Sea Gyro Marine

Vessel roll motion controller

Factors effecting passenger comfort and safety

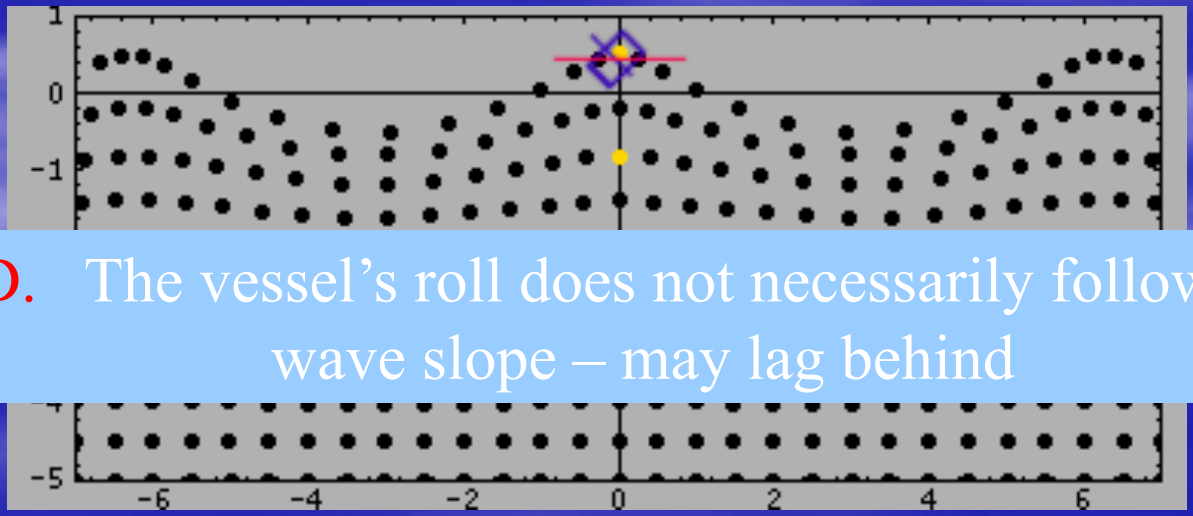
- Satisfaction of a voyage is typically determined by the motion of the vessel
- The safety and loading on equipment is limited by the overall movement of the craft, of which rolling is a major component
- Passenger comfort is sometimes overlooked in lieu of speed or performance

Excessive rolling- what causes it?

A. The maximum wave slope seldom exceeds 3 degrees.

B. Excessive roll is caused by the natural frequency of the vessel resonating with the wave frequency

C. Without resonance, a vessel would not roll beyond 3 degrees



D. The vessel's roll does not necessarily follow the wave slope – may lag behind

Researcher

Mr. Colin Ayres

- Post Graduate Diploma in Applied Physics
- Student of Curtin University of Technology
- Centre for Marine Science and Technology

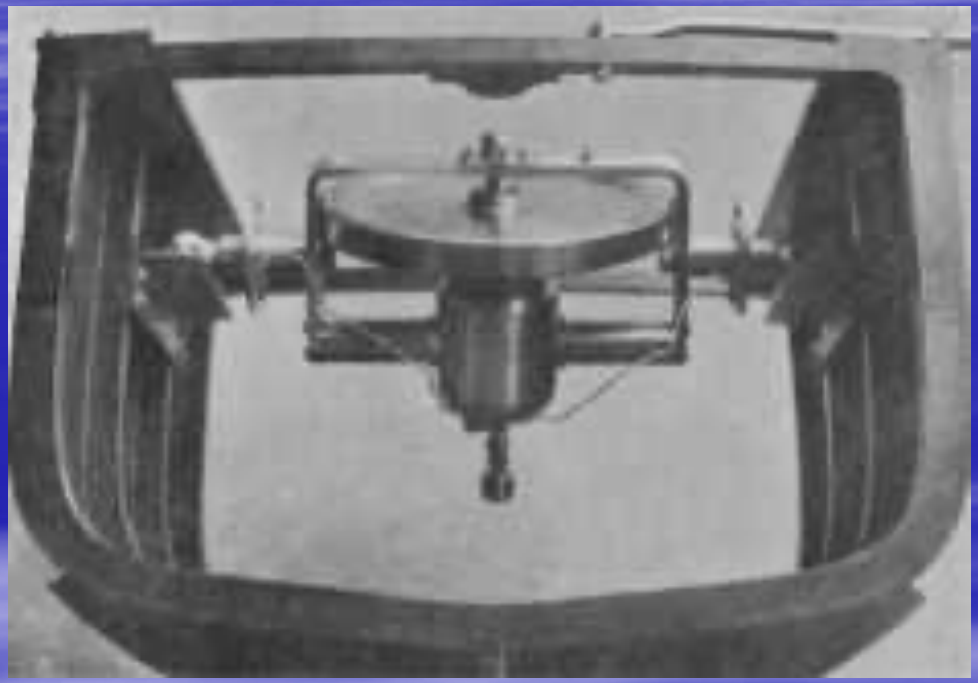
Previous work

Vessel fitted with testing equipment to determine drag forces being applied during rolling

