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JAN 05 2010

John Greenewald Jr.
[REDACTED]

Dear Mr. Greenewald

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MARK E. HESS, Colonel USAF

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Deadlock of the Space Race (Chapter 2)

FOREIGN AEROSPACE SCIENCE AND TECHNOLOGY CENTER ...

27 MAY 1993

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FOREIGN AEROSPACE SCIENCE AND TECHNOLOGY CENTER



DEADLOCK OF THE SPACE RACE

(Chapter 2)

by

I.I. Isachenko



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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>А а</i>	A, a	Р р	<i>Р р</i>	R, r
В в	<i>В в</i>	B, b	С с	<i>С с</i>	S, s
В в	<i>В в</i>	V, v	Т т	<i>Т т</i>	T, t
Г г	<i>Г г</i>	G, g	У у	<i>У у</i>	U, u
Д д	<i>Д д</i>	D, d	Ф ф	<i>Ф ф</i>	F, f
Е е	<i>Е е</i>	Ye, ye; E, e*	Х х	<i>Х х</i>	Kh, kh
Ж ж	<i>Ж ж</i>	Zh, zh	Ц ц	<i>Ц ц</i>	Ts, ts
З з	<i>З з</i>	Z, z	Ч ч	<i>Ч ч</i>	Ch, ch
И и	<i>И и</i>	I, i	Ш ш	<i>Ш ш</i>	Sh, sh
Й я	<i>Й я</i>	Y, y	Щ щ	<i>Щ щ</i>	Shch, shch
К к	<i>К к</i>	K, k	Ъ ъ	<i>Ъ ъ</i>	"
Л л	<i>Л л</i>	L, l	Ы ы	<i>Ы ы</i>	Y, y
М м	<i>М м</i>	M, m	Ь ь	<i>Ь ь</i>	'
Н н	<i>Н н</i>	N, n	Э э	<i>Э э</i>	E, e
О о	<i>О о</i>	O, o	Ю ю	<i>Ю ю</i>	Yu, yu
П п	<i>П п</i>	P, p	Я я	<i>Я я</i>	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ѣ in Russian, transliterate as yě or ě.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	\sinh^{-1}
cos	cos	ch	cosh	arc ch	\cosh^{-1}
tg	tan	th	tanh	arc th	\tanh^{-1}
ctg	cot	cth	coth	arc cth	\coth^{-1}
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian English

rot curl
lg log

GRAPHICS DISCLAIMER

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DEADLOCK.

OF THE SPACE RACE.

I. I. Isachenko.

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CHAPTER II.

ORGANIZATION OF CONTROL BY MASTERY OF THE COSMOS.

Space programs of capitalist countries are carried out by state and private capital. In the course of the execution of these programs occurs the joining of an organization of large political purposes with the development of state-monopolistic complexes as a special form of the integration of the controlling activities of state authority and the economic power of monopolies. The leading role in the organization of this interaction belongs to state, which is determined first of all by its predominant contribution to the resource guarantee of mastery of space. All this makes it possible to consider the space program as an important element in the system of state activity in the region of the scientific-technical progress as a whole.

State leadership of the national space program of the USA.

The capitalist practice of the implementation of space programs - obvious case of formation and functioning of specific state-monopolistic complexes, in which is achieved the joining of various forms of capitalist ownership - state, monopolist, its small and average owners. Within the framework of such complexes is organized the same directional activity of large corporations, banks, small, and average business, state scientific centers and

laboratories, and universities.

It is possible to isolate following characteristic features of contemporary state-monopolistic complex. First, there is the juridical independence of the organizations entering it, government institutions, firms, etc. Secondly, relatively constants, are repeating economic, legal, organizational-administrative relationships and a community of specific scientific-technical, industrial, and social and economic problems appearing on this basis. Thirdly, the financial, organizational and scientific-technical dependence of all entering the complex teams, which is based on a highly developed distribution system and use of resources, joint plans and programs, privileges, and guarantees, on one hand, and on the juridical and economic responsibility for the fulfillment of undertaken obligations - on the other. And finally, the presence of the national program, which determines the policy of state in the appropriate sphere and by serving as the basis for the organizational integration of separate and often competing elements in the economy into a more or less complete complex with clearly expressed purposeful orientation.

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Main role in formation and organization of functioning of similar state-monopolistic complex, connected with execution of national space program of USA, belongs to federal departments. They accomplish direct (operational) control of the implementation of program and of the creation of necessary space systems and means of ground-based

guarantee. In accordance with the concept "parallel" existences and development of civilian and military components of the national space program of the USA these functions are made by two different departments: by the National Aeronautics and Space Administration and by the Ministry of Defense through the created in its structure United Space Command. The latter is subordinated directly to the Secretary of Defense and to the Committee of Joint Chiefs of Staff.

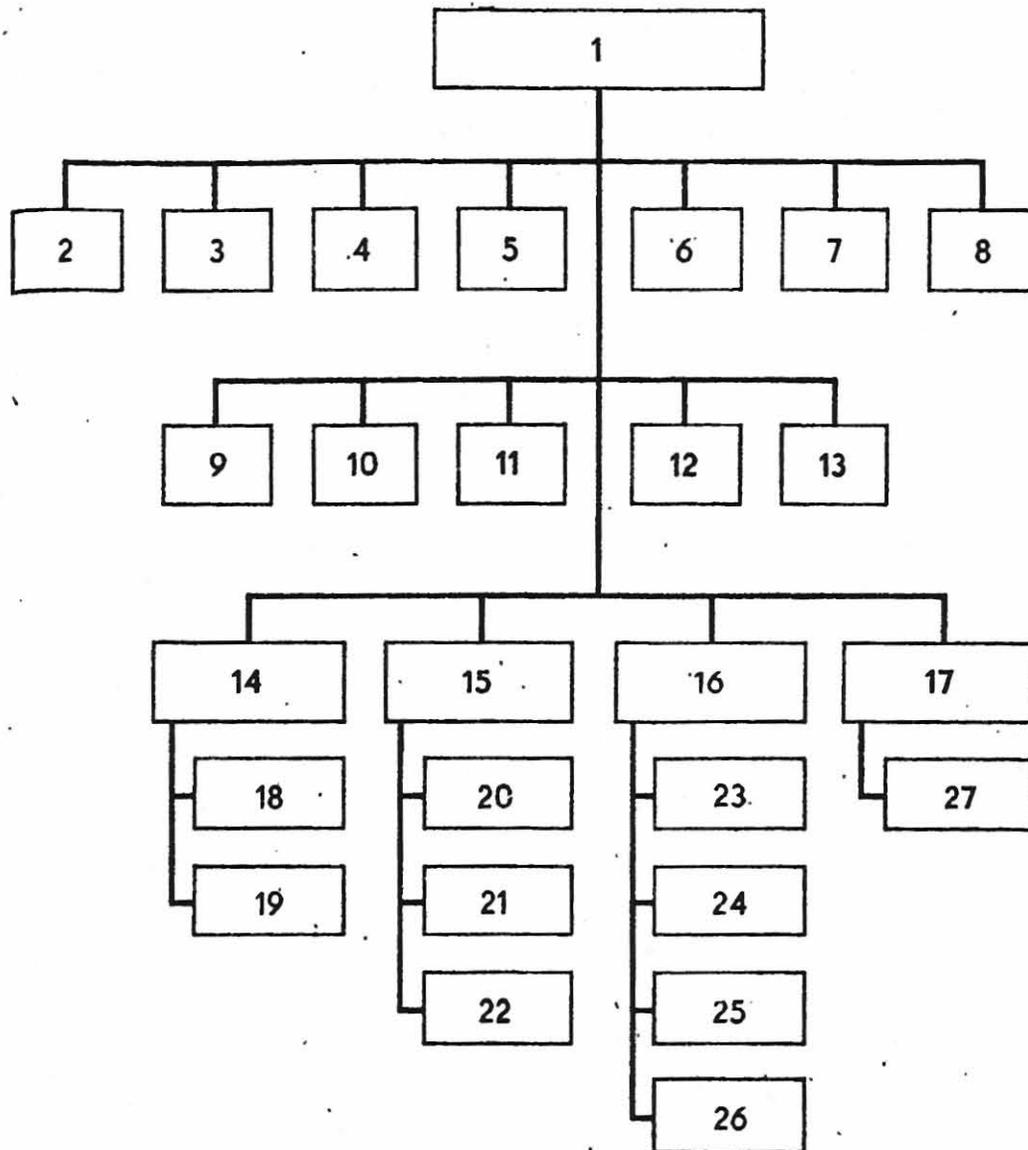
Of considerable interest is the organization of leadership of the civilian national space program of USA, which carries out by NASA [National Aeronautics and Space Administration] - a special organization of the federal government, created in 1958 for the purpose of eliminating the country's lag in the mastery of outer space. The institution NASA represents an important stage in the development of the mechanism of the state-monopolistic regulation of scientific-technical progress. A fundamentally new type of government organization is actually developed, to which is entrusted accomplishing two interconnected functions - the organization of a space program on a national scale and the conducting of the significant part of scientific studies and developments for the realization of this problem. As noted well-known American specialist in the problems of control of science D. Wolfle, "NASA was never the largest organization of the country by volumes of financing and by number of personnel, but by the complexity of operations, rates of growth and by technical complexity of decided problems it is unique"

1. NASA's accumulated experience of the effective organization of

operations is considered in the USA as one of the most important results of the entire space program. "Even if our flights to the Moon brought nothing, except the experience of acceptance and realization of decisions, asserted the former director of NASA J. Beggs, expenditures, which were required for the delivery of people and mechanisms to this excellent, but dead world, would be completely justified" ².

Organizational structure of NASA gives representation about nature of activity of control. Diagram 4 reflects the level of the priorities of the separate directions of the national space program of the USA in first half of the 80's. Subsequently, as is repeated earlier, this structure underwent a partial rebuilding, at basis of which rested the searches by the leadership of NASA for the optimum relationship between centralization and decentralization of control on different development stages of American cosmonautics. Nevertheless in the composition of NASA can be isolated some elements constant for all periods, which ensure the decision of primary tasks, entrusted to this department, subdivisions of organizational (administration, programmed controls, functional services) and scientific research (centers) types. Interaction in the course of accomplishing the space projects of four organizational subsystems composes the basis of the functioning of the system of management of NASA.

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4. Organizational structure of NASA.

1. Director. First deputy director. 2. Chief engineer. 3. Main financial controller. 4. Chief inspector. 5. Juridical department. 6. Deputy director for problems of administration and personnel. 7. Assistant director for foreign connections. 8. Special assistant of deputy director. 9. Departments for connections with industry. 10. Department for connections with organizations of small business. 11.

