Space & Global Security of Humanity

2009

Cyprus

1st International Specialized Symposium

SPACE AND SECURITY OF HUMANITY

УДК ...
ББК ...
П ...

Авторы:
Prof. Anatoliy N. Perminov
Head of Russian Federal Space Agency (Roscosmos)

Prof. Valery A. Menshikov
Head of IGMASS' Project,
International Academy of Astronautics (IAA)

Anatoliy N. Perminov, Valery A. Menshikov
П ... Space and security of humanity. — М.: НИИ КС имени А. А. Максимова, 2009. — 12 с.

ISBN 978-5-902991-...

The article is devoted to the issues and prospects of the creation of International Global Monitoring Aerospace System (IGMASS), to solve global issues of contemporary humankind and to guarantee seismic, ecological and geophysical security, preventing global risks and threats of the 21st century and developing forms and methods of distance education on a global scale. The authors analyze contemporary world's space activities and sustainable development; the role of advanced space technologies in reducing the risks and threats posed by dramatic phenomena and man-caused disasters of the present on the basis of some philosophical aspects of cosmonautics: development of the ideas of "cosmism" and cosmic consciousness issues.

In the article you can also find the purposes of creation, main tasks, variants of deployment and functioning of the International Global Monitoring Aerospace System; main principles of its creation, system management, aerospace monitoring data acquisition, compilation and acceptance; humanitarian, economic and ecological aspects of the IGMASS's appearance, development and utilization, role of IAA activities in field of solving dozens complicated questions mentioned above.

ISBN 978-5-902991-...

The nowadays era of globalization and global integration requires from the Humanity new planetary strategy of space exploration. Its main difference from the previous half-century space era is have to sharpen the shifting of space activity paradigm — its gradient transforming from "space motor-paced race" for expansion and superiority in the new sphere of human activity to unify the efforts of the world's states in the field of joint space exploration. The purpose of such approach is to satisfy real demands of the present for secure, safe and sustainable development of the World Community. The main essence of such paradigm coincides with the ideas of the classics of Cosmism, such as Konstantin E. Tsiolkovskiy, Alexander L. Chizhevskiy and Vladimir I. Vernadskiy and members of Roerich's family — apologists of "Philosophy of Cosmic consciousness". In this case philosophical aspects of space activities nowadays and forming its proper, clear and adequate conception is followed by the idea of deadline situation on our planet, suffering from continuous wars, man-caused and social disasters, dangerous experiments of the Earth's population, which threatens the life of our common home, can kills all the living in a global planetary catastrophe.

The Earth's "noo-sphere" (according to prof. Vladimir I.Vernadskiy) is already overflowing with negative images of violence, earthliness, death and mass destruction. Specific Geo-patogenic zones all over the planet day by day remind people of their existence, turning into creaks of the Earth's crust, accompanied by natural disasters such as earthquakes, tsunami, volcanic eruptions, landslides etc. The recent global climate changing, which trends are becoming progressively less acceptable for proper forecasts, are followed by catastrophic transforming of land-utilization, crops reducing and weather anomalies, which lead to the most dramatic consequences.

The forecast of natural and man-caused disasters on the Earth, their initiation and evolution is taking on a special significance urgency already. Earthquakes, tsunami, volcanic eruptions, landslides, floods, storms, droughts are the most common and danger-

ous natural phenomena. According to the estimates of the UN International Strategy of Disaster Reduction (UN ISDR) during the period of 1975 — 2008 there were 23 mega disasters (Fig.1) with 1.8 million fatalities. During the same period natural disasters resulted in the damage of 1.53 billion US dollars /1/. Disastrous earthquakes annually kill about 30 000 people on average. Seismic disasters result (for example, the recent earthquake in Italy, which drew the attention of the July G-8 Summit) several hundreds of billions US dollars, and sometimes up to 40 per cent of a country national patrimony.

To warn about natural man-caused disasters on the basis of monitoring their forerunners or primary indicators, degrade their consequences and be alert — is more profitable economically than to react and rebuild the destructions. From the economic point of view creating an effective disaster warning system is a more effective investment then a forced response to their worst devastating results. The world's practice confirms this conclusion: disaster forecast expenses are 15 times less than its rectification consequences cost. Thus, natural and man-caused disasters alert, weakening their consequences and readiness for preventing actions is more sound economically than responding to their consequences.

According to the scientific estimates, the annual straight loss resulting from all kinds of extraordinary natural phenomena and man-caused disasters is more than trillion US dollars which, according to our estimates is two orders more than the costs for creation of the International Global Monitoring Aerospace System (IGMASS), proposed by the scientists of Space System Research Institute — branch of the biggest Russian space Holding — Khrunichev Space Center (Moscow). It is significant that unifying the efforts of thel world community for solving such a wide-scale issue, connected with the concentration of economic, science-technical, intellectual and administrative recourses for utilizing space sphere for solving such a peaceful task in the interests of all humanity could become a real alternative to the US efforts of outer space militarization and its turning into arm race an arena in ABM and anti-satellite modes.

The contemporary Russia as one of the main space states holds strong positions in the field of Remote Sensing Control (RSC) technologies. Maksimov's Space System Research Institute has already been working in these direction for more than 10 years, including mega-system's technologies of RSC. The main result of such researches was the Russian patent on inventing the IGMASS prototype — "International Monitoring System of Global Geophysical events and Forecasting of Natural and Man-Caused Catastrophes". The patent was issued to the authors team headed by Pr. Anatoliy Perminov (Head of Russian Federal Space Agency) in 2007 and nowadays the filing of the International patent is in progress.