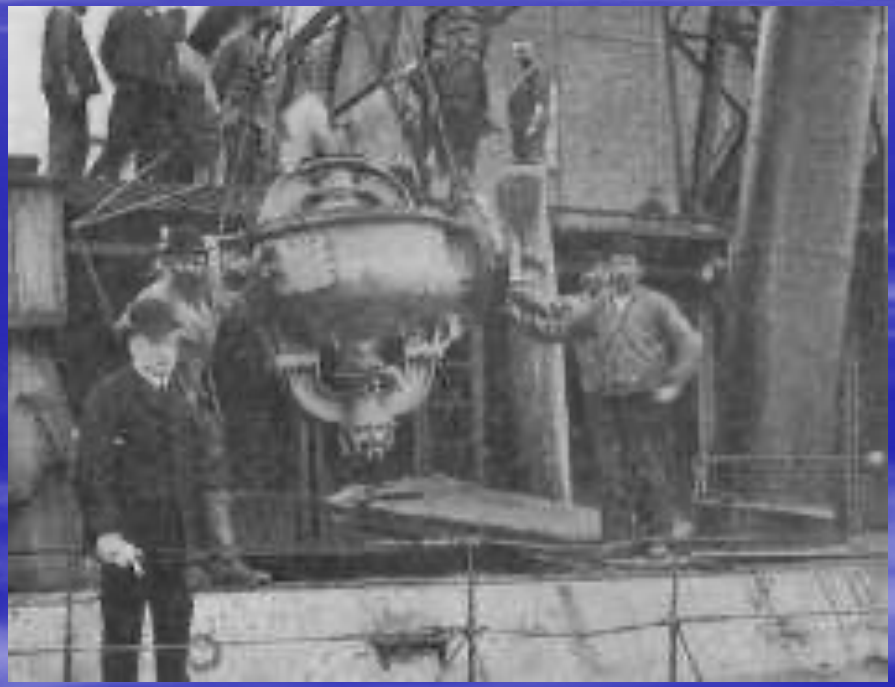
Disadvantages of hydrodynamic systems

- Passive systems only reduce roll partially, not stop it totally
- Can be sensitive to wave direction and speed
- Active fins are ineffective at low speeds
- Increase drag by fins or keels
- Subject to damage by sea debris

