

# Historic Growth of Space

## Activities:

### Services Provided by Space Assets

Growth in military, civilian, and commercial uses of space has been dramatic in the four decades since the beginning of the space age. More than 2,700 non-military satellites orbit the earth today.<sup>8</sup> While nearly 85% of these satellites belong to the United States and the former Soviet states combined, there are also now many other-space faring nations, including China, Japan, and India. Furthermore, several developing countries are joining the growing list of countries that have their own satellites launched. Today's satellites carry out a wide range of activities. Table-1<sup>9</sup> lists the various non-weapon applications of satellites, which include commercial, civil, and military satellites. Table-2 shows the major commercial applications in different orbits.

#### Table-1 Non-weapon Space Operations

- o Geodesy
- o Astronomy
- o Navigation
- o Surveillance
- o Meteorology
- o Space Stations
- o Communications
- o Lunar Exploration
- o Earth Observation
- o Search and Rescue
- o Manned Orbital Shuttles
- o Space Physics Research
- o Interplanetary Exploration
- o Microgravity Experimentation

## Table-2 Examples of Commercial Uses in GEO, MEO, and LEO

- **GEO: Altitude 22,223 miles**
  - o DBS/DARS
  - o Satellite Broadband
  - o Broadcast and Cable Distribution
  - o Telephony
  - o Mobile Communications
- **MEO: Altitude > 609 miles**
  - o Mobile Communications
  - o GPS
- **LEO: Altitude 400 - 1,600 miles**
  - o Mobile Communications
  - o Satellite Broadband

## Military Use of Commercial Space Assets

The growth rate in the utilization of space in U.S. military affairs has been staggering. For example, in the 1991 Gulf War, 92% of the bombs were unguided and 8% were laser guided. By contrast, nearly 60% of the bombs dropped on Afghanistan in 2001 and 2002 were either laser or GPS guided. Moreover, this dependency on satellites is limited not only to the guided missiles or bombs. It encompasses the whole operation of war fighting from foxhole to the Pentagon by virtue of its reliance on information. During Desert Storm or the first Gulf War, the total bandwidth required for information exchange was 100 megabits per second (Mbps), while the war in Afghanistan required 250 Mbps although it involved only 10% of the forces deployed during Desert Storm.<sup>10</sup> Largely commercial geosynchronous satellites perched high above the earth at nearly 23,000 miles provide nearly all of this bandwidth. The commercial satellites provide the U.S. military with an unparalleled advantage over its adversaries in its ability to apply overwhelming force without significantly risking its assets or the lives of its troops. At the same time, the critical dependence of the United States on space is apparent to any adversary.

While the growth in commercial satellites has come primarily from the explosion in telecommunications in general, in the last few years there has also

been dramatic demand for commercial satellite imagery, which is quickly catching up with the resolution offered by the secret intelligence satellites of the United States and the former Soviet Union. This development is of increasing concern to the United States for not only security reasons, but possibly other reasons as well.<sup>11</sup>

The most precise imagery now available in the commercial market has resolution of 0.6 m panchromatic, 2.5 m color. Space Imaging's Ikonos and OrbImage's Orbview 3 provide 0.8 and 1.0 panchromatic imagery, respectively. Non-U.S. satellites deliver somewhat lower resolution. Panchromatic resolution is expected to improve to 50 cm or less in the next few years.<sup>12</sup>