

## RAND CORPORATION – A GLOBAL FLAGMAN AT THE LONG-TERM FORECASTING IN THE FIELD OF NATIONAL SECURITY AND THE MASTERING OF OUTER SPACE

YUKSEL AHMED

PHD STUDENT  
AT THE UNIVERSITY OF LIBRARY STUDIES AND INFORMATION TECHNOLOGIES

**BULGARIA**  
YUKSELAHMED@IHIST.BAS.BG

**ABSTRACT:** CREATED AS A MILITARY RESEARCH ORGANIZATION IN THE MIDDLE OF THE 20TH CENTURY, RAND CORPORATION – USA QUICKLY BECAME THE MOST POWERFUL "THINK-TANK" INFLUENCING THE DEVELOPMENT OF THE AMERICAN AND GLOBAL SOCIETY AND FRAMING THE PERSPECTIVES IN FRONT OF THE SYSTEMS FOR NATIONAL SECURITY. THE REPORT MAKES A FULL ANALYSIS OF THE FIRST LONG-TERM FORECASTS OF RAND, WHICH ARE REALITY TODAY FOR THE MANKIND AND THE MASTERING OF THE OUTER SPACE, WHICH CORRESPOND WITH THE SECURITY OF THE USA. THEY ARE DEVELOPED BY SPECIALISTS WITH A HIGH SCIENTIFIC POTENTIAL, INCLUDING A GREAT NUMBER OF NOBEL LAUREATES.

**KEY WORDS:** FORECAST, LONG-TERM FORECAST, SCIENTIFIC POTENTIAL, THINK-TANK, COLD WAR, OUTER SPACE MASTERING, ROCKETS, ROCKET PROGRAM, ARTIFICIAL ORGANS, DELPHI METHOD, SIMULATION, COMPUTER SYSTEM, SUBMARINES, SILENT AIRCRAFT, OCEAN FARMING, AUTOMATION, AUTOMATED LIBRARIES, ARTIFICIAL GENOMES, ROBOTICS, ROBOTISATION.

**I**F in Antiquity different oracles presented intuitive forecasts for the future, in the 20th century, modern times, characterized with intensive technological changes, a place appeared, which not only outlines the future, but also justifies the strategies for its complete occurrence in the interest of the human development. This is **RAND Corporation – an American strategic research centre in the sphere of the national security.**

**T**HE creation, development, mission of Rand Corporation are subject to the work of many authors, but Alex Abella made this in a most detailed way in his book *Soldiers of Reason: The RAND Corporation and the Rise of the American Empire*, 2008.

**I**N the book, the author presents RAND as a driving force for the national security, standing behind the US government for the past 60 years. Pointing the meaning of RAND for the US society, A. Abella [2, c.8] writes: "If we look in the mirror, we will see that RAND is every one of us."

**R**AND Corporation starts back from the time of the WWII, when a big group of US citizens, mainly scientists and engineers – were drafted into the army to war on the technical field [5].

**A**T the end of the war, when this group started to disintegrate, the Ministry of Defense of the USA decided to keep some of the most talented employees, in order to give them the

possibility, over the following years, to develop military technologies, and mainly to continue their efforts in the study of military operations. For this purpose, **General H. Arnold** of the US Air Forces, made a proposal for an agreement between the Air Forces and **Airline "Douglas"**. His proposal was approved and thus the unique project RAND was created. In the beginning it started to function as a sub-unit of the Douglas company. The contract was worth \$ 10 million [2], [5]. In the very beginning the organization had the task to research unexplored possibilities, which could be of interest to the military forces [4].

**AT** a later stage – in 1948 RAND started an independent existence, spun off from Airline Douglas and became an independent, private, non-government and non-political party organization. One of the main tasks of the corporation was to guarantee the national security of the USA, and to carry out researches in the field of social and international problems. Since the beginning of the 1960s, the RAND experts have been actively dealing with computers and programming [5]. It is the first organization in the world, called a "think-tank."

**THE** first big task of RAND was a research dubbed *Preliminary Design of an Experimental World-Circling Spaceship* [12], [13]. Despite the fact that at this stage the satellite was mainly a science fiction, the 1946 report provided a thorough evaluation of the perspectives for scientific satellites, elaborated by 50 scientists. Since this research was surprisingly prescient, it contributed to a greater extent to the weight of the corporation. The space explorations of RAND turned out prophetic not only in this case.