Innovation derived from old design



Gyrostabilizer model presented before the Royal Society in 1907

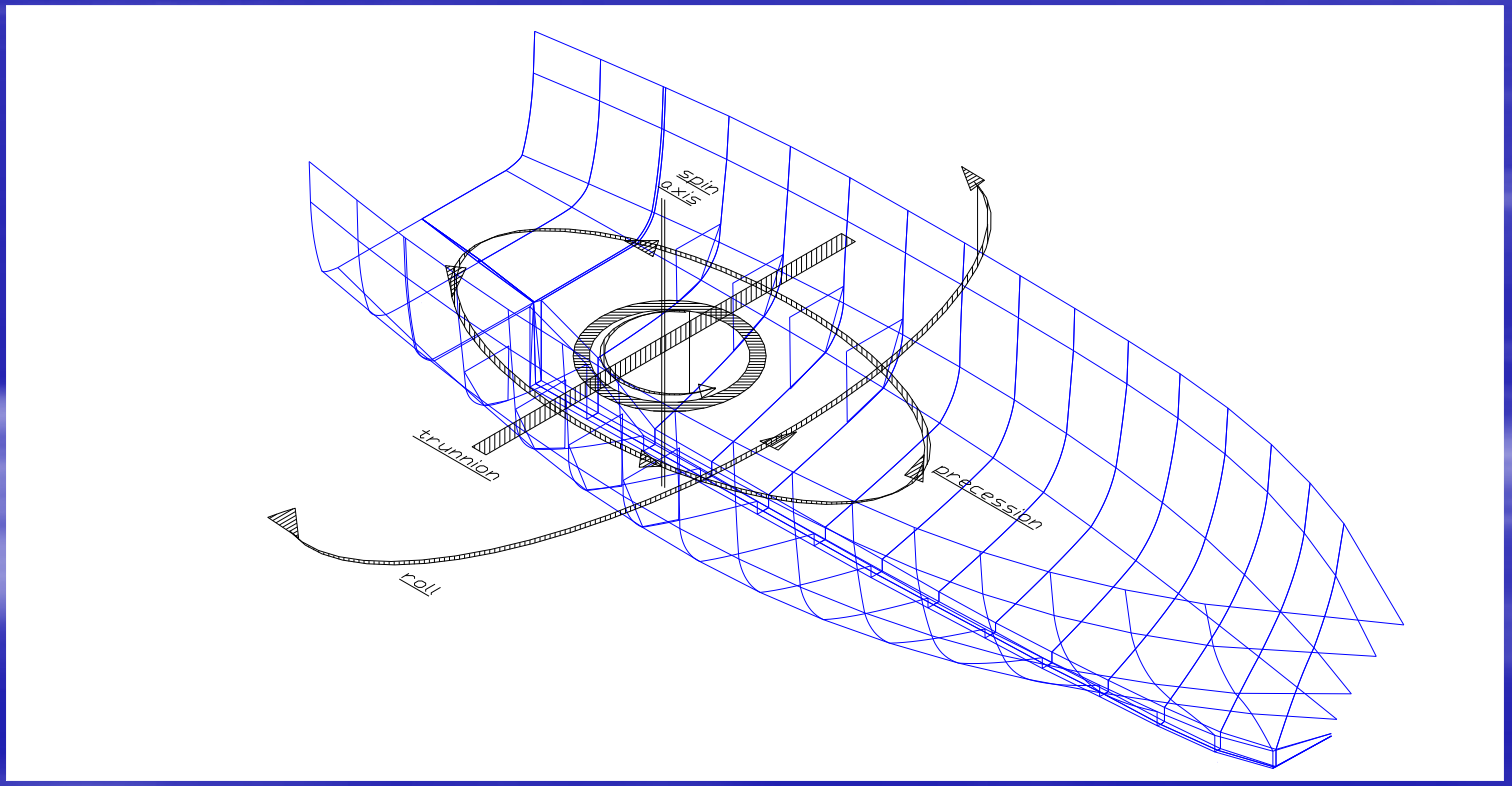


Gyrostabilizer experiments being carried on the "Sea-bar" torpedo-boat

From the book: H.Crabtree (1914) "Spinning Tops and Gyroscopic Motion"
Photo by: Underwood & Underwood.

Basic principle

A modern gyroscope fixed athwartships, able to precess in the longitudinal axis



Effects of Gyroscopic action

Model of a typical 20 metre high performance planning hull

No gyroscope

Gyroscope fitted

What action is happening

External force on vessel forces the gyroscope into precession.

