



## RAND CORPORATION - THINKING FACTORY ("THINK TANK") IN FUTUROLOGY

**Abstract:** RAND is the first organization in the world to be called a think tank. In principle, recommendations for it are not necessary. Proof of this are the words read when opening the older version of the corporation's website: "By opening this page you are using the technology we developed in the 1960s." This is the RAND Project. RAND Corporation is an American futurology and research center focused on educational and charitable activities in the interests of public welfare and national security, developing and defining new methods for analyzing strategic issues and new concepts.

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If the ancient oracles provided intuitive predictions about the future of BC, then in the twentieth century, in the modern world, characterized by intense technological and political changes, also appears a place where not only the future is looming, but also justify strategies for its full course, in the interest of human development.

### Historical background for RAND Corporation

RAND Corporation is an American strategic research center focused on educational and charitable activities in the interests of public welfare and national security, developing and defining new methods for analyzing strategic issues and new concepts.

The creation and development of the Rand Corporation's mission has been the subject of many works, but in detail Alex Abella [1] in his book "Soldiers of Reason: The RAND Corporation and the Rise of the American Empire" (2008). This is the first of its kind popularly written history of the corporation, with the author full access to its archives, which at the same time sheds light on the last half century in America and on its troubled present. A. Abella shows RAND as a driving force behind the US government for the past 60 years.

Born on the eve of World War II as an "idea factory" to advise the Air Force on how to wage and win wars, RAND quickly became the creator of the US anti-Soviet nuclear strategy. It has become a magnet for the best and smartest Cold War politicians, strategists and scientists, such as Albert Walstetter, Bernard Brody and Herman Kahn, who are said to have saved humanity from nuclear annihilation. At a later stage, RAND's theories of rational warfare guided American military behavior in Vietnam. These same theories led to the invasion of Iraq forty-five years later, supported by the RAND, through related names such as Paul Wolfowitz, Donald Rumsfeld, and Zalmay Khalilzad. Noting the importance of RAND for American society, A. Abella [1, p.1] writes: "If we look in the mirror, we will see that RAND is each of us."

RAND Corporation dates back to the Second World War, when a large group of US citizens - mostly scientists and engineers - were mobilized to wage war on a technological basis. Within a relatively short period of time, this group developed a new method for analysis and research of

military operations, which was successfully applied to strengthen air defense and created such innovations as the atomic bomb, intelligence, radar and more. [3].

At the end of the war, when this group began to disintegrate, the US Department of Defense (USA) decided to keep some of the most talented employees to enable them to develop military technology in the coming years, more specifically to continue their efforts in the study of military operations. To this end, General X. Arnold of the United States Air Force is proposing an agreement between the Air Force and the Douglas Airline. His proposal was approved, creating the unique RAND Project. Initially, it began operating as a division of Douglas with a \$ 10 million contract [1], [3].

Also working on the RAND Project, which later became the RAND Corporation, established in late 1946: E. Bowles of the Massachusetts Institute of Technology, General L. Norstad of the US Air Force, Major K. Limey, D. Douglas - President of Douglas Airlines, A. Raymond - Chief Engineer of Douglas Airlines, F. Culbaum - Assistant to A. Raymond at Douglas. They aim to protect national security and implement a research program on a variety of topics on intercontinental warfare in all its aspects, with the exception of ground warfare. The RAND Project headquarters is tasked with exploring unexplored opportunities that could be of interest to the military [3].

In May 1948, RAND began to exist on its own, when the company separated from Douglas Airlines and became an independent, private, non-governmental and non-partisan organization. Since then, RAND's mission has been to help define policies and decisions related to various public spheres. One of the main tasks of RAND is to ensure US national security through research and analysis of the most pressing issues facing American society. RAND works closely with the US Army and conducts research on social and international issues. Since the beginning of the 1960s, RAND experts have been actively involved in computer technology and programming [3].

This is the path that an organization dedicated primarily to military purposes is pursuing toward common goals for the benefit of American society.

### **Scientific achievements of RAND Corporation**

RAND is the first organization in the world to be called a think tank. In principle, recommendations for it are not necessary. Proof of this are the words read when opening the older version of the corporation's website: "By opening this page you are using the technology we developed in the 1960s." [1].

Aviation and space are at the forefront of RAND's focus. It undertakes a number of secret programs to develop military technology, including a rotating scanning camera for air reconnaissance, "quiet" night-time air reconnaissance aircraft, as well as new methods of bombing and more.

The next group of research conducted by RAND Corporation, which is no less important than the activities in the field of strategy and tactics, is the creation of fundamentally new approaches to research policy. Some of these techniques and methods have emerged in the course of numerous studies conducted by the corporation, while others have been proposed by experts who, since the corporation's inception, have been primarily engaged in seeking new methods of analysis. Many of these methods were developed within the corporation and then refined and redesigned by other organizations. Some of the methods are mathematical and they are so complex and difficult that in the absence of specialists it can be difficult to understand in detail. Taken together, these methods define the corporation's unsurpassed and unique style.

