DEPARTMENT OF DEFENSE
OFFICE OF FREEDOM OF INFORMATION
1155 DEFENSE PENTAGON
WASHINGTON, DC 20301-1155

23 SEP 2014

Ref: 14-F-1331
DTIC # 2014-183

Mr. John Greenewald
[redacted]

Dear Mr. Greenewald:

This is the final response to your Freedom of Information Act (FOIA) request to the Defense Technical Information Center dated August 13, 2014, and received in this Office on August 26, 2014, along with 282 responsive pages. The enclosed 282 pages are provided as responsive to your request, a copy of which is included. The pages are being released without excision. Inasmuch as this constitutes a full grant of your request, I am closing your file in this Office. There are no assessable fees associated with this response.

Sincerely,

for Charles P. Mangye

Paul J. Jacobsmeyer
Chief

Enclosures:
As stated

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

AD-B176 332

1 AGENCY USE ONLY (Leave blank)	2 REPORT DATE	3 REPORT TYPE AND DATES COVERED
	1 Jul 86	Final. JULY 1986

4 TITLE AND SUBTITLE
SOVIET VIEWS ON MILITARY OPERATIONS IN SPACE

5 FUNDING NUMBERS
C: E-9096

6 AUTHOR(S) J. Kipp et al

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Ctr. for Strategic Technology
Texas A&M Univ.
College Station, TX 77843

8 PERFORMING ORGANIZATION REPORT NUMBER
SS86-1

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Office of the Secretary of Defense
Office of the Director of Net Assessment
Rm 3A930, The Pentagon
Washington, D.C. 20301

10 SPONSORING/MONITORING AGENCY REPORT NUMBER
86-2565

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
E. Distribution authorized to DOD Components only, DIRECT MILITARY SUPPORT, 1 JUL 86. Other requests shall be referred to ~~OSD/Net Assessment~~

12b. DISTRIBUTION CODE

13. ABSTRACT
Studies Soviet reaction to the Strategic Defense Initiative (SDI).

14 SUBJECT TERMS
Soviet Union Strategic Defense Initiative

15 NUMBER OF PAGES
280

16. PRICE CODE

17 SECURITY CLASSIFICATION OF REPORT	18 SECURITY CLASSIFICATION OF THIS PAGE	19 SECURITY CLASSIFICATION OF ABSTRACT	20 LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	SAR

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)

SOVIET VIEWS ON MILITARY OPERATIONS IN SPACE

Jacob W. Kipp
Alfred L. Monks
Joseph J. Muniz
Kevin D. Stubbs
Richard E. Thomas
Ronald J. Wright

Soviet Views on Military Operations in Space

Jacob W. Kipp
Alfred L. Monks
Joseph J. Muniz
Kevin D. Stubbs
Richard E. Thomas
Ronald J. Wright

STRATECH STUDIES SS86-1

Stratech Studies Series

This study was prepared for Battelle Memorial Institute under Purchase Order No. E-9096. The views, opinions, and findings contained in this report are those of the authors and should not be construed as an official Department of Defense position, policy, or decision, unless so designated by other official demonstration.

Published by the Center for Strategic Technology, The Texas Engineering Experiment Station of the Texas A&M University System.

College Station, Texas
July, 1986

Table of Contents

Foreword

On 23 March 1983 President Ronald Reagan described to the nation and the world his intention to direct the U.S. military to undertake a program of research to investigate the feasibility of developing and deploying a system to defend the United States and its allies against attack by ballistic missiles, a so-called Strategic Defense Initiative (SDI). Looking back over the 2 1/2 years since that pronouncement, it seems fair to say that, at least in this writer's memory, no other single event, save perhaps the bombing of Hiroshima, has stirred so much reaction among military, political, academic and scientific leaders not to mention media representatives, around the world.

Even though it was and is a research program, many people concluded that the weapons systems being considered either existed or were just around the corner. Might these non-existent systems be used as "bargaining chips" in arms control negotiations with the Soviet Union? Should we deploy them? How effective a shield would the SDI provide?

Feasible or not, the Soviets saw the SDI as an effort by the U.S. to seize the technological initiative and to create a force which, if workable, would negate the major elements which undergirds Soviet claims to superpower status, its substantial array of long and medium range land-based and submarine-based ballistic missiles. Suddenly, the "ultimate" offensive weapon of the 1950's had been overtaken by new defensive technologies of the 1980's.

Realizing that such a concerted effort by the U.S. would quickly surpass their own lead in space and ballistic missile defense and that they would be left in the technology dust, the Soviets mounted a tremendous

political campaign to stop the SDI. They played on divisions in the Western Alliance, using the SDI as the means for further driving the wedge between the U.S. and Western Europe. They quickly recovered from their pouting spell over the Pershing II/cruise missile deployments in Europe and returned to the negotiating table. Gorbachev leads the effort to intimidate the West by calling the situation "explosive" as he prepares for a summit meeting with Mr. Reagan.

It is, of course, important for the U.S. to assess Soviet views on strategic defense systems and, in particular, to separate form from substance, not an easy task when Soviet writings and pronouncements are so affected by maskirovka.

In the Spring of 1985 the Center was asked to investigate Soviet literature dealing with space and ballistic missile defense in order to identify the major avenues along which the Soviets were moving. It was also important to determine if Soviet plans were affected by the SDI.

Since, in the centrally-directed Soviet system, military doctrine provides the primary framework for establishing requirements, both organizational and technological, it was appropriate to review doctrinal writings as a basis for understanding how the Soviets were developing their "SDI." Of equal importance was the study of ways the Soviets might counter the U.S. defensive effort.

The Center was fortunate to be able to enlist the aid of two pre-eminent Sovietologists, Dr. Jacob Kipp and Dr. Alfred Monks. Dr. Kipp, our old friend and colleague, is broadly knowledgeable regarding historical and current trends in the Soviet military especially in matters relating to operational art. Dr. Monks, just prior to his coming to the Center as a

Summer Fellow, had authored a book on Soviet military doctrine. Both are fluent in Russian.

The other member of the basic research team was the writer and engineer whose recent research dealt with various elements of Soviet military technology, particularly sensor systems and long-range missiles.

This interdisciplinary team of senior researchers functioned in an almost classical way, each reading and analyzing the literature and synergizing his colleagues in our frequent meetings. Support in locating and organizing the literature was ably handled by Ronald Wright and Kevin Stubbs, both doctoral students in the Department of History and by two undergraduate students, Joseph Muniz (history) and Rob Gest (aerospace engineering). Wright, Stubbs and Muniz authored a section of the study which actually came about as a follow-on effort after the completion of the main study.

An effort such as this cannot come to fruition without the assistance of many other people. Lisa Zalmanek and Jessica Duran typed the drafts and Melinda Lindsay oversaw the preparation of the final manuscript.

To all of you I must say, "Well done!"

Richard E. Thomas
July, 1986

Acknowledgement

This study was conducted under Purchase Order No. E-9096 with Battelle Memorial Institute of Columbus, Ohio. The contract monitor was Dr. Ben Freudeureich whose assistance is gratefully acknowledged.

SECTION I

Overview

Dr. Richard E. Thomas

The objectives of this overview are (a) to recount for the reader the general goals of the research which formed the basis for the studies contained herein, (b) to attempt to identify some of the primary results described by the contributions and, (c) to discuss some of the implication's of those results.

It must be stated at the outset that in this Section the writer is attempting to describe in his own words the fruits of the efforts conducted by him and his colleagues during the Summer of 1985. Those works contained in the later Sections of this study deserve to be read in their entirety. However, some sort of integrated statement is needed, the responsibility for which is mine alone.

(A) Objectives

Our task, stated in its most elementary form, was as follows: study and describe the Soviet reaction to the Strategic Defense Initiative (SDI). That statement is, in that succinct form, somewhat misleading for it suggests the notion that as of 23 March 1983, when President Reagan announced his intention to pursue the SDI, the Soviets were confronted with something new and unexpected. That is not true.

The Soviets have been thinking and writing about space and ballistic missile systems, defensive, offensive, reconnaissance and support, for at least 20 years. Much of that literature is discussed and analyzed in the individual papers which comprise this report.

Therefore, part of our task was to assess the trends which existed in the minds of Soviet authors before the SDI was announced and to attempt to discern any changes which occurred after 23 March 1983.

Another part was to examine doctrinal and technological prospects for an "end run" by the Soviets around the proposed SDI systems which are

configured primarily for defense against ballistic missiles. While the Soviets might and probably will in the near term develop means for penetrating the SDI, they might also confront the US with a different threat such as the delivery of warheads using very high speed, i.e. hypersonic, cruise missiles flying deep within the atmosphere. Such missiles would require the development of ramjet engines to replace the currently used turbojet engines which limit speeds to about M=2.5. Aerodynamic heating at higher Mach numbers would also require the development of high temperature structures for such missiles. Soviet research literature dealing with these areas of technology was also examined.

As the research effort evolved it became clear that the notion of a Space TVD, a Space Theater of Military Operations, was a rather firmly rooted concept embracing Soviet military activities in space. Since the implications of that concept are rather important, the research team expanded its sphere of inquiry to include that topic.

This, then was the general framework of our investigation.

(B) Results

It is clearly truistic to say that all policies and actions undertaken by the U.S.S.R. are centrally directed -- that is the hallmark of Soviet-style Marxism. Access to the levers of power is closely controlled by the upper echelons of the Nomenklatura, the relatively small group which sits atop the CPSU, so that admission to that status is possible only to those whose basic principles are embodied in the phrase "of, by and for the Nomenklatura." As a result it seems to many that there are a few differences between Czarist Russia and the modern Soviet Union -- the

Revolution has succeeded only in bringing new "Czars" and their cronies to power.

Dr. J. J. Dziak and others believe that the central governing body in the Soviet Union is the Defense Council, an organization which appears to be comprised of representatives of the major power structures within the U.S.S.R. There is little doubt that the central direction for the Soviet military evolves from that group in the form of Soviet military doctrine. Doctrinal positions are usually reflected in the writings and speeches of high-ranking military officers but the parameters which influence doctrine are manifold and frequently are discussed in the debates, the "ordered ferment," to use another Dziak phrase, which percolate up through the system.

Soviet military doctrine evolves out basic assessments of political, perhaps geopolitical might be a better term, conditions and objectives as well as economic and scientific development. Threat assessment is clearly integrated into the deliberations but the resulting positions are simultaneously active as well as reactive. While statements of doctrine do not describe objectives per se, they do appear, as John Erickson has observed, serve to define requirements, including organizational and technical matters, which the hierarchy determines to be essential to the attainment of their goals.

In the process doctrine establishes a framework out of which flow strategy, operational art and, occasionally, new elements of military science, the system of knowledge defining the character and laws of war.

Soviet military writers have long been concerned about the impact of technology on future wars and they have made significant efforts to predict

its effect. In the years between the two World Wars, they foresaw the important role to be played by increasing mobile forces and firepower. The development of nuclear weapons, coupled with rocket-powered missiles led to the description around 1960 by the Soviets of the so-called "revolution in military affairs." As the pace of development of military technology has quickened over the past 30 years, military leaders in the U.S.S.R. including Svechin, Ogarkov, and others, have written, either directly or indirectly, about the existence of a technological initiative and that its attainment should be considered as a proper military objective.

Sensitivity to the role of technology in military affairs is perhaps best exemplified by a new Soviet Law of War which appeared in late 1983, after the announcement of the SDI. However, this statement was probably formulated before March, 1983, and should not be construed as a response to the SDI. It is,

> The development and shift in the methods of combat are dependent upon quantitative and qualitative changes in military technology, and upon the level of morale-military qualities of military personnel."

and is discussed in Section III in this paper by Dr. Monks.

It is important to the Soviets to assess not only the nature and influence of future military technologies but also their rate of development. From their writings one perceives that military space operations and ballistic missile defense systems have been on the minds of Soviet military planners almost since the appearance of the first ICBM and the first manned space flight. Perhaps because military considerations have so dominated their own thinking and because they do tend to "mirror-image" us, they seem to have sensed a military threat from space from the days of the Mercury

program. Unquestionably, they saw the Manned Orbating Laboratory (MOL) project as proof of the U.S. intention to militarize space.

In 1963, Sokolovsky's Military Strategy described how air defense (PVO) had expanded to include missile (PRO) and space (PKO) defense. In 1966 General Matveyev described the need for active and passive optical systems designed to operate from 0.76 microns to 500 microns (!), clearly a requirement for space-based sensor systems.

The Soviets appear to have predicted that ICBM defensive technologies would develop rather slowly and that offensive weapons would dominate for a considerable span of years following the doctrinal "revolution" of the early '60s and the ascendancy of the Strategic Rocket Forces to the position of first among equals in the structure of military forces in the U.S.S.R. The achievement by the mid '70s of parity in ICBM/SLBM delivery systems paved the way for another doctrinal shift, this one favoring the modernization of conventional war-fighting forces. Soviet armed forces were charged with doing more than protecting the Motherland -- a global role was identified, one which charged them with defending the conquests of socialism.

All during this time since Sokolovsky first called attention to the space threat from the U.S. (1963) and defined the space combat environment (1967), the military writings in the U.S.S.R. continuously reflected plans for military space operations. Discussion of terminal phase (ABM) systems was extensive in the late '60s but disappeared after the ABM treaty was signed. At that time the Soviets perceived the impact of political leverage in affecting the U.S. development of military technology -- they concluded that President Nixon was forced by domestic politics into arms

control agreements, a view which has no doubt influenced their initial reaction to the SDI.

Associated with their view that offensive systems would dominate the missile/space picture for some time has been the belief that all defensive systems were limited in the number of targets they could handle. Penetration was simply a matter of overloading those systems using, as one Soviet writer described them, "clouds of decoys." Attacks on space-based assets such as sensor and communications satellites were considered useful in assisting Soviet ground-based defensive systems in accomplishing their mission.

Against this backdrop of relatively near term operational moves to assure the effectiveness of their ICBM forces, the Soviets continued their plans for the evolution of full scale military space operations. Several influential writers saw space as the ultimate combat theatre, some of them stating the belief that the nation which controls space will also control the earth.

Perhaps the best evidence of their intentions to ultimately control space has been the development of the concept of a space TVD. Soviet military literature began to describe space as a theatre of military operations (TVD) in the 1970s with Anureyev's description of combat zones in space. He described how lasers and other new technologies, particularly heavy lift boosters, could open up the space theatre. The TVD concept would seem to connote the full range of combined arms military operations encompassing offensive as well as defensive, reconnaissance and support (e.g. navigation) systems. In this connection Soviet thinking about military space operations appears to transcend that of the U.S.

Based on statements in Soviet literature, the Soviets saw the SDI coming but, of course, it was not labeled as such. Since their own assessment was that these technologies would be rather slow in developing, there appeared to be no substantial changes in military doctrine even though some Soviet writers credited the U.S. with having seized the technological initiative. Early in the '80s the Soviets were convinced that their political cards would not only enable them to stop the deployment of the Pershing II's and cruise missiles in Europe, but also to use anti-Reagan elements in the U.S. to slow or stop the pace of development of new weapons technologies.

At the same time they seem to be considering new ways of countering space-based defensive systems which, while possibly able to detect, track and destroy ICBM's during boost or post-boost phase and surviving warheads during subsequent segments of flight, would have enormous difficulty in intercepting a high speed cruise missile flying deep within the atmosphere. Although a turbo-jet powered cruise missile travelling at its limiting Mach number near M-2.5 would present a difficult target for earth-based systems and an even tougher target for space-based systems, increasing its speed into the hypersonic range would reduce its vulnerability even further.

The Soviet scientific research literature reveals the existence of a substantial effort to develop ramjet engine technology to a point where hypersonic cruise missiles could be utilized as an "end-run" around space-based defensive systems. The literature describes hypersonic inlet and supersonic combustion research adequate to constitute a technology base for the design of such missiles. Importantly, it appears that the

publication of diffuser research in the open literature ceased abruptly at the end of 1981, indicating its possible importance in military weapons applications.

It is likely that the Soviets saw the SDI announcement as an indication of the U.S. intention to accelerate the development of technologies which were already being studied prior to March, 1983. The SDI probably did not confront the Soviets with anything new and startling -- their doctrinal positions regarding the evolution of their own military space capabilities and their plans for countering U.S. military space systems are in hand. They may, however, need to modify their plans if they fail to stop or slow the SDI via their political offensive.

(C) Implications

In order to be of maximum use the discussion of the implications of the research work reported herein should be cast in a framework which would include all facets of relations between the U.S. and the Soviet Union. The long range objectives of the two nations, relations with Western Europe, trade and technology transfer, arms control negotiations, policy decisions by the new Soviet leadership, the future of the SDI are but a few of the elements which should probably be considered but such an approach is a very tall order indeed.

This discussion will be conducted in rather narrower context, one which devolves from those main ideas which are discussed in papers which follow.

One cannot read the works of Drs. Kipp and Monks without being impressed with the increasing Soviet concern for the technological threat. Soviet response to the SDI which began before the SDI was announced has

been substantial, apparently exceeding in its volume and intensity anything which has gone before.

The U.S. has made efforts in the past to draw a response from the U.S.S.R., one which hopefully would form the basis for a new, less adversarial relationship between the two nations. Perhaps the best known and most comprehensive of these came on the heels of the Cuban Missile Crisis in October 1962 when, in spite of the substantial concessions granted to the Soviets, they felt deeply humiliated at having been faced-down and forced to remove their missiles.

Some leaders have said that there was a conscious decision by the United States to let the Soviets attain military equality in the hopes that their paranoia would disappear and that the U.S.S.R. would become a more positive force in the community of nations. The era of detente, with its treaties, reduced development of U.S. weapons, increased trade and cultural interactions did not produce change in the U.S.S.R. That may have been in part a product of the U.S. involvement in Vietnam which led the Soviets to conclude that the U.S. had lost the will to defend itself. Mr. Brezhnev indicated that he expected the "correlation of forces" to continue to shift in favor of the U.S.S.R. so that, by 1985, the Soviets could be the dominant force in the World.

Whatever the reason, the Soviet response to U.S. actions in the decade and a half following October, 1962, was not what had been hoped.

When the U.S. began to rearm in the late 1970s, the Soviets seemed to see it as a declaration of technological war since the U.S. began to consider a whole new array of weapons, not simply improved versions of existing ones.

This was a particularly onerous problem because their own projections foretold an increasing impact of technology on the nature and conduct of war. One needs no more eloquent testimony than the Sixth Law of War, discovered by Dr. Monks. Several interpretations can be derived from it -- two of the more obvious ones are:

a) If the technological imbalance between two combatants is too large, no amount of wile and ingenuity on the battlefield can make up the difference.

b) If the troops do not have confidence in their weapons (technology) their morale and combat effectiveness will diminish. (One cannot help but recall the reaction of Allied bomber crews when the German ME-262 appeared in the skies over Germany.)

The SDI represents an accelerated, concentrated effort to develop high technology weapons and the Soviets would regard it as clear evidence of the U.S. intention to seize the initiative in advanced weaponry. If, as John Erickson says, the Soviets have techniques for "querying their system" and, one presumes, making accurate assessments of its capabilities, they must have genuine cause for concern over their prospects for staying sufficiently close to the United States to permit them to remain, over the long term, a superpower.

No doubt a major question in the Kremlim since March of 1983 has been, "Can the American's do it? Can they develop the SDI?" Although the direct answer they have evolved is not known, their anti-SDI political program is so extensive that they clearly believe the U.S. might achieve its objective, therefore they want to stop or slow the U.S. effort.

The leaders of the CPSU are responding to the threat posed by U.S. technology. It has brought them back to the negotiating table however it remains to be seen if the results of those discussions will produce anthing

meaningful in the way of modifying the behavior of the U.S.S.R. Nonetheless, we must remember that the Soviets have enormous respect for the scientific and technical talent of the United States. Looking beyond the SDI, a strong research program in advanced weaponry would appear to be an extremely important lever in the West's effort to bring about change in the Soviet Union.

There is another side to that scenario -- Dr. Monks mentions in his paper the prospect of a preemptive attack by the Soviets, a possibility which deserves further consideration. In view of their concern for "the technological initiative" and their conclusion that quantity can have only limited effectiveness in countering a qualitative (i.e. technological) difference, if the Soviets become convinced that the next "revolution in military affairs" will leave them in such an inferior position as to threaten their superpower status, they might take some precipitate action to confront the West while the correlation of forces is more in their favor. Here, a better understanding of their techniques for assessing the balance in technological potential, the relative rates of advance in the development of new weaponry, would be important.

The research reported herein shows three potential facets of Soviet thought regarding strategic defense and military space operations:

a) a belief in and commitment to a comprehensive capability for military operations in space, combined arms activities to gain supremacy in space and to use space assets to support surface forces,

b) a substantial effort to develop the technological base for the design and production of high speed cruise missiles as a means of delivering both nuclear and conventional warheads,

c) a conviction that any system designed to defend against ballistic missiles can be penetrated by saturation, "clouds of decoys," to use Anureyev's term.

How might these fit together to form a long range Soviet plan to maintain the viability of their offensive forces?

Assuming that the SDI goes forward toward development and deployment, it seems that their current doctrinal position is congruent with the notion of overloading any defensive system designed to intercept ICBM's and to limit the system insofar as is possible by attacking sensor and communications elements.

As the SDI evolves, the Soviets will likely deploy high speed, long-range, cruise missiles (HYCM's) to confront the U.S. with delivery systems which the SDI is not designed to handle. This would have the effect of "bringing the U.S. back down to earth" in order to study, design and deploy methods to defend against the HYCM's.

All the while that this scenario is unfolding, the Soviets will continue to move ahead with their military space program which eventually would combine their own SDI with other space assets to produce capabilities consistent with a Space TVD. The ability to control space would assure the viability of their ICBM force and enhance their tenure as a superpower.

If the SDI can be blunted by their political offensive then the Soviets would likely seek to develop smart weapons which would strengthen their conventional, land-based forces while continuing their move toward space supremacy.

Finally, as the technological pressure mounts on the U.S.S.R., we can expect significant changes in the relationship between the Soviet military and the scientific establishment of the U.S.S.R. These changes will be aimed at greater scientific productivity to support the evolution of advanced weapons systems.

SECTION II

Technological Surprise vs. Technological Initiative: Reflections on the Strategic Defense Initiative

Dr. Jacob W. Kipp

Introduction

The point of departure for this investigation of possible Soviet responses to the Strategic Defense Initiative must be an attempt to define what that research program upon which the U.S. government has embarked is intended to achieve. As President Reagan stated those objectives in his March 1983 speech, they include moving the strategic context within which the superpowers operate from one based upon mutual assured destruction to guaranteed survival through a vigorous research program leading to the development of a system of defenses against ballistic missiles.[1] Government spokesmen have taken great pains to emphasize three points: first, the program is a research effort; second, the objective is to create an effective defense of the United States, and, finally, the program is supposed to be a step towards the reduction and elimination of the threat of thermonuclear war under which humanity has lived for the last four decades.[2]

Behind these three assumptions is yet another upon which the U.S. military build-up under the Reagan administration has rested. Following a decade of detente it was necessary to increase American power sufficiently to bargain with the Soviet Union from a "position of strength."

In assessing the probable responses of the Soviet Union to this initiative and the research program that preceded it, the point of departure must be a conscious effort to illuminate, penetrate, and explore the interconnections and interdependencies which will affect the Soviet perception of the immediate, short-term, and long-term threat posed by the program. The most capital mistake that could be made in this assessment would be to fall into the trap of naive empiricism. Major General V.K.

Konoplev has warned that such naive empiricism in its stereotypical form concentrates exclusively on technological dimensions of military questions ignoring the political side and treats the interactions between the contending parties as essentially a mirror-imaging of technological responses within the isolated realms of strategic doctrine and tactical use. At its very best such arguments will, on the basis of historical analogies, attempt to extrapolate specific aspects of a given situation into the indefinite future without any sense of the historical context and conditions under which the current situation developed.[3] The point is to recognize consciously the explicit differences between the Soviet Union and the United States with regard to both the subject and the object of such foresight.

For the purpose of this analysis it is essential to begin with an explicit definition of the institutional and ideological context of the Soviet response. The Strategic Defense Initiative as a potential threat to the security of the Soviet Union will come to the direct attention of the Soviet Party-State elite functioning within the Politburo and the Defense Council. At these high levels of the party-state bureaucracy the assessment of the threat will in good measure depend upon the competency of a host of experts within the Party and state institutions charged with assessing the political-military and the military-technical aspects of the threat. When finally articulated, this response will become part of the military policy of the Communist Party of the Soviet Union and will, in turn, affect Soviet military doctrine.[4]

The Military Policy of the Communist Party of the Soviet Union thus stands at the core of our problems for it is here that Marxism-Leninism and

military affairs are infused into Soviet military doctrine and science by means of Marxist-Leninist teachings about war and the army.[5] Ideology in the Soviet world view is a guide to action, a prism through which the events of the objective world are organized as part of a system of social transformation, aiming at nothing less than transformation of the world. Since the time of Marx and Engels its ideologues have argued that the effective check against ideological ossification and dogmatism is the constant testing of theory against praxis. Marxism-Leninism demands of its practitioners a unity of theory and praxis which serves as the ideological guide of a state, a commonwealth, and the international movement of the working class. Marxism-Leninism explore the interconnections and interdependencies of theory and praxis. Theory must inform praxis and praxis must serve as a corrective to theory. Praxis thus becomes a "feedback" loop within this ideological system and allows it to give expression to its historicity.[6]

Within the Soviet system the Communist Party exercises authoritative control of ideology, adjusting it to socio-economic, political, and military shifts in the correlation of forces. The Party as a democratic-centralist institution mandates such ideological adjustments through the decisions of the Politburo, the plenums of the Central Committee and the actions of the Party Congresses. These adjustments take place within a Marxist-Leninist Weltbild which emphasizes the centrality of economic modes of production within social processes, the political manifestation of the transformation of such modes taking the form of class struggle, leading to the historically inevitable victory of communism. This particular eschatology which combines the Enlightenment's faith in

progress with the Romantics' attraction to social revolution is supposed to bring about an end to exploitation of man by man and of alienation of man from man and from nature.

Since the early 1920s when Mikhail Frunze first called for a "unified military doctrine" this concept has embraced the idea of creating a maximum of military power for the Soviet state through a "unified organism welded together . . . by a community of political ideology."[7] Military doctrine in modern Soviet usage embraces at a given time, "the system of views on the reality, goals, and character of a feasible future war; on the preparation of the country and its armed forces and on the means of conditioning it."[8] Soviet military doctrine, like the military policy of the CPSU, is based upon Marxism-Leninism's teachings about war and the army. This ideological infusion into Soviet military doctrine affects its two mutually-connected and mutually-interacting sides: the socio-political and military-technical. Since Lenin the central emphasis has been upon the former, for Soviet officials, apparatchiki, and officers are taught the centrality of Lenin's reformulation of Clausewitz's dictum. "War is a continuation of politics by other, i.e. violent, means."[9] War is in this context an instrument to a political end, but the end is, in turn, the product of the existing class and social arrangements within the contesting sides. Politics in this regard gives expression to the inter-connections between domestic and foreign affairs and is by its very nature concerned with the long-term thrust of such relations and not immediate, tactical maneuvers. Soviet military doctrine is not, therefore, technologically driven.

The military-technical side of doctrine does, however, encompass a wide range of issues relating to the organizational development of the

armed forces, raising their combat preparedness, the perfection of their technical equipment and control, and further development of Soviet military art. In this context military art refers to the efforts to define the ways, means and methods of the armed forces' preparation and execution of tasks relating to the defense of the U.S.S.R. Thus, while the military-technical side of doctrine cannot be called the wheel-horse of Soviet military doctrine it does, nonetheless, impact upon the formulation of doctrine. With Engels they return to economic transformation as the engine of socio-economic change, the context of developing class hostilities, and the source of new technologies, which directly find their uses in military affairs. Scientific-technological change has, according to the Soviets, accelerated to the point where it is possible to speak of a scientific-technical revolution. This scientific-technical revolution has had and continues to have a fundamental impact upon Soviet percepts of the relative potential of the competing social systems, their governments, and armed forces to achieve specific immediate goals and tasks and the prospects for achieving those and other tasks in the future.[10] Within military affairs it is now clearly possible to define two distinct stages to this scientific-technical revolution: the first began in the mid-1950's with the development and deployment of nuclear-armed, ballistic missiles, and the second came in the 1970s with the development and introduction of third-generation computers and automated systems of troop control. In the early 1980's Marshal N. V. Ogarkov began to call attention to yet another stage associated with the development of new types of weapons based upon radically different scientific principles.[11]

The medium through which the Soviet military elite formally exercises its influence upon the formation of Soviet military doctrine is military

science, which has been defined as "the system of knowledge on the character and laws of war, the preparation of the armed forces and the country for war, and the means to conduct it." Infused with Marxist-Leninist ideology, which serves as the prism through which external events are organized and categorized, Soviet military science has a class base and is infused with the spirit of the party (partiinost').[12] Military science is, however, also shaped by technical change, the praxis of war, and the economic resources available to the Soviet Union and its allies. By definition Soviet military science is dialectical, i.e., it sees itself engaged in constant struggle with bourgeois military science. The relative success of Soviet military science in guiding and informing Soviet military doctrine depends in great measures upon the unity of theory and praxis achieved by its successful application to the conduct of armed struggle. As a recent work done under the direction of General I.E. Shavrov, when he was Chief of the Voroshilov Academy of the General Staff, asserted:

> The most concentrated expression of military-scientific knowledge is to be found in Soviet military doctrine, which embodies a system of scientifically sound views on the reality, character, and means of conducting war, as well as on the demands of military construction, the preparation of the armed forces and the country for the complete defeat of the aggressor. Soviet military doctrine finds its concrete manifestation in the theory and practice of the construction of the armed forces, in strategy, operational art, and tactics.[13]

Military science and doctrine are thus intimately and mutually connected in Soviet military thought. Military doctrine becomes state policy regarding the goals and character of a possible war. Doctrine takes into account what sort of enemy against which the war will be fought, the character and objectives of the war in which the state and its armed forces

are expected to participate, and the missions of the armed forces. Military science shapes and, in turn, is shaped by military doctrine.

One part of Soviet military science is military art, which has been defined as "the theory and practice of the preparation and conduct of military actions on land, at sea, and in the air."[14] Military art must by its very nature develop in connection with the expansion of the arena in which warfare can be conducted. Acquisition of the technological means to prepare and conduct military actions in space and under this definition inevitably carries with it the requirement to develop a military art in embracing all three levels of warfare, i.e., strategy, operational art, and tactics. From a Soviet perspective such a development takes place under two constraints. The first refers to the existing scientific-technical levels achieved by the competing social systems. Marxists of all persuasions have and continued to have a healthy respect for the ability of bourgeois societies to engage in technological innovation. The question has rather been whether such societies could in fact, given their social structures, engage in the necessary foresight and planning to make optimal use of their technological innovations.[15] The issue of military art for warfare in space then at one level comes down to a question of whether Soviet political leaders and military figures believe that the scientific-technical revolution has recently made it possible to speak of a new threat or opportunity from space. The other side of the same question is expressed by what the Soviets refer to as law of "the unity and struggle of opposites." In class struggle, international competition,and warfare, Marxism-Leninism emphasizes this interaction between the opposing sides within a system of struggle and competition, the outcome of which is historically determined, i.e., victory of the forces of socialism.[16]

The Nuclear Rocket Revolution in Military Affairs

From the Soviet perspective the use of space for military purposes began in 1944 when the Germans initiated operational launches of V-2s against London. Yet, the V-2 could no more be classed a space weapon than the arrow or cannon ball could be called an air weapon. In all three cases the weapon passed through the medium without creating the necessity for the development of a military art for space. Major General I.I. Anureev has hinted that such a trend might have developed if the British in their search for a counter to the V-2 attack had developed combat means of intercepting the V-2s. However, in 1944-1945 the technological requirements for such a defensive system, embracing a target acquisition radar, computer-assisted control capability, and an interceptor rocket were not technically feasible, and the capture of the German launch sites proved the most effective means of countering the threat.[17] It is worth noting, however, that Soviet authors have called attention to the development of British defensive measures against the V-1 "flying bomb" as an appropriate starting point for consideration of the development of air defense systems against cruise missiles. In this case, as opposed to the V-2, existing technology taken from the military art of air warfare made it possible to develop a workable solution to the V-1 problem at all levels of warfare, strategic, operational and tactical.[18] The relative effectiveness of these sets of measures underscores a specific theme of Soviet work on the development of military science and art: the impact of quantitative and qualitative changes on the conduct of war.

Writing in the 1920s in the first systematic work on strategy compiled during the Soviet period, and the last until Marshal Sokolovsky's Voennaia

strategiia appeared in 1962, A. A. Svechin, a military specialist of the Imperial General Staff who had joined the Red Army (RKKA), addressed the inherent problem of technological change as posed in the warfare of the industrial era. Svechin ran into substantial opposition within the Soviet military and Communist Party because his strategic assumptions embraced the idea of "war of attrition" as opposed to operations designed to achieve destruction of the enemy. On the other hand, he was the first Soviet officer to address the twin problems of technological surprise and initiative in modern warfare. Svechin warned that the historical experience of industrial warfare had made it next to impossible to achieve technological surprise. He cited several cases, i.e., the French misuse of machine guns during the Franco-Prussian War and German employment of gas during World War I, to underscore the difficulties. In the former case Louis Napoleon's army had neither the necessary number of weapons or a military art for their employment in a decisive manner in combat. In the latter case the German High Command had, when confronted by the uncertainties of gas warfare, decided to test the gas in combat as part of their effort to develop a military art for its tactical employment. The result of these efforts was to reveal to the enemy the potential danger and the loss, thereby, of operational surprise. Svechin concluded that technological surprise was possible in theory but difficult to achieve in practice.[19]

On the other hand, Svechin viewed "technological initiative" as a real and obtainable military objective. Svechin emphasized that the side which managed to get and maintain the technological initiative gained many advantages. The key to holding the initiative was a massive intelligence

effort to discover and study the major tendencies in enemy technology, joined with a security program that concealed such developments from your adversaries. Technological initiative here, however, embraces more than research and development and includes mass production of the systems in question. A weapons system in this view can only have a decisive and radical impact upon the conduct of war if it is employed in sufficient numbers. Likewise, its impact depends upon the development of a military art which will maximize its impact at all levels of warfare. The incremental addition of new types of weapons in such circumstances will lead to their absorption within the existing military art as nothing more than supporting means to the already-existing structure of forces.[20]

Svechin's views had a profound impact upon the development of Soviet military thought during the later 1920s. B. M. Shaposhnikov, himself a former tsarist General Staff officer and voenspets from the Civil War, cited Svechin's work approvingly in his ellucidation of the role of the General Staff as the "brain of the army." Shaposhnikov underscored the necessity of developing an integrated plan through the cooperation of the civilian leadership and the general staff for preparing the national economy for war. Shaposhnikov openly acknowledged the political hegemony of the Party in such matters but stressed the need for pre-war planning as the only effective means for engaging in modern, industrial war.[21] In the 1930s after the creation of the Soviet General Staff it did under Stalin assume just this role.