The expediency of such studies as and idea of proposed system firstly was recognized at the 1st International Conference "Advanced Space Technologies for Humankind Prosperity" in Dnepropetrovsk, Ukraine, then at the 1st IAA-RACTs Conference "Space for Humanity" in Korolev, Russia, then at the Conference "Advanced Space Technologies and Their Application" in Shanghai, China, 1st Mediterranean Astronautical Conference in Tunisia. The propos-

CYCLONE NARGIS
Fatalities 84,000 direct, 54,000 missing
Damage $10 billion (2009)

HURRICANE KATRINA
Fatalities 1,836 confirmed, 705 missing
Damage $ 89.6 billion (2009)

SICHUAN EARTHQUAKE
Casualties: 69,227 dead
374,643 injured
17,923 missing

Fig. 1. Consequences of disasters

als were also discussed at the round table and IAA Scientific Activities Committee meeting during IAA Academy Day in Glasgow, Scotland. In May 2009, according to the agreement between the International Academy of Astronautics (IAA) and Russian Academy of Cosmonautics named after Konstantin E. Tsiolkovsky, with the support of IAA representatives from Belorussia, Bulgaria, China, France, Germany, India, Italy, Russia, Tunis, Ukraine, and the USA in the framework of the International Academy of Astronautics (IAA) a special Study Group For studying the opportunities to decrease the danger and negative consequences of global geophysical phenomena, natural and man caused disasters using up-to-date and advanced aerospace technical facilities and technologies was established. Preliminary results of its activity are going to be discussed at The First International Symposium "Space & Global Security of Humanity" which is to be held at Limassol city, Cyprus, on November 2-4, 2009.

Let us say a few words about the Cyprus Symposium. This wide-scale scientific forum is to consider the issues and prospects of creation of International Global Monitoring Aerospace System (IGMASS) for solving global issues of contemporary humanity to guarantee seismic, ecological and geophysical security, preventing emergency, parrying global risks and threats of the XXI century, developing forms and methods of distant education on a global scale. Holding of the Symposium, which has been organized by the International Academy of Astronautics (IAA) jointly with Russian Academy of Cosmonautics named after Konstantin E. Tsiolkovsky and the International Association ZNANIE has been supported by some UN bodies, Russian Federal Space Agency and Ministry of Foreign Affairs of Russia.

Five groups of issues mentioned below are to be discussed at the Symposium. So, there are 5 items on the agenda:

1. Space Exploration and Global Problems of the Humanity and the Present (space activities and sustainable development; role of advanced space technologies in reducing the risks and threats and disaster management by negative consequences of natural phenomena and man-caused disasters the present; philosophical aspects of cosmonautics: development of the ideas of "cosmism" and cosmic consciousness issues).

2. The prospective profile of the International Global Monitoring Aerospace System — IGMASS (purposes of creation, main tasks, variants of deployment and functioning of the system; principles of the IGMASS creation, system management, aerospace monitoring data acquisition, compilation and acceptance; economic aspects of the IGMASS's creation, deployment, development and utilization, steps of the IAA activities in the field of the IGMASS creation).

3. Global aerospace monitoring methods and techniques (engineering) of natural phenomena, emergency man-made disasters and catastrophes (opportunities for using the existing and future orbital, airborne and ground technical facilities, appropriate engineering aerospace monitoring for forecasting both natural phenomena (earthquakes, tsunamis, volcano eruptions, flooding, billows etc.) and emergency situations and huge man-caused disasters settlement; Environmental— ecological monitoring of Earth surface and circumterrestrial space by using Remote Sensing Control technologies; monitoring local war zones, terror threats and risks, drug traffic and pirate routs).

4. Up-to-date technologies of aerospace monitoring data acquisition and compilation and acceptance (technologies of aerospace monitoring data collecting, computer handling, multi-dimensional interpretation and processing, including "neo geography" methodology).

5. Development of distant learning (tele-education) conceptions using the IGMASS' informational resources (IGMASS and solving global human issues — illiteracy, freedom of informational exchanges; specialist training in the fields of global aerospace monitoring; development of distant learning (tele-education) international institutions; issues of the united educational sphere establishment, based on contemporary informational and aerospace technologies).

It's necessary to note that the UN focuses its considerable attention at the use of space systems in the interests of disaster management support. So, in annually reports of Committee on the Peaceful Use of Outer Space (UNOOSA) there is a special section devoted to analysis of the activity in the direction of disaster management support on national and international levels. Directions of activity concerning this problem are also determined in this section. That is why the main purpose of the Cyprus Symposium and IAA working team activity has to be the preparation of address on behalf of the IAA to the UN, with a request to support the creation of International Aerospace System for Monitoring of Global Phenomena and its realization.

We understand that we will not create the IGMASS from zero. The system should utilize all the existing potential of International and regional space monitoring systems and their components. Even more attention has been given of late to the creation of international systems for monitoring natural disasters based on multiple-satellite systems. Projects and initiatives for building of the global space-based systems for monitoring of hazardous geophysical phenomena are in various stages of implementation in the USA, Europe and Asia. During our study we analyzed systems, projects and programmes, which directly deal with monitoring natural and man-caused disasters from space: Global Earth Observation System of Systems (GEOSS),Global Monitoring for Environment and Security (GMES), Disaster Management Support System in Asia-Pacific Region "Sentinel Asia", Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters, so-called International Charter "Space and Major Disasters" (Charter Disaster), Disaster Monitoring Constellation (DMC). In common, the analysis of projects of international space-based multi-satellite systems used for disaster monitoring showed that their special feature is dedication to recovery efforts following natural and man-caused disasters and, to a lesser extent, a short-term forecasting of such events.

Moreover, the development of space facilities for the Earth observation and monitoring gives principally new opportunity to solve extremely complex problem to forecast and prevent natural and man-caused disasters. At the moment there are some pessimistic moods concerning the state of the problem of short-term negative global natural phenomena forecast. But in spite of this, space observation systems having abilities for global monitoring of the

Earth's surface, atmosphere, near-Earth space can provide detection of short-term signs and reliable forecasts of earthquakes, tsunami, geophysical phenomena and on-line data transmitting practically to any point on the Earth.

