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John Greenewald Jr.

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A New Space Race

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH

30 NOV 1978

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FOREIGN TECHNOLOGY DIVISION



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A NEW SPACE RACE?

Ву

Maarten Houtman



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Date 30 Nov 19 78

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A NEW SPACE RACE?

by Maarten Houtman

Will there be another "Space Race," in the immediate future? According to us, we can say: yes, without any hesitation. With an open eye and mind for news SPACEVIEW published a lead article on the upcoming Soviet space shuttle, some two years ago. Although various European aerospace magazines abstracted our article, we have received a lot of severe criticism from foreign intelligence analysts who study technological trends in the Soviet Union. American and French specialists in this field had a disappointing negative outlook on our article. In fact we have been accused of recreating the Space Race. If we were not sure of our sources, we would of course never have printed such an article. At the moment we still back our original story, that the Soviet Union is already in full progress of constructing a complete fleet of probably over five completely reuseable, maneuverable earth-orbitearth ferry spaceplanes, that will touchdown again in the neighbourhood of their original leunch sites. Although those people have opposed our views, accusing us of enthusiastic propaganda makers for the Soviet Union, we stress again that the accused article is none of such tendency. Actually we decided to give a premature "overexposure" of the Soviet program as an eyeopener to the western world's aerospace industry officials. It would be bare nonsense not to assume that the Moscow Partyleadors would be interested in shuttlerelated ferrycraft, because of the silly reason that the Soyuz production lines have not closed yet. As a result of pressing investigations, we have decided to release part of our main sources that might make our detailed accounts somewhat more authorative As far as we know at the moment, at the closing of 1977, the Soviet Union will try hard in 1978 to have its twin recoverable shuttle (ultimate design) on complete operational flight readiness status by the end of this year, probably at the occasion of a major Soviet Anniversary Day (October 4, 1978?). This special article segment to SPACEVIEW is an indepth look into history and background of the Soviet shuttle. This is our story ... about Albetros ...

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INTRODUCTION

Two years ago SPACEVIEW reported for the first time on an eventual future Soviet shuttle. These articles can be found in issues 76/2, 76/3, and 77/3 (ref. 1, 2, 3). In this series we revealed -- perhaps prematurely -the necessity of a cosmic shuttle system for the Moscow leaders; an economic necessity of the first order in view of the steadily increasing launch frequency of the Soviet Union. Already at that time we had sufficient information

-1-

available to discuss this matter in depth. We were surprised, however, by the comments our articles generated.

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We were aware that our journal circulated among many foreign government institutions and companies, but we had not expected that we would receive so many vehement reactions to our "ALBATROS" article. But, except for the hard criticism (mainly from French and United States sources), it was after all gratifying to see the main points of our lead article reflected in several foreign aerospace journals. For example, in England (ref. 5), Finland (ref. 6), Germany (East and West) and Checkoslovakia, while additional rewrites are being prepared.

CRITICISM AND DOUBT

As mentioned before, the criticisms of the interpretation specialists in France and the United States were the most biting. We were to some degree accused of too much "investigative journalism" which could lead to negative probing, dirt-digging, and to activities compromising the national interests. And that in turn could become the cause of disenchantment in the European/American cooperation in space. The reactions -- varying between

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straight disbelief to uncertainty -- ranged from "damaging negativism" to "inciting a new space race." We, SPACEVIEW contributors, should keep in mind that the American shuttle was the only true one. And that it would be nonsense, pure fantasy and "wishful thinking" to maintain that a type of shuttle of Eastern European design could possibly fly first. Let alone, that Eastern Europeans would travel in space as Intercosmonauts sooner than those from the West. The cooperation of Europe and America in order to develop into equal partners in the design and operation of the Space Transportation System should not be discussed by us in a negative way.

In short, it was clear that our series of articles was a big stick in the peaceful Western chicken coop. In our opinion, however, there was no indication of a negative view from our side, but at most a timely "overexposure" of the Russian program.

PRESS FREEDOM?

ALL Y

Astounded by these reactions, we have answered with the statement that all the information published by us came from reports which, although rare, certainly were not secret.

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If other leading analysts (especially Americans) did not reach the same conclusions, then -- again in our opinion -this group of specialists should be accorded a certain degree of blindness.

Subsequently it was requested that in the future we provide complete source references with this kind of article. An understandable situation, although this indicates that the concept of freedom of the press is somewhat regarded as a far removed ideal. This time however we gave in; after all, we do not desire to be held responsible for "starting a new Space Race." And it will also be for the benefit of SPACEVIEW, since only by opening our books we can give proof of our reliability and integrity. In the case in question -- especially concerning the so-called "hypothetical Soviet Shuttle" -- we will in this article provide full reference to all sources used. An unexpected "spin-off" of this situation is that, at the strong suggestion of the foreign centers, we will give all Russian names or concepts in the English transcription (transliteration). In the following we will therefore not again write about the Sojoez or Saljoet, but about the Sojuz and Saljut. This situation will probably

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not be accepted gladly by everybody. We can imagine that the Moscow leaders are not all that happy with this situation and would have to make their plans public prematurely.

