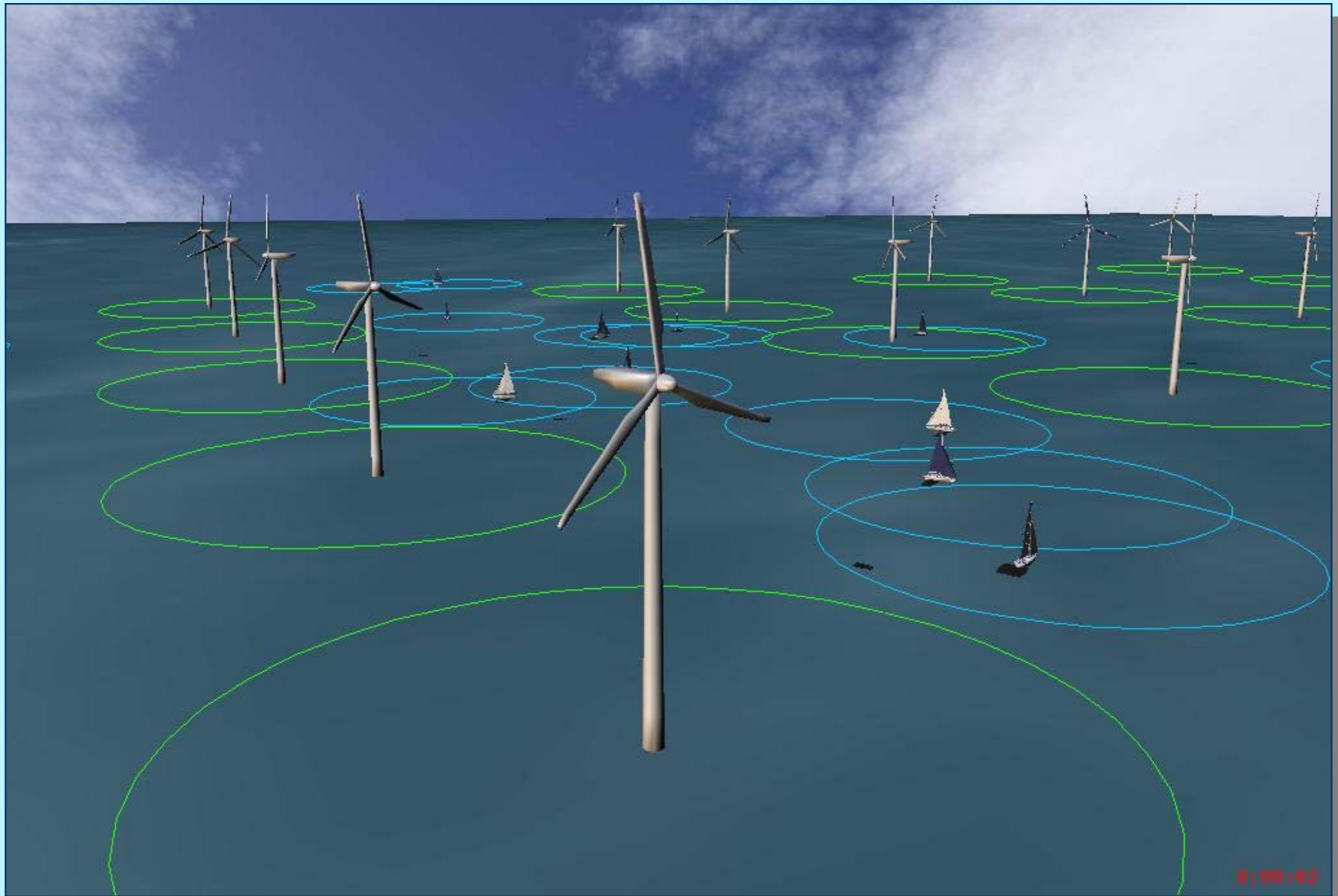- Human factors

Autonomous agents

- Scalability

- Flexibility

- Agent direction

- Human interaction

A Mariner's Brain

Immersive Environments

Challenges