The following facts give some reasons for optimism. For the last 5 — 7 years considerable progress has been achieved in understanding the processes of predetermining birth of negative geophysical phenomena, in determination of their signs. Russian scientists revealed relations between ionosphere characteristics and the state of the Earth's crust tectonic. The advent of dense geodetic networks in seismically active regions (e.g., SCIGN, the Southern California Integrated Global Positioning System Network), and satellite interferometric synthetic aperture radar (InSAR) from the European Remote Sensing (ERS) satellites, have resulted in great progress in understanding fault ruptures, transient stress fields, and the collective behavior of fault systems, including transfer of stresses to neighboring faults following earthquakes.

Thus, the IGMASS is a mega-system which has to be the unique instrument in the matter of implementation full-scale policy of preventing and reducing consequences of natural disasters and man-caused catastrophes.

Let us say a few words about how we imagine the future appearance of the IGMASS. It is well-known that the short-term forecast of natural and man-made disasters and earthquakes needs dedicated operational information from across the globe concerning the changes in the Earth's lithosphere, atmosphere and ionosphere. Such information must be processed in a special way and transmitted to relevant decision-making authorities. This can be achieved by building an optimum in-orbit complex (Fig.2) with an adequate instrumentation package in conjunction with airborne systems, sensing equipment and efficient on-land infrastructure. None of the considered projects fully meets these requirements.

The results of conducted analysis allow us to conclude that the creation of the International aerospace system for monitoring of global phenomena in the interests of short-term forecast of natural and man-caused disasters is urgent and current importance task.

Taking into consideration the previous creation of international aerospace system for monitoring of global phenomena — the International Global Monitoring Aerospace System (IGMASS), it is easy to understand that it is one the most important directions for solving the problem dealing with on line global and short-term forecast of natural and man-caused disasters. Consequently, the main purpose of creation of the IGMASS is Global monitoring of the Earth's surface, the Earth's atmosphere and near-Earth environment from the space with the possibility to transfer observation data to ground situation centers which carry out forecast and warning in quasi-real time to prevent natural and man-caused disasters. The aim of the IGMASS is decreasing danger and negative consequences of natural and man-caused disasters for the population and economic potential of countries on the base of creating united scientific and technical and informational space in the field of monitoring the Earth's lithosphere, atmosphere and ionosphere. This goal is achieved by means of effective development and mutual use of

