Sea Gyro

Sea Trials Azura

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Background

Azura has been operated as both a charter vessel and as a privately operated pleasure boat. Her main attractions are its game fishing ability, using a powerful deep vee hull for sea handling at speeds and the tall fishing tower. The combination of the tall tower and deep vee hull has led to an uncomfortable roll motion, and the owner investigated the use of a Sea Gyro to control this unwanted movement.

Figure 1: Azura showing fish tower

Installation

A single SG40 gyro was installed between the bottom longitudinal frames. This custom installation was a system built into the boat's structure. There were some initial problems including a faulty bottom bearing housing. However, the final configuration operated very smoothly with very little noise or vibration. In fact the general consensus was that it was difficult to notice any sound above the genset.

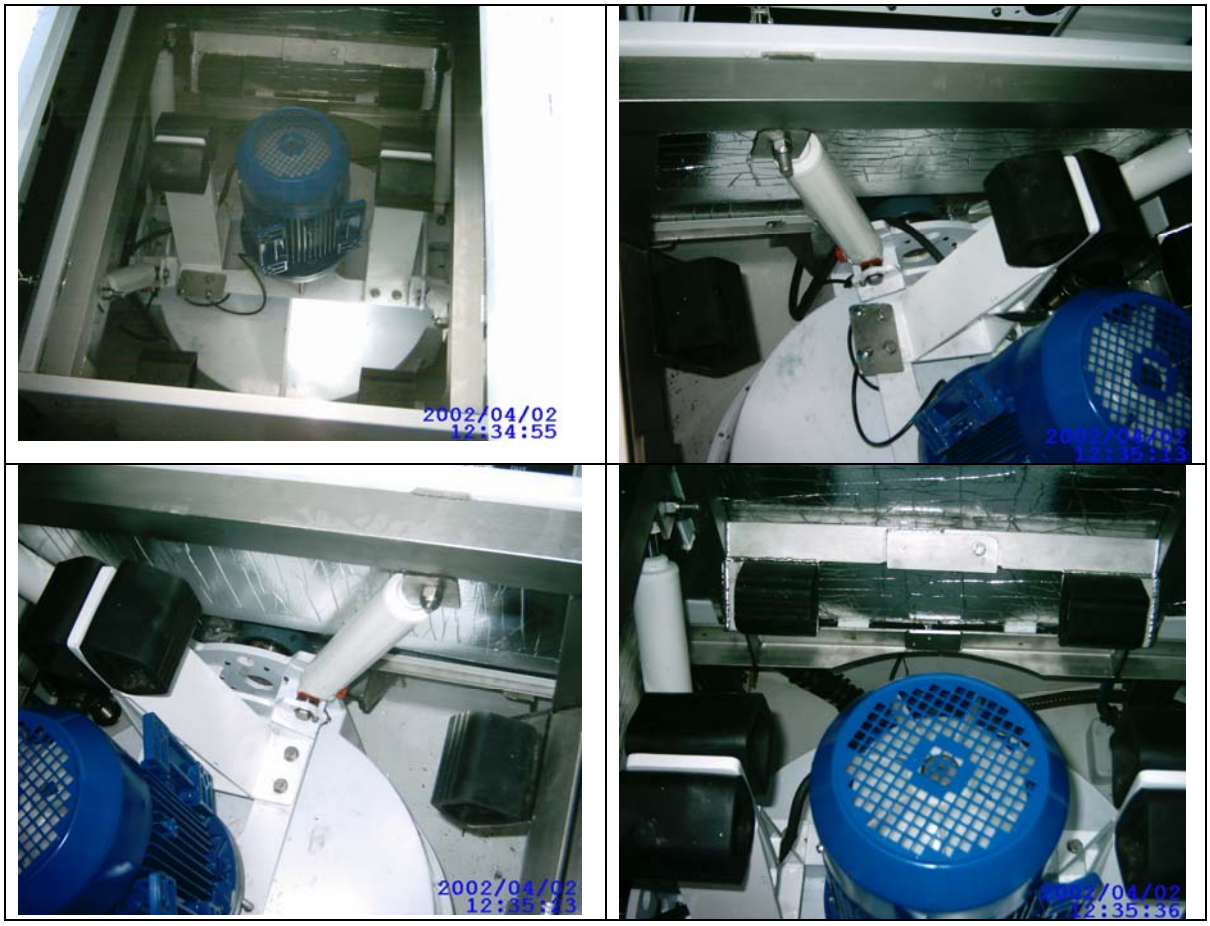

