

BAB VI

PENUTUP

A. KESIMPULAN

Dari hasil analisis dan pembahasan yang telah dilakukan, maka dapat ditarik beberapa kesimpulan sebagai berikut:

1. Perencanaan dan perhitungan dimensi ukuran utama yang telah dilakukan terhadap pembangunan lambung *airboat* telah memenuhi kebutuhan perencanaan lambung untuk kapasitas 3 orang. Hasil dimensi ukuran tersebut ialah dengan panjang keseluruhan LOA 4 meter, panjang garis air LWL dan panjang garis tegak LPP 2,9 meter dan *draft* T 0,11 meter.
2. Kondisi stabilitas pada lambung *airboat* mempunyai nilai yang cukup efektif terhadap kondisi muatan yang direncanakan, dimana dari hasil uji coba didapatkan hasil *draft* yang relatif kecil yaitu 0,04 m. Sehingga dari kondisi tersebut diharapkan hasil selanjutnya dapat sesuai harapan sampai dengan proses *airboat* telah jadi seutuhnya.
3. Ketersediaan mesin untuk sistem penggerak *airboat* ini relatif terbatas dimana nilai daya yang ada sangat besar bila dibandingkan dengan yang diperlukan, sehingga penggunaan mesin dari ketersediaan yang ada tersebut sangat berpengaruh terhadap kecepatan dan efektivitas dari *airboat* itu sendiri baik secara teknis maupun dari nilai ekonomis penggunaannya.
4. Secara konstruksi lambung *airboat* ini telah diberikan gading-gading atau *frame* sebagai penguat bagian dasar dan samping lambung dan dibangun dengan prosedur laminasi yang telah mengikuti standar klasifikasi yaitu Biro Klasifikasi Indonesia untuk pembangunan dengan bahan *non metallic*,

sehingga lambung *airboat* ini telah memiliki kekuatan yang baik secara konstruksi untuk dapat digunakan.

5. Penggunaan *fiberglass reinforcement plastic (FRP)* sebagai bahan utama dalam pembangunan lambung *airboat* ini memiliki kelebihan yaitu berat yang lebih ringan dibandingkan dengan bahan lainnya seperti pelat besi dan lain sebagainya. Sehingga dapat mendukung perencanaan lambung untuk kapasitas 3 orang ini secara optimum.

B. SARAN

Berdasarkan hasil penelitian dan pembahasan serta kesimpulan yang telah dikemukakan diatas maka penulis mempunyai beberapa saran antara lain:

1. Untuk meningkatkan hasil yang lebih baik terutama dalam pemanfaatannya di Indonesia perlu dilakukan penelitian dan analisa khusus mengenai konstruksi pembangunan lambung *airboat*. Sehingga diharapkan melalui analisa yang lebih mendalam dapat menemukan hasil yang optimum dan efektif bagi perencanaan lambung *airboat* yang diperlukan.
2. Perlu dilakukan beberapa uji coba terhadap beberapa mesin dari ketersediaan mesin yang ada. Diharapkan dengan beberapa mesin tersebut dapat menemukan daya yang lebih efektif terhadap pengoperasian *airboat* dengan kapasitas penumpang yang direncanakan. Karena pada dasarnya *airboat* bisa saja menggunakan mesin motor, *gokart* dan lain sebagainya.
3. Penulis berharap kedepannya penelitian ini dapat terus dilanjutkan sampai akhirnya *airboat* telah selesai seutuhnya dan dapat dioperasikan serta memiliki manfaat bagi kehidupan orang banyak. Besar harapan saya, Fakultas Teknologi Kelautan dapat menjadi bagian dalam menciptakan sesuatu yang berguna dan bermanfaat bagi negeri ini.