Bureaus of commercial programs. 12. Administrative departments. 13. Group of consultants. 14. Directorate of study and use of outer space. 15. Directorate of aviation and space equipment. 16. Directorate of space flights. 17. Directorate of KIK (Control Measuring Complex) and systems of information processing. 18. Goddard center. 19. Jet Propulsion Laboratory. 20. Ames Center. 21. Langley Center. 22. Lewis center. 23. Johnson center. 24. Kennedy center. 25. Marshall center. 26. National laboratory of space technology. 27. Tracking stations and data reception.

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Administration of NASA is represented by a director, his substituents and their assistants, a chief engineer, a main financial controller, and a legal adviser. Key decision making is accomplished by them in the determination of problems of operations, their organization, financial, scientific-technical and frame guarantee. Administration makes by rule of selection of chief contractors, designation of leadership of projects. The activity of NASA with other federal departments is coordinated at this level, connection with scientific and technical engineering circles of the country is carried out.

Programmed controls in structure of NASA - basic operating unit for leadership of specific directions of activity: to space flights, to study and to use of outer space, to aviation and space equipment, to control-measuring complex (KIK) ¹ and to systems of information

processing.

FOOTNOTE ¹. Tracking of outer space objects and reception of information from space are carried out. ENDFOOTNOTE.

The heads of the programmed controls have the rank of deputy directors of NASA for the appropriate directorates. For the coordination and control of the operation according to large-scale programs, in which participates a number of administrations, in the make-up of the administration is provided for a special official - an assistant to the deputy director.

In programmed controls are formed two types of departments - in the directions of research operations and according to specific programs, carried out by NASA in this period. Analogous diagram is used also on the scales of all central apparatus: together with the presence of constant subdivisions to the period of operation on large-scale programs is created a number of purposeful organs - program administration, special committees, working groups, which unite the representatives of different subdivisions. This makes it possible to concentrate the necessary number of different specialists in a specific section and to ensure the coordination of the works of all occupied with accomplishing programs of management and subordinated to them organizations. Since one or several large-scale programs are always present in the plans of NASA, the presence of a system of "temporary" purposeful controls is a constant and essential

element of its structure.

Thus, already in the very initial stage of formation of a program of development of permanent orbital station in structure of NASA were carried out large organizational changes. An administration for the planned program was instituted, subordinated to the assistant to the deputy of the director of NASA, to which the responsibilities of planning, transmitting of tasks, and coordination of operations between all subdivisions of control, including its peripheral research centers. In the make-up of program administration is organized a small group for the development of concept, which includes first-class specialists, which is intended to determine the make-up of station, a clear sequence of operations and the cost of new developments of units and separate functional modules, and also the cost of separate stages and the program as a whole. Furthermore, is organized the intradepartmental leading committee on questions of the creation of space station, which generalizes the proposals of separate subdivisions and which represents the "coordinated recommendations" to leadership of NASA in the affirmation.

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In the composition of this committee are 10 working groups in separate directions of studies. Is additionally created also a leading committee on technologies. Preliminary study and evaluation of new technical decisions, proposed by administrations and departments enter into its task. The enumerated organizational measures must provide

enlistment to the project of all without exception of the subdivisions of NASA, coordination of their activity, collective discussion of appearing problems and methods of their solution.

Subdivisions of scientific research level in structure of NASA are by organizations of three types - research centers, centers of space flights, complex of stations for tracking, reception, processing, and transmission of information. The scientific research complex of NASA includes 7 main centers, equipped with contemporary equipment and computer technology, which not only accomplish national space program, but also compose a noticeable part of the state scientific-technical potential of the USA.

The task of the three research centers of NASA is the conducting both by its own forces and by contracts in laboratories of universities and industrial corporations of fundamental and applied research along entire front of problems of creation by new and modernization of existing space technology. These studies are not orientated in essence to specific current problems, but are occupied with the search for solutions of the most important problems of the future. Each of the centers represents a large complex organization, which works on broad problems. The main specialization of these centers are:

the James Research Center (Moffett-Field, the state of California) - laboratory investigations and flight experiments in the

region of fundamental physics, chemistry, materials science, guidance and control, biomedical problems;

the Lewis Research Center (Cleveland, the state of Ohio) - work in the field of rocket engines, physical metallurgy, fuel, lubricants, hydrodynamics;

the Langley Research Center (Hampton, the state of Virginia) - problems of the dynamics of large designs, aero-thermodynamics, methods and instruments for distant observations of the earth.

Research centers of NASA are structurally subdivided into departments and laboratories. Into their composition enters the department of the service of the chief inspector of NASA, which carries out a check of central apparatus during course of operations on the spot. All centers have special departments according to connection with the organizations of the ministry of defense, and also laboratories, which are directly subordinated to this department and completing operations on its order.

Centers of space flights - these are four multiprofile organizations, which carry out a whole series of functions: drawing and designing works (by its own forces and by contracts in industry), manufacture, assembly, adjustment and testing space technology, training astronauts, launching and flight control. Main specialization of these centers:

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Kennedy Space Center (Cape Canaveral, state of Florida) - preflight tests and launching of manned and automatic outer space objects, reconditioning of spacecraft "space shuttle";

Johnson Space Center (Houston, state of Texas) - development and testing manned outer space objects, selection and training astronauts, exploitation of Mission Control Center of manned objects;

Marshall Center of Space Flights (Huntsville, state of Alabama) - development of space transport systems, outer space objects of scientific purpose, guarantee of some work of ministry of power engineering;

Goddard Center of Space Flights (Greenbelt, state of Maryland) - work on automatic satellites and research rockets, exploitation of ground-based control-measuring complexes, which ensure flight of automatic and manned orbital objects.

A large volume of works is made by the two largest laboratories of NASA:

Jet Propulsion Laboratory¹ (Pasadena, state of California) - analysis of planets, development and exploitation of control-measuring complex, which ensures flights of interplanetary outer space objects;

FOOTNOTE ¹. It belongs to California technological institute, is exploited on contract principles of NASA. ENDFOOTNOTE.

National Laboratory of Space Technology (St. Louis, state of Mississippi) - fire bench tests of liquid propellant rocket engines.

Besides named scientific research centers of NASA has available a number of auxiliary research stations and laboratories, and its space flights are provided by 11 stationary tracking stations, located at different points on the terrestrial globe, and by specially equipped vessels of the navy. The total cost of all named centers, stations and auxiliary equipment by NASA exceeds 7 billion dollars, and effective areas of all its constructions comprise more than 2.3 million sq. m. (Table 2.1).

Functional departments and services of NASA - finances, cadres, protection, transport, connection with industry, universities, press and the like - are intended to accomplish general guarantee of activity of programmed controls and scientific research centers out of connecting with accomplishing of works in specific projects.

Lying at basis of activity of NASA is the execution of special-purpose programs according to one or the other directions of study and mastery of outer space. These programs represent the complexes of fundamental and applied research and developments of different volumes and duration. In their number are located the

large-scale programs, which determine the long-term prospects of the activity of NASA ("Apollo" - in the 60's, the "space shuttle" - in 70-80's, orbital station - in 80-90's), and also a number of smaller (programs) ensure accomplishing the main things or have independent value.

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Space programs serve as the object of wide application of principles and instrumentation of goal-programming planning. Primary task of planning in this case consists in the search for optimum accordance between the desired goals and the technical, scientific, production and economic possibilities of designing of the means of achieving these goals. As a result of comprehensive studies, which are based on the predictions of foreign policy situation and scientific-technical progress, the evaluation of the available scientific-technical and production potential, are formulated the proposals according to the force conditions in the development of separate directions of national space program in proportions, optimum for achievement of the main goal of the country in the region of study and mastery of space in this period.

In accordance with American practice cycle of development and realization of target-oriented programming is plan be carried out into three interconnected stages. In the first a wide analysis of goals and problems is conducted, the long-term consequences of the realization of space programs are forecast, is estimated an entire aggregate of factors, which affect its formation and realization.

Table 2.1. Cost of scientific research base and the number of personnel of NASA in first half of the 80's ¹.

	(a) Стоимость ² , млн долл.				(g) Численность государственного персонала, чел.
	(b) Полная	(c) В том числе			
		(d) земельного участка	сооружений (e)	оборудования (f)	
Исследовательские центры: (1)					
Эймса (2)	697,2	2,9	251,7	300,3	2 058
Лэнгли (3)	641,9	0,2	425,1	189,1	2 895
Льюиса (4)	465,6	2,2	295,3	153,5	2 690
Центры космических полетов: (5)					
Годдарда (6)	865,0	3,1	267,0	566,0	3 699
Джонсона (7)	918,3	9,1	271,9	614,8	3 380
Кеннеди (8)	1 866,8	71,3	841,8	936,0	2 155
Маршалла (9)	787,9	7,2	355,5	430,9	3 385
Лаборатория реактивного движения (10)	453,6	1,2	166,0	257,7	—
Национальная лаборатория космической техники (11)	307,0	18,1	281,6	25,5	105
Центральное управление НАСА (г. Вашингтон, окр. Колумбия) (12)	29,0	—	—	22,4	1 506
Итого... (13)	7 032,4	115,3	3 155,9	3 496,2	21 873

(a). Cost ², millions of dollars. (b). Complete. (c). Including. (d). land section. (e). constructions. (f). equipment. (g). Number of state personnel, man. (1). Research centers: (2). James (3). Langley. (4). Lewis. (5). Centers of space flights: (6). Goddard. (7). Johnson. (8). Kennedy. (9). Marshall. (10). Jet Propulsion Laboratory. (11). National laboratory of space technology. (12). Central management of NASA (Washington, D.C.). (13). Altogether

FOOTNOTE ¹. Evaluation.

². Including cost of administratively subordinate state scientific

research institutions. ENDFOOTNOTE.

It is comprised on: Department of Housing and Urban Development - Independent Agencies Appropriations for 1983: Hearings before a Subcommittee US House of Representatives. Wash., 1982. Part 5. p 491, 654.

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By the results of this stage is determined the complex of requirements for each project, on the basis of the evaluation of its contribution to the solution of specific problems. In the second stage is conducted the analysis of the alternative ways of the realization of project, their evaluation from the point of view of technical feasibility, needs for the financial and resource guarantee, are compared the expected results with achieving of the goals presented. Sum of stage - formulation of technical and operational requirements for developments in industry. In the final stage occur the development, manufacture and adjustment of equipment of space complex. Basic result here - the preparation of the created complex for practical use (exploitation). Important value have also the indirect useful results of the project (see Fig. 5).

Organization of practical activity of NASA is based on development of plans for prolonged prospect in combination with yearly evaluation of state of execution of programs and their correction, on the basis of results reached and in accordance with resources being

isolated.