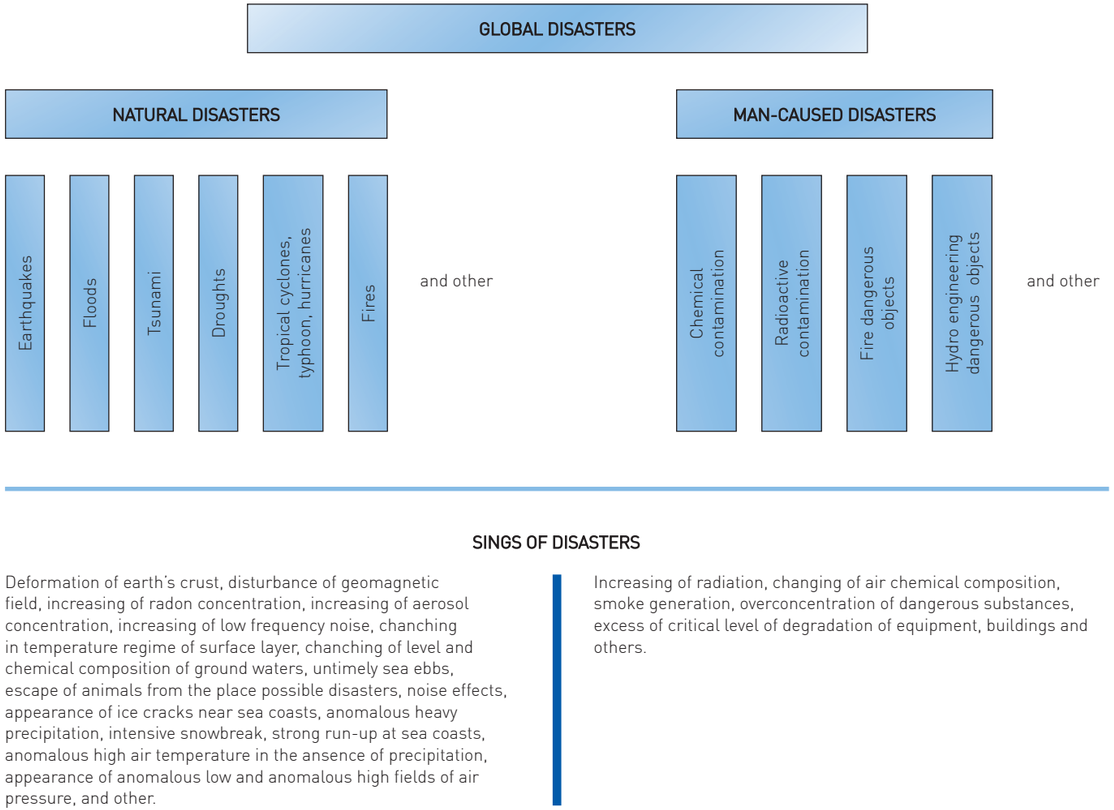

Fig. 2. Global natural and man-caused disasters and their precursors

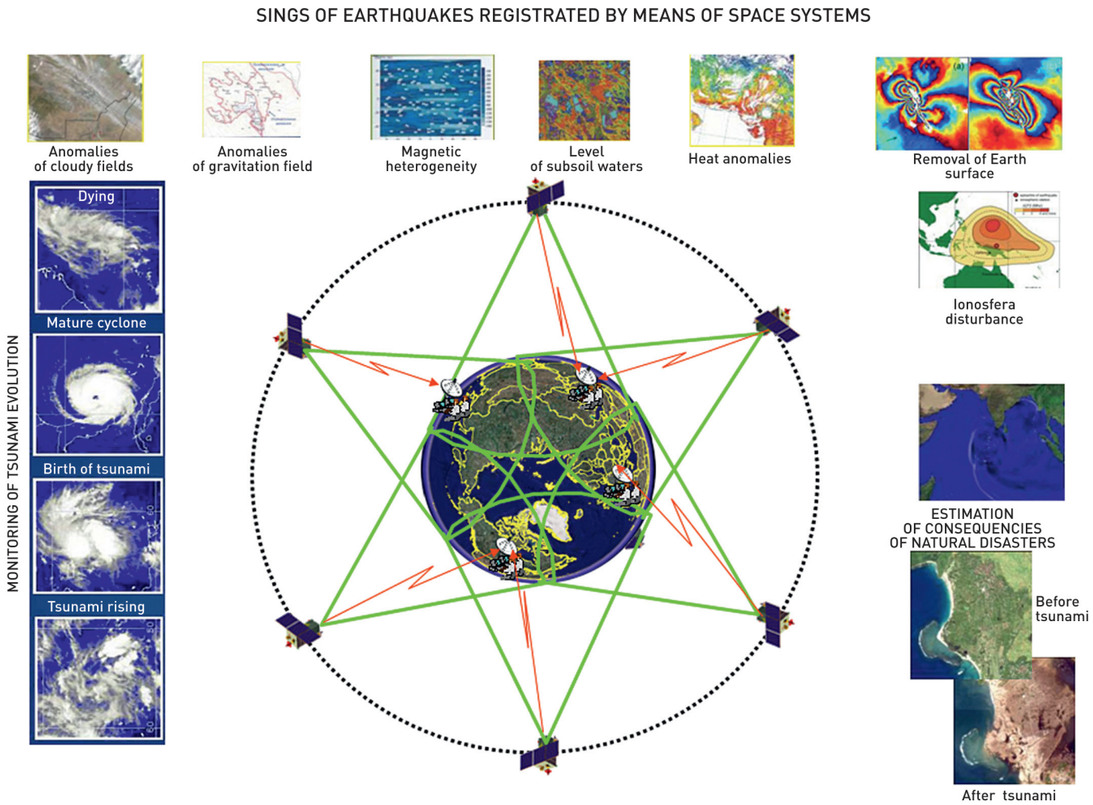

Fig 3. Indicators of earthquakes registered with the help of space systems

space potential, advanced monitoring technologies and procedures for data processing which different countries have for the sake of providing the global operational and short-term forecast of natural and man-caused disasters.

The main tasks of the system are:

— Remote observation of the Earth's surface, atmosphere and ionosphere with the help of visible and heat range equipment, low— and high-frequency wave complexes, complexes for monitoring charged particles, magnetometers, mass-analyzers, spectrometers,

— Data obtaining by satellite equipment and its registration, transfer of monitoring data from satellite to ground centers to obtain, store and process the Earth observation information both in real-time and with delaying in case of data storage in satellite on-board memory,

— Preprocessing and processing of the Earth observation information with the use of ground stations which are part of global (international) and national situation centers;

— Monitoring data acquisition and processing in the interests of operational and short-term forecast of natural and man-caused disasters, and data storage and display in the international situation centers as well,

— On-line and operational delivery of necessary information to state authorities both in Russia and in other countries for the sake of hazard reducing and decreasing of negative consequences of natural and man-caused disasters for people and economic potential of different countries,

— Remote education (distance learning) in the interests of training specialists in the field of monitoring, forecast of natural and man-caused disasters and other areas of science and engineering with the help of advanced space and informational technologies

To achieve the goal and solve the tasks of the creation of the proposed system it must consist of space, air and ground segments (Fig.3).

The orbital segment of the system has to consist of the upper (GEO) and lower deck groups of satellites. At that, system uses extra information obtained from satellites of other international disaster monitoring systems such as GEOSS, GMES, DMC, Charter Disaster, Sentinel Asia. The use of information supplied by these satellites ensures, in the first place, its complexity and reliability, and, in the second place, enables to test ground segment of the system prior to the deployment of its orbit constellation. The obtained data is transmitted to the situational centers for control during emergency situations which supplies users with information on results of monitoring. Orbital segment consists of small satellites which have mass of 100 1000 kg). Microsatellite "Soyuz-Sat" that is now designed and created in Maksimov Space Systems Research Institute can be used as microsatellite platform. Small and micro satellites are completed with highly sensitive radiometric visible and heat range equipment, on-board systems on the base of low— and high frequency wave complex, plasma complex, charged particles monitoring complex, magnetometer, Fourier spectrometer, registering signs of natural and man-caused disasters.

The space-based segment of the system enables the process of obtaining background distributions and emission of disturbances of thermal, magnetic,

PURPOSE: Global monitoring of Earth's surface, Earth's atmosphere and near-Earth environment from space with the possibility to transfer observation data to ground situation centers which carry out forecast and warning in quasi-real time to prevent natural and man-caused disasters.

AIM: Decreasing of danger and negative consequences of natural and man-caused disasters for population and economic potential of countries on the base of creation of united scientific and technical and informational space in the field of monitoring of Earth lithosphere, atmosphere and ionosphere.
This aim is achieved by means of effective development and mutual use of space potential, advanced monitoring technologies and procedures for data processing which different countries have in the interesting of providing the global operational and short-term forecast of natural and man-caused disasters.

MAIN TASKS OF SYSTEM

— Remote observation of Earth's surface, atmosphere and ionosphere with use of visible and heat range equipment, low- and high-frequency wave complexes, complexes for monitoring of charged particles, magnetometers, mass-analyzers, spectrometers,

— Data obtaining by satellite equipment and its registration,

— Transfer of monitoring data from satellite to ground centers to obtain, store and process the Earth observation information both in real-time and with delaying in case of data storage in satellite on-board memory,

— Preprocessing of Earth observation information with use of ground stations which are part of global (international) and national situation centers,

— Monitoring data acquisition and processing in the interesting of operational and short-term forecast of natural and man-caused disasters, and data storage and display in the international situation centers as well,

— On-line and operational delivery of necessary information to state authorities both in Russia and in other countries in the interesting of hazard reducing and decreasing of negative consequences of natural and man-caused disasters for people and economic potential of different countries,

— Remote education (distance learning) in the interesting of training specialists in the field of monitoring, forecast of natural and man-caused disasters and other areas of science and engineering with use of advanced space and informational technologies

— Providing with data for weather analysis and forecast on regional and global levels.

