

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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**FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY**

In the Matter of)
)
Amendment of the Commission's) ET Docket No. 95-183
Rules Regarding the 37.0-38.6 GHz and) RM-8553
38.6-40.0 GHz Bands)

**COMMENTS OF
ANGEL TECHNOLOGIES CORPORATION**

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Angel Technologies Corporation ("Angel"), by its attorneys, hereby submits these comments in the above-captioned proceeding. These comments are submitted in response to the Commission's *Notice of Proposed Rule Making and Order* dated December 15, 1995.^{1/} In this proceeding, the Commission has sought comments on its proposed channeling plan and licensing rules for operations in the 37.0-38.6 GHz band and its proposed amendment to the rules for operations in the 38.6-40.0 GHz band. The Commission's proposed rules would facilitate use of these frequency bands for point-to-point links supporting terrestrial mobile communications systems.

Angel is a new entity which was formed to pursue opportunities for low-cost, advance wireless communications systems using HALO™ (High Altitude Long Operation) technology.^{2/} As

^{1/} *Amendment of the Commissions Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands, FCC 95-500, Notice of Proposed Rule Making and Order (Dec. 15, 1995) (hereinafter "Notice"). Due to the Commission's closing for furlough days and severe weather, the original comment period was extended to February 12, 1996. Order Extending Time, DA 96-15 (Jan. 16, 1996). A second extension of time extended the comment period until March 4, 1996. Order, DA 96-144 (Feb. 9, 1996).*

^{2/} HALO technology involves the use of High Altitude Long Operation aircraft which serve as a platform for communications transmission equipment capable of relaying voice or data communications between two terrestrial users. A detailed discussion of Angel and the HALO concept is contained in Section B below.

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is discussed in greater detail below, Angel's technical analyses have indicated that HALOs are compatible with the Commission's proposed uses of these bands. As a result, Angel encourages the Commission to draft its final rules for these bands to provide sufficient flexibility to accommodate compatible uses such as HALOs.

A. Introduction

This proceeding was initiated in response to a Petition for Rulemaking the Telecommunications Industry Association ("TIA") filed in September 1994. In that petition, TIA proposed a channeling plan and rules for the 37 GHz band. The Commission had not, and has not yet, adopted service rules for this band. Although there are a few government fixed operations in this band, there are no current non-government operations in the band.

The TIA petition requested that the Commission allocate the 37 GHz band for point-to-point communications to support broadband personal communications services ("PCS"), cellular operators and other common and private carriers. Both the TIA petition and the Commission's proposed rules included in the *Notice* envision that the point-to-point communications links would serve as "backhaul" or "backbone" links for mobile communications services provided in other bands. As the Commission explains in the *Notice*, backhaul links would be used by operators to connect cell sites with the more central mobile switching office. Backbone links would interconnect mobile switching offices.^{3/} The TIA petition also requested that the Commission adopt uniform service rules

^{3/} *Petition* at n.2.

for the 37 GHz and 39 GHz bands in order to facilitate licensees operating across the entire 37-40 GHz band.

B. Background on Angel and HALOs

Angel is a Delaware corporation run by a seasoned team of professionals who have successfully started and run high technology, communications and services businesses. A number of the company's founders and principals have had extensive experience in mobile communications, aviation, satellite technology and other services businesses.

Angel proposes to operate HALO platforms to provide low-cost, flexible wireless communications services. HALOs are high altitude aircraft which can remain aloft for extended periods of time. By flying in small radius circles at altitudes above 35,000 feet, the HALO can provide constant coverage of areas ranging from 100 to 240 miles in diameter (up to 44,000 square miles). Angel plans to deploy multiple HALOs to provide uninterrupted telecommunication services.