THE WARNED MODAL MAN

counts at least for two. We, the SPACEVIEW editors in Holland, are georgraphically about as far removed from Moscow and Washington. This has also the consequence that we, from a neutral position, can take a penetrating look at the news from East as well as West and probably are somewhat better informed about the Russian projects than our colleagues in America. An advantage of Western Europe is that there are many small countries with a higher level of technology. In these countries there are as many Soviet embassies and technical staff members who are from their side interested in this kind of activity in and around Europe. In this way there are more "staff members" available than in America where there is only one Soviet embassy. Also the frequent international air shows in Europe, for example in Le Bourget, Hannover, and Farnborough, contribute a great deal to the contact between West and East, and that are contacts which are not readily available in the United States. In short,

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the research which we have done for SPACEVIEW at those places for this series of articles probably goes deeper than the investigations -- possibly rather arbitrarily ordered by the Senate -- made by the different governmental offices in North-America. The annual superficial "probings" which are made by this institution in many areas of foreign science and technology are done on a grand scale but do not always go very deep. In reality, they represent the highs and lows of quick research, while the often numerous but more subtle indications remain uncovered.

It is exactly this kind of superficiality which treats the news as unconnected items and does not completely consider the background peculiarities that is the cause of incorrect interpretations or translations. Especially since this kind of work is not done by specialists in the field. And it is exactly this gap in interpretation which has been already several times detrimental to the United States in the past. We refer for example to the Russian announcements of the Sputnick 1, the first manned spaceflight in April of 1961, the construction and flight of a moon rover, etc. All these events had been announced in the Soviet press long in advance (and by official spokesmen). And these original

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notices appeared in several American congressional reports but were almost not regarded seriously by the American government as well as by the executive political bodies.

SCARE AND THREAT?

It is therefore not surprising that the people in Washington were continuously alarmed by the Russian "military" superiority; the actual Soviet events -- even when they occurred three to four years after having been announced -- presented the Americans with unbelieveable facts as well as painful moments. The Russians can play this game to the fullest, since they keep their time schedules secret while those of NASA, as a public government institution, are available to everybody. And when NASA plans to launch a certain spaceship on date X, then the Soviet Union will do its best to bring a similar vehicle in space at time X-1. The Russian cosmonaut Vladimir Komarov described at the time the moon race in the following way. In a Russian journal he wrote in 1965 regarding the coming moon flights:

> "The United States have (for the moon flight --Ed. S.V.) the formula 1969+X. But our formula is 1969+(X-1)." (ref.7)

The words indicate clearly that the Soviet Union follows the foreign programs with great interest and absorbs available information as a sponge. This is not something new; it has

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been happening for decades. Also, the memoirs of Alexander Romanov, the cosmos correspondent of the state information office TASS, indicate this. In an interview with Sergey Korolev, the engineer-director of the Sputnik program, he mentioned the detailed reports which he received about the preparations and plans of the Vanguard project of the Americans in 1955. And after having read these reports his team proposed to the party leaders to launch before the expected take-off date of the first Vanguard their own produc with a weight of approximately 100 kg (ref.8). And so happened

USSR: CURIOUS

The information regarding foreign procedures and plans, and especially the timing, has been collected in the Soviet Union for years by a gigantic translation institute of the Academy of Sciences. The institute, called VINITI (Vsesoyuznyy Institut Nauchnoy I Technicheskoy Informatsii = All Union Institute for Scientific and Technical Information) and resorting under the Ministerial Soviet with the rank of State Commission, is located in Lyucertsy, a suburb about 5 km southeast of Moscow on the road to Ryazan. And through this institute the Soviet Academy of Sciences enjoys at this moment without doubt the numerous technical delicacies

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which the Western system, because of the freedom of the press, offers to the VINITI almost at will. All pieces of information of any importance in the foreign press are collected by the embassies in foreign countries and transformed in the VINITI in useful reports for scientists and politicians. And according to abstracts from SPACEVIEW which we receive translated in Russian from VINITI even our own journal is regarded as reliable in the area of space exploration. (ref.9) In this way all interested members of the Academy of Sciences are probably informed in detail about NASA and ESA activities in the area of space shuttle and space lab. And if questions remain about technical construction details which have not yet appeared in print, then these matters can always be discussed informally at one of the annual international conferences of the IAF (International Astronautical Federation).

CONFERENCES AND THE KGB

These exchanges do indeed take place between scientists and designers from East and West. Regardless of the large distances, the differences in philosophy, way of life and language, this type of conference is a good place for the exchange of ideas. This to the great displeasure of a Mister Semen Kuzmich Tsvigun, the first assistant president

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of the Russian State Security Service, better known as the KGB. Tsvigun has expressed the opinion in a Russian monthly in 1971 that as few as possible Soviet scientists and technicians should be sent to conferences in foreign countries since moments of unguardedness always may occur which an active westerner may use to his advantage and places the Russian in question in a difficult position, which can bring great danger to the secrecy of the large space and defense projects. It is not necessary to state that Tsvigun is the chief of the directorate for the promotion of this secrecy (ref.10). And from this position Tsvigun is the chief censor of aerospace information (ref.10A).