During the Cold War, one of RAND's first developments was to effectively oppose the USSR, and he conducted a series of studies in 1948 focusing on the economic and military potential of the Soviet Union - the first attempt to understand the Soviet system of views. . RAND became the first American institution to develop the theory of the so-called "Cold War", using methods that include intensive study of the potential enemy from a distance [8]. Another development of RAND is entitled

"The Soviet military doctrine", by R. Gartoff, and in the work of M. Mead examines the "Soviet attitudes towards authority" [5].

The polarization between the two world powers, the United States and the USSR [324], dictated the establishment in 1983, within the RAND, of the Center for the Study of Soviet Behavior of the USSR, together with the University of California, Los Angeles (RAND-University) of California, Los Angeles). His task was to fill the lack of specialists in Soviet foreign and domestic policy. The focus of these specialists is the relationship between internal and external factors of the Soviet military strategy. The director of this center - Arnold Horelik is a specialist in RAND in the study of the USSR (Russia) and Eastern Europe.

The main activities of the Center are related to the training of qualified personnel for the state apparatus and the media, training of doctoral students who study disciplines in: the role of the Soviet Union in international politics; relations between the USSR and Eastern Europe (former socialist bloc); Soviet foreign policy, US-USSR relations; the internal factors of Soviet foreign policy; Soviet defense, etc. [2], [4].

RAND's links with NASA have led to participation in measuring the effectiveness of its space program. In 1968 he published a catalog of his scientific goals in space, which contains over 1,000 items in five main areas of research: Earth and the environment; life on other planets; The solar system, the universe, space as a science laboratory. RAND also analyzes the effectiveness of the Space Shuttle program.

Other early studies of RAND cover whole new areas, such as: the use of rocket engines for strategic weapons systems (missiles); nuclear power plants; game theory (applicable to military affairs); new concept of air protection; design of new types of aircraft; high energy radiation, etc.

From its first year, the corporation began to fill the group of its specialists with economists, psychologists, sociologists and social anthropologists, who expanded their theoretical research not only in the field of exact sciences.

With the expansion of the RAND of its creators, it became clear that the experiment was successful. Part of that success lies not only in retaining the talented research teams created during World War II, but also in the fact that the US Department of Defense receives as its ally a creative unit of this magnitude. RAND's long-term developments in various fields could not be developed in the offices of official government agencies, whose employees have adapted their thinking to everyday needs and narrow goals. It is also clear that an organization like RAND is more maneuverable and manageable than any university center, where different organizational boundaries between departments usually have to be overcome in the course of researching problems affecting different scientific disciplines. In the course of its development, in the 1960s, RAND turned to US domestic policy and introduced its own model of empirical research aimed at independent analysis in the study of real social and economic problems in the country. Currently, the corporation continues to work on long-term socio-political programs covering all spheres of public life, individual projects, evaluation and policy for research and technological development programs, operational analysis [1].

In 2001, RAND formulated the agenda of the then presidential administration in the field of science and technology. The corporation is also important for the current presidential administration. In 2009-2010, RAND conducted an analysis of President Obama's proposal for health care reform in the United States, based on a specific micro-simulation model.

A high school and master's programs in futurology are located in RAND. They function as the Frederick S. Pardee RAND Graduate School (PRGS). The program aims to add practical value to the training by enabling learners to work with RAND analysts on real-world issues in American and global society. In Santa Monica, RAND is developing a college specializing in political analysis and forecasting.

RAND has the right to award the scientific degree "Doctor". The doctoral program usually accepts a competition for graduates of mostly prestigious private universities. Doctoral students not

only participate in the educational process, but also participate in current and implemented by the corporation programs and documents, participate in conferences and symposia.

By 2020, more than 30 of the Nobel Prize winners, mostly in economics and physics, have been involved in RAND at some point in their careers.

In the dissertation it is not possible to write the whole list of Nobel laureates, but the most famous of them are: Peter Diamond - Nobel Laureate in 1962 and Nobel Laureate in 2010 in economics; Willard Libby - Nobel Prize in Chemistry in 1960; Luis Alvarez - Nobel Laureate in 1968 in nuclear physics; Murray Gel-Mann - 1968 Nobel Laureate in Physics; Kenneth Arrow - Nobel Laureate since 1972 in economics; Henry Kissinger - Nobel Peace Prize Laureate since 1973; James Tobin - Nobel Prize in 1981 for economics; Harry Markovic - 1990 Nobel Prize in Economics; Gary Becker - 1992 Nobel Laureate in Economics; Robert Lampert - Nobel Peace Prize Laureate since 2007; Oliver Williamson - 2009 Nobel Prize in Economics and others.

