Boletín Nº12. **O.J.A** (OBSERVATORIO JURÍDICO AEROESPACIAL)
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Mr. Víctor Barrio Aranda

Senior Associate at Hogan Lovells (Madrid).

Vicepresident of the "Asociación Española de Derecho Aeronáutico y Espacial" (AEDAE)

Conclusions of the International Roundtable on "Lunar Space Traffic Management". Hogan Lovells & AEDAE. World Space Summit. Airspace Integration Week Madrid, 26/09/2023

(Space Theatre, IFEMA).

Mr. Víctor Barrio Aranda.

Moderator and Speaker:

Mr. Víctor Barrio Aranda

Senior Associate at Hogan Lovells and Vicepresident of AEDAE (Space Section).

Speakers:

Mr. Emanuelle Di Sotto

Flight Segments Product Manager GMV

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Mr. Manuel Sansurjo Rivo

PhD. Aerospace Engineer - Associate Professor UC3M

Mr. Pedro Pintó

New Programmes Director, HISPASAT

Joan-Manel Casalta

Science Department Director, SENER AEROESPACIAL Y DEFENSA

On 26 September, during the World Space Summit (IFEMA), Hogan Lovells and AEDAE organized a panel of experts dedicated to the management of lunar space traffic and the new technologies necessary for the exploration of our satellite and the establishment of permanent human settlements, as well as for the implementation of the new international space station (Gateway).

In this panel, moderated by **Víctor Barrio**, Senior Associate at **Hogan Lovells** and Vice President of **AEDAE**, **Emanuele di Sotto** (Flight Segments Product Manager at **GMV**) and **Manuel Sansurjo Rivo** (PhD. Aerospace Engineer - Associate Professor **UC3M**) took the floor first, sharing some reflections on the particularities of lunar orbital dynamics.

Thus, by way of example, they highlighted the difficulties presented by the planning and management of lunar satellite orbits, since they are not orbits in the strict sense (circular or elliptical trajectories around the Moon), but halo and Lyapunov orbits (among other examples) due, among other factors, to the non-uniformity of the lunar gravitational force or the gravitational forces exerted by the Earth and the Sun, which also affect the space object. These variables make the projection of satellite trajectories much more complex than in the case of objects orbiting our planet. They also highlighted, as a consequence of the above, the importance that the Lagrange points of the Earth-Moon system will play both for the proper management of a future lunar navigation system and for the future positioning of the international space station.

Finally, they also highlighted the substantial differences in the maneuverability of special objects in the lunar environment, as a greater number of maneuvers are necessary (given the lack of stability of the trajectories), since small impulses give rise to much greater modifications in the trajectory than those experienced in terrestrial orbits.

Pedro Pintó, New Programmes Director at **HISPASAT**, shared with the audience some of the main characteristics of ESA's Moonlight project for lunar communication and navigation services, of which HISPASAT forms part. In addition to highlighting the importance of this project for the human presence on the Moon and the operations of any element that requires the emission and reception of communications (rovers, astronaut communication equipment, among others), he emphasized that the aim of this program is to establish an Earth-Moon communication system. In this context, he reflected with the other panelists on the difficulties posed by the latency

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of communications over the Internet, requiring new technologies to overcome the difficulties of transmission at a distance of 400,000 km, which are even greater in the case of operations carried out on the far side of the moon.

Finally, **Joan-Manel Casalta**, Science Department Director at **SENER AEROESPACIAL Y DEFENSA**, briefly reviewed SENER's experience in space projects (electromechanical systems, communications and navigation, microgravity experiments, etc.) and then went on to outline some of the challenges facing human space exploration, especially in view of our aspirations for a permanent presence on the Moon. He mentioned, among other issues in which SENER provides engineering solutions, new instrumentation that operates in microgravity conditions (for physiological systems, refrigerators and freezers, protein crystallization or biological experiments) and life support systems (such as the MELISSA control system, biomass monitoring systems and water and waste management systems).

He also stressed that the challenges include the development of electronic components that are able to overcome extreme temperature changes, especially relevant for missions at the lunar south pole (whose richness in water seems likely to attract a significant part of them), given that every 14 days the temperature to be endured goes from 180 degrees Celsius (lunar day) to - 180 degrees Celsius (lunar night) and vice versa; as well as to deal with lunar dust, which will also affect the use of mechanisms and optics.