Protecting the Planet Through International Space Cooperation

By William Jones

Global Aerospace Monitoring and Disaster Management
Valery A. Menshikov, Anatoly N. Perminov, and Yuri M.Urlichich
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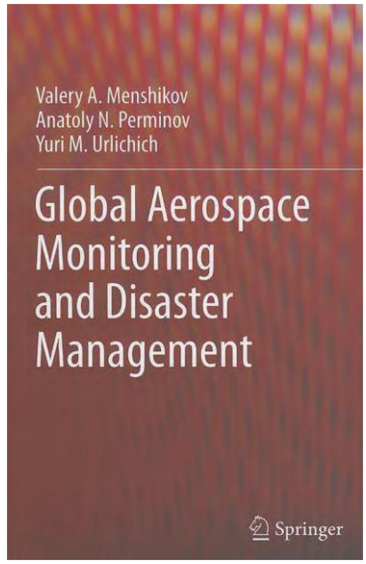
This work is a comprehensive treatment of the utilization of space assets in order to protect mankind from a variety of threats, both from the Earth and from space. At the same time it is a rallying cry for a major mobilization of all the space assets deployed by many nations in the world into a comprehensive system of protection, against threats such as earthquakes and volcanoes, as well as more long term threats such as asteroids and comets.

Mankind is often faced with major shocks coming from Nature. Recent events such as Hurricanes Sandy and Katrina, as well as the devastating tsunami that erupted in the Pacific in 2004, caught the world by surprise – and resulted in tremendous loss of life and property. By the time the population is able to see or hear the effects of the threat, it is already upon them, leaving them with no option but to seek cover – if possible – and hope for the best. And yet man's ability to "see" and "hear" such threatening phenomena has long outgrown the limited abilities of our five senses alone.

In particular, since the dawn of the space age, we have created a new space-based "sensorium" which allows us to "see" and to "hear" far beyond our limited physical sensory organs. In fact, there is not an area of the globe which is not under almost constant observation by some form of satellite capability, scanning the atmosphere, surveying the lands and the seas, and even, in the case of remote sensing satellites, penetrating beneath the surface of the Earth. In addition, there are satellites and telescopes placed to look out into the universe, at other, and more ominous threats to our planet Earth.

This book represents a comprehensive treatment of the wide variety of threats facing mankind, and outlines the various ways in which space assets can predict, possibly prevent, or at least reduce the damage wrought by all types of natural catastrophes, whether from the Earth or from the skies. The authors, Anatoly Perminov, Valery Menshikov, and Yuri Urlichich, are all key players in the project which the book is promoting, the International Global Monitoring Aeropspace System (IGMASS) project. Anatoly Perminov is the former head of Roskosmos, the Russian space agency; Yuri Urlichich is the Designer General of the Russian GLONASS, Global Space Navigation System; and Valery Menshikov is the chairman and chief promoter of the IGMASS project and the vice-chairman of the K. E. Tsiolkovsky Academy of Cosmonautics. While the project has been initiated primarily by Russian and Ukrainian space scientists within the context of the UN and international space organizations, and has its origin in the specific Russian experience in space exploration and space utilization, its realization is of importance for all Mankind.

Space has affected every nation on Earth. Even the poorest nations in Af-



rica or Asia are supported by satellite communications or satellite monitoring. While the actual space-faring nations are still limited in number (although the number is growing), there is hardly a nation on the face of the Earth that has not become a space-{using} nation.

And yet these capabilities remain largely limited to the needs and the requirements of their purchasers or end-users. If they were brought together into a single collaborative network, they would represent a capability for mankind which would be far more powerful than the simple sum of its parts.

The goal of the IGMASS project is to convince the various space-faring nations of the need to bring together their capabilities into a coordinated network. As the introduction to the book states: "The creation of a viable international mechanism for efficient forecasting and early warning against dangerous natural and man-made phenomena that pose planetary-scope danger is high on the agenda. It is time to seriously state that modern and maximum efficient warning against impending emergencies of space, of natural or artificial origin, can be provided only on the basis of large-scale international projects with complex, coordinated, and rational use of the scientific and technical potential of all countries of the world."

The book is divided into chapters, dealing respectively with the various types of threats facing mankind and the means by which space can be utilized in dealing with them.