Figure 2: Installation

Sea conditions

The trials were conducted near “The Windmills” off Fremantle. The swell was about 1.5metres. There was minimum sea breeze and little windwave. The initially data was taken in a sea of 0.4metres. These conditions changed with a sea which built up to 0.7metres during the final run. The sea breeze was evident with white caps and an irregular chop. Visual observations of wave height corresponded with the wave buoy located at Cottesloe.

The vessel was set adrift in the sea and generally laid at 80 degrees to the wave direction.

Trials were performed on Friday, 12th January, 2007 from 11.00 am to 12:30 pm.

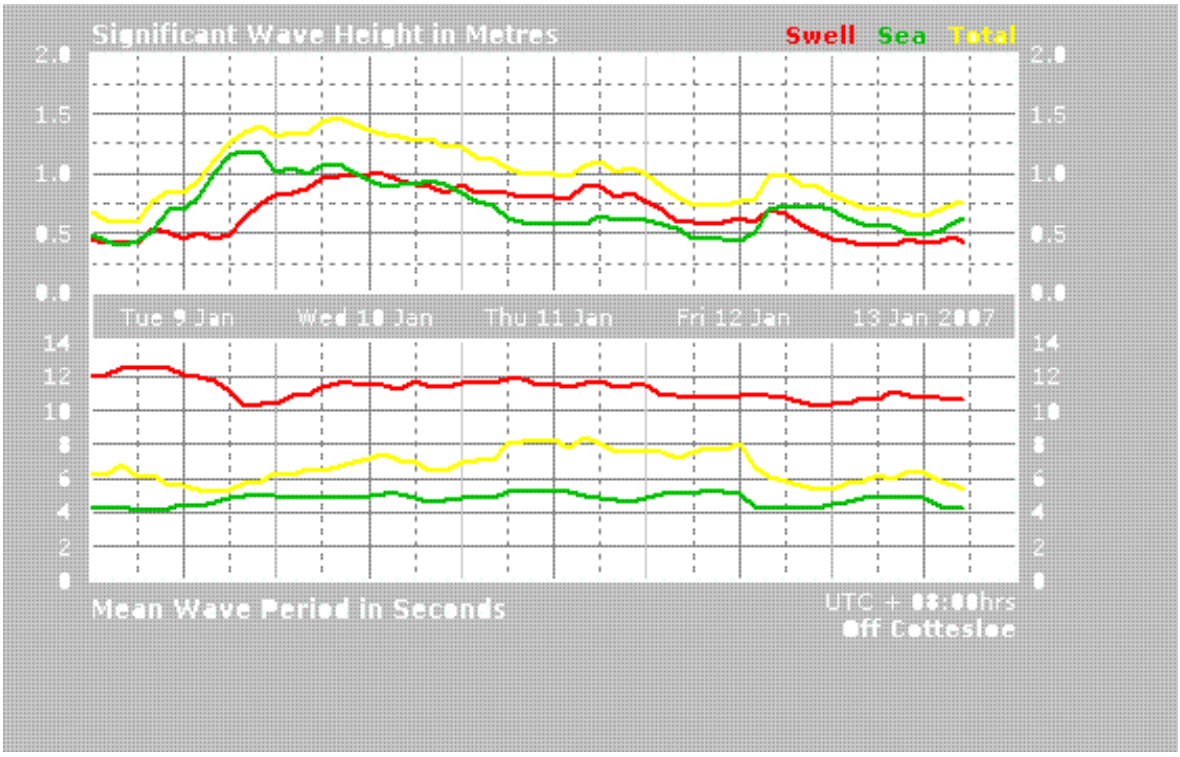

Figure 3: Cottesloe wave buoy

Raw data

Data was collected with a TSS three axis motion sensor. This information was stored on a computer for analysis using Excel spread sheets. Data was collected with zero gyro speed, then three other gyro speeds at 20, 40 and 60hz.