Writing in the mid 1920s Svechin's ideas on economic mobilization of the nation to support military modernization were conditioned by the economic realities of the New Economic Policy, a set of measures which

Lenin and his Party had introduced in 1921 to bring about a recovery of peasant agriculture and the revival of petty trade. While the NEP did bring about rapid economic recovery, by the late 1920s serious questions were being raised within the Party about policy changes which would radically accelerate the pace of economic growth and bring about industrial development according to a state-adopted plan. In the military, voices were raised supporting such a course. M. N. Tukhachevsky, one of the RKKA's most outstanding commanders during the Civil War and Chief of Staff of the RKKA, 1925-1928, began to call for the "total militarization" of Soviet society. Tukhachevsky rested his argument upon Lenin's concept of imperialism as a system of warfare capitalism and Frunze's "unified military doctrine" with its vision of inevitable conflict between the young Soviet state and the surrounding, hostile capitalist powers.[22]

With Tukhachevsky's encouragement a number of bright, young officers of the RKKA began to consider the problem of "future war" in this period. One of the most important contributors to this research was V. K. Triandafillov, who served as Section Chief of the Operations Directorate of the RKKA from 1923 to 1931, at which time he died in an airplane accident. Triandafillov's work focused on the problem of the scale and character of modern offensive operations, designed to disrupt and destroy the enemy defense throughout their depth. Based upon his analysis of the military praxis of World War I and the Civil War and his assessment of the trends in armament development, he asserted that deep, successive operations would be the key to victory in future war. However, in his analysis of the economic-technological bases for such operations Triandafillov divided Europe into two parts: a Western zone where existing economic capabilities

made it possible to create large-scale mechanized forces and an Eastern one, including the U.S.S.R., where economic backwardness precluded the large-scale introduction of such technology and therefore confined mechanization to small-scale increments and experiments.[23]

Writing in 1929, Triandafillov's analysis was an implicit call for the acceptance of Tukhachevsky's "total militarization" of the society as an immediate requirement for the defense of the Soviet Union. For Tukhachevsky and Triandafillov it did not matter whether Western capitalist powers had embarked upon the creation of large-scale mechanized forces by the late 1920s. It was enough, given their ideological assumptions regarding the inevitable hostility between capitalism and socialism, for such societies to have created the technological prerequisites for such a mechanization.[24]

By the late 1930s, even as Stalin carried out his sweeping purge of the Soviet military, the institutional mechanization for engaging in similar exercises in military foresight regarding the possible trends in the development of hostilities within the next five year plan had been created. After 1935 the Soviet General Staff under Shaposhnikov undertook the task of assessing the probable military environment in which each five year plan would take place. The prospects of hostilities, their nature, and the probable adversaries were evaluated in conjunction with technological assessments. The future marshal and head of the General Staff, 1960-1963, 1964-1971, M. V. Zakharov described this process in which he took part as one in which the General Staff as the "'unwinking eye' which constantly gazes ahead into the future."[25] Zakharov terms this process as one of competition between general staffs for relative

advantage, in which each sought to penetrate the "holy of holies," their adversaries' war plans, while making every effort through counter-intelligence to prevent enemy penetration of ones own planning process.[26]

This was the system with which the U.S.S.R. fought and won the Great Patriotic War and with which it had to confront the dawn of the nuclear era and the beginning of the military exploitation of space. Although in some ways hampered by Stalin's management style and control of channels of communication, the Soviet military system seems to have functioned reasonably well. The beginnings of Soviet atomic research, leading up to the detonation of a bomb in 1949, have been well-covered elsewhere.[27] The Soviet program of rocket research and development is not so well-known and deserves our attention as the starting point for Soviet interest in the exploitation of space. Soviet rocket research has its roots in pre-revolutionary Russia and the inspired genius of K. E. Tsiolkovsky, who in the first decade of this century speculated on the exploration of the universe by rocket-spaceship.[28] Russia's radical democrats were notably sympathetic with such ideas; the early Bolshevik A. A. Bogdanov even wrote a novel, Krasnaia zvezda, about such interplanetary journeys.[29]

Interest in the military applications of rocket technology was quite extensive in tsarist Russia. However, after the October Revolution and with the outbreak of the Civil War the new Soviet government turned its attention to the military application of rocket technology and took the first steps towards developing state-funded institutes for the development of rocket science and technology.[30] In 1921 the Jet Laboratory was founded in Moscow under the direction of N. I. Tikhomirov, a chemical engineer.

Until his death, Tikhomirov pushed his laboratory's efforts in the development of solid-fueled rockets. Early successes in this area led to the decision by the Military Research Committee of the Revolutionary Military Council of the U.S.S.R. to expand Tikhomirov's laboratory into the Gas-Dynamic Laboratory (GDL) in 1928. In the same year Tikhomirov supported the proposal of a young university graduate from Leningrad, V. P. Glushko, to build an "electrothermal" rocket engine. Glushko's proposal was accepted in May 1929 and a new section joined the GDL.[31] Research and development of rocket technology continued throughout the 1930's even in the face of the disruptions to Soviet society engendered by Stalin's purges. In 1931 the Central Council of Osaviakhim (Society for the Assistance to Defense and Aviation-Chemical Construction) directed the creation of another research facility for the study of jet propulsion. Shortly thereafter this facility became the Central Group for Studying Jet Propulsion (TsGIRD), headed by F. A. Tsander. It was TsGIRD, GIRD after 1932, which launched the Soviet Union's first successful liquid-fueled rocket in August 1933.[32] In order to coordinate rocket-jet propulsion research GDL and GIRD were formed into one agency, the Jet Scientific Research Institute (RNII).

Pre-war Soviet rocket research enjoyed its greatest success in the development of solid-fueled rockets for ground and air launching. Building upon the work of Tikhomirov, who died in 1930, Soviet engineers developed such solid-fueled rockets of various sizes and tested their launching from ground platforms and aircraft. Marshal Tukhachevsky, who was then chief of armaments for the RKKA, supported these efforts. Such solid-fueled rockets got their first combat tests late in the fighting at Khalkhin-Gol in August

1939, when air-launched rockets were tested against Japanese aircraft. By the outbreak of the Great Patriotic War, the development of solid-fueled rockets and mobile launching systems had reached the stage of deployment. These multiple launcher, mobile systems became one of the most deadly weapons of Soviet artillery preparation and became known to the world as katiushas. In the course of the war the military art associated with the employment of this new weapon system underwent development, leading to the development of the katiushas as an integral part of the Soviet artillery offensive. Gradually rocket units were formed into larger formations, until Soviet commanders had at their disposal entire katiusha divisions, capable of firing 3,840 rockets in a single salvo and delivering 230 tons of fire upon the enemy.[33] One of the most stunning examples of the offensive use of this new instrument at the operational level came at Jassy-Kishinev in August 1944, when M. I. Nedelin, commander of artillery for the 3rd Ukrainian Front, used the katiushas with other artillery means to shatter the Rumanian and German defenders.[34]

Soviet development of larger liquid-fueled rockets continued during the war but the immediate tactical and operational needs of the military received primary attention. Soviet scientists and engineers were in a position to evaluate the progress made by German rocket engineers during the war and made strenuous efforts to absorb those innovations into their own work. In 1945 Stalin made the decision to pursue vigorously the development of atomic weapons and the means of their delivery, including both long-range aviation and rockets. Because of pre-war and wartime experience rocket development fell within the purview of artillerists. The first rocket unit of the Soviet Army was formed in July 1946 from a Guards Artillery Regiment commanded by Major General A. F. Tveretsky.[35]

The world learned of these successes in October 1957 when Korolev oversaw the launch into orbit of Sputnik I. This event which marked a major step forward for the U.S.S.R. in its rocket program was also a spectacular propaganda success, setting in motion an intense competition between the two superpowers to derive major international advantages from its programs for the exploration of space. At the same time it also marked the real beginning of the militarization of space as both powers pursued the development of ballistic missile systems for the delivery of nuclear weapons at intermediate and intercontinental ranges. In December 1959 the Soviet government authorized the formation of a new combat branch of the Soviet Armed Forces, the Strategic Rocket Forces, with M. I. Nedelin as its first commander.[36]

The development of nuclear weapons and systems of their delivery began in the mid-1950's to have a profound impact upon Soviet military science, military doctrine, military art and the military policy of the CPSU. Under Khrushchev there appeared a tendency to assume that the nuclear-rocket revolution had made other forms of military power secondary to the defense of the U.S.S.R. The Premier was particularly adept at using the early Soviet space spectaculars to underscore both the implicit military power of the U.S.S.R. and the world-class status of its science and technology.[37]

Militarization of Space in Soviet Military Doctrine

Adaptation of Soviet military thought to this new situation began after Stalin's death and took on a momentum all its own in the late 1950s as Soviet officers sought to grasp the implications of the new weapons systems for military science and art. This task fell to the Soviet General

Staff and the Higher Military Academy, renamed the Academy of the General Staff in 1958. In 1957 the post of Deputy Director of the Academy for Scientific-Work was created. For four years Lieutenant General N. A. Lomov held this post, and he was followed in 1958 by Lieutenant General A. I. Gastilovich, who served until 1964. Associated with this increased use of the Academy of the General Staff as a think tank to deal with the impact of nuclear weapons upon the art of war went a renewed concern for the problem of strategy, which had received little attention at the academy since the 1930s. In creating a text book for the Academy's course on strategy, General of the Army G. K. Malandin, who had served as Deputy Chief of the General Staff, 1948-1952, 1953-1955, and General Gastilovich played a leading role.[38] This effort served as the foundation for the first systematic, mass-circulation volume on strategy since the appearance of Svechin's work in the 1920's, Voennaia strategiia, which appeared in 1962 and listed Marshal V. D. Sokolovsky as editor-in-chief.[39]

Marshal Sokolovsky (1897-1968) had joined the RKKA in 1918 and rose quickly during the Civil War to command a brigade and serve as divisional chief of staff. In the inter-war period he combined command assignments, education, and staff work and in 1935 became chief of staff in a military district. The outbreak of war in 1941 found him posted as a deputy chief of the General Staff. In the first phase of the war he served as Chief of Staff for the Western Front and then the Western Direction, an intermediary command entity, linking the various fronts with Stavka. In the second and third phases of the war he commanded the Western Front, 1943-1944, and then was posted to the 1st Ukrainian Front as Chief of Staff, serving first under Marshal Zhukov and then Marshal Konev. Following the war Sokolovsky

served as Chief of Staff to Group of Soviet Forces Germany until 1949 when he was appointed Deputy Minister of Defense. From 1952 to 1960 Sokolovsky served as 1st Deputy Minister of Defense and Chief of the General Staff. After 1960 he served until his death in the Group of General Inspectors of the Ministry of Defense, an institution founded in 1958 to provide a consultative mechanism to use the expertise of senior commanders too old to hold active command appointments.[40]

Sokolovsky's Voennaia strategiia was and should, therefore, be considered a work of the General Staff, commissioned during Sokolovsky's tenure as Chief of the General Staff and reflecting that institution's efforts to adjust strategy to the nuclear-rocket revolution in military affairs. Voennaia strategiia went through three editions in rapid succession: 1962, 1963, and 1968. It is therefore a valuable source for examining the shifting Soviet emphasis on the impact of thermonuclear weapons upon military strategy. It is also significant because in the volume Sokolovsky introduced the concept of militarization of space. This discussion, as it inevitably must with a ist-Leninist ideological framework, was couched in terms of U.S. efforts to transform space into a military arena.

Sokolovsky defined space means in the first edition to include "strategic weapons" directly and as support systems of other strategic weapons. The Marshal noted the leading role of the USAF in the development of U.S. space systems and identified research efforts in the following areas: "reconnaissance, early warnings, radio navigation, communications, and defense against ballistic missiles and enemy satellites, as well as those to be used for nuclear strikes against enemy strategic ground targets."[41]

Sokolovsky drew particular attention to the trend towards militarization of space implicit in U.S. budgetary allocations and plans for long-range research and development. In addition, to major investments in the development of space reconnaissance, electronic warfare, navigation, and detection of nuclear explosion satellites, he called attention to the proposed research effort in the construction of aerospace vehicles. Finally, he noted: "The development and use of space systems for the destruction of ballistic missiles in the boost phase, for the recognition and destruction of enemy military satellites, etc., is also planned."[42] All of these developments were to be pursued, according to Sokolovsky's analysis, while the United States moved rapidly from relying upon manned bombers to deliver nuclear strikes to a posture embracing the ballistic missile as the primary weapon of strategic nuclear war, a process which Sokolovsky estimated would transpire by 1966. In this discussion Sokolovsky pointed towards space as an auxillary environment to support strategic operations but held out the prospect that the Soviet Union should anticipate that by 1975, if current trends continued, space would become a combat environment itself.[43]

The second edition of Voennaia strategiia, which was signed to press in late August 1963 -- less than a year after the Cuban Missile Crisis had brought the two super powers close to nuclear war, introduced major changes in Soviet postulates about space. The Marshal's concept of thermonuclear war still rested upon an amalgam of deep strategic operations designed to destroy the enemy's forces and economic potential in combination with a hardheaded assessment of the political element of such a struggle. Thus, the use of thermonuclear weapons was still treated as a means, indeed, the

decisive means of achieving what remained a political end. The volume continued to counsel prudence in the application of military power within this context. Indeed, Sokolovsky argues in the second edition that the Soviet Union's successes in rocketry and space flight since 1957 had forced the U.S. to abandon its proclaimed strategy of "massive retaliation" in favor of one emphasizing the avoidance of thermonuclear war.[44]

At the same time nuclear rockets had radically altered the concept of theater of military action by substantially changing their spacial and temporal aspects. This was a theme developed by Major General S. Bronevsky in Voennaia mysl' in July 1973, where the General argued that the armed forces had to be prepared for war in specific theaters, taking into account the impact of new technologies -- notably aviation and ballistic missiles -- on the spacial and temporal aspects of the conduct of operations.[45] Such a concept embraced a deepening of operations into intercontinental dimensions along with a concommitant shortening of time. Space was not treated as a separate theater of war, although it was freely acknowledged that space would play a significant role in the acceleration and expansion of command, control, communication and intelligence functions. Marshal Sokolovsky did not list space as a theater of combat action but noted that U.S. political and military figures were calling space "the strategic theater of tomorrow" and identified "command of space" as a national objective for the next decade.[46]

While concentrating on U.S. programs to improve C^3I capabilities via satellites, i.e., attributing to immediate U.S. programs missions similar to those of Soviet systems in support of strategic warfighting, Marshal Sokolovsky identified a number of long-range programs, which were supposed

to turn space into a combat environment, including anti-satellite systems (ASAT), space planes for which the Dyna-Soar Project was the first step, and orbital bombardment systems (BOSS) under development. He also treated the U.S. program to reach the moon as a first step towards militarization of that celestial body. He noted that work was progressing on lasers, plasma beams, and anti-gravity weapons. He concluded, "All these facts point to the fact that the American imperialists are on the path to the direct use of space for the execution of their aggressive plans."[47]

This conclusion, of course, underscored the differences between socialism and capitalism: Sokolovsky pictured Soviet space successes, which he enumerated, as serving the cause of peace and scientific progress. However, the Soviet Union could not ignore the fact that U.S. imperialism was using its space program to militarize space in preparation for nuclear attacks upon the Soviet Union and other socialist countries.[48] The Marshal stated that: "It would be a mistake to allow any sort of superiority to the imperialist camp in this area. It is necessary to counter the imperialists with more effective methods and means for the use of space in defensive tasks. Only in this way is it possible to deny them the use of space for an aggressive and destructive war."[49] Sokolovsky did not discuss the military art which would have to support such an attempt at space denial in the context of the strategic operations, which he had described. It is worth noting that the programs he described were in the research and development stage and so did not yet require an explicit military art for the conduct of combat against them. At the same time in their absence the Soviets could count upon the use of their own C^3I assets in space. Without effective ASAT means the disruption of U.S. C^3I assets

in space was also quite limited. Thus, in the shortrun space was an auxillary environment for strategic war, in which, thanks to their space means, both sides could count upon relatively stable and increasingly more sophisticated C^3I capabilities. In discussion the trends in the development of the U.S. strategic posture from early 1963 to 1966 projected not only radical growth in the land-based and sea-based ballistic missile systems, while the modernized long-range bomber force remained relatively constant in size, but also the initial procurement of "active space weapons" capable of destroying enemy ICBMs and satellites and of delivering nuclear strikes.[50] These acquisitions were, however, projected to be quite small in comparison with the range of missions and the implied combat norms required for such systems to have a qualitative impact on the conduct of strategic operations.

This emphasis upon C^3I was one of the first indicators of the impact that cybernetics was beginning to have upon the Soviet Military. In October 1962, as the Cuba Missile Crisis was reaching its climax, A. I. Berg, a Deputy Minister of Defense in the 1950's and the initiator and leader of research in cybernetics and its application, linked the field with Lenin's interest in the Scientific Organization of Labor (NOT). Thereafter cybernetics, operations research, and the application of mathematical methods to military affairs received priority attention.[51] Such an emphasis was justified in practical and ideological terms. In 1966 Major General N. Ia. Sushko and Lt. Col. T. R. Kondratkov collaborated on the first Soviet work to bring mathematical methods into the methodology of military theory and practice, offering an introduction to forecasting techniques as a necessary response to the on-going scientific-technical

revolution in military affairs.[52] I. I. Anureev of the Academy of the General Staff discussed a wide range of applications of mathematical methods to military affairs, relating them specifically to a trend towards the mathematization of knowledge, which was drawing military affairs closer and closer to the natural sciences via cybernetics. At the same time the application of more modern computer technology to the resolution of all sorts of military and combat-related problems held out the prospect of reducing decision time by increasing the speed with which information could be processed.[53]

In June 1967 Anureev used mathematical methods to discuss the problem of nuclear warfighting. In his treatment Anureev addressed the problem of trying to model the interaction of strategic forces in a nuclear exchange and introduced into Soviet literature the problem of counter-force as opposed to counter-value targeting. In his conclusion Anureev suggested that the most expedient method of shifting the correlation of forces during a nuclear exchange was not the exclusive targeting of enemy weapons systems but to attack the enemy's system of troop control and to disorganize thereby his ability to carry out a sustained, coordinated attack. Lacking that ability, the enemy's strategic forces would be substantially degraded.[54] Command and control assets were, of course, in the process of being placed into orbit, putting a high premium on the ability to sustain such assets for one's own forces and to degrade those of the adversary.

Space was, according to S. Vol'nov, one of the areas where this electronic revolution in command and control was making its impact felt. Appearing at the same time as Anureev's article on mathematization of military affairs, Vol'nov's article discussed the U.S. Department of Defense

programs dealing with electronic warfare in space. Vol'nov emphasized the increasing U.S. investment in electronic capabilities for its satellites and spacecraft. He presented the American decision to invest in MIRV technology for its ICBMs as one made possible by the quality of U.S. electronics and cybernetics. This investment, which Vol'nov predicted would reach 200-300 million dollars by 1970, was a prerequisite for the militarization of space, which the U.S. intended to transform into "a new sphere for conducting war operations, both for purposes of supporting combat actions by all branches of the Armed Forces, and for conducting independent, space, offensive and defensive operations."[55]

In March 1967 Engineer-Colonel A. Vasil'yev offered his own assessment of U.S. programs for the militarization of space. In his discussion Vasil'yev concentrated upon the former, rather than the latter, aspect of U.S. programs, i.e., the use of space to support strategic combat operations. The reconnaissance role of U.S. space satellites got top priority and then treatment of satellites to aid communications, navigation, collect geodetic and meteorological information. Second priority went to manned spacecraft, especially the Dyna-Soar Program, which Vasil'yev linked to the plans to build a Manned Orbital Laboratory (MOL). Vasil'yev predicted a manned space presence by 1975 and anticipated major benefits for MOL from the Apollo Project.[56] The end of Vasil'yev article struck a different tone. In it the Colonel hinted that the Space Treaty signed in 1967 by the U.S., UK, and U.S.S.R. had in some measure created a check upon U.S. plans for the militarization of space. "At the end of January 1967 representatives of the U.S.S.R., U.S. and Great Britain signed a treaty of principles of state activity in the study and use of outer space, including the Moon

and other celestial bodies. The treaty establishes legal norms, juridical principles and laws concerning the use of space. Up to this time, some have attempted to look upon space as a sort of undeveloped jungle and hoped that the law of the jungle -- might makes right -- would prevail. The treaty forces the reflection and review of such views."[57] This treaty and the 1963 Test Ban Treaty were to Vasil'yevand some others within the Soviet leadership, both civil and military, evidence of the possibility of constructing a web of relations which would inhibit U.S. militarization of space, keep that threat within manageable proportions and allow the U.S.S.R. to maintain its place as a space superpower without having to face the prospect of unbridled competition. Colonel Vasil'yev retired but he continues to occupy a conspicuous place in Soviet studies of the U.S. defense effort, especially the space program, as a researcher for the Institute of the Study of the United States and Canada of the Soviet Academy of Science.

Vasil'yev's views touched upon a central problem confronting the Soviet military by the late 1960's: having been confronted by an American atomic monopoly since 1945 and having made strenuous efforts to create its own intercontinental nuclear arsenal, the Soviets were poised to reap the benefits of their investments. And the question remained: how would the U.S. respond? By July 1967 Soviet officers were discussing the economic foundations of Soviet military doctrine. While highly conventional in their treatment of the components of military doctrine and the issues which it addressed, these authors emphasized the impact which the economic condition of the state had upon both the political-military and military-technical sides of doctrine. While explicitly clear in the latter case with regard to the state's military capabilities, the effect was also

present on the political-military side as it affected class arrangements and the character of the aggregate social product. The authors identified three periods (stages) for Soviet military doctrine, on which the economic base had a profound effect. In the first, that of the Revolution, Civil War, Foreign Intervention, and New Economic Policy, economic backwardness constrained Soviet military doctrine in a time of struggle for survival. With the economic transformations of the five-year plans the Soviet Union achieved a level of industrial development which made possible the implementation of an advanced military doctrine during the Great Patriotic War. The third stage the authors described as one of a scientific-technical revolution dominated by weapons of mass destruction and their delivery systems. Such weapons had revolutionized the relationship of pre-war preparations and wartime conduct. Short wars between nuclear powers were possible because in the first few hours of hostilities, nuclear weapons could be used to destroy an opponent's economic base.[58]

However, the authors acknowledged the possibility that trends in warfighting could in some measure reduce the consequences of nuclear attacks upon an adversary's industrial base, including concealment and dispersal. In addition, the authors pointed towards the development of "defensive weapons capable of seriously neutralizing the destructive force of nuclear weapons." The creation of such weapons was on the technological horizon and made it possible to consider the reemergence of protracted war as strategic offensive systems were countered by strategic defensive systems. The authors explicitly pointed to the contradiction between offensive and defensive weapons as one factor which would affect the correlation of forces in the future.[59]

By 1968 the Soviet military had focused upon the problem of foreseeing the trends which would affect the scientific-technical revolution. Marshal M. V. Zakharov, who had served as Chief of the General Staff from 1960 to 1963, when he was replaced by Marshal S. S. Biriuzov, and from 1964 to 1971 after Biriuzov's death, called upon an intense campaign to further perfect Soviet military science in which he spoke of the need for "new elaborations and bold daring in military theory and resolute rejection of preconceived points of view," drawn from the praxis of the last war. The problem instead was to link military praxis and weapons developments associated with the scientific-technical revolution in a search for new solutions embracing theoretical foresight of future. Concisely, the issue was the nature of future war at all levels of combat: strategic, operational and tactical. The driving force and the locus of theory construction was the nuclear-rocket weapons which the Marshal described as "of decisive importance for increasing the might of the Soviet Union."[60] Zakharov listed a number of tasks which the scientific-technical revolution had placed before Soviet military science and identified the shift from war fighting based upon a series of successive operations culminating in the defeat of the enemy's forces to that of a single, deep strike with maximum concentration of force in the minimum amount of time. Zakharov identified this as the decisive combat form affecting the military art of all branches. Military science was in its subject and content supposed to support the elaboration of this concept, including the study of the probable enemy, his military theory, and the ideology of imperialism.[61]

A major theme of this new effort in Soviet military science was the use of space in warfare. Voennaia mysl' carried a number of articles

touching upon space. Engineer-Colonel V. Anyutin treated the U.S. reconnaissance and electronic warfare programs using space satellites. In this article space was identified as an sphere where military experts from capitalist countries expected armed conflict, but the author's treatment concentrated upon space systems which supported combat in other theaters.[62] Other authors treated the interaction of strategic offensive and defensive systems. Indeed, in May 1968 Voennaia mysl' published back-to-back articles dealing with the proposed U.S. ABM system, "Sentinel," and the modernization of U.S. strategic forces. Engineer Colonel V. Bezzabotnov described "Sentinel" as a limited system. It was clear from his discussion that the limit existed at two levels. On the one hand, "Sentinel" was, in fact, only a slight improvement over Nike-Zeus. Although a more complex weapons system incorporating two ABM interceptors, "Spartan" and "Sprint," and an advanced radar and command and control system, the "Sentinel" did not prompt a reliable defense for both counter-force and counter-value targets. Bezzabotnov noted McNamara's into a high-cost procurement program when Vietnam was eating up defense dollars. But McNamara's objections were treated as matters of cost-effectiveness since the Secretary of Defense had announced that the U.S. should consider spending not $40 billion but $400 billion, if a truly effective ABM defense was feasible. The complication, as Bezzabotnov noted, was that U.S. defense experts could already foresee a means of overwhelming the best ABM system by means of MIRVs.[63]

Bezzabotnov also treated "Sentinel" as a system that was politically limited. McNamara's "zig-zags" on ABM development and the decision to go forward with a limited sentinel system in 1967 were the product of

political limitations favoring symbolic, as opposed to substantive, actions. McNamara's effort to sell the ABM decision as having no effect on U.S.-Soviet relations and aimed primarily at a supposed Chinese threat was a polite fiction. McNamara's realism in advocating a limited system was less a product of his "peaceloving" sentiments than a hard-headed assessment of the technical limitations of available components to perform the task of missile interception. Bezzabotnov suggested that McNamara had been caught in an untenable position by the political infighting between President Johnson and his rightwing critics.[64]

If political and technological constraints were imposing "zig-zags" on U.S. ABM research and development programs, no such constraints could be seen in the U.S. program for the modernization of strategic offensive forces. Here Soviet authors pointed towards the rapid modernization of existing strategic systems, especially the MIRVing of ICBMs. The logic of MIRVs lay in the increase in the number of targets destroyed without increasing the number of lift vehicles and in the radical increase in demands that would be placed upon any defensive system, thanks to numbers, maneuverability of re-entry vehicles, and maskirovka.[65] At the same time an inter-agency group with the U.S. government had already developed a paradigm for the next generation of ICBMs under the designator "WS-120A." The authors identified a series of requirements that this new system would have to meet: "insure penetration of any anti-missile system which can be created during the next ten years; have a high degree of accuracy of target destruction; and withstand a nuclear strike inflicted by ballistic missiles which have a high degree of accuracy."[66] The authors described this weapon as a larger version of the Minuteman with considerably greater payload and

range. The WS-120A, which would become the Minuteman III, was supposed to cost $10 billion and take 10 years of development, leading to a force of 200-300 missiles. It is worth pointing out that twenty years after the fact, this missile is still the backbone of U.S. ICBM force. The Soviet discussion assumed that the U.S. would resolve the problem of ICBM protection by one of two roads: either protect the new ICBM silos with an ABM system or develop a mobile system. The authors did not anticipate any great difference in the costs of either solution.[67]

They did, however, call attention to the U.S. critics of the U.S. strategic modernization program. These critics within the USAF Association dealt with three problems: the increased threat which more accurate Soviet ICBMs would pose to the force; the threat of electromagnetic pulses from nuclear explosions to the ICBM force on the ground or in flight; and the possibility to locate SSBNs in the ocean's cloak.[68] None of these problems could be resolved "merely by increasing the number of strategic missiles or warheads."[69] The solutions lay in the immediate and broad application of science and technology to strategic systems. Given the recognition by Soviet military commentators of the dialectical relationship between offensive and defensive weapons systems, it would seem that the authors were, in fact, speaking of a broad-front approach which went beyond ICBM modernization.

This theme, which in Soviet literature became identified with U.S. plans for the "militarization of space," was shortly developed by Iu. Listvinov in Voennaia mysl'. Listvinov dated American plans for the militarization of space to October 1945, when the Navy expressed interest in an earth satellite program. What had happened, however, was that American

overconfidence had allowed the Soviet Union to get ahead and deliver a psychological "Pearl Harbor" with its launch of Sputnik in October 1957. Among the U.S. advocates of militarization of space Listvinov gave prominent place to Senator and later President Lyndon Johnson. The decision to create a civilian space agency, NASA, had, according to Listvinov, run into powerful opposition from "hawks" who wanted a unified program under military direction. A major advocate of such an approach was General Curtis LeMay, former commander of SAC. It was LeMay and the USAF who were presented as the advocates of the manned orbital laboratory (MOL), which the author pictured as the first step in 1965 to the construction of space armadas.[70] In discussing the 1964 Presidential election, the author noted that Johnson had followed the Kennedy administration's line of a dual track space program, but Listvinov argued that by 1965 the President was under attack from the right and had moved to embrace the creation of a space combat force. The line of argument here led directly to militarization, i.e., the creation of combat forces with a basic mission of neutralizing enemy ICBMs. However, as General LeMay had recognized, the road led to the "development of qualitatively new -- but not 'absolute' arms systems."[71] Critics of the current program of strategic modernization called it a nuclear Maginot Line and advocated outflanking the Soviet Union technologically. Listvinov, unlike Vasil'yev, saw no web of political-legal developments which were acting as a check upon space militarization.

The discussions of offensive and defensive strategic systems and the militarization of space took place within a specific geostrategic context -- one remarkably favorable to the U.S.S.R. On the other hand, the United States was locked in an expanding land war in Asia that in no way

threatened the direct security of the U.S.S.R. On the other hand, the war was imposing a telling economic, political, military and international burden upon the chief bastion of the capitalist system. At the same time the modernization of Soviet strategic forces had progressed to a point where the U.S.S.R. did, in fact, for the first time have the ability to employ its nuclear arsenal on an intercontinental scale. The Soviets were well aware of the fact that the very potential of this development had brought about another "zig" in American grand strategy. It was in this context that the third and final edition of Sokolovsky's Voennaia strategiia appeared.

The revisions between the 2nd and 3rd editions were substantially greater than between the 1st and 2nd. The treatment of U.S. and NATO grand strategy and basic trends in the development of their armed forces emphasized "flexible response" and long-range strategy to achieve politico-military objectives. The structure of the armed forces in this new strategy no longer was determined by balancing the branches but was related to the fulfillment of specific missions. The two top-priority missions were strategic attack and defense. Under the former, the Soviet authors identified the Triad and supporting forces. Under the latter, they grouped air defense, anti-submarine warfare forces, ballistic missile defense, and space defense along with the supporting command, control, communication and intelligence assets to support each capability. In these areas, as in others, the U.S. objective was to seize and keep the technological initiative under the assumption that falling behind in decisive areas of arms competition could lead to nothing less than the disadvantaged side being "unilaterally disarmed."[72] This discussion took place within the context of a specific treatment of the need to develop a generalized superiority

in both means of attack and defense, including the creation of "an effective means of antimissile and antispace defense, so as to reduce losses in men and material from enemy nuclear strikes."[73] At the same time one of the driving forces in the modernization of U.S. strategic offensive forces was the need to overcome successfully a Soviet PRO system.[74] For the Soviet Union technology did not drive doctrine, but the U.S. effort to seize the technological initiative and undermine the reliability of Soviet weapons systems by its very nature required a response. From a Soviet perspective the modernization of U.S. strategic forces was interconnected with and dependent upon military-political and the military-technical sides of U.S. doctrine. A Soviet response to such trends had by its very nature to grasp those interconnections and dependencies.[75]

One area of development which received extended treatment in the 1968 edition was the military space program, which the authors described as a concerted effort to militarize space:

> The militaristic circles of the U.S.A. are the principal aggressive force nuturing insidious plans for using space for military purposes and transforming space into a new theater of military operations; they consider space the most suitable for implementation of global military operations.[76]

As this statement implies, the Soviets saw U.S. plans for the militarization of space moving from a role of combat support for other non-space-based weapons systems, through the creation of weapons aiming at space denial (means of antispace defense), toward the development of offensive space systems designed to conduct operations in space and to strike ground targets from space. That this process reflected a dialectical interaction and a technological spiral was not accidental. Voennaia strategiia posited a current stage of space development in which the cosmos was a supporting

medium for operations elsewhere. The analog was the sky during the early days of aviation when balloonists, airship pilots, and aviators used the sky for reconnaissance in support of ground operations -- a situation that preceded the Wright brothers' flight at Kitty Hawk and continued to exist into World War I when aviation developed the capability to engage in air-to-air combat with the initial objective of denying the adversary use of the air and then developed the capacity to strike at ground targets. In the first phase of air warfare as in space warfare the arrival of assets in the medium had radically altered the reconnaissance capabilities of both sides, putting a premium on the organization of the intelligence collection and analysis process and creating the need for camouflage, concealment and deception of ground forces.[77]

Sokolovsky's analysis left the impression that this stage of the militarization was well-developed, having reached a new plateau in 1965 with the emergence of the capacity to launch multipurpose satellites. On the other hand, systems for space denial, which embraced both ABM and space defense systems, were only in their developmental stage. The book listed a number of projects -- "bambi," "sorti," and "saint" -- which had been pursued and then abandoned when it became clear that their technical complexity, high costs, and marginal utility made them unacceptable.[78] The promising avenues of development in these areas were still MOL and the Gemini program, which the Soviets described as a manned satellite interceptor testbed.[79]

Finally, the Soviets depicted a number of projects including Dyan-soar and BOSS (an orbital bombardment spacecraft system) as the final technological indicators of the more-distant third stage, when space would

become a medium for the launching of strategic attacks upon ground targets. Mastery of space was the lever to politico-military hegemony according to U.S. advocates of the militarization of space. In the shortrun, i.e., over the next decade, no technological miracles were going to neutralize the Soviet strategic arsenal. Indeed, investments in defensive PRO and PKO systems were quite likely to give very marginal returns, ones totally out of keeping with the investment costs according to U.S. defense analysts.[80] At the same time massive expenditures on research development in these twin areas were fully justified because, according to Western defense specialists, "the side which first creates an antimissile (antispace) defense will have the most important strategic advantage which would allow the threatening of war or its unleashing without fear of the enemy's retaliatory strikes."[81]

For the United States such a system with the ability to protect counter-force and counter-value targets held out the prospect of restoring the U.S. strategic invulnerability which had existed down to 1945, thanks to geostrategic circumstances. In describing the origins and development of the Nike-X program within the context of the problem of continental air defense, the authors underscored U.S. efforts to create "an effective antimissile and antispace defense" which they labeled as the road to "strategic superiority in the military sphere."[82]

Soviet programs during the same time period were pursuing the acquisition of military capabilities in space in precisely the same avenues attributed to the United States. The U.S.S.R. had an extensive program of reconnaissance satellites, was developing an anti-satellite system, and had begun the research and development of an ABM system, based upon the further

improvement of their SAM technology. The Soviets were also pursuing the development of fractional orbit bombardment systems (FOBS), which might be described as a technological homunculus -- a modest version of the fullblown orbiting strike weapon capable of carrying out nuclear strikes. The conclusion to be drawn from the third edition of Voennaia strategiia and other works appearing in 1968, was that the Soviet General Staff had already developed a probable scenario for the militarization of space. The three stages were clearly outlined; the operational constraints on existing technologies seemed to suggest that while stage one was well-advanced, stage two would not arrive for at least another decade. Finally, the first research efforts aimed at mounting offensive systems in space would be even more modest and not have a strategic impact for at least well into the second decade. This scenario did not pay much attention to the political forces within the capitalist camp that might for whatever reasons wish to slow, halt, or redirect the arms race.

Detente and Arms Control

In 1969 Soviet attention focused precisely on this aspect of U.S. military policy. In January an unsigned review of John S. Tompkins' The Weapons of World War III: The Long Road Back from the Bomb gave prominence to one aspect of that work: the development of science and research capabilities in the U.S. around the U.S. defense effort. Tompkins had argued that the attempts to sell a national science and technology policy based upon the Soviet threat and the civilian pay-offs had run into problems. With an expanding list of civilian needs and radically increased costs for research and development on military hardware even such high prestige items as the space program and Apollo were facing sharp criticism.[83] The

critical point here is that Voennaia mysl' had shifted its line to embrace the idea of political constraints as an effective check on U.S. efforts to get technological superiority.