Process of long-term planning in NASA includes two basic stages. The first - this is the compilation of predictions, which define the versions of possible goals both according to separate directions of studies, and in the complex for a specific period. They are developed by special groups of experts. Part of such predictions for 10, 20 and more years is prepared by personnel of NASA, part - by external experts on the orders also for its means. In a number of cases the long-term forecast can be carried out, also, outside of NASA, formally independent of it. Thus, at the end of 1987 to the President and to congress were presented the results of a large-scale comprehensive study regarding the long-term prospects for the development of a civilian space program of the USA, prepared by the national board for space. Simultaneously the same questions were deeply studied by two independent groups of highly skilled experts, also, within NASA itself - with group of strategic planning and by a consultative committee.

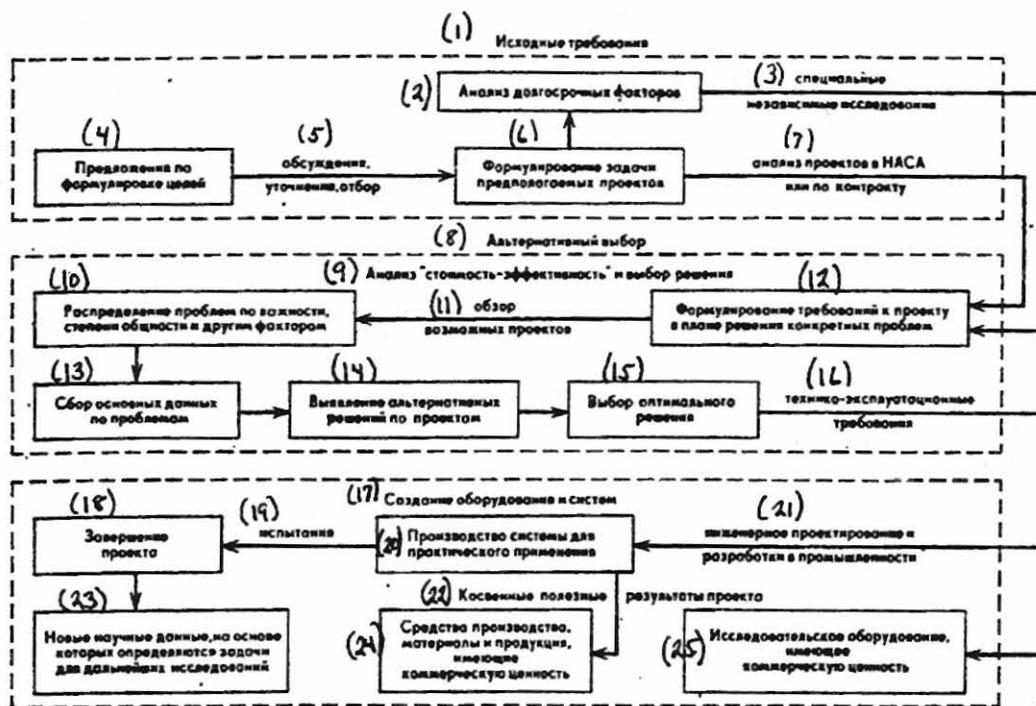
Second stage - this is working planning within NASA. Its main form is the development of a five-year plan, moreover this is done not once every 5 years, but yearly, so that the five-year plan is "sliding". It is continuously moved a year forward and each time it is more precisely formulated and corrected. In its complete form (5 years) this plan outside NASA is not asserted, into the external spheres enters only that part of it, which relates to the next financial year - as the project of annual budget ¹.

FOOTNOTE ¹. The five-year plans of NASA are discussed (but they are not asserted) in congress of the USA only from the point of view of the analysis of the prospects for the development of civilian directions of the national space program ². ENDFOOTNOTE.

However, each such budget is developed not by itself, namely as part of the five-year plan, which realizes the specific stage of long-term forecast.

This method of planning was used beginning in 1976, and since then "sliding five-year plan" has become the basis of entire activity of NASA. The possibility to combine the sufficiently prolonged prospect with the flexibility, necessary in realizing of complex innovative projects, which with difficulty yield to a precise calculation, is its advantage.

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5. An approximate general cycle of goal-programming planning and realization of space projects of NASA.

Key: (1). Initial requirements. (2). Analysis of long-term factors. (3). Special independent studies. (4). Proposals on formulation of goals. (5). Discussion, specification, selection. (6). Formulation of problem of supposed projects. (7). Analysis of projects at NASA or on contract. (8). Alternative selection. (9). Analysis "cost-effectiveness" and selection of decision. (10). Distribution of problems according to importance, degree of commonality and other factors. (11). Survey of possible projects. (12). Formulation of requirements for project in plan of solution of specific problems. (13). Collection of basic data on problems. (14). Development of yes-no decisions by projects. (15). Selection of optimal solution. (16): Technical and operational requirements.

(17). Creation of equipment and systems. (18). Completion of project. (19). Testing. (20). Production of system for practical application. (21). Engineering design and development in industry. (22). Indirect useful results of project. (23). New scientific data, on basis of which are determined problems for further studies. (24). Means of production, materials and production, that have commercial value. (25). Research equipment, which has commercial value.

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Furthermore, this form of planning is combined well with the practice of financing all state institutions and programs accepted in the USA, according to which the volumes of the means being isolated are finally determined not for the number of years ahead, but only for the forthcoming financial year and can substantially oscillate depending on economic and political conditions.

Annual cycle of operations in forthcoming five-year plan begins with an examination in staff office of NASA with participation of heads of centers of proposals, prepared by separate administrations. During the operation NASA consults in academic circles, with specialists of industry, universities, ungovernmental research associations. The version prepared as a result and the corresponding project of annual budget reflect in a certain degree the balanced result of the consultations indicated, which is very substantial for the subsequent discussion and affirming the budget in congress.

Composed NASA project is examined and is corrected by government budgetary administration, then it is presented to the President and after approval is transferred as the part of the total budget of the U.S. Government for examination and affirmation to congress '.

Analysis of programs carried out by NASA for time of its existence shows that one program, which is basic for this period and supplemented by a number of comparatively short term and less scale projects, corresponds to approximately each decade. For the 60's and the beginning of the 70's basis was the program "Apollo", for the 70's - beginning of the 80's - "space shuttle", at present - the program for the creation of a manned orbital station. Although leadership of NASA and higher instances, including the President, repeatedly declared about the need for a "balanced" approach to space research, constant coordination of all directions, in reality the main program always absorbed a considerably large part of the efforts and means as was initially planned. Therefore remaining projects it was necessary to reduce, to extend in time, and generally to abolish.

As characteristic example can serve practice of development of ship "space shuttle" at the end of 70's, when miscalculations in planning coincided with financial limitations and actual (taking into account inflation) decrease of total budget of NASA. Under the influence of past successes in achievement of manned space flights NASA determined the periods of development, oriented to the successful confluence of the circumstances, i.e., such, which could be sustained

only in the case of the absence of any considerable technical problems. Furthermore, program year for a year was financed in insufficient volumes. The prestige of the program for creation of shuttle ship, its international scales, interest of military departments, which appeared as the basic potential user of new transport system, all this forced NASA to concentrate forces and facilities on its accomplishing and to compensate planning errors due to politically less significant, although important in the scientific sense, projects. As a result the overexpenditure according to this program was about 1.5 billion dollars without taking into account the effect of inflation, and the first manned orbital flight took place for 3 years later than was planned. This result was accompanied by a sharp contraction of scientific research of space and planets, whose state in the beginning of the 80's in a special memorandum, prepared by the administration for evaluation of technologies for the congress of the USA, was characterized as "crisis" ⁵.

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However, with all the negative consequences of unbalanced development of different directions of the national space program and heads of NASA, still as many authoritative experts as before adhere to the consensus of advisability of "large space initiatives". This found its recurrent confirmation in the resultant recommendations of the already mentioned studies of the prospects for development of the civilian space program of the USA. The realization of projects, similar to the organization of a manned space flight to Mars or to the creation of an inhabited lunar base as the stage of a Martian expedition, is capable of raising, in the opinion of American researchers, the national prestige of the USA, of fastening the authority of NASA in the eyes of the public, of giving new momentum to the activity of this department, of stimulating the development of new technologies.

As already mentioned, implementation of specific study programs and developments is carried out on contracts and under the leadership of NASA in industry, in universities and other state scientific institutions, in profitless organizations, and also in named scientific research centers. The yearly accountability of NASA gives demonstrative representation about the scales of influence of this department for leadership of accomplishing complex space projects and their coordination. Thus, in the 1976 financial year - a year of a

maximum span of works according to the "Space Shuttle" program - NASA distributed 177 thousand contracts for a total sum greater than 3.2 billion dollars. Contracts with a value of more than 10 thousand dollars each were only obtained by 2498 industrial firms and 389 scientific and profitless organizations in 49 states and the District of Columbia. According to reports 46% of contractors of NASA, for accomplishing the tasks by them was drawn 1344 different subcontractors.

Established structure of distribution of orders of NASA is sufficiently stable. It reflects the dimensions of the contribution of each category of performers to the national space program. Given statistics clearly testify that the greatest - both by cost of obtained orders (to 80%) and by volume of employed personnel - volume of works according to the program of NASA is made by the efforts of contractors, mainly in industry. (The influence of industrial corporations in accomplishing the orders of NASA is examined in further detail.)

Extremely important for NASA are works, its orders done by universities, although they are not great in volume (with a value up to 200 million dollars a year in the mid 1980's). NASA actively uses university scientific potential, constantly practicing the purposeful subsidizing of VUZ [Institutes of Higher Education], the delivery of orders for conducting of research programs, payment of allowances to scientists, who work on problems of space research and creation of

space technology.

Every year 2- 2.5 thousand research projects, which cover a wide spectrum of thematics, are financed; in works almost 300 VUZ participate, including several foreign universities.

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Special emphasis is put on basic research (60-65% of all assignments), the smaller portion of works falls on applied research (20-25%) and developments (10%). A part of the means (about 5%) is isolated with ultimate purpose for development of the research base of universities

Influence of department of defense of USA in field of research and developments for creation of military space systems does not have vital differences in comparison with that already examined from organizational-administrative point of view. So, work within the framework of SOI can be characterized as a special-purpose program, the realization of which goes on in the following five main directions:

observation, the discernment of targets, tracking, and the evaluation of their damaging ability; in 1985-1989 here it was proposed to consume 42% of the sum total of more than 25.2 billion dollars, which it planned to expend in the "research stage" of SOI achievement;

a weapon of directed energy (23%);

a weapon of kinetic energy (23%);
the analysis of the concepts of systems of arms and control of
combat (4%);
supporting means (7%)⁷.

In limits of named main directions are isolated separate research programs - completed, complex set of works, designed for 3-5 years. The total number of formed programs exceeds 30. Programs are divided into projects, which have as a precisely determined goal, a clear graph of performance (duration of up to three years) and a fixed budget. Within the framework of projects are formed the separate purposeful tasks, the performance period of which is 3-12 months. In the 1986 financial year, for example, were planned 73 such tasks.