First, there are the natural calamities: earthquakes, volcanoes, floods, hurricanes, and the like. The latest research by Russian scientists has long noted that changes in the ionosphere precede burgeoning earthquakes by some time, giving the possibility of a longer lead time for affected populations to prepare themselves for what is to come. (see "Are Eathquakes Forseeable? The Current State of Research," by Sergey Pulinets, {EIR}, August 5, 2011). While earthquakes and volcanic eruptions are typically consigned to the lower geosphere, changes in the Earth's crust bring about early changes in the Earth's atmosphere: release of characteristic gases, changes in the electromagnetic fields, changes in the ionospheric plasma, proton, and high-energy electron precipitation in the upper atmosphere – all of which can be monitored from space. And it has been statistically confirmed, the authors note, that such ionospheric anomalies occur on average five days before a seismic shock, a relatively long lead-time to prepare for an earthquake. While such calamities as earthquakes and volcanic eruptions cannot at the present time be controlled by man, with the aid of heightened level of monitoring precursors, losses can be brought down to a minimum. The difference can be dramatic. The authors relate two different incidents of earthquakes in China to make their point.

Peter Haeussler , U.S. Geological Survey

Denali Fault: Susitna Glacier. Patty Craw, DGGS, stands in front of the Susitna Glacier thrust fault. The November 3 earthquake started with an M7.2 earthquake along this fault in Alaska, USA on Nov 10 2002.

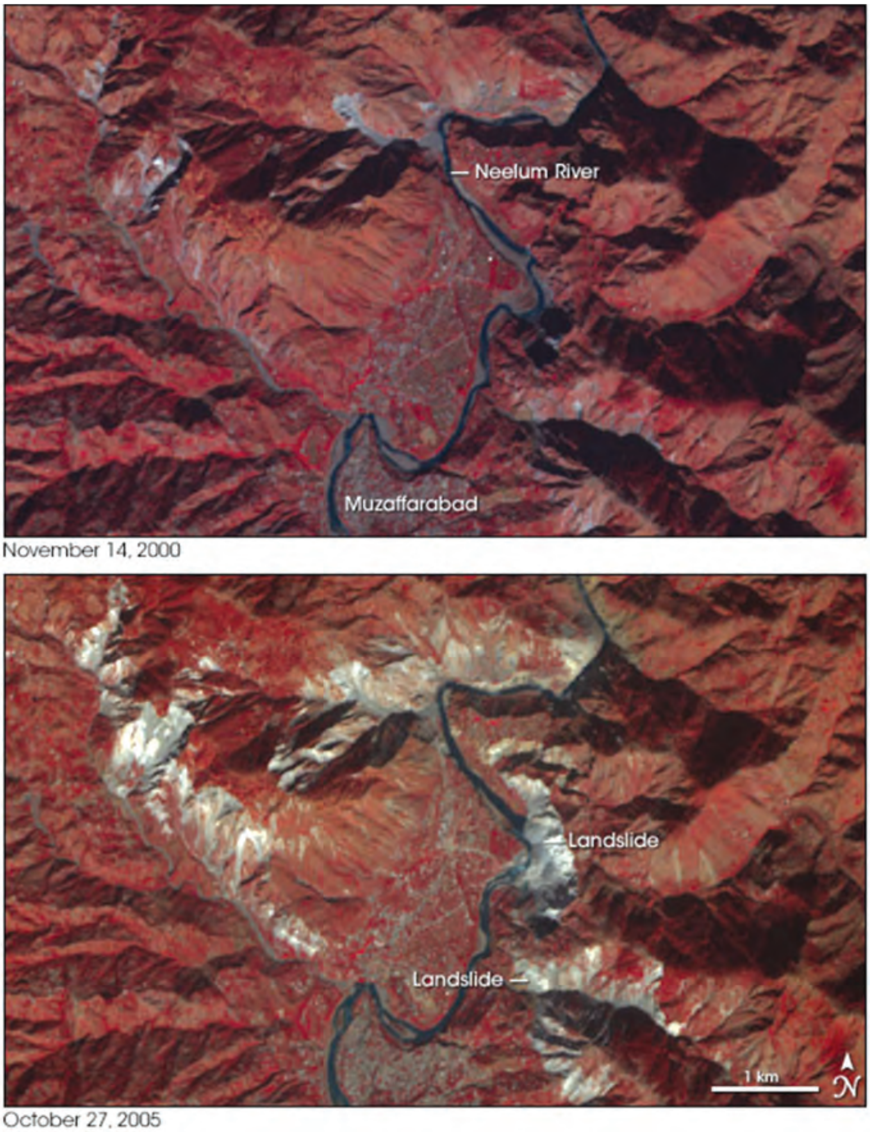
In 1975 when Chinese seismologists sounded the alert about a possible earthquake in the area of Haichen, the population was evacuated. One evacuation, carried out two hours before a nine-point earthquake, saved thousands of lives. A year later, scientists, concerned about several earlier alarms they had issued that turned out to be false alarms on signs of a pending earthquake, refused to issue an alert for the city of Tangshan, with a population of 1.3 million. The earthquake that did eventually ensue killed hundreds of thousands of people.