Fig. 4. Purpose and tasks of IGMASS

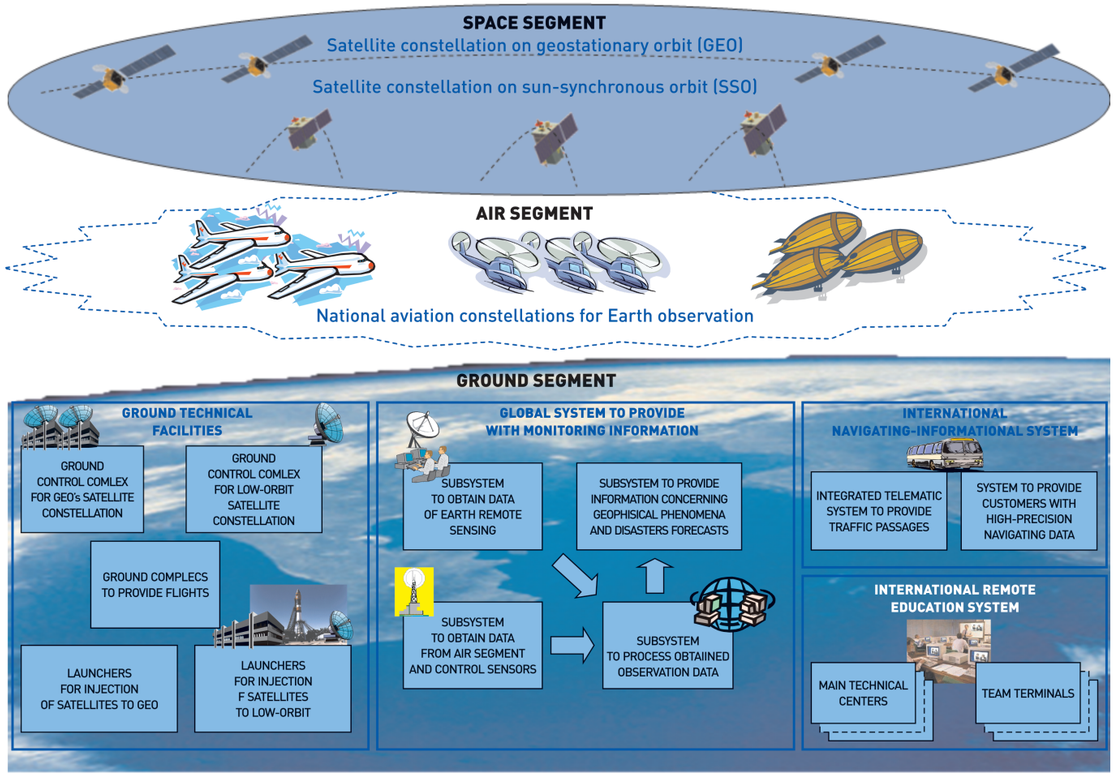

Fig. 5. Structure of IGMASS

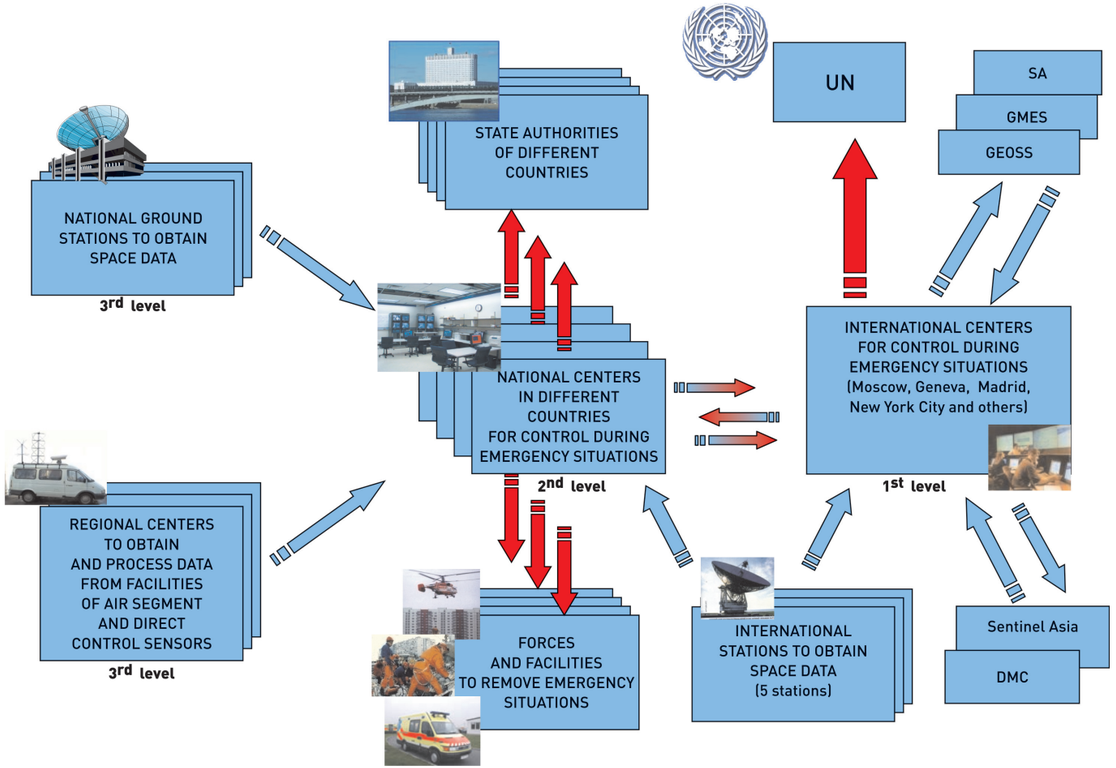

Fig. 6 Structure of global system that provides customers with monitoring information

and gravitational fields and plasma in ionosphere and detects changes in the ozone layer and atmosphere. It also detects geodynamic transformations in the Earth's crust and hydrodynamic fluctuations in underground waters, which could be forerunners of natural and man-caused disasters.