Angel will use an FAA type certified aircraft capable of carrying communication payloads to altitude for extended periods of time. These HALO platforms are able to support various communications payloads for wireless services. Angel envisions that these services would complement existing terrestrial and satellite-based communications networks in areas where existing service providers are not providing coverage or where those services are not a low-cost service option. Angel will provide "turnkey" operation of the HALO platforms including installation of the system, continuous aircraft operation and implementation of ground stations.

The following is a list of significant technical advances that make it possible to construct and operate HALO platforms as economical telecommunications platforms:

- Advanced flight control systems have been the subject of intense research and development in the aviation community. Advances in micro circuitry have reduced power and weight requirements of even the most sophisticated flight control systems to a modest level.
- The Global Positioning System (GPS) is now in full operation and maintained by the U.S. government for general use worldwide. This satellite based system provides highly accurate altitude, attitude, and position reference data.
- Newly perfected construction methods using composite materials permit the design and construction of airframes well suited to long endurance high altitude missions.
- Breakthroughs in radio and antenna technology make possible wide bandwidth throughput from payloads weighing less than a few hundred pounds while consuming only a few thousand watts of power.
- Government funded studies have contributed to a growing understanding of high altitude platform design, construction and operation related to the proposed HALO operating environment.
- Reliable turbofan high altitude aircraft powerplants are now available for commercial use.

HALO platforms offer some unique benefits when compared to equivalent terrestrial and satellite systems. First, unlike terrestrial facilities, HALOs allow new service build-out or facilities redeployment without the delays associated with erecting new towers or burying miles of cable or fiber. Once the plane is operational, it can be deployed at any location as soon as it is flown to that area. Second, the local footprint of HALOs increases frequency reuse when compared to satellite systems and eliminates the need for international frequency coordination. Third, because they return

to the ground after each flight, HALOs facilitate payload upgrades on an ongoing basis, allowing for implementation of advances in technology. Fourth, Angel estimates that capital costs for expeditious implementation will be lower in most cases. Fifth, the footprint from the HALO is appropriately sized for providing coverage to a metropolitan area without precluding other uses of the frequency in other areas. Finally, the mobility of the HALO platform makes this technology a valuable disaster recovery solution.

Angel recognizes that, due to their unique technology, HALOs may not fit into many of the current Commission rules for particular wireless operations. Nonetheless, in the case of the current proceeding, Angel is confident that HALOs will be compatible with the Commission's proposed uses of these bands and encourages the Commission to provide sufficient regulatory flexibility in the final rules to permit HALOs to operate at these frequencies.

C. HALOs Are Compatible with the Proposed Use of These Bands

Angel has reviewed the Commission's proposed rules for these bands and determined that HALOs are compatible with the operations proposed in the *Notice*. Angel is concerned, however, that the Commission is not envisioning that these frequencies will be used for primary communications links, but will be restricted to supporting operations in other bands. Angel submits that any such restriction on the use of these frequencies would be unnecessary, inefficient and contrary to the public interest.

Angel agrees that there are many benefits to wireless support for mobile communications systems, particularly in less densely populated areas where wireline backbone and backhaul links could be quite expensive. It is unnecessary, however, to set aside large amounts of spectrum

nationwide for services which in many cases could be provided using wireline capacity. In particular, in urban areas where wireline capacity is relatively inexpensive and extremely efficient, setting aside this spectrum solely for ancillary uses may not be the most productive use of scarce spectrum resources. Angel anticipates much greater demand for its proposed services in more concentrated urban areas which could be served efficiently within the footprint of one HALO. These areas are a direct match with those areas in which wireline connections for backhaul and backbone operations may make the most economic sense.

Angel offers these specific comments on the proposed rules with regard to their impact on HALOs. First, Angel notes that the Commission has proposed to modify Parts 21.107 and 94.73 of its rules^{4/} to add the frequency band 37 to 38.6 MHz with a maximum allowable EIRP of +55 dBW. Although it may be appropriate for equipment deployed at ground level or on towers to have this limitation to address safety and sharing concerns, this limitation, and the existing limitation in the 38.6 to 40.0 MHz band, do not address any relevant concerns when applied to HALO-based platforms. Because HALOs operate at altitudes above several miles, they eliminate safety concerns that may arise from use of terrestrial antenna facilities. Similarly, transmissions to and from HALO are vertical as opposed to the horizontal transmissions inherent in terrestrial systems. The interference issues presented by horizontal terrestrial transmissions are minimized or eliminated when using the vertical transmissions of HALOs.