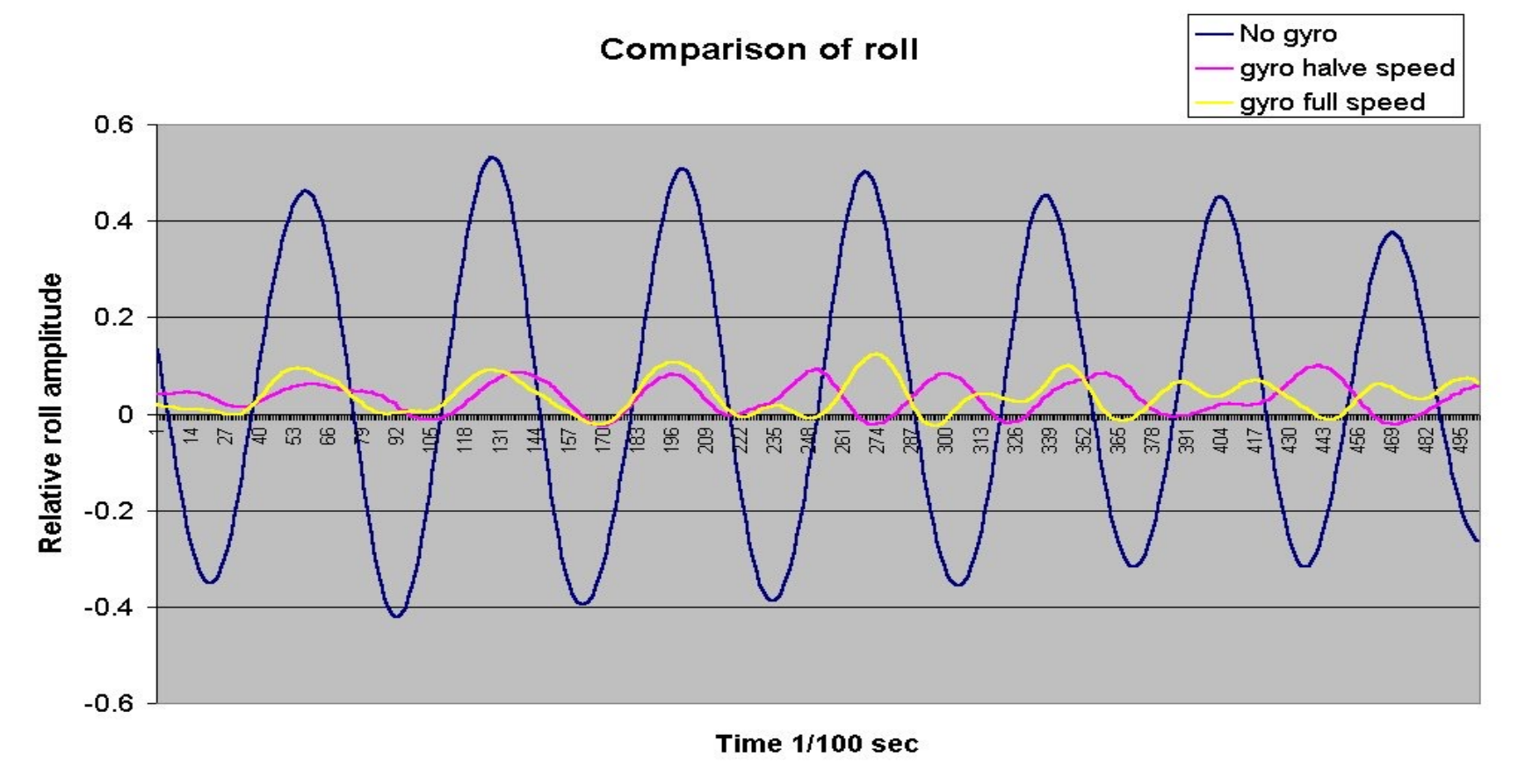
Gyroscopic motion reduction

Model loaded for comparative effects on a 20 metre boat in seas of 1.5 metres

Roll without gyroscope

Roll with gyroscope

A closer look at the data



- Reduced amplitude and acceleration