The air-based segment of the IGMASS will include national air-born sensors (on airplanes, dirigibles or pilotless aircrafts). The segment is created in case of need by each state at its own expense and is not international.

The ground segment of the IGMASS consists of ground facilities to provide orbital injection of satellites and their control (rocket-and-space complexes and ground control complex — Fig.5) and special ground complex — hierarchic sub-system (Fig. 6) that provides customers with monitoring information concerning geophysical processes and forecast of natural and man-caused disasters. Delivery of obtained data to the interested organizations is realized by means of global system that provides customers with monitoring information concerning geophysical processes and forecast of natural and man-caused disasters. This data is necessary for scheduling of use, obtaining, structural recovery, processing, storage and circulation of all types of data transmitted from satellites.

Structure of such hierarchic sub-system that provides customers with monitoring information has three levels: the highest level, which includes international centres for control during emergency situations which are situated in Moscow, Geneva, Madrid, New York City and others cities; medium level, which includes national centers for control during emergency situations, these centres have to interface with the centres of the highest level and the lower level which consists of ground stations which provide space data obtaining.

For efficient transmitting of monitoring information from GEO satellites for the sake of providing global centers of emergency situations control with space data it is necessary to have five international distributed ground stations to obtain space data. These stations, for example, can be situated at the West coast of North America, East coast of South America, Central America, Central Africa, Indo-China, the central part of Russia. Furthermore, these stations have to be used to obtain data from the lower level satellites. In the interests of direct providing national centers of control in emergency situations with necessary space data the corresponding countries can build their own ground stations to obtain space data. The creation and operation of these centers has to be financed by the governments of the corresponding countries.

The IGMASS' navigation and information support sub-system is designed to supply different states with the navigational information received by space navigation systems for addressing a variety of social and economic needs, including information exchange and telecommunications. An on-Earth dedicated navigation and information support includes an integrated telecommunication system of transport corridors and a system for supplying consumers with high-precision navigational information. The integrated telecommunication system of transport corridors is designed for: enhancing the transportation network throughput, ensuring traffic safety, protecting the environment, and increasing cargo

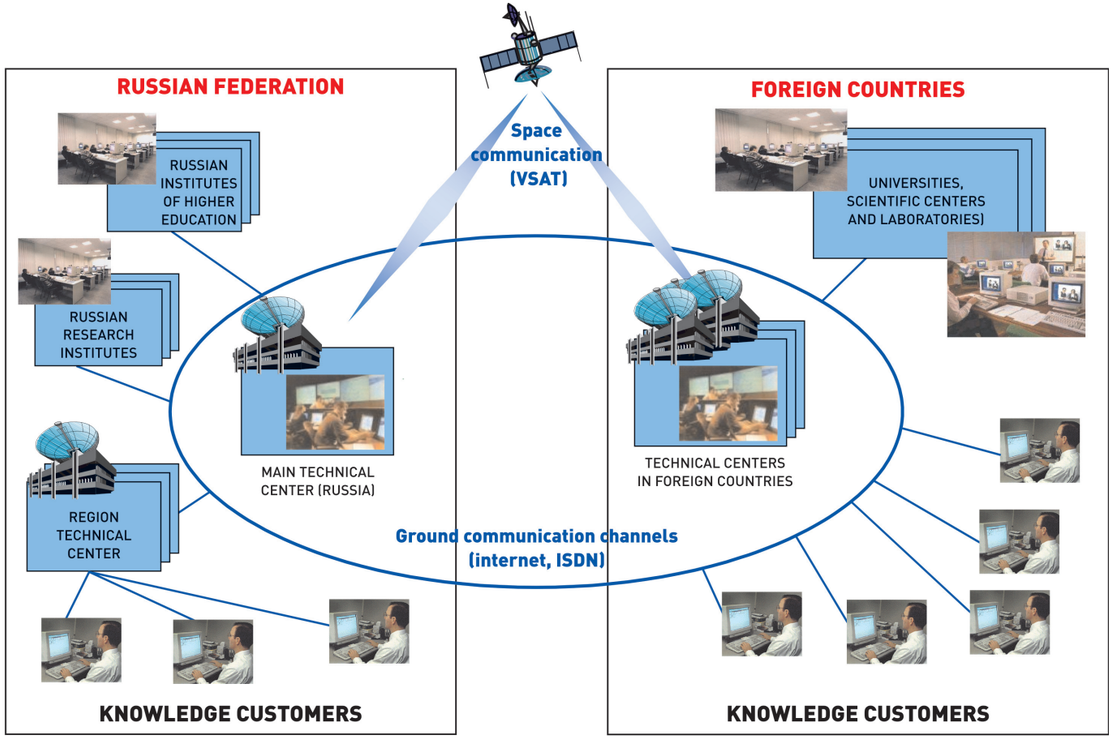

Fig. 7. Remote education (distance learning system)

EFFECT RESULTING FROM CREATION AND UTILIZATION OF THE IGMASS

HUMANITARIAN

— Maintenance of life and health for thousands people on the Earths due to on-line control, forecast and early warning about natural and man caused disasters,

— Increasing of comprehension by world community the necessity of peaceful coexistence on the Earth and preservation of world civilization

ECOLOGICAL

— Reliable estimate of influence of factors concerning ecological threats on the Earth,

— Increasing of efficiency of development and realization by world community the large-scale actions to prevent the ecological threats resulted from natural and man-caused factors

ECONOMIC

— Decreasing of unemployment due to opening new jobs,

— Preservation and steady raising of scientific, design and technological potential in Russia,

— Annual resources savings due to prevention of emergency situations dealing with natural and man-caused disasters (in the world — hundreds billions US dollars),

— Re-orientation of resources savings to humanitarian needs of humanity.