PATIENTLY OBSERVING

We have -- perhaps with more attention than others -paid attention to the minimal Russian announcements during all these years and have collected the tens of declarations of spokesmen. And these activities brought us in 1971 to the conclusion that a serious and large-scale effort in the area of shuttle systems existed in the Soviet Union already at that time. One of the factors supporting our conclusion was, for example, the fact that a whole series of Russian technical books discussed the shuttle technology

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extensively. In addition to carefully recording the developments in America they always treated in much more depth the one aspect which NASA had not selected because of the cost aspects, i.e., the totally reusable shuttle (ref.11,12,13,14).

In addition a series of technical treatises started to appear at the same time (1971/19172). These were published by collectives of Soviet scientists and were presented at various international conferences which were organized by the IAF (International Astronautical Federation), by COSPAR. (Committee on Space Research), by the IFAC (International Federation of Automatic Control) and by the ICAS (International Council of Aeronautical Sciences). In this case a certain pattern emerged. The titles, authors and abstracts were published at the time of the conference in question, but the presentation was cancelled at the last moment by the Russian delegation. The contents of the short abstracts published in the program books provided however partial information regarding actual shuttle problems. It was not possible to ask the authors for more information because they were not present at all or could not be found on the day of the presentation.

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Three coverleafs of Russian books treating space shuttle problems. These title pages indicate clearly that also in the Eastern Bloc this subject enjoys great interest. The drawings indicate however that it is not the NASA concept which is prevalent (partially reusable) but more the totally reusable systems.

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Multiple-Use Rockets I.I. Anureyev R. S. ELETTICE

PANKETTER WINGT DIRECTORS MCCTORESSERVER



The coverleaf of the book by Igor Anureyev (Voyenizdat 1975) does not leave room for doubt: his book contains a detailed study of all American shuttle proposals based on total reusability (booster as well as orbiter). It seems that he is particularly enthralled by the technically very advanced proposal from the now defunct Boeing/Lockheed team, a system which has been adopted for a large part by the Russian shuttle designers. Many Russian popular science journals have discussed the Boeing/Lockheed design extensively and regard it as the only "sensible" system. The bay area however was always filled with passengers instead of satellite cargoes.

KOSMOLET IN AMSTERDAM

During the last six years however some information became available at these conferences. We will discuss this at a later time.

To return to the Netherlands, one should remember the fall of 1974 when Holland served as host country for the 25th Conference of the International Astronautical Federation which took place from 30 September to 5 October in the RAI conference center in Amsterdam. In addition to planned presentations by Soviet participants concerning shuttle-type vehicles which had been kept as vague as possible (and were not presented in full anyhow) a press conference was held in the current-events section to discuss Apollo-Sojuz aspects. There cosmonaut Alexei Leonov gave somewhat "harder" information about a Russian space-plane. Since a question was not well understood by Leonov and since Gerton van Wageningen (as moderator of the press conference) was not familiar with the technical content of the question, the Russian press-attache Gennady Salin asked SPACEVIEW for the Russian term for the concept "shuttle." And when the concept (TKK or also kosmolet, a contraction of Kosmicheskiy samolet) and the questions were put to Leonov

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he stated very explicitly that the Soviet Union had been working for quite some time on such a system. Since mainly photoreporters and conference participants were present at the small press conference who were more interested in photographs and signatures because of Leonov's future Soyuz Apollo activities, the statement was not heard by most of those present (ref.15). The news was eventually made public in the English language press, but only several months later in the monthly journal, Spaceflight. In the February issue of 1975 an extensive report was given about the whole conference. On page 43 it was pointed out again how the Russian way of reporting was akin to concealment. The writer of the article, probably Kenneth Gatland, reported as follows "He (Leonov -- ed. S.V.) confirmed also that the Soviet Union is working on a space shuttle. In this respect it should be noted that the Russians use the word shuttle only rarely and exclusively when they are referring to the Western vehicle of that type. With respect to their own design and experiments (on a similar vehicle) the Russians use an equivalent of the concept "transport vehicle" or "transport apparatus," which includes also the concept of a space tug. This terminology, which is so misleadingly general in english but which is systematically used in the Russian literature, may be cause of the unfamiliarity in the Western world with the Russian

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publications in this area. It comes down to a consistent disinterest for these publications since they do not seem relevant to space engineering." (ref.16)

AMERICA: NOT AN OPEN EYE

Leonov's statements in Amsterdam about the kosmolet did not receive the attention they deserved. The few spacearea correspondents present did not have the required background information and language ability to follow the discussion and to realize the importance of Leonov's contribution. And the Westerners who did have these capabilities could not do much with the statement since revealing pictures or authentic Russian sketches were not available. In this way the news would get at most two or three lines in a forgotten corner in a journal. And although this statement was another drop in the bucket, the American analysts in the area of east block technology were not yet seriously interested in these developments. Analysts like the chief of the department of foreign technology of the Library of Congress, Dr. Charles Sheldon; or USAF Captain James Oberg, connected with the American shuttle program at the Johnson Space Center; or Charles Vick, designer of Nuclear Power Plants for Bechtel

