AMSAT® **The Radio Amateur Satellite Corporation**

FACT SHEET

A BRIEF HISTORY OF THE PHASE 3-D SATELLITE PROJECT

Development of the Phase 3 series of Amateur Radio relay satellites was initiated in 1975 to provide a capability for longer range, more reliable communications than had been possible with the preceding series of low altitude Amateur Radio satellites initiated by the launch of OSCAR 1 in December, 1961. The name OSCAR is short for *O*rbital *S*atellite *C*arrying *A*mateur *R*adio. The Phase 3 series of satellites were designed to fly in highly elliptical "Molniya" orbits pioneered by the Soviet Union, carrying multiple transponders and operating in frequency bands allocated to the Amateur Radio Service. While many of the worldwide, non-profit Radio Amateur Satellite Corporation (AMSAT) groups were involved in these projects, the most involved were Germany's AMSAT-DL, and North America's AMSAT-NA organizations.

Three 150 kg class spacecraft of similar design were developed and launched between 1980 and 1988. Unfortunately, the first, Phase 3-A, was lost due to a booster failure. Recovering from this setback, the second and third spacecraft were successfully launched to become AMSAT-OSCAR 10 and AMSAT-OSCAR 13 upon reaching orbit. One of these, OSCAR 10, continues to provide communications relay capability, although attitude control has been lost due to radiation damage. OSCAR 13 is due to re-enter the Earth's atmosphere in December, 1996.

Following the launch of OSCAR 13, two design studies were initiated to define follow-on missions. AMSAT-DL chose to study a continuation of the Phase 3 series using a larger, more capable Phase 3-D spacecraft launched into an improved elliptical orbit. The orbit would be carefully selected to be easier understood by most Amateur Radio Operators, allowing them both increased access time and more convenient availability than orbits afforded by the current Phase 3 spacecraft. At the same time, AMSAT-NA began study of a Phase 4 satellite that would operate in a geostationary orbit. The Phase 4 spacecraft would have provided a platform for vastly improved communications for those amateurs within range, but the concept would have required multiple satellites to provide worldwide coverage. Both studies assumed similar three-axis stabilized, 500 Kg class spacecraft carrying higher power transponders operating across more frequency bands and employing more advanced modulation techniques than the current Phase 3 satellites

When it became clear that funding for the Phase 4 program would have had to come almost exclusively from the Amateur Radio community in North and South America for a single satellite, and would have required a much larger outlay of resources from the worldwide Amateur Radio community for a multiple satellite system, the decision was made, albeit reluctantly, to shelve the Phase 4 concept in favor of teaming with AMSAT-DL on the Phase 3-D program.

(Current as of April, 1998) **-more-**

An added decision driver for this course of action was the fact that AMSAT-DL had been successful in securing a flight opportunity on one of the two test flights of the new Ariane 5 launch vehicle developed by the European Space Agency (ESA). The timing of this project was also critical. Soon after the Phase 3-D project commenced, it became known that orbital instabilities would cause the atmospheric reentry of OSCAR 13 in December 1996. Without its replacement, the worldwide Amateur Radio community would be left without a reliable high altitude satellite for the first time in more than a decade.

Today, the International Phase 3-D Project Team also includes AMSAT groups from Great Britain, Japan, Finland, Canada, Russia, Belgium, Czech Republic, Slovenia, France, New Zealand and Hungary in addition to the groups from AMSAT-NA and AMSAT-DL. Recent advances in propulsion, materials, electronics, antennas, structures, orbital stability and control as well as computational finite element structural and thermal analyses have now brought construction and launch of a Phase 3-D-like vehicle well within the technical expertise of the AMSAT community. Further, this project is being accomplished while still supporting all the stringent launch requirements of ESA for their Ariane launch vehicles.

While its primary focus is on improved worldwide satellite communications, the Phase 3-D project will also have a positive influence on the very future of Amateur Radio. Whenever the topic of Amateur Radio is discussed at international meetings, it is frequently the Amateur Radio space communications program that captures the attention and imagination of national officials. It's also the Amateur Radio community's continued willingness to support projects like Phase 3-D...projects that continue to expand the state of the art in communications...that garner praise by these officials and help justify the amateur's continued access to valuable radio spectrum.

In addition, as the leading showcase of expertise and talent for the Amateur Radio community, the Phase 3-D effort epitomizes perhaps the most unique managerial and technical approach to research and development of a space vehicle ever realized. There is nothing else quite like the Phase 3-D program anywhere in the world. The managerial and technical challenges and resulting "lessons learned" from an international team of volunteers working largely on their own time, in their own homes, and at their own pace, has been significant. This experience is already proving invaluable to corporate, government and private institutions now searching for innovative ways to promote significantly lower cost access to space while still maintaining technical excellence.

While the vast majority of design, development and fabrication needs for this project have been donated by private individuals and institutions, active fund raising efforts by AMSAT and other Amateur Radio organizations worldwide have also helped secure the approximate $4 Million out-of-pocket development and launch resources needed to make the Phase 3-D program a reality.

FOR MORE INFORMATION VISIT US ON THE WORLD WIDE WEB AT: "WWW.AMSAT.ORG"

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