**DURING** the Cold War one of the first operations of RAND was related to the effective confrontation with the USSR. It conducted a series of studies in 1948 focused on the economic and military potential of the USSR. RAND has become the first US institution in which the so-called "Cold War" theory had been developed, using methods, which include intensive study of the potential enemy from a distance [15]. Another operation of RAND was dubbed *The Soviet military doctrine*, by **R. Garthoff** [6], while together with **M. Mead** the Soviet national character was studied *Soviet attitudes toward authority* [11].

**THE** polarization between the two world powers, the USA and USSR [8], dictated the establishment in 1983, within RAND, of a Center for the Study of Soviet International Behavior, together with the University of California, Los Angeles. Its aim was to fill in the gaps for specialists on Soviet foreign and internal policy. [3], [9].

**THE** links of RAND with NASA lead to participation in measuring the effectiveness of its space program. In 1968 it published a catalogue of its scientific goals for the outer space, which included over 1,000 positions in five main areas of research: the Earth and the environment; life on other planets; the Solar system, the Universe, the outer space as a scientific laboratory. RAND also analyzed the effectiveness of the Space Shuttle.

**NOWADAYS** RAND publishes reports on a wide range of topics – from the healthcare problems and the drugs control to the labor market researches, the regional integration, the environment, the international relations, the security issues of the USA and other countries. Among the clients of this method are the carmaker Ford Motor, the pharmaceutical company Pfizer, the Harvard and the Stanford University, the UN, the European Commission, the World Bank, the Soros Foundation, the Rockefeller Foundation, the Chinese Ministry of Healthcare and many other [14].

**IN** 2001, RAND formulated the agenda of the then presidential administration in the field of science and technologies. The Corporation has its merit for the present presidential administration, too. In 2009-2010 RAND carried out an analysis on the proposal of President

B. Obama for the healthcare reform in the USA, based on the specific micro-simulation model [10].

By 2011, over 30 of the **Nobel Prize laureates**, mainly in the area of economics and physics were connected with RAND at some point of their careers. Among the most famous are: **Peter Diamond, Willard Libby, Luiz Alvarez, Murray Gell-Mann, Kenneth Arrow, Henry Kissinger, Gary Becker, Robert Lampert, Oliver Williamson** and others.

**OTHER** famous representatives of RAND are: **Bernard Brodie, James Huber, Samuel Cohen, Allen Noel, Condoleeza Rice, Donald Rumsfeld, James Slesinger, Norman Shapiro, Roberta Wohlstetter** and others. [14].

**RAND** gave many specialists, who established different scientific centers. An example of this is Herman Kahn, who founded The Hudson Institute, which deals with problems of the military-political strategies of the USA, consults the Nuclear energy commission, and others. [14].

**THE ACHIEVEMENTS OF RAND SINCE ITS ESTABLISHMENT ARE [14]:**

1. research on the spread of nuclear weapons, including an analysis of the economic political and technical aspects of the nuclear capacities in different countries;
2. a series of secret programs for the development of technical means for warfare, including the spinning camera for scanning, designed for air surveillance, "silent" flying devices for night air surveillance and new methods for bombardment;
3. forecasting of the first spacecraft and the subsequent ones for mastering and development of the outer space, as well as aiding the NASA programs;
4. it is supposed that at least one nuclear bomb, which is part of the arsenal of the USA at present, has been created due to ideas, stemming from a research carried out by RAND;
5. development of a method, based on the use of computers – electronic simulation of creation of a computer system, which simulates the work of another system, which in its turn can be everything – from the model of the human heart to weapon systems;
6. development of several fine mathematical techniques, in particular linear programming, dynamic programming, prioritization of the problems, non-linear programming, etc;
7. justification and development of the Game theory;
8. development of the concept for "flexibility" and "confrontation" etc.;
9. Development of new methods in the field of the techniques for futurological and technological forecasting, with *Delphi* being the most popular one [1] etc.

**HOW MUCH EFFECTIVE ARE THE LONG-TERM FORECASTS OF RAND?**

**WHETHER** the Corporation with all its scientific potential has succeeded and succeeds to forecast future processes in the national security, mankind development and outer space mastering – one of its main goals?

**SUITABLE** for such an analysis are one of its first long-term forecasts, connected with two of the first RAND reports: 1 *Preliminary project for manned spacecraft in orbit around the Earth* from 1946 [12] and 2. *Report for a long-range forecasting study* from 1964 [7]. Their analysis is interesting from the point of view that they contain one of the most primordial long-term forecasts formulated by RAND, as well as the fact that there is enough evidence in view of their occurrence. In other words the future for the 1950s-60s is already present.