Research into gyroscopic motion reduction

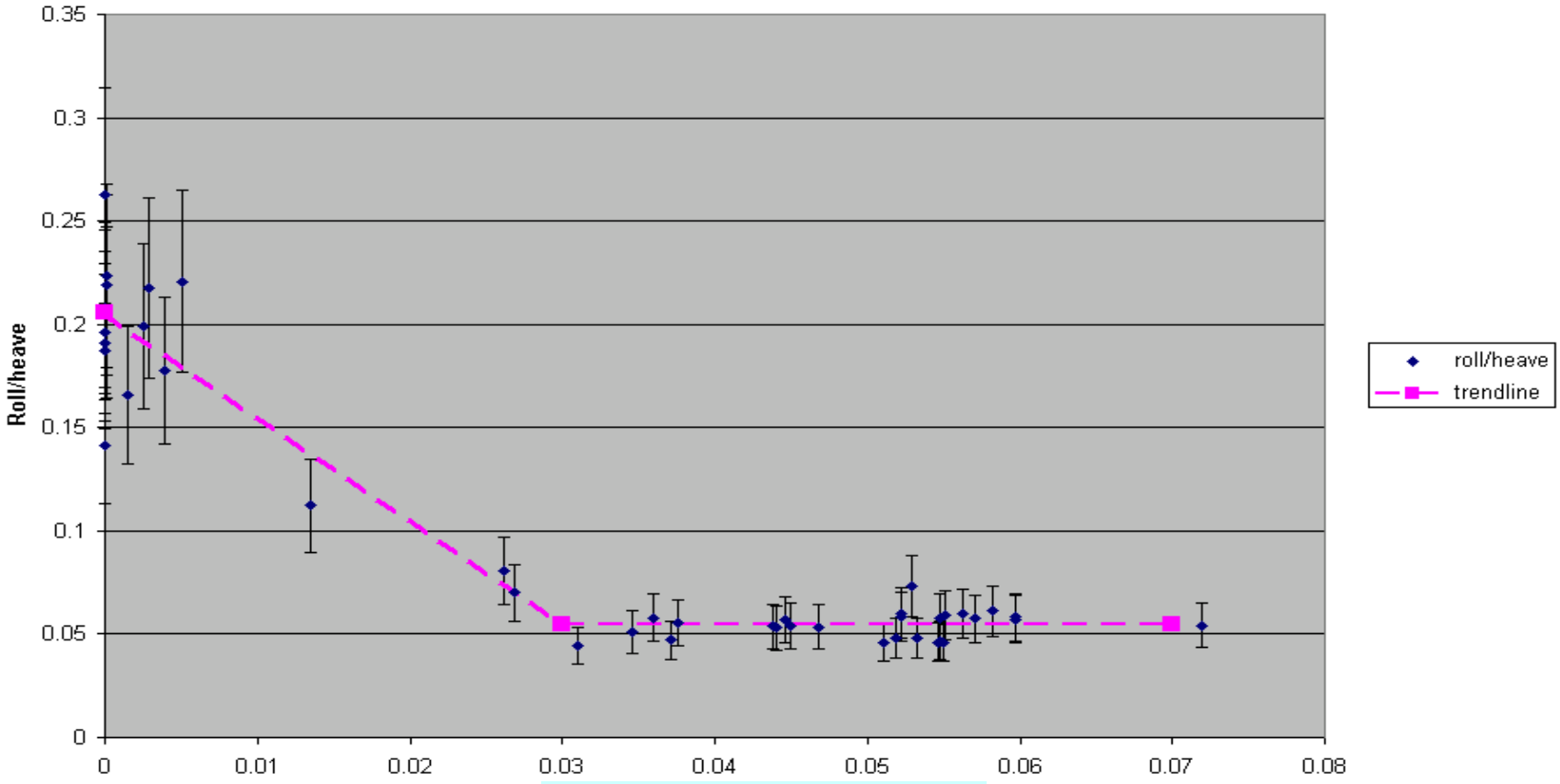
Active system

Gyroscopic precession driven by electronic controls to force the vessel to roll

Passive system

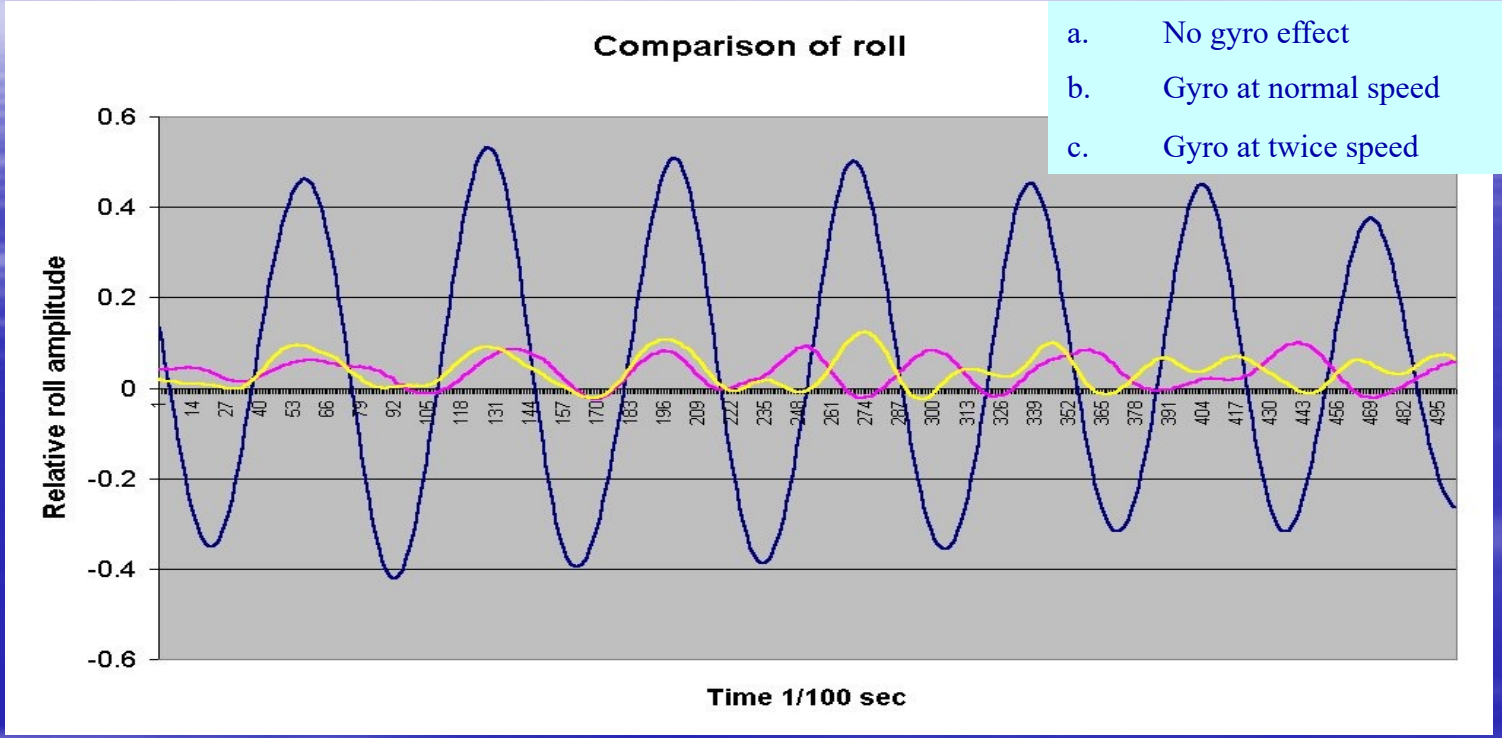
Gyroscopic precession driven by wave motion