Further evidence of this new line of analysis was quickly forthcoming. In 1968 G. Trofimenko had published Strategy of Global War, in which its author, who went on to be become the Chief of the Foreign Policy Department of the Institute for the Study of the United States and Canada, provided an analysis of the domestic political context to the evolution of U.S. military-political strategy in the postwar period. The volume appeared under the imprinture of the Publishing House "International Relations," which is directly affiliated with the Institute of World Economy and International Affairs, the largest and oldest of the Soviet civilian think tanks, dating back to the prewar period.[84] This analysis, which treated developments down to the Johnson administration, incorporated the concept military-industrial complex as an institutional actor in the process of policy formation. However, Trofimenko saw the complex as divided by contradictions arising out of objective circumstances. For him the key point was: "The greater the importance acquired by the military potential of the imperialist states, the more difficult it is to apply it as an instrument of foreign policy." The frustrations of Vietnam were in this case only an immediate manifestation of the central paradox of the nuclear age. Trofimenko assumed, however, that their impact would be profound regarding domestic support for U.S. grand strategy.[85]

It might be argued that the opinions of a civilian analyst in one of the new think tanks would hardly have appreciable impact upon the Soviet military's views on the same topic. Many arguments can be mustered to

support such an assertion. The think tanks were recent creations. The style of the Soviet leadership was to want intelligence collection and not independent analysis from specialists. The men in these think tanks are outside the loop in setting Soviet defense policy and so will not have a major role in threat assessment, especially where prudence and tradition demands hardheaded realism and worse-case assumptions. But, and this is an important but, the Soviet leadership does seem to have given the civilian assessment some credibility. Indeed, Trofimenko's volume was reviewed favorably in Voennaia mysl' and recommended as a companion volume to Sokolovsky's Voennaia strategiia. Even more conspicuous is the fact that the reviewer was not a senior military officer but a civilian with close ties to the foreign policy elite and Central Committee of the Party, Anatoli Gromyko.[86]

Gromyko's article was more than a review of Trofimenko. In assessing U.S. military-political strategy he asserted that the U.S. military-industrial elite had abandoned victory in a general nuclear war as an attainable objective. He went on to say that while the vast majority of this elite held such a view they had not abandoned the search for a military-technical policy that would make limited war feasible. This path was one of zig-zags veering between "total war and peace."[87] The various U.S. strategems were designed to impose certain rules upon the U.S.S.R. The point was not that U.S. policy-makers had become peaceloving. Rather, Gromyko demanded that Soviet analysts transcend their traditional functions of unmasking and denouncing the plans of the imperialist warmongers and "analyze the position of those who, due to objective circumstances and more flexible thinking, recognize the extremely dangerous consequences of the

arms race and who would like to slow this process." Gromyko did not assert that such "realism" was by any means the dominant trend in U.S. politics. He pointed to the fate of former Secretary of Defense Robert McNamara as an example of what happened to such "realists." It is valuable to contrast Gromyko's analysis of McNamara with that of those of Anyutin's. In the latter case the secretary's realism was driven by cost-effectiveness criteria and emphasis fell upon his declared willingness to pursue an effective ABM system, irregardless of cost, as opposed to the flawed interrum solutions which were feasible with current technology. In the former case Gromyko characterized McNamara as a more or less sober analyst of trends in the arms race. Where Snyutin had seen a dispute among the faithful over means and not ends, Gromyko saw the fighting as symptoms of more fundamental divisions, what we might describe as the collapse of the postwar bipartisan approach to grand strategy. This debate was not about the nature of the adversary. McNamara had become one of the architects of the U.S. military-industrial complex and was a committed anti-communist. The shift was more subtle and involved an erosion of ideological confidence in the ability of technology to answer the strategic dilemma created by the mass acquisition and deployment of nuclear weapons by the Soviet Union.[88]

Gromyko carried Trofimenko's analysis forward into the Nixon administration, contrasting the assertions of Secretary of Defense Laird calling for strategic superiority with those of President Nixon about "sufficiency" as a policy objective. He pictured the acid test of these competing conceptions as coming over the "hawks" calls to transform the "sentinel" ABM system into the Safeguard ABM system, a dense defense against Soviet ballistic missiles, at a cost of $50 billion. Gromyko

identified Senator Edward Kennedy as one of the voices in the Senate who were charging that such a program would be a waste of resources and were calling for increased spending on domestic programs. Gromyko concluded that the Nixon administration, whatever its ideological assumptions was being forced by domestic economic and social conditions to seek to moderate the arms race.[89]

At exactly this juncture the Soviet leadership was actively calling for normalization of relations between the United States and the Soviet Union. Even in the wake of the Soviet-Warsaw Pact invasion of Czechoslovakia, Foreign Minister Andrei Gromyko had been quick to call for resumption of dialogue. It is true that in the same period, October-November 1968, Brezhnev had used the 5th Congress of the PZPR in Warsaw to articulate a justification for that action and to raise it into a principle of interstate relations within the Socialist system as the Brezhnev Doctrine. But the rather restrained U.S. response to events in Prague may well have suggested to those in Moscow that the forces of realism were much stronger than initial Soviet assessments had credited them. Certainly the political confusion of that spring, summer and fall added weight to such arguments. In November 1968 Premier Kosygin had former Secretary McNamara visit with him and in a series of meetings thereafter with U.S. officials advocated both detente and the need for talks on strategic arms limitations. Signals from the Nixon administration in early 1969 indicated that the President did accept strategic sufficiency as a policy objective. At a press conference at the Foreign Ministry L. M. Zamyatin made a clear call for strategic arms talks, citing the 1963 Test Ban, 1967 Outer Space Treaty and 1968 Non-Proliferation Treaties as

evidence of the "broad understanding in the world both of the dangerous consequences of continuing the arms race and of the necessity to take effective measures for halting that race."[90] Zamyatin went on to call for negotiations to limit and ultimately bar all nuclear weapons.

In March 1969 President Nixon announced that the U.S. would pursue development of the Safeguard ABM system. In his statement the President enumerated three purposes: protection of land-based ICBMs from Soviet attack; population defense against foreseeable Chinese missile capabilties well into the next decade; and modest protection against an accidental or irrational attack from the Soviet Union in which only a fraction of that country's ICBM arsenal would be used.[91] The signal from the U.S. was, as this press conference suggested, that Safeguard would be as limited in both senses of that term as Johnson's Sentinel had been.

Soviet articles by military officers on the U.S. space program in 1969 reflected a continuing division in their ranks regarding the assessment of U.S. intentions to "militarize space." I. Rognedin treated the U.S. space program as primarily military in its orientation. However, he stressed the fact that since 1963 a set of treaties had blunted this drive and held out the prospect of the demilitarization of space. Yet, here the author seemed to draw a line between space reconnaissance counter-measures which would make it difficult to attack satellites in orbit. For Rogedin the decisive area of space competition was in low earth orbit, where such systems could support other combat assets.[92] The U.S. space program was still driven by the assumption that superiority in space, based upon holding the technological initiative, would translate into real politico-military power. However, the prospects for radical breakthroughs with existing

technologies were quite low. The real pay-offs were to be foreseen in the more distant future.

> U.S. military theorists devote considerable attention to the elaboration of operational-strategic concepts on space as a possible area of military operation. The substance of their conclusions is that near space can be used primarily for armed forces support and for battle against missile systems of the probable enemy. In addition they consider that the physical properties of space offer suitable conditions for developing basically new techniques of warfare.[93]

Two points are particularly noteworthy in this quote. The first is the gentler tone regarding the warmongering imperialists' "probable enemy." In earlier works Soviet officers would have called a spade a spade. The second point is that the translation of the final sentence is ambiguous as it reads. In Russian the word tekhnika covers both techniques and technology. I suspect that the author meant new technologies, which were to be incorporated in space-based weapons systems. Such new technologies, if they were developed and deployed in sufficient scale, could bring fundamental changes in military art and, indeed, transform space into a theater of military operations well beyond that described in Sokolovsky. But the author's main point was that existing technologies did not hold out any such immediate prospects.

As if to reinforce this theme Iu. Listvinov gave an appraisal of the Apollo Moon Program which played down its military pay-offs. Listvinov stressed that heavy lift boosters and long-term voyage capabilities did have major military benefits, but stated that the real benefit came in near-earth orbit of manned laboratories. The U.S. space program which was then about to land on the moon had run into funding problems. The national pride which had helped to generate support for it was no longer there. Now

the space effort would have to be sold in terms of immediate military advantages. The bureaucratic politics of this process Listvinov described as a merging of NASA and DoD space programs with the military getting "space stations, flotillas of aerospace vehicles -- interceptors and fighters."[94] Listvinov's style of exposition was certainly more in keeping with earlier Soviet military writings on militarization of space, but his conclusions were basically in line with those of Rognedin's: the area of contest was near space; major developments in lift capacity with reduced costs of orbiting payloads, and the development of technologies were long-range prospects and not immediate threats.

Preceding the 24th Party Congress Voennaia mysl' carried an article which touched upon the problems of foreseeing such trends and avoiding technological surprise. The author, Colonel L. Kuleszynski, was a Pole, and the article had originally appeared in Mysl Wojskowa in 1970. Kuleszynski discussed surprise as a psychological condition and borrowed from cybernetics the concept of entropy which in this case meant the degree to which surprise brought about the steady degradation or disorganization of a system. Surprise was not a passing phenomenon but could have a continuing impact on the conduct of war. Indeed, the author argued that the degree of surprise was an inverse function of the victim's probable expectation of the event. In this fashion foresight, while not an absolute counter, could serve as a vital antedote. The point was to keep the system ready for surprise so that it could respond rationally, avoid panic, and recover quickly. Kuleszynski agreed with Svechin's earlier assertion that the grander the scale of surprise the more difficult it was to achieve. Kuleszynski listed six counter-measures to the threat of

surprise. While all of these applied to each level of combat, they could also be applied to technological developments as well: 1) study of the modern methods of conducting combat operations as well as the potential character and methods of future war; 2) improve the ability to predict by getting away from subjectivism, voluntarism, and intuition and toward logical, dialectical, mathematicized calculations; 3) develop and improve intelligence and reconnaissance systems; 4) avoid enemy provocations since in being provoked the commander does what his opponent wants; 5) maintain the flow of information to subordinates about possible (predicted) enemy actions; and 6) increase the combat stability and readiness of the system of troop control.[95] The key to the execution of surprise was to limit enemy access to information about your forces, means, and intentions, to deceive him with false information, to disorganize his command system by active measures. At the same time, Kuleszynski warned that it was most dangerous to base one's own plans on the assumption that such actions would achieve and maintain surprise.[96]

The 24th Party Congress in March 1971 represented a clear victory for those who wished to pursue detente with the United States, including the SALT negotiations and ABM Treaty. Some, notably Lawrence Caldwell, have argued that prior to the Party Congress the military was forced to accept a more modest budget as a result of a "modernist" drive to expand the economy. As in most such cases there is an element of truth here. In 1970-1971 a shake-up was under way in the Soviet military. Marshal Zakharov retired as Chief of the General Staff, and Marshal A. A. Grechko, who had served as Minister of Defense since 1967, emerged as the most authoritative voice within the Soviet military. Zakharov's successor, V.

G. Kulikov, was a relatively junior commander in 1971, having only served as a chief of staff to an independent tank brigade during the Great Patriotic War. In comparison, Zakharov and Grechko had each senior command or staff responsibilities at the army and front levels. In this context the General Staff does not seem to have enjoyed the sort of commanding authority, which it has possessed under Zakharov.

It is quite true that Brezhnev in his major speech on foreign policy to the Congress stressed the theme of "detente" and an active struggle for peace, including arms control.[97] On the other hand, in his discussion of Soviet economic development during the Ninth Five-Year-Plan, 1971-1975, Brezhnev emphasized the scientific-technical revolution as the key to the transformation of the national economy. Brezhnev specifically acknowledged the intensification of competition between the socialist and capitalist systems in this area. While emphasizing increasing the social product in all sectors, Brezhnev drew special attention to the problem of turning science itself into a direct factor of production and to drive Soviet enterprises to leap at scientific and technical innovations. This emphasis seems to suggest that the CPSU had given top priority to research and development under the next five-year plan. In addition to the compelling needs of domestic economic expansion there were two other powerful factors affecting this line.[98] First, the Party's assessment of the international climate was one of a shifting correlation of forces in favor of the forces of socialism and a significant decline in the immediate military threat confronting the U.S.S.R. Second, in many areas of military technology the Soviet Union had already completed its procurement cycle and was at the stage of research and development, where the immediate prospects of the

appearance of deployable, efficient weapons systems were relatively low for the immediate future, i.e., during the next five-year plan. The acquisition of space weapons systems, including Soviet ABM development, certainly fit within the framework of this analysis.

After the Party Congress a great mass of circumstantial evidence appeared to support this analysis. In April 1971 Soviet cosmonauts presented the flights of Soiuz 6, 7 and 8 as evidence of the long-range benefits to science of permanently manned space stations. One of them stated:

> Our science has approached the creation of long period orbital stations and laboratories and these are decisive means for the broad conquest of space. Soviet science regards the creation of orbital stations with replaceable crews as man's main path into space. They can become cosmodromes in space and jumping off points for flight to other planets. Major scientific laboratories for the research into space technology and biology, medicine, geophysics, astronomy and astrophysics will come into being.99

This agenda took a long look at space and a prolonged period of study before practical application in space of these studies. In July Voennaia mysl', which had all but ignored manned space flight, suddenly gave a prominent place to an interview with Soviet cosmonauts. Major General G. T. Bergevoi went further to picture large, manned orbital stations as laboratory-production facilities where research engineering could take place dealing with such exotic technologies as crystal growing in a vacuum, electron-beam technology, manufacture of micro-electronics, and the production of ultrapure materials.100 Colonel G. S. Shonin pointed out that Voennaia mysl' in its coverage of space and spacecraft had concentrated almost exclusively on automatic vehicles and given little coverage to cosmonauts or their ships. The editors themselves promised to correct this oversight.101

In August 1971 Voennaia mysl' carried an entire set of articles which treated trends in the development of space technology and their military application. In an unsigned article discussing the tasks of military science in light of the 24th Party Congress the journal was silent about any immediate threat from the capitalist world regarding the militarization of space. However, the article did stress the need for Soviet military science to develop its powers to foresee "future prospects for development of means of armed combat." Emphasis was, however, placed upon rapid decision-making and minimization of losses. Military science did have the task of organizing and sustaining cooperation among the various forces and means but this task was confined to land, air, and sea. There was no mention of space as a problem of military art. Instead, military science was to study U.S. capabilities and potentialities in order to accurately assess the threat. The editors emphasized the need for doctrinal solutions which would minimize losses, reduce the time involved in the conduct of decisive operations and maximize combat potential through combined arms solutions. Space as a dimension to military science's deliberations was thus only a supporting medium and not a decisive one in contemporary armed combat.[102]

This theme Colonel A. Vasil'yev elaborated upon in the same issue of Voennaia mysl'. In an analysis of the development of U.S. military space systems and equipment the colonel concentrated upon two themes: the immediate use of space to support combat operations in the air, on the ground, and at sea. Vasil'yev noted that even with tighter purse strings for the defense budget space research and development still had a high priority. The investment in the shortrun, however, seemed to be directed

towards the support of combat operations through the development of multi-purpose satellite systems to conduc reconnaissance, electronic warfare, communications, and navigation functions. These were immediate technologies which Vasil'yev expected to undergo evolutionary improvement.[103]

The colonel also noted some research efforts which were going to pay off only in the more distant future. These included MOL, as the Soviets described "Skylab 1," which they saw as the platform for studying manned operations in space. More importantly, the author noted the U.S. intention to develop under joint NASA-USAF sponsorship a "manned spaceship for repeated use." This vehicle, which the author described as a two-stage system capable of carrying out missions of 7-30 days length would evolve over the next decade into the U.S. "Space Shuttle."

Vasil'yev treated this program as part of the general trend in the U.S. development of military space systems but couched his argument in terms of the financial savings which reuseable systems would bring to the process of inserting manned and unmanned equipment into orbit. The military tasks which such a system might perform included the capture and inspection of foreign satellites, space reconnaissance of earth objectives, transportation of crews and equipment to space stations and even lunar landing bases (!), and launching of military satellites into geocentric orbits and retrieving them.[104] Vasil'yev did not attribute a military capability to the shuttle itself. Instead, he pictured it as a programmatic focus for the U.S. military-civilian space program, playing an analogous role in the 1970s to that which the Apollo Program had played in the 1960s, i.e., a program which would carry both research and development benefits to other space-related military programs and enjoy substantial national prestige and support. Vasil'yev concluded:

> From what has been said, one can see that the U.S. military space systems and equipment are constantly being improved on the basis of technical and technological achievements and accumulated experience. With the goal of reducing expenditures on space systems, there is a tendency towards creating multipurpose satellites and manned space craft for repeated use, and the latter, apparently will become the basis of the entire U.S. space program up to 1980, just as in the 1960s the basis was the "Apollo" program which had as its goal putting a man on the moon.[105]

Soviet statements about their own space program and their explicit analysis of the U.S. space program in the early 1970s suggest that Soviet military experts expected a decade of competition in the realm of research and development. Political circumstances and technological capabilities had by the early 1970s combined to forestall the threat of the militarization of space as Soviet experts had understood that phenomenon in the 1960s. The case for this interpretation was made by I. I. Anureev, a professor at the Academy of the General Staff and one of the Soviet Union's leading theorists of nuclear warfighting. In the same issue of Voennaia mysl' where Vasil'yev's article appeared, Anureev used a discussion of the methods of military science to make a sweeping case for the greater mathematization of military science. Anureev drew particular attention to the role of "the dialectical law of transition of quantity to quality" to treat the problem of technological initiative and surprise. Citing Engel's remarks on the topic, Anureev emphasized that only the mass introduction of qualitatively new weapons systems can lead to radical changes in the character and methods of waging war.[106] No mention was made of space systems in particular. However, the entire context of this discussion and what followed it make it plain that Anureev was, indeed, assessing the general prospects for such qualitative breakthrough which would radically affect the conduct of war.

Anureev in his call for greater mathematization of military science tied the law of transition of quantity to quality with the law of the unity and struggle of opposites and the negation of the negation. War, Anureev depicted as an interactive process involving two sides engaged in armed struggle to achieve specific political objectives. This is, of course, vintage Clausewitz à la Lenin. But Anureev pointed towards a process of interaction between offense and defense, where the party possessing the initiative was able to produce reactions in the other side.[107] The development of warfare remained for Anureev historically grounded in past experience and conditioned by present conditions. A correct understanding of these two should, according to the author, allow one to predict the future. Such predictions should not be based upon mere extrapolations of current trends. On the contrary, the key to such foresight lay in the rigorous application of the law of the negation of the negation.[108] Specifically Anureev pointed to the fact that the study of the history of the development of methods of conducting military operations indicates that sometimes old, obsolete methods have been reborn on a new, higher social and technological basis. Technological change, thus, played a conspicuous role in military affairs but one conditioned by the interactive processes outlined in the law of the unity and struggle of opposites. The struggle for the technological initiative was a two-sided, interactive process. Anureev argued one way of forecasting this process of negation of the negation was the application of mathematized knowledge to military science. After outlining various techniques, Anureev concluded that mathematical modelling offered great promise because, although they could not reflect the entire real process of phenomenon, they could make it possible

to encompass complex systems of operations and to study numerous variants to the solution of specific military problems and aid in selecting the optimal variant.[109]

These methodological comments might at first glance seem to have no direct relevance to the problem of the militarization of space. However, they should be interpreted within the context of a major work on ABM and space defense systems which Anureev published at the same time. The work, based upon an analysis of U.S. weapons technology was a tour de force in the application of the very laws which Anureev had explored in Voennaia mysl'. The entire structure of the work was an attempt to address the problem of interaction between strategic offensive systems and defensive ones. The central reality of strategic warfare was, and Anureev asserted, would remain the ballistic missile. Such unprecedented technology had to lead, in Anureev's opinion, to a struggle between offensive and defensive systems. This process, Anureev asserts, began literally with the development of the first ballistic missiles by Nazi Germany during World War II. Responses to the threat included attempts to destroy the industrial base supporting the weapons production, which Anureev considers to have been ineffective, and projects for the development of a ballistic missile defense system. The components of such a system were quickly grasped by the Anglo-Americans: an effective radar system for location of the missile in flight, a missile weapon system to intercept the ballistic missile, and a computer-assisted command and control system to manage target interception and destruction. Anureev's point here is not that such a system was feasible in 1945 but rather that the component parts of such a defensive answer could be foreseen.[110]

In this discussion Anureev applied the law of the negation of the negation to the specific problem of potential trends in the development of strategic offensive and defensive systems and concluded that the advantage still lay with the strategic offensive forces because the direction of their modernization, especially the introduction of MIRVed missiles, greatly complicated the problems of defense. Anureev discussed a wide range of other measures which could be used to conceal, deceive, and misinform the enemy's defenses. Anureev's conclusion was that competition between offensive and defensive systems would continue but that there were no immediate prospects for the creation of an effective ABM system against mass attacks if such a system was based upon the interception of one missile by another during reentry, using existing technologies. The argument here fully supported the political decision to sign both the SALT I and ABM Treaties. Anureev did not rule out technological developments which could shift this correlation between offensive and defensive systems and explicitly pointed to the problem of rapid obsolescence of missile weapons.[111] In discussing the U.S. program of missile modernization Anureev saw its basic objective as getting "the greatest possible increase in their combat effectiveness as well as reduction in expenditures on development, production and operation.[112]

In treating ABM and space defense weapons Anureev concentrated upon the interaction between technical requirements imposed upon the defense to match this modernization of strategic offensive forces and the intense political struggle which surrounded the U.S. programs to acquire an ABM system. With no immediate technological breakthroughs on the shelf which could transform the correlation between offensive and defensive systems,

Anureev's argument was one for prudent procurement of available ABM technology and substantial investments in research and development of more advanced technologies which offered radical breakthroughs but only on the horizon. Anureev nowhere asserted that the ICBM must remain the unchallenged strategic arbitrator. Rather, he emphasized the need to look to developments in computers and control technologies, radars and sensors, and more advanced weapons systems.

Anureev depicted the Nixon Administration's decision to develop the Safeguard ABM system as a de facto recognition that existing technologies in all three areas, i.e., radars and sensors, computers and command and control systems, and missiles and weapons, were unequal to the task of providing a reliable defense for population centers against mass attacks. The best an ABM system might achieve, according to the Soviet officer, was protection against a small, uncoordinated attack and the degradation of a larger attack to allow U.S. counterforces to ride out the attack and retaliate.[113]

Anureev did, however, point to U.S. efforts to improve the chances of ABM defense by developing satellite-based sensor systems which could detect ICBM boosters from launch and the development of chemical lasers which could be used to attack such targets in their boost and mid-trajectory phases.[114] The success of such a system would depend upon the linking together of early warning satellites with a "fleet of combat spacecraft" similar to those envisioned in the Bambi Project. Anureev pointed to U.S. speculations about the feasibility of creating such a system by the late 1970s and speculated about the developments in missile and laser technologies necessary to make the system functional in the ABM role. From a

Soviet perspective the key advantages to the new technology lay in the ability to provide for early engagement before the ICBM could deploy counter-measures and in the possibility of engaging in a battle of attrition over the entire trajectory of the attacking missiles. The key to the success of such a program lay in a number of new technologies and in reducing the costs of putting payloads into space while increasing the dependability of orbital objects.[115]

Anureev concluded his work with a treatment of the prospects for the development of space defense weapons systems. Here again he stressed the interaction between offensive and defensive systems and underscored the advantages to be derived from neutralizing and degrading enemy space-based command and control systems. Anureev drew attention to the articulation of concepts of space control in the U.S. and outlined the various programs for the detection and tracking of space objects. Again Anureev stressed the tension between present capabilities and improvement of capacity by system modernization with regard to sensors, command and control, and weapons. One such system of the future was an air-launched ASAT system. He also discussed the use of MOLs and manned ASAT systems capable of inspecting, capturing and destroying hostile orbital objects in space defense. Anureev presented these developments within the context of an emerging U.S. interest in combined arms warfare in a space theater.[116]

The book's entire argument was a call to support the arms control process as one in keeping with the current technological correlation and the shifting strategic balance in favor of the U.S.S.R. SALT I and the ABM Treaty of 1972 offered a structure to an arms race which was militarily and politically appropriate to the Soviet Union. Anureev provided a sophisticated argument in support of that case in his book.

This point was explicitly acknowledged by reviewers of the volume, including Major General Provorov. Writing in Voennaia mysl', Provorov approached Anureev's book as a treatment of the steadily increasing role of aerospace defense as a characteristic feature of the technological revolution in military affairs.[117] Provorov made the telling point that Anureev's extensive treatment of offensive missiles and space systems was the key to understanding the core of the book, "military-strategic and scientific-technical problems of antimissile defense." Provorov called the reader's attention to Anureev's discussion of the interaction and interdependencies to be found in the U.S. "Safeguard" ABM system.[118] The argument here rested upon the assumption that serious technical problems had impinged upon the prospects of success of such a program and had led realists in the U.S. to grant the premise that in the short run an effective ABM system was not on the horizon. At the same time Provorov noted that U.S. policy still had an aggressive intent and that the U.S. was still seeking to bolster its claims to world leadership through the acquisition of "global weapons systems."

With regard to the technological roadblocks to an effective ABM system Provorov pointed to radar and computers relating to battle management. With regard to interception of ICBMs and their warheads Provorov pointed to two contradictory trends. On the one hand, because of the slowing which takes place during reentry, interception during that stage of flight seemed to offer greatest promise. But such a system required the development of more advanced radar systems to see over the horizon. At the same time the development of MIRV technology made it imperative to intercept the bus before the individual warheads had separated, creating many more targets

and allowing the enemy to engage in a full range of deception measures. Early engagement before MIRVing thus became a top priority for a successful ABM system. The unstated conclusion to be drawn from this proolem was that using intercept weapons operating at ballistic speeds against ICBMs could not resolve the problem.[119] Given the rapid modernization and expansion of the Soviet strategic arsenal in the late 1960s and early 1970s, the correlation between offensive and defensive systems for the immediate future seemed to be one favoring a stable development along anticipated technological lines. Provorov cited Brezhnev's speech to the 20th Party Congress to underscore the fact that Soviet offensive forces were and would remain a deterrent to any and all aggressive forces. The U.S.S.R could meet any attempt to achieve military superiority by its own timely countermeasures. The rhetoric justified the modernization of offensive forces just as it projected the search for long-term technological solutions to the problems of ABM and space defense.[120]

The theme of long-term research and development was further explored in another article by Anureev. The ostensible subject of the article was the correlation of military science and the natural sciences, but the subtext was the general direction of the scientific-technical revolution in military affairs. Exploring the direct, indirect and feedback connections between military science and the natural sciences Anureev drew attention to the revolutionary transformation of troop control which was coming with the introduction of cybernetics into military affairs. Anureev's theme here was one close to the earlier topic of the mathematization of military science but underscored the revolutionary changes in troop control as the foundation for revolutionary changes in the development of military hardware. This led to an emphasis upon mathematical models and simulations

as a way of indirect verification of solutions to practical military problems. This method was to be applied in peacetime with major emphasis upon forecasting weapons development and changes in doctrine. Anureev in this regard pointed to quantum electronics, the basis of both laser and particle beam systems, as one area which would lead "to the development of new areas of tactics, operational art and strategy."[121] The natural sciences were only then developing the theoretical principles which could be applied to weapons systems, but Anureev asserted that a close link between military science and the physics of elementary particles could be forecast.

The thrust and direction of these observations by Anureev and others were towards the feasibility of arms control agreements covering existing technologies and reflecting the correlation of forces which had emerged in the international arena as a result of improvements in the Soviet Union's geostrategic situation and the complications -- both international and domestic -- which constrained U.S. policy. Soviet military observers did not take this situation as one that would continue indefinitely into the future and seem to have been well aware of the areas of technological development which might in the future affect the strategic balance and make a major shift in the correlation of strategic offensive and defensive systems possible. These areas were: radar and sensors, computers and control technology, lasers and particle beams, and the acquisition of space technology which would make it possible to place greater payloads into space at substantially reduced cost, thus allowing a power to introduce into space sufficient assets to exploit the potential of these other weapons technologies from space itself. These were only trends and not yet

weapons systems. Anureev's point was that the military had a vested interest in supporting research and development in the natural sciences so that military science would be able to apply the latest discoveries to potential weapons technologies. The subtext of the SALT I and ABM Treaties was a postponement of the decisive phase of the struggle over the militarization of space until such advances might be applied.[122]

The Soviet research and development effort would appear to have been a major one. However, it was in large measure driven by an explicit recognition that the U.S. was committed to the same process. Indeed, the attention Soviet authors devoted to the space shuttle program confirms the impression that the shuttle was seen as the key to U.S. military space efforts. A. Volodin identified a number of missions which the shuttle could perform including reconnaissance, identification and interception of enemy space objects, interception of missile warheads and the destruction of strategic targets. The author did not identify such targets as to location but did seem to imply earth targets. The shuttle or multiuse transport spacecraft had two key advantages: economy and versatility. Volodin saw such craft as being used as space tugs for lunar and deeper space activities and noted their utility in transporting materials for the construction of permanent space stations. He attributed to USAF leadership a desire to employ the shuttle for ABM and space defense purposes.[123] Volodin's piece on the prospects of the space shuttle, then only in the planning stages, could be compared with Colonel Yur'yev's mundane article on space satellites as reconnaissance systems. The article contained the usual detailed technical information about latest developments in U.S. reconnaissance satellites within the context of supporting combat operations in other theaters of military operations. In keeping with the Soviet

general assessment of existing technologies Yur'yev made no mention of the militarization of space. Nor did he address the potential development of anti-satellite systems, which could degrade or destroy reconnaissance and communication satellites and thereby undermine the command and control systems upon which modern military operations rested.[124]

Based upon Soviet forecasts of the pace of weapons development, a seeming anomaly appeared in the mid-1970's. On the one hand, Soviet forecasters were fixing upon a weapons development cycle of ten to fifteen years with the explicit expectation that the pace of weapons developments would accelerate as a result of the scientific-technical revolution in military affairs. At the same time the authors associated with the General Staff were posting a shift in the correlation of forces as a result of the Soviet acquisition of a strategic arsenal capable of countering any American claims to military superiority. This had the effect of radically reducing the prospects of nuclear war from the Soviet perspective since its initiation by the West no longer made any political sense. The Soviets did not accept and indeed found quite alien U.S. strategic doctrines based upon assumptions of deterrence by post facto punishment. For the Soviet General Staff and party elite as well, war continued to be a continuation of politics by other means. In keeping with the achievement of strategic superpower status and its policy of relaxation of tensions, i.e. detente, Colonel Spirov interpreted the SALT I Agreement as a de facto end to the Cold War imposed upon U.S. policymakers by their political defeats in Vietnam and the emergence of a strategic balance favoring the Soviet Union:

> The present correlation of forces between the U.S.S.R. and the U.S.A. has found expression in the agreement signed in May 1972, regarding questions of the limitation of strategic offensive weapons and systems of anti-missile defense. Agreements on these

questions give witness to the downfall of the policy of 'cold war' which has been conducted by American imperialism for more than a quarter of a century.[125]

Spirov and his fellow authors pointed towards two contradictory consequences of this situation. One was an increasing interest in new scientific and technological developments which might permit the U.S. strategic arsenal to escape this dilemma and the other was a doctrinal search for some military adaptations which would restore political utility to the U.S. strategic arsenal. Soviet responses in both areas were symmetrical, i.e. to follow such developments while modernizing both the scientific-technical and military-political base of the Soviet strategic posture. Colonel General N.A. Lomov, in his conclusion to this volume, identified four features of the scientific-technical revolutions impact upon military affairs: 1) the fact that nuclear weapons and their delivery systems had obliterated the boundary between front and rear; 2) the fact that these same weapons had created the preconditions for the achievement of wartime objectives in a short period of time; 3) the fact that the armed forces, and here he included all branches, under the conditions of a nuclear war had to be able to resolve combat tasks which were radically different from those performed in the past; and 4) the fact that the revolution in military affairs had to a significant degree elevated the importance of suprise as a factor at all levels of combat.[126]

The results of these developments pushed the Soviet military towards consideration of non-nuclear operational options under conditions of the existing correlation of strategic forces, while at the same time giving greater emphasis to the study of local war. Soviet military science devoted increased attention to the conduct of deep operations using conventional forces and surprise to achieve military successes in a strategic

environment in which the nuclear option could be delayed, forestalled or preempted by the judicious use of modernized conventional forces. Strategic parity, since it robbed the U.S. of faith in its ability to achieve escalation domination in theater-nuclear or strategic exchange, was sufficient to make rapid deep operations by conventional forces an appealing military option. But strategic parity rested upon the continuation of the existing correlation of forces into the future. In the short run, this seemed a viable policy. Whether it was over the long-term depended upon the military-political and scientific-technical assessment of trends. All the evidence suggests that by the mid-1970s, the Soviet General Staff was well aware of the fact that the scientific-technical revolution in military affairs had entered a new stage, distinct from the one dominated by nuclear-rocket technology, and centering upon the military application of cybernetics to problems of troop control. Increasing emphasis upon the man-machine-system interface, the application of automated systems of control to all aspects of military affairs, and the expanded application of operational research, systems analysis and system design engineering give witness to this shift. Yet, this new stage in the scientific-technical revolution could not be confined to strategic systems and, as the literature suggests, stimulated a wide ranging consideration of troop control throughout the Soviet military.

Soviet interest in and discussion of ABM and space defense during the same period was remarkably restrained. Soviet statements about their own space program and their commitment to manned orbital stations became a reality with the expansion of the Soiuz and the Saliut Programs. Ambitious plans were hinted at involving the industrialization of space and the

generation of energy through the construction of space stations to convert solar energy into electric power and sending it back to earth. Such plans required a radical expansion of the loads which could be placed into orbit and a significant reduction in the transportation costs of such payloads. In this context Soviet authors, including I.I. Anureev, examined the U.S. Space Shuttle Program, which had been authorized in 1972.[127]

Anureev's book on reusable spacecraft contains a vast amount of technical data on the U.S. Shuttle Program from the various competing designs and proposals from which the shuttle evolved to extensive information on the missions and uses envisioned for the shuttle when it was placed into service. Anureev emphasized the economic rationale for shuttle development and described it as a transport vehicle which by reducing payload costs could facilitate a whole range of more ambitious space projects, using even more advanced technologies. Anureev's treatment of the program was quite extensive and his conclusions underscored the utility of such a system. However, one of the most conspicuous features of this volume, which appeared in 1975, was the author's silence about the military applications of the shuttle. This silence is especially puzzling from so eminent an authority on ABM and space defense systems. That the book was published by Voenizdat makes the omission doubly curious. The only point where Anureev explicitly addressed the shuttle's role in the U.S. military space program came at the end of the study. Here, Anureev noted the substantial investment planned by NASA in the program and cited foreign press sources on the role the Department of Defense was playing in shuttle design.[128] His remarks were by Soviet standards reserved in the extreme:

> The U.S. Department of Defense has taken an active role in the solution of the principal decisions relating to the TSC transport space craft, the conduct of different research and tests. It is reputed, that the selection of the program for the creation of the TSC to a greater degree depends upon the support from the Department of Defense that on economic factors.[129]

Anureev's reserve here in discussing military applications of shuttle technology cannot be explained by any failure on his part to grasp the truly radically new prospects for the exploitation which such a system held out. Nor, as recent evidence confirms, can it be explained by a lack of Soviet interest in or knowledge of the system's applications. The absence of references to the potential military missions of the shuttle and more general references to U.S. plans for the militarization of space seems to have been a particular fruit of detente, since the book was written during the period when both sides expected major advantages from the relaxation of tensions and each had sound reasons not to provoke needless conflict. It was, after all, the time of Apollo-Soiuz. At the same time we should emphasize the extent to which such a treatment of the shuttle and the militarization of space was in keeping with Soviet views on the nature of the correlation of forces in the international arena. Soviet authors repeatedly stress the primacy of politics as the sources of armed conflict. Capitalism had not changed its spots, but Soviet analysts, by the middle of the decade, were willing to see structural restraints that operated to inhibit imperialism's aggressiveness.

Throughout the era of detente, Soviet civil and military spokesmen embraced a highly sophisticated analysis of the international scene and U.S. domestic politics which emphasized the increased paralysis of U.S. policy and the emergence of substantial and powerful forces who in their political realism sought to restrain the adventurist policies of the more

militant elements of U.S. elite. General Mil'shtein of the Institute for the Study of the United States and Canada offered a most intriguing analysis of these tendencies in his book on the U.S. military-industrial complex. Written four years after Anureev's technical treatment of the issues of ABM and space defense and reflecting the dominant themes of Brezhnev's peace offensive, Mil'shtein's treatment of the military-industrial complex was highly sophisticated by Soviet standards and went well beyond Marxist-Leninist precepts about state capitalism and war. Indeed, the central theme of the book, which drew heavily upon U.S. "new left" scholarship and more centrist critics of the foreign policy and national security processes, was that in the process of its development the military industrial complex had generated within its own ranks elements who for objective reasons, based upon a realistic assessment of the trends in the correlation of forces, were unwilling to accept any futher military adventures, while at the same time remaining institutionally committed to or at least accepting the further militarization of U.S. foreign and domestic policy.

These forces, which Mil'shtein too associated with former Secretary of Defense McNamara and others in the Nixon administration, had learned restraint as a result of the U.S. setbacks in Vietnam. Mil'shtein divided the U.S. MIC into liberal and conservative wings, reflecting American perceptions about the "hawks and doves of the 1960s and 1970s." The conservatives or hawks were still seeking complete victory but lacked a domestic political base to support their policies. They were also more willing to see in the military instrument as a solution to difficult and complex international problems. The liberals or doves, on the other hand,

could be defined as realists on three grounds: they sought to conduct a foreign and national security policy based upon limited political objectives and limited military means; they understood the necessity of an organic connection of military, economic, and foreign policy in the international arena and were more willing to address the limits of military power in resolving international issues and finally they were realists in their understanding of the total irrationality and unacceptability of the "very idea of global war in our era."[130] It is worth noting that Mil'shtein did not refer to global thermonuclear war as a subcategory of global war. Soviet military doctrine did not acknowledge the possibility of convertional global war, rather it emphasized that conflict between the socialist and capitalist systems must escalate into global thermonuclear war. As opposed to U.S. notions of deterrence by punishment or theater nuclear war, the Soviets were by the mid-1970s emphasizing the possibility of regional conflict which would be contained by the accepted judgement of both camps regarding limited means and ends. In the final analysis Soviets not only continued to see war as a continuation of politics, but had also grasped the fact that objective conditions were leading elements of the U.S. elite to accept a more narrow and limited definition of the U.S.-Soviet contest.[131]

Mil'shtein linked his analysis of these trends with the politics of ABM and the impact of Vietnam. Mil'shtein concluded that the victories won by the hawks in promoting a first-generation ABM system of dubious technical merit had in the end strengthened the hand of the opposition. Mil'shtein noted that the realists in the U.S. were hardly "doves", one-worlders, or advocates of unilateral disarmament. On the contrary, in

order to sink the ABM system which they saw as technically and doctrinally compromised the "liberals" advocated the modernization of offensive systems, including such programs as MIRV development, Minuteman modernization, and replacement of the Polaris SLBM with the Poseidon. Mil'shtein argued that one of the major promoters of ABM development were defense contractors who had been involved in the Eisenhower-Kennedy expansion of the U.S. strategic arsenal, and now possessed excess industrial capacity and no other orders. The strategic modernization program, while fulfilling doctrinal requirements, also created another demand in this monopsonistic situation.[132]

Mil'shtein argued, however, that in the final analysis the shock of Vietnam was what tipped the political balance within the American elite by threatening to disrupt conventional politics and by forcing some elements within the elite to seek to reduce the influence of the professional military on policy formation while at the same time not weakening the military-industrial complex. Supposedly this was the line followed by Nixon and Kissinger and led to detente, the SALT I Agreement and ABM Treaty. The emphasis upon the politics of ABM in bringing about the dominance of realism within a Republican administration, headed by an avowed anti-communist with the best of credentials as a cold warrior, suggested a basic shift in American politics. But Mil'shtein did not see this shift as irreversible.[133] The struggle continued and by implication a prudent Soviet policy would follow a line that protected and promoted Soviet interests while avoiding provoking an anti-Soviet mood within the U.S. policy and thereby strengthening the hand of the conservatives and hawks.[134] The competition between socialism and capitalism continued. The

class struggle had not been suspended. But new international circumstances had radically enhanced the relative power and prestige of the Soviet Union.