Corrected data

The results were corrected based on the wave heights and conditions that the vessel operated in.

Corrections

Sea (metres)	0.4	0.5	0.6	0.7
Gyro speed	0	20hz	40hz	60hz

Figure 4: Wave height corrections

Net results

It was apparent from the initial start-up of the gyro that there was a change in the motion of the vessel. Figure 5 demonstrates that over the sea trial period that the roll, pitch and heave was reduced by over 50%.

What was surprising was the effect the gyro had on pitch and heave. This is not typical in standard round or shallow vee boats, and can only be attributed to Azura's deep vee and tall tower.

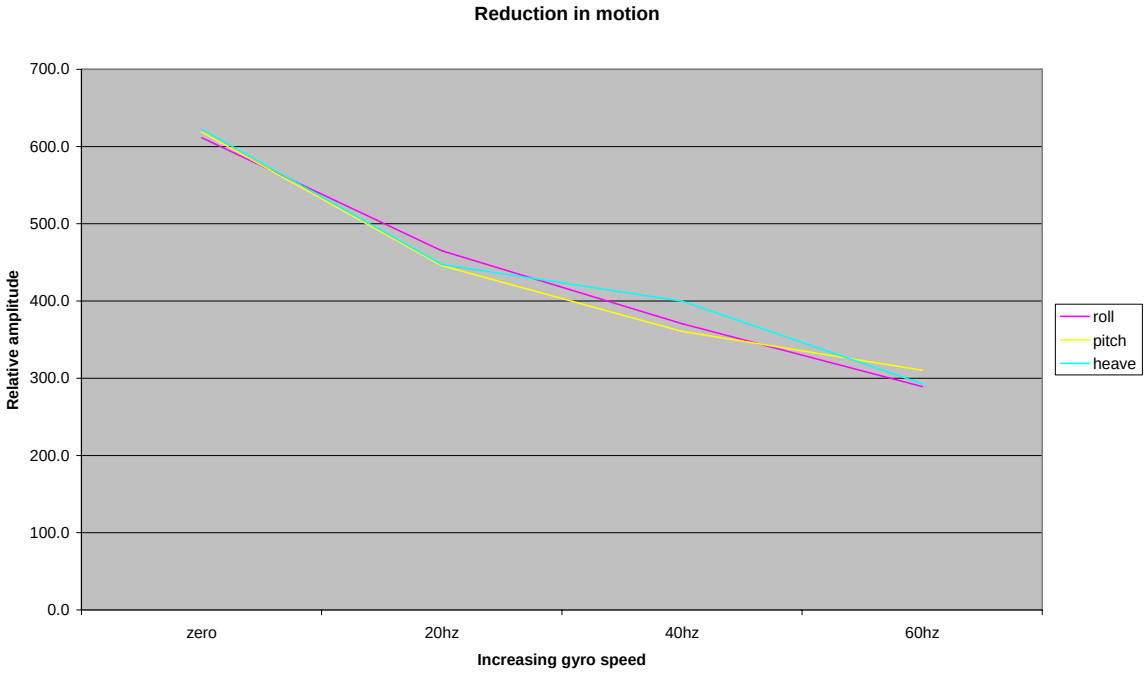

Figure 5: Motion reduction

Deck acceleration

In Figure 6 there is demonstrated the large decrease in deck acceleration, much greater than the 53% attenuation achieved in roll. This is the combine result of roll, pitch and heave reductions