DAFTAR PUSTAKA

- AB. Bryan, *Ship Hydrostatic and Stability*, Butterworth-Heinemann, London. 2003. Perangkat Lunak 10,3 MB
- Biro Klasifikasi Indonesia, *Rules For Non-Metallic Materials*. 2006. Jakarta. Perangkat Lunak 0,818 MB.
- Herbert Schneekluth & Volker Bertram, *Ship Design for Efficiency and Economy*, Butterworth-Heinemann, London. 1998. Perangkat Lunak 1,69 MB.
- Indra Kusna Jaya, *Teknik Konstruksi Kapal Baja*, Direktorat Pembinaan Sekonlah Menengah Kejuruan, Jakarta. 2008. Perangkat Lunak 3,62 MB.
- ITTC. *The International Towink Tank Conference Recomendated Procedures and Guidelines*. 1978. Perangkat Lunak 0,314 MB.
- Jenkinson, L. R and John Wiley & Sons Inc., *Aircraft Design Projects*, New York. 2003. Perangkat Lunak 2,43 MB.
- L. Yun & A. Bliault, *Theory and Design Air Cushion Craft*, John Wiley & Sons Inc., New York. 2000. Perangkat Lunak 45,7 MB.
- Lars Larsson and Rolf E Eliasson, *Principles of Yacht Design Second Edition*, London. International Marine. 2000. Perangkat Lunak 17,1 MB.
- Maritime New Zealand. *Barge Stability Guidelines*. New Zealand. 2006. Perangkat Lunak 0,264 MB
- Morthon Gertler. *A Reanalysis of The Original Test Data For The Taylor Standard Series*. 1954. USA.
- Prof. Manuel Ventura, *Estimation Methods For Basic Ship Design*, Portugal. Instituto Superior Tecnico. Perangkat Lunak 0,346 MB.
- SNAME, *Principles of Naval Architechture Volume I*, USA. 1988. SNAME. Perangkat Lunak 28,9 MB.
- Sv. Aa. Harvald, *Ship Resistance and Propulsion*, Perangk at Lunak 11,3 MB.
- James W. Sebastian. *Stability Methods. Naval Postgraduate School. USA* 1997. Perangkat Lunak 2,37 MB

