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## THE RUAV & THE “MEHAR BABA” PRIZE

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### The Prize

On October 03, 2018 Air Chief Marshal BS Dhanoa PVSM AVSM VSM VM ADC announced the institution of the “Mehar Baba” prize worth Rs 10 lakh with a provision of an additional development fund of Rs 10 crore to the winner.<sup>1</sup> The competition is for developing an Unmanned Aerial System (UAS), capable of deploying and operating multiple Unmanned Aerial Vehicles (UAVs), loosely termed as a “drone swarm” in a collaborative manner. The aim is to enhance the Humanitarian Assistance and Disaster Relief (HADR) capabilities of the Indian Air force (IAF). A secondary aim of the effort would be to nudge the development of indigenous capabilities in the field of Artificial Intelligence (AI) and allied technologies. The IAF webpage,<sup>2</sup> while giving December 17, 2018 as the date of presentation of the ‘Phase I,’ also depicts the Advanced Light Helicopter (ALH) as the platform of choice for HADR operations. Therefore, this may also be the right time to carry out a status check on the indigenous Rotary Unmanned Aerial Vehicle (RUAV) programme.

### The Indigenous RUAV Programme

The world’s first RUAV—optionally manned Kaman HTK-1K helicopter— saw its first operational mission on May 23, 1957 (with a safety pilot on board) and thereafter in July 1957 as a pure drone, both times flying to the US Navy ship- USS Mitscher (DL-2).<sup>3</sup>

In 2006, India too initiated a joint Israel Aerospace Industries (IAI) and Defence Research and development organisation (DRDO) project worth Rs. 1163 crores<sup>4</sup> to meet the Indian Navy’s requirement of using the RUAV in a shipborne Intelligence, Surveillance and Reconnaissance (ISR) role. It was expected that the IAI’s specialist Malat division would be able to supply a kit enabling the Hindustan Aeronautics Limited (HAL) manufactured Chetak to be flown in an unmanned configuration and subsequently be able to modify the Light Utility Helicopter (LUH)<sup>5</sup>. The desired performance characteristics included an endurance of six hours and ceiling of 15,000 feet with a payload of 220 Kgs. The programme started facing difficulties in 2010

itself, due to the limitations of the flight control system of the Chetak, which was servo assisted and without an autopilot system, along with its fully articulated rotor<sup>6</sup> system. In the project, the dependence on IAI for key technologies was also an unstated fact.

Drawing upon the key lessons learnt, HAL along with IIT-Kanpur,<sup>7</sup> thereafter compared notes and undertook fundamental research into helicopter stability and control systems along with the autopilot, which would aid in the RUAV design. This effort, resulted in the demonstrated flight of the first indigenous RUAV system, on August 03, 2018.

### **The HAL RUAV Technology Demonstrator**

On August 03, 2018, HAL demonstrated the capabilities of a 10 Kg RUAV, which is based on a conventional main rotor/tail rotor design. The RUAV has an endurance of one hour and a range of ten kilometres with a payload of 2.5 Kg. As was announced by HAL<sup>8</sup>:

*“The flight lasted for about ten minutes during which the Attitude Control Attitude Hold (ACAH) mode, Position Control, Position Hold mode (autonomous hover), low speed flight in forward, backward and sideward directions, were demonstrated. The video feed from onboard the helicopter was streamed live and shown on the dedicated video receiver. The status of the helicopter, its parameters and its real-time position on the map were also shown.”*

The demonstrated technologies included the entire range of control laws governing helicopter control systems besides the fly-by - wire system (full authority controller) along with associated systems required for full exploitation of the platform. Other options could also include various other types of EO/IR payloads. However, the important aspect of building upon the expertise so gained must not be lost sight of.

### **What Next?**

The HAL-RUAV project must be exploited for military purposes. It is a seemingly small but a significant start in developing the indigenous technological expertise in the field of RUAS. In its current configuration the HAL RUAV, with its demonstrated capabilities, can be gainfully deployed for various military applications, including perimeter security and surveillance missions.

However, the next logical step must necessarily involve the application of this technological expertise to the indigenous ALH (Dhruv) platform. The ALH Mk-IV would qualify as an ideal platform to be configured and flown in an “optionally manned” mode.

Secondly, the HAL RUAV and the IIT-Kanpur team also has an opportunity to accept the “Meher Baba” challenge and formulate a plan to demonstrate the capability of flying the RUAV “technological demonstrator” in form of a “swarm” to accomplish HADR missions – a task

for which, the helicopter as a platform is the most ideal vehicle.

*(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])*

## Notes

<sup>1</sup> Indian Air Force, "Meher Baba Prize Competition", <http://indianairforce.nic.in/meharbaba/> accessed on October 04,2018

<sup>2</sup> Ibid.

<sup>3</sup> CAPT Vincent C. Secades, "The Naval Helicopter Highlights in Naval Helicopter History", [https://issuu.com/rotorrev/docs/naval\\_helicopter\\_history\\_pamphlet\\_web](https://issuu.com/rotorrev/docs/naval_helicopter_history_pamphlet_web) accessed on October 04, 2018

<sup>4</sup> Rajat Pandit, Economic Times, March 26, 2010, "India lines up Israeli drones in race with Pakistan" <https://economictimes.indiatimes.com/news/politics-and-nation/india-lines-up-israeli-drones-in-race-with-pakistan/articleshow/5725711.cms> ... accessed on October 04,2018

<sup>5</sup>You Tube, "What is IAI-HAL Unmanned Chetak UAV for Navy 5min18Sec"

<https://www.youtube.com/watch?v=OH9UqhYI6Rs> accessed on August 19,2018

<sup>6</sup> A fully articulated rotor system usually consists of three or more rotor blades. The blades are allowed to flap, feather, and lead or lag independently of each other. Each rotor blade is attached to the rotor hub by a horizontal hinge, called the flapping hinge, which permits the blades to flap up and down.

<sup>7</sup>IIT-Kanpur, "IT Kanpur Signs Agreement with Hindustan Aeronautics Limited (HAL)" <http://www.iitk.ac.in/aero/iit-kanpur-signs-agreement-with-hindustan-aeronautics-limited-hal> accessed on Oct 04,2018

<sup>8</sup> HAL-India, "HAL Successfully Demonstrates 10Kg Helicopter UAV" [https://hal-india.co.in/HAL%20Successfull/ND\\_234](https://hal-india.co.in/HAL%20Successfull/ND_234) accessed on Oct 04,2018