

**AHS International**  
**Igor I. Sikorsky Human Powered Helicopter Competition**  
Questions & Answers

**Who is the sponsor of the Human Powered Helicopter Competition?**

- The Igor I. Sikorsky Human Powered Helicopter Competition is sponsored by AHS International. Sikorsky Aircraft has pledged the money for the prize.

**How long has this been going on?**

- The American Helicopter Society (as it was then known) initiated the Igor I. Sikorsky Human Powered Helicopter (HPH) Competition in 1980, initially with a prize of \$10,000. The prize was later raised to \$20,000, and then to \$25,000.
- Igor I. Sikorsky was a founding member of AHS 70 years ago, and the prize was named after him due to his innovative spirit.
- AHS was inspired by the Kremer Prize for the first human-powered airplane to navigate a figure-eight between two markers a half-mile apart. Paul MacCready won that in 1977 with the Gossamer Condor.
- Through 1992, about 17 human-powered helicopters were built. Then the number of pursuits tailed off until recently.
- In 2009, Sikorsky Aircraft sought to increase the motivation for innovators by pledging \$250,000 for the first flight of a human-powered helicopter that meets all of the requirements of the AHS competition.

**What is the significance of the competition's requirements to hover at 3 meters over a 10 by 10 meter box using only human power?**

- **One-minute hover:** approaching the limits of human endurance, as well as efficient power extraction from the pilot and transmission to the rotors
- **Three-meter altitude:** total lift generated vs. total weight of the aircraft and pilot
- **10-by-10-meter box:** controllability

**How were these measured?**

- **One-minute hover:** Measured as the time between when the last rotor lifted off the ground until the time when the first rotor touched down (i.e. the elapsed time when the entire aircraft was off the ground). This was verified on multiple video cameras to exceed 60 seconds.
- **Three-meter altitude:** It was verified by AHS that the lowest part of the aircraft – including all structural wires and support cables – were significantly above the plane of 3m across the entire span of the soccer field.
- **10-by-10-meter box:** A reference point – the center of the Atlas aircraft – had to remain within a 10-by-10-meter invisible square that could have been drawn on the floor after the flight. All flight data verified that the center of the aircraft remained within a 10-by-10-meter square during the entire flight.

### **What technical and technological challenges must a contender overcome to win the competition?**

- Pushing the limits of minimizing weight, maximizing lift, controlling aeroelasticity, and maximizing power transmission, with controllability
- Another challenge has been finding a large enough facility for test flights.

### **What is the practical value of demonstrating human-powered helicopter flight?**

- The AHS Human Powered Helicopter Competition isn't about creating a practical machine. It is intended to challenge engineers in the vertical flight community to harness a variety of technical skills and work as a team to meet stringent technical requirements.
- It is like climbing Mount Everest. It is to prove it can be done.
- The scientific breakthroughs, engineering innovations and inspiring accomplishments that have been engendered by the AHS Sikorsky Prize are a testament to ability of the human spirit to tackle seemingly impossible challenges.

### **What previous attempts have been made?**

- In 1989, California Polytechnic State University, San Luis Obispo, California (Cal Poly) students succeeded in getting the first HPH off the ground and hovered for 8.6 seconds.
- In 1994, a Japanese team at Nihon University flew their Yuri HPH for 19.46 seconds.
- In 2011, graduate students from the University of Maryland Alfred Gessow Rotorcraft Center in College Park, Maryland flew the Gamera helicopter for 11.4 seconds. Maryland's new helicopter, the Gamera II, has flown for more than 60 seconds and in August 2012 reached a height of 2.9 meters, or almost 9.4 feet.
- Many other teams also have studied the challenge over the years. The University of British Columbia (2004) in Vancouver and École de Technologie Supérieure (ETS) (1999) in Montreal both built full-scale contenders for the competition, but they did not fly. A rotor blade from the ETS HPH is on display in the Montreal Science Centre.