Increasing gyroscopic forces



Limit of roll reduction

Preliminary results



- *Graph comparing the effects of the gyroscope in roll reduction*
- *Reduced amplitude and acceleration*
- *Roll is reduced by 80% of the extreme value by use of the gyroscope*

Large forces may be applied through forced precession

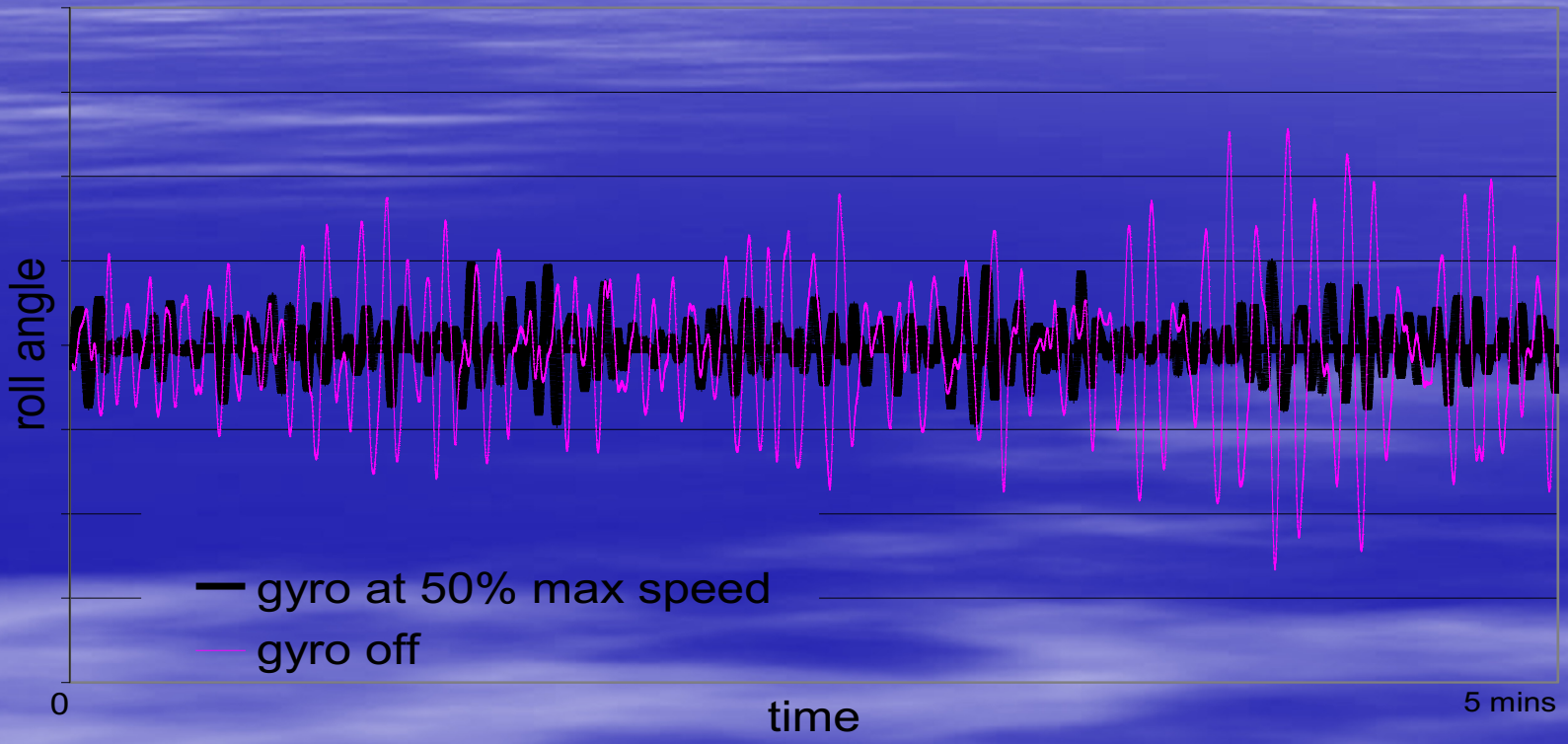
Driving the gyroscope through small angles can roll the vessel in calm water

Prototype development

Two “Sea Gyro” prototypes bolted to aft deck on research craft

Research and confirmation of theoretical expectations on full scale vessel.

