

## AN AIRBOAT FOR RURAL RIVERINE TRANSPORTATION AND MANGROVE MARINE ENVIRONMENT APPLICATIONS

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### ABSTRACT

The present works describe the design and initial performance study of a prototype airboat for riverine transportation, including mangrove habitat applications, with particular reference to Sarawak, East Malaysia. Many local rural riverine transportation and marine habitat studies are limited due to tide-line dependent and the limitation of conventional blade type marine engine. The use of airboat could ply at the local everglades areas and shallow waters; however the conventional airboat having flat bottom hull may at times not suitable in the narrow mangrove habitat which generally has extended roots. In the present study, our boat was custom designed with Shallow-Vee hull shape, employing a 2-stroke engine. Experimental results have shown that the new airboat built has good performance and balancing capability. Subsequent simulation study employing PROLINE software suggest that 2 passengers as the optimum number for the airboat overall performance (optimum performance and stability), coherent with the experimental trials. Compared with conventional air boats, the new boat design is likely to have two added advantages: (1) relative cheap cost and affordable in development, and (2) shallow-Vee shape design is more suitable than the wider flat bottom shape type due to narrow mangrove habitat, where the shallow mangrove trees generally having roots in the water and extended roots on the water surface.

**KEYWORDS:** *Rural riverine transportation; Swallow rivers, Mangrove habitat; River engineering; Low-tide delta; Boat performance; Modeling*

### 1. INTRODUCTION

Unlike other developed urban areas, the usage of water transportation is very important in the nearshore marine habitat and riverine areas of Sarawak, Malaysia (Fig. 1), especially in the rural areas that could not be assessed by normal means of car transportation, such as the delta (Fig. 2a) and mangrove habitat (Fig. 2b). Many parts of these areas are also swamp and shallow especially during low tide in the delta regions (Fig. 2a and Fig. 2c). Thus the conventional blade type marine engine is not feasible for use during low tide. Unlike conventional boats, airboat's propeller is above the water thus it could easily move around on the swampy, shallow and everglade areas. Furthermore, wave generated from conventional boats is known to be able to cause unwanted river bank erosions, see e.g. Gerald et. al [1]. As such, the airboat could be used during low tide situation for rural riverine transportation. Moreover, airboat could be considered as one of the promising low cost but robust methods outlined by, e.g. Steve et. al [2] useful for field survey of coastal and riverine habitats.

The use of airboat in ice and water rescued emergencies environments had been reported by Dumment [3]. It had been found that airboats could minimize risk to responding personnel and reduce the time required to perform life saving operations by a quantifiable figure of 50-80%. Compared with the cost of an ambulance, the author concluded that an airboat, which cost around US\$ 25,000-40,000, could be considered as an inexpensive investment under ice water environment. According to Dumment [3], the airboat is more stable and less maintenance cost than a hovercraft. Here, it is to be noted that the working principle of airboat and hovercraft are quite similar where the wind thrust acting backward generated by the propeller of airboat and hovercraft causes the vessel to move forward. They are only different in the base construction to provide air cushion in the later. Racine et al. [4] reported that airboats had been used in Alaska particularly in the interior regions. The capability of the airboats to traverse wetlands with sensitive vegetation and soils makes them different from ordinary watercraft. Thus they suggested airboats should be considered as a separate category of off-road vehicles by the managers of public lands. James [5] reported that airboat was able to bounce over broken ice at frozen Mississippi River for hydro survey application.