For control of works within the framework of SOI in department of defense of USA is formed special subdivision - organization for realization of SOI (OOSOI), subordinated directly to Secretary. Budget of OOSOI is asserted by congress.

Work of organization is built according to principle "centralized planning - decentralized performance". This means that OOSOI determines the goals (final and intermediate) of each program, project, task and the periods of their performance. Research works are conducted directly in the scientific centers of the department of defense, other federal departments, which do not consist of the direct command of OOSOI, or of the industrial firms - contractors and the

universities. Taking into account the high indeterminacy of results of the conducted studies, OOSOI attempts to distribute contracts predominantly on a concurrent basis.

Organizational structure of OOSOI is built around named five main directions of realization of SOI as special-purpose program. In accordance with this in the organization there are 5 thematic departments, which control the course of studies in different scientific centers, in operational order. Furthermore, into the structure of control enters the group of consensuses and construction of systems, which corresponds for the integration of all elements of SOI into a single whole, and also for the timely bringing of information according to program to the attention of interested government departments.

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Important role is assigned to department of innovative science and technology. Its problem - the distribution of orders among external scientific centers and universities for perspective studies, whose results could be used in one of the stages of SOI realization. At the end of 1985 one additional department was created, which corresponds to the application of results of studies "for educational and civilian purposes".

A supplementary element of structure OOSOI is the consultative committee, which consists of independent experts on different

scientific and technical disciplines. Its function - the rendering of consultations, the review and evaluation of the claims of aspirants to obtaining of orders, of the scientific results of carried out studies. Furthermore, in the composition of OOSOI acts a whole series of traditional functional subdivisions.

Thus, contemporary structure of leadership of realization of SOI is built with use of general principles of target-oriented programming control, realized with formation and execution of national space program of USA as a whole '.

Forms of participation of state in studies and mastery of outer space in other developed capitalist countries on the whole are analogous to American. Responsibility for the formation of directions and the execution of national space programs here is also entrusted to the state departments - Department/Ministry of Scientific-Technical Studies in the FRG, the Ministry of Industrial and Scientific Development in France, the Commission for mastery of outer space with the office of prime minister of Japan, etc. The leading actuating elements are, as a rule, specialized state research centers, which make part of the works by their own efforts and heading developments, carried out in industry and educational institutions for contracts (National Center of Space Studies (KNES) in France, National Administration according to mastery of outer space (NASDA) and the Institute of Aeronautics and Space Studies of the Department of Education in Japan, etc.). Three-five- year state budgetary programs

serve as the basis of activity of actuating elements. It is characteristic that in France and Japan (countries, which attained in 70-80's noticeable successes in the mastery of space) is inherent the greatest centralization with the execution of space programs.

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2. Militarization of American space program: organization and methods.

During organization of state administration of mastery of space increasing importance acquire questions of interbranch interaction, what reflects objective trends of development of cosmonautics - increase of its applied function and, as a result, increase in number of plenipotentiary state organizations, which introduce space technology in different spheres of practical activity. Thus, in the USA according to the programs of NASA the creation of space technology, which demonstrated its possibilities to effectively solve economic problems, led to the connection already from the end of the 60's to works in the region of space of a number of departments - users of services, provided with the aid of satellite systems. To these departments was entrusted the responsibility not only for the exploitation of a number of space systems, which are found in the conduct of state, but later for further development (in interaction with NASA) of the specific directions of applied space technology.

Within the framework of the civilian space program of the USA such functions are entrusted to the National Administration for research of ocean and atmosphere of the Department of Trade - with respect to systems of space meteorology and the remote study of natural resources, to Department of Agriculture and Administration of

Geology of Department of Internal Affairs - for development of methods of evaluation of land tenure and exploration of mineral raw material with the aid of photography from space. In the middle of the 80's "space activity" included the Department of Transportation, to which was entrusted keeping an eye on the process of commercialization of the one-time carrier rockets created by NASA, questions of development and uses of this type of "transportation" in the country.

Dimensions of financing of national space program of USA along line of all federal departments, except NASA and ministry of defense, are insignificant, traditionally being only 1.5-2% of "space" budget of country (Table 2.2). However, one should consider that these means in their overwhelming part ¹ led to the development of applied civilian cosmonautics, where in the middle of the 80's they already reached 40% in the structure of corresponding state assignments.

FOOTNOTE ¹. Exception is small by volume work on creation of nuclear engines and isotopic sources of power, carried out by department of power engineering, and also part of basic research, financed by national scientific fund. ENDFOOTNOTE.

Together with an increase in financing works for economic-applied mastery of outer space department-users substantially enlarged forms of their participation in this activity, having set about accomplishing a number of new functions. In the last decade promoted considerably were their own studies of "nonspace" departments

regarding the requirements for the specialized satellites of the following generations.

A number of federal departments began commercial dissemination of satellite information, suitable for practical use in a number of branches of economy. Even in the middle of the 70's the Departments of Agriculture, Trade and Internal Affairs created the centers of collection and storage of the information about natural resources, received with the aid of "Landsat" satellites and aviation. Only the information array of the center in Sioux Falls (state of South Dakota) toward the end of the 1980 financial year comprised about 6.5 million images of different areas of the surface of the earth (more than 80% its total area), including approximately 1.5 million photographs from the "Landsat" satellites and more than 60 thousand photographs from the manned spacecraft "Gemini", "Apollo" and the orbital station "Skylab", 4.9 million photographs from aircraft. The commercial dissemination of materials of the giant banks of information is carried out through 42 special representatives of the named centers, opened in 23 states of the USA, federal district of Columbia and the Panama Canal zone.

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Income from sales of satellite information constantly grows and in 1984, for example, achieved a sum of approximately 4 million dollars, which was distributed according to users by following manner (%):
government departments - 45, industrial firms - 26, scientific

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organizations - 5, local organizations of authority - 3, private individuals - 2 and foreign countries - 19'.

Table 2.2. Participation of federal departments of the USA in the realization of national space program, millions of dollars (in parenthesis %).

Ведомство (a)	(b) Финансирование космической программы — бюджет 1985 фин. г.	(c) Главные направления деятельности
Министерство обороны (1)	12 913 (64,4)	(2) НИОКР в части создания перспективных военно-космических систем. Разработка и эксплуатация систем космической разведки, связи и управления, навигации, метеорологического обеспечения
НАСА	6 804 (34,0)	(3) НИОКР в области исследования космоса и прикладного использования космической техники. Разработка космических транспортных систем. Космические полеты
Министерство торговли (4)	255 (1,3)	(5) Эксплуатация метеоспутников и спутников для исследования природных ресурсов
Министерство энергетики (6)	34 (0,2)	(7) Разработка ядерных энергетических установок для космических систем, технологии удаления радиоактивных отходов в космос
Министерство сельского хозяйства (8)	20 (0,1)	(9) Оценка урожайности сельскохозяйственных культур. Мониторинг почв, водных ресурсов, растительности
Министерство внутренних дел (10)		(11) Разведка и оценка запасов минеральных ресурсов. Картирование
Министерство транспорта (12)		(13) Курирование процессов коммерциализации одноразовых ракет-носителей НАСА
Национальный научный фонд (14)		(15) Фундаментальные научные исследования
Итого... (16)	20 026 (100)	

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Key: (a). Department. (b). Financing space program - budget 1985 financial yr. (c). Main directions of activity. (1). Department of

Defense. (2). NIOKR in part of creation of perspective military-space systems, development and exploitation of systems of space exploration, communications and control, navigation, meteorological support. (3). NIOKR in field of space research and applied use of space technology. the development of space transport systems. Space flights. (4). Department of trade. (5). Exploitation of weather satellites and satellites for study of natural resources. (6). Department of power engineering. (7). Development of nuclear power plants for space systems, technology for removal of radioactive wastes into space. (8). Department of Agriculture. (9). Evaluation of productivity of agricultural crops. Monitoring ground, water resources, vegetation. (10). Department of Internal Affairs. (11). Exploration and evaluation of reserves of mineral resources. Charting. (12). Department of transportation. (13). Dissemination of processes of commercialization of one-time carrier rockets of NASA. (14). National scientific fund. (15). Basic scientific research. (16). Altogether

Page 52. Together with the fixed expansion of economic and scientific-technical possibilities an increase in the national space program of the USA, introduced into this region of activity known elements of decentralization, interdepartmental contradictions and frictions, brought in a number of cases to the loss of the clear prospects for further development of the existing systems. For the purpose of an improvement in the organization of the execution of national space program the Presidents J. Carter and R. Reagan were forced to take supplementary measures for the intensification of the

coordination of the civilian, military, and commercial space programs of the USA. In the directives accepted by them the role of NASA is consistently emphasized as the central team of the organizational structure of the civilian space program of the USA, responsible for the development and the bringing to stage of the exploitation of the basic types of space technology, the scope of this organization in the development of long-term prospects for American cosmonautics. Along with that in practice just as consistently is carried out course for the withdrawal at NASA of authorizations of formation and exploitation of the potential of applied cosmonautics, which with the maintaining of existing tendencies threatens this department to become in the course of time a research organization with very limited functions. Provisions are made for supplementary measures for the integration of military and civilian space projects, the closer connecting of the corresponding efforts of federal departments and particular business.

Such activities of the American administration testify about attempts of a bourgeois state to modify the economic mechanism, to introduce some elements of planning principle into it, to search for new forms and methods of stimulating scientific-technical progress in spite of numerous obstacles, given rise to by a capitalist system. However, the practice of capitalist mastery of space not only indicates about the low resultfulness of such efforts, but also reflects the important contemporary trend of development of the national space program of the USA as a whole - militarization of all its directions, including formally civilian.

Although officially NASA deals only with civilian space studies, while servicemen relate to scope of department of defense, this separation is very conditional and difficultly realized, since to conduct division between the two categories in majority of cases is practically impossible: achievements of space engineering and technology can be used both for peaceful and for military purposes. This situation is widely acknowledged. This is how this thought was formulated, for example, one of the heads of NASA, J. Martin, the head for control of aviation and space equipment, intended to provide a scientific reserve for the activity of the remaining subdivisions of the department: "The program of technological studies by NASA was not directed exclusively toward the satisfaction of the demands of the department of defense. However, according to our evaluation, approximately 80% of completed works have for this department vital importance. Many perspective programs of NASA are oriented to the achievement of results, which are equally important for decisions in the future of both civilian and military problems. Moreover, the significant part of the problems, which appear with the execution of civilian studies and flights, are completely analogous to problems of the developments of military technology. We do not foresee changes in the indicated segment of studies of dual purposes" 10.