Within the community of seismologists, there are still many who deny the possibility of predicting earthquakes by means of ionospheric changes in spite of the strong evidence presented by the physicists studying the ionosphere. (see "The Emerging Science of Earthquake Prediction," by Oyang Teng, *21st Century Science & Technology*, Winter 2011-2012). This has presented a serious obstacle to the needed collaboration between these two important groups of scientists. These spurious arguments have also been buttressed by the minions of Prince Philip's environmentalist movement, which has as its leitmotiv the Malthusian axiom that "natural catastrophes" should not be interfered with by man since they help to "cull the herd" of the human population.

While the impetus for the IGMASS project has primarily emanated from Russian and Ukrainian scientists, the data that they have accumulated with regard to natural calamities, while limited largely to studies on the Eurasian landmass and adjacent maritime areas, is quite persuasive – and wide-ranging. This is not surprising, given the fact that the Eurasian land-mass and the Pacific Ocean seas are the location of well over half of the world's major natural disasters.

The second chapter of the book deals with calamities caused by human error, so-called technogenic emergencies. These also include accidents resulting from lack of foresight regarding possible "unintended consequences" when planning industrial or infrastructural projects. According to the United Nations, such disasters rank third in the number of casualties, just trailing behind natural calamities caused by weather or geological factors. Again, not surprisingly, these are concentrated in the less developed areas of the world, in countries of Asia and Africa, where the austerity policies imposed upon these nations have limited their ability to adequately develop their technology.

Many of these types of disasters, which the book gives as examples, such as the explosion at a Union Carbide plant in Bhopal, India in 1984, which killed more than 4,000 people and poisoned over 40,000, are simply the result of human error – or pure negligence. In some cases they are simply the result of the attempt to continue using a specific technology beyond the useful life of its operation, without modernizing the technology.



NASA

Area surrounding Muzffarabad Pakistan before and after the 2005 earthquake.

They are difficult to predict or and the use of aerospace assets may seem somewhat limited in dealing with them.

Nevertheless, space assets can also play a major role in monitoring and detecting looming problems. Russia has begun to use its aerospace capabilities in order to monitor their extensive system of gas and oil pipelines. Russia's Gazprom has developed a system of monitoring its arctic oil-gas field at Yamburg, which utilizes Russia's space assets. As noted by the authors: "Gazprom has lately created and been actively testing a pipeline aerospace monitoring system on the basis of existing and future remote earth sensing spacecraft as well as unmanned aerial vehicles. The system is designed to detect sections of trunk gas pipelines laid at a smaller depth than necessary, and would monitor the conditions of gas pipelines, engineering systems and other facilities such as dykes, surface sections, water crossings, transport routes, etc."

In addition to such dramatic phenomena as earthquakes and volcanoes, there are smaller and less dramatic geological movements which can also wreak havoc on human infrastructure. These involve cyclic geodynamic movements or displacement of the Earth's crust. In particular, in areas where there is extensive mining, this activity can cause subtle shifts in the Earth's crust surrounding it which are strong enough to disrupt structures built upon it.

In Russia, this is particularly true in the Ural Mountain region, a major mining area for Russian minerals. The Mining Institute of the Urals Branch of the Russian Academy of Sciences already utilizes Global Positioning System (GPS) surveying equipment that can monitor crustal deformations caused by the impact of mining operations.

Another type of crustal movement that can seriously disrupt man-made engineering systems and infrastructure is the phenomenon know as "planetary pulsation." This occurs exclusively in areas of tectonic faulting. Although the variations of the "pulse" involve relatively small frequencies, they can have an impact on any vertical construction (posts, supports, etc.) causing them to incline toward the center of the stress zone. Such stresses can be detected through space-based geodetic monitoring.

Most of the Russian ministries utilize some form of space-based assets for monitoring their operations, but the IGMASS program calls for an extensive upgrading of these capabilities. "The Russian Federal Space Program," our authors write, "calls for developing national remote earth sensing system up to 2015, including the creation and/or development of certain space assets that can jointly monitor natural calamities and technogenic disasters. These include remote sensing and monitoring, navigation and hydrometeorology, communications and relay systems. All of these space systems should, despite their departmental disunity, constantly interact with each other through ground-based infrastructure designed for controlling space missions and for receiving, processing, and distributing space data."