Taken together the Anureev and Mil'shtein volumes reveal what was probably the military-technical and military-political assessment of U.S. strategic doctrine. The Soviet leadership did not expect the arms race to end, but it did hope to use the arms control process to create a climate of accomodation, enhance the security of the U.S.S.R., and devise a web of agreements which would inhibit U.S. efforts to exploit a strategic technological initiative or to seek strategic superiority by means of technological surprise. That this interpretation of detente was misunderstood by all sides in Washington seems quite evident. By the mid-1970s, the Soviet military was no longer talking about winning a nuclear war, and the political leadership in the person of Brezhnev repeatedly stressed the horrors of such a conflict. But from the perspective of the General Staff and the Politburo, these points in no way negated the general utility of military power in the conduct of foreign relations. Rather, Soviet military science began to investigate the application of the latest discoveries of science and technology to conventional warfighting with the objective of revolutionizing mechanized operations by increasing their speed, depth and decisiveness. From a Soviet perspective this was a prudent policy in keeping with the concept of limited conflict and the rising importance of local wars. The fruits of this line of development can now be seen in the Soviet order of battle, its doctrine, and the West's concerns over the application of the concept, operational-maneuver group, to combat in a European theater of military operations.135

Strategic modernization did continue apace, and Soviet concern regarding the application of new technologies to strategic warfighting was

evident. In 1976, Orlov published a study designed to familiarize his public with the rapidly expanding field of lasers. Based upon foreign developments of laser systems since 1961, Orlov outlined the principles of their action, their construction, the various models and their basic parts and talked about their military application, especially target designation and sighting.[136] Orlov did, however, discuss the various U.S. programs to turn the laser into a weapon using heat as the agent of destruction. Orlov concentrated upon chemical lasers and discussed their utility in destroying ICBM boosters, buses, and warheads in the vacuum of space. Orlov had noted that the thin skins of aircraft and ICBM boosters made them particularly vulnerable targets to attack by lasers. But he concluded that such inexpensive countermeasures such as coating the ICBM with an ablative shield or using aerosol sprays to diffuse the beam, could seriously degrade laser effectiveness. Such countermeasures could radically increase the level of energy required to maintain the beam's focus and the level of heat necessary to burn through the skin. Orlov's statements pointed towards a prudent conclusion. The combat application of lasers had already arrived. Laser weapons systems were becoming feasible and ICBM's were a logical target. But it was as yet unclear where such labors should be focused or whether existing technology made it possible to design combat-effective lasers which would overcome simple and relatively cheap countermeasures. Orlov did not discuss space-based lasers directly but his analysis of U.S. programs and the weapon's characteristics makes it plain that he grasped the possibilities of such weapons.[137]

The central focus of Soviet analysis of the stategic balance in the mid 1970s was that the arms control process had brought about a political

climate in which detente would thrive. Soviet analysts took their cue from General Secretary Brezhnev who used the 25th Party Congress to outline the shift of the correlation of forces in favor of the forces of peace, socialism, and anti-imperialism. Brezhnev began by noting the North Vietnamese victory. Detente and the advance of socialism went hand-in-hand. Soviet satisfaction with anti-imperialist and pro-Soviet forces' gains elsewhere received primary emphasis. Only then did Brezhnev turn to the struggle for peaceful coexistence and the successes which the CPSU had gained since the 24th Party Congress with its Peace Program.[138] Brezhnev praised its timeliness and realism, while underscoring bilateral and multilateral successes, especially the Helsinki Conference's Final Act. With regard to U.S.-Soviet relations Brezhnev emphasized what had been achieved while putting forward a lengthy agenda of topics for arms control agreements ranging from banning the development of a new generation of offensive strategic weapons to conventional forces. But there was no mention of space or the threat of militarization, which suggests that in 1976, demilitarization of the Indian Ocean had a higher priority with the Soviet leadership than the struggle against the militarization of space. The Soviets seem to have accepted that the network of treaties signed on space, which culminated in the ABM Treaty had created a sufficient restraint.[139]

An analogous restraint in assessing Soviet interest in and capabilities for the militarization of space was evident on the U.S. side. In a Senate committee survey of the Soviet Space Program, the section on the military use of space was short and not particularly informative. The report began by noting that Soviet charges regarding U.S. intentions to militarize space became more muted as detente flowered. It then went on to

look briefly at the interconnections between the Soviet civilian and military space programs and discussed the support role which various types of satellites provide to the Soviet Armed Forces. The authors noted the suspension of the FOBS (Fractional Orbital Ballistic System) after 1971, which had created great concern in some defense circles in the U.S. The report credited the Soviets with a primative ASAT capability and called attention to the Galosh ABM complex around Moscow as being in compliance with the ABM Treaty. It concluded that there was no evidence that the Soviets had developed orbital bombs. The report did not offer any assessment of how these various programs fitted together or any judgement about the direction of the Soviet military space program.[140]

While research and development of basic technologies which could be applied to armed combat in space continued, both sides spent the late 1970s emphasizing other aspects of their political-military competition. During the Carter Administration, a marked cooling toward detente and arms control in the U.S. policy became evident. There was a growing concern that Soviet and Western objectives in the arms control progess were radically different and that the arms control agreements, which had been signed were not in keeping with U.S. interests. Critics of the arms control process saw the agreements as structuring an arms race rather that containing it and found the terms of the agreements flawed because they contributed to incentives for the development of Soviet counterforce capabilities. The ABM Treaty in their terms had been a success only in the sense that it had robbed the U.S. of the lead which it had possessed in ABM research, development, testing and engineering.[141] One need not agree completely with this line of argument, but the central point remains that

much of the U.S. conceptualization by the early realists of the arms control community was based upon a certain element of intellectual hubris. These advocates of arms control had, by rational analysis, concluded that it was possible to devise technical measures of arms control to be applied to both sides. They had little concern for Soviet strategic concepts and seemed to believe that the very process of negotiating arms control agreements would lead to the education of the Soviets regarding the self-evident merits of the U.S. concepts. By the late 1970s such pious hopes were under strenuous attack from those who accused arms control of becoming a substitute for strategic planning.[142]

The Post-Detente Era and Militarization of Space Revisited, 1979

The continued modernization of the Soviet strat gic arsenal in conjunction with the arms control process led to a series of decisions, beginning in 1974 and continuing down to the present, to move away from assured destruction toward a war fighting posture based upon a wider range of nuclear options and capabilities. This process created a "gap" between arms control as policy and strategic planning. The assumptions underpenning U.S. arms control policy, however, began to disintegrate in the second half of the 1970s as it became apparent that no domestic consensus existed to support it. While it is very difficult to assess what factors most contributed to this erosion of support, perceived Soviet gains and demonstrable U.S. setbacks played a conspicuous role. Iran and Afghanistan may have had more impact than all the technical arguments about the flaws and one-sidedness of the SALT II Agreement. With the shifting political climate came a revival in the U.S. defense effort, the NATO decision to modernize its theater nuclear forces to counter Soviet deployments of the

SS-20, and a heating up of the Cold War following the Soviet Union's armed intervention in Afghanistan.

This new political climate began to have an immediate effect upon Soviet threat evaluation. Space and the threat of militarization did not figure conspicuously in initial Soviet assessments. In 1979, as part of a survey of U.S. space reconnaissance assets Captain 2nd Rank V. Grisenko of the Navy felt it necessary to do no more than remind his readers that satellites "occupy an important place in imperialist plans for preparing a new World War."[143] Grisenko did point to an increasing military share in the U.S. space program but emphasized the use of space assets to support other weapons systems. In the same year a collective of authors discussed U.S. force postures into the early 1980s, emphasizing the aggressive character of U.S. military policy, and the Carter Administration's initiatives were treated as a serious threat to peace. But there was a conspicuous imbalance in their treatment of U.S. forces. While they discussed force posture, assets command and control, weapons acquisition and doctrine with regard to every branch of the armed forces, they did no more than identify strategic defense as a category and link anti-missile, anti-space, and anti-air defense as the missions of the "system of aero-space defense" with its personnel drawn from the ground forces and Air Force.[144] The Soviet analysis seemed to assert that the U.S. had a concept but no real capabilities in this area.

At the same time the Soviets were downplaying the threat of the militarization of space from the West, they were speculating about great strides in the peaceful exploitation of space by the Soviet Union. Lieutenant General V. Shatalov, himself a cosmonaut, speculated about using

orbital stations for space engineering in connection with the creation of permanent orbiting stations.[145] Saliut-6 and its long-term manning by crews from the various Soiuz spacecraft was to be the beginning of a program for industrial production of goods in space, including crystals.[146] Over the long-term Soviet scientists spoke of the development of techniques to produce super-pure pharmaceuticals, composite alloys, and electric power in space.[147] V.P. Mishin of the Soviet Academy of Sciences used the coming 20th anniversary of Iurii Gagarin's first manned orbital flight to make the case for developing an entire arsenal of spacecraft transports to carry payloads into orbit cheaply and to get materials back to earth. Mishin pointed to the Progress cargo ship, which can lift 2,300 kilograms into orbit as a first step in this process but pointed towards the creation of ultraheavy rocket transport vehicles.[148] Soviet cosmonauts abroad confirmed that the U.S.S.R. was in the process of developing a reuseable space transport vehicle which, like the U.S. Space shuttle, could be launched like a rocket but could land like a plane.[149] Mishin and the other Soviet authors did not discuss the military applications of any such Soviet technologies. They were not, however, silent about the military implications of analogous systems in the United States.

By early 1980 the Soviet press was ready to renew its alarms about the "Pentagon's dangerous plans" for the militarization of space. While the authors made it clear that such efforts were not new, they attributed to the Carter Administration a wide range of initiatives in space weapons programs aiming at transforming space into a theater for war and thereby upgrading U.S. strategic offensive forces. The source of such plans and projects was "the sinister American military-industrial complex."[150] It is

noteworthy that Soviet charges about renewed interest in the militarization of space seem to have been motivated by the deteriorating political climate between the two superpowers than by specific programs or projects. Likewise, these new charges left little room for the subtle sort of political analysis which had been common to Soviet works on arms control, the ABM issue, and space developments since 1969. Indeed, the same Soviet authors attributed the most sinister implications to the popularity of such science fiction films as "Star Wars," suggesting that these box office successes were little more than propaganda tools for the Pentagon. The Soviet response to such efforts had to be one that would neutralize the Pentagon's plans for its new space weapons:

> Heightened vigilance with respect to the aggressive intrigues of the militaristic circles in the United States and the military cliques of the NATO countries and unity of our peaceloving foreign policy, together with a readiness to give the necessary rebuff to an aggressor, are the starting point of the policy of the CPSU and the Soviet government in the field of strengthening this country's defensive capabilities.[151]

Soviet authors began to hint that U.S. programs, which they described as increasing rapidly in size in the last years of the Carter Administration, were moving toward certain breakthroughs that would shift the qualitative nature of military assets in space from supporting other branches of the armed forces toward combat in space. Special attention went to U.S. ASAT programs using a miniature homing vehicle launched from an F-15.[152] The authors of this article in Red Star, G. Sibiriakov and A. Khabarov, emphasized the U.S. commitment to laser research and drew attention to the fact that the testing of laser devices was one of the top priority missions for the Pentagon's missions for the space shuttle.[153] Soviet authors dismissed U.S. claims of a Soviet threat in space and attributed the U.S.

programs to a combination of greed for profits by member firms of the military-industrial complex and to a national policy of hegemonism.

In January 1981, Colonel K. Osmachev, writing in Foreign Military Review, charged that the Space Shuttle was a vital part of Pentagon plans for the militarization of space. While Soviet commentators prior to and after the 26th Party Congress had been echoing Brezhnev's line that there was no Soviet military threat and that the U.S.S.R.'s defense posture aimed at sufficiency, Osmachev declared that the United States was out for military superiority and space was to play a major role in these plans. After outlining the delays that had slowed the Shuttle Program, Osmachev emphasized the influence which the Pentagon had had in getting the craft redesigned to support military missions, including the expansion of its cargo bay.[154] He identified a wide range of services which the Shuttle could perform in support of the testing and development of weapons systems and military equipment:

> placing warheads of ballistic missiles on board, as well as laser and beam weapons, tools for the recognition and destruction of satellites belonging to other countries, and reconnaissance equipment and other kinds of military hardware.[155]

In contrast with Anureev's views of six years before and in the face of Soviet declarations that they were themselves developing a craft similar to the Shuttle, Osmachev pictured the Shuttle as a means of accelerating the arms race. Some Western commentators and analysts interpreted this strident tone to fear among the Soviet elite that the U.S.S.R. was technologically incapable of equaling the U.S. achievement in the Shuttle. They asserted that this fear translated into a recognition that the U.S. could "change the military balance in its favor almost overnight."[156]

Whatever the source of such judgements of the Soviet mood, they fly in the face of the rather prudent and judicious assessments which the Soviets had been making for over a decade of the direction of development of space technology in general and the Shuttle program in particular. What was particularly distinct in the Soviet rhetoric was the renewed claim of U.S. plans for the militarization of space and its transformation into a theater of war. Soviet authors attributed to U.S. leaders a desire to escape from the political restraints which a decade of treaties covering the use of space had imposed upon the superpowers.

Two months after the first Shuttle mission, SShA carried an analysis of the U.S. defense build-up as envisioned under Carter and revised under Reagan. Potashov reviewed the total program but concentrated upon the improvement of nuclear warfighting capabilities which were to be achieved by modernization of forces and a vigorous research and development program. Potashov emphasized that American critics of the build-up had described the latest weapons systems as possessing increased counterforce capabilities which were being enhanced by a substantial research and development effort in air and space defense. Such systems would, when operational, make it possible for the U.S. to engage in a counterforce strategy, initiating hostilities and relying upon air and space defense capabilities to "weaken a retaliatory strike."[157] Space-based laser systems in conjunction with ASAT forces used to blind Soviet satellites and disrupt enemy command and control were already developed concepts. Looking at U.S. R&D expenditures over the period 1978-1982, Potashov identified massive increases in the areas of missile defense, space defense, laser weapons, ray weapons, Navstar satellites, and reconnaissance and command

and control capabilities. At the heart of the program were the anticipated benefits which would accrue from the utilization of the Space Shuttle. With about 100 military missions set aside for the Shuttle, Potashov identified the program as "a qualitatively new level of cosmic militarization."[158]

In the final analysis, the U.S. strategic modernization program and the development of space defense capabilities were intended to give the U.S. escalation domination in the crucial area of counterforce operations, reducing U.S.-Soviet strategic parity to countervalue targeting and the option of initiating mutual suicide. Potashov did not dismiss "limited nuclear war" or postulate some total, unlimited Soviet response. On the contrary, he pointed to the fact that for the U.S. strategy to work in practice it required superiority at all levels of struggle to guarantee U.S. strategic initiative and control of hostilities. But such plans would be frustrated by "even parity of strength in just isolated or selected stages."[159] The Soviet response to the U.S. defense build up would be adequate to protect the U.S.S.R. and the socialist commonwealth.

By the summer of 1981, the Soviet political offensive against U.S. plans for space-based weapons systems was in full swing. S. Stashevskii described the Shuttle as an instrument in implementing the Pentagon's "new, far reaching military programs in space." Stashevskii pointed to a number of applications of Shuttle technology from the inexpensive deployment of military satellites to the use of the Shuttle as an ASAT system itself. However, the long term military implications of the Shuttle lay in its use to deploy a "space based anti-missile defense system built around 10 permanent orbital stations equipped with powerful chemical lasers."[160]

The immediate Soviet response at the political level came in the form of a draft-treaty proposed by Foreign Minister Gromyko which would have banned all weapons in space. This latest document was presented as a logical extension of earlier treaties, which had inhibited the militarization of space.[161] The fact that this proposal went to the UN suggests that the Soviets did not view prospects of bilateral U.S.-Soviet negotiations as having any chance of success and so had decided to embark upon the mobilization of international opinion to influence the diplomatic climate and inhibit support for such efforts in the United States itself.

Soviet political assessments of the U.S. defense build-up in 1981 saw the Reagan Administration as an essential continuation of the Carter Administration. While they noted the modernization of strategic forces, and the expansion of U.S. capabilities to engage in protracted global war, Soviet authors were convinced that objective conditions and an articulate and powerful opposition would act as checks upon plans for expanded defense spending. V.V. Zhurkin of the Institute for the Study of the U.S.A. and Canada concluded that U.S. objectives were to gain military superiority as a first step to reasserting global political hegemony, but objective conditions made it quite impossible for either power to gain a clear superiority. Space as such did not figure directly in Zhurkin's analysis. He did, however, see a fundamental continuity between NSDM-242, signed by President Nixon in January 1974 and Carter's PD-59 in that both represented an effort to restore political utility to the U.S. strategic arsenal.[162]

V. Basmanov did explicitly address U.S. programs in the context of the Soviet proposals "for a weapon-free space". Basmanov noted that a shift in U.S. attitudes was apparent in 1979 when the Carter Administration "froze

the talks on anti-satellite systems", which had begun in 1978.[163] Increased appropriations for new weapons technology which could be applied to space combat were supposed to result in command of the "high ground" and improved war fighting capabilities. Basmanov, however, warned that while such efforts would escalate the arms race it would not make limited nuclear war into the road to victory over the socialist system:

> However, the record of space exploration has shown that the U.S. plans for domination in outer space are mere illusion. Just as hopeless are its attempts to tilt in its favour the current approximate balance of forces via a spurt in space technological potential. Underestimation of the U.S.S.R. scientific and technical potential which is obvious in this case, made itself felt more than once in the postwar time. America's plans are fraught with a serious danger, once their implementation would sharply escalate the arms race, opening a new area in this field.[164]

Intended for foreign consumption, Basmanov's views on the Soviet military response were little more than political declarations of intent. Since it is quite clear that the Soviet military had for over a decade been aware of the very research and development trends upon which U.S. strategic innovations depended, the prospects of technological surprise were quite limited. On the other hand, Soviet military commentators did seem to credit the U.S. with an ability to seize the technological initiative and to force the direction of the arms race.

The response of the Soviet military at is highest levels in the person of Marshal N. Ogarkov, Chief of the General Staff, did not directly focus upon space. Instead Ogarkov enumerated three trends in his assessment of the threat: terminating treaties which inhibited U.S. and NATO military programs, seeking military superiority over the U.S.S.R., and expanding the U.S. capacity for intervention around the globe. It is noteworthy that on the first two points Ogarkov did not mention either the ABM Treaty or space

defense forces but under the second trend concentrated upon the build up of strategic offensive forces and the deployment of theater nuclear forces. Ogarkov did, however, list the space shuttle under the category of strategic offensive forces.[165] Turning to Soviet military doctrine, Ogarkov discussed the application of Soviet military science to a global war between the capitalist and socialist system. Ogarkov implied that the pace of scientific and technological change had and would continue to have a profound impact upon the stucture and missions of the Soviet Armed Forces.

> The art of warfare has no right to lag behind the combat potential of the means of armed struggle, particularly at the present stage, when on the basis of scientific and technical progress the main weapons systems change practically every 10-12 years. In these conditions sluggishness, failure to revise outlooks, and stagnation in the development and particularly in the practical assimilation of new methods of employing armed forces in war are fraught with serious consequences.[166]

Ogarkov's references to analogous situations in the pre-WWII period set the stage for a discussion of the pace and scale of modern combat operations in a theater of war but left Soviet strategic offensive forces with deterring aggression and if deterrence fails of executing a "crushing retaliatory blow."[167] While long on the need for increased combat readiness and improvement of the Soviet rear's ability to sustain intense combat operations, consuming unheard of masses of weapons and equipment, Ogarkov's article did not point towards militarization of space as having a profound impact upon the superpower correlation of forces.

By 1982, Ogarkov had changed his emphasis to underscore the impact that new technologies were about to have on military affairs. Here he wrote, "A profound revolution in the full meaning of the word is taking place in military affairs in our times in connection with the development

of thermonuclear weapons, rapid advances in electronics, development of weapons based on new physical principles as well as in connection with extensive qualitative improvements of conventional weapons."[168] While the concept of scientific technical revolution in military affairs was not new, Ogarkov's argument now embraced the idea that this revolution had entered a second phase, transcending the application of nuclear-rocket weapons to armed combat and underscoring the importance of improved command and control capabilities and radically new weapons such as lasers and particle beams. Ogarkov again called attention to the rapid pace of weapons development and its impact upon the military-technical side of military doctrine. He stressed the need for balanced but far-sighted appreciation of these trends, again pointing to the Soviet development of the concept of operation as the embodiment of such an approach, which grasp the revolutionary implications of mechanization and air warfare without degenerating into a technological fetishism.

In the postwar period, the Marshal identified five general characteristics which dominated the military affairs. In addition to the scientific-technical revolution and its impact upon the quality of military equipment and the search for new modes and forms of combat, Ogarkov pointed to the accelerating pace of technological innovation which was making for shorter intervals between qualitative leaps, the increased importance of strategic weapons, their ability to exert a direct influence upon the course and outcome of war, and the greater importance of strategic command and control organs, the increased complexity of troop control processes and the development of new structure and equipment, and the greater role of the air in the conduct of military operations which had given the theater a three-dimensional quality.[169] While addressing the impact of these trends

upon both sides of Soviet military doctrine, i.e. the socio-political and the military-technical, Ogarkov emphasized the linkage between increased combat readiness and the equipping of the armed forces with the latest weapons and equipment. The Soviet economy in the stage of mature socialism was touted as able to meet any needs which might arise, even in the context of the "stormy development of the nuclear rocket weapon and the possibility of the surprise use of it by the enemy." Given the fact that Soviet analysts had already linked the acquisition of space-based ASAT and ABM weapons to U.S. plans for a disarming blow at Soviet counterforce capabilities, Ogarkov's statements in this area seem to suggest a definite response to U.S. capabilities, real and potential, in these areas:

> The point is to be able not simply to defend oneself, to oppose the aggressor with appropriate passive means and methods of defense but also to deliver devastating response strikes on the aggressor and to defeat the enemy in any condition which the situations turn out.[170]

The military-technical side of military doctrine thus embraced the problem of responding to the "threat" in a manner in keeping with the demands of the scientific-technical revolution. Technology could not drive Soviet military doctrine but it did in the form of enemy capabilities create a dialectical tension for Soviet military science.[171] How this would be resolved with regard to the militarization of space has only been addressed circumspectly in Soviet publications.

Conclusion

We are left with a conclusion that the Soviet response to the Reagan Administration's Strategic Defense Initiative was already being articulated before the President's speech in March 1983. At the political level the

response has been towards mobilizing international public opinion to place pressure on the U.S. in order to act as a brake upon American efforts to gain a technological initiative in an area, which Soviet commentators have seen as an arena of military development. Soviet efforts have focused upon creating pressures for new arms control agreements, which would structure and manage the competition in the interests of Soviet national security. They have, likewise, attempted to reach domestic constituencies in the U.S. and the West who would for their own reasons be opposed to such a course. They have also attempted to use existing arms control agreements, most notably the 1972 ABM Treaty, to preclude certain research and development activities.

This response has not been narrowly technical, although technical themes have been explored in the Soviet pronouncements. Rather, the thrust and direction has been fundamentally political. In the Leninist tradition of seeing war as a continuation of politics, the Soviet leadership under Andropov, Chernenko and Gorbachev has focused on the political aspects of the context. Soviet authors treat Reagan's announcement of the research initiative as a process of "coming out of the closet," i.e., making public what had been under development for years, but at the same time trying to camouflage the actual intent by speaking of population defense when the intention has been to develop a war-fighting capacity which would back up U.S. counterforce capabilities with a shield to undermine Soviet retaliatory capability. In this regard SDI is but one more shift in the zig-zags of American grand strategy.[172] Soviet assessments do not see current technologies as resulting in any immediate opportunity for technological surprise. Space-based lasers and the supporting target acquisition and

battle management capabilities are still unequal to the demands, which a major ICBM, SLBM, attack would pose to the defense. The problem is that the Soviets have become less certain that U.S. domestic constraints would inhibit the acceleration of the research and development process.[173]

In the first years of the Reagan Administration the Soviet leadership had shown restraint and had consciously tried to distance itself from any concept that asserted a nuclear war was winnable. Indeed, Chernenko and Marshal Ogarkov both used the term "criminal" to describe any concepts of limited nuclear war because such doctrines paved the way for crossing the nuclear threshold and leading civilization into a cataclysm of uncontrolled escalation. While many in the West have described such views as a propaganda effort to enhance the Soviet Union's political posture, there was some substantial evidence that the Soviets had been trying to move their own conventional forces into a configuration which would make possible operational decision through air-mobile actions without recourse to nuclear weapons. In this context the Soviets SS-20s in Europe could be seen as a form of escalation domination, i.e., a theater reserve which would make NATO reliance upon nuclear weapons to deal with a conventional Soviet offensive less palatable. Certainly, this was the real context of NATO's decision to deploy a new generation of U.S. theater nuclear weapons. Trying to use a two-tracked detente to derail that process, Moscow was gradually being forced by the acceptance of the theater nuclear weapons into Europe to recognize that internal contradictions within NATO were not going to slow the arms race to the advantage of the U.S.S.R.

In the period following Brezhnev's death it would seem that the new Soviet leadership did want to use detente to slow the arms race and in the

summer of 1983 there is some evidence that grounds for negotiations existed. After the shooting down of KAL 007 that interlude ended, and Moscow reverted to answering the U.S. defense build-up on its own terms. While renewed talks were opened in Geneva following the 1984 elections, neither side was willing to spell out what it would do to reach an agreement. Indeed, there seem to be major constituencies in both countries who agreed to the talks on the grounds that they had no chance of success.

Of the militarization of space and the appropriate response to the Strategic Defense Initiative Soviet and East European authors have addressed questions of military doctrine only circumspectly. Assessments of the U.S. program have tended to emphasize the severe limitations of the first generation of technology, especially chemical lasers, the ease and relative low costs of countermeasures, including the use of ablative coatings on ICBM boosters, to make the tasks of the space-based ABM system more complex. Soviet attention to the technical details of a space-based laser system have identified seven distinct tasks for the creation of such a system ranging from beam concentration on target through reduction of divergence over long distances, through the delivery of sufficient energy upon target to destroy the object in a short period of time. Behind this range of problems Soviet commentators point to the problems of sustained energy production to permit space-based lasers to engage and destroy the number of targets necessary to meet the anticipated ICBM threat, the development of systems that would provide for timely target location, discrimination, and battle management, the creation of space transport lift capacity capable of lifting the required assets into orbit, and the development of means of defense for the system's components once they are on station.[174]

Soviet authors have informed Western scientific audiences that while a minimal system may be feasible by the end of the century, which they define as 18 stations in circular orbit, each station weighing 70 tons and equipped with a 5 megawatt laser, such a minimal defense would cost $20 billion dollars by their figures and protect against only 15 ICBMs. For a defense against a full-scale missile attack involving 1000 ICBMs the Soviet authors redefine the program to involve 18 stations in polar orbits weighing 800 tons each and armed with 60 megawatt lasers. In short, the mini program, according to the Soviet specialists who include some of the most prominent Soviet scientific elite and informed specialists on the U.S. space program from the General Staff, will not deliver what the SDI research initiative promises in its first manifestation. The maxi-program, on the other hand, is not technically feasible.[175] Soviet authors stress that neither system can protect a state from a strategic first strike but they might create an illusion that a state could radically reduce its damage from a retaliatory second strike. Clear inferences have been made by the Soviets that ground-based laser and particle beam systems hold out greater promise because they will permit longer targetting against incoming warheads than the 100-second burn time associated with space-based lasers attacking boosters. However, this argument runs into the contradiction that warheads are far easier to harden than boosters. This tends to lead one towards the conclusion that the Soviet preferred solution to the technical problem of ABM defense lies in further development of ground-based particle beams, since the latter could damage a target by heat and electronic disruption.[176]

Space-based, laser-armed ABM systems would in the Soviets' opinion be only a first step into a qualitatively-new military capability. V.

Avduevsky of the Soviet Academy of Science wrote in October 1983 that space would follow the model of other theaters of war. The first step would have to be followed by others. His pleas were for space remaining "peaceful." But his argument was one which suggested that should the U.S.S.R. not be able to stop the evil plans of the United States then the U.S.S.R. would have to follow suit in order to maintain the rough strategic parity which exists. While describing the Space Shuttle as a wolf in sheep's clothing, Avduevsky emphasized the thrust of U.S. plans to develop a whole range of space combat craft, including a mini-shuttle and spaceplane.[177] As is now clear, the U.S.S.R. was at the same time testing its own mini-space plane, which landed in the Indian Ocean, and was well along on the development of its own space shuttle type craft.[178]

While these programs are not operational as yet, their progress suggests the sort of investment which the U.S.S.R. engaged in during the 1970s in this particular arena. The U.S. Congress's Office of Technological Assessment has estimated that the Soviet leadership has invested over $40 billion in the Soiuz-Saliut Program. The improvements of both systems and the development of a heavy lift transport system are further evidence of the national investment. The Soviets describe their entire manned orbital program in terms of peaceful use of space and have been quite outgoing in identifying the long-range objective of their manned program as the creation of permanent space colonies engaged in industrial production. They include ambitious plans for space-based solar energy systems.[179] At the same time Soviet authors have emphasized the visionary aspects of their program; they have also pointed to the immediate and down-to-earth pay-offs of the space program. Academician V. Mishin, writing in Kommunist in 1983,

pointed to cosmonautics as a powerful stimulus to the national economy where science and technology function smoothly. Mishin enumerated an entire host of industries which have benefited from the research and development effort done to advance space exploration. These included cybernetics, electronics, and machine-building.[180] These very areas do, of course, stand at the heart of what the Soviet military has identified as the second stage of the scientific-technical revolution in military affairs. Mishin himself points to a solar power station as worthy of national attention and identifies it with the respected term "a new cosmic GOELRO" in honor of the Soviet Union's first development plan, one pressed by Lenin for the electrification of the republic.[181] The key to such plans Mishin sees in the development of reliable, cheap lift capacity, or a multi-use space transport similar to the U.S. Space Shuttle, which Soviet authors had been screaming was in the vanguard of U.S. plans for the militarization of space.[182]

As Soviet authors painted their own programs white, while attributing the most sinister implications to U.S. efforts, a Polish officer was more explicit about the military future of space. Colonel Jsef Smoter, writing in a Polish Air Force and Air Defense journal in late 1982, stated: "Apparently as early as in the next 15 years and certainly by the year 2000, the air attack arsenal will include spacecraft equipped with laser weapons, capable of destroying space, air and ground targets."[183] Smoter described this new capability as creating qualitative changes in the nature of air defense. Space here was not the arena of man's salvation from nuclear war but a new dimension to armed combat. Smoter implied that space assets would be used in the same combined-arms fashion that other Soviet

and WPO forces are supposed to be used towards the achievement of decision with space assets being fit into an already defined operational art. The point here is that Smoter left the reader with the impression that both offensive and defensive operations would be undertaken in space to support combat elsewhere. The demand for the future seemed to be to turn anti-air, anti-rocket and anti-space operations into a coordinated whole. In Smoter's view to treat SDI as a weapon syster designed to deal with a particular problem, i.e., strategic attack by ICBMs, is to miss the radical implications for the use of the weapons system's potential.[184] We are reminded of General Anureev's emphasis upon the interactions and inter-dependencies of offensive and defensive weapons and systems.

A circumstantial case can be made that the Soviet General Staff has concluded that these new technologies in their future weapons manifestations will affect the conduct of war radically. Marshal Ogarkov's emphasis on weapons based upon new physical principles and his attention to the problem of adapting the military-technical side of military doctrine to the demands of the scientific-technical revolution suggest this line. Even civilian commentators have hinted that a space-based ABM system would require an analogous response. Kokoshin in June 1985 identified SDI as a first step to a space-based ABM system in violation of the existing treaty.[185] Marshal Akhromeev had made the same charge ten days before.[186] But Kokoshin went further and while affirming the Soviet Union's declaratory position against a concept of limited nuclear war predicted the U.S.S.R. would mount its own decisive countermeasures.[187]

Several years earlier in response to U.S. strategic modernization, Marshal Tolubko of the Strategic Rocket Forces had suggested that the

Soviet response would be symmetrical. Tolubko had pointed to Typhoon as an answer to Trident and the Soviet cruise missile then undergoing testing as the response to the deployment of cruise missiles.[188] In 1982 General M. M. Kir'ian of the General Staff not only used the same examples to make a case for symmetrical response by the Soviet Union but put it in the context of U.S. research and development efforts in the fields of lasers and particle beams. He even discussed a U.S. proposal to place nine such space-based, laser-armed battle stations into polar orbit.[189] More recent statements about a space-based ABM system have been pointed in their avoidance of such a symmetrical response. This is not to say that the U.S.S.R. does not take seriously the militarization of space but rather to assert that they do not believe that the U.S. research initiative will be confined within the parameters laid out in U.S. public declarations. The Soviet emphasis upon linking strategic force modernization, improved command and control capabilities with space-based ABM technology and improved ASAT capabilities is suggestive of the Soviet perception that the technology in question lends itself to a combined arms approach.[190] It is unclear as yet just how the Soviets will go about responding.

In the short run the Soviet Union will continue, as it has, to use the political process to degrade the program, mobilize international opinion to restrain acquisition, and seek to bolster the forces of "reason" who will be willing to accept a web of limitations as in the interests of both powers. This is a prudent course for all sorts of economic, political and military reasons. At the same time the Soviet Union will find it necessary to acquire the basic elements of such a system in order to preclude U.S. technological surprise. Since the late 1960s leading figures in the Soviet General Staff, including General Anureev, have been recommending such a

course. What we know of current Soviet programs in the areas of the space plane, space shuttle, particle beam, lasers, and manned orbital stations affirm that this course has been accepted.[191] Acquiring such minimum capabilities is, however, only a first step.

Soviet assessments of the thrust and direction of the arms race emphasize acceleration in the process of weapons development with rapid obsolescence becoming an increasing problem. Soviet authors are, however, quick to point out that such new systems will also, when they are introduced in sufficient quantity, bring about radical changes in the organization and structure of the armed forces as well as in the forms and means of armed combat. The question for the Soviet forecaster is whether current and anticipated technology have indeed made it possible to deploy in space adequate assets to make space into a decisive theater of military operations. Evidence of U.S. doctrinal development and organizational shifts would seem to point to an anticipated radical shift in the dimensions of the "threat." Soviet military officers engaging in worse case analysis may conclude that militarization is more than on the horizon. However, the Soviet political elite will still have final say in the measure of the Soviet response. If that elite can, as it did in the late 1960s, identify a constellation of political contradictions which will inhibit, slow and/or degrade the SDI effort, then calls for a response to the militarization of space may be muted and the acquisition of masses of weapons required to answer such a threat delayed while research and development goes forward. It is impossible on the basis of available evidence to conclude whether Marshal Ogarkov's removal as Chief of the General Staff and then re-emergence in the summer of 1985 with the WPO command have anything to do

with which of these alternatives the Soviets have adopted. It is fair to assume, however, that if the case is for a radical expansion of space combat assets then the organization, structural and doctrinal shifts will be in keeping with Ogarkov's appraisal of the latest trends in the scientific-technical revolution in military affairs and not a simple mirror image of U.S. programs or intentions.

In April 1985 at the Plenum of the Central Committee the Soviet Union's new leader, Mikhail Gorbachev, endorsed the line that the primary task of military construction was to make sure that the U.S.S.R. could "at any moment give a decisive rebuff to the aggressor."[192] Gorbachev went on to point out that pious hopes that space weapons would mean the end of nuclear weapons were groundless, and he pointedly remarked that nuclear weapons' appearance had not led to the disappearance of conventional arms.[193] Marshal Sokolov, the Minister of Defense, followed this with charges that SDI's defensive rhetoric was designed to conceal plans for the development of offensive, space-based weapons.[194] Finally, Marshal Ogarkov's latest tract in favor of vigilance appeared in May in which Ogarkov explicitly compared the international situation in the 1980's with that confronting the U.S.S.R. in the 1930's.[195] The point for a member of the Soviet General Staff was to underscore the need for the U.S.S.R. to chart its own military path, evaluating the threat realistically but responding to it in such a fashion as to be in keeping with existing and projected doctrinal requirements. Marxism-Leninism and a sound understanding of military theory give these officers a sense of the evolutionary flow of such change. Soviet authors stress the fact that new technologies cannot have a truly revolutionary impact until they exist in sufficient

quantity to force structural and doctrinal adjustment. Space-based weapons systems are at the moment "science fiction," as Gorbachev has described them, but their potential must be explored. In this regard Soviet officers will, it seems prudent to predict, handle them in the same fashion that they have handled other technological innovations. First, Soviet doctrinal requirements will be well in excess of existing capabilities as was the case with Soviet field regulations in the 1930's or Ogarkov's recent modifications of deep operation theory. Second, great stress will be placed on mastery of the basic scientific-technical components of such systems as well as the acquisition or organizational and structural experience in the command and control of the assets and their integration into a combined arms environment.