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This situation makes it possible for department of defense to orientate to a considerable extent efforts of NASA for development of

scientific and technical bases of creation of military-space systems, limiting its own programs of NIOKR only in those directions, which provide final adjustment of specific characteristics of constructed technology, determined by its military purpose. This confirms the nature of the distribution of state allocations into appropriate categories and directions of NIOKR. Thus, in the 1985 financial yr. the allocations of NASA for basic research (826.7 million dollars) exceeded more than four times the analogous allocations of USAF (206.2 million dollars), by line of which it is isolated to 80% of allocations for military space programs. The excess of the allocations of NASA for applied research was almost twofold (1088.1 million and 557 million dollars accordingly). However, as far as allocations for fundamental and applied research on such scientific disciplines as astronomy and astronautics are concerned, here the sum of the means, isolated by the state of NASA (1260.4 million dollars in the 1985 financial yr.), considerably exceeds allocations according to analogous articles of the department of defense as a whole (410.9 million dollars) ¹¹.

Use of results of NIOKR, carried out according to programs of NASA, in interests of department of defense is provided by presence of branched system of coordinating organs, which control interrelations of two departments. General leadership is carried out by a group on space to studies and space technology of interdepartmental coordination council for aeronautics and astronautics (see Fig. 1). Furthermore, is formed a whole series of special coordination groups

in the most important thematic directions. The representatives of the Pentagon and the special subdivisions, which are occupied by military thematics, work in all centers of NASA. But if we still consider the constant rotation of the leading officials between NASA and department of defense (for example, mentioned J. Martin arrived at NASA, after leaving the post of the assistant of the Secretary of the Air Force; the "Space Shuttle" program over a number of years was headed by General J. Abrahamson temporarily sent on business from the armed forces, who after this returned to the Pentagon and was appointed as the head of SOI program and, etc.), then it becomes obvious that NASA can be considered as an active and very important team of the military industrial complex of the USA.

As formal basis of cooperation of federal departments with execution of state programs serves slogan about efficient use of resources being isolated, which can be provided by elimination of duplication of works. The need for close cooperation of military and civilian organizations for accomplishing of space projects, exchange of information and as obtained results repeatedly emphasized in a "memoranda about mutual understanding", signed by the officials of NASA and Pentagon in connection with the organization of a different kind of general and specific problems of the cooperation of departments in the region of the mastery of space. The realization of the principles of "mutual understanding" in practice indicates the use of a scientific-technical "reserve", research and experimental base, cadres, the financial resources of NASA for the final adjustment of

the elements of military-space programs.

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Thus, according to evaluations of the main controlling-financial administration with congress of the USA, of the sum total of the 5334 million dollars, which NASA asked for according to the article of "NIOKR" on the 1983 financial yr. budget, 1100 millions (20.5%) was envisaged for operations, which relate to military programs, and 400 additional million dollars (7.7%) - to operations, which relate to programs of dual purpose ¹².

Practice of creation of new space technology in the USA gives many examples of "asymmetric", regarding American researchers, cooperation of military and civilian organizations. The convincing examples to that were demonstrated in the course of creation of a repeated space transport system - the largest project of American cosmonautics of the 70's - beginning of the 80's. As is known, the development of spacecraft "Space Shuttle", the Navy construction of four ships and their exploitation were charged to NASA. However, in the initial stages of design, lending in that period only purely symbolic financial support to project, the USAF insisted on the characteristics of spacecraft realized now, after rejecting a more "modest" project of NASA. The increased dimensions of cargo hold and degree of maneuverability of ship upon entry into the atmosphere were connected with the plans of creation of a "very important payload" of the USAF, which had to require the appropriate size and energy

characteristics of transportation means.

On border of 80's, when development of spacecraft "Space Shuttle" entered completion stage, attitude of department of defense toward project underwent considerable changes: military departments "in more complete measure" began to lend support to program. These changes were connected not only with the real evaluation of the possibility of the "inscription" of new transportation means in the consensus of acting military-space policy, but in the later stage and with the decisions about the definite change in the approaches taking into account the disclosed prospects¹³.

Ship "Space Shuttle" is capable of placing in orbit objects, doubly great in weight and triply great in volume, than "Titan-e" (the most powerful of one-time carrier rockets utilized by department of defense). This makes it possible to ensure greater redundancy of onboard systems of satellites, increasing thus the duration of their active existence and decreasing the frequency of replacement. Furthermore, to install in the satellites auxiliary equipment, which makes it possible with the aid of one apparatus to solve a whole complex of problems. The latter has special importance from the point of view of effective execution of programs of experimental final adjustment of equipment and systems of perspective space technology. As a result of the realization of all these new approaches it is proposed to ensure considerable savings of expenditures of the department of defense.

The ship makes it possible to return to earth for repair satellites, on which arose troubles in track-out phase or with location in orbit. With gaining of experience of the exploitation of ship "Space Shuttle" it is proposed to modify the design of the satellites, launched into low orbits, in order to make their return to the earth for the subsequent repair and repeated use possible.

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Specialists of the USAF discuss the possibility in principle to use ship "space shuttle" for the inspection, removals from orbits and deliveries to earth of satellites of foreign countries.

In light of planned creation of antimissile system representatives of Washington administration are increasingly more determinedly voiced in favor of close fitting of plans of exploitation of space transport system with realization of "defense" concept of Pentagon, examining ship "Space shuttle" as a necessary means of transportation and guarantee of assembly of elements of space basing of a perspective antimissile system. Changed the views of the Pentagon and on the possible role of astronauts in the solution of military problems. As a result of carried out analysis the specialists of the USAF arrived at a conclusion about the need of expanding the presence of man in space both for purposes of research and developments and for the solution of such operational problems, where the activity depends on changes in the situations. The number

of military specialists in the vanguard of the astronauts of NASA was considerably increased for this.

Claims of Pentagon on use of new space transport system were officially attached to "memorandum about mutual understanding", signed by department of defense and NASA. This document determined the rights of the department of defense to accomplish flights, connected with providing of "national security", including with the use of launching system and Mission Control Center, that belong to NASA. For all flights, which fall under the named category, the head is appointed by the department of defense. The Secretary of the Air Force obtained the right to question the extraordinary execution of any flight concerning a program of the department of defense before the director of NASA. Servicemen did not delay in using their right of priority. Already in 1982 by ship "Space Shuttle" was launched the first experimental payload of the department of defense, "displaced" for this from the 18th flight (as was planned initially) to the 4th. In this case from the flight program an experiment of NASA was excluded.

With all changes in approaches to use of repeated transport system for removal of payloads into space specific weight of launching according to programs of department of defense in compound "model of flights" of ship "Space Shuttle", periodically corrected in accordance with priorities and financial possibilities of American cosmonautics, remains stably high. If, according to the evaluations of the mid

70's, for the satisfaction of military needs for a means of launching were planned less than 20% of flights of ship "Space Shuttle" in the 80's, then subsequently this number was invariably corrected only in the direction of an increase. According to the evaluations, made in mid 1982, to 1988 by programs of the Pentagon were proposed to use already half the flights. As is known, the loss of "Challenger" and the subsequent then prolonged interruption in the exploitation of transport ships caused considerable failure of the curve of launching of payloads, NASA matched previously with clients. However, even under these conditions five of the first after this interruption nine flights of the ship "Space Shuttle", which are planned for 1988-1989, are intended to carry out in the interests of the department of defense.

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Attaching so great a value to use of ship "Space Shuttle" in the implementation of its own plans, department of defense together with that did not reveal readiness to pack means of military budget into implementation of program. And although the total allocations of the USAF for program "Space Shuttle" achieved in the 1988 financial yr. almost 5 billion dollars, only an insignificant part of these means was isolated for financing the works of general nature according to the program. Their basic purpose - enclosure into the construction of her own launching system of the Air Force on the base Vandenberg, financing the development of different payloads of military purpose for the ship "Space Shuttle", the interorbital stage for the transfer

of payloads from the base into the higher orbits, which are preferable for a number of military-space systems.

Using ship "Space Shuttle", heads of Pentagon attain a definite redistribution of means, isolated by NASA, into their benefit. As is known, the operational flights of ship "Space Shuttle" are conducted by NASA on the basis of compensation of expenditures by the owners of the launched payloads. Initially for the DOD of the USA for the period of 1982-1988 was established a tariff on the freight of ship "Space Shuttle", almost 1.5 times less than for other government departments. The amounts of payments expected were considerably below the prime cost of launching of the spacecraft. Indicating the financial difficulties of NASA, which became already chronic, the main controlling-financial administration noted that the discussion deals actually with completely unjustified "subsidizing of users". According to calculations, only for 12 years of the exploitation of the new transport system the department of defense had to underpay NASA 745 million dollars (in the prices of 1975) ¹⁴. The tariff on the freight of ship "Space Shuttle" for the department of defense then was somewhat increased under the pressure of congress. However, it as before remained considerably lower than the level of corresponding payments of other government and commercial users, that does not make it possible for NASA to rely on the complete liquidation of the nonequivalent nature of calculations with the military departments.

So in practice intense militarization of a program of creation

and exploitation of repeated space transport system, which is still represented by means of mass information of USA as one of the largest civilian projects of American cosmonautics, is accomplished. This policy of the department of defense with respect to the most important programs of NASA underwent its further development, when military department was mixed into complex negotiations relative to the types of cooperation for the creation and the rights of participation in the exploitation of a permanent orbital station, which were conducted by NASA with the West European space agency, Japan, and Canada. The department of defense decided to prevent the conclusion of agreement about joint control of station, which would contradict potential military activity of the USA on board this formally civilian object. "We must retain the possibility to conduct onboard experiments in the interests of national security" ¹⁵ - thus formulated requirements of the military by J. May, responsible official of the council of national security, that watches in it the development of national space program. Only with the intercession of an interdepartmental group on space with the President of the USA was it possible to solve the disagreements between NASA and the department of defense about the use of an orbital station by military departments.

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The department of defense obtained the right to conduct on station research, connected with the creation of a weapon; however, it was obligated not to place on its aircraft similar systems. This compromise allowed NASA to confirm its obligation to use the station

"for peaceful purposes, consistent with international law", and to continue negotiations with foreign partners.

Support by department of defense of programs of NASA, which have, in its opinion, direct or potential military value, is a form of wider influence of Pentagon on structure and proportions of national space program. Under the conditions for chronic budgetary limitations "sufficient" financing of some projects of NASA has already a long time been carried out by reducing means allotted to others. In many respects under the pressure of the Pentagon the allocations for space research and the aeronautics program became the customary articles of such reductions. Thus, during the discussion of annual budgets NASA in the congress of the USA has repeatedly noted that they provide only those programs (referring to aviation equipment), which are connected with military aviation in essence. However, as far as the analyses of planets are concerned, for their realization NASA is forced to accept the financial aid of different kinds of public organizations.

Completely different appears practice of implementation of those research programs, whose results promise to lead to cardinal breaches in creation of newest technology, which have in principle important military value. In such cases the military departments attempt already in the initial stages to subordinate the course of studies to their own interests, actively utilizing in this case financial resources, material resources, the experience of junior partners in cooperation.

