

A Review on Current Design of Unmanned Surface Vehicles (USVs)

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Abstract – *The paper discusses the expanding technologies that have allowed the USVs to emerge widely in various of sector marine as well as the application areas where they offer valuable serve. The paper comparing from the previous concept design until the current design of USVs and their function and suitability. Copyright © 2015 Penerbit Akademia Baru - All rights reserved.*

Keywords: USV, Catamaran, Trimaran

1.0 INTRODUCTION

The ocean covers more than 71 percent of the Earth's surface and contain about 97 percent of the planet's water, yet more than 95 percent of the underwater world remains unexplored [1]. Unmanned underwater and surface vessels are an essential technology to advance the exploration of these areas at lower cost and higher efficiency and safety compared to research vessels [2]. Unmanned surface vehicle (USV) have also been called autonomous surface craft (ASC) [3], mainly known from fine-scale surveys of limited area and diverse measuring vehicles are available for that short-term measurements with various adaptable sensors [4].

Moreover, long endurance vehicles were designed for long-term missions, generating energy from solar, wind or waves, which are suitable for low-power applications, [5]. Other than that, the USV also must able to carry various devices like battery, servo motor system for underwater propeller and the most important thing it must able to withstand with the rough sea wave condition.

2.0 CURRENT DESIGN OF USV-FUNCTION

The concept of USV is not new and the examples can be found quite far back in the past, even earlier than World War II, where the Canadians developed the COMOX torpedo in 1944 as a pre-Normandy invasion USV designed to lay smoke during the invasion [6]. The most designs of USV were developed for reconnaissance and surveillance missions with the development of the Autonomous Search and Hydrographic Vehicle (ASH) were planning hull with high speed like Roboski and Owl MK II (Fig. 2) which are a Jet Ski chassis equipped with a modified low-profile

hull for increase stealth and payload capability [6]. One of the most compelling in USVs, could serve as unmanned force multipliers for a number of littoral combat mission.

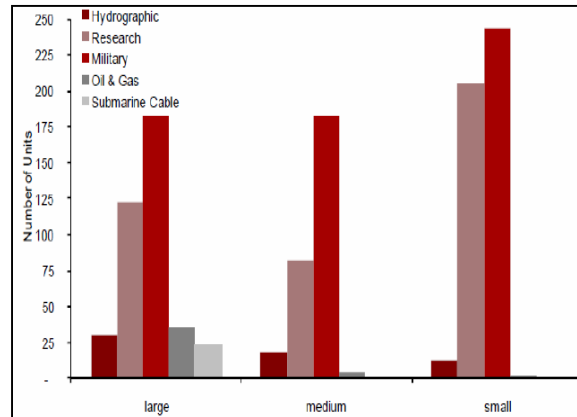


Figure 1: USVs market prospect. (Source: *The World USV Market Report 2010-2019*)



Figure 2: OWL MK II.

Survey applications have made use of a variety of hull forms like numerous catamaran type USVs have been developed to support academic interests [7, 8]. An Italian catamaran USV, called SESAMO, was used in Antarctica in support of oceanographic research [9]. Cause by the stability, payload capacity and ease of deck access make catamarans a compelling choice for academic USVs. Figure 3 shows the ROAZ vehicles from Portugal, like SESAMO, exemplify the general arrangements [10].

As USVs achieve longer endurance it is possible to envision a new era of ocean engineering. The expensive fixed mooring may soon be replaced by the USVs where the vehicles could keep station in a desired location [3]. The majority of the USV is submerged with only a mast for communication and air intake protruding above water. Figure 4 shows, C&C Technologies has used autonomous unmanned vehicles (AUVs) successfully for commercial and scientific surveys [11] and similar applications of this USV can be expected.



Figure 3: The ROAZ USV.

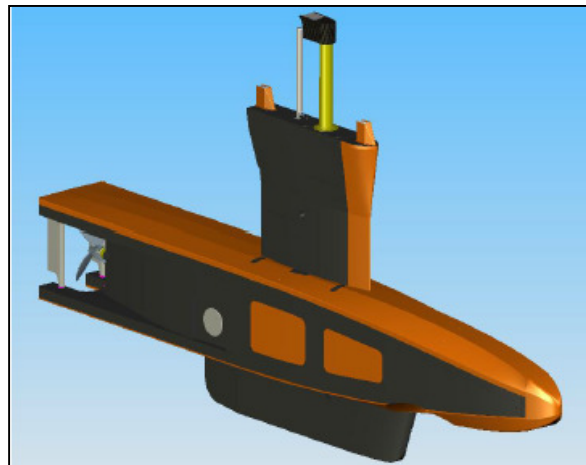


Figure 4: A new USV Design for survey applications (courtesy C&C Technologies).



Figure 5: The robot-boat CatOne using the concept of catamaran for shallow water hydrography.



Figure 6: Deep-Robot with the concept of SWATH.

Most of the USV's design, built with planning hull and it is good for high speed seems most of the USV's built used for military and guard the shore's territory whereas most of them used at shallow water. But the results is different when planning hull give their service at the deep sea whereas the wave is rough and highly resistance. Besides that, USVs also can be found with the concept of small waterplane area twin hull (SWATH) and catamaran [12, 13].

3.0 New low-drag USV craft

The developing of USVs was continuously and the new design of low drag USV have been introduced.

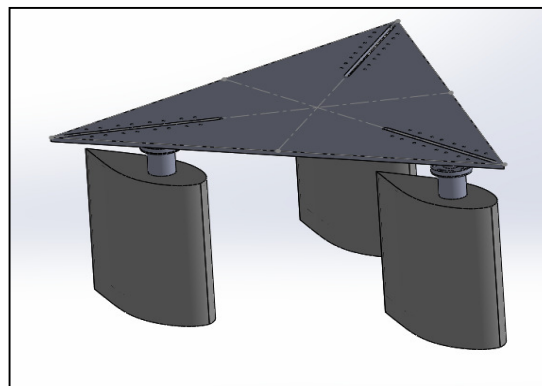


Figure 7: New low-drag USV.

Figure 7, the concept of the design based on the combination of trimaran and spar platform where the submerged draft is higher than free surface in order to withstand the high resistance at the open and deep sea.

4.0 CONCLUSION

This paper presented an inclusive review on current and future design of USV. Every USVs have their own advantages and disadvantages regarding their limitation of service area based on why

they made up for. But they offer many users the opportunity to gather data safely and effectively without risk any life. The study on the low-drag design still in progress and hopefully will come out with something important and useful for the next research.

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