The ability to place the satellites into orbit which are needed to build a global system of this nature is made possible by the existence of the three major navigation systems, the Russian Global Navigations Satellite System (GLONASS), the U.S. Global Positioning System and the European GALILEO system, which would allow the prompt positioning of mobile objects, such as microsatellites, to accomplish the needed geodetic surveying of a region in order to detect even minor geological shifts that might affect human life and production.

The book's third section outlines the more ominous threats to the Earth from space objects that could destroy human life on the planet. Far from being an object of science fiction or a fantasy of some Hollywood producer's attempt to titillate a gullible audience, the threat from space objects is very real and getting closer by the day.

As the authors note, the Earth has been struck by asteroids and comets (Near-Earth Objects, NEOs) many times throughout its history, sometimes with absolutely devastating effects as in the one 65 million years ago that caused the disappearance of the dinosaurs. But this is not ancient history. It is the nature of the universe in which we live. As recently as October, 2009, an unobserved asteroid approaching the Earth exploded in the upper atmosphere at a height of 15-20 km directly over South Sulawesi province in Indonesia. NASA estimated that it entered the atmosphere at a speed of more than 20 km/s, realizing an energy of 50,000 tons TNT equivalent, or three times more powerful than the Hiroshima atomic bomb. Our ability to deal with such threats is determined solely by our space capabilities, both to detect and to monitor the movement of such threatening objects, and, at a certain point, to deflect them from any trajectory headed our way, or to destroy them in flight. Here we're dealing with a somewhat more complicated dilemma, as coping with NEOs requires discovering the threatening bodies and then determining - with a good degree of accuracy - the orbit of the body and its physical properties.

The authors note that, at the time of their writing, the total population of NEOs larger than 1 km in diameter was estimated to be between 1,000 and 1,200. As of December 18, 2008, a total of 5,901 NEOs had been discovered, with 761 of these approximately 1 km or larger in diameter. In addition, 1,004 NEOs had been classified as Potentially Hazardous Asteroids, based on the asteroid's potential to make threatening approaches to the Earth. Much public attention has been given to the asteroid Apophis, which is predicted to approach close to Earth by 2029 and could hit Earth by 2036.

Chapter 3 gives a summary description of the dangers presented by these Near Earth Objects and the various ways in which those deadly collisions with such asteroids can be avoided. If the dangerous space object is over 7.6 million kilometers away from Earth, detection is accomplished by powerful optical telescopes. If the object comes closer, radio telescopes can be used to track its movement.

According to the Russian scientists, a dangerous space object must be either shifted from its trajectory or disintegrated into small fragments. This could be done, using what they describe as kinetic star-shaped penetrators or, in some cases, a nuclear explosive device.

The final chapter outlines a program for creating a Planetary Defense System against such threats. The authors envision that the technologies now available to mankind would be sufficient to create a coordinated system. In addition, there already exist in the various national programs, or collaborative programs among nations, much of the technology that would provide the basis for such a system. The authors do not see IGMASS as an alternative to those already existing operations, but rather as a forum for bringing together those capabilities into a global coordinated network.

The big problem is getting the various space-faring and space-utilizing nations to cooperate on that level. While the initiative has come from a group of Russian and Ukrainian scientists and is making some headway among many other nations, NASA has been singularly absent from involvement in the project, although by no means oblivious to the danger. In 2012, NASA set up, under the Jet Propulsion Laboratory, an NEO Office, tasked with the responsibility to map out the various threats on the horizon. And, as the authors of the IGMASS book indicate, the NASA capabilities in this respect are absolutely essential in elaborating a global defense system. This importance has only been enhanced by the recent success with the deployment of the Curiosity rover on Mars by NASA scientists. As statesman and economist Lyndon LaRouche has noted, this has opened a new chapter in our space exploration capabilities. Curiosity now shows that our ability to "see" and "hear" can now be accomplished from other planetary bodies, perhaps better situated to detect potential dangers. While there is extensive cooperation between the U.S. and Russia in space, the NEO issue has not been taken seriously enough to bring about the needed cooperation in this effort.

But the looming danger facing humanity, which will become even more apparent as some of these space objects begin to approach our Earth, must serve to overcome the psychological barriers that still remain preventing mankind from taking that "giant leap" toward a system of defense against the threats that now face us all.