On such principles is built, in particular, cooperation of department of defense and NASA for program of creation under leadership of military departments of experimental aerospace aircraft (VKS), on base of which subsequently can be developed repeated single-stage spacecraft of class "Land-orbit", aerospace apparatuses of military purpose, hypersonic airliners. Financial expenditures for development and construction to mid 90's of three experimental models of VKS are evaluated to 3.3 billion dollars, of which from the department of defense are intended to isolate about 80% and only 20% fall in the portion of NASA. However, it is determined, that NASA will bring in 300 scientists and engineers from their own regular personnel for accomplishing of NIOKR, which will cause supplementary expenditures for the payment of personnel, experimental base, and operational provisions at the sum of 500 million dollars. Furthermore, by industrial firm-contractors, who participate in operations according to the program, must be accomplished capital investments for approximately 725 million dollars '6.

No less interest, than to the sphere of research and developments, exhibits department of defense of USA to use of applied space systems of civilian departments and particular firms. Beginning of this practice was established in the mid 60's, when a number of corresponding military systems was located in the developmental stage. Thus, in that period was conducted the planning of launching of military reconnaissance satellites taking into account data about the

nature of cloudiness in the area of the objects of interest, which came from weather satellites, which belong to civilian departments.

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Use of civilian space technology did not lose its urgency, also, after putting into commission of corresponding military space systems. On the contrary, in a number of cases its scales grew considerably, and it seized several new spheres of the applied application of space technology. Thus, the department of defense is the most important user of information, which enters from "Landsat" satellites. To its share fall more than 1/3 of all information, bought by federal departments of the USA. It is used, in particular, for hydrographic mapping (detection of shallows, etc.), and also for the evaluation of characteristics of soil from the point of view of planning participation of various types of techniques in tactical operations.

A significant part of the needs of department of defense for means of communication is provided by international organization ITSO and privately owned corporations of the USA, which control commercial satellite communication systems. The USA as before actively uses for the needs of the armed forces information from civilian weather satellites. The department of defense desires to use civilian space technology deliberately in the future, planning, in particular, the transmission of information from perspective satellites of military intelligence through satellite- repeaters TDRSS, leased by NASA at particular firm "Spacecom".

Should be noted almost complete absence of any reciprocal steps of military department in this region. Over a number of years, for example, the possibility of use for civilian needs of information, received with the aid of reconnaissance satellites of the department of defense, is discussed by American administration. The result of many-year debates on this question at the level of highest state authority was transfer to the civilian users only of an insignificant volume of available data on conditions of observing a whole series of limitations during their use.

Increase in cost of creation of space systems forces department of defense to search for possibilities of reduction in its expenditures in this region. One of such ways is the course for creation of applied complexes of dual purpose, designed for use by both military, and civilian users. This was, in particular, one of the reasons, which explain the initiative of VMS of the USA for creation of the commercial communication system "Marisat" for the care of military and commercial fleets in the water areas of the Atlantic and Pacific Oceans. After paying less than 40% of the cost of the design of the space and coast complexes of the system, the department of defense obtained an exceptional right to use for putting into commission her own system "FLEETSATCOM" a significant part of the capacity of "MARISAT" satellites in the zone of each ocean.

Similar form of enlistment of private capital by department of defense for solution of her own problems was further developed. At

the end of the 70's VMS of the USA concluded new agreement with a particular corporation for the creation by it of the space communication system "LISAT". This space complex, which is the property of firm "Hughes Aircraft", is intended for the guarantee of activity of the Navy of the USA in the water areas of three oceans; it will be used by VMS on the conditions of a long-term lease.

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This method of replacing the operational system of military space communication "FLEETSATCOM" by a more advanced means was considered not randomly advisable. A similar organization of programs of the modernization of serving military-space systems increasingly more frequently is examined as an alternative to the creation of space technology for our own means.

Use by military departments of potential of civilian cosmonautics in diverse forms is pursued, undoubtedly, and common goals. Expanding its influence along entire front of the applied mastery of space, carried out by civilian departments and particular firms, the department of defense attains a maximally possible orientation of operations for the satisfaction of military needs conducted by them. In relations with government organizations these goals are reached with the aid of the determined levers of state regulation. However, as far as the sphere of activity of corporations is concerned, here the Pentagon attains cooperation, attracting privately owned organizations by the prospect of obtaining long-term contracts for the

care of military users.

Under conditions for an increase in competition on markets for services big monopolies willingly use given possibilities of expanding owner's activity with orientation for guaranteed state consumption. The existing tendencies for use of commercial systems by organizations of the department of defense form a definite approach of privately owned corporations for the creation of new space technology, impelling them to consider the specific demands of potential military users. As an example of civilian development, oriented to military use, can serve the satellites of the national commercial system of communications of the firms "American Satellite", to exploit which it is proposed from the end of the present decade. For practice of use of civilian space vehicles first commands transferred on their board will be coded, which must protect satellites from "random or desirous interferences".

Thus, as a result of its interference in sphere of economic applied mastery of space Pentagon receives access to developed complex of civilian space means, oriented to certain degree for needs of military users. Solution of this problem is examined by the department of defense, also, in the context of changes in the common strategy of military use of space. In the opinion of K. Oldermen, deputy of the assistant of the Secretary of Defense on questions of the technical policy, one of the leading contemporary tendencies in this field is rejection of the common in the past practice of the

creation of optimized expensive space vehicles and the reorientation to simpler satellites, which require lesser expenditures. "We prefer 10 comparatively vulnerable satellites of space basing to a "super-satellite" with a means of self-defence", he stated in the summer of 1987.

Nevertheless military experts continue to develop recommendations regarding increase in protection of space and ground-based complexes of commercial satellite systems.

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The planned measures are intended, in particular, to decrease the vulnerability of communication satellites to the influence of ionizing radiation and other damaging factors, to raise their freedom from interference and secretiveness of transmissions. The department of defense attains so that the government would guarantee to firms the compensation for supplementary expenditures, and also the compensation of the decrease of income, connected with limitations during exploitation, by the caused requirements of military use of systems. Recently the Pentagon undertakes efforts, also, on the organizational strengthening of its claims on the advantageous use of civilian space technology, developing the procedures of the special changeover of commercial systems for the solution of military problems in the case of an emergence of "national need".

Everything presented makes it possible to make conclusion that

complex of large-scale measures for militarization of American space program carried out not only causes displacement of internal priorities and a breakdown of logic of development of activity of USA in study and mastery of outer space. It embeds tendencies toward the definite reduction in the independent value of space of NIOKR, the contraction of the potential contribution of cosmonautics to economic growth and social development.

3. Peculiarities of capitalist integration in the mastery of space: West European model.

Multilateral international cooperation presents characteristic feature of participation of West European states in study and mastery of outer space. Besides the common objective reasons for the unification of scientific-technical and economic resources in this new region of state activity the development of regional cooperation in the matter of the mastery of space in Western Europe is dictated by a number of supplementary political and economic goals. In the political plan the integrated processes were proclaimed as "instruments of the construction of Europe". By this was implied the firm intention to convert Western Europe into the "third space power". In the plan this cooperation is considered economic in Western Europe as the sole way to a more equal cooperation with the USA in space studies and, more importantly, in an economic-applied mastery of outer space as the possibility of increasing the competitive ability of West European industrial firms in the struggle for orders with

accomplishing of international projects.

Reasons indicated led to institution in the beginning of 60's of two important intergovernmental unifications: European organization for development of carrier rockets (ELDO) and European organization of space studies (ESRO). The members of ELDO were Belgium, Great Britain, Italy, Netherlands, France, FRG, and also Australia; members of ESRO - Belgium, Great Britain, Denmark, Spain, Italy, Netherlands, France, the FRG, Switzerland, Sweden.

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Furthermore, some from the West European countries were represented to the named unifications as observers: in ELDO - Denmark, Switzerland, in ESRO - Austria, Ireland. Thus, in the mid 60's, when embarked in force the constitutive conventions of ELDO and ESRO, on the path of regional cooperation arose 12 West European states.

Total expenditures of these unifications, formed from yearly contributions of participating countries (Table 2.3), at the beginning of 1975 achieved almost 1.7 billion dollars, which composed more than 43% of means, spent on study and mastery of outer space by all countries of Western Europe for the years 1961-1974. However, as testifies the structure of the budgets of ELDO and ESRO, financing the programs of these unifications was carried out predominantly by France, the FRG, Great Britain (79% of budget of ELDO and 64% - ESRO). This made it possible for them to determine the technical policy and

the basic directions of West European cooperation in study and mastery of outer space.

According to programs of ESRO within this period were created and launched 7 research satellites with the aid of carrier rockets of USA, 184 research probe rockets, were constructed Center of Space Studies in Noordwijk (Netherlands), Control Center in Darmstadt (FRG), training ground for launching of research rockets in Kiruna (Sweden), network of tracking stations of outer space objects. The development of "European" carrier for the program of ELDO (project "Europe") was not crowned with success, and operations, on which were spent about 0.9 billion dollars, were convoluted.

Decennial experience of joint activity of West European countries in study and mastery of outer space even taking into account definite failures confirmed advisability of this cooperation. Therefore, in spite of the reorganization of activity in the region of space, undertaken by the countries of Western Europe in the mid 70's, further prospects for the development of space programs are connected here as before with accomplishing of joint projects.

Table 2.3. Portion of participating countries in financing of the programs of ELDO and ESRO, %.

(a) Страна	Годовой взнос в бюджет (b)		(c) Страна	Годовой взнос в бюджет (d)	
	ЕЛДО*	ЕСРО**		ЕЛДО*	ЕСРО**
(1) Франция	25,0	28,6	(2) Дания	-	1,8
ФРГ	27,0	25,9	(3) Испания	-	2,1
(4) Великобритания	27,0	16,6	(5) Швеция	-	3,6
(6) Италия	12,0	11,3	(7) Швейцария	-	2,6
(8) Бельгия	4,5	4,3	(9) Австралия	(10) предо- ставле- ние по- лигона Вумера	-
(11) Нидерланды	4,5	3,2			

It is comprised from:

* 1968. ** 1974.

Key: (a). Country. (b). Annual contribution to the budget. (c). Country. (d). Annual contribution to the budget. (1). France. (2). Denmark. (3). Spain. (4). Great Britain. (5). Sweden. (6). Italy. (7). Switzerland. (8). Belgium. (9). Australia. (10). granting of training ground Woomera. (11). Netherlands.

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The basic meaning of reorganization was the search for a more flexible structure, which, after preserving the advantages of cooperation and as far as possible after excluding the excessive duplication of completed works, would make it possible in greater measure to consider national interests of individual states. The need for structural changes indicated is explained by two reasons. The first of them is

connected with the real achievements of countries of Western Europe in the area of space technology, which to the mid 70's already made it possible for them to more soundly raise the question about the creation of space systems, including commercial nature, the competing with analogous systems of the USA or intergovernmental unifications, controlled by monopolies of this country. The main problem, which it was in prospect to solve for the countries of Western Europe, was the creation of its own means of launching outer space objects in to highly energetic orbits, which would afford the possibility to conduct a more independent policy in questions of the applied use of space technology by it.