### **Why have many people said this was an impossible challenge?**

- Based on the amount of power that a human can output, it did not appear that a pilot could generate sufficient power to drive the rotors at sufficient power to provide sufficient lift. It would have required a highly athletic bicyclist at a very light weight who could power a very large machine at very light weight and generate high lift from the rotors. AeroVelo succeeded with all of these.
- In addition, historical data was used in some analyses which were did not take into account current approaches:
  - 1) Ground effect (aerodynamic lift benefit from the cushion of air between them and the ground): the historical paradigm and data were based on smaller rotors farther from the ground.
  - 2) Materials: historical paradigms and trends did not account for strength and stiffness benefits of fiber-reinforced composite materials
  - 3) Construction techniques: historical paradigms and trends did not account for new structural approaches that capitalized on the properties of new composite materials

### **What was the motivation for the HPH Competition?**

- The competition was specifically designed to energize students and other innovators, by providing a hands-on, galvanizing experience for the next generation of vertical flight engineers, scientists and other specialists.
- Each of the students and young innovators involved in an HPH project was part of something special that they will remember for the rest of their lives. They tried to succeed where so many had failed in the past. They brought their fresh ideas, innovative skills and technical acumen to bear on the problem. They discovered things and tried approaches that had never been thought of before. They worked on a project that was very much like a “real-life” technical and management challenge that they will experience in their careers. Every team that worked on an HPH project got to experience this to some degree.

### **Why did it take so long for a winner?**

- There are two main reasons why it took a third of a century: (1) the state of technology and technical understanding and (2) the size of the prize.
- Over the past 33 years, the aerospace industry has benefited from huge advancements in multiple technologies. These include revolutionary improvements in composite structures and computer simulation, as well as improvements in understanding of rotor aerodynamics and human power output, to name a few.
- To build a successful human powered helicopter takes a significant amount of manpower and money. It’s possible that the flying teams each spent more than the \$250,000 prize money. For someone to invest that amount of time and money, they would either need to be independently wealthy and/or have at least some chance to recover their investment.

### **Do the flight results need to be validated by the Fédération Aéronautique Internationale before you can award the prize?**

- No. AHS International is the certifying body for the AHS Sikorsky Prize.
- The FAI is the international governing body for setting standards for records and for verifying record claims. AeroVelo, if desired, can submit for world records through their FAI country representative, the Aero Club of Canada.

### **If AeroVelo’s Atlas is larger than any other production helicopter ever constructed, was there ever a larger experimental helicopter?**

- The overall maximum dimension of the Atlas is 162 ft. No production helicopter has ever had such a large dimension, nor has any Western helicopter of any type. Of course, by weight (120 lb), it is one of the lightest helicopters ever constructed.
- A Soviet experimental aircraft, the Mil V-12 (sometimes called the Mi-12), NATO reporting name “Homer”) was a gigantic twin rotor helicopter, first flown in 1968, that had an overall maximum dimension of 219 ft, larger than the wingspan of a Boeing 747-400.

### **What will the next challenge be?**

- AHS International is working on the details of the next challenge and will announce it in the coming months. It will not necessarily be a human-powered helicopter.

### **What is AHS International?**

- The American Helicopter Society (AHS) International is the world's oldest and largest technical society dedicated to enhancing the understanding of vertical flight technology. Since it was founded in 1943 – just as the first US helicopter was being put into service – the Society has been the primary forum for interchange of information on vertical flight technology.
- According to the AHS Bylaws, the purpose of the Society is to "advance the theory and practices of the science of vertical flight aircraft."
- Our Vision: To provide global leadership for scientific, technical, educational and legislative initiatives that advance the state-of-the-art of vertical flight.
- Our Mission: The American Helicopter Society (AHS) International is the world's premier professional vertical flight technical society. Since its inception in 1943, AHS has provided an international forum through which to expand the body of knowledge of vertical flight. The Society is the global resource for information on vertical flight technology.
- AHS International is a 501(c)(3) charitable non-profit educational institution. It is based in Alexandria, Virginia, USA. It has more than 6,000 members, including 1,300 outside the U.S.

#### **Where can I find more information?**

- The AHS Human Powered Helicopter Competition webpage is [www.vtol.org/hph](http://www.vtol.org/hph). There are links to videos and extensive media coverage over the past two years. Specifically, media should review these two documents:
  - **Vertiflite**, "[Human Powered Helicopters Rise Higher](#)", November-December 2012
  - **Vertiflite**, "[Human Powered Helicopters Take-Off](#)," July-August 2012
- **Contacts**
  - **Contact for July 13-21:** Jim McKenna, AHS International Director of Communications: [jmckenna@vtol.org](mailto:jmckenna@vtol.org) or cell 202-734-0179.
  - **Other dates:** Mike Hirschberg, AHS International Executive Director: [director@vtol.org](mailto:director@vtol.org) and cell 571-499-1444 (please leave a message if no answer)