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At the end of the first day of the XXVth IAF conference in Amsterdam the so-called "current events" session was held for a small group of interested persons on 30 September 1974. The Apollo and Soyuz commanders Stafford and Leonov were present. After the unavoidable ASTP questions there was still time for "future expectations." Stafford talked about the shuttle, after which Leonov confirmed work being done on an analogous system. From L to R on the photograph: Press representative Gerton van Wageningen, NIVR-president (and ret. gen. R.D.A.F.) Albert Wolff, Brig-Gen. Thomas P. Stafford and Col. Alexei A. Leonov. (Photo SPACEVIEW). Engineering: all these did not really believe in the actual existence of an East Block shuttle program, even though its necessity was clearly recognized. The old hints which were present in previous Sheldon analyses were probably completely forgotten.

UNBELIEF IN AMERICA

Nevertheless, the rumors became louder and louder. The large groups of specialists from NASA and from the Academy of Sciences which met with each other on a regular basis during the preliminary meetings about the ASTP program sometimes made some disclosures. More direct impressions were obtained however by the Western space press in the Moscow ASTP press centrum in Hotel Intourist. And it was especially the American journalists who were surprised because at no time and not in any way was it ever mentioned at home that also the Soviet Union was working on a shuttle program. Notwithstanding all these unconfirmed rumors coming straight from the Eastern bloc, the predominant American trade journal Aviation Week did not pay any attention to the recurring hints. In the column "Industry Observer" in the AWST issue of 11 August 1975 the journal reported: "There is no proof of any kind of development of a reusable space

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Three of America's most well known analysts, responsible for interpretation and publication of Soviet space activities. FLTR: Charles Sheldon II, transport specialist of the Library of Congress, USAF Captain James Oberg, and energy-engineer Charles Vick. The special meeting in 1974 in Sheldon's office on Capitol Hill of this "mini-thinktank" was devoted to future trends in the Soviet space program, in which the Russian superrockets Proton and Lenin held a central position. A Soviet shuttle vehicle was not considered a realistic project. (Photo SPACEWORLD) vehicle, such as a space shuttle, at Turyatam. The Soviets have however constructed a new launching complex and a new R and D complex on the site (ref.17). And this report, planted by government sources, is all that ever was published in Aviation Week. The possible existence of a Russian shuttle is therefore completely disregarded to this day, at least in America.

X-1 APPROACHING?

The Moscow planners, without doubt, follow closely the development of America's Space Transportation System. All critical arrangements between NASA and ESA have been made, and the flight schedules for the coming years have been set, with the exception of a few details. If everything goes according to plan, the Shuttle Orbiter 102 will be launched around 17 March 1979 from launch complex 39A at the Kennedy Space Center; 21 years after the launch of Vanguard I. Perhaps on 14 March 1979, exactly one century after the birth of Albert Einstein (ref. 18,19), SPACEVIEW expects, that in Moscow the cards are being shuffled again. We expect, that not too long from now Day X-1 will occur. And again the United States will be awakened out of a beautiful dream. But let's not say too much too soon....

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AMERICAN ANALYSES

We were, after all, able to obtain a general chronological summary of the most important official Russian statements concerning the plans and/or construction of a space shuttle vehicle out of the extremely complete reports of the very experienced top analyst in the area of Soviet technology and transport systems, the American Dr. C. S. Sheldon, department head of the Library of Congress in Washington, D.C. But before we discuss his analyses further, we should explain a little bit more about the gigantic information apparatus and the procedures of his department, the so-called CRS/SPRD/LOC, or in full the Congressional Research Service, Science Policy Research Division, Library of Congress.

THE LIBRARY OF CONGRESS

The Library of Congress is actually the memory of the United States government, responsible for accurate political, technical, and civilian information about more than a hundred countries, and is therefore (similar to the VINITI institute near Moscow) the largest databank in the world. We will restrict ourselves to the technological branch, the Science Policy Research Division, only a part of the Library but nevertheless by itself a gigantic library

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covering the area of international technological developments. Similar to all other library departments the information system is based mainly on the fact that many automated index systems are used and that in addition a gigantic budget is available for the acquisition of all kinds of foreign written and printed publications. In addition to thousands of foreign sources, the Library of Congress enjoys the active support of the United States embassies. In these respects it keeps up with the VINITI.

This covers, however, only one part of the information available, since another part consists of the analysis of the spoken word. Reception and processing of this is taken care of by another American government institute, the Foreign Broadcast Information Service (FBIS). As a kind of counterpart to "The Voice of America," this information apparatus could best be called "The Ear of America." The essential project description of this institute is to record on tape day and night all (important?) public radio and TV programs broadcast anywhere in the world. The tapes are typed out and arranged according to subject and country, and photocopied summaries of the texts are subsequently forwarded for analysis to the political executive

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organizations, and therefore also to the "Memory of America," the Library of Congress. The SPRD in this way has available a complete collection of written and spoken references concerning foreign technological developments and activities.