Other well-known representatives of RAND are: Paul Baran - one of those whose developments were used in ARPANET and later in networks such as the Internet; Barry Bohm - software and economic expert, inventor of COCOMO; Harold Broad - physicist, leading expert on nuclear weapons; Bernard Brody - military strategist and nuclear architect; James Huber, PhD in International Relations; Amir Ibrahimi - Security Specialist in the Middle East; Samuel Cohen - inventor of the neutron bomb in 1958; Walter Cunningham - astronaut; James Digby - American military strategist, author of the first treatise on the precise management of ammunition 1949-2007; Francis Fukuyama - academician, futurist, author of futurological bestsellers; Margaret Mead - social anthropologist; Alan Newell - AI specialist; Condoleezza Rice - former US Secretary of State; Donald Rumsfeld - former US Secretary of Defense; James Schlesinger - former Secretary of Defense and former Secretary of Energy of the United States; Norman Shapiro - mathematician, co-author of the Rice-Shapiro theorem; Lloyd Chapley - mathematician and specialist in game theory; James Steinberg, Bill Clinton's deputy national security adviser; Ketsuoki Terrasawa is an economist; Roberta Walsteter - political analyst and military historian; Ratan Tata - Chairman of Tata (Tata Sons) and others.

RAND operates not only in the United States but also in other countries around the world [7]:

The corporation's headquarters are still based in Santa Monica, but over time RAND has opened offices in New York, Washington, Pittsburgh, Pennsylvania, and since the early 1990s, beyond USA in the Netherlands (Leiden, The Netherlands), Great Britain (Cambridge, United Kingdom), Germany (Berlin, Germany) and Qatar (Doha, Qatar). In addition to these RAND affiliates, there are three field sites - in Langley, USA - where the CIA headquarters, Boulder, Colorado, and Moscow (Russia) are located.

I. RAND has various research units [1], [7]: 1. RAND Arroyo Center; 2. RAND - Education; 3. RAND - Europe; 4. RAND - Healthcare; 5. RAND - Infrastructure, safety and environment; 6. RAND - Center for the quality of police work; 7. RAND - Drug Policy; 8. RAND - Labor and population; 9. RAND - Legal and economic regulation; 10. RAND - Department for National Security Research; 11. RAND - Air Force Project.

II. Other corporate programs [1], [7]: 1. RAND - Child; 2. RAND - Political Institute of the Persian Gulf States; 3. RAND - Political Institute of Qatar; 4. RAND - Research Group for Research.

For more than 60 years RAND has been synonymous with high quality and objectivity.

The specific work in the corporation is performed within each department or in an interdisciplinary group, specially created for a given project. Work on the project begins with the appointment of a team leader. The choice of a group is voluntary. The number of its members can vary from one or two to several dozen. Rather, a typical case is when the group consists of three or four.

### **RAND Corporation reports**

The main achievements of RAND since its establishment until 2020 are:

- study of the proliferation of nuclear weapons, including analysis of the economic, political and technical aspects of nuclear power in different countries;
- a series of covert programs to develop technical means for military operations, including a rotating scanning camera for air reconnaissance, "quiet" night air reconnaissance aircraft and new methods of bombing;
- forecasting the first spacecraft and subsequent ones for space exploration and development, and supporting NASA programs;
- It is assumed that at least one new nuclear bomb, which is currently in the arsenal of the United States, was created thanks to ideas arising from research conducted by RAND;
- development of a method based on the use of computers - electronic simulation or creation of a computer system simulating the operation of another system, which can be anything - from the model of the human heart to weapon systems;
- development of several fine mathematical techniques, in particular linear programming, dynamic programming, problem prioritization, nonlinear programming, etc.;
- substantiation and development of Game Theory;
- developing the concept of "flexible approach", "opposition", etc.;
- development of new approaches in the field of techniques for futurological and technological forecasting, as the most popular method is known as "Delphi" and others.

All these areas are "backed up" by thousands of reports, so it is not possible to specify them in detail, as the following paragraph lists the Reports of the Club of Rome.

Today, RAND publishes reports on a wide range of topics, from health issues and drug control, to labor market research, regional integration, the environment, international relations, security issues in the United States and other countries. Thus, his clients include car giant Ford Motor, pharmaceutical company Pfizer, Harvard University and Stanford University, the United Nations, the European Commission, the World Bank, Soros Foundation, Rockefeller Foundation, Chinese Ministry of Health and many others.

But the most important, according to the author of this article, RAND report on the mastery of space by mankind is the "Preliminary Design of an Experimental Spacecraft" from 1946 - (Preliminary Design of an Experimental World-Circling Spaceship, Report No. SM-11827, 1946) [6]. This RAND report is a long-term forecast that sends humanity into outer space and sets the stage for its mastery, which is why the subject of the article is discussed in detail.