Fig. 8. Effect Resulting from Creation and Utilization of the IGMASS

transportation efficiency via transport corridors. It must include a complex of information and software devices bringing together modern information and telecommunication technologies with traffic stream organization based on a single territorially distributed and protected information resource of a state participating in this project.

The sub-system of supplying consumers with high-precision navigational information is designed for forming navigational and informational space within which an unlimited number of mobile and fixed objects in any point on land, at sea or in the air fitted with navigational, sensing and data exchange systems are able to automatically and accurately determine the whereabouts, based on signals from GLONASS, GPS, and Galileo.

One of the key components of the IGMASS is the Special Sub-system of Distant Learning for training specialists in the field of monitoring and forecasting of natural and man-caused disasters performs the following function:

— Enhancing the capability of learning in monitoring and forecasting of natural and man-made disasters for Russian and non-Russian citizens residing far from major educational institutions,

— Enabling learners to get knowledge in monitoring and forecasting of natural and man-made disasters at their place of residence or work,

— Improving professional skills of personnel of organizations and companies in countries involved in monitoring and forecasting natural and man-made disasters,

— Improving the process of efficient training the experts in the IGMASS elements and in organization of its employment,

— Improving the students' knowledge at different educational institutions (schoolchildren, college and university students).

We expect that creation and operation of IGMASS will result in the effect which will include pronounced humanitarian, economic and ecological aspects (Fig. 8).

The humanitarian aspect of the IGMASS creation includes both health and life preservation of hundreds of thousands of people with the help of permanent control and forecast of natural and man-made disasters and early warning the population about natural disasters and global calamities, and better understanding the necessity of peaceful co-existence on the Earth by the world community and preservation of the world civilization. The economic aspect of the issue is positioned as retention and buildup of research, engineering and technological capability of participant states; annual saving financial and material resources due to preventing the emergencies (mitigation of the negative impact) caused by man-caused disasters, and warning about natural disasters that could bring multi-billion-dollars-damage; re-orientation of saved funds towards humanitarian needs. Ecological effect from the creation and utilization of the system is characterized by obtaining reliable information about the impact of human activity on the environment and the Earth; more effective development and implementation of large-scale efforts aimed at addressing ecological threats generated by natural and man-made disasters.

Fig.9 shows some possible steps on the direction of the IGMASS' creation.

Taking into consideration the fact that the problem of forecasting and preventing natural and man-