Regarding the idea of a high-speed, ram-jet, cruise missile as a means of countering our efforts to neutralize their land-based ICBM force, the asymmetry of the response, if it is technically feasible, gives it credibility. Since it would undermine the political credibility of SDI by positing another costly threat with which the U.S. would have to deal, it would fit well within a long-term political campaign to undermine SDI while at the same time offering an avenue of escape in the more distant future if SDI did prove effective against ICBMs. One thing is certain, the U.S.S.R. will not give up its hard-won ability to hold the U.S.A. a strategic hostage. The great danger for the U.S. would be to go forward with SDI on the understanding that such was the national objective only to fail to achieve it and then have to face the domestic and international ramifications of such a failure.[196]

END NOTES

1. New York Times. (March 24, 1983), p. A20.

2. U.S., Department of Defense, Report to the Congress on the Strategic Defense Initiative. (Washington, D.C., 1985), p. 7.

3. V. K. Konoplev, Nauchnoe predvidenie v voennom dele. (Moscow: Voenizdat, 1974), pp. 8-9.

4. For a discussion of this process see: John J. Dziak, Soviet Perceptions of Military Power: The Interaction of Theory and Practice. (New York: Crane, Russak & Co., 1981), pp. 39-60.

5. Sovetskaia voennaia entsiklopediia. (Moscow: Voenizdat, 1976-1980), 2, pp. 191-193.

6. I. E. Shavrov and M. I. Galkin, ed., Metodologiia voenno-nauchnogo poznaniia. (Moscow: Voenizdat, 1977), pp. 6-8.

7. M. Frunze, "Edinaia voennaia doktrina i krasnaia armiia," Voennaia nauka i revoliutsiia, No. 2 (1921), pp. 30-31.

8. Sovetskaia voennaia entsiklopediia, 3, pp. 225-229.

9. V. I. Lenin, Polnoe sobranie sochinenii. XXVI, p. 224. See also: A. S. Milovidov and V. G. Kozlov, eds., Filosofskoe nasledie V. I. Lenina i problemy soverennoi voiny. (Moscow: Voenizdat, 1972).

10. M. V. Galkin, ed., Nauchno-tekhicheskii progress i revoliutsiia v voennom dele. (Moscow: Voenizdat, 1973), pp. 9-38; and M. M. Kir'ian, ed., Voenno-tekhicheskii progress i vooruzhennye sily SSSR. (Moscow: Voenizdat, 1982), pp. 356-326.

11. N. V. Ogarkov, Vsegda v gotovnosti k zashchite otechestva. (Moscow: Voenizdat, 1982), pp. 31-32.

12. Sovetskaia voennaia entsiklopediia, 2, pp. 183-188.

13. Shavrov and Galkin, Metodologiia voenno-nauchnogo poznaniia, p. 59.

14. Sovetskaia voennaia entsiklopediia, 2, pp. 211-218.

15. Trotsky was rather candid on this point when he asserted that the international bourgeoisie were capable of the greatest technical feates but were naive children in matters of politics. See: L. D. Trotsky, "Voennaia doktrina ili mnimo-voennoe doktrinerstvo," Voennaia nauka i revoliutsiia, No. 2 (1921), p. 205.

16. I. A. Grudinin, Dialektika i sovremennoe voennoe delo, (Moscow: Voenizdat, 1971), pp. 22-27.

17. I. I. Anureev, Antimissile and Space Defense Weapons. (Moscow: Voenizdat, 1971), pp. 1-5, 105-109.

18. A. Orlov, "Battle Against Winged Rockets," Vestnik PVO, No. 5 (May 1971, pp. 88-91) and A. Orlov, "England in Its Struggle Against the V-2 Ballistic Missiles," Vestnik PVO, No. 1 (January 1974), and "The Development of the Means and Methods for Combating Cruise Missiles During the Years of World War II and in the Postwar Period," Voenno-istoricheskii zhurnal, No. 4 (April 1983), pp. 59-66.

19. A. A. Svechin, Strategiia. 2nd edition (Moscow: Voennyi Vestnik, 1927), p. 69.

20. Ibid., p. 70.

21. B. M. Sahposhnikov, Mozg armii. (Moscow: Voennyi Vestnik, 1927), I, passim.

22. M. N. Tukhachevsky, "K voprosu o sovremennoi strategii," in: Voina i voennoe iskusstva v svete istoricheskogo materializma. (Moscow: Gosizdat, 1927), pp. 126-135.

23. V. K. Triandafillov, Kharakter operatsii sovremennykh armii. (Moscow: Gosizdat, Otdel Voennoi Literatury, 1929), pp. 70-72.

24. Sovetskaia voennaia entsiklopediia. (Moscow: Gosudarstvennoe Slovaro-Entsiklopediia Izdatel'stvo, 1933), II, cc. 834-844.

25. M. V. Zakharov, "On the Eve of the World War II (May 1938-September 1939)," Soviet Studies in History, XXIII No. 3, (Winter 1984-1985), p. 101.

26. Ibid., pp. 101-102.

27. David Holloway, The Soviet Union and the Arms Race. (New Haven, Conn.: Yale University Press, 1983), pp. 3 ff.

28. V. P. Glushko, Development of Rocketry and Space Technology in the USSR. (Moscow: Novosti Press Publishing House, 1973), pp. 8-17.

29. Kathleen Lewis and Harry Weber, "Zamyatin's We, the Proletarian Poets and Boydanov's Red Star," Russian Literary Triquarterly, No. 12 (1975), pp. 259-276. Kendel Bailes has pointed out the "cult of aviation" which developed during the Stalin era as symbol of science and technological progress. See: Kendall E. Bailes, Technology and Society Under Lenin and Stalin: Origins of the Soviet Technical and Intelligentsia, 1917-1941. (Princeton: Princeton University Press, Nikita Khrushchev was particuarly adept at the use of space successes to highlight the triumphs of Soviet science and technology, and at the time of Brezhnev's death Pravda called attention to the fallen leader's contribution to scientific and technical progress and space exploration. See: Pravda (November 12, 1982), p. 1.

30. Glushko, Development of Rocketry and Space Technology in the USSR. pp. 11-12. See also: David Holloway, "Military Technology," in: R. Amann et al., eds., The Technological Level of Soviet Industry. (New Haven: Yale University Press, 1977), pp. 446-489.

31. Ibid., pp. 12-13.

32. V. P. Mishin, "O roli F. A. Tsandera v razvitii sovetskoi raketno-kosmicheskoi tekhniki," in: B. V. Raushenbakh, ed., Issledovaniia po istorii i teorii razvitiia aviatsionnoi i raketno-kosmicheskoi nauki i tekhniki. (Moscow: Nauka, 1981), pp. 69-76.

33. Sovetskaia voennaia entsiklopediia, 2, pp. 492-493.

34. M. Zakharov, "Molianenosnaia operatsiia," Voenno-istoricheskii zhurnal, No. 8 (August 1964).

35. B. Tolubko, "Raketnye voiska strategicheskogo naznacheniia," Voenno-istoricheskii zhurnal, No. 4 (May 1975), 50-56; "Raketnye voiska strategicheskogo naznacheniia, "Voenno-istoricheskii zhurnal, No. 10 (October 1976), pp. 19-27; and Nedelin. (Moscow: Molodaia Gvardiia, 1979). See also: David Holloway, The Soviet Union and the Arms Race.

36. Tolubko, "Raketnye voiska strategicheskogo naznacheniia," Voenno-istoricheskii zhurnal, No. 10 (October 1976), pp. 22-23; and Sovetskaia voennaia entsiklopediia.

37. James Obery, Red Star in Orbit. (New York, 1981).

38. V. G. Kulikov, ed., Akademiia General'nogo shtaba. (Moscow: Voenizdat, 1976), pp. 141-158.

39. V. D. Sokolovsky, ed., Voennaia strategiia, 1st edition. (Moscow: Voenizdat, 1962).

40. Voennyi entsiklopedicheskii slovar'. (Moscow: Voenizdat, 1983), pp. 216, 689.

41. Sokolovsky, Voennaia strategiia, (1962), p. 409.

42. Ibid.

43. Ibid., pp. 410-411.

44. Sokolovsky, Voennaia strategiia. (1963), p. 77.

45. S. Bronevsky, "The Factors of Space and Time in Military Operations," Voennaia mysl', No. 7 (July 1963), p. 47.

46. Sokolovsky, Voennaia strategiia. (1963), p. 402.

47. Ibid., p. 405.

48. Ibid.

49. Ibid., pp. 405-406.

50. Sokolovsky, Voennaia strategiia. (1962), p. 109.

51. Pravda, (October 24, 1962), p. 4.

52. N. Ia. Suskho and T. R. Kondratkov, Metodologicheskie problemy voennoi teorii i praktiki. (Moscow: Voenizdat, 1966).

53. I. Anureev, "Determining the Correlation of Forces in Terms of Nuclear Weapons," Voennaia mysl', No. 6 (June 1967), pp. 35-45. Anureev, an engineer by training, received his candidate's from the Academy of the General Staff in the late 1950's or early 1960's and has gone on to be a professor and consultant at the Academy. See: Kulikov, Akademiia General'nogo shtaba. pp. 167-168, 188, 215.

54. I. Anureev, "Mathematical Methods in Military Affairs," Voennaia mysl', No. 9 (September 1966), pp. 46-61.

55. S. Vol'nov, "Space and Electronic Warfare," Voennaia mysl', No. 9 (September 1966), pp. 74-86.

56. A. Vasilyev, "Development of Space Systems of Armament in the U.S.," Voennaia mysl', No. 3 (March 1967), 54-63.

57. Ibid., p. 63.

58. A. Korniyenko and V. Korolev, "Economic Aspects of Soviet Military Doctrine," Voennaia mysl', No. 7 (July 1967), pp. 28-30.

59. Ibid., p. 30. While not discussing Soviet programs, Voennaia myls' had already started to carry articles assessing the US ABM and Space Defense effort. See: B. Aleksandrov, "Problems of Space Defense and Means of Solving them," Voennaia mysl', No. 9 (September 1964), pp. 94-104.

60. M. Zakharov, "Soviet Military Science Over Fifty Years," Voennaia mysl', No. 2 (February 1968), pp. 47-48.

61. Ibid., pp. 50-51.

62. V. Anyutin, "Surveillance of Outer Space," Voennaia mysl', No. 3 (March 1968), pp. 35-43.

63. V. Bezzabotov, "The U.S. Limited ABM System 'Sentinal'," Voennaia mysl', No. 5 (May 1968), pp. 70-72.

64. Ibid., pp. 73-75.

65. N. Yegiazarov and B. Yakovlev, "Trends in the Development of US Strategic Missiles," Voennaia mysl', No. 5 (May 1968), pp. 76-81.

66. Ibid., p. 81.

67. Ibid.

68. Ibid., p. 82.

69. Ibid.

70. Iu. Listvinov, "The Militarization of the American Space Program," Voennaia mysl', No. 6 (June 1968), pp. 75-77.

71. Ibid., pp. 78-82. Soviet publications on the US plans for the militarization of space were extensive in the mid-1960's. They included: G. S. Khozin, Militaristy v kosmose (voennye kosmicheskie issledovaniia v SShA). (Moscow: Voenizdat, 1967), and Iu. N. Listinov, Amerikanskaia kosmicheskaia strategiia. (Moscow: Mezhdunarodnye otnoshenii, 1969). Khozin credited the US with using its research program to perfect operational-strategic concepts for the use of space in its aggressive plans (p. 41).

72. V. D. Sokolovsky, Soviet Military Strategy (1968) translated by Harriet Scott, (New York: Crane, Russack, 1984), p. 77.

73. Ibid., p. 78.

74. Ibid., p. 79.

75. Ibid., pp. 80-84.

76. Ibid., p. 84.

77. Ibid., p. 87. It is noteworthy how Soviet military writers have historically approached the aerial reconnaissance as a mission. Soviet air power theorists were never taken with the idea of air power by itself winning wars. Aerial reconnaissance and, indeed, all air operations were to be seen within the context of the air-land offensive. On these themes see: A. N. Lapchinsky, Vozdushnaia razvedka. (Moscow: Gosvoenizdat, 1938) pp. 1-4; and Vozdushnaia armiia. (Moscow: Gosvoenizdat, 1939), pp. 103-105. Commenting on the aviation situation at the beginning of World War I, Lapchinsky wrote in the introduction to Air Reconnaissance that while many theorists expected air reconnaissance to aid the offensive in the pre-WWI period the fact that aviation was not armed in 1914 made it possible for both defender and attacker to use air reconnaissance in their conduct of operations and in this fashion became one of the factors contributing to the stabilization of the front (pp. 3-4). In the tsarist military encyclopedia, published after the Russo-Japanese War a direct connection was made between the threat of air reconnaissance and the need for the development and application of maskirovka to conceal, deceive, and camouflage forces and their movement. See: Voennaia entsiklopediia (St. Petersburg, 1914) XV, pp. 219-220.

78. Sokolovsky, Soviet Military Strategy. (1968), p. 88.

79. Ibid.,

80. Ibid., p. 90.

81. Ibid., p. 91.

82. Ibid., p. 93.

83. Annonymous, "Science and Warfare," Voennaia mysl', No. 1 (January 1969), pp. 82-88.

84. Carl G. Jacobsen, "Soviet Think Tanks," in: David R. Jones, ed., Soviet Armed Forces Review Annual. (Gulf Breeze, Florida: Academic International Press, 1977), pp. 149-152.

85. Genrikh Aleksandrovich Trofimenko, Strategiia global'noi voiny, (Moscow: Mezhdunarodnye Otnosheniia, 1968), pp. 301-320.

86. A. Gromyko, "American Theoreticians Between 'Total War' and Peace," Voennaia mysl', No. 4 (April 1969), pp. 91-92.

87. Ibid.

88. Ibid., pp. 93-96.

89. Ibid., pp. 96-97.

90. Pravda, (January 21, 1969).

91. Lawrence T. Caldwell, Soviet Attitudes to SALT. In: Adelphi Papers No. 75, (London: International Institute for Strategic Studies, 1973), p. 8.

92. I. Rognedin, "Space and Problems of Its Conquest," Voennaia mysl', No. 6 (June 1969), pp. 51-51.

93. Ibid., p. 57.

94. Iu. Listvinov, "The Moon and the Pentagon," Voennaia mysl', No. 6 (June 1969), pp. 76-78.

95. L. Kuleszynski, "Some Problems of Surprise in Warfare," Voennaia mysl', No. 5 (May 1971), pp. 97-105.

96. Ibid., pp. 105-108.

97. Pravda. (March 31, 1971).

98. Ibid.

99. Krasnaia zvezda. (April 28, 1971).

100. Anonymous, "Current Progress and Cosmic Research," Voennaia mysl', No. 7 (July 1971), pp. 27-29.

101. Ibid., p. 34.

102. Anonymous, "The Tasks of Soviet Military Science in Light of the Decisions of the 24th Party Congress, Voennaia mysl', No. 8 (August 1971), pp. 1, 7.

103. A. Vasil'yev, "The Development of Military Space Systems and Equipment in the USA," Voennaia mysl', No. 8 (August 1971), pp. 99-165.

104. Ibid., pp. 105-106.

105. Ibid., p. 107.

106. I. Anureev, "Methods of Military Science," Voennaia mysl', No. 8 (August 1971), pp. 37-38.

107. Ibid., p. 38.

108. Ibid., pp. 38-39.

109. Ibid., pp. 42-43.

110. Anureev, Antimissile and Space Defense Weapons. pp. 105-108.

111. Ibid., pp. 9-41.

112. Ibid., p. 41.

113. Ibid., pp. 173-180.

114. Ibid., p. 197.

115. Ibid., pp. 197-201.

116. Ibid., pp. 201-250.

117. K. Provorov, "Missile and Space Defense Weapons and the Problems of Countering Them," Voennaia mysl', No. 5 (May 1972), pp. 119-122.

118. Ibid., pp. 122-123.

119. Ibid., p. 123.

120. Yu. Yur'yev, "Artificial Earth Satellites in Reconnaissance Systems," Voennaia mysl', No. 9 (September 1973), pp. 54-63.

121. I. Anureev, "The Correlation of Military Science with the Natural Sciences," Voennaia mysl', No. 11 (November 1972), p. 35.

122. Paul H. Nitze, "SDI: The Soviet Program," Current Policy No. 177. (Washington, D.C.: U.S. Department of State, Bureau of Public Affairs, 1985), pp. 1-4. Nitze outlines the major lines of research currently being pursued which might have application to war fighting in space. He includes under this high-energy laser research, particle-beam weapons, radio frequency weapons, kinetic energy weapons, and the military space program. My point would be that as early as representatives of the Soviet General Staff had identified these areas as research fields in which technological progress in the next generation would deliver qualitatively-new weapons systems. Since SALT I and the ABM Treaty did not preclude the research and development effort in these areas by either side, the implication was a structuring, not a curtailment, of the arms race.

123. S. Voldin, "The Multiple-Use Transport Spacecraft and Prospects for Its Development," Voennaia mysl', No. 2 (February 1973), pp. 65-71.

124. Yur'yev, "Artificial Earth Satellites in Reconnaissance Systems," Voennaia mysl', No. 9 (September 1973), pp. 54-63.

125. M. N. Galkin, ed., Nauchno-tekhnicheskii progress i revoliutsiia v voennom dele. (Moscow: Voenizdat, 1973), p. 253.

126. Ibid., pp. 272-273. In 1969 Voennaia mysl' carried a very explicit statement by senior Soviet General Staff Officers about the relationship of political strategy to scientific-technical development:

> These of Soviet strategy primarily reflect the political strategy of the Communist Party of the Soviet Union. It is in the interests of political strategy that military strategy makes use of the achievement of scientific-technical progress which materializes in weapons of varying power. . . . Of all factors which affect military strategy, the most important are political factors, which determine the nature and goals of war and the scale of employment of armed forces. This influence is due essentially to the role played by the military doctrine of the state, which officially consolidates specific principles, methods and forms of preparing for and waging war in case of attack by an imperialist enemy.
>
> G. Semenov and V. Prokhorov, "Scientific-Technical Progress and Some Questions of Strategy," Voennaia mysl', No. 2 (February 1969), p. 23.

127. I. I. Anureev, Rakety mnogokratnogo ispol'zovaniia. (Moscow: Voenizdat, 1975), pp. 56-73.

128. Ibid., pp. 129-212.

129. Ibid., p. 205.

130. Mil'shtein, Voenno-promyshlennyi kompleks. (Moscow: Voenizdat, 1975), pp. 139-140.

131. Ibid., pp. 3-40.

132. Ibid., pp. 158-169.

133. Ibid., pp. 170-178.

134. Ibid., p. 186.

135. P. H. Vigor, Soviet Blitzkrieg Theory. (London: Macmillan, 1983); C. N. Donnelly, "The Soviet Operational Maneuver Group: A New Challenge for NATO," Military Review, LXIII (March 1983), pp. 43-60; Philip A. Petersen and John G. Hines, The Soviet Conventional Offensive in Europe. (Washington, D.C.: Defense Intelligence Agency, 1983); and John Mearsheimer, Conventional Deterrence. (Ithaca: Cornell University Press, 1983). For Soviet works outlining the principles of modern operational art see: N. V. Ogarkov, "Guarding Peaceful Labor," Kommunist, No. 10 (October 1981), pp. 85-88; A. A. Sidorenko, The Offensive. (Washington, D.C.: GPO, 1976); S. P. Ivanov, Nachal'nyi period voiny. (Moscow: Voenizdat, 1974; V. E. Savkin, Osnovnye printsipy operativnogo iskusstva i taktiki. (Moscow: Voenizdat, 1972); and V. G. Reznichenko, ed., Taktika. (Moscow: Voenizdat, 1984).

136. Orlov, Lazery. (Moscow: Voenizdat, 1976), pp. 123-133.

137. Ibid.

138. L. I. Brezhnev, Report of the CPSU Central Committee and the Immediate Tasks of the Party in Home and Foreign Policy. (Moscow: Novosti, 1976), p. 20.

139. Ibid., p. 28.

140. U.S. Congress, Senate, Committee on Aeronautical and Space Sciences. Soviet Space Programs. (Washington, D.C.: GPO, 1976), pp. 12-14.

141. Barry J. Smeroff, "A Bold Two-Track Strategy for Space: Entering the Second Quarter-Century," in: Uri Ra'anan and Robert L. Pfalyzgraff, Jr., eds., International Security Dimensions of Space. (Guilford, CT: Archon Books, 1984), pp. 17-29. Smeroff for one does see a need for an arms control process to limit the threat posed by Soviet offensive strategic forces to a US ballistic missile defense system. Smeroff offers a sort of pragmatic leap into the new technologies without making clear why the Soviets should respond to the US initiative in a fashion that will enhance the initiative's prospects for success. For a countervailing view of the need to maintain the ABM Treaty as in US interests see: Sidney D. Drell, Philip J. Farley and David Holloway, "Preserving the ABM Treaty: A Critique of the Reagan Strategic Defense Initiative," International Security, 9, No. 2 (Fall 1984), pp. 51-91 and Gary L. Guertner, "What is 'Proof'?" Foreign Policy, No. 59 (Summer 1985), pp. 73-84.

142. Patrick J. Friel, "New Directions for the U.S. Military and Civilian Space Program," in: Ra'anan and Pfaltzgraff, Jr., eds., International Security Dimensions of Space. pp. 121-123.

143. V. Grisenko, "Reconnaissance from Space," Morskoi sbornik, No. 11 (November 1979), pp. 91-94.

144. N. Petrov, N. Sokolov, and P. Katin, SShA i NATO: Istochniki voiny ukrozy. (Moscow: Voenizdat, 1979), pp. 215-218. The basic shift in the Soviet assessment of U.S. defense policy was the declining prospects for detente as apparent in a book on U.S. strategic concepts edited by Bogdanov, Mil'shtein, and Semeiko and appearing in 1980. This volume addressed two contradictory lines in U.S. strategic concepts and military policy between a "dominant line to the deepening and widening of the relaxation of international tensions and a contradictory course to this towards an arms race, to material preparation for war, toward intervention in foreign affairs. Contrary to this statement, the authors concluded that events in late 1970 were proof that the balance had shifted in favor of the latter rather than the former. Since this volume had been submitted to publication in June and signed to press in October 1979 it would seem these later revisions were, in fact, a function of politically inspired editorial changes late in the publishing process. See: R. G. Bogdanov, M. A. Mil'shtein, and L. S. Semeiko, eds., SShA: Voenno-strategicheskie kontseptsii. (Moscow: Nauka, 1980), pp. 295-304.

145. V. Shatalov, "Orbital Stations: Prospects and Problems," Aviatsiia i kosmonavtika, No. 10 (October 1979), pp. 36-37.

146. Ibid., and Sovetskaia Estoniia, (December 5, 1979), p. 3.

147. V. P. Mishin, "The Road Into Orbit," Aviatsiia i kosmonavtika, No. 11 (November 1980), pp. 42-44.

148. Ibid., p. 44.

149. Frankfurter Allegemeine Zeitung, (September 20, 1979), p. 8.

150. P. Pliachenko, "The Pentagon's Dangerous Plans for Space," Sovetskii voin, No. 24 (1980), pp. 44-45, and Anatolii Manakov, "Myths Feel Cramped on Earth," Literaturnaia gazeta, (March 12, 1980), p. 9.

151. Pliachenko, "The Pentagon's Dangerous Plans for Space," Sovetskii voin, No. 24 (1980), p. 45.

152. Krasnaia zvezda, (March 19, 1980), p. 3.

153. Ibid.

154. K. Omashev, "The 'Shuttle' System," Zarubezhnoe voennoe obozrenie, No. 1, (January 1981), pp. 55-59. No entry on the Shuttle appeared in the Soviet Military Encyclopedia, but when the Military

Encyclopedic Dictionary appeared in 1983, it carried an entry. See: Voennyi entsiklopedicheskii slovar', pp. 813-814.

155. Ibid., p. 59.

156. G. Guroff and Steven Grant, Soviet Elites -- World Views and Perceptions of the U.S., Office of Research, International Communications Agency, R-18-81 (September 29, 1981), p. 17.

157. V. V. Potashov, "Arms Race in the United States -- Threat to Peace," SShA: Ekonomika, politika, ideologiia, No. 6 (June 1981), pp. 32-33.

158. Ibid., p. 40.

159. Ibid.

160. S. Stashevskii and G. Stakh, "Outer Space Must be Peaceful," Mirovaia ekonomika i mezhdunarodnye otnosheniia, No. 2 (February 1982), pp. 15-24.

161. Izvestiia, (August 12, 1981), p. 4.

162. V. V. Zhurkin, "Outlines of U.S. Military-Political Strategy," SShA: Ekonomika, politika, ideologiia, No. 11 (November 1981), pp. 9-10.

163. V. Basmanov, "For a Weapon-Free Space," International Affairs, No. 11 (November 1981), p. 100.

164. Ibid., p. 103.

165. N. Ogarkov, "Guarding Peaceful Labor," Kommunist, No. 10 (October 1981), pp. 80-84.

166. Ibid., p. 85.

167. Ibid., p. 85.

168. Ibid., Vsegda v gotovnosti k zashichite otechestva. p. 31.

169. Ibid., pp. 43-44.

170. Ibid., p. 58.

171. Ibid., pp. 58-61.

172. V. Avduevsky, "Kosmos dolzhen byt' mirnym," Kommunist, No. 15 (October 1983), pp. 108-111.

173. Ibid., p. 116.

174. Committee of Soviet Scientists in the Defense of Peace and Against the Threat of Nuclear War, "Annotsiia," [uncirculated report of Soviet paper delivered at Washington Conference in 1984] Russian text pages are numbered in original./1.

175. Ibid., /1-4, prilozhenie ?.

176. Ibid., /5-6.

177. Avduevsky, Kosmos dolzhen byt' mirnym," Kommunist, No. 15 (October 1983), pp. 112-113.

178. James E. Oberg, "The Elusive Soviet Space Plane," Omni, (September 1983), pp. 126-129, 143.

179. U.S. Congress, Office of Technology Assessment, Saliut: Soviet Steps Towards Permanent Human Presence in Space -- A Technical Memorandum. (Washington, D.C.: GPO, 1983), pp. 29-39. The Soviet declarations about the purposes of their space program are frequent and often visionary. For a recent statement see: M. Aleksandrov, "The Space Program Serving Science and Economy," Aviatsiia i kosmonavtika, No. 1 (January 1985), pp. 44-45; V. Mishin, "Zemnye programmy kosmonavtiki," Kommunist, No. 6 (1983), pp. 80-90; and S. G. Grishin and S. V. Chekalin, "Kosmicheskii transport budushchego," in Novoe v zhizni, nauka, tekhnike: Seriia "Kosmonavtika i astronomiia, No. 11 (November 1983), pp. 15-59.

180. Mishin, "Zemnye programmy kosmonavtiki," Kommunist, No. 6 (1983), pp. 80-81.

181. Ibid., p. 84. See also: V. S. Avduevsky, "Prospects for Power Engineering in Space," Zemlia i vselennaia, No. 6 (November-December 1981), pp. 2-5.

182. Ibid., pp. 86-87. Other Soviet authors have, however, asserted that the Space Shuttle is not as effective as their Saliut Program with its non-reusable transport rockets. See: P. Pelekhov, "Space Research: The Effectiveness of the Soviet Program," Argumentry i fakty, No. 35 (August 30, 1983), pp. 4-5. I would argue that Pelekhov has created a false dichotomy between the Shuttle and Saliut Programs. It need not be a choice of either/or. Instead, as Mishin's comments about the need for cheap-lift capacity in the earth-orbit and orbit-earth tasks the re-usable space transport can supplement the already existing technologies. Other Soviet authors have suggested design modifications to make a shuttle more effective and have hinted that the US program was rushed to get immediate military advantage. This seems to suggest that a Soviet shuttle or MTTK will be different in a number of features. See: Grishin and Chekalin, "Kosmicheskii transport budushchego," Novoe v zhizni, nauke, tekhnike: Seriia "Kosmonavtika i astronomiia," No. 11 (November 1983), pp. 17-20.

183. Jozef Smoter, "Operation of National Air Defense Forces in a Possible War," Przeglad wojsk lotniczych i obrony powietrznew kraju, No. 9 (September 1982), p. 5.

184. Ibid., pp. 6-8.

185. Pravda, (June 14, 1984), p. 4.

186. Pravda, (June 4, 1985), p. 4.

187. Pravda, (June 14, 1985), p. 4.

188. V. Tolubko, "Na strazhe zavoevanii oktiabria," Kommunist, No. 3 (1983), pp. 62-63. Marshal Tolubk was replaced as Commander of the SRF as part of the shake-up of the Soviet High Command in July 1985. Tolubko's replacement is General Iurii Pavlovich Maksimov, a senior ground forces commander with combined arms experience who has played a leading role in Soviet operations in Afghanistan. Maksimov's appointment seems to underscore the importance which the Soviet leadership attaches to command success and combined arms experience. As Richard Woff has pointed out, Maksimov was not an SRF insider and his appointment will clear the way for Gorbachev to make sure that SRF is in the hands of "his" man. See: Richard Woff, "Soviet Command Changes and Policy Implications," Rapid Report No. 25 (August 1985), pp. 4-5.

189. M. M. Kir'ian, Nauchno-tekhnicheskii progress i Vooruzhennye Sily SSSR, pp. 260-262.

190. Krasnaia zvezda, (May 30, 1985).

191. Russell G. Breighner, "Air Defense Forces," Soviet Armed Forces Review Annual, 1983-1984. VIII, pp. 128-131.

192. Pravda, (April 8, 1985), p. 1. The declarations that the USSR will not let the US gain an advantage but will spend to keep a credible defense has been repeated as the state policy see Admiral Sorokin's comments on SDI in Krasnaia zvezda (June 28, 1985), p. 3.

193. Pravda, (April 8, 1985), p. 1. The same theme was repeated in Gorbachev's address commemorating the victory over Nazi Germany. See: M. S. Gorbachev, "Bessmertnyi podvig sovetskogo naroda," Kommunist, No. 8 (May 1985), pp. 15-17.

194. Pravda, (May 5, 1985).

195. Krasnaia zvezda, (May 30, 1985). The author was not able to obtain a copy of Ogarkov's latest volume and so has had to relie upon Soviet reviewers' comments. It is, however, important to note that shortly after the volume's appearance Ogarkov was appointed to replace Marshal Kulikov as C-in-C Joint Warsaw Pact Armed Forces.

196. Soviet analysts understand the politico-psychological impact of strategic vulnerability upon US society. In 1980 in an interview for The New York Times Georgii Arbatov, Director of the Institute for the Study of the United States and Canada, made that point explicitly: "Americans lived for many years behind two oceans, with a feeling of 100 percent security. Then they lived a couple of decades after World War II with a feeling of overwhelming strategic superiority.

Now they have become just as vulnerable as we are, as all Europeans. . . .The Americans have become vulnerable for the first time, so there have been constant attempts to somehow reverse the situation. And there was the naive hope that more dollars and more military hardware could make you invulnerable. Now there is parity. Whatever you do won't change that." The New York Times, (October 5, 1980).

Administration efforts to sell SDI have run into the problem of open criticism from US scientific-technical experts of the feasibility of the research program. This is not the place and the author lacks the technical competency to comment upon whether current and future developments in lasers, sensors, and computer technology (hardware and programming software) will permit the creation of an effective space-based ABM system. However, the line of argument taken by some defenders of SDI that such affairs are difficult to predict runs into problem that weapons programs begun with one purpose in mind often in the process of their development evolve into systems capable of other tasks. Radar research began to work on a death ray, evolved into the premier defensive system of the Battle of Britain, and by the late stages of the war was employed for offensive purposes in the bomber offensive. To say as Kenneth L. Adelman has, "If it won't work, why are the Russians so worried about it?" is to miss this dialectical aspect of weapons development. Of course, the Soviet Union is pursuing the development of such weapons technology, but it is the height of hubris to believe that the USSR will copy our operational art and structure in applying such weapons systems to warfighting. Moral grounds for building SDI as some answer to the problem of accidental attack a la Failsafe miss the central point that war, as opposed to accidents, remains a continuation of politics. For SDI to work it must deliver what President Reagan promised in his March 1983 address. Short of that our democratic policy will create a climate for recriminations and a discrediting of even a more modest and prudent pursuit of such technologies. We are walking a very thin line. For Adelman's views see: Kenneth L. Adelman, "SDI: Setting the Record Straight," Current Policy No. 370, (Washington, D.C.: U.S. Department of State, Bureau of Public Affairs, 1985). For a very articulate assessment of the dangers we now face in "selling" SDI at home and abroad see: James Schlesinger, "The Eagle and the Bear," Foreign Affairs, (Summer 1985), pp. 958-961.

SECTION III

Soviet Military Doctrine in the 1980's: Implications for the SDI

Dr. Alfred L. Monks

INTRODUCTION

Since the unveiling of President Reagan's Strategic Defense Initiative in early 1983, Soviet responses to this program have been a matter of growing concern to U.S. policymakers, Western defense analysts, scholars, and to laymen interested in Soviet-American relations. These observers, however, do not always agree in their assessment of Moscow's reaction to it. Some assert that the Soviet Union intends to use outer space for military purposes and they point to Soviet military doctrine and to the development and deployment of Soviet military space capabilities to substantiate their argument. Others argue that such conclusions cannot be drawn from Soviet military doctrine, since its tenets are often vague and ambiguous, nor can they be drawn from Soviet space capabilities. Further, this second group asserts that Soviet officials have always refused to acknowledge the existence of a military element in their space programs, and attempts to impute such motives to Moscow represent "mirror-imaging" on the part of the United States in order to justify growing U.S. space programs.

Admittedly, Soviet military doctrine does not constitute a body of fixed rules which sets forth rigid prescriptions for such matters as future weapons choices and Soviet military strategy, etc. In addition, there is much about Soviet military thought that may seem vague, ambiguous, and forbidding, especially to someone unschooled in Marxist-Leninist thought. Nonetheless, we believe that Soviet military doctrine, if systematically studied and properly understood, may serve as a valuable instrument in our comprehension of Soviet military developments, including those which may be related to outer space.

In this paper, we seek to determine which tenets of Soviet military doctrine can, with reasonable certainty, be related to Soviet responses to the SDI, which tenets may be associated in the SDI, but not with as high a degree of certainty, and which doctrinal components are probably unrelated to the Soviet reaction to the SDI. It is the hope of this writer that shedding light on Soviet military doctrine within the context of the Strategic Defense Initiative may contribute to a better understanding of Soviet military and political intentions. This, in turn, should allow others to more effectively assess the viability of President Reagan's plan to build a space-based defense shield.

SECTION I

DESCRIPTION

THE RELATIONSHIP BETWEEN SOVIET MILITARY DOCTRINE

AND SOVIET WEAPONS POLICY

A knowledge of the relationship between Soviet military doctrine and Soviet weapons choices is important for those in the West who study Soviet military affairs, as well as for Western policymakers. However, there has been no consensus among these observers concerning the role of military doctrine in this relationship.[1] Some have asserted that Soviet military doctrine "drives" Soviet weapons policy choices. Others have argued that the role of Soviet doctrine in the weapons aquisition process is much more modest, being simply that of providing theoretical justification for weapons choices already made.[2] To these analysts, other factors, such as general bureaucratic momentum, specific vested interests within the Soviet military-industrial complex, or an East-West action-reaction phenomenon, provide the stimulus for Soviet weapons programs.

The relationship between Soviet military doctrine and Soviet weapons policy choices is complex. One reason for this is that Soviet military doctrine is itself complex, comprising two major components -- a political component and a military-technical component. The political side of Soviet military doctrine defines the general nature of war and the political goals of the state in war. The military-technical component, more susceptible to change than this political element, defines the means and methods of waging war. It also organizes and structures the armed forces for waging war,

directs to some extent weapons development, trains and prepares the troops, as well as the entire populace for a conflict, and plans how war will be waged. In sum, Soviet military doctrine is concerned with the nature of a future war and the goals of the state in it, how to prepare the country for it, and how to wage it if war is joined.

It is a hypothesis of this paper that it is not a matter of either military doctrine "driving" technological progress, including weapons choices, nor of doctrine simply "reacting" to, and "rationalizing" new weapons policy choices already made. We believe that the role of Soviet military doctrine in the weapons policy process can be described as follows: Soviet military doctrine, in its political aspect, adapts (adjusts) the existing conception of the character of a future war, including its political goals, to new weapons breakthroughs. This occurred in 1960 when Soviet doctrine adjusted to the development of nuclear weapons and their introduction into the Soviet Armed Forces which took place in the late 1950s. In turn, this new concept of war provides general guidelines of criteria which are utilized by the military-technical side of doct· in shaping Soviet force posture -- the size, organizational structure of the armed forces, and the procurement, allocation of men, materiel, and resources needed to develop the armed forces. The material-technical side of doctrine does this by discerning the military utility of new technologies and new weapons and by presenting new requirements for the armed forces within the framework of the official concept of war. In sum, the material-technical component of Soviet military doctrine seeks answers to the following questions[3]: For what kind of war is it necessary to prepare? What kind of armed forces should one have and in what quantity? How should they be

trained? In what ratio should the individual branches be developed? What armed branch, if any, should be considered the main one, and what means of warfare should be considered decisive in each type of war?