**BELOW**, in this research work is presented basic texts from these two reports and evidence of their success:

1. **THE** report *Preliminary project for manned spacecraft in orbit around the Earth* from 1946 [12], [13] was prepared for three weeks and was part of the space program of the USA, which started the same year. Editors of the report were **Jack Lipp and Robert Salter**, who were considered pioneers of the satellite surveillance. For their work they took into account the notes of other 195 scientists. The report noted that ""conservative and realistic engineering estimates of the possibilities for the construction of a spaceship, that will circle the Earth like a satellite, were taken" [12, c.10]. The forecast was based on the „current state of the technological advance and did not include such possibilities like the future development of nuclear energy." [12, c.10]. The spaceship project forecast its launch 11 years before the Soviet Sputnik-1 to enter orbit. The punctuality of the forecast had a difference of one week. According to the authors of the report, it marked the beginning of the US space program. The introduction noted that the forecast machine, which would fly in the outer space [12, p. 1-2] „will be a serious „satellite device”, which will be built for the first time by the USA and its importance will equal the nuclear bomb explosion.” Right after that, it was said that the forecast was based on the existing technologies and this forecast did not take into consideration the development of the nuclear energy, which, probably, might be mentioned in future reports, as a second line of the forecast.

**THIS** research program covered several areas: structural expansion theory; structural materials; tanks; phases separation; installation; assembly; logistics; rocket engines; rocket accessories; aerology; servo system; telemetry; trajectory and others.

**ACCORDING** to the forecast of the said Report from 1946 the spacecraft, which was designated like a "satellite device" would take off in 1957, i.e. *the technological forecast was with an 11-year forecast period*. When in the evening on October 4, 1957 the successful launch from the Earth of the first spacecraft was reported, RAND gained the first important position in the area of the long-term technological forecast. The small metal ball, weighing 83.5 kg was launched on an R7 rocket, which was used as a main rocket booster of the USSR in the beginning of the Space race with the USA, including the putting into orbit of the first cosmonaut – Yuri Gagarin.

**THE** USA, which was developing its satellite program, dubbed Vanuand, after October 4, 1975 doubled the efforts, in addition that the USSR, a month later – on November 3, launched Sputnik – 2 with the dog Laika on board. Explorer 1 (officially named by NASA as Satellite 1958 Alpha) was launched on January 31, 1958. Its launch was done with the help of the ballistic missile Redstone, developed by the Chrysler Corporation in 1952 on the basis of the German Fau-2 missile. Later on this rocket was exchanged for the Pershing missile.

2. **IN** the **Report for a long-range forecasting study from 1964** [7] **Theodore Gordon** and **Olaf Helmer** described the results of the long-term forecast, carried out with the Delphi Method, as to what will be the future world of the mankind: after 20 years – in 1984; at the turn of the new century – in 2000; during the first 100 years of the new century – 2100 r.

**THE WORLD OF 1984.** (bolded by the author.) ...The following picture of the world from 1984 appears: The world population would increase by about 40% from its present size to 4.3 billion, provided that no Third World War happened before that. It is 80% to 85% probable that if the present trend is kept, this possibility may increase to 95% ... the increased needs for food and agriculture will be aided by the automation and the presence of desalinated sea water. A control over the effective fertility will be practiced; the birth rate will keep on falling. In the area of medicine, the transplantation of biological organs and the

implanting of artificial (plastic and electronic) organs will be common practice.... Complex teaching machinery will enter into force. Automated libraries, which will play a given material, will aid the researches to a greater extent. On a global scale, the communications will be improved via a universal satellite system and automated translation machines. The automation will enable the taking of a wide range of operations for some kind of decision takings on a managerial level. On a permanent basis, small probes will be located in the space... Working laboratories will be flying in the deep Space. The power from nuclear and ion engines will become available. In the military sphere, the ground war will be transformed by the rapid mobility and highly automated tactical possibilities, aided by the presence of a wide range of weapons, from non-flying biologic devices and a light missile of the type for personal armament, small tactical nuclear bombs and energy weapons of different kinds. The start of ground anti-intercontinental ballistic missiles will become quite efficient. The armament to fight against submarines will advance very much, but the deepwater diving will make these vessels hard to detect, and this will create new problems [7, p. 72-73].”