^{4/} 47 C.F.R. §§ 21.107 and 94.73.

For example, at a potential HALO altitude of 18 km (60,000 feet), the peak power flux density at the Earth's surface from a +55 dBW EIRP HALO transmitter would be less than 0.00001 mW/cm². This is over a million times below the ANSI/IEEE permissible exposure level in these frequency bands. Even a +115 dBW EIRP transmission from the HALO would always be below the limit at every point on the Earth's surface.^{5/}

The proposed and existing limits address valid safety and sharing concerns for equipment deployed at ground level or on towers, and Angel Technologies supports them. However, Angel Technologies urges that an appropriate maximum allowable EIRP limit, greater than +55 dBW and lower than +115 dBW, be established by the Commission for HALO operations in these bands.

Second, Angel is concerned about the proposal to modify Parts 21.108 and 94.75 of the Commission's rules.^{6/} The *Notice* proposes to impose a minimum allowable antenna gain of 38 dBi and consistent radiation suppression as a function of off-axis angle to operations in the 38.6 to 40.0 MHz band. These restrictions address sharing concerns by ensuring maximum spatial reuse of the frequencies and may be appropriate for terrestrial systems. Angel requests that these requirements not be applied to HALOs which operate at high altitudes. HALOs, by their very nature, result in a significant increase in frequency reuse compared to terrestrial systems, even with antenna gains less than 38 dBi. Imposing the 38 dBi minimum antenna gain requirement would not serve any particular purpose. This requirement is not necessary to insure various HALO systems or HALO

^{5/} A +55 dBW EIRP transmitter deployed at ground level has the potential for exceeding the permissible exposure level for a distance of 18 meters.

^{6/} 47 C.F.R. §§ 21.108 and 94.75

and terrestrial systems can operate in an acceptable manner. However, the imposition of this requirement would inhibit the use of HALOs. It would make these platforms uneconomical, depriving potential subscribers of the significantly increased spectral efficiency and other significant benefits that could be provided by this technology.

For example, at the same HALO altitude of 18 km (60,000 feet), a 38 dBi gain HALO antenna beam would illuminate an area, on the Earth's surface, of 1.4 square kilometers. The same antenna on a 30 meter tower illuminates an area of 19.5 square kilometers, a fourteen times greater area. A HALO antenna gain of 26 dBi would pose about the same interference potential as the 38 dBi terrestrial requirement.

The proposed restrictions address valid frequency sharing concerns for equipment deployed at ground level or on towers, and Angel Technologies supports them. However, Angel Technologies urges that an appropriate minimum antenna gain requirement, less than 38 dBi be established by the Commission for HALO operations in these bands.

Third, Angel is concerned about the Commission's proposal to modify Part 21.711 of its rules^{2/} to restrict antenna structure height in the 37.0 to 40.0 MHz band. Furthermore, the proposed footnote 18 in Section 94.61 would apply this restriction to the Private Operational-Fixed Microwave Service. This restriction, although appropriately requiring FAA notification and coordination for terrestrial antenna structures, would be unnecessary for HALO platforms which are not operated at the Earth's surface.

^{2/} 47 C.F.R. § 21.711

Angel requests that the Commission modify its proposed rules to take into account these comments and the impact that these rules would have on Angel's ability to use these frequencies to provide wireless services from HALOs.

D. Conclusion

For the foregoing reasons, Angel Technologies Corporation requests that the Commission accept these comments and grant the flexibility requested herein.

Respectfully submitted,



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