SECTION II

SOVIET LAWS OF WAR

Soviet military thinkers assert that a correct understanding of war as a social process is possible only if one takes into account its "laws" and that only Marxist-Leninism provides such a comprehension.[4] Soviet laws of war are defined as "essential, necessary, repeating, stable links and relations between the various components and elements of war as a process shaping its creation, function, and development and outcome". Soviet laws of war comprise three types: laws of the genesis of war, laws of the course and outcome of war (called "general laws"), and laws of armed conflict. The general laws of war provide the basis of Soviet military science, are reflected in Soviet military doctrine, and tend to shape Soviet military policy. They are extremely sensitive to the military implications of new technology, as is evidenced by the fact that the importance of strategic nuclear strikes in a future war was elevated to the status of a general law of war in the Khrushchev period. The laws of armed conflict, in contrast, concretize the general laws of war, especially that postulating the dependence of the course and outcome of war on the relationship of military forces of the opposing sides, and the law postulating the dependence of the development and change in methods of armed struggle on quantitative and qualitative changes in new weapons and military technology. The laws of armed struggle are used by commanders of the Soviet Armed Forces primarily in formulating and solving specific strategic, operational, and tactical problems.

Soviet military thinkers claim that, equipped with a Marxist-Leninist comprehension of war, they can achieve victory in war.[5] It is further asserted that a knowledge of the laws of war provides one with an opportunity to predict future military developments, both inside and outside the Soviet Union. For example, armed with the knowledge of the law concerning the origin of war, and that postulating the dependence of war on its political goals, the Soviets claim that they can predict the nature of war preparations by the West and how such a war will be conducted, as well as predict the development of new weapons systems and new organizational changes within the Soviet Armed Forces. Further, by focusing on the law concerning the scientific potentials of the combatant states and that which is concerned with technological change, one can make predictions concerning the need for new combat operations. Since the general laws of war are more pertinent to possible Soviet responses to the SDI, only they, and not the laws of armed conflict, will be discussed in this paper.

SECTION III

THE GENERAL LAWS OF WAR

The most general law of war in Soviet military thinking is:

"War depends on the political goals of the warring states."

This law expresses the Soviet belief that the political goals of states and their politics determine the character of war and its essence, as well as the extent that military force will be employed in war. This means that the nature of a state's political system and its goals determine the overall strategic plan of war, as well as its economic, political, diplomatic, and ideological bases of support, the choice of weapons (nuclear/conventional) employed, and how the war's strategic goals will be achieved.

The second general law of war is:

> The course and outcome of war depend on the correlation of economic forces of the warring states.

Soviet military thinkers assert that of the various factors underlying victory or defeat in war, the most crucial one is the economic level of a state. The level of development of the economy purportedly determines the quantity and quality of weapons produced, which in turn shapes the nature, scale, and specific type of military operations to be employed. Further, the Soviets argue that as the scale of military operations expands, and as weapons and military technology are perfected, the role of economic factors in war becomes even greater. In addition, the level of economy is said to determine the extent to which a state can mobilize its reserves and fight a protracted war. Soviet leaders fiercely argue that the Soviet system is

superior to the capitalist system in its capacity to support the state with needed reserves, stores of food, energy, and raw materials.

The third general law of war is:

> The course and outcome of war also depend on the correlation of the scientific potentials of the opposing sides.

This expresses the dependence of war and its processes on the scientific and technological achievements of a country, and the extent and degree of the use of such potentials by the combatants. Figures show that Soviet leaders are serious about taking advantage of this law of war -- they have turned out about 100,000 new scientific personnel in the past seven years, including some 50,000 new candidates of science and about 4,000 doctors of science.[6]

The fourth general law of war is:

> The course and outcome of war are dependent upon the correlation of social, and morale-political forces and possibilities of the belligerents.

This law says that the physical and morale-political steadfastness of the masses determines to a great extent whether a state will win or lose a war. To emphasize the importance of this feature in Soviet military affairs, Soviet military thinkers quote Lenin's statement that "In any war, victory in the final analysis is determined by the spiritual conditions of those masses who shed their blood on the battlefield."[7] The Soviets further assert that the history of wars clearly demonstrates the applicability of this law.

The fifth general law of war is:

> The course and outcome of war are dependent upon the correlation of the military forces of the belligerent sides.

This law says that the military capability of a state, expressed in quantitative as well as qualitative terms, as well as its mobilization capacity, determine to a great extent the course of war, and whether that state will win a war if it is engaged. Also of importance is the level to which the military theory of a state is developed.

A new, sixth law of war was added in 1983/1984. The sixth, and final law of war is:

> The development and shift in the methods of combat are dependent upon quantitative and qualitative changes in military technology, and upon the level of morale-military qualities of military personnel.

This indicates the Soviet belief that the development and changes in military operations (operational art) are caused primarily by changes of a particular type of weapons, as well as by corresponding changes in the physical/moral steadfastness and military expertise of the troops. This law also asserts that new shifts in military operations are not caused by the will of military commanders, but by the force of new weapons technologies. Marshal of the Soviet Union, former commander of the Soviet General Staff, N. V. Ogarkov, put it this way:

> The history of wars and military art convincingly demonstrate that changes in military affairs are caused by changes occurring primarily in weapons and in military technology. '...The successes of technology F. Engles wrote, -- scarcely have they become applicable and virtually employed in military affairs, then immediately -- almost by force, and often against the will of the military commander -- have produced changes and even transformations in the methods of conducting battle...'[8]

It is also emphasized that this law is manifested in combat operations of <u>any scale and at all levels</u>.

Soviet military thinkers also state that the above laws are subsumed under a system of laws which express the "historical inevitability of the triumph of the new over the old," i.e., that socialism will be victorious over capitalism. The most characteristic of these systematic laws is:

> That side will be historically victorious which represents the new, more progressive social and economic system and effectively uses the possibilities inherent in it.

The above law is purportedly applicable for wars fought in defense of the Soviet Union and its socialist allies, as well as newly liberated countries building socialism, and for those conducting national liberation struggles.

While all the above general laws of war influence Soviet military doctrine and defense policy, including weapons acquisition choices, law number six, adopted after President Reagan's Star Wars speech of March 1983, appears to have a particular relevance for possible Soviet responses to the Strategic Defense Initiative.[9] Moreover, the authority of both Engles and Lenin were invoked to substantiate this law. Of the six general laws of war, only one other, number two, invoked the authority of both of these thinkers for substantiation.

In order to comprehend the meaning of this general law of war, one must first grasp the Marxist-Leninist dialectical laws of the transition of quantitative change into qualitative change, and of the negation of the negation. The former law addresses the question of how change occurs (the source of change). It states that change will occur by a gradual buildup of quantitative changes and their transition at a certain state of development into basic qualitative changes, which in turn provide the basis

for new quantitative changes. The qualitative changes which occur have a dual nature: they result in a change of the state of the given quality, and secondly, produce a jump, a sharp transition to a new quality. As related to military affairs, it is postulated that if any quantitative changes take place in the armed forces which affect their quality or the nature of military operations, then qualitative changes will occur, provided that basic new types of weapons are produced and supplied to the armed forces in sufficient quantities. But to leave the matter here would be inexpedient, since this provides the Soviet analyst (including the military analyst) only with an approach, a methodology for comprehending change in the world. The analyst must probe more deeply. This point was made in the following statement:

> The methodological requirements for an analysis of the basic qualitative transition consists in the following: to clarify the nature and features of the basic qualitative transition, the jump; to determine its beginning; to detect the direction and character of this transition; to point out the paths, the means for its most expedient realization in various forms of practical activity.[10]

This means that the analyst must examine the rate at which qualitative change will occur. While it is generally assumed that changes in military technology take place much more rapidly than in the past, one must answer such questions as: which new types of weapons (air, sea, land-based) will bring about the fastest qualitative changes in military affairs, and what quantities of these weapons must be produced to cause a qualitative change in military operations? In addition, the analyst must be able to detect as quickly and rationally as possible, the beginning of qualitative change in the following statement

> The 'mechanism' of the dependence (changes the combat operations as a function of level of military technology) consists in that new technology by necessity forces out the old. However, this occurs not immediately, for some time they coexist. The new technology at first is used within the framework of old methods of operations, but having reached a sufficient degree of perfection of quality, it is forced to change the methods of struggle. They do not give up the old technology immediately. For a certain period they maintain subordinate functions with respect to it and its use is subordinate to the new methods of combat operations.[11]

What is of critical importance for the analyst is the timely detection of the direction of qualitative changes, i.e., to be able to preserve elements of the old in the new and not to skip stages of development. For the military analyst, this means that he must see positive features in existing weapons and operations and to take full advantage of them. In sum, changes in quality, based on changes in quantity, may be varied in terms of character and result. What is most important is to see what is "progressive" in development. This is the task of the law of the negation of the negation which is discussed in the following section.

The dialectical law of the negation of the negation states that change must be viewed as process in which elements of the new "negate" elements of the old, while preserving the "progressive" features of the old. In characterizing the essence of this law, Lenin stated that dialectical negation -- "this is not empty negation... but negation as a moment of linkage, as a moment of development, with the retention of the positive..."[12] As Engles pointed out, the nature and the means of negating of the old by the new will be different in each concrete case.[13] In other words, each phenomenon examined is unique. Marshal N. Ogarkov put it this way:

> As experience shows, the depth of the negation can be different. In some cases, the elimination of the old, the antiquated, breaking further progress occurs by preserving the bases of the existing one.[14]

According to the Marxist-Leninism, in each negation there will be two types of negation, depending on the nature of the qualitative changes occuring. The first constitutes a negation of elements of the old while preserving the bases of the existing state of the phenomenon. The second involves a negation of the bases of the existing state of the phenomenon and the formation of a new quality on a new base. The first type of negation is said to be encountered quite often in military affairs. For example, in the aircraft industry, as long as the focus of aircraft designers was directed at the perfection of aircraft based on propeller-driven engines, the negation simply involved improving certain structural features of the airplane (improving the wing design etc.), while the basic features of the airplanes were preserved (piston-driven engines and propeller). This type of negation is viewed by Marxist-Leninist thinkers as important if the objective is to preserve the existing qualitative state of the phenomenon, or in preventing superfluous destruction of existing weaponry, military operations, etc. The second type of negation takes place when development is no longer possible by simply making modifications in the existing bases of the object. What is needed is the creation of a new quality on a new base. For example, the further development of screw-propeller aviation was no longer possible on the basis of piston-driven motors, and so a qualitative shift to jet aviation occurred. This type of negation is seen by Marxism-Leninism as not as common for military affairs as the first type, although the nuclear revolution in military affairs has often involved this type of negation. Marxist-Leninist thinkers warn that this second type of negation must be applied with extreme caution. The authority of both Lenin and Frunze have been invoked to substantiate this point. Lenin stated that "one should not learn to solve one's task by new methods today if

yesterday's experience has not opened our eyes to the invalidity of old methods".[15] And Frunze warned that "serious innovations in military affairs which play a decisive role in the fate of states should be pursued with extreme caution".[16]

The law of the negation of the negation imposes certain requirements on the analyst. First, the negation must preserve positive elements of the earlier stage of development. It does this by linking together elements of the new and of the old. According to Marxist-Leninist thinking negation means preserving key elements of the old and tranforming them to new. The second requirement is that the analyst be able to see in a creative way elements of the new contained in the existing state of the object, and to transform the positive elements of the old and to apply them to the needs of the new. Lenin expressed this point as follows:

> When the new has been created...the old always remains, for a certain period of time, is stronger than it, this always happens in nature as well as in society.[17]

This point is considered by Marxist-Leninist thinkers as being especially important for military affairs since it provides the basis for determining what is new in military affairs and what is not. Each new type of weapon, each new technology proposed cannot be considered new. Only those weapons and technologies which promote the improvement of the functions of the armed forces as a whole, which have superior military qualities compared to existing ones, which can be integrated with their types of weapons, and which can be produced in sufficient quantities can be considered new.

SECTION IV

BASIC FEATURES OF WAR FOUGHT IN DEFENSE OF THE SOCIALIST HOMELAND

Soviet military thinkers also claim that wars fought in defense of socialism possess special and unique features, in terms of goals and social character, methods of conducting combat operations, the relationship of the people toward them, and the historical significance of them. According to Marxist-Leninist thinking, these general features of wars fought in defense of socialism include:

The revolutionary character. This feature expresses the idea that such wars represent (symbolize) a continuation of the class struggle of the world proletariat and its allies against world imperialism and all reactionary forces in the world. The Great Patriotic War (1941-1945) is described as a prime example of the revolutionary struggle of the peoples of Soviet nation for the independence and freedom of the Soviet Homeland.

The All-Peoples Character. This feature expresses the idea that in wars fought in defense of socialism, all the Soviet peoples are consciously involved in the conflict and actively support the policies of the Communist Party.

The International Character. This feature expresses the Marxist-Leninist axiom that wars fought in defense of socialism are at the same time defending the interests of the International proletariat and supporting nations fighting their national liberation struggles.

The Decisive and Implacable Character. A new basic feature of wars fought in defense of socialism was added in 1984. This expresses the Soviet conviction that the Soviet nation and its armed forces will conduct,

under the guidance of the CPSU, the war until the complete defeat of the enemy. The authority of Lenin was invoked to substantiate this new feature of war:

> War must be conducted in a genuine way, or do not conduct it at all. There can be no middle point.[18]

SECTION V

PRINCIPLES OF SOVIET MILITARY BUILDING

Soviet military thinkers state that the "principles of military building" constitute a set of guidelines and precepts of the political and military leadership which shape the main directions in strengthening the military capability of the Soviet state. They further state that such principles, as well as the principles of military art, concretize Soviet laws of war and the laws of armed struggle. These principles focus on the political, ideological, military, economic, and social dimensions of Soviet military power. Not viewed as constant and fixed, they are constantly being revised in conformity with changes in the nature of war, the nature of the external threat, the methods of combat, the defense needs of the Soviet Union, and the level of Soviet economic development. The most important principle is said to be leadership of the Communist Party over all aspects of Soviet military affairs, while others have included strict military discipline, unity of the nation and the Soviet armed forces, the harmonious development of all branches of the armed forces, (combined-arms), and others. Usually there is only one set of principles -- considered to be official -- adopted by Soviet leaders at a particular time. However, in 1980, two formulations of Soviet principles of military building appeared. The first contained a principle which stated that a regular army be built, but with the provision that a territorial military system of military organization might also be created.[19] The second, which appeared in June 1980, was identical to the first, except that the principle of "conformity of the forms of military organization to concrete historical conditions"

replaced the "regular army principle".[20] Emphasis on "concrete historical conditions" suggests that Soviet leaders believed that more weight should be given to conventional forces for fighting a conventional war, especially in Europe (concrete historical conditions), or that debate was taking place within the Soviet leadership over resource allocations.

In 1983-1984, a list of principles of Soviet military building appeared which included a completely new principle: "continuous improvement of the organizational structure [of the Soviet armed forces]". It may be presumed that this was the result of Marshal Ogarkov's influence.[21]

SECTION VI

ORGANIZATIONAL STRUCTURE OF THE SOVIET ARMED FORCES

Organizational structure is concerned with the optimum relationship among the various branches and combat arms of the Soviet Armed Forces, their relative significance, and the role they will play in any future war. In addition, a central question in deciding on proper organizational structure is that of the numbers and types of weapons to procure and their relationship to Soviet security requirements. Even though adherence to the cherished Soviet concept of "combined-arms" has been persistently proclaimed by Soviet military thinkers, organizational structure has been one of the most vigorously debated issues of Soviet military thought beginning with the Khrushchev period (1955-1964). This is not surprising since the development and adaptation of nuclear weapons and other equipment in all branches of the armed forces, from the end of 1953 to 1959, and the creation of the Strategic Rocket Forces in January 1960, were bound to cause a substantial rethinking of the existing organizational concept (combined-arms), and to promote a more nuclear-oriented one. Beginning in 1954, Soviet armed forces personnel began to study nuclear weapons and the means of combat operations under conditions of the use of nuclear weapons. The first large-scale field exercise in which the atomic bomb was detonated was conducted in September of that year.[22] This constituted the beginning of qualitative changes in troop organization and the technical equipping of Soviet troops and modes of combat operation under conditions of nuclear war. The Soviet Ground Forces, for example, began to experience the influence of nuclear weapons during the 1954-1959 period as missiles troops,

including tactical and strategic missile subunits and units, were added to the composition of the Ground Forces.[23] Further, nuclear weapons were officially adopted by NATO in 1954, and missile and nuclear warheads began to be introduced in Europe. Also, the United States and its allies adopted the doctrine of "massive retaliation," based on the employment of strategic nuclear weapons, on a broad scale. These developments soon precipitated fresh debates within senior Soviet military circles over the most expedient mix of nuclear and non-nuclear weapons in the armed forces and the proper organizational concept to be adopted. After enjoying a period of pre-eminence among branches of the Soviet Armed Forces, by 1980, the Strategic Rocket Forces had been de-emphasized, and the traditional combined-arms doctrine had been reestablished within the framework of strategic nuclear force primacy. Correspondingly, the Party was said to be promoting the "harmonious development of all branches and arms of the armed forces," and "victory in modern war was said to be achievable only by their combined efforts."

While some Soviet military thinkers had emphasized in the late 1960s the "strategic nuclear forces" (the SRF, Soviet Rocket Forces, and the nuclear-powered navy) as the most important units of the SAF in a future war, they were said to consist of three separate and distinct branches of the SAF.[24] It came as some surprise, therefore, when the Chief of the General Staff Marshal N. V. Ogarkov, described in his 1982 book, Always in Readiness to Defend the Homeland, the "main component" of Soviet military power as consisting of the "Strategic Nuclear Forces" without specifying their respective branches. Further, it came as more of a surprise when Ogarkov called the Soviet Ground Forces in "essence, the main branch of the

Armed Forces," and listed the Air Forces ahead of the National Air Defense Troops, marking the first time that the Ground Forces and Air Force were so listed in organizational priority.[25] In June 1983 Ogarkov warned that because of the "increased Imperialist threat," i.e., the building of new American strategic and conventional weapons, as well as their mastering of outer space and their creation of weapons based on "new physics principles", members of the Soviet General Staff had to concentrate their main efforts on the most rapid solution to critical problems of organizational structure and the combat readiness of the Soviet Armed Forces.[26] Ogarkov added that this was of critical importance because the United States and NATO forces were perfecting the organizational structure of their armed forces.

Ogarkov elaborated his novel concept of organizational structure of the SAF in an article which appeared in late September 1983. He stated:

> The main concept of the military power of the Soviet Armed Forces under modern conditions, the main factor for containing the aggressor are our strategic nuclear forces, consisting of units and formations of the Strategic Rocket Forces, the Navy and Air Forces. Their creation was a necessary response to Imperialist threats.[27]

Ogarkov added that "all branches of the Soviet Armed Forces are developing harmoniously," and then described the non-strategic components of the SAF -- the Ground Forces, Air Forces, Air Defense Troops, and Navy, in that order.

Until the early fall of 1984, other Soviet military leaders, including defense minister Marshal S. Sokolov, repeated the Ogarkov doctrine of strategic nuclear force primacy coupled with the harmonious development of all branches of the armed forces.[28] However, since that time, the available

evidence suggests the existence of considerable ferment within senior Soviet military circles -- ferment which may be related to possible Soviet responses to the SDI. This development is suggested by an analysis of Soviet statements surrounding the one hundredth birthday anniversary of M.V. Frunze, considered to be the father of Soviet military doctrine. For example, in his review of the book M.V. Frunze, Captain First Class A. Belyaev emphasized the importance of a "unity of views" on military problems in the Soviet Union:

> In his works, 'The Red Army and its Tasks', and 'Reorganization of the Red Army', M.V. Frunze reveals the essence of the military policy of the Soviet state -- poses the question of developing unified views for the military and political leadership on problems of military building. Under conditions of a constant threat of attack of imperialist states on the Republic of Soviets, a vital task of the Party and nation is the conversion of the Red Army into a "unified organ, solidified from top to bottom not only by a commonality of political ideology, but also by a unity of views on the character of military tasks for the republic, the necessity of military preparation of the troops.[29] (emphasis added)

The author added that "These views have not lost their validity even today".

It can be argued that this emphasis on unity was intended not simply to describe an historical event, but to promote such unity. This notion is also suggested in the following quotation of Frunze taken from Belyaev's book:

> M.V. Frunze based all his activities on the basic Leninist postulate that the fundamental guiding principle of Soviet military building is leadership by the Communist Party. 'Nobody and nothing... can build his policy both within the country as well as in the army against the party and without it.' M.V. Frunze called the Communist Party the leader and commander of the Red Army. The Red Army -- he noted -- knew and knows only this commander.[30] (emphasis added)

If one contrasts the above quotation, which appeared in November 1984, with a similar quote from Frunze, which appeared in the 1984 edition of M.V. Frunze, a significant distinction appears:

> M.V. Frunze played an outstanding role in carrying out the principle of party leadership of all problems of military building, in strengthening the positions of the Communist Party within the army... 'Nobody and nothing can build his policy both within the country as well as in the army against the party and without it. As long as the party is strong and united, the Union of Soviet Republics is also strong.'[31] (emphasis added)

While both of the above articles stress the importance of Party leadership over the armed forces, and warn against those who become too independent of this leadership, the accent in the earlier quote (taken from the book of M.V. Frunze, which was sent to the typesetter in August 1983 and was published in early 1984) is on Party unity/strength as a precondition for the strength of the young Soviet state. In contrast, the later article (November 1984) emphasizes the Party's function as not only the "leader" of the armed forces, but its "commander" (vozd) which is reminiscent of the Party leadership over the armed forces exercised by Josef Stalin. The statement that the "army knew and knows only this commander" invites the speculation that it was directed at a military leader who had become too powerful. Was that person Marshal N.V. Ogarkov?

Yet, to further complicate matters, this same statement of Frunze, quoted above, was given a still different treatment in early 1985. Then, General P. Lushev, commander of the Moscow Military District, in reviewing another book on M.V. Frunze, stated:

> M.V. Frunze based all his activity on the Leninist postulate that the fundamental guiding principle of Soviet military building is leadership of the Communist Party. In the profound devotion of

> the military personnel to the Communist Party, in their faithful following its ideals, its discipline and steadfastness, the proleterian commander perspicaciously saw the indispensible condition of the strength of the army and navy, their military capability. Under conditions of developed socialism, there occurs a further increase in the leadership role of the CPSU in all areas of strengthening defense of the country.[32]

While Lushev's article reiterates the time-honored principle of CPSU leadership over the SAF, it lacks the strong vituperative language of the two previous articles. It emphasizes instead certain political attitudes held by the troops as essential for promoting Soviet military capabilities. While Lushev cited "unified views" of the SAF as being important, he linked this with combined operations based on a single strategic command:

> M.V. Frunze on more than one occasion emphasized the necessity of unified views on the building of the Armed Forces and the methods of armed struggle, the importance of coordination of operations of the R ' Army and Navy. These postulates have now acquired special relevance. Under contemporary conditions of decisive significance are the coordinated operations of the various branches of the Armed Forces based on a unified plan of the strategic command.[33]

While we must be cautious in our interpretation of the above trends, it can be speculated that the statements above about Frunze reflected growing Party-Military tensions, but that such tensions have now been mitigated. It is not without interest that Marshal Ogarkov has been named to replace Marshal V. Kulikov as Warsaw Pact commander, suggesting that he is now in an excellent position to implement his novel views on organization structure.

SECTION VII

THE DURATION OF FUTURE WAR

The duration of war has been one issue which Soviet military thinkers have been unable to reach any solid consensus on since Krushchev's time. While Krushchev had said that a future war would be short, most Soviet military thinkers during the post-Khrushchev period have argued that a future war could be either short or long. During the period of 1976-1980, it appeared that the "duration of war" issue was being debated within senior Soviet military circles as it was during Krushchev's time. In 1978, for example, General Nikolai Lomov, a leading Soviet military writer, asserted:

> ...Despite new theories on 'small professional armies', on the leading and decisive role of bomber aviation, tanks, or other branches of the armed forces in achieving victory..., a future war may be global, conducted by mass armies and for a long period of time.[34]

Nonetheless, the short war thesis gained ground when the Strategic Rocket Forces were described as capable of reaching decisive goals in the "quickest possible time".[35]

While the available evidence may be less than fully persuasive, it appears that more weight in the 1981-present period has been given to the short-war thesis. Thus, current Soviet military doctrine places considerable emphasis on the initial period of war, with its swift, massive nuclear strikes, which purportedly can influence the entire outcome of the conflict relatively quickly. This concept was advanced by Colonel Jozef Smoter in his article on air defense in a future war.[36] He asserted that within the

next 15 years, and certainly by the year 2000, the air attack arsenal of the United States and Soviet Union will include spacecraft, equipped with laser weapons capable of destroying space, air and ground targets. Consequently, the air defense forces of both states will have a decisive influence on the outcome of war at the beginning of war, and must be capable of responding quickly. Marshal N. Ogarkov appeared to be a staunch supporter of the short-war concept. In his article published on May 9, 1984, Ogarkov had the following to say about the impact of new military technology on the nature of a future war, including its conventional variant:

> The sharply increased range of conventional weapons make it possible to immediately seize by active military operations not only border areas, but also the territory of an entire country, which was not possible in past wars...In this case, the zones of possible military operations are sharply expanded and the role and significance of the initial period of war and its entire operations increase incomparably. A new war, if Imperialism unleashes it, will in its nature be certainly different from wars in the past.[37]

This concept of the nature of future war has had a considerable effect on the Soviet view of combat readiness, as the time factor has been sharply elevated in importance. As noted in the authoritative work Marxism-Leninism on War and the Army:

> The criteria of combat readiness have substantially changed. At the present stage the Armed Forces must be capable at any moment and in any situation to frustrate the surprise attack of the aggressor. Of particular importance is the time factor. The enormous speeds of flight of missiles and airplanes require the bringing the troops (forces) into the highest combat readiness in literally a matter of minutes. Only in this case can one count on an effective repulsing of the surprise strikes of the aggressor and a successful fulfilling of the tasks set before the Soviet Armed Forces.[38]

Further, Sergei Akhromeev, Ogarkov's replacement as chief of the Soviet General Staff, has also placed much emphasis on the initial period of war. Writing in the authoritative journal Kommunist, in early 1985, Akhromeev, asserted that if a nuclear war broke out, "large cities, major economic targets would be exposed to devastation and destruction in a short period, these will be massive losses of the population and military groupings."39

SECTION VIII

FUNCTIONS OF THE SOVIET ARMED FORCES

Marxist-Leninist military writers assert that the nature of the Soviet Armed Forces (SAF), as well as its functions, are shaped by the nature of Soviet society. Thus, as an instrument of the Soviet state established in 1917, it has had two types of functions: an internal and an external function. The former focussed on the expiration of the capitalist class and its vestiges inside Russia. With the establishment of socialism in the Soviet Union in 1936, and the formation of an all-peoples state in the 1970s, the army's internal functions -- as an organ of the state security, to suppress counter-revolutionary forces inside the country, and as a deterrent to potential rebel resistance to the Soviet state, became superfluous. The external function of the SAF is said to be basic since it is directed at the "main threat to the building of socialism and communism -- Imperialism". The current Party Program, adopted by the 22nd Party Congress in 1961, states that "from the point of view of internal conditions, the Soviet Union does not need an army, but the military danger posed by Imperialism forced the Soviets to strengthen its defenses and to develop its armed forces.[40] Thus, the basis of the external function of the SAF remains fixed and consists in defending the U.S.S.R. from "aggressive attacks of international Imperialism". But Soviet military thinkers have stated that this function may take on new dimensions (forms), depending on changes in the global correlation of forces.

After Khrushchev was removed from power in 1964, a shift occurred in the Soviet view of the functions of the SAF. No longer was the SAF seen as an instrument designed simply to defend the Soviet Union and its borders

and those of its Eastern European neighbors, and its "liberation function" was no longer restricted to Europe. The Soviet Armed Forces were given new broader functions which included:

1. Deter global nuclear war and preserve world peace.
2. Protect the Soviet Union and its socialist allies in case of an Imperialist attack.
3. Destroy the colonial system and blunt Imperialist counter-revolution.
4. Promote revolution within Western states.[41]

This view of the functions of the Soviet Armed Forces persisted until late 1977-early 1978. At that time, the focus of the SAF began to shift from wider international concerns to efforts to protect "socialist conquests in the Soviet Union and Warsaw Pact states."[42] The new Soviet constitution, which went into effect in October 1977, provided the legal basis for the new version of the SAF. Thus, Soviet military thinking at that time no longer spoke of the global functions of the SAF (establishment of socialism world-wide, blocking of Imperialist counter-revolutions, etc.). Further, the Marxist-Leninist terms "proletarian and socialist internationalism" had an inward orientation and focused on the equality of Soviet citizens, and the promoting of friendship of Soviet military personnel across ethnic Soviet boundaries, as well as closer ties with Warsaw Pact states (socialist internationalism). The tasks of the SAF during this period included:

1. Deter a global nuclear war.
2. Fight a nuclear/conventional war if deterrence broke down.

This narrowed concept of the functions of the Soviet Armed Forces persisted until sometime in 1983.[43] Then the broadened concept of the functions of the SAF resurfaced sometime during the summer of 1983. This concept was

evident in the authoritative work, Marxist-Leninist Teaching on War and the Army, which was published in early 1984.[44] The following were given as the new functions of the SAF:

1. Deter a global nuclear war.
2. Defend the U.S.S.R. and the Socialist block in case of the outbreak of war.
3. Extend aid to other countries and to nations of developing states protecting their freedom and independence from Imperialism aggression.

This expanded version of the Soviet Armed Forces' functions received further substantiation in June 1984 in an article by Lt. General D. Volkogonov:

> The Armed Forces of the Soviet state have always been an instrument for the protection of the revolutionary conquests of the Socialist Homeland. But there has now come into operation the so-called "globalization" of the manifestation of the main contradiction of the epoch associated, also with the providing in the corresponding political, moral-technical form, international aid to national-liberation movements, progressive regimes, young states struggling against Imperialism.[45] (emphasis added)

In sum, the functions of the SAF have undergone four shifts since 1960. The first, lasting until mid-1966, viewed the SAF as having a narrow continental orientation focusing on the defense of the U.S.S.R. and its Eastern European allies. The second, lasting from 1966 until late 1977-early 1978, perceived the SAF as an instrument with wider, international concerns, including the support of national-liberation struggles and civil wars in capitalist states. The third, which persisted until sometime in 1983, was again narrow in scope and saw the SAF along with the Warsaw Pact, as being an instrument solely to deter global nuclear war and to protect the borders of the U.S.S.R. and its Eastern European allies from Imperialist

encroachments. The fourth shift, discernible in mid-1983, again saw the SAF as having broader, more international concerns.

Preemption

Preemption refers to the ability or willingness of a state to launch strikes against an enemy at the first indication that the enemy is preparing to, or intending to attack. At the heart of preemption is the ability to react with utmost speed, particularly in response to a nuclear attack. This means that the state which intends to preempt another's attack on it will need a large standing army, as well as reserves which can be mobilized quickly. No state wishes to convey to another that it has adopted preemption as a strategy, since this would likely motivate the other to use its force -- thus fueling the arms race. Consequently, Soviet references to preemption have been shrouded in ambiguity and sparse in number.

Since 1981, Soviet military thinkers have been adamant in asserting that they are not building up their strategic forces to launch a first strike against the West. This has been buttressed by the late Chairman L. Brezhnev's declaration, delivered to the UN Special Session on Disarmament in June 1982, that the Soviet Union would not be the first to use nuclear weapons against an opponent,[46] and the treaty proposed by the Warsaw Pact and the U.S.S.R. in January 1983, calling for the mutual renunciation of a first use of all types of weapons against the other alliance.[47]

Targeting

Soviet military thinkers have traditionally postulated that Soviet targeting must have two basic goals first, to destroy the enemy's means of

nuclear attack, and the second to wreck his political and economic centers, as well as his urban-industrial centers. What this has meant is that the enemy's missile sites, his command and control facilities, as well as his industrial and population centers, must be destroyed. Beginning in 1979, more attention has been given in Soviet targeting doctrine to pinpoint targeting of U.S. missiles, silos, and military industries, possibly as a reaction to the U.S. doctrine of counterforce targeting, first announced in early 1974.

SECTION IX

ANALYSIS

In this section, we seek to determine the implications for the Strategic Defense Initiative of those doctrinal shifts which were described in the previous section. Our aim is to establish (1) which components of Soviet military doctrine can most likely be associated with possible Soviet responses to the Strategic Defense Initiative; (2) which doctrinal components may be related to Soviet responses to the SDI; and (3) which tenets of doctrine are probably unrelated to space warfare.

The Components of Military Doctrine Which Most Likely are Associated with the Soviet Response to the SDI

Certain components of Soviet military doctrine discussed in this study can with the most confidence be related to the Soviet response to the SDI. This seems to be the case for one of the Soviet laws of war (number six), those principles of military building that relate to the SAF's organizational structure, and the organizational structure of the Soviet Armed Forces.

Relationship Between General Law #6 and the Soviet Reponse to SDI

It appears highly likely that the sixth law of war can be related to the Soviet response to the SDI. This law postulates that the development and change in combat operations of any scale and at all levels depend on quantitative and qualitative changes in military technology and on the level of training of military personnel. While Soviet military thinkers have long been cognizant of the impact of new technology on various aspects

of military affairs, including combat operations and organizational structures, this influence had never been enshrined in a general law of war. It was only in the late summer of 1983 that this influence was given that status, after President Reagan's Strategic Defense Initiative speech.[48]

What insights can this new law of war provide us in our endeavor to assess probable Soviet responses to the SDI? It is reasonable to suggest that this new law provides several options for Soviet defense planners, depending on their interpretation of it.[49] If Soviet leaders focus on that aspect of the law relating to the source of change (the dialectical transition of quantity to quality), then they will be predisposed to selecting a weapons system which can be produced in sufficient numbers. While the Soviets have the option of conducting research on, and subsequently planning various types of highly sophisticated weapons systems as SDI countermeasures, they may feel that these weapons, because of their cost, are beyond their technological reach in the foreseeable future. If this line of reasoning is correct, then the new Soviet law of war would incline Soviet defense planners to select countermeasure weapons which could be produced in sufficient numbers, such as ICBMs and SLBMs. Accordingly, the Soviets would respond to the SDI by saturating the U.S.A.'s space umbrella with large numbers of ICBMs and SLBMs. In sum, if the Soviets make this interpretation of the law, it would shape -- and quite narrowly -- the parameters within which their defense planners can operate in planning and designing a suitable weapon system to counter the American space initiative.

If, however, Soviet defense planners focus on that aspect of the law of war relating to the nature, type, and means of change (expressed in the

dialectics of "negation of the negation"), then they will have more flexibility in a weapons choice. To repeat what was said earlier about the "negation of the negation": there may be two types of "negation" -- one involves an elimination of elements of the old state, while preserving its essential features, but at a higher level. The second involves the elimination of the essential structure (base) of the existing phenomenon (state), and the creation of a fundamentally new structure. If Soviet military leaders focus on this aspect of the new law of war, they could opt for building weapons systems which would maintain the basic features of the existing system, but in its advanced stage, it would constitute a new weapons system. We suggest that an advanced cruise missile might be the weapons systems selected by the Soviets as the most optimum means of penetrating the U.S. space umbrella. The reasons for this conclusion are given below.

The general attraction of cruise missile technology is due to its relatively low cost, the difficulty in intercepting it (because of its low radar cross section and low flight altitude, plus the ease with which it can be camouflayed, its versatility, high accuracy, and potential for technological upgrading.[50] Of these features, the missile's low cost and its early availability for new technology would be particularly attractive to Soviet defense planners. However, why would the Soviets be inclined to opt for a new advanced high speed cruise missile as an SDI response, given their past restraint in pursuing cruise missile technology, and given the missile's slow speed? First, earlier Soviet restraint in this area was related to their interest in reaching an arms accord with the United States to ban long-range ground-launched and sea-launched cruise missile,

(GLCMs and SLCMs) respectively, and to limit air-launched cruise missiles (ALCMs) in accord with the now-abortive SALT II treaty and protocol. Given the current momentum of both U.S. and Soviet cruise missile programs, and the current uncertainty regarding the future of an arms accord, the leitmotif for Soviet moderation in developing an advanced cruise missile has disappeared.

Second, while the cruise missile, admittedly, suffers from some shortcomings it has some advantages as a strategic weapons system. An "ideal" cruise missile is one which has long range, low flying capability, low RCS (radar cross-section) for penetration, and hopefully a speed comparable with other strategic weapons. The main asset of the current cruise missile technology, compared to other strategic penetration systems, is its long range. With its current range of several 1,000 miles, it can deliver a payload more effectively than a rocket-powered missile, but at relatively slow speeds. With maximum speed of M = 2.5, the cruise missile is vulnerable to attack from a whole range of enemy sources. In order to increase its speed, the Soviets would need to develop a new engine for the cruise missile, replacing its present turbojet engine, giving it higher thrust and higher efficiency.