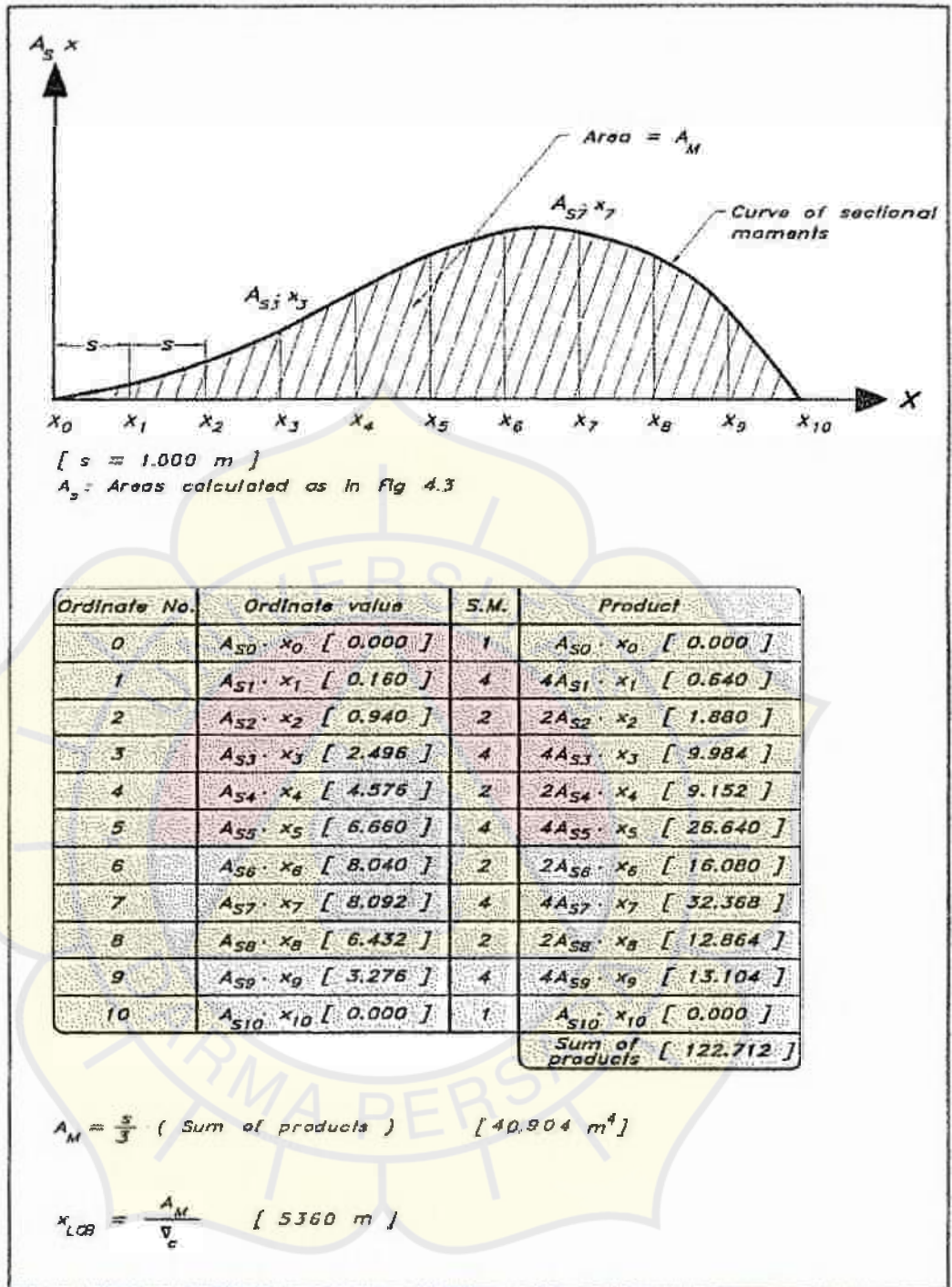
TUGASAKHIR

HADI KISWANTO 09310005

-
- Syamsul Arif Muharam, *Desain dan Konstruksi Kapal Fiberglass Di PT. Carita Boat Indonesia Kecamatan Setu, Kota Tangerang Selatan, Banten.* 2011. IPB. Bogor. Perangkat Lunak 2,986 MB.
 - <http://www.alumitech.net>
 - <http://www.americanairboats.com>
 - <http://www.google.com/image>
 - <http://id.wikipedia.org>
 - http://id.wikibooks.org/wiki/Pelayaran_Sungai_dan_Danau/Dasar-dasar_Kapal
 - <http://www.yellowboat.com>



4.6 Calculation of the longitudinal centre of buoyancy of the canoe



of a knife at right angles to the longitudinal axis. When the cardboard is balanced, its centre of gravity is on the edge of the knife. This is also the position of the LCB. If the piece is hung on a needle and allowed to rotate, the vertical line through the needle crosses the centre of gravity. By hanging the piece at two positions and using a plumb bob to mark the vertical lines, the centre of gravity is found at their intersection.

For the determination of the vertical position of the centre of buoyancy (VCB), the vertical distribution of sectional moments must be considered. If the areas of several waterlines are known, the vertical distribution of the volume can be plotted in the form of a curve. This curve can then be

$$GM = KB + BM - KG = \frac{1}{2} + \frac{b^2}{12t} - h$$

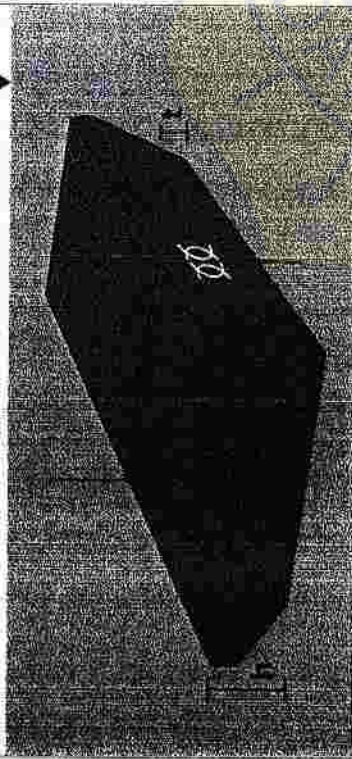


ILLUSTRATION TWO GLOSSARY

t	Draught
b	Length
b	Beam
h	Height

For a pomboon shaped barge an approximation for the metacentric height (GM) can be obtained from the rectangular block formula which says:

$$GM = (b/2) + (b^2/12t) - h$$

where t is the draught, b is the beam, and h is the height of the barge, as shown in illustration two.

This formula assumes the barge is a rectangular block with the lightship centre of gravity at deck level. Careful examination of this formula shows the stabilising effect of a beamy barge, referred to above, is considered negligible.

