

High Altitude Platform Solutions For Today

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Abstract

Throughout the long term, a few terms have been utilized for this kind of airplane, for example, "High Altitude Powered Platform", "High Altitude Aeronautical Platform", "High Altitude Airship", "Stratospheric Platform", "Stratospheric Airship" and "Environmental Satellite". The expression "High Altitude Long Endurance" (HALE), which has now and then been utilized to name HAP, is commonly more connected with customary automated airborne vehicles (UAVs), with administration roof of around 18 km, as the Global Hawk. Presently, the articulation "High Altitude Platform" (HAP), received by the ITU, has been the most usually utilized. A striking actuality for the HAPs idea was the underlying meaning of a recurrence band for its broadcast communications administrations on the World Radio communication Conference 1997 (WRC-97), sorted out by the International Telecommunication Union (ITU), which manages the guideline of the utilization of radio frequencies. At this gathering, the expression "High Altitude Platform Station" has been built up, characterized as a broadcast communications station situated at an elevation of 20 to 50 km and at a predetermined fixed direct relative toward the Earth. This reality shows that, at that point, there was a developing enthusiasm for HAP use as a supplement to earthbound and satellite-based correspondences organization.

Keywords

High-altitude platform; High-altitude airship; Stratospheric satellite; Unmanned aerial vehicle; Technological challenges; Technology trends

Back Ground

In the 1990 and 2000 decades, several projects were launched in order to explore the potential application of high altitude platforms for telecommunications and remote sensing. Large projects were started in the United States, Japan and South Korea (Levine 2004; Eguchi and Yokomaku 2000; Lee et al. 2006).

High-altitude platforms (HAPs) are aircraft positioned above 20 km altitude, in the stratosphere, in order to compose a telecommunications network or perform remote sensing, for civilian or military applications. These aircraft may be airplanes, airships or balloons, manned or unmanned. The stratosphere is the layer of the atmosphere where the temperature starts to

increase with altitude. Immediately after the tropopause, which has a constant temperature of about 160 °C, the stratosphere starts at an altitude of 7 km at the poles and 18 km at the Equator, extending to around 50 km (Widiawan and Tafazolli 2006).

A remarkable fact for the HAPs concept was the initial definition of a frequency band for its telecommunications services on the World Radiocommunication Conference 1997 (WRC-97), organized by the International Telecommunication Union (ITU), which deals with the regulation of the use of radio frequencies. At this conference, the term "High Altitude Platform Station" (HAPS) has been established, defined as a telecommunications station located at an altitude of 20 to 50 km and at a specified fixed point relative to the Earth. This fact shows that, at the time, there was a growing interest in HAP utilization as a complement to terrestrial and satellite-based communications network.

Over the years, several terms have been used for this type of aircraft, such as: "High Altitude Powered Platform", "High Altitude Aeronautical Platform", "High Altitude Airship", "Stratospheric Platform", "Stratospheric Airship" and "Atmospheric Satellite". The term "High Altitude Long Endurance" (HALE), which has sometimes been used to label HAP, is generally more associated with conventional unmanned aerial vehicles (UAVs), with service ceiling of about 18 km, as the Global Hawk. Currently, the expression "High Altitude Platform" (HAP), adopted by the ITU, has been the most commonly used.

The altitude range adopted for HAP operation, around 20 km, is motivated by the facts that in these altitudes the wind speed is less intense and, as a consequence, the HAP requires less power to maintain position (Colozza 2003). The altitude next to 20 km also has the advantage of being positioned above the strong wind currents (jet stream) existing between 10 and 15 km. Other important advantages are a large coverage area for telecommunications and be situated above normal commercial airline traffic. The maximum altitude for controlled airspace varies from country to country, 20 km (65,000 ft) being a typical value, set at the time of Concorde commercial supersonic jet operation (Widiawan and Tafazolli 2006).

The focus of this review will be on technologies directly related to the aerial platform, inserted in the aeronautical engineering field of knowledge, not detailing aspects of the telecommunications area, such as laser technologies for data link and electronically scanned antenna arrays.