If a hypersonic ramjet engine were developed, the Soviets could increase sharply the speed of the cruise missile, allowing it to reach speeds of Mach 5-6 or more. With this speed, and coupled with its other features, Soviet cruise missiles could flood the U.S. space umbrella in large numbers, and presumably would experience relatively low attrition rates. Accordingly, Soviet assertions that they can build a countermeasure weapon far cheaper than what the space-based ballistic system would cost

the United States would be realized! Is the above scenario chimerical or not? While there are those in the West who would respond to this question in the affirmative, there are serious research efforts now being conducted in the Soviet Union designed to develop and perfect an advanced hypersonic ramjet engine which presumably could be fitted to the cruise missile. Further, it is likely that these efforts have intensified since 1982.[51]

Principles of Soviet Military Building and the Soviet Response to the SDI

As stated earlier, the principles of Soviet military building constitute a set of precepts and guidelines for Soviet defense leaders in planning the main directions in strengthening the defense capability of the Soviet Union. Two of these principles which were adopted in 1983-84, seem to be closely related to Moscow's response to the SDI. These are the "continuous perfection of the organizational structure" and the "harmonious development of all branches and arms of the Soviet Armed Forces." While the combined-arms concept had for sometime been considered a key principle of Soviet military building, its close linkage with that calling for the constant perfection of the SAF (they appear together in the 1983-1984 formulation), suggests that combined-arms must now be continuously adjusted to new military realities, including the latest weapons development, and correspondingly, new methods of conducting combat operations. In other words, it is no longer sufficient to postulate "combined-arms" as an organizational principle, per se, since what this had traditionally meant was the employment of the military forces of the various branches of the SAF in terrestrial environments -- land, sea, and air, with each making a valuable contribution to the overall goals of the state in war. Now, combined-arms must be "perfected" to take account not only of the introduction of new

weaponry into the various branches and arms, but also the expansion of the Soviet Armed Forces into a new military environment -- outer space. Thus, it can be argued that with this new theoretical formulation, the Soviets can view their military space activities as a vital complement to the operations of their traditional combat arms and can integrate such activities into a combined-arms approach to warfare.[52]

Relationship Between the Organizational Structure of the Soviet Armed Forces and the Soviet Response to the SDI

The organizational structure of the Soviet Armed Forces (SAF) is another doctrinal tenet which seems to be related to the Soviet response to the Strategic Defense Initiative. We believe that several factors point to this linkage. First, it is noteworthy that a determination of future trends of weapons development and the most expedient organizational structure to be adopted by the SAF were considered in the 1970s by formulators of Soviet military science to be the most "urgent tasks" facing it.[53] Thus, it is likely that Soviet military science was striving at that time to find a military utility for new weapons, including those in outer space, and to fit such weapons into a new organizational structure for the SAF. Again, as in the case of the creation of the Strategic Rocket Forces in early 1960, military thought seems to have responded quickly to a technological weapons breakthrough (the appearance of sophisticated terrestrial and space weapons), and was seeking to fit them into a new organizational framework.

A second factor which suggests that Soviet organizational doctrine may be related to Moscow's response to the SDI is the reemergence of the combined-arms concept, coupled with the concomitant downgrading of the

Strategic Rocket Forces from their former position of preeminence within the Soviet Armed Forces.[54] This means that the Soviet commitment to air-breathing strategic systems (long-range bombers, cruise missiles, etc.), which had been discouraged during the "hey-day" of the SRF, can now be increased. Thus, there is now an organizational framework more receptive to promoting Soviet space activities including military. To put it more directly, Soviet military space activities can now be integrated into a general combined-arms approach to Soviet organizational matters.

Third, a certain development which occurred in 1983-1984, may point to a link between Soviet organizational doctrine and their response to the [illegible] In June 1983, the then Chief of the General Staff, Marshal Nikolai Ogarkov warned his colleagues that because of the "increased Imperialist threat", based on a buildup of new American strategic and conventional weapons, as well as the creation of new weapons based on "new physics principles", members of the Soviet General Staff had to concentrate on the "most rapid solution" to organizational problems and to strengthen the combat readiness of the Armed Forces.[55] Ogarkov stated that this was urgent because the United States and its NATO allies were perfecting the organizational structure of their military forces and, consequently, Soviet military leaders had to take "corresponding measures" to cope with this threat. While Ogarkov may have been referring to matters other than those relating to outer space activities (such as those relating to the Warsaw Pact), he may also have had in mind the creation of a new Soviet space command. While the existence of such a command cannot be established at this time, because such matters are shrouded in secrecy, it can be argued that

Ogarkov's statements may have been a Soviet reaction to the U.S. Space Command which was established in 1 September 1982.

The Components of Soviet Military Doctrine Which May be Related to the SDI

Certain tenets of Soviet military doctrine may be related to Moscow's response to the Strategic Defense Initiative; yet this relationship between Soviet doctrine and the American decision to build a space-based nuclear shield cannot be postulated with a high degree of confidence. These components of doctrine include the origin of war, duration of war, and functions of the Soviet Armed Forces, the Marxist-Leninist view of the nature of war fought in defense of socialism, preemption, and targeting.

The Origin of War

Since the Khrushchev period, the standard thesis advanced by Soviet military thinkers has been that future war would be most likely initiated by a surprise enemy strategic nuclear attack on the Soviet Union, the escalation of a Western-inspired conventional or tactical nuclear war, or even the accidental outbreak of war. Presumably influenced by the Nazi attack on the U.S.S.R. in 1941, Soviet military thinkers place major emphasis on the likelihood of a surprise enemy attack. This doctrinal tenet may be linked to the Soviet response to the SDI since more attention has been given recently to the possibility of a war starting by accident/miscalculation, and the Soviet concept of surprise attack has been broadened to include space assets. The notion of an accidental outbreak of war was advanced in a Soviet article in early 1984.[56] The author stated that given the presence of space-based ASATs (anti-satellite satellites), there would be a strong temptation for one state to mistakenly attack another if its own reconnaissance satellites were destroyed or damaged by any means.

Further, the Soviet concept of surprise has been expanded to include the possibility of an enemy surprise attack involving its space assets -- manned and unmanned space vehicles, nuclear space explosions aimed at destroying enemy command and control systems, etc.[57] Yet, despite the above indications of a possible linkage between Soviet military doctrine and a Soviet response to the Strategic Defense Initiative, we cannot affirm at this time this linkage because of the paucity of data to support it.

Duration of War

Another tenet of Soviet military doctrine which may be linked to the Soviet response to the Strategic Defense Initiative is the duration of war. As suggested in this study, since around 1980, more emphasis seems to have been given in Soviet military thought to the short-war thesis. Correspondingly, current Soviet military thinking puts much emphasis on the initial period of war, with its massive, nuclear strikes which can purportedly decide the entire outcome of the conflict. At the same time, Soviet combat readiness emphasizes speed (especially in dealing with the strategic nuclear components of the armed forces), and Soviet training sessions focus on destroying with the first shot, the first nuclear strikes, the enemy immediately after being attacked. If the short-war concept were accepted as official Soviet military doctrine, then it might well be linked to a possible response to the SDI. This is so since this would indicate an enhanced Soviet propensity to conduct military operations, including those in outer space, in the shortest possible time in order to do as much damage to the enemy at the outset of the war before Soviet command and control reconnaissance satellites are destroyed by enemy ASAT space assets. Alternatively, the Soviets might postulate a short war in order to be capable of

quickly destroying NATO's early warning satellites at the beginning of hostilities. If the Soviets could indeed destroy NATO early warning satellites, the West could be rendered blind and defenseless, and forced to its knees by political pressure without a shot being fired.

While there indeed has been greater interest in the short-war concept, this cannot be said with any high level of confidence. This is so since there appears to be supporters of the long war thesis among Soviet military thinkers. Some of these emphasize the importance of well-prepared reserves able to withstand the rigors of a protracted war.[58] Still others stress the large size of the U.S.S.R. which allowed it to survive the Civil War in 1918-1921, as well as the demographic potential of the country.[59] Moreover, Marshal Ogarkov and others have stated that due to the huge military and economic reserves of the country, a future war might be protracted as well as short.[60] Futhermore, while the bulk of those writers who reported on the military activities of M. Frunze failed to mention his emphasis on the protracted nature of a future war, some of those did include reference to the long-war concept.[61] In short, we are left with a rather ambiguous situation regarding views on the nature of a future war. Finally, to futher complicate matters, some assert that a future nuclear war may be short or long.[62] This may be the Soviet intention in order to increase the West's uncertainty concerning Soviet intentions.

Relationship Between the Functions of the Soviet Armed Forces and the Soviet Response to the SDI

The functions of the Soviet Armed Forces constitute another component of Soviet military doctrine which may be related to the Soviet response to the SDI, but this linkage is uncertain. The expanded nature of the SAF's

functions, discernible in mid-1983, after a period of quiescence (1983-1984) has several military-political implications which may bear on the Soviet reaction to the Strategic Defense Initiative. First, it may indicate a Soviet intention to further build its military capabilities, such as that which occurred after the 23rd Party Congress in mid-1966. This earlier period, which saw the Soviet Union begin a vigorous strategic weapons buildup, corresponded to a shift in the functions of the SAF from an inward, continental focus to an external, international one. At that time, Soviet political and military leaders justified further increases in their military spending on the basis of the expanding functions of the SAF in an increasing threatening international environment.[63] While this may not tell us much about what types of weapons are being planned by Soviet defense planners, an expanded view of the Soviet Armed Forces' functions does suggest a climate more propitious for weapons growth, especially strategic.

Second, this tenet of Soviet military doctrine may be associated with Moscow's perception of the increased efficacy of their military power as a key instrument of Soviet foreign policy in a more favorable (for the U.S.S.R.) international climate. To be credible, Soviet foreign policy goals must have a military shield, and the more expanded the goals, the larger and stronger must be the shield. While Soviet leaders have traditionally viewed their military power as a prime instrument in restraining the West in the conduct of its foreign policy and in expanding their own, their perception of the increased effectiveness of Soviet military power seems to be associated with their more favorable assessment of the current correlation of global forces.[64] It appears likely that this view of the

SAF received a boost at the June 1983 Plenum of the Party Central committee. At that session, both Yuri Andropov and Konstantin Chernenko emphasized the importance of the correlation of global forces for Soviet policymakers. Chernenko, in particular, went beyond the ritualistic repetition that the correlation of global forces was shifting in favor of socialism, and indicated the tasks of Soviet social sciences, including military science, in utilizing it.

> It is clear, that the optimistic view of the future of mankind inherent in communists cannot be based on a simplistic, unilinear understanding of the historical process. This requires (us) to constantly penetrate the correlation of global forces, to take into account and to predict their influence on solving the main problem of our days -- the problem of war and peace.[65]

It is significant that shortly after the June Plenum, the authoritative work Marxist-Leninist Teaching on War and the Army went to press. In a section describing the "expanded functions" of the Soviet Armed Forces, it was stated:

> Under conditions of a change in the global correlation of forces in favor of socialism there has appeared a real possibility to thwart imperialists, to prevent a new global war...
>
> Expansion of the external function of the socialist armies is also due to the fact that imperialism by all its forces strives to suppress national-liberation movements as a component of the modern world revolutionary process, that the aggressive actions of imperialism against certain countries, and nations are fraught with serious consequences, may become transformed into a global war. Therefore, aid to the liberation, revolutionary movement and its support -- this is the international duty of the Soviet Union, of other socialist countries of the socialist community.[66] (emphasis added)

Thus, the Soviet Armed Forces are again seen by Soviet leaders (as they were in 1966-1978) as a prime means of further shifting the distribution of

global forces in its favor by serving as the "bastion of global peace" and by supporting select "progressive forces" in the world. This role derives from the Soviet Union's rejection of the traditional concept of "balance of power" in the world arena since this implies a retention of the status quo and a static equilibrium of forces. In contrast, the correlation of global forces constitutes a network of shifting relationships buttressed by Soviet and Warsaw Pact military force. Consequently, the stronger the SAF and the Warsaw Pact are, the weaker becomes the U.S. ability to resist Soviet global influence short of a direct Soviet attack on the U.S.A. itself.

What, it may be asked does all this have to do with a possible Soviet response to the SDI? It is arguable that Moscow believes that, buttressed by its strengthened military power and that of the Warsaw Pact, it can tip the correlation of global forces in its favor by mobilizing a vigorous political/economic/diplomatic/military campaign of support to the Third World and other select countries. Significantly, a component of this offensive would be attempts to gain their support for Soviet foreign policy goals (disarmament, arms control, the non-militarization of outer space, etc.), and concomitantly, to discredit U.S. policies including "Star Wars."

Thus, this doctrinal shift in functions of the SAF may be associated with a Soviet belief that they have the capability and the will to match the United States in all areas of military buildup, (including outer space) and that with this capability, they can galvanize socio/political-economic forces in the world for their benefit and block the policies of the United States. This optimism was expressed by Chief of the General Staff Sergei Akhromeev in arly 1985, when he stated that the "Situation had basically changed in the world in comparison with the period preceding World War II."

> Now to suppress the new pretenders of global hegemony of humanity there are much more powerful forces and possibilities than before the Second World War. This is the Soviet Union, the socialist community, along with the great majority of peaceloving states of the planet, progressive society who come out as a united front for detente, for disarmament and peace on this earth.[67]

Akhromeev added that the military power of the United States could be essentially nullified by Soviet military force:

> ...now there is no possibility that the aggressor can deliver a devastating blow and remain unpunished, something that until now illusions have been created overseas. Nothing will save the aggressor if he commits a crime before humanity. He cannot shield himself from the danger of response, by covering himself with "a space umbrella" or the creation of a shield of a universal system of anti-missile defense. The U.S.S.R. will not allow the United States to gain military superiority over it.
>
> ...Hence it is quite obvious that a future arms race will not guarantee the security of a potential aggressor, but on the contrary, increase this danger...The attempt, however to create a "universal system of anti-missile defense" will cause a corresponding counteraction from the other side.[68]

It is also conceivable that Moscow hopes that its international "peace offensive," now underway, would spur the United States to put more emphasis on its SDI programs in order to cope with the increased Soviet threat! Thus, Soviet leaders may actually want the U.S.A. to pursue its efforts to build a space-based ABM shield, since this could, because of its high costs and potential for exacerbating internal political conflicts, promote the deepening of the "final crisis of capitalism." This to Moscow would be the iron logic of the dialectics of history. In sum, we are suggesting in this section that the new, expanded version of the functions of the SAF seems to reflect a growing Soviet optimism that they can match (and even surpass) the West in general, and the United States in particular, in all areas of competition, including that in outer space. While this may not tell us

much about the nature of the Soviet responses to the SDI, it does indicate that there will be a response, and that Moscow feels confident that it will be effective.

Wars Fought in Defense of the Socialist Homeland and the Soviet Response to the SDI

Another doctrinal tenet which may be linked to the Soviet response to the Strategic Defense Initiative is the Marxist-Leninist concept of the "decisive and implacable character" of wars fought in defense of the Socialist Homeland. As stated, this feature of such wars was added in 1983-1984. While the "decisive political and military goals" of such wars had been cited in earlier doctrinal formations, they were subsumed under the "Revolutionary Character" of such conflicts, and thus did not appear as a separate feature.[69] Moreover, the earlier focus was on the decisive nature of theater operations rather than the decisive political goals of the war. The new formulation, in contrast, emphasizes the contributions of the Soviet peoples and the armed forces to achieving the political and military goals of the country in peacetime and during wartime. This new concept may tell us something about the nature of the weapons Soviet leaders plan to use in a future war, since according to Soviet military doctrine the dimensions of the political goals of a war dictate the type of the weapons employed.[70] This doctrinal modification may suggest that Soviet leaders envisage the employment of all types of weapons and operations, including those relating to space, to completely destroy the enemy. Yet, we should avoid drawing easy inferences in assessing the Soviet responses to the SDI, since this doctrinal innovation might relate to

Soviet views on the nature of war on earth and to the conduct of terrestrial military operations, and having nothing to do with space warfare.

Preemption

Soviet views on preemption may be associated with Moscow's response to the Strategic Defense Initiative, although this linkage also cannot be affirmed with any degree of confidence. Currently, more attention seems to be given to the initial period of war in Soviet doctrinal statements, as well as to the notion of combat readiness which emphasizes the importance of speed. Preemption may be implied in the following statement, which appeared in 1984:

> The qualitative perfection of the means of attack on the part of probable imperialist aggressors and the growing time factor require a new approach to many problems of combat readiness. The attempt of the aggressors to deliver a surprise strike must be countered not only by effective means of defense, but an even more perfected and flexible system of combat readiness of our Armed Forces. It must provide for the capability to immediately react to the intensification of danger and in an organized manner bring into operation the troops and naval personnel in the most complex situation.[71] (emphasis added)

It was further stated that "under conditions of the threat by the enemy to use weapons of mass destruction", we cannot allow aggressive states to be better prepared than we. With its emphasis on "the attempt of the aggressor," and "react to the intensification of danger," and "under conditions of the threat by the enemy to use weapons." these statements suggest preemption, and not retaliation to an attack. In sum, the above statements seem to imply preemption. But because of the paucity of the data and its ambiguous nature, all we can state is that this doctrinal component may be related to the Soviet response to the SDI. We should however, avoid easy

inferences, and not state that because of the Soviet experience in World War II, their emphasis on speed in combat operations, and their statements that a space-based, anti-missile system enhances mutual fears of preemption, that the Soviets have indeed adopted a preemptive strategy.

Targeting Doctrine

Soviet targeting is another doctrinal tenet which may be related to the Soviet reponse to the SDI, but this linkage is not certain. It is possible that more attention is now being given to a "countervalue" targeting strategy in Soviet military thought. This is suggested in a statement made by Chief of the Soviet General Marshal Staff Sergei Akhromeev in early 1985. Akhromeev asserted that a global nuclear war would have a devastating effect on mankind since it would result in the "devastation and destruction in a short time of large cities, major industrial targets, there would be mass losses of population and of military forces".[72] Significantly, Akhromeev did not cite the enemy's nuclear forces (hard targets) in his list of probable war losses. If this does represent current Soviet views on targeting, it also represents a departure from their concept of pinpoint targeting of U.S. missile site, silos, and military industries which had prevailed since 1979.

A targeting concept which threatens all-out retaliation against U.S. cities might be associated with a Soviet response to the SDI in two ways. First, it might reflect a Soviet shift to countervalue targeting in order to offset expected heavy losses of their ICBMs and SLBMs in a war involving an American space-based antimissile system. Alternatively, it may be linked with a Soviet emphasis on cruise missiles as a possible countermeasure to the SDI. Soviet defense planners must be well aware of the

potential constraints of cruise missiles when used against hard targets.[73] Such targets require that the CEP (circular error probability) of cruise missiles be extremely good. In addition, the pre-launch survivability, as well as the penetration capability of such missiles, must be extremely high for there to be enough of them to cover a large number of hard targets. Furthermore, hard targets must be quickly struck and are likely to be protected by terminal defenses, which render cruise missiles less effective. Also, the use of cruise missiles against other military targets is restricted by the fact that many of the latter are mobile. In short, cruise missiles may be most effective as an independent force against soft targets such as urban-industrial targets. While this presupposes that such missile be used immediately, this is taken into account in the current Soviet concept of combat readiness with its strong emphasis on speed.

The Components of Soviet Military Doctrine Which are not Related to the SDI

It was found that certain components of Soviet military doctrine were not related to the Soviet reaction to the Strategic Defense Initiative. This seems to be the case for the source of war, the character of the Soviet Armed Forces, and the effects of war and victory in it.

Source of War. The Marxist-Leninist dogma that the source of war lies in the socio-political nature of capitalist society, rooted in its economic base, appears to be unrelated to any Soviet response to the SDI. This dogma has been advanced by Soviet political and military leaders for years, and thus remains quite impervious to change. Admittedly, there has been some doctrinal ferment over the expediency of war as an instrument of state policy, with some Soviet military thinkers arguing that war can still be an

instrument of policy, and others disagreeing. Yet, those who argue that war may still be a tool of policy emphasize that this pertains only to civil wars and national-liberation struggles. Hence, it can hardly be related to any Soviet responses to the Strategic Defense Initiative.

Character of the Soviet Armed Forces. The character of the Soviet Armed Forces is another doctrinal tenet which appears to be unrelated to any Soviet response to the SDI. It has been axiomatic since the Khrushchev period that the SAF constitute an organ of Soviet society, serving as an instrument to defend the interests of the working masses against the encroachments of Imperialism. Since the nature of Imperialism remains unaltered, the SAF must continue to function. While the SAF may modify their functions in accord with changes in Soviet society, the character of the Soviet Armed Forces is more fixed.

Effects of War and Victory In It. Finally, the official Soviet position on the issue of victory in war appears to be unrelated to the Soviet reponses to the SDI. This position is that no winner can emerge from a nuclear war because of its destructiveness. The statement, made by the late Party Chairman, Leonid Brezhnev, at the XXVI Party Congress in early 1981, "To try to defeat the other in an arms race, to count on victory in a nuclear war -- this is dangerous insanity,"[74] has become the official Soviet position on victory in war. While these views have not been shared by all members of the Soviet military establishment, and while there may be a profound Party-Military shift surrounding this issue, this does not seem to be related to the Soviet reaction to the American plan to construct a space-based antimissile system. This is because the position of Moscow on

nuclear war, described above, has been advanced by Soviet leaders ever since the Khruschev period, with little modification.

SECTION X

CONCLUSIONS

In this study, we have described Soviet military doctrine and have attempted to relate its tenets to Soviet responses to the Strategic Defense Initiative. Our specific aim was to establish (1) which components of Soviet military doctrine are related to the SDI; (2) which doctrinal tenets might be linked to the Soviet response to the SDI; and (3) which components of Soviet doctrine are unrelated to this response. It was found that one general law of war, two principles of Soviet military building, and the doctrinal tenet shaping the organizational structure of the Soviet Armed Forces, could be reasonably linked to Soviet responses to the Strategic Defense Initiative.

While Soviet military thinkers have long been cognizant of the impact of new weapons technology on combat operations and on other aspects of military affairs, this relationship had never been given the status of a general law of war until after the announcement of President Reagan's proclamation of "Star Wars" in early 1983. We believe that this new law of war provides a theoretical underpinning for a Soviet attempt to counter the SDI with a weapons system, such as the cruise missile. The new principles of military building provide the Soviets with a theoretical framework for expanding their combat operations into outer space as a complement to terrestrial operations. The ferment, observed over the issue of the proper organizational structure for the SAF, also seems to be linked to the Soviet reaction to the SDI as Soviet military leaders seem to be striving to find a military utility for new weapons systems, including those relating to

outer space, and to fit them into the most expedient organizational framework.

For other doctrinal tenets, however, the linkage between Soviet military doctrine and their response to the SDI, appears to be more tenuous. There have been indications that more attention is being given in Soviet military thought to a war starting by a surprise enemy attack, or by accident, that such a war might be short, and if it is fought in defense of the socialist homeland it will have decisive political goals, and correspondingly, it will be characterized by decisive military operations at all levels. While these doctrinal features would appear to have some bearing on the Soviet response to the SDI, this cannot be affirmed with any degree of confidence. In addition, an expansion of the functions of the Soviet Armed Forces may be linked to a Soviet reaction to the SDI, since it may reflect a growing belief that, buttressed by increased military power, the Soviet Union can tip the global correlation of forces in its favor by mobilizing progressive forces in the world against U.S. policies, including the SDI. While more attention seems to be given in Soviet military thought to preemption and to countervalue targeting, the paucity of information on these issues makes us hesitant to link them to a possible Soviet response to the Strategic Defense Initiative.

The doctrinal issues of the source of war, the character of the Soviet Armed Forces, and the issue of victory and the consequence of it, seems to be unrelated to the Soviet reaction to the Strategic Defense Initiative since they have been advanced persistently since the time of Khrushchev.

END NOTES

1. David Holloway, "Doctrine and Technology in Soviet Armaments Policy" in Soviet Military Thinking, (Dereck Leebaert, ed.), (Boston: George Allen & Unwin, 1981), pp. 259-262; also see Julian Lider, Military Theory, Concept, Structure, Problems, (New York: St. Martin's Press, 1983), pp. 358-364.

2. This view was advanced by Arthur J. Alexander in Decision Making in Soviet Weapons Procurement. Adelphi Papers, No. 147/148. (London: International Institute for Strategic Studies, Winter 1978/1979, especially pp. 1-3 and 31-35.

3. Maj. Gen. V. Zemskov, "Ideological and Theoretical Bases of Soviet Military Doctrine," Voennaya Mysl', No. 1, 1972, pp. 47-48.

4. Unless otherwise stated, the material in this section was taken from Lt. Gen. D. A. Volkogonov, (ed.), Marxist-Leninist Teaching on War and the Army, (Moscow, Voenizdat, 1984), pp. 67-85.

5. It should be pointed out that knowledge of the general laws of war must be coupled with a knowledge and pursuance of the "principles of political direction of the war effort," which are derived from the laws of war, in order to provide for victory in war. See Col. M. P. Skirdo, People, Army, the Military Leader, (Moscow: Voenizdat, 1970), pp. 96-150.

6. This is derived from a comparison of data given in 1977, and that given in 1984. See D. A. Volkogonov, A. S. Milovidov, and S. A. Tiushkevich, War and the Army, (Moscow: Voenizdat, 1977), p. 209; Lt. Gen. D. A. Volkogonov, (ed.) Marxist-Leninist Teaching on War and the Army, (Moscow: Voenizdat, 1984), p. 273.

7. V. I. Lenin, Poln. Sobr. Soch. (Complete Works), Vol. 41, p. 121, quoted in Volkogonov, op cit., p. 74.

8. Marshal N. V. Ogarkov, Always in Readiness to Defend the Homeland, (Moscow: Voenizdat, 1982), p. 30. See also N. Ogarkov, "On Guard of Peaceful Labor," Kommunist, No. 10, (July, 1981), p. 85. Ogarkov, reportedly has replaced Marshal V. Kulikov as Commander of the Warsaw Pact Forces. Jane's Defense, Vol. 4, No. 4 (27 July 1985), p. 155.

9. This law was not included in the earlier formulation of the general laws of war. See D. A. Volkogonov, A. S. Milovidov, S. A. Tiushkevich, (eds), War and the Army, (Moscow: Voenizdat, 1977) pp. 149-157. Also see Sovetskaya Voennaya Entsiklopediya (Moscow: Voenizdat, 1977) Vol. 3, pp. 375-378, and Voennyie Entsiklopedicheskii Slovar' (Moscow: Voenizdat, 1983) p. 262. This last work was sent to the typesetter on April 29, 1982, and to the publisher on January 14, 1983 -- before President Reagan's SDI speech.

10. Gen. of the Army, I. E. Shavrov, Col. M. I. Galkin (eds.), The Methodology of Military Scientific Cognition, (Moscow: Voenizdat, 1977), p. 253.

11. D. A. Volkogonov, A. S. Milovidov, S. A. Tiushkevich, op cit., p. 164.

12. Lenin, V. I. Poln. Sobr. Soch. (Complete Works), Vol. 29, p. 207, quoted in N. V. Ogarkov, op cit., p. 41.

13. Marx, K. Engels, F. Soch. (Works) Vol. 20, pp. 145-146, quoted in Shavrov, et al., op cit., p. 258.

14. Ogarkov, op cit., p. 41.

15. I. E. Shavrov, M. I. Galkin, op cit., p. 260.

16. Ibid.

17. Ibid., p. 263.

18. Lenin, V. I. Poln. Sobr. Soch. (Collected Complete Works) Vol. 35, p. 408, quoted in D. A. Volkogonov, Marxist-Leninist Teaching, op cit.

19. Col. A. Babakov, "Leninist Principles of the Construction of the Soviet Armed Forces," Kommunist Vooruzhennykh Sil, No. 8 (April 1980), pp. 20-25.

20. Col. M. Plelushkov, "The Historic Experience of the CPSU in Organizing the Defense of Socialism," Kommunist Vooruzhennykh Sil, No. 11 (June 1980), p. 19.

21. In his 1982 book, Always in Readiness to Defend the Homeland, Ogarkov stated that the organizational structure of the Soviet Armed Forces is "continuously improving," op cit., p. 48. Also see N. V. Ogarkov, Krasnaya Zvezda, September 23, 1983.

22. 50 Let Vooruzhennykh Sil SSSR (50th Anniversary of the USSR Armed Forces), (Voenizdat, 1968, p. 479), quoted in Lt. Gen. M. Gareyev, "Ever Guarding the Achievements of October," Voyenno-Istoricheskii Zhurnal, No. 11 (November, 1977), pp. 19-29.

23. Lt. Gen. of Tank Troops, A. Dunin, "Postwar Development of the Ground Forces," Voyenno-Istoricheskii Zhurnal, No. 5 (May 1978), pp. 33-40.

24. Alfred L. Monks, Soviet Military Doctrine: 1960 to the Present, (New York: Irvington, 1984), esp. pp. 135-136.

25. N. V. Ogarkov, Always in Readiness to Defend the Homeland, op cit., pp. 48-49. See also N. Ogarkov, Krasnaya Zvezda, February 23, 1983.

26. Krasnaya Zvezda, June 22, 1983.

27. Izvestiya, September 23, 1983.

28. See for example, Maj. Gen. V. Samoilenko, Krasnaya Zvezda, December 9, 1983; Marshal of the Soviet Union S. Sokolov, Krasnaya Zvezda, February 23, 1984, August 28, 1984. Also see Lt. Gen. D. A. Volkogonov, Marxist-Leninist Teaching on War and the Army, op cit., p. 177.

29. Cpt. First Class A. Belyaev, Krasnaya Zvezda, November 4, 1984.

30. Ibid.

31. M. V. Frunze, Military and Political Activity,(Moscow: Voenizdat, 1984), p. 214.

32. Gen. of Army P. Lushev, Krasnaya Zvezda, February 19, 1985. Lushev was appointed commander of Soviet forces in East Germany on July 19, 1985.

33. Ibid.

34. N. Lomov, S. Alferov, "On the Problem of Soviet Military Doctrine, Voenno-Istoricheskii Zhurnal, No. 7 (July, 1978), p. 22. Also see Marshal N. V. Ogarkov, "Military Science and the Protection of the Socialist Fatherland," Kommunist, No. 7 (May, 1978), p. 112.

35. See for example, Col V. Bokarev, "The Armed Forces of the U.S.S.R. in the Post-War Period," Kommunist Vooruzhennykh Sily, No. 12 (June, 1979), p. 73

36. Col. Jozef Smoter, "Operation of National Air Defense Forces in a Possible War," Przeglad Wojsk Lotniczych i Obrony Powietrznaw Kraju, No. 9 (September, 1982), pp. 5-12.

37. N. Ogarkov, Krasnaya Zvezda, May 9, 1984.

38. Lt. Gen. D. A. Volkogonov, (ed.) Marxist-Leninist Teaching on War and the Army, op cit., p. 291.

39. Marshal S. Akhromeev, "Superiority of Soviet Military Science and Soviet Military Art - One of the Most Important Factors of Victory in the Great Patriotic War," Kommunist, No. 3 (February, 1985), p. 60. A further indication of the emphasis on the short-war concept is the fact that not all the military writers who described in Pravda and Krasnaya Zvezda M. Frunze's military contributions on the occasion of his centennial stated that he had emphasized a future protracted war. Of the five commentaries, two reported Frunze's support of a protracted war and three did not. For those who did, see Cpt. First Class A. Belyaev, Krasnaya Zvezda, November 4, 1984, and Krasnaya Zvezda, January 25, 1985. For those who did not, see Lt. Gen. V. Reznichenko, Krasnaya Zvezda, November 29, 1985, Gen. P. Lushev, Krasnaya Zvezda, February 19, 1985, and B. Kenrov, Pravda, February 26, 1985. In addition, a major book review on Frunze failed to mention his support of the long-war concept. See Maj. Gen. I. Liutov, "M. V. Frunze -- Military Theoretician," Kommunist Vooruzhennykh Sily, No. 12 (June,1985), pp. 88-90.

40. "Program of the Communist Party of the Soviet Union," Pravda, November 2, 1961, p. 4; The 27th Party Conference, which will convene in February 1986, will draft a new Party Program.

41. Alfred Monks, op cit., pp. 51-52.

42. For example, see Cpt. First Class V. Puzik, Krasnaya Zvezda, January 12, 1978.

43. This narrow concept of the functions of the Soviet Armed Forces was still evident in an article written in February 1983. See Lt. Gen. B. Utkin, "Soviet Army -- An Army of the Friendship of the Peoples," Voenno-Istoricheskij Zhurnal, No. 2 (February, 1983), pp. 3-11.

44. Lt. Gen. D. A. Volkogonov, op cit., p. 187.

45. Lt. Gen. D. A. Volkogonov, Krasnaya Zvezda, June 29, 1984.

46. Pravda, June 16, 1982.

47. Pravda, January 7, 1983. This idea was first made public by Leonid Brezhnev at the XXVI Party Congress in February 1981. See Pravda, February 24, 1981.

48. The work, Marxist-Leninist Teaching on War and the Army, was submitted to the typesetter in August 1983 and sent to the publisher in September 1983, and was published in early 1984. Lt. Gen. D. A. Volkogonov, op cit., p. 187.

49. We do not deny that the Soviet weapons procurement process, as it is in other states, is complex, with many factors impinging on the decision-making choice of weapons. What we do assert, however, is that Soviet military doctrine plays a crucial role in discerning at an early stage the military utility of new technology, as well as determining quantities in which equipment is procured. See David Holloway, op cit., pp. 260-261, and p. 266.

50. This material on cruise missiles was taken from John C. Toomay, "Technical Characteristics," Richard K. Betts (ed) Cruise Missiles, Technology, Strategy, Politics, (Washington: Brookings, 1981) pp. 31-52.

51. This inference is made on the basis of a comparison of the Soviet reaction to U.S. military space research made in 1982, which omits reference to Soviet cruise missile developments, and that made in 1985 which cites such developments. For the 1982 statement, see Lt. Gen. M. M. Kiryan, op cit., p. 262. For the 1985 statement, see V. Tolubko, "On Guard of the Conquests of October," Kommunist, No. 3 (February, 1983), p. 62.

52. As far back as the mid-1960s, Soviet military thinkers had called for combined space-earth combat operations, with the focus being defense against the West's air and outer space surprise attack. See Col.

Gen. N. Tsyganov, "Types and Forms of Combat Operations," Voennaya Mysl, No. 8, 1965, p. 31.

53. "The Tasks of Soviet Military Science in Light of the Decisions of the 24th Party Congress," Voennaya Mysl', No. 8, 1971, p 4. Rear Adm. M. Kholodov, Col. A. Sidorenko, "Character and Basic Principles of Military Research," Voennaya Mysl', No. 8, 1971, pp. 27 and 31. Also see V. Kulikov, "The Soviet Armed Forces and Military Science," Kommunist, No. 3 (February, 1973), p. 99. Also, see D. A. Volkogonov, A. S. Milovidov, S. A. Tiushkevich, op cit., p. 229.

54. The Strategic Rocket Forces have suffered a gradual decline in prestige since around 1977. See Alfred L. Monks, op cit., p. 136.

55. N. Ogarkov, Krasnaya Zvezda, June 22, 1983. The Soviets reportedly are developing two large high-speed, long-range cruise missiles, which have no counterpart in the U.S. inventory. See Gen. Robert T. Herres, "Strategic Aerospace Defense," Current News, (Special Edition), July 18, 1985, No. 1322, p. 9. Walter Andrews, Washington Times, July 2, 1985.

56. A. Mozgovoy, Sovetskaya Rossiya, March 2, 1984.

57. This first appeared in 1968. See Maj. Gen. N. Vasendin, Col. N. Kuznetsov, "Modern Warfare and Surprise Attack," Voennaya Mysl, No. 6, 1968, p. 43.

58. Col. A. Dmitreev, "Military Potential and the Combat Readiness of the Soviet Armed Forces," Kommunist Vooruzhennykh Sily, No. 3 (February 1983), p. 17.

59. Maj. Gen. N. Tabunov, "The Defense Power of the Country: Its Essence and Structure," Kommunist Vooruzhennykh Sily, No. 7 (April, 1982), pp. 20-21.

60. N. Ogarkov, quoted in the New York Times, March 16, 1983; also see Lt. Gen. M. M. Kiryan, op cit., p. 314.

61. See FN, p. 39.

62. Lt. Gen. M. M. Kiryan, op cit., p. 314.

63. "Speech of the First Secretary of the Central Committee of the CPSU L. I. Brezhnev, Pravda, March 30, 1966. "Speech of Marshal of the Soviet Union R. Ya. Malinovskii to the XXIII Congress of the CPSU," Krasnaya Zvezda, April 2, 1966, p. 145.

64. The term "correlation of global forces" is a phenomenon made up of Soviet military power, the viability of the Soviet economy, the intra-bloc socialist system, and the degree of Soviet political influence in the world. More specifically, it is the aggregate of all forces -- military, psychological, political, and economic -- bearing on a particular situation and in the world at large. While it is an

article of faith among Soviet leaders that the "correlation of global forces" has shifted in favor of socialism since World War II, their assessment of the rate at which it is moving in this direction is not uniform.