The initial metacentric height (GM) obtained using the rectangular block formula is a fair approximation for a vessel with a block coefficient of about 0.9 and above. The block coefficient is a measure of how closely a particular vessel is to a rectangular block of length x beam x height. In order to more exactly determine the position of the centre of gravity (G) and the metacentric height (GM) for a particular vessel, an inclining experiment needs to be conducted and the results used for a stability analysis. In an inclining experiment weights are moved to the outer edge of the deck of the barge and the heel that results is measured with a pendulum.

An inclining experiment should be undertaken by a Ship Surveyor recognised by Maritime NZ to do so, and the results of the inclining experiment should be analysed by a similarly recognised Naval Architect.

Static Stability

For stability to be adequate, the righting lever (GZ) resulting from the heeling of a loaded barge is required to be greater than zero (positive) for all angles of heel up to a certain minimum heel angle. 35° is a recommended minimum heel value.²

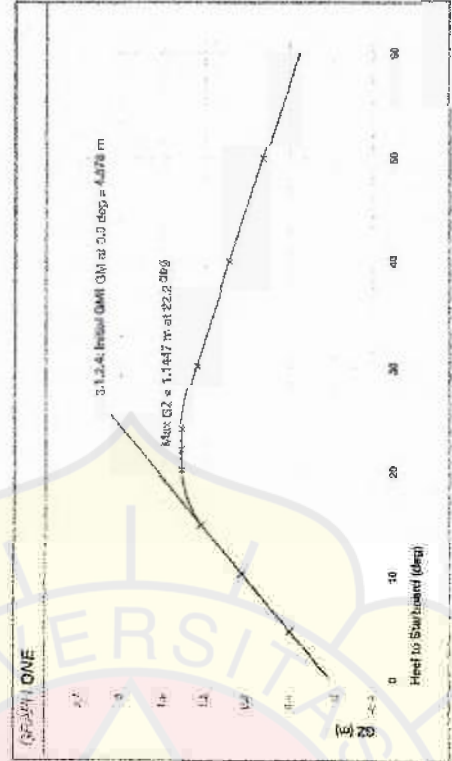
The righting levers arising from different angles of heel are best understood when plotted on a curve. A typical righting lever curve (GZ curve) is shown below in graph one. This particular curve is for a 24m by 8m barge with a loaded displacement of 148 tonnes. It can be seen that the GZ value (measured in metres) is greater than zero for all heel angles up to more than about 60°.

GZ curves, such as the one shown, are generated from the stability analysis undertaken by a Naval Architect who will most often use the results from an inclining experiment. Each vessel will have a unique curve depending on displacement, weight distribution and hull shape.

Dynamic Stability

The area under the GZ curve (and above the horizontal (0) axis), is a product of metres and degrees, and is also an important measure of the stability of a vessel. The larger this area the greater the capacity of the vessel to right itself as it rolls from side to side. This is known as righting energy.

A recommended minimum value for the area under the GZ curve is 5.72° metre x degrees.³



The size of this area is determined by the initial GMI (which gives the starting slope of the curve), the heel angle at which maximum GZ occurs (which gives the height of the curve) and the range of heel angles for which GZ is positive (which gives the length of the curve).⁴

² The value is a simplified summary of Maritime Rules 40C Appendix 1 (2010) and (1), and consistent with Class Society requirements for barge operations.
³ This is a conservative application of the requirements of Maritime Rule 20M.

To facilitate non-dimensional plotting, he also introduced the residuary stability coefficient, C_{RS} , whereby

$$C_{RS} = \frac{MS}{BM_T} \quad (11)$$

Figure 6 shows curves of C_{RS} for various sized tankers and warships, calculated using General HydroStatics (GHS) software, for angles of heel up to 90 degrees. It can be readily seen that the positive C_{RS} at lower angles is what causes the GZ curve to have a steeper slope than the sine curve used in Equation (4). At higher angles, C_{RS} quickly becomes negative, drawing the GZ curve down toward the unstable region. The transition point between the lower and higher angles, although not easily discerned, corresponds to the point where the deck edge is immersed. In general, GZ can be thought of as getting its height from GM and its shape from C_{RS} .

Residuary stability however, is not merely hull form "dominant," it is entirely independent of the location of the center of gravity. This is illustrated in Figure 7, which shows the CRS curves for a fine-lined hull with varying heights of center of gravity (KG). While this is true, it can not be said that residuary stability is independent of loading all together. The extent of loading or total weight will determine the displacement, and hence the draft, of the vessel which greatly influences the residuary stability.