#### ACTUAL RESULTS ACHIEVED BY THE MANKIND FOR THE FORECAST PERIOD:

**THE** world population in 1985 – around 4.831 billion people /i.e. about 800 million above the forecast/. The rapid development of the agriculture machinery, appearance of selected seeds and fertilizers, development of specialized literature, laboratory equipment, automated inventory and equipment, plant protection and others. The desalination of sea water was carried out for the first time in Santa Barbara, California in 1991-1992. Its mass usage started in the first years of the XXI century in Singapore, China, Israel, China, Oman, Aruba, Gibraltar and others.

**THE** birthrate on a global scale fell by 1.9%. Yet in 1967 Doctor Christian Barnard performed the world’s first successful human-to-human heart transplantation in Cape Town, SAR. Since then the transplantation has become a widespread medical practice on a global scale. Since mid-70s there have been a production of limbs and organs, joint prosthesis, contact lenses, hearing aid devices and biomaterials, synthesized by means of chemical process through special plastics and other high-tech materials. The scientists and engineer-chemists through impact on the structure of the molecules, create new, strong, flexible and durable medical devices. A large number of human organs can be replaced by high-tech materials and devices – still in the 1950s artificial heart valves were created; the first surgical transplantation of a permanent artificial heart was performed in 1982. The plastic contact lenses were introduced, and in 1985 the soft bifocal lenses appeared.

**IN** the military area: the military rockets are produced *in the USA* - Douglas AIR-2 Genie, CRV7, MGR-3 Little John, RP-3 (Rocket Projectile 3 inch), RUR-4-Weapon, Alpha, XMQR-13A Ballistic Missile Target System (BMTS), GTR-18 Smokey Sam, LOCAT, MIM-104 Patriot and others; *in the USSR* – the missile complexes R-36MUTTKh/R-36M2, UR-100N, RT-23 Molodets, RT-2PM Topol, RT-2PM Topol-M (silo and mobile based) and others. As regards to surveillance missions with submarines: During the 1970s the US submarines Halibat and Parsh placed a sound-recording device at about 120 m of depth in Okhotsk Sea to catch the communication between the Soviet naval bases in Kamchatka and the Far East. The operation was stopped by the USSR in 1980. Now one of the devices can be seen in the KGB museum in Moscow. During the Cold War the US submarines used such devices against China, North Korea, North Vietnam Libya and Cuba.

**THE WORLD OF 2000.** (bolded by the author) When we continue our projection to 2000, the following additional functions appear as a descriptive part of the world at that

time, if we judge by the forecasts of the six panels: The population will reach 5.1 billion (65% more compared to 1963). New sources of food will be available by massive ocean farming and production of synthetic protein. A controlled thermal-nuclear power will be a new energy source. New minerals will be obtained from the oceans. A regional control of the climate will be achieved at an experimental stage. There will be general immunization against bacterial and viral diseases. Primitive forms of artificial life will be generated in laboratories. Correction of congenital defects will be possible through molecular engineering. The automation will advance and it will be driven by robots for many "servants' services" to complex machines with a high quotient of intelligence. There will be a universal language, through automated communication. Propellant materials will be obtained on the Moon. People will touch down pilotless research stations on Mars, whereas the Earth will have a global commercial ballistic transport. The manipulation of the climate for military purposes will be possible. Efficient intercontinental ballistic missiles for protection will be developed. Aimed energy beams will be developed [7, c. 73]."

#### **ACTUAL RESULTS ACHIEVED BY THE MANKIND FOR THE FORECAST PERIOD:**

The world population was about 5.978 billion, or some 800 million more, compared to the forecast. The proof for the "ocean farming" is the use of seaweed. A typical example for this is Japan, Korea and China, where seaweed occupies more than 10% of the Japanese diet. In the 1973 the consumption of seaweed reached on average 3.5 kg per household. For the last 10 years their consumption has grown by 20%. The research of Doctor C. Drapeau and Doctor G. Jenssen on the eating of AFA seaweed was patented. Patent No. 6814961, given in 2004 in the USA, shows that the eating of AFA activates the movement of mature stem cells – which accompanies the treatment of the diseases of Parkinson, Alzheimer, diabetes, multiple sclerosis, heart attack and regeneration. The production of synthetic protein started even before the millennium, but the discovery of a team, headed by Professor M. Hecht (Princeton University) deserves the attention. The team created artificial proteins, enabling the possibility for growth of live cells. The team created genetic sequences, not seen so far in the nature. They could produce substances which sustain the life of the cells almost as easy as the proteins, produced in the nature.