DR. SHELDON, CHIEF SPRD

After being employed in a logistics function by the Department of Defense where he was responsible for the wartime material transportation over the Pacific Ocean (1940-1955), Dr. Charles Stuart Sheldon II accepted a position with the Legislative Reference "arvice (precursor of the SPRD) of the Library of Congress. That was at the end of 1955. Because of his interest in the actualities of the East Block economy and transport systems during those years (the height of the cold war) Sheldon had within the LRD the function to study the Soviet economy. This first report on this subject was published in 1957 with the title: "Soviet Economic Growth." Subsequently there came a period of general hysteria. The Russians launched a satellite, Sputnik I, of at least 83.6 kg. Was that possible at all? Was the period not printed in the wrong place? Was it propaganda?

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Not at all. A stunned America could hear the first earth satellite pass overhead emitting beeps at the announced frequency, in a trajectory which required a rocket with a capacity of at least 20.4 times the power of the American Vanguard rockets. To Dr. Sheldon's department was given the additional duty to anticipate this kind of unfortunate event in the future and to evaluate relevant information. The same surprise occurred with the Luna-1 moon mission in January 1959.

During a reorganization of the Library in 1966 the Legislative Reference Service was transformed into the so-called Science Policy Research Division, of which Dr. Sheldon was appointed chief (ref.20).

ANALYSES AS STANDARD REFERENCES

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Since that time Sheldon has become very active. Initially he treated the Russian space effort, with its rational series construction methods and standardization, as an area of private study covering the efficiency of transportation systems. Later he added it as a hobby to his regular work, supported by the immense sources of his library department. The first reports, issued around 1959, were not more than selected and rubricated translations of East-bloc

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Dr. Charles Stuart Sheldon IT's first space activities included the drafting of the NASA Statute in 1958 as well as the law covering communication satellites of 1962. Sheldon was until 1961 the technical director of the House Science and Astronautics Committee, and subsequently until the end of 1966 a staff member of the President's Space Council under Kennedy and Johnson. Since 1955 he has been a member of numerous aeronautic and astronautic societies in the Western world. reports, but in 1967 he published complete analyses, including identifications of the tens of flights of the Cosmos series. Since 1959 more than 25 reports and treatises were published by Sheldon covering the development and rationalization of rocket transport systems in the Soviet Union. His best known work is without doubt the penetrating analysis of the classification of Russian launch rockets; the well-known A-B-C identification system which is generally used in the Western world since 1968 (ref.21).

That success formed the basis for Sheldon's further work. Since his studies clearly identified trends and directions of development in the Russian space program and thereby contributed to extremely interesting discoveries, he was allowed to make his "hobby" his official line of work. Since that time the reports have been published under the auspices of the SPRD and they were almost immediately sold out by the Government Printing OFfice.

SEARCHING FOR A SOVIET SHUTTLE?

In his second official study, entitled "Soviet Space Programs 1966/1970," Sheldon analyzed all specific space-

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technological trends to study the five-year plan (ref.22). The concept, involving thousands of pages of typed manuscript, was finally finished in the spring of 1971 and the preparation for printing took half a year. When the book was printed in December of 1971 it still contained about 700 pages. In Chapter 10, with the title "Projections of Soviet Space Plans" (Section C, paragraph 4, pages 356-357), Sheldon referred to Russian opinions regarding the gigantic waste of launch rockets useable only once and to the continuous interest in that problem from the part of Russian designers. Sheldon wrote as follows:

"One of the most urgent questions regarding the future directions of the Russian space program concerns the timetable of the development of reusable shuttle vehicles which are equivalent to the proposed American space shuttle.

There are numerous statements which suggest that the single rockets are regarded as obsolete and that their (the Russian's) ultimate objective -- economical space transportation -- will only be realized by introduction of reusability, so that this type of development

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can be expected in the design of future vehicles. The critical question however is: When? There does not seem to exist a not-secret way to obtain the answer to this question, unless, of course, the Russians tell us so, but this will probably happen only after such a vehicle flies outside of the territorial boundaries of the Soviet Union. Only then, during the reentry of that vehicle, be it on home ground or somewhere else, will it reveal its descent trajectory to the earth. This trajectory will be an indication of the degree of maneuverability and of the value of the "lift to weight" ratio which are connected with the degree of reusability. Taking into account the large scale of the Soviet space program it may be a good investment to make the necessary capital available for the design of such a vehicle. It will be of great interest to search in the (Russian) trade journals for possible indications as well as for test programs which might throw light on this matter."

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SUFFICIENT INDICATIONS!

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During the past twenty (!) years tens of concrete indications have appeared in the general press and in the trade journals. Somewhat hesitatingly in the first years but much more concrete later on. These reports were probably supported by scant details from the initial study reports or perhaps even by experimental results. A long history, one might think, especially when the vehicle itself does not yet exist. But the last two decades have been years of an active phase of brainstorming and wishful thinking, during which analyses were made continuously of the future value and use of technological achievements like rockets, airplanes, and plussonic transport. In one of the following SPACEVIEW issues we will discuss these problems and the history of the shuttle idea in detail. At this time, however, we will give a short review.