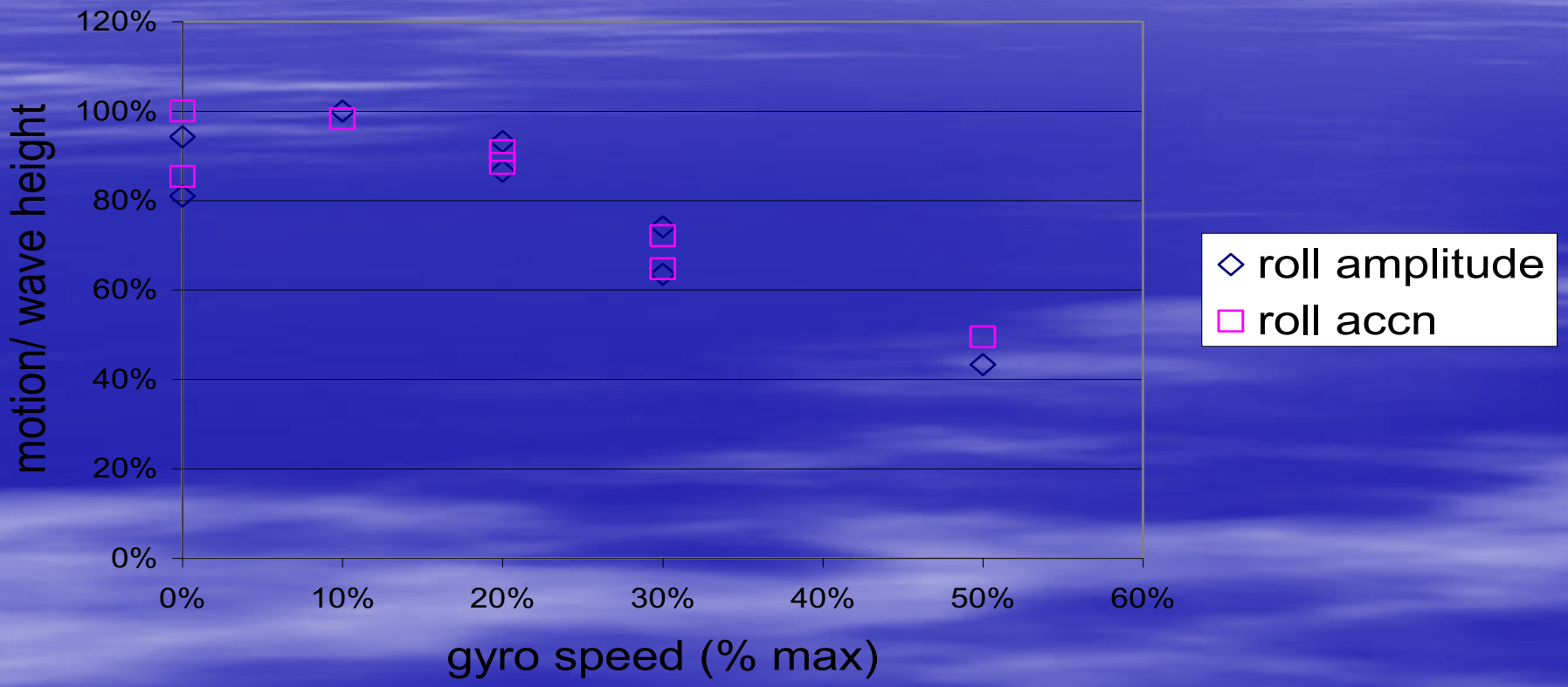
Sea trials



K. Klaka

The Gyro controls vessel roll as predicted from theoretical and modelling work

Full scale results



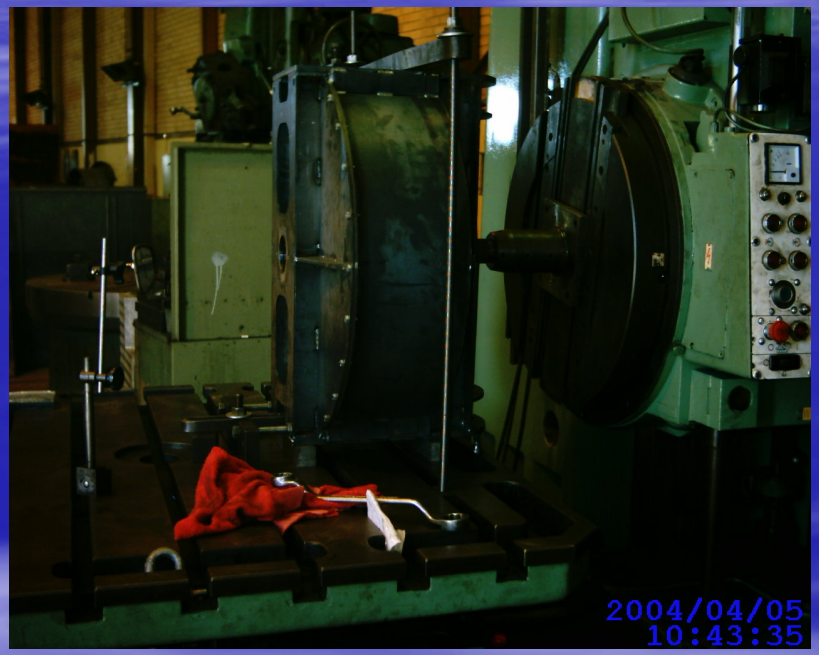
K. Klaka

Roll reduction with increasing gyroscopic effect

Advantages

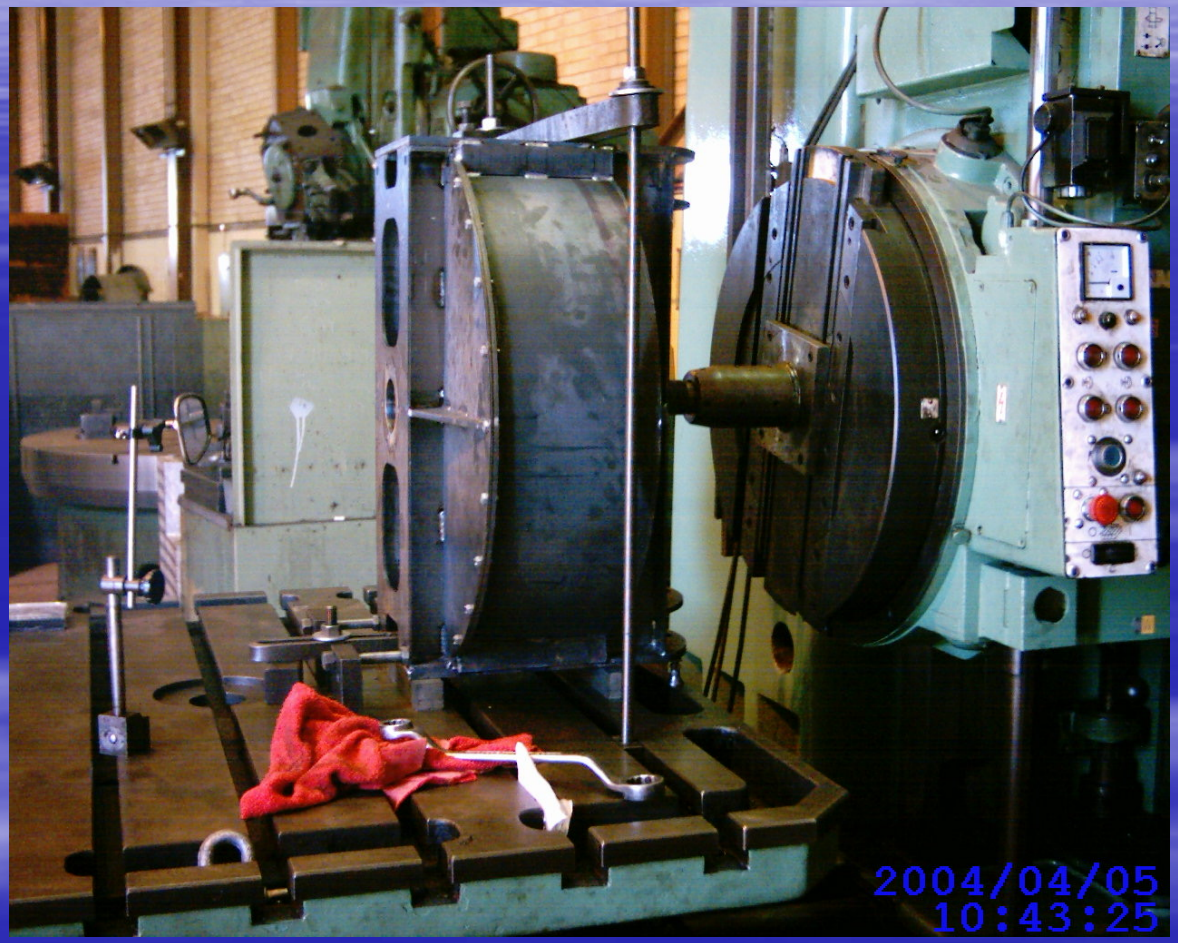
- *The Gyro is a system that operates at all vessel speeds, including stationary or at anchor*
- *Fitted internally so as to avoid damage or entanglement*
- *Suitable for shallow water operations*
- *There is no increase to the hull drag on the vessel because there are no extra appendages.*
- *Ease of handling – set and forget – fully automatic*
- *Occupy minimum of usable space anywhere on the vessel*
- *Very energy efficient when running*

First full scale prototypes



- *Precision machining and balancing of gyros.*
- *Use of precision bearings and computer electronic controls*

Machining main housing



Models

- *The new mini Sea Gyro*

- *One of two units installed on a charter vessel*

Next steps

- Investigate overseas market potential
- Participate in International Boat Show with an exhibition booth
- Initiate limited production of Sea Gyros
- Source volume manufacturer
- Establish a good track record
- Appoint a CEO to drive the company forward
- Develop new techniques to improve the stabilizing system
- Seek license manufacturers