Second reason consists in a definite contradiction of interests of countries, which possess greatest scientific-technical and economic possibilities in West Europe, with interests of remaining participants in unifications. The mid 70's was marked by the tendency of some of them, in particular by the FRG, to more closely connect its space programs with operations, made in the USA. Solution of this problem would make it possible to considerably accelerate the contraction of the explosion of these countries with the United States in the matter of creation of newest types of space technology and to realize practical advantages from the mastery of outer space in the sphere of economy. However, cooperation with the USA according to large-scale programs requires the enclosure of such considerable means, that this placed for doubt the possibility of the successful realization of perspective projects of ELDO and ESRO with the established

organizational forms within the planned periods.

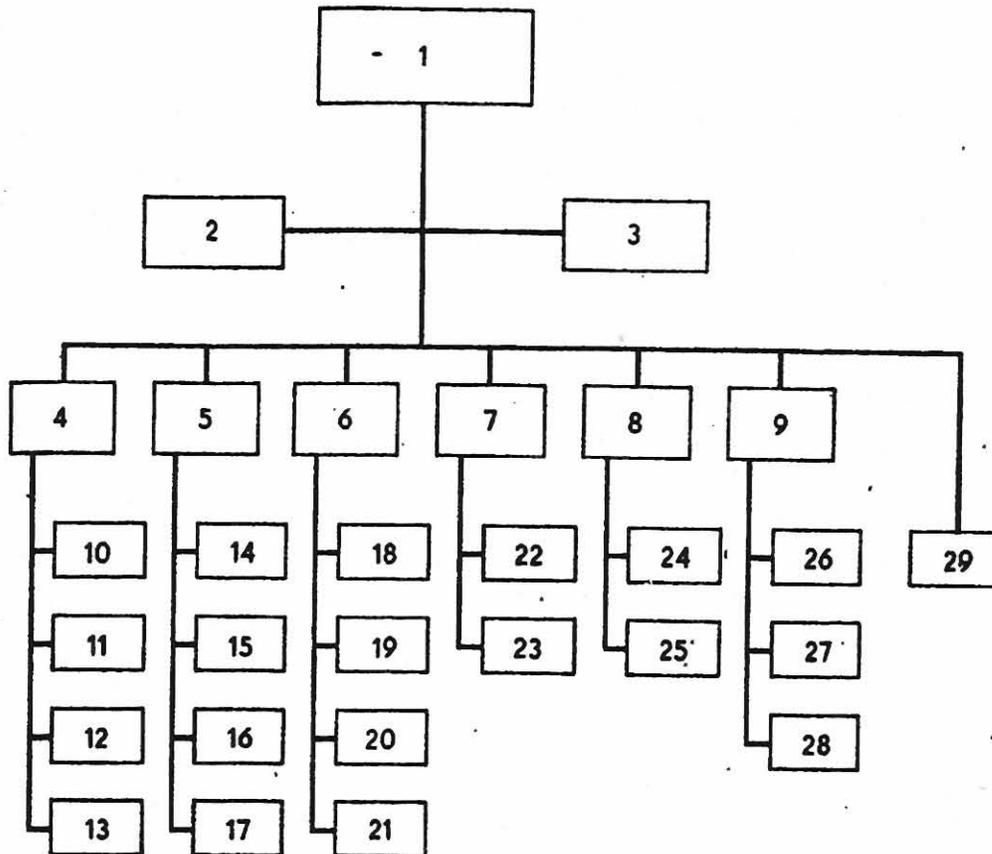
For eliminating emergent contradictions in 1975 was accepted decision about creation of a uniform West European organization for mastery of outer space - West European Space Agency (EKA) - by merging programs of ELDO and ESRO and acceptance of the organizational structure of the latter as basis. As participants of EKA arose 10 West European states - members of ESRO and somewhat late Austria, Ireland, Norway, status of associated members obtained Canada and Finland. The goal of unification is the guarantee of more precise cooperation of West European states in research and mastery of outer space, development of rocket-space technology and its applied use. Participating countries attain a practical solution of presented problems by manufacture and conducting a uniform long-term West European policy in the mastery of outer space and in relations with other states, international organizations and institutions, which participate in this activity; the development and realization of a uniform West European research program and mastery of outer space; a more complete agreement of general routine with the national programs of mastery of outer space is possible .

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Basic organization of strategic leadership EKA - a council of the agency composed of representatives of all member states, which have available to it one vote. In the function of council enters the determination of the policy of EKA in the scientific, technical,

administrative, and financial areas, the acceptance of yearly budget and the determination of the level of expenditures for a five-year period. The convention about the institution EKA provides for possibility of designing with the council of different kind of boards for specific directions of activity of organization, which include the representatives of states - participants in the corresponding programs.

Executive power (operative management) belongs to Director-General of EKA, elected by council for a determined period. Under his leadership operate six administrations, which operate according to programmed (control of scientific programs, applications programs, space transport systems) and functional (administration for the guarantee of programs, technical-engineering, administrative) principles.



6. Management of program of West European cooperation in mastery of space.

1. Secretary general of EKA. 2. Service of coordination and control. 3. Apparatus of secretary general. 4. Administrative management. 5. Technical management. 6. Management of exploitation. 7. Management of scientific programs. 8. Management of applications programs. 9. Management of space transport systems. 10. Personnel division and general guarantee. 11. Financial department. 12. Juridical department. 13. Department of contracts. 14. Department of payload design. 15. Department of satellite design. 16. Department of tests and calculations. 17. Department

of system design. 18. Department of computer technology. 19. Department of systems exploitation. 20. Department of meteorological support. 21. Department of ground-based complex. 22. Department of scientific projects. 23. Department of space studies. 24. Department of space communication. 25. Department of natural resources research. 26. Department of "Ariane" rocket-carriers. 27. Department of manned orbital objects. 28. Department of orbital experiments. 29. European Institute of Space Research.

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General directivity of joint West European space programs underwent considerable changes. If previously prevailing in the activity of ESRO was the creation of research satellites, then in EKA basic accent was postponed by the development of space technology of applied purpose - weather satellites, communication satellites, to the studies of natural resources. Special position in the united West European program occupied work on the creation of carrier rockets "Ariane" and the manned orbiting laboratory "Spacelab". The successful realization of the first project is examined not only as a material basis of an independent policy of the countries of Western Europe in questions of creation and exploitation of its own space technology, but also as a ponderable argument in the struggle for a more equal nature of co-operation with the USA during the formation of international systems, for orders of the creation of national space systems of applied purpose for developing countries. The creation of the orbiting laboratory "Spacelab", consistent with the space

transport ship of the USA, for the first time revealed for the countries of Western Europe the possibility of participation in manned space flights.

Considerable increase in magnitude of united "space" budget of countries of Western Europe - more than 2.4 times during period of 1975-1980 in comparison with previous sexennial - was a reflection not only of the total increase of assignments for space programs in these countries, but also changes in nature of distribution of resources to national and international elements of programs themselves. On the established tendency in this region testifies an increase in the portion of the means, directed for financing of programs of EKA, in the structure of the "space" budgets of the leading West European states. Thus, if in 1975 this portion for the first time somewhat exceeded half of the budgets of France and FRG, then in 1977 it composed already respectively 61 and 58%, and in the budget of Great Britain - even 65%. The determined increase in this portion continued also for the next 10 years. Thus, under the slogan of integration in space from second half of the 70's was begun "regulated" reductions of national comprising space programs of West European states.

Important changes occurred also by way of financing space programs by countries - participants in unification. In contrast to the practice, accepted in ESRO, all made space programs from the point of view of their financings are subdivided now into the necessary and the facultative. Necessary programs (first of all, the space program

and general security, and also the separate applied projects, were added to the category of necessary by special decisions of the council of EKA) are financed by all members of unification in essence proportional to the size of their GNP. Total expenditures according to necessary programs comprise usually about 1/4 annual budget of EKA. The facultative programs, which as a rule unite, overwhelm a quantity of projects of applied purpose, are financed only by those countries, which are interested in their completion.

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The amount of participation of individual West European states in financing of the main directions of space program of EKA are given in Table 2.4.

In first half of 80's the main projects, affirmed during creation of EKA, were in essence successfully completed. A number of complex study programs of outer space was realized, the developments of some types of space technology of applied purpose were conducted to the borders of commercial introduction, at the end of 1981 were begun the operational launching of carrier rocket "Ariane", in 1983, was realized the first orbital flight of multipurpose unit "Spacelab" with a West European cosmonaut aboard. The dimensions of annual budget of EKA in the mid 80's approached 1.5 billion dollars.

Data about structure of financing basic directions of activity of EKA show that if according to research programs for leading West

European countries it was possible to attain relative reduction in their expenditures, then in field of creation of most complex types of rocket-space technology their role in financing as before remained determining. Thus, the portion of France and FRG in financing of two main projects of EKA of the 70's - the beginning of the 80's - orbiting laboratory "Spacelab" and carrier rocket "Ariane" (total cost - more than 2 billion dollars) - exceeded 78%, including one by France alone - 44%. It is obvious that under such conditions from the consistent fulfillment by these countries of accepted to themselves obligations depend the successes of "space" of Western Europe as a whole.

Table 2.4. Structure of financing the main directions of space program of EKA in 1986, % of total.

Источник (а) финансирования	(b) Доля вклада	Статья расходов (С)	Доля (d) расходов
Франция (1)	21,6	(2) Обязательные программы	19,6
ФРГ	18,1	(4) исследования космоса и планет	11,2
Италия (3)	10,7		
Великобритания (5)	9,5	(6) общее обеспечение	8,4
Бельгия (7)	3,0		
Нидерланды (9)	2,7	(8) Факультативные программы	80,4
Испания (10)	2,4	(11) космические транспортные системы	27,6
Швеция (12)	1,8		
Швейцария (13)	1,5	(15) орбитальные станции и платформы	13,5
Дания (14)	0,8		
Ирландия (16)	0,2	(15) космическая связь	24,9
Австрия, Норвегия, Финляндия, Канада (17)		(19) исследования природных ресурсов из космоса	11,2
Прочие поступления (20)		25,7	(21) технологические эксперименты в космосе
Всего... 1 369,3 млн экю (22)		(23) Всего... 1 367,1 млн экю	

Comprised from: Focus '86: A Summary of the 1986 Annual Report of the Activities of the European Space Agency. P., 1987. p 85.