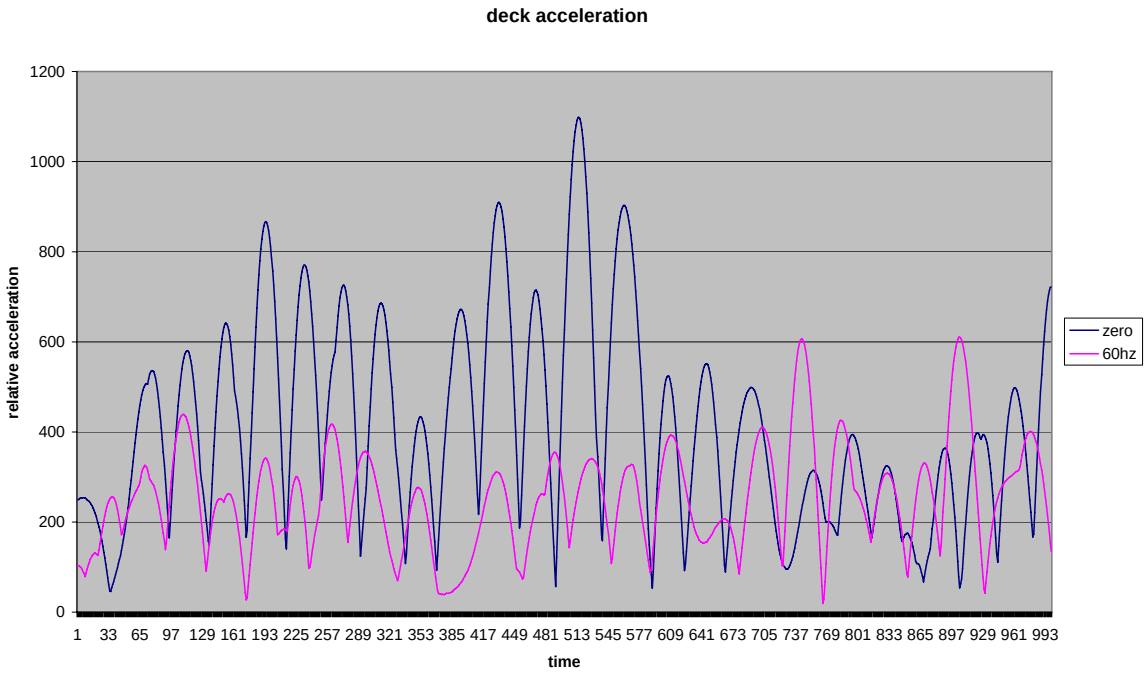

Figure 6:Deck acceleration

Conclusion

The data and analysis results were extremely pleasing, with an addition benefit of pitch and heave reductions. The motion and acceleration on Azura is now more acceptable to general use.

Appendages

wave height		0.40	0.50	0.60	0.70	**% at 60hz**
1/wave height		2.50	2.00	1.67	1.43	
Raw	zero	20hz	40hz	60hz		relative to z
roll		244.6	232.6	222.4	202.5	83%
pitch		82.5	74.3	72.1	72.4	88%
heave		16.6	14.9	16.0	13.7	82%
Corrected						
roll		611.6	465.2	370.6	289.3	47%
pitch		206.3	148.6	120.2	103.5	50%
heave		41.5	29.8	26.7	19.5	47%
Combined raw						
roll		244.6	232.6	222.4	202.5	83%
pitch		247.5	222.9	216.4	217.3	88%
heave		249.0	223.7	239.9	204.9	82%
Combined corrected						
roll		611.6	465.2	370.6	289.3	47%
pitch		618.9	445.8	360.7	310.4	50%
heave		622.6	447.5	399.8	292.8	47%
Deck acceleration						
combined movement		343.8	321.8	310.5	288.6	84%
corrected		859.4	643.7	517.5	412.3	48%

Figure 7: Table of results

Figure 8: Graph relative roll, pitch and heave zero gyro

Figure 9: Graph relative roll, pitch and heave 60hz gyro