

FCC Form 442 Supplemental Information

Question 6

a. Description of Research - The research objectives of the ORCA spacecraft, whose operations are the subject of this experimental license application, are as follows:

1. Using the two programmable payload radio transceivers, the spacecraft can be used to test the suitability and usefulness of new waveforms, modulations and protocols that can be applied to future earth/space communications systems. The Rockwell Collins radios built into the payload will be used precisely as normal radios are used, except that they are on orbit and remote controlled. The spacecraft is intended as a research tool to be shared among many potential future designs, in lieu of the impractical alternative of launching an experimental spacecraft dedicated to each new communication technology to be tested.
2. The two programmable transceivers can be used to map radio noise and phenomena across the earth's surface, operating strictly in the receive mode, and coupled with GPS location of the spacecraft.
3. The two programmable transceivers can be used for radioastronomy, strictly in the receive mode, from the orbital location outside the impeding atmospheric layers.
4. The two programmable transceivers can be used for propagation research, transmitting a probe signal to the earth to allow measurement of atmospheric effects on signal propagation.

b. Necessity for Research Objectives - The necessity of this spacecraft, and requisite license, lies in verifying the real performance of earth/space communication systems, and collecting scientific data from orbit that cannot be otherwise obtained from a terrestrial location. Specifically:

1. Earth/space communications can be tested either by modeling, or by actual earth/space tests. Modeling can be performed only to the extent that the effects of the orbital location on the new communications systems are known—specifically from prior data. If data does not exist on a new frequency or waveform, there is no basis for validating the model. Thus on-orbit testing is needed in order to advance earth/space communications because there is no other way to confirm orbital performance of a communications system.
2. Scientific data gathered from orbit, such as radioastronomy and radio physics studies, cannot be conducted from underneath the shielding effects of the earth's atmosphere. Thus there is no alternative to spaceborne facilities.

c. Inadequacy of Existing Communications Facilities - There are presently no programmable communications satellites in orbit, much less available for general experimental use. More specifically, all existing communications satellites have

fixed-band payload transmitters, many with on-board processing, that have essentially no flexibility to accommodate new waveforms and communications modes for future use, nor can they be commanded to a new frequency outside their design range (which is usually fixed and very narrow).

Question 12

The applicant is a consortium of universities dedicated to the furtherment of space-related science and education. The Iowa Space Grant Consortium (ISGC) is comprised of Iowa State University, Ames, IA (public institution); University of Iowa, Iowa City, IA (public institution); University of Northern Iowa, Cedar Falls, IA (public institution); and Drake University, Des Moines, IA (private institution). A number of other public and private organizations are also associate members, providing various support to ISGC's educational programs.