

# ANALISIS STABILITAS DAN OLAH GERAK KAPAL PADA KASUS TENGGELAMNYA KMP YUNICEE DI PERAIRAN GILIMANUK

**Nanang Satrio**

## ABSTRAK

Penelitian ini bertujuan untuk menganalisis karakteristik stabilitas model KMP Yunicee, menganalisis respons Olah Gerak Kapal (*heave, pitch, roll*) terhadap variasi arah gelombang ( $0^\circ$ ,  $45^\circ$ ,  $90^\circ$ ,  $180^\circ$ ), mengevaluasi stabilitas dari variasi loadcase sesuai kronologi kejadian kecelakaan, menganalisis pengaruh bukaan rampa buritan terhadap stabilitas kapal, mengkaji respons olah gerak kapal pada berbagai kondisi pemuatan, serta merumuskan kesimpulan komprehensif berdasarkan analisis stabilitas dan olah gerak kapal pada kasus tenggelamnya KMP Yunicee di Perairan Gilimanuk. Analisis stabilitas dilakukan pada lima kondisi progresif masuknya air laut ke geladak kendaraan yaitu Keadaan 1 hingga 5 dengan variasi genangan 0%, 10%, 20%, 30%, dan 40% dari kapasitas geladak. Setiap kondisi dianalisis dengan memperhatikan perubahan posisi pusat gravitasi vertikal kapal (*keel to gravity/KG*) dan dievaluasi kesesuaiannya terhadap kriteria stabilitas IMO. Analisis Olah Gerak Kapal dilakukan untuk mengkaji respons gerakan kapal terhadap gelombang dengan arah *following sea* ( $0^\circ$ ), *quartering sea* ( $45^\circ$ ), *beam sea* ( $90^\circ$ ), dan *head sea* ( $180^\circ$ ). Hasil penelitian menunjukkan penurunan stabilitas signifikan pada kondisi genangan 30-40% yang tidak memenuhi kriteria IMO, dengan respons *pitch* tertinggi terjadi pada kondisi *beam sea*. Bukaan rampa buritan mempercepat masuknya air laut dan memperburuk kondisi stabilitas kapal. Penelitian menyimpulkan bahwa kombinasi penurunan stabilitas akibat genangan air laut, bukaan rampa buritan, dan kondisi gelombang *beam sea* merupakan faktor kritis yang berkontribusi terhadap tenggelamnya KMP Yunicee di Perairan Gilimanuk.

**Kata kunci:** KMP Yunicee, stabilitas kapal, Olah Gerak Kapal, genangan air laut, keel to gravity, arah gelombang, kriteria IMO

# **STABILITY AND SHIP MOTIONS ANALYSIS OF THE VESSEL IN THE SINKING INCIDENT OF KMP YUNICEE IN THE WATERS OF GILIMANUK**

*Nanang Satrio*

## **ABSTRACT**

*This research aims to analyze the stability characteristics of the KMP Yunicee model, analyze Olah Gerak Kapal responses (heave, pitch, roll) to wave direction variations (0°, 45°, 90°, 180°), evaluate stability from loadcase variations according to the accident chronology, analyze the effect of stern ramp opening on ship stability, examine ship motions responses under various loading conditions, and formulate comprehensive conclusions based on stability and Olah Gerak Kapal analysis of the KMP Yunicee sinking in Gilimanuk Waters. Stability analysis was conducted on five progressive conditions of seawater ingress to the vehicle deck, namely Condition 1 to 5 with flooding variations of 0%, 10%, 20%, 30%, and 40% of deck capacity. Each condition was analyzed by considering changes in the ship's vertical center of gravity position (keel to gravity/KG) and evaluated for compliance with IMO stability criteria. Olah Gerak Kapal analysis was conducted to examine ship motion responses to waves from following sea (0°), quartering sea (45°), beam sea (90°), and head sea (180°) directions. Research results show significant stability degradation at 30-40% flooding conditions that do not meet IMO criteria, with the highest pitch response occurring in beam sea conditions. The stern ramp opening accelerated seawater ingress and worsened the ship's stability condition. The research concludes that the combination of stability degradation due to seawater flooding, stern ramp opening, and beam sea wave conditions are critical factors contributing to the sinking of KMP Yunicee in Gilimanuk Waters.*

**Keywords:** *KMP Yunicee, ship stability, motions, seawater flooding, keel to gravity, wave direction, IMO criteria*