Key: (a). Source of financing. (b). Portion of contribution. (c). Classes of expenditures. (d). Portion of expenditures. (1). France. (2). Necessary programs. (3). Italy. (4). Research of space and planets. (5). Great Britain. (6). General security. (7). Belgium. (8). Facultative programs. (9). Netherlands. (10). Spain. (11). Space transport systems. (12). Sweden. (13). Switzerland. (14). Denmark. (15). Orbital stations and platform. (16). Ireland. (17). Austria, Norway, Finland, Canada. (18). Space communication. (19). Study of natural resources from space. (20). Other entries. (21). Technological experiments in space. (22). Together... 1 369.3 million ECU. (23). Together... 1 367.1

million ECU.

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At the same time the practice of completion of projects of EKA indicates that the undertaken reorganization proved in status only to partially and only in initial stage soften contradictions, organizationally inherent in capitalist integration. A difference in the approaches of France and FRG - the most important participants of EKA - to the strategy of developments of their space programs, contradiction between them and junior partners in the cooperation are important factors, which impede further consolidation of the efforts of countries of West Europe in the mastery of space.

Nevertheless after prolonged agreements of a perspective program the West European cooperation in the matter of mastery of space entered in the second half of 80's into its new stage. Its chief characteristic is course on development within the framework of EKA of joint West European programs of manned space flights. As important independent goals to further prospect are accepted also the following: the maintenance of a common level of activity in study and mastery of space, which makes it possible to pretend to qualified participation in international projects; guarantee of competitiveness of West European space technology in the elected directions of its economic-applied application.

In accordance with stated goals activity of EKA to end of present

century is concentrated on following basic directions. According to programs for the creation of space transport systems is intended to be carried out a major project, the total cost approximately 6.5 billion ECU (in 1985 prices) - to put into operation complex "Hermes" - "Ariane-5". By program is provided for the creation of a reusable spacecraft "Hermes", designed for launching into space by new rocket "Ariane-5" - by the first West European carrier, intended for launching into orbit of manned outer space objects. Basic purpose of ship - servicing of orbital stations and automatic platforms. "Hermes" will be able to deliver to station up to three cosmonauts even 3 t of payload, to be used as a rescue facility if necessary for the urgent evacuation of people from the station, to serve as a scientific laboratory while conducting of research and experiments in autonomous flight. In the stage of exploitation it is provided for accomplishing 2-3 flights per year with maximum duration up to 11 days. It is planned to form the vanguard of the cosmonauts of EKA with a number of 15-20 people for piloting of ships and conducting of trajectory events.

In the direction of "orbital stations and platforms" are planned to realize program "Columbus" with a cost of approximately 5 billion ECU (in 1985 prices). It provides for the creation of four outer space objects:

- an orbital unit, designed for the derivation into space by American transport ship and the exploitation in the composition of the orbital station of the USA. Unit will maintain 2-3 researchers,

delivered to it by a transport ship from earth;

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- manned orbital station "Pallas", designed for derivation into space by carrier rocket "Ariane-5" and planned as an alternative to West European unit in composition of USA station in case, if cooperation with NASA in this question concerning any reasons will be convoluted. The maintenance of "Pallas" station will be provided by ships "Hermes", it is designed for periodic visits by the cosmonauts every 1-2 months;

- two platforms on them for the location of interchangeable research and research equipment, designed for the removal and the servicing by West European ("Ariane-5" and "Hermes") and American ("Space Shuttle") technical equipment. In the second case platform is planned to be used in the composition of the orbital station of the USA.

In region of applied space systems - observations of Earth from space and space communication - EKA desired to be occupied with fundamental problems of development of climatology, study of natural resources, organization of communication through satellites in insufficiently studied frequency ranges, with mobile objects, etc. Special importance is given to the implementation of the program of the creation of satellite ERS for the study of the natural resources of sea (cost of program - about 360 million ECU). This project is considered as a stage of creation over the long term for an

operational system for the study of natural resources of Earth.

Another important project - development of a system of repeaters DRS (cost of project - about 900 million ECU) for guaranteeing communication with outer space objects, created according to program "Columbus", and ship "Hermes". It is assumed that the introduction of space systems of national-economic purpose, which already demonstrated their commercial potential, will be carried out according to national programs, and also by particular firms.

Is outlined a vast program of technological experiments under conditions of micro-gravitation, which are planned to be carried out with the use of a space complex, developed according to program "Columbus", and before its putting into commission - of satellite-platform "Eureka" and orbiting laboratories "Spacelab". These experiments are intended for the guarantee of competitiveness of Western Europe in the newest fields of materials science and carrying out of biological preparations, preparation of the necessary scientifically-technological reserve for the future use of outer space as the sphere of the location of industrial production. Perspective developments of EKA are intended to solve the common problems of technical support of all space programs of unification and at the same time to support the high level and reputation of West European industry in the field of the creation of science-intensive production.

Within the framework of study programs of outer space and planets

is proposed to carry out three or four major projects, exceeding scientific-technical and financial possibilities of individual countries, after supplementing them with six-seven projects of lower range. Thus, as one of the major projects is affirmed the program of the creation of an infrared space laboratory ISO for photometry and spectroscopy of infrared radiation of different outer space objects - planets, stars, interstellar substance, normal and active galaxies, quasars, etc. Is examined a number of other projects with a cost of approximately 250 million ECU each, from which is proposed to select one for its realization in the first half of the 90's.

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Execution of this vast program requires, naturally, a serious increase in the scales of financing by countries-participants. By plan of assignments for years 1987-2000 is outlined a more than 1.5-time increase in annual budgets of EKA - from 1 400 million to almost 2 300 million ECU. However, the overall amount of the means, which participating countries intend to invest in the programs of EKA during the period of 1987-2000, is approximately 30 billion ECU (all data in 1985 prices). The planned distribution of budgetary means in the basic directions of space program of EKA and the supposed participation of individual countries in financing of the most important projects are given in tables 2.5 and 2.6.

At the same time EKA also counts on certain supplementary financing of applied directions of its program by users, taking into

account that commercial results of exploitations are realized actually by particular firms, which use results of programs of unification during creation of corresponding practical systems. Furthermore, was outlined definite focusing of the attention of participating countries on national elements of its programs, within the framework of which (at least in the most developed countries) now is conducted all large part of the developments of applied space systems.

In the 80's West European countries took the course on dissemination of principles of regional cooperation (with all their inadequacy of nevertheless justifying themselves with accomplishing joint space programs and developments) also for region of practical realization of obtained results. The specific form of the embodiment of this course was the institution of international consortiues for financing of creation and subsequent exploitation of regional satellite systems of an economic-applied purpose, whose development was realized according to the programs of EKA.

In conducting of consortium "Evtelsat", that is of interest for 20 West European states, at the end of 1983 was transmitted system of space communication on base of satellites ECS.

Table 2.5. Structure of financing perspective programs of EKA on 1987-2000.

	(a) Мли экю (в ценах 1985 г.)	%
(1) Обязательные программы	6 226	21
(2) исследование космоса и планет	2 899	10
(3) общее обеспечение	3 327	11
(4) Факультативные программы	23 563	79
(5) космические транспортные системы	9 159	30
(6) орбитальные станции и платформы	6 176	21
(7) космическая связь	3 486	12
(8) исследования природных ресурсов из космоса	3 178	11
(10) технологические эксперименты в космосе	1 564	5
(11) Итого...	29 789	100

It is comprised from: Air et Cosmos. 1987. 14, III pp. 25-26.

Key: (a). Million ECU (in 1985 prices). (1). Necessary programs. (2). space and planetary research. (3). general security. (4). Facultative programs. (5). space transport systems. (6). orbital stations and platform. (7). space communication. (8). study of natural resources from space. (10). technological experiments in space. (11). Altogether

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From the end of the 80's the exploitation of the West European system of meteorological observations from space will be carried out by the organization "Evmetsat", of which 23 countries are members. It is characteristic that both consortiums are considerably expanded due to states, which are not members of EKA. However, key positions in these unifications as before belong to France, FRG, and Great Britain.

Very remarkable fact became institution in Western Europe of new commercial organization - international unification "Arianespace". The primary tasks of consortium are: proposal to potential users of services for launching of their outer space objects with the aid of "Ariane" carrier rockets, developed by EKA; financing and control for production of operational models of the carrier "Ariane" of existing today and perspective modifications; control of the activity of space center of Kourou in French Guiana in part of the realization by it space transport operations. Distinctive characteristic of this unification - participation in its creation of private capital. The founders of consortium on longitudinal principles were the French national center of space studies, 36 leading firms in aero-rocket-space and radio-electronic fields, the industries of the countries of Western Europe, and the 13 largest West European investment banks. During the creation of "Arianespace" the actions of the consortium between the founders, who represent different countries, were distributed as follows (%): France - 59.25 (including KNES - 34), FRG - 19.6, Belgium - 4.4, Italy - 3.6, Switzerland - 2.7, Spain - 2.5, Great Britain - 2.4, Sweden - 2.4, Netherlands - 2.2, Denmark - 0.7, Ireland - 0.25 (remaining actions were subject to distribution during later periods).

Table 2.6. Portion of planned financial participation of the individual countries - members of EKA in the most important perspective projects, %.

Страна (a)	(b) "Гермес"	(c) "Ариан-5"	(d) "Колумб"	DRS
(1) Франция	45 - 50	45 - 51	15	30
ФРГ	20 - 30	22	38	30
(2) Италия	13 - 15	15	25	31
(3) Великобритания	5 - 10	4	15	34
(4) Бельгия	7	5 - 6,5	5	5
(5) Нидерланды	5	3	4 - 5	7
(6) Испания	5 - 7	3	8	6
(7) Швеция	3 - 4	3 - 4	0,5	7
(8) Швейцария	2	2	2	2
(9) Норвегия	1	1 - 2	0,5	-
(10) Ирландия	0,6	-	-	-
(11) Дания	1	1	1	-
(12) Австрия	1,5 - 2	-	0,5	-
(13) Канада	2 - 2,5	-	-	-

Note. Data are tentative. The amount of specific contributions of participating countries are subject to correction after the specification of the cost of programs. Comprised from: Air et Cosmos. 1986. 29 XI. pp. 33, 35, 41, 43, 45; 6 XII. p. 40.

Key: (a). Country. (b). "Hermes". (c). "Ariane-5". (d). "Columbus". (1). France. (2). Italy. (3). Great Britain. (4). Belgium. (5). Netherlands. (6). Spain. (7). Sweden. (8). Switzerland. (9). Norway. (10). Ireland. (11). Denmark. (12). Austria. (13). Canada.

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Thus, analysis of joint activity of countries of Western Europe in study and mastery of space in past years testifies about contradictoriness of integrated processes, which take place in this region of scientific-technical progress. Reflecting potentially a

more effective form of organization of space program, than only within the framework of the possibilities of individual states, the joint activity of the countries of Western Europe in the mastery of space in practice demonstrates entire inconsistency and limitedness of capitalist integration, organizationally inherent in it, are deepened the nonuniformity of scientific-technical development and appearing on this basis contradictions between the countries - partners in cooperation.