**THE** creation of artificial life forms: 1. Since 1978 (i.e. 22 years earlier than the forecast) the In-Vitro Fertilization and the Embryo-Transfer were realized (IVF–ET) 2. In 2008 (i.e. 8 years later than the forecast) scientists, headed by Doctor K. Venter – USA created artificial cells on the basis of a computer-generated genome, dubbed *Synthia*. The artificial genome of the *Mycoplasma mycoides* bacteria was transplanted to another type of bacteria, thus receiving a "synthetic cell", ruled by this genome.

**DOMESTIC** robots: The twentieth century started with the availability of a large number of robots – machines that can perform movement and physical operations. They occur in many forms, varying from humanoids, which imitate the human form and way of moving to industrial, whose type is determined by the function they perform. The robots can be grouped into mobile (including the autonomous means of transport), operating (industrial robots) and reconfigured, which can adapt to the task. The market offers domestic robots, which perform simple operations like dusting or lawn mowing. Examples of these are Scooba and Roomba, a production of Electrolux. The task of other domestic robots was to keep company or play with the people. For example Sony, realized successful products, like a dog-robot, a baby-seal robot, which took care of the patients in their homes, and a humanoid-robot for the needs of the elderly and disabled people.

**THESE** Delphi forecast did not happen: propellant materials will be obtained in 2000 on the Moon; the mankind will conquer Mars; a global commercial ballistic transport will be organized on the Earth.

**POSSIBLE FEATURES OF THE WORLD IN 2100** (bolded by the author)  
**WHEN** we try to see far ahead in the future, in 2100 we may not be demanding as to the existence of a consensus among our respondents... By 2100 the world population will be around 8 billion. A chemical control over the ageing process may be achieved and the lifespan may be prolonged to over 100 years. The development of new limbs via biochemical stimulation is probable. The "Human-Machine" symbiosis will enable the mankind to increase their intelligence with electromechanical stimulation via a computing machine, which is a real probability. The automatics, of course, will have made giant steps forward, and as a proof will appear things like domestic robots, remote fax reproduction of newspapers and magazines at home, fully automated motorway transport, etc. The problem connected with the adequate care of the need of life of all peoples on the Earth, is expected to be solved by international agreements, based on abundance, new energy sources and raw materials, which will be discovered during the twenty-first century... We suppose that revolutionary developments will be possible as regards to the weight control by means of some sort of change in the gravity field. A permanent Moon colony may be established with a regular commercial traffic between the Earth and the Moon [7, c. 74]." Furthermore the forecast of the experts are connected with a permanent base on Mars, Jupiter and manned spaceships passing by Pluto, missions in other solar systems and communications with extraterrestrial intelligent creatures.

**ACTUAL RESULTS ACHIEVED BY THE MANKIND FOR THE FORECAST PERIOD:**  
**THE** UN forecast for the world population is not for 2010 but for 2050 - 8,918,724,000. I.e. even in 2050 the population will be over 8 billion stipulated in the forecast of RAND, though Delphi. An evaluation of the other forecast processes and phenomena by 2100 can be give when they occur, but it can be said that most of the projected things for some 90 years from now are already happening, for example the chemical control over the ageing process, the "Human-Machine" symbiosis, the mass usage of automation in the human life etc.

**AS** for the rest of the forecast it is too early to foresee before 2100 whether it will happen or not.

**THE** data for the world population is taken from: 1.UN report 2004 data and 2. World Population Clock – Worldometerso.

**THE** analysis of the abovementioned RAND reports suggests that:

1. The expert staff of RAND Corporation, including high-rank specialists, Nobel Prize laureates as well, is a reliable source for leading forecasts for the national security, as well as for innovative skills, whose abilities for sensible scientific estimate are in the core of the justification and creation of long-term forecast both for the harnessing of the outer space and related to the national security area.
2. The long-term forecast of the corporation are heavily affected by the external environment and its rapid-changing characteristics – it started its activity with tasks connected with the harnessing of the Space and the Cold War, and in the following years with the setting up of policies, aimed at the development of the national and global society, in a world without confrontation between two political systems.
3. The two analyzed reports of RAND prove the high scientific potential of the organization, because over 80% of the long-term forecasts are already part of our present. Greater inaccuracy is seen in the forecasts for the period of over 100 years, but this does not change

their significance of where the mankind will go. At the same time, the long-term forecasts of RAND prompt solutions to problems, which may appear in the systems of the national security.

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