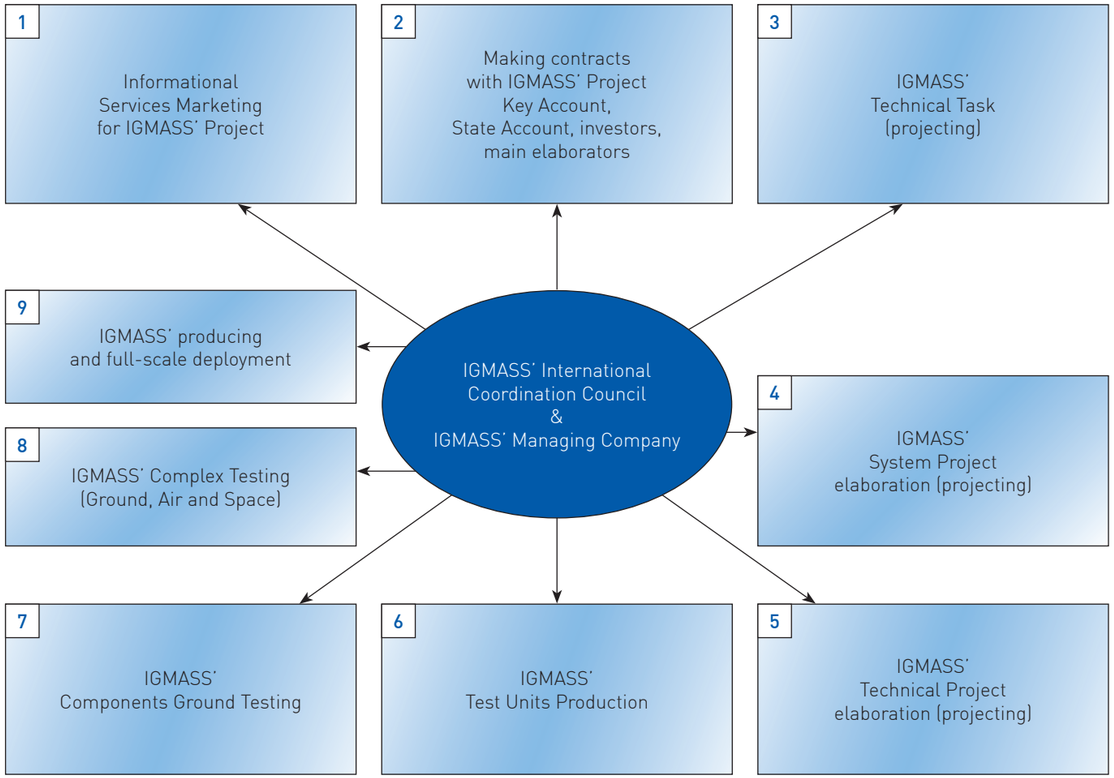

Fig. 9. Main Steps of IGMASS Creation

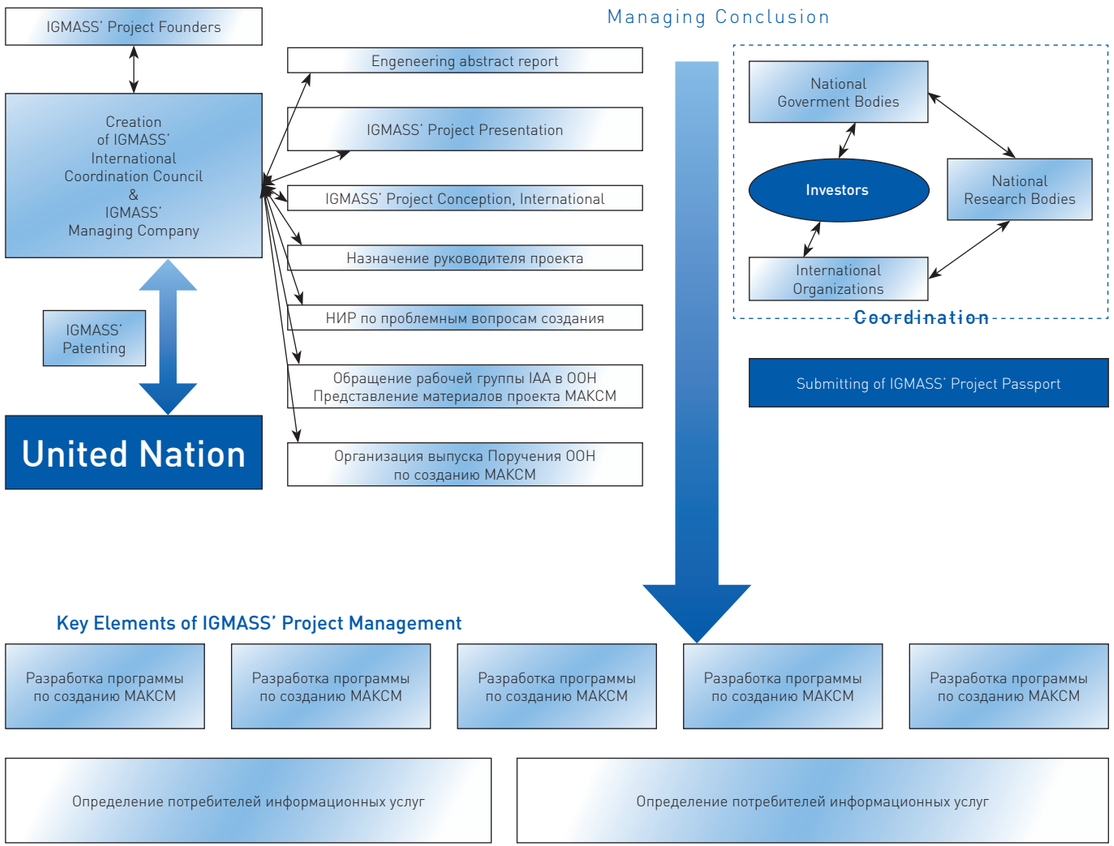

Fig. 10. IGMASS' Project Initialization

caused disasters is of an obviously international character and while creating the international aerospace system for monitoring global phenomena we must solve a number of scientific and applied tasks dealing with development, test and utilization of special facilities for registration of global phenomena signs, the following organizational steps should be taken (Fig.10).

1. To provide the IGMASS with an adequate support from the UN, including financial one, during realization of the proposed project. Large-scale programme which has been realizing since 2007 by the initiative and under the aegis of the UN is the so-called United Nations Platform for Space-based Information for Disaster Management and Emergency Response (SPIDER-UN). This is aimed at ensuring that all countries and all relevant international and regional organizations will have access to all types of space-based information and be able to use it I order to support the full disaster management cycle by being a gateway to space information for disaster management support.

2. The proposed IGMASS project has to be initialized and conducted by IAA as an organization which will accumulate the world scientific potential in the field of space sciences and engineering, first of all in the interests of humanity.

3. The ultimate aim of IAA Study group should be the concrete proposals concerning the creation of the IGMASS for monitoring global geophysical phenomena and forecasting natural and man-caused disasters on the base of efficient development and joint use of aerospace capability, advanced technologies in the field of the Earth's lithosphere, atmosphere and ionosphere monitoring, data processing methods and instruments to provide global operative and short-term forecast of natural and man-caused disasters in the interests of decreasing dangerous and negative consequences of global geophysical phenomena, natural and man-caused disasters.

4. Recently, Russian Academy of Cosmonautics named after Konstantin E. Tsiolkovsky jointly with Maksimov's Space Systems Research Institute held independent research on IGMASS' agenda to define its technical profile and operational performance. Scientific report about main results of the research are five books, including more then one thousands pages.

The potential member states of the project to build the IGMASS are the Russian Federation, the USA, Canada, the EU member-states, Japan, India, China, Indonesia and other countries of the Asian-Pacific region, Australia, African countries, and countries of South and Central America. The contribution of Russia into the IGMASS project can be determined by the facilities and technologies the creation of which is planned in programme and conceptual documents such as "Federal Space Program of Russia for the Period of 2006 — 2015", "Concept of Development of Russian Space Earth Observation System for the Period till 2025", "Concept of Space Activity Development in Russia for Long-Term Perspective — till 2040". Particularly, some directions to solve tasks of monitoring and forecast of incidents and disasters are determined in "Federal Space Program of Russia for the Period of 2006 — 2015". Among them there are several ways of creation:

— GEO and low orbit complexes and systems of new generation for hydro meteorological support and efficient monitoring of earthquakes, man-caused and natural incidents and disasters;

— Optical-to-electrical complex and corresponding system to research the Earth's natural resources,

— Space radar observation systems and integrated satellite the Earth observation system

— Advanced multifunctional complexes and centers of ground facilities to obtain, register and process space information concerning the Earth remote sensing

— Complexes of validated sub-satellite observations, data banks and technologies for distribution of space information

— On-board equipment for EOS' satellites.

In order to warn and forecast earthquakes "Federal Space Program of Russia for the Period of 2006 — 2015" launches satellites in the framework of "Kanopus-V" programme. These satellites are equipped with sensors to register anomalous geophysical phenomena in the Earth's atmosphere, ionosphere and magnetosphere which appear during seismic activity.

Thus, a long lasting conception of International Global Monitoring Aerospace System creation which was proposed by Russian scientists and supported by their foreign colleagues, and would be used for complex of short-term and on-the-spot forecasting natural disasters and man-caused catastrophes could become the backbone idea, which in case of its practical realization would indicate the beginning of new strategy of space exploration — strategy directed on maintaining ecologically secure and socially sustainable development of the world community with the basis of common and imperishable values of lifesaving mode of our planet.