Prohaska's further research into residuary stability and the effects of hull form on transverse stability resulted in the broad conclusion that the ratios of beam to draft (B/T) and depth of hull (B/D) have a comparatively greater influence on transverse stability than do the coefficients of form (i.e. fullness parameters). His work included the analysis of C_{RS} for a series of 42 systematically varied hull forms, covering the range of fullness coefficients seen in the merchant ship fleet of the day. (Prohaska, 1951)

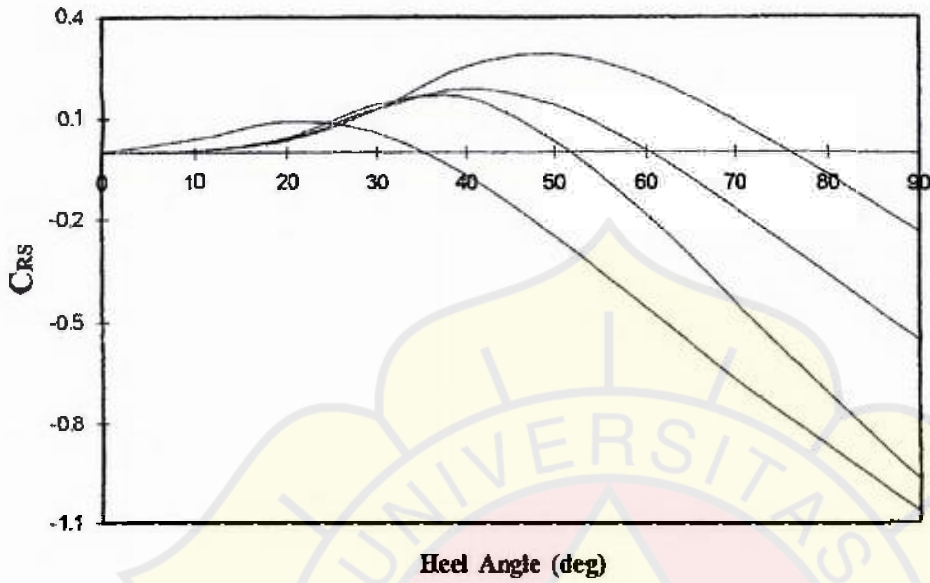


Figure 6. Residuary Stability Coefficient Curves

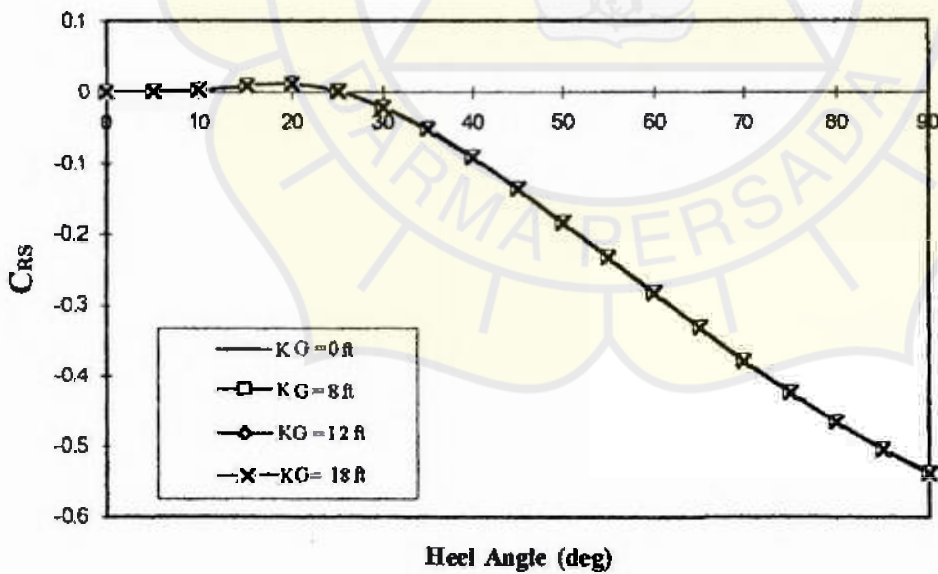


Figure 7. Residuary Stability Coefficient for Various KG