Sky-high on water: Young researcher proves potential of air-water propulsion

With further development, the water-propelled rocket could have far-reaching applications

Expressing his excitement on the recent ground-breaking research conducted by one of his students at the University of Pretoria (UP), Dr Arnaud Malan of CSIR Defence, Peace, Safety and Security borrowed a phrase coined by Thomas Edison: "*Genius is one per cent inspiration and 99 per cent perspiration.*"

This is after Malan's student, Ernest Aylward, designed a pressurised, water-propelled rocket as part of his final year thesis. Water-propelled rocketry is becoming increasingly attractive in engineering for military, industrial and recreational applications. This is due to its unrivalled cost and safety as compared to combustion based systems.

Aylward's project covered the complete spectrum of rocket launching, including the interactive processes of design, manufacture and testing of the pressurisation and launching mechanisms, fuselage, stabilising fins and an acceptable recovery system. All the components are designed to make the system safe and easy to operate.

The rocket fuselage's crumple zones (recovery system) and stabilisation wings were manufactured from polyester resin and fibreglass, using filament winding and hand lay-up laminating processes. Further mathematical models were developed to predict the fuselage behaviour under pressure and the overall rocket behaviour optimised.

The final rocket was 3,6 l in volume, weighing 860 g. The rocket was launched successfully, and with an initial internal pressure of 2,2 MP, reached an estimated 146 km/h and a height of 96 m. This was done within 8% of the predicted height.

According to Malan, the obvious potential application of this technology lies in military reconnaissance. He says the military can use it to launch a surveillance camera into the air and take snapshots of the surroundings. "All you need is a pressurised air cylinder and access to water," says Malan, adding that the launch of the rocket is "super safe, completely non-toxic and basically represents a super green solution".

The technology can also be used on construction sites to launch cables. In addition, it can be used to measure wind speed and temperature at various sites, he says. "The toy industry could potentially benefit and could help to lure children to take up science," he says.

Malan, who is a principal researcher in aeronautic systems at the CSIR, says he was approached by the UP to supervise students and a mutually-beneficial relationship has been formed.

Recently Malan was appointed as an extraordinary lecturer at the UP for three years. "This form of collaboration means that we undertake exciting work that captures the imagination of bright, young minds. They in turn engage in postgraduate studies at the CSIR, resulting in research outcomes that contribute to CSIR research and development work while fostering the CSIR scientists of tomorrow."

Malan and his protégé have received funding from the Department of Science and Technology and Aylward will be working on his Master's to develop the next generation water-propelled rocket with commercial value.

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