The editors of the report are Jack Lipp and Robert Salter, who are considered pioneers of satellite intelligence. In their development, they take into account the notes of another 195 scientists. The report notes that conservative and realistic engineering assessments have been made of the possibility of building a spacecraft that will travel around the earth as a satellite. The forecast is based on the current state of technological progress and does not include such opportunities as the future development of nuclear energy. " [6, p.10]. Despite the fact that at that distant stage the satellite was mostly science fiction, the report in 1946 gave a detailed assessment of the prospects for science satellites and space research, prepared by 50 scientists. As this study is surprisingly far-sighted, it later greatly contributed to strengthening the corporation's prestige. RAND's space research turns out to be prophetic not only in this case. So, when the expected launch date of the first satellite was announced in mid-1957, it turned out that the prediction error was only two weeks.

According to the forecast of the 1946 Report under consideration, the spacecraft, which is designated as a "satellite facility", will take off by the end of September 1957 - ie. the technological forecast has an 11-year forecast period. When the first launch of the first spacecraft from Earth was announced on the evening of October 4, 1957, RAND won the first important position in the field of long-term technological forecasting. The small metal ball weighing 83.5 kg was launched with the R7

rocket, which was used as the main launch vehicle of the USSR at the beginning of the Space Race with the United States, including the launch of the world's first astronaut - Yuri Gagarin.

The United States, which was developing its own satellite program called Vanguard, redoubled its efforts after October 4, 1957, especially since the Soviet Union launched Sputnik 2 a month later, on November 3, with the dog Camomile on board. Explorer 1 (officially named by NASA as the 1958 Alpha Satellite) was launched on January 31, 1958. It was launched with the Redstone ballistic missile developed by the Chrysler Corporation in 1952 based on the German Fau. -2 ". This missile was later replaced by the Pershing missile.

The 50 authors of the report write that it undertakes a conservative and realistic engineering assessment of the possibilities for building a spacecraft that will travel around the earth as a satellite. The work is based on the current state of technological progress and does not include such possible future developments as nuclear energy.

The authors suggest something that is already a fact [6, p.VII]: "Since the vehicle is unlikely to be damaged by meteorites and can be safely returned to earth, there is good reason to hope that future satellite vehicles will be built to transport people. "

According to the authors of the report [6, p.1,2], "although the crystal ball is cloudy, two things seem clear:

1. A satellite vehicle with appropriate equipment can be expected to be one of the most powerful scientific instruments of the twentieth century.
2. The arrival of a satellite ship from the United States would ignite the imagination of mankind and would likely lead to consequences in the world comparable to the explosion of the atomic bomb.

## SUMMARY AND CONCLUSIONS

- From the above data and facts it can be concluded that the Delphic oracle of modern times - RAND Corporation, differs from its original prototype - the oracles, the huge and highly qualified staff of "priestesses" - many of them world-renowned and famous scientists - Nobel laureates; by its specialized units, which cover all spheres of public functioning; on the location of its structural units on several continents and most importantly: the long-term forecasts of RAND are based on strategies for their implementation and have nothing to do with the intuitive prediction of the future by the priestess Pythias.

- The expert staff of RAND Corporation, including high-ranking specialists, including Nobel laureates, is a reliable source of extensive knowledge and innovative skills, whose ability for reasonable scientific judgment is the basis for substantiating and creating rift topics related to long-term forecasting.

- The research at RAND Corporation is aimed at substantiating knowledge in the form of verifiable explanations, which can predict the results of future events, united in a wide range of scientific theories, experimentally tested and accepted by the world scientific community - e.g. Game Theory, Rice-Shapiro Theorem, Artificial Intelligence Theory and others;

- The scientific methodology of RAND includes the formulation of hypotheses tested in controlled conditions, which can be reproduced by other scientists and other scientific organizations;

- The main achievements of RAND since its establishment until 2020 are: study of the proliferation of nuclear weapons, including analysis of the economic, political and technical aspects of nuclear facilities in different countries; a series of covert programs to develop technical means for military operations, including a rotating scan camera for air reconnaissance, "quiet" night air reconnaissance aircraft and new methods of bombing; forecasting the first spacecraft and subsequent ones for space exploration and development, and supporting NASA programs;

- The development of a method based on the use of computers - electronic simulation or creation of a computer system simulating the operation of another system, which can be anything -

from the model of the human heart to weapon systems; development of several fine mathematical techniques, in particular linear programming, dynamic programming, problem prioritization, nonlinear programming, etc;

• All these areas are "backed" by thousands of reports, so it is not possible to specify them. *In view of the theme of the daddy, its author focuses on the 1946 forecast to predict the first spacecraft related to space exploration and development, and support for NASA programs. This report sends humanity into space and makes it the leading futurological forecast of RAND Corporation.*

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