HISTORICAL SHUTTLES

The science fiction of a reusable space transport vehicle started actually already in 1933. The basic idea -transportation to and from space -- can therefore not be regarded as new. The Austrian Dr. Eugen Sänger described such a vehicle long ago in his thesis "Rakettenflugtechnik."

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On the basis of Eugen Sänger's idea the Nazis designed tens of future space weapons, but after the end of World War II the space bomber became again (temporarily?) a civilian project. Peenemunde commander Walter Dörnberger was hired by Bell Aerosystems. When there he published, in 1955, his detailed study of a shuttle. The Dörnberger shuttle could carry freight and/or 30 passengers to any desired point on earth within the hour.

Photo: BELL AEROSYSTEMS

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Dr. Sänger imagined a somewhat more militant version, e.g. a space bomber. His, design had (and still has) great value. Sanger had in mind a space bomber which first would be launched to great heights and then, when gliding, would be reflected again and again on the denser atmospheric layers because of its speed, similar to a flat stone on water. Maybe it was a worn-out idea, but even today it is still an extraordinary design. Sanger's bomber, skipping on top of the atmosphere without needed motor power, would be able to attack cities at the other end of the world. This gave the project its better known name of "Antipodal Bomber" (ref. 23,24). At the time of Hitler's Third Reich the design was seriously studied in Peenemunde and by the war industry. This sciencefiction design of the future has since that time been in the mind of Dr. Walter Dornberger, who at the time was director of Peenemunde.

(9) After he was brought to the United States he was assigned the

task of making an inventory of all the future plans which the Germans had not been able to finish. Dornberger was offered a leading position at the design plant of experimental rocket planes, Bell Aerosystems, and continued there his work on the shuttle idea. He made his plans finally public in 1955. A space transport plane with a capacity for

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thirty people could in principle be regarded as a future possibility. But rockets were still unreliable and the commercial airplane industry was more interested in supersonic transport (ref. 25,26).

EARLY SOVIET INTEREST

Sänger's plans were not unknown in Moscow. On 18 April 1947 a State Commission for rocket weapons was installed which had the task of collecting as much bounty as possible from Hitler's Reich. The "tour leader" of these annexation expeditions was Lt. Colonel G. A. Tokaty who had the honored task to also take Sänger in custody and to deliver him safe and sound in Moscow. That action took place in August of 1947. But Sänger was not home in Berlin. The French occupation forces had tracked him down sconer and Sänger worked from that time on for the French government (ref. 27,28).

Cololel Tokaty especially remembers the two-day conference of General Staff members, directors of weapon factories and of the chief designers of airplanes and rocket weapons which took place on March 14 and 15, 1947 in the Kremlin in the offices of the Politburo and the Council of Ministers. (ref.29).

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The first schematic (but official) representation of a Russian shuttle was presented to the West on November 7, 1957. It shows a carrier plane, probably planned as reusable booster, with turboramjets in the wings and liquid fuel rocket motors in the parallel fuselages on which a two-stage rocket is mounted. The explanation with the film indicated that this kind of rocket vehicle was planned for the launching of a "radio-tank" to the

moon. The radio-tank indeed came into existence, although about 13 years later: Lunokhod-1.



According to the memoirs of Tokaty, Stalin addressed the group as follows:

"In Hitler's time the German scientists have developed many interesting ideas. This Sanger project seems to be one of them. Such a rocket could change the aspects of a war. Do you all understand the enormous strategic importance of such machines?"

Stalin then proposed to create a State Commission for Science and Technology which would occupy itself mainly with this kind of problem. The council of Ministers approved the proposal and since that time a workgroup has been studying the possibility of vertical take-off one-and multiple-stage rockets while another workgroup occupied itself with the horizontal (airplane-type) projectile approach. All this takes us into the fifties already . . .

ANNO 1955 . . .

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Even before the Soviet Union launched the first Sputnik, discussions took place at a high level concerning the construction of an optimal launch system. One had to face the choice between the construction of a reusable rocket system or the use of already available "throw-away" rockets.

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Since very little was known at that time about space itself -its properties had not yet been determined experimentally -the most obvious solution was chosen: It was decided to use for the time being ICBM's, available from the military, as one-time usable rockets for satellite launchings. It was expected that after a number of years a sufficient amount of theoretical knowledge and practical experience would have been obtained to work out the other proposed project. The project group "Reusable Cosmic Vehicle (TKK)" continued its studies however. In this group were represented the chief designers of the airplane companies, Tupolev and Mikoyan, rocket designers and designers of rocket and airplane motors like Kurnetsov, Isayev, and Kosber.

The results of their preliminary study involved a carrier plane as the first stage which after its mission was completed could return to earth as well as two rocket stages which could boost the payload in an earth orbit.

