# 7 Concluding Remarks

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In anticipation of trends and needs in satellite communications, the National Institute of Information and Communications Technology (NICT) has put forth many proposals for satellite missions. At the same time, NICT has been involved in developing experimental communication satellites and constructing the foundations of communication satellite technologies in Japan. In particular, with the Wideband InterNetworking engineering test and Demonstration Satellite (WINDS), NICT began with studies of the concept of a communication satellite aiming at providing a 1-Gbps-class data transmission rate, the fastest in the world, to a third of the earth within the satellite's field of view. Based on the results of these studies, including the establishment of a Ka-band large-scale active phased array antenna prototype and investigations of the onboard switch, NICT has pursued the development of WINDS as a joint project with the Japan Aerospace Exploration Agency (JAXA).

WINDS is capable of 1.2-Gbps transmission, representing the world's fastest satellite communications. Past examples shed light on its potential: on the occasion of an earthquake in Taiwan, the optical fiber links connecting Taiwan with other countries, including Japan, were disrupted. Financial transactions were impossible for several days, and the stock market was in turmoil. Based on such scenario, WINDS is expected to establish the technologies for providing a high-speed satellite link as a backup when the ground communication network is unavailable in the event of natural disasters or other calamities. As another feature, WINDS can provide broadband communications at 155 Mbps to an earth station with an antenna of only 45 cm in diameter, easily installed on the balcony of a home. Moreover, it is estimated that approximately five percent of the homes in Japan are on isolated islands and in mountainous areas lacking ground broadband environments. Satellite broadcasting has largely reduced areas with poor reception in terms of television, and satellites are now anticipated to provide Internet broadband environments to these areas, with WINDS positioned on the leading edge. WINDS will also provide fixed beams to major cities in the Asia/Pacific region, as well as beams available for scanning freely over the Asia/Pacific region. Other than providing 1.2-Gbps high-speed communication links between major cities, the satellite will thus also provide broadband environments to areas, including islands, in the Asia/Pacific region in which broadband environments have not been established. As such, expectations are high that WINDS will prove extremely useful in providing ultra-high-speed communication links and bridging the digital divide in areas both in Japan and in the Asia/Pacific region.

As an added note, NICT had undergone some trying experiences in its large-scale satellite projects. Among the large-scale over-two-ton-class experimental satellites in which NICT has taken part, the Engineering Test Satellite Ⅳ (ETS-Ⅳ, launched in 1994) and COMmunications and broadcasting Engineering Test Satellite (COMETS, launched in 1998) failed to enter geostationary orbit, and we were forced to make do with experiments in elliptical orbits. Consequently, mission goals have not been accomplished to our satisfaction. In terms of the ETS-Ⅷ, launched in 2006, the receiving LNA system for the large-scale antenna presented problems, and experiments continue

under less-than-ideal conditions.

Against this backdrop, WINDS is scheduled for launch in the winter of fiscal 2007. In response to problems in the receiving LNA system of ETS-Ⅷ NICT developed we are rechecking the reliability of the onboard baseband switch NICT has developed for WINDS. The development team is continuing persistent efforts to ensure sufficient reliability and normal operation of WINDS following launch.

In this special issue, we have solicited the cooperation of the parties involved in the WINDS development to provide an overall view of the satellite system, the earth station facilities, and the plans for experiments using this system and these facilities. This represents the first such expository document summarizing the subject to date. We expect that this special issue will be of much interest to the many people involved in WINDS fundamental and application experiments, as well as to many other readers who are following this project.

The development of WINDS involved the assistance of many engineers and other participants, including personnel of the Ministry of Internal Affairs and Communications; the Ministry of Education, Culture, Sports, Science and Technology; the Japan Aerospace Exploration Agency (JAXA); the National Institute of Information and Communications Technology (NICT); the satellite manufacturer; and a number of universities. As a result of these efforts, we are now in the final stage of satellite development. We would like to express our sincere respect and gratitude to all parties involved for their continued efforts. We would also ask them for their continued support, to ensure that our efforts are rewarded with a multitude of internationally valued experimental results.

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