The design (dated approximately 1956) displayed a lot of vision. The first stage, the space plane, consisted of a supersonic airplane which was envisioned as a parallel fuselage section with eight jet motors, a kind of early SST.

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Another Russian drawing of a preliminary shuttle design. The A-shaped flying wing with a battery of hypersonic motors separates in the background from the orbiter; it is actually a scaled-up version of the hypersonic jet fighter (Mach 5-12) which was proposed at the time by "Republic Aviation" and would become known by the name "Scramjet." In the foreground a not yet separated booster/ orbiter combination.

From: KOSMICHESKAYA AVIATSIYA



At that time supersonic transport planes were still a far-away goal, although it had attracted the attention of the Western press (and therefore also of VINITI). Since the actual launch movie of the Sputnik I was still a state secret of the highest classification, the TKK project was included as an animated movie in the official Russian documentary about the flight of the world's first satellite. The movie was released at the occasion of the 40th anniversary of the Russian revolution, 7 November 1957, in the Moscow news theatres and for TV, and one could call this the first "official" announcement of a shuttle.

TECHNOLOGICAL BARRIER

After that period, the actual development and the design of shuttle plans in the USSR stops for awhile. It becomes evident that there exist big gaps between plans, possibilities and eventual reality. Estimates of "20 years from now" do not seem unrealistic. At this time, the world is just changing from propellor planes to modern jet planes, and the efficiency of jet motors is not yet something to boast about. It is therefore not considered realistic to talk already about hypersonic rocket planes. First it will have to be

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shown that the plans for large supersonic airplanes which surfaced in the West around 1956 are indeed realisable. Also, the nuclear powered airplanes for space travel remain pure fantasy.

SKB-TKK + OKB/MIKOYAN

The next information on a regular basis about reorientation with respect to a space plane starts to dribble from Moscow in 1962. It seems that the technological barrier of heat technology, shock waves, and supersonic flight has been overcome. According to several sources the airplane designer and Air Force Colonel-General Artem Ivanovich Mikoyan accepted in 1962 the challenge and put the work group "Special Projects" of his design office at the drawing boards. His office is probably not the only one which delivers a number of designs to the "special office for the study of a space plane" (SKB-Kosmolët) which was created in Moscow.

The office, which probably is a branch of the central technical university for aero technology (TsAGI), has in mind a reusable, maneuverable space plane which can reach cruising speeds of Mach 6-8 (ref. 30,31).

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SHELDON'S NOTES

At this point it will serve us well to review Sheldon's notes of East European radio and TV announcements and journal articles. We already cited his main publication which is given as reference 22 in our list of sources. From Chapter 10, Projections of Soviet Space Plans, of this study published in 1971, we have selected those items which in our opinion clearly indicate the early interest from the side of the USSR in the subject of the shuttle. In this chapter, Sheldon put together several hundred short news items which reached the West through his department. The following are total or partial citations from items collected by him in ref. 22: Chronology 1964-1970 (pages 360-381). C

1. Rocket designer Petrovich (Prof. G. V. Petrovich = pseudonym for Prof. Glushko Valentin Petrovich -ed. S.V.) declared that in the future nuclear rocket motors will be used, and that electrical propulsion will be commonplace for the final stages of planetary missions within a few years. Space vehicles with wings will be constructed which make a gliding re-entry and perform a soft landing by means of their own maneuverability (ref.32).

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2. Rocket designer Petrovich reported in Aviatsiya and Kosmonautika that before the end of the seventies a space vehicle will be launched which will weigh more than 400 to 500 tons. "Only in this way will it be possible to place manned space laboratories, multidisciplinary stations, and interplanetary ships in space" (ref.33).

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- 3. Cosmonaut Titov reports that designs exist for payloads between 400 and 500 tons, as well as for returning space vehicles with retractable wings which can fly back to the cosmodrome and make a soft landing (ref. 34).
- 4. Professor Pokrovskyi (Prof. Dr. Georgyi Iosifovich Pokrovskyi; major-general engineering -- technical services/Engineering service; since about 1956 one of the leaders of the space program -- MH, ed. SV) predicted the future link-up of large space vehicles which can form an orbital launch platform. From this platform it will be possible to launch interplanetary "trains" (ref.35).

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- 5. Cosmonaut Feoktistov discussed a series of current problems, in part concerning the effect of aerodynamic lift during re-entry and orbit-toorbit shuttles. Feoktistov suggested the two most promising propulsion systems for these orbital transfer vehicles for manned planetary missions. He had in mind plasma or ion motors (ref. 36).
- 6. Academy member G. Petrov. (Georgyi Ivanovich Petrov, at the time director of IKI, specialist in gas dynamics and member of the IAF - ed. SV) declares that he sees a better future for passenger flights by rocket transport than by supersonic airplane. One hour would be sufficient to travel nine to twelve thousand miles (15000 to 20000 km). Heat protection would not be required in the deep vacuum of space. The launch could be vertical with air-breathing engines, while later in flight at higher altitudes a switch to rocket motors is made (ref. 37).
- Cosmonaut Titov announces the future arrival of a series-production "aerospace plane" which will be

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used for shuttle flights to an orbit and will return to earth on a normal airfield. The first series of vehicles of this type will have two manned stages. Only later, when motors can be built with a specific impulse of 500 seconds, a one-stage reusable system will be put in service (ref. 38).

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- 8. Cosmonaut Popovich predicts that the future manned orbital stations will be resupplied by so-called "boost-glide" vehicles which take off from and return to normal airfields. Passengers without special training could eventually be transported. These vehicles are the key to the assembling of stations in orbits around the earth before these are sent on interplanetary missions (ref. 39).
- 9. Cosmonaut Belyayev predicts that it will not longer be necessary to search for future spaceships in the stepps since they will land like airplanes at cosmodromes which are located not far away from the launch site (ref. 40).

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10. Air transport specialist Nikolayev (probably V.S. Nikolayev - ed. SV) reported that it is a very complicated task to design a space vehicle which takes off horizontally from an airport and returns from orbit to an arbitrary airport. He described the American experiments with lifting bodies but says that in the Soviet Union a different approach is preferred. This approach involves a two-stage ship with three rocket motors in the first stage and one in the second stage, all of which use liquid hydrogen and oxygen as fuel. When the initial acceleration is provided by a booster or a carrier plane (compare 1933: Sanger's antipodal bomber! -- ed. SV) then one vehicle (i.e., the "orbiter") of 150 tons is sufficient. (As comparison: The supersonic transportplane Tupolev 144 weighs 180 tons in the present form -- ed. SV). In addition Nikolayev describes a second vehicle as a variation of the horizontal starter mentioned above. Variant 2 also uses a liquid oxygen/hydrogen combination but has a total of 6 motors. The first stage makes a ballistic return to the place of origin.

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The second stage, with a payload of 3 tons of instruments, delivers this equipment to a permanent orbital station. Nikolayev emphasized the problems of determining the proper re-entry characteristics to dissipate the maximum heat generated during the re-entry phase (ref. 41).

Engineers Andanov and Maksimov (the last one is 11. Gennadiy Yuryevich Maksimov, one of the most prominent designers of space vehicles at the O.K.B. of S.P. Korolev since 1958 -- ed. SV) describe several future Russian space stations. The stations, constructed on earth, are with respect to their design, weight, and shape restricted by the power and shape of the booster rocket, but the size of a station assembled in orbit is in principle unlimited. This assembly can take place through automatic couplings or by cosmonauts. The larger stations must be used during several years by crews and will therefore be difficult to maneuver. It has to be evaluated which is the most acceptable situation: the dangers of the radiation belts compared to the

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(12)

friction of the upper layers of the atmosphere and the lift capacity of the launch vehicles. The inclination of the trajectory will also be affected by the mission. Reusable space shuttles will be necessary by that time to resupply and exchange crews (ref. 42).

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12. The scientist Nikolayev has discussed in detail the future of large manned space stations. He envisioned a special requirement for the addition of artificial gravity to the existing concepts. But at the same time it will be necessary to reduce the Coriolis effect. That can be done by applying a slow rotation to two stations which have been connected by a long cable. Nikolayev also emphasized the necessity of evacuation during periods of increased sun activity. As the plans become more elaborate, more station sections will be coupled together. In the final stage these station sections will be put in orbit by a reusable space taxi. Scientists without cosmonaut training will be passengers on these trips (ref. 43).

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- 13. Party secretary Brezhnev gives an elaborate speech over Radio Moscow after completion of the Soyuz 7/8/9 missions. Two years later cosmonaut Nikolayev reviews the essential points of this speech in the Krazhnaya ²/₂vezda. Brezhnev said: "Our scientific effort has reached the point where permanent orbital stations and space laboratories are created. The Soviet scientific community regards the creation of large stations, with exchangeable crews as the main endeavor of man in space. The stations can become cosmodromes in [space and serve as launch platforms for flights to other planets. Station sections can be used for the study of space technology, biology, medicine, geophysics, astronomy, and astrophysics (ref. 44,45).
- 14. Cosmonaut Beregovoy communicated that the characteristics of future space projects become more and more defined and can now be evaluated better because of the appeal of manned orbital stations. Each new phase is planned to provide maximum advantage. In the near future special aerospace planes and transport rockets will reduce the distances between the continents (ref. 46)

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END OF FIRST PART

We will cut off our list at this point because we do not want to overwhelm you with the tens of economic and technical publications and references which we also would like to present. Our list of references approaches the number fifty and that is a good place to stop for the time being. We will conclude by announcing that in one of the following issues (and possibly already the next) the second and for the time being the last part of this article will be published. That part will describe the activities of the Soviet Union from 1970 until today in the areas of the space shuttle.

We conclude therefore with a final magic figure; an artist's impression, not before published outside the Soviet Union, of their shuttle (TKK). But as we have said, (much) more about that next time

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"ALBATROS," the present version of the Russian shuttle as it was sketched in approximately 1970. More about this subject in a following issue of SPACEVIEW.





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