65. "Current Problems of the Idealogical, Mass-Political Work of the Party," Report of Member of the Politburo of the CC of the CPSU, of the secretary of the CC CPSU comrade K. U. Chernenko, Kommunist, No. 9 (June, 1983), p. 20.

66. Lt. Gen. D. A. Volkogonov, Marxist-Leninist Teaching on War and the Army, op cit., p. 187.

67. Marshal S. Akhromeev, op cit., p. 60.

68. Ibid., pp. 60-61.

69. D. A. Volkogonov, A. S. Milovidov, S. A. Tiushkevich, War and the Army, op cit., pp. 98-100.

70. Peter Vigor, The Soviet View of War, Peace, and Neutrality, (London: Routledge and Keegan Paul, 1975), pp. 39, and 175.

71. D. A. Volkogonov, Marxist-Leninist Teaching on War and the Army, op cit., p. 295.

72. Marshal S. Akhromeev, op cit., p. 60.

73. This material on the cruise missile was taken from Richard K. Betts (ed.), Cruise Missiles, op cit., p. 170-171.

74. L. I. Brezhnev, quoted in Col V. Iemailov, "The XXVI Congress of the CPSU in Strengthening the Defense Power of the Country," Kommunist Vooruzhennykh Sil, No. 8 (April, 1981), p. 79. Also see Brezhnev's report delivered to the XXVI Party Congress, Pravda, February 24, 1981.

SECTION IV

High Speed Cruise Missile Technology in the U.S.S.R.

Dr. Richard E. Thomas

SECTION I

Introduction

The effort underway in the United States to study possible ways of defending against intercontinental ballistic missiles, the Strategic Defense Initiative (SDI), has evoked considerable debate and reaction around the world. It is natural that interest is focused on the response of the Soviet Union. This paper seeks to describe one potential facet of that reaction.

It is clear from Soviet publications dating back to the late 1960's and early 70's that they have long been considering various elements of space and ballistic missile defense systems. These actions appear to have been engendered by their perception of a substantial military threat posed by various elements of the U.S. space program in spite of the fact that those efforts, particularly the Apollo program, had little, if any, military content. Soviet fears have obviously been heightened by the Shuttle development since it is in part a military effort. In addition there were U.S. research programs in place prior to President Reagan's speech of March 23, 1983, which are now part of the SDI.

Therefore, the Soviets very likely perceived that the U.S. was actively pursuing a military space and strategic defense research program before the SDI actually appeared.

It is essential for the United States to ascertain as best it can Soviet plans for countering weapons systems based on SDI technology. Given that those systems will be designed primarily to intercept ICBM boosters, post-boost vehicles or warheads in their various stages of flight, it may

well be that the Soviets might attempt to penetrate U.S. defenses using a different means of delivery such as high speed cruise missiles.

One should not be surprised to find the Soviets attracted to this type of "end-run" technology -- it has happened before. In the early 1950's the primary means for delivering nuclear weapons was the manned bomber. The U.S. was developing a line of cruise missiles, Matador, Shark and Navajo. The Atlas ICBM was being designed but development and deployment were considered to be a long term prospect.

In true mirror-image fashion U.S. planners expected that the Soviets would follow the U.S. pattern and U.S. defensive systems were predicated on an air breathing threat. While the Soviets did experiment with early cruise missiles, it was predicted in 1952 (by the author, incidentally) that a Soviet ICBM would appear in about 1957. When Sputnik was launched using an ICBM booster, it was apparent that the Soviets had leap-frogged to the ICBM thereby confronting the U.S. with an unexpected threat, thereby "negating the negation" as Dr. Monks has described in his paper.

As the U.S. pursues the development of systems to defend against ballistic missiles, U.S. planners seem to believe that the only option open to the Soviets is to confront the SDI in a direct fashion, to devise systems which will penetrate it. While that is an option, it is not the only one.

If the U.S. focuses on countering an ICBM threat, might the Soviets now revert to an air-breathing delivery system, again "negating the negation?" Such a move is consistent with their thinking and congruent with their past behavior patterns.

Systems that are designed principally to intercept delivery systems based on long range, rocket-propelled vehicles will face a different and somewhat more formidable task if confronted with, for example, a small hypersonic cruise missile operating close to the surface of the earth, that is, deep within the atmosphere. If space-based systems are to be used to handle this challenge, they must be designed rather differently than if they were to confront only the task of intercepting ballistic missiles. Of course, it may be that other defensive systems either integrated with or separate from space-based systems might be better for intercepting high-speed cruise missiles.

Cruise missiles that are currently operational or in development by the Soviet military are nearly all relatively short range and are powered by turbojet engines. While most of them are subsonic or transonic vehicles a few are capable of velocities of the order of M = 2.5 which is near the maximum that can be obtained with turbine engines. While a M = 2.5 cruise missile would be a formidable weapon, its evolution into a higher velocity vehicle would substantially decrease its vulnerability and confront the U.S. with a substantial threat.

If the Soviets were to develop a cruise missile capable of operating at higher speeds, they would very likely utilize ramjet engines perhaps in the ducted rocket or ramrocket configuration. Supersonic combustion or scramjet technology might also be important to them, perhaps using high energy propellent such as hydrogen.

The design of diffusers or air intakes for flight at hypersonic Mach numbers would be critical to the performance of a ramjet engine. Flight within the atmosphere at such high speeds would also produce substantial

aerodynamic heating of the vehicle structure. Operation at elevated temperatures may require new materials or structural design techniques. These, therefore, are the technological parameters which one might examine in order to assess the Soviet interest in high speed cruise missiles.

In this study we review and evaluate papers contained in the Soviet scientific literature relating to the above topics. Most of these papers are publications in Soviet scientific journals by individuals associated with organizations which are part of the Soviet scientific community, particularly the Academy of Science. One must recognize that in the Soviet Union all scientific activities are, like most other significant undertakings, centrally directed. The central direction for Soviet military is found in their military doctrine which describes general technological and organizational requirements (Ref. 1).

When the Soviets decide to develop specific types of weapons technologies such as those associated with high speed cruise missiles they enlist the aid of <u>all</u> facets of their scientific community including not only those that work directly for the military but also those which appear to the uninitiated to be "civilian" in nature. In point of fact, little is "civilian" in the Soviet Union. Any individual or organization that has the capability of supporting the military mission is enlisted in that endeavor. Therefore, one can conclude that the publications by their scientific community do reflect decisions made by their top military planners, thus one can view Soviet scientific publications as a kind of window on the Soviet military doctrine.

In that which follows then we shall first review some writings related to ramjet-powered missiles in general. This will include some West

European publications which describe some important elements of those technologies. This will be followed by reviews of Soviet papers dealing with diffusers, combustion, and nozzles. Finally, some conclusions are drawn from this investigation.

SECTION II

Ramjet Engine Research

Soviet scientific literature, particularly that of recent vintage, does not contain many articles dealing with ramjet engine technology as a whole. However, one important article was published in 1983 (Ref. 2) In this study the Soviets seek to determine the "design profiles" which will represent the optimum configuration of a hypersonic ramjet. Their approach is to examine the effect of total pressure losses on the so-called reduced thrust which is defined to be:

$$\overline{R} = \frac{R}{p_H F_1}$$

Where $\overline{R}$ = the reduced thrust

R = Engine thrust

p_H = Atmospheric pressure

F_1 = Cross section area at the entrance to the combustion chamber.

The diffuser is assumed to have a two shock configuration, however, with the velocity remaining supersonic behind the diffuser. They seek to account for both shock and friction losses as well as heat transfer to the engine components. Complete combustion is assumed to occur in the chamber and the only total pressure losses therein are associated with the boundary layer effects in the chamber and on the nozzle walls. Moreover they assume no separation of the flow in the nozzle.

In the author's opinion the parameters that influence the losses affecting the maximum engine thrust include the diffuser angle, the combustion chamber expansion angle, the combustion chamber length to

diameter ratio, the nozzle angle and the nozzle length to diameter ratio. They redefine another dimensionless thrust:

$$\tilde{R} = \frac{R}{m_a / u_H}$$

Where $\tilde{R}$ is the dimensionless thrust

R = Thrust

m_a = Air flow rate through the engine

u_H = Flight velocity

The results are presented in Figure 1 below and indicate that there is a local thrust maximum for the nozzle angle and length diameter ratio. It is interesting to note that these extreme values occur near M = 6.

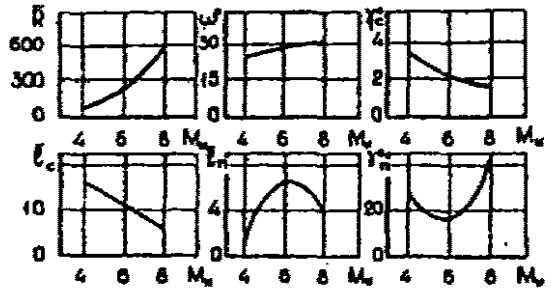


Fig. 1. Optimum parameters of engine components vs. flight Mach number M_H.

The concluding paragraph in this paper is:

> On the basis of the above a real-world engine for the projected aircraft with higher M_H must be a compromise. The determining criteria for this engine must be chosen with allowance for aerodynamic layout features, the cooling system, combustion conditions, and maneuverability considerations."

West European nations, notably France and the Federal Republic of Germany, have funded research dealing with ramjet-powered missiles. One study (Ref. 3) deals with the consideration of guidance system design in order to maximize the range of ramjet-powered missiles which operate under certain flight path constraints. The missiles considered are of the sea-skimming type which are programmed for a weaving flight path as they approach the target. The author believes that the best propulsion systems for this application is the integral rocket-ramjet concept, that is, one in which solid rocket propellent is burned initially to accelerate the ramjet engine to the appropriate flight speed whereupon the products from an incomplete combustion of the rocket propellent are burned in the ramjet combustion chamber. Techniques are developed for trajectory optimization. This paper is especially interesting in that it points out that range improvements of about five to eleven percent can be obtained through engine throttling.

A French study (Ref. 4) states that a ramjet-powered Vega missile flew at velocities in excess of M = 4 in 1963 and that another French missile, Stataltex attained a speed of M = 5 at an altitude of 35 kilometers. The author describes the advantages and problems associated with a dual-function combustion chamber which utilizes solid propellent during the boost phase of the missile and kerosene during the cruise phase. The paper also discusses the advantage of using side inlets in order to permit a guidance system to be housed in the missile nose.

West German researchers have also considered the utilization of a hybrid propulsion system for missiles which are designed to operate at various combinations of altitude and Mach numbers (Refs. 5 & 6).

SECTION III

Hypersonic Inlets

The design of diffusers is critical to the development of ramjet engines for use in high speed cruise missiles. Soviet researchers have produced several interesting studies related thereto.

An investigation conducted in 1975 by researchers at the Zhukovskiy Central Aero-Fluid Mechanics Institute (TsAGI) reported an interesting experimental investigation on a plane or ramp air inlet with compression surface angles of ten degrees, fifteen degrees and twenty degrees tested at Mach numbers ranging from 1.5 to 3. They measured the performance of the inlet at off-design conditions which might be caused by "flow throttling of the engine, insufficient throat area, or change of flow direction at the cowl lip by a turning angle greater than critical." The paper includes pressure and flow rate distributions through the engine as well as excellent schlieren photographs of the shock wave configurations.

At hypersonic velocities the aerodynamic heating of the engine components becomes important especially on the central body of the inlet. The surface temperature there can affect the character of the boundary layer which, in turn, greatly influences the performance of the diffuser. Soviet scientists reported (Ref. 8) an experimental study at Mach numbers ranging from 2.5 to 9.7 (!) at Reynolds' numbers ranging from 10^6 to 10^7 with both turbulent and laminar boundary layers. The central body in the model was cooled and the effects on the boundary layer and diffuser measured. The authors state that at Mach numbers ranging from 5 to 8 the skin temperatures will range from 1,000 and 2,300 degrees centigrade. Surface cooling increases the heat transfer rate, stabilizes and thins the boundary layer thereby improving the aerodynamic performance of the system.

There was no indication that the centerbody was moved to vary the design Mach numbers of the models which were configured for M = 5 and M = 8.

In another interesting study (Ref. 9) Soviet researchers examined the effects of vortex generators located ahead of supersonic diffusers. The objective of the study was to investigate the influence of the vortex generator on the condition of the boundary layer in the inlet. Studies were made with both two and three-dimensional configurations at Mach numbers ranging from 1.4 to 1.95. They concluded that although the vortices had some positive effects on the boundary layer, the shock wave interactions resulted in a net deterioration of inlet performance.

A 1980 publication (Ref. 10) presented the results of a series of experimental investigations of hypersonic air inlets at Mach numbers ranging from 7.5 to 13.1. Tests at such high velocities would probably be more suitable for a trans-atmospheric vehicle configuration rather than a high speed cruise missile design to operate at low altitudes. The facility in which the research was done is located at Novosibirsk. It is described as a shock tube utilizing air or nitrogen and can provide flows in relatively high Reynolds' numbers.

Both two-dimensional and three-dimensional inlets were tested. Critical Reynolds' numbers were measured at values in excess of 10^6 and compared with results from other facilities. The Soviet scientists concluded that the results compared well in spite of the brief operating time (50 to 60 milliseconds) and that their findings "illustrate the broad possibilities of pulsed tunnels for studying air intakes and other complex flows."

This would seem to indicate an ongoing interest by the Soviets in the study of hypersonic inlets.

Soviet capabilities to perform theoretical calculations in complex hypersonic, chemically-reacting flows have been well-known for some time. This capability would obviously be important to them in designing hypersonic inlets, a competence clearly demonstrated in one paper (Ref. 11) encountered in the current investigation. Because of problems resulting from the operating limitations of experimental facilities in the simulation of hypersonic flows at high Reynolds' numbers, Soviet researchers cite the utility of using certain similitude laws for interpolating and extrapolating experimental results. In this study they examined the simulation of the hypersonic flows of viscous gases over blunt bodies by solving the equations of a viscous shock layer and the complete Navier-Stokes equations including chemical kinetic relations which corrected for nonequilibrium rotational relaxation, diffusion, dissociation and ionization. The result of the study was the development of a "binary similitude law" which met the conditions for blunt bodies operation in the "transition mode."

A fair number of documents relating to diffuser research were found in the literature up through 1981 after which no additional papers appeared. This circumstance might indicate that at that point Soviet studies of hypersonic inlets became classified. It is unlikely that their investigations terminated -- although a great deal is known about diffuser gas dynamics at high Mach numbers, additional research on viscous/heat transfer effects and other parameters is needed.

SECTION IV

Combustion Studies

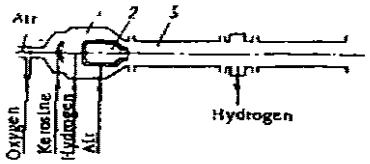
In considering the design of a ramjet engine for use at high velocities it is worthwhile to be able to inject and burn fuels in a supersonic stream. By accomplishing this one avoids the necessity to reduce the velocity of the stream to subsonic levels thereby incurring substantial entropy increases and the associated total pressure losses. This permits the engine to operate at much higher efficiencies.

The Soviets have clearly been active in studying supersonic combustion as evidenced by papers extracted from their scientific literature. Utilizing numerical simulation techniques, Soviet scientists examined (Ref. 12) the effects of injecting hydrogen into a mixture consisting of O, H, N, and Ar utilizing equations describing an inviscid thermally nonconducting reacting gas in a two-dimensional, converging-diverging inlet for mach numbers in the range from 7 to 10. Reaction products were calculated noting that ignition did not occur for mach numbers less than 7. Temperature profiles were calculated through the duct. The researchers conclude that:

(A) "Reactions involving components that contain nitrogen atoms have only a slight influence on the gas dynamic properties of the flow," and

(B) "Gas dynamic and kinetic factors have a strong influence on the combustion process."

An interesting study was reported (Ref. 13) wherein the Soviet researchers studied the injection of hydrogen into a high temperature stream. The experimental arrangement and some of the results are presented in Figure 2.



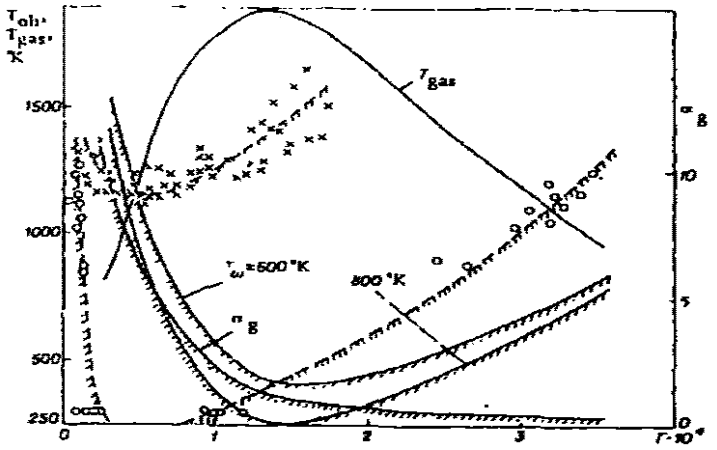


Fig. 2

$\Gamma = \frac{G_{H_2} F_d}{G\ F_1}$ ≡ Dimensionless injection parameter.

G_{H_2} = Flow rate of H_2

F_d = Cross-section area of the duct.

G = Flow rate of air.

F_1 = Cross-section area of the annular groove where H_2 was injected.

α_g = Heat transfer coefficient over the groove.

For a range of α_g the researchers concluded that flame-out occurred at oxidizer temperatures between approximately 1100° and 1400°K while ignition occurred between temperature of 1950° and 2300°K. By describing the temperature limits for ignition ramjet engine designers would then be in position to describe the conditions of the flow inside the engine in which hydrogen combustion would occur.

Experimenters at Novosibirsk used the IT-301 supersonic shock tube to study the self-ignition of liquid fuels injected into a supersonic air stream (Ref. 14). The shock tube was arranged to produce an air flow at mach number 7.3 and a flat plate at angles ranging from 20° to 30° was fixed in the flow. The mach number behind the shock wave created by the flat plate ranged from 2.4 to 3.7. Liquid was sprayed through an orifice in the plate. The materials injected included a "bororganic composition," termed "Liquid 1" and various mixtures of kerosene and Liquid 1. Kerosene was injected through the plate but self-ignition was not observed, a circumstance which was attributed to the substantial delay time for the ignition of gaseous kerosene. Gaseous hydrogen had been studied in an earlier experiment. Flame temperatures and flow fields were evaluated along with the ignition delay time.

In an interesting numerical investigation Soviet researchers studied (Ref. 15) the effects of injecting a propellent into the base region of the streamlined body. Although the objective here was stated to be the reduction in the base drag of a body moving at supersonic velocity it would seem also to be applicable to the investigation of combustion in a supersonic stream. The complete Navier-Stockes equations were used, supplemented by the appropriate relations describing the chemical reactions and kinetics.

Only hydrogen injection was investigated. The results indicated that an elevated base pressure could not be obtained "since the flow configuration realized does not contain a subsonic flow domain connecting the base region and the elevated pressure zone." The researchers do note, however, that the numerical results presented demonstrate the utility of numerical methods in the analysis of complex mixture formation and combustion phenomenon in a supersonic stream.

Several other studies, both experimental and theoretical, dealing with supersonic combustion of both hydrogen and hydrocarbon fuel were found in the literature (Refs. 16-24). While most of these documents do not describe the specific application which stimulated the research, three of them (22, 23 and 24) mention specifically application to ramjet engines.

It seems clear therefore that the Soviet program of research in supersonic combustion is designed to provide engine designers with the requisite information needed to evolve engine configurations which will provide efficient and reliable operation under a wide variety of conditions. The evolution of this data would clearly support the notion of Soviet intentions to develop ramjet-powered missiles; however, based on this information, it is not clear that such vehicles would be intended for long-range (strategic) use.

If hydrogen fueled ramjet-propelled missiles were to be used operationally, provisions would have to be made to fuel the missiles shortly before launch. This would impose some concerns regarding the storage and handling of liquid hydrogen. Such concerns would also obviously relate to the utilization of liquid hyrdrogen as a rocket engine propellent.

In the course of the current investigation, one paper (Ref. 25) dealt specifically with the safety aspects of the handling of hydrogen. The

paper stated that hydrogen is regarded as the most promising component in "the energy systems of the future" and they cite the lack of experimental data concerning the possibility of the detonation of hydrogen air mixtures in an open space. The researchers considered both analytical and experimental approaches with the latter consisting of "spills of up to 30 liters of liquid hydrogen" in a concrete box measuring 4 X 4 X 6 meters. After taking several gas samples ignition of the cloud was induced by a spark 0.5 meters above the evaporation surface. The various parameters of the reaction zone were measured. They note that it is possible for a hydrogen air cloud to produce conditions conducive to a detonation.

SECTION V

Nozzles

The design of a nozzle for use with a ramjet engine involving supersonic combustion confronts the designer with some formidable problems. First, the gas stream approaching the nozzle is likely to be nonhomogenous because of the combustion processes occurring upstream. In addition, since the nozzles are likely to be fixed in configuration, the nature of the flow field entering the nozzle will vary with the flight conditions and the operating mode of the engine.

During the current investigation a single very impressive paper which was written by researchers at TsAGI in 1974 was discovered (Ref. 26). This study was described by the authors as being the first to attack directly the determination of the flow field in the nozzle given the entering conditions. They state that earlier the inverse problem had been solved wherein, if one was given the gas velocity distribution along the nozzle axis, the flow field in the nozzle could be determined. The Soviet researchers used the method of characteristics in its finite-difference version to conduct the calculations. Inviscid conditions were initially assumed, then boundary conditions established for calculation of the nature of turbulent boundary layers along the nozzle wall. They stated that the nozzle can be designed to produce nearly uniform conditions in spite of the nonuniformities at the nozzle entrance. It should be noted that this is an entirely analytical study with no experimental verification. Since this study was conducted in 1974 it may be assumed that some follow-on work has been done. We must search the literature diligently to see if it contains some of those results.

SECTION VI

Conclusions

1. As the United States concentrates its considerable scientific and technological talent on the development of systems to defend against ballistic missiles, the Soviets will likely be attracted to other means, such as high speed cruise missiles, for delivering warheads.

2. A review of Soviet scientific literature reveals a substantial research effort directed toward the investigation of hypersonic inlet and supersonic combustion technologies. One study describes a ramjet engine configuration optimized at M = 6. It is concluded that the Soviets are developing the requisite base of technology required for the design of ramjet ex-propelled cruise missiles.

3. It is significant that no papers dealing with hypersonic diffusers were found in the literature after 1981 indicating that the work may have become classified at that time.

4. The U.S. would be well advised to consider systems designed to defend against high speed cruise missiles.

References

1. Thomas, Richard E., Long Wave Infrared Research in the Soviet Union, SS84-1, The Center for Strategic Technology, Texas A&M University System, March 1984.

2. Bazhanov, V. I. and A. A. Stepchkov, "An Analysis of the Parameters that Determine Ramjet Maximum Thrust," Izvestiya VUZ. Aviatsionnaya Tekhnika, Vol. 26, No. 1, pp. 12-16, 1983.

3. Schottle, Ulrich M., Range Maximization Method for Ramjet Missiles with Flight Path Constraints, Institut fur Raumfahrtantriebe, University of Stuttgart.

4. Piernay, Patrick, "Strong Trend Toward Use of Ramjet Engine," L'Usine Nouvelle, No. 3, pp. 6-7, January 8, 1984.

5. Meinkohn, Dirk and Jurgen W. Bergmann, Experimental Investigation of a Hydrocarbon Solid Ramjet, Institut fur Chemische Antriebe und Verfahrenstechnik.

6. Benkmann, Peter and Peter A. Kramer, Design Consideration and Analytical Comparison of Different Types of Ramjets and Ramrockets, Institut fur Raumfahrtantriebe, University of Stuttgart.

7. Simonov, I. S. and S. A. Stefanov, "The Flow at the Inlet and in the Throat Region of a Plane Supersonic Air Intake," Fluid Mechanics -- Soviet Research, Vol. 6, No. 6, pp. 82-91, November-December 1977.

8. Gurylev, V. G. and Yu. A. Mamet'yev, "Effect of Cooling of the Central Body on Startup, Separation of the Flow at the Intake and the Throttling Characteristics of Air Scoops at Supersonic and Hypersonic Velocities," Fluid Mechanics -- Soviet Research, Vol. 7, No. 3, pp. 158-167, May-June 1978.

9. Zatoloka, V. V., A. K. Ivanyushkin, and A. V. Nikolayev, "Interference of Vortexes with Shocks in Airscoops. Dissipation of Vortexes," Fluid Mechanics -- Soviet Research, Vol. 7, No. 4, pp. 153-158, July-August 1978.

10. Boshenyatov, B. V., B. N. Gilayzemdinov, and V. V. Zatoloka, "Experimental Investigations of Hypersonic Air Intakes," Fluid Mechanics -- Soviet Research, Vol. 9, No. 2, pp. 69-78, March-April 1980.

11. Gusev, V. N., V. P. Provotorov, and V. V. Ryabov, "Effect of Physical and Chemical Nonequilibrium on Simulation of Hypersonic Rarefied-Gas Flows," Fluid Mechanics -- Soviet Research, Vol. 10, No. 5, pp. 123-135, October 1981.

12. Ermolin, N. E. and V. M. Fomin, "Numerical Study of Supersonic Gas-dynamics in a Duct in the Presence of Nonequilibrium Processes," Fizika Goreniya i Vzryva, Vol. 16, No. 3, pp. 47-54, May-June 1980.

13. Zimont, V. L., V. M. Levin, and E. A. Meshcheryakov, "Stabilization of Combustion in a Supersonic Flow," Fizika Goreniya i Vzryva, Vol. 18, No. 3, pp. 40-43, May-June 1982.

14. Baev, V. K., Yu. A. Pronin, and V. V. Shumskii, "Self-Ignition of Liquid Fuels in a Supersonic Air Flow," Fizika Goreniya i Vzryva, Vol. 18, No. 4, pp. 22-26, July-August 1982.

15. Golovichev, V. I., "Numerical Modeling of Thermal Compression of a Supersonic Stream by Combustion," Fizika Goreniya i Vzryva, Vol. 19, No. 1, pp. 50-56, January-February 1983.

16. Zimont, V. L., V. M. Levin, E. A. Meshcheryakov, and V. A. Sabel'nikov, "Characteristics of Supersonic Combustion of Unmixed Gases in Channels," Fizika Goreniya i Vzryva, Vol. 19, No. 4, pp. 75-78, July-August 1983.

17. Meshcheryakov, E. A. and O. V. Makasheva, "Calculation of the Conditions for the Breakaway of the Combustion Following a Step or a Depression with a Supersonic Flow of a Hydrogen -- Air Combustible Mixture," Fizika Goreniya i Vzryva, Vol. 12, No. 6, pp. 871-879, November-December 1976.

18. Baev, V. K., A. F. Garanin, and R. S. Tyul'panov, "Structure of a Hydrogen Diffusion Flame Behind a Concical Cyclinder in a Supersonic Flow," Fizika Goreniya i Vzryva, Vol. 12, No. 1, pp. 129-132, January-February 1976.

19. Baev, V. K., G. V. Klimchik, V. A. Konstantinovskii, E. A. Solovova, and P. K. Tret'yakov, "Diffusional Combustion of Hydrogen in a Flat Channel with Sudden Expansion," Fizika Goreniya i Vzryva, Vol. 12, No. 3, pp. 382-389, May-June 1976.

20. Zimont, V. L., V. M. Levin, and E. A. Meshcheryakov, "Combustion of Hydrogen in a Supersonic Flow in a Channel in the Presence of a Pseudodiscontinuity," Fizika Goreniya i Vzryva, Vol. 14, No. 4, pp. 23-36, July-August 1978.

21. Meshcheryakov, E. A. and V. A. Sabel'nikov, "Combustion of Hydrogen in a Supersonic Turbulent Flow in a Channel with Simultaneous Delivery of Fuel and Oxidant," Fizika Goreniya i Vzryva, Vol. 17, No. 2, pp. 55-64, March-April 1981.

22. Annushkin, Yu. M., "Basic Rules Governing the Burning of Turbulent Jets of Hydrogen in Air Channels," Fizika Goreniya i Vzryva, Vol. 17, No. 4, pp. 59-71, July-August 1981.

23. Annushkin, Yu. M. and G. F. Maslov, "Experimental Investigation of the Combustion of Hydrogen-Kerosene Fuel in Air-Direct Flow Channel," Fizika Goreniya i Vzryva, Vol. 18, No. 2, pp. 30-36, March-April 1982.

24. Annushkin, Yu. M., G. F. Maslov, and F. D. Sverdlov, "Stability of a Hydrogen Diffusion Flame in an Accompanying Air Flow," Fizika Goreniya i Vzryva, Vol. 19, No. 6, pp. 14-20, November-December 1983.

25. Makeev, V. I., V. F. Nieshakov, and A. P. Chuguev, "Formation and Combustion of Hydrogen-Air Mixture in Processes Involving the Evaporation of Liquid Hydrogen into the Atmosphere," Fizika Goreniya i Vzryva, Vol. 17, No. 5, pp. 14-21, September-October 1981.

26. Tagirov, R. K. and Yu. M. Shikhman, "Calculation of Supersonic Flow in Flat and Axisymmetric Nozzles of a Given Geometry, Assuming Arbitrary Inlet Gas Properties," Fluid Mechanics -- Soviet Research, Vol. 5, No. 3, pp. 1-11, May-June 1976.

SECTION V

The Soviet Concept of a Theater of Military Operations: Implications for Outer Space

Kevin D. Stubbs
and
Joseph J. Muniz

Edited and with contributions by
Ronald J. Wright

Introduction

An important concept in the Soviet lexicon of military terms is that of a teatr voyennykh deystviy (theater of military operations). The Soviet Dictionary of Basic Military Terms defines a TVD as:

> A particular territory, together with the associated air space and sea areas, including islands (archipelagos), within whose limits a known part of the armed forces of the country (or coalition) operates in wartime, engaged in strategic missions which ensue from the war plan. A theater of operations may be ground, maritime, or intercontinental. According to their military-political and economic importance, theaters of operations are classified as main or secondary.[1]

It is the primary purpose of this brief paper to examine Soviet views on this multidimensional geographic entity, especially as it relates to potential conflict in outer space.

TVD is a concept which is firmly rooted in the past. In the first section of this paper, Joseph Muniz presents an historical overview of the development of Soviet thinking on the subject. The idea of a TVD predates the Soviet era, but it was largely nutured by Soviet military theorists in the 1920s and 1930s. Theory was tested during the 1940s in the crucible of wartime experience. In the post-war era the TVD concept was reexamined as new technologies led to the growth in scale and scope of military operations.

Since the early 1960s Soviet analysts have repeatedly raised the question, what is the potential for military operations in space? This concern has increased with announced American intentions to seek answers to this question. Kevin Stubbs has examined Soviet writings concerning their views on the uses of space for military purposes, including the viability of a "space TVD." From halting beginnings in the early 1960s, Soviet

writings have developed by the mid-1980s to the stage where they are revealing some very specific points about this issue.

Ronald J. Wright

Development of the Concept of a Theater of Military Operations

The Soviets credit Henri Jomini with the creation of the concept of a theater of military operations (TVD), defined by the French military theorist as an area in which two or more armies conducted independent operations.[2] In 1847 a Russian, D. Milyutin, expanded Jomini's idea by including a consideration of geographical, political, and economic factors.[3] From the experiences of the Imperial Army in wars fought in the late 19th and early 20th centuries, Russian theorists further examined the concept of a theater of military operations.[4] It remained for Soviet thinkers to fully develop it.

When the Soviet Republic was established in 1917, it was beset with numerous military threats. In order to survive, the new regime was forced to transform its militia into a true armed force -- the Red Army. During the Russian Civil War the Red Army was unable to achieve decisive victories against the White forces. In part, this occurred because the Revolutionary Military Council (Revvoensovet), responsible for all Soviet military affairs, did not have effective control over its armed forces. The Council decided that a complete reorganization was necessary, and in September 1918 it created Fronts -- a strategic formation normally made up of two or three armies.[5] The improved command and control resulting from this reorganization contributed to the eventual victory of the Red Army in the Civil War.

After the war, Soviet military theorists analyzed the experiences of the Imperial and Red Armies in World War I and the Russian Civil War. Lessons were extracted from these conflicts in order to develop an effective doctrine for the control of Soviet forces.

In the early 1920s, M. Frunze studied the military operations conducted in the Ukraine during the Civil War. He concluded that a need existed for an intermediate command echelon between the Revolutionary Military Council and the Fronts in this region.[6] He recommended that the position of representative of Revvoensovet, with the rights of a deputy commander-in-chief, be created. This individual would act to insure the ". . . unity of command and control over all the armed forces in the Ukraine. . . ."[7] Frunze also pointed out that the geographic and strategic factors existing in the Ukraine at the time showed that three "military districts" could be created, which in wartime would be converted into "theaters of wartime."[8] M. Tukhachevskiy, a contemporary of Frunze, also recognized that a theater level of command was essential to success in war.[9]

When German forces swept into the Soviet Union on 22 June 1941, the Red Army failed to stop the onslaught at the border as planned. With Soviet defenses and communications shattered, Stavka (Supreme High Command) was unable to control the Fronts effectively. In order to bring strategic leadership closer to the Fronts, Stavka created High Commands (Glavnokomandovanie or Glavkom) on the Northwestern, Western and Southwestern strategic sectors on 10 July 1941.[11] The primary function of the Glavkom was to insure coordination of multi-Front operations; however, the experiment was unsuccessful.[12] The failure of the Glavkom to provide intermediate strategic leadership resulted from the fact that Stavka regularly bypassed them, and that they lacked operational control over available reserves.[13] By the late spring of 1942, this intermediate command echelon was eliminated in favor of direct control over Front level operations by Stavka.[14]

For the winter campaign of 1942-43 Stalin created the Stavka representative system in an attempt to find a solution to the strategic command problem resulting from the failure of the Glavkom. Under the new system, Stavka dispatched senior commanders to provide direct control over two or more Fronts for specific operations.[15] Each Stavka representative had a hand-picked team of specialists who accompanied him from sector to sector.[16] They were, in effect, mobile theater headquarters able to relocate quickly to critical sectors in order to coordinate the offensive and defensive operations of groups of Fronts.

Stavka representatives coordinated a series of successful multi-Front operations throughout 1943 and 1944. By 1945 the strategic front had so narrowed that the intermediate command link between Stavka and the Fronts had become superfluous.[17] During the Berlin campaign, Stavka directly controlled all the forces committed to the capture of the city. Only one Stavka representative remained active in the field, with the mission of reducing the Courland Pocket in Latvia.[18]

A few weeks before the end of the war in Europe, the Soviets began making preparations for offensive operations against the Japanese in Manchuria. Marshal A. Vasilevskiy was assigned to the Far East as Stavka representative for the upcoming campaign. Soon after his arrival in the theater, he determined that his position as Stavka representative was inadequate for the execution of his mission. After conferring with Stavka, Vasilevskiy established the "High Command of Far Eastern Forces," a formal command echelon of greater independence and authority.[19] This Glavkom was, in essence, a TVD headquarters directly controlling the three Fronts, aviation units, and naval forces assigned to the Manchurian campaign.[20] Soviet military historians point to the success of the Manchurian campaign

and to the use of a TVD headquarters as an example of the proper organization of a theater operation.[21]

The end of World War II in August 1945 marked the beginning of the atomic era. Soviet military theorists immediately recognized the significance of atomic weapons but were constrained from publicly debating the role of these weapons in the initial postwar period (1945-1953), largely because of Stalin's control over military doctrine. Although they understood the importance of atomic weapons delivered by long-range bombers against strategic targets, the Soviets realized that atomic weapons were as yet ineffective at the tactical level. Writing in the mid-1950s, General B. Olisov stated that, "Strategic atomic bombs . . . [a] great danger to the civilian population, are of little effect on the battlefield."[22]

Given the lack of a credible tactical delivery system for nuclear weapons, the TVD remained unchanged in Soviet military science until the death of Stalin and the introduction of the atomic cannon by NATO in 1953.[23] With the deployment of this weapon, and later of early battlefield rocket systems equipped with nuclear munitions, the concept of the TVD underwent radical alterations. The spatial and temporal characteristics of a TVD increased as the effective range and lethality of battlefield weapons improved.

In 1956 N. Krushchev delivered his now famous destalinization speech, which opened the door to substantial reforms in the Soviet military under the leadership of Marshals G. Zhukov and R. Malinovskiy. During the 1950s, the Soviet General Staff undertook a complete reevaluation of military doctrine to incorporate battlefield nuclear weapons. Directed by Marshal V. Sokolovskiy this reassessment resulted in the publication of Voyennaya strategiya in 1962. It is in this work, and in the pages of Voyennaya mysl', that a description of the modern TVD was first promulgated.

In 1964, Rear Admiral V. Andreyev wrote a definitive article in Voyennaya mysl' entitled, "The Subdivision and Classification of Theaters of Military Operations."[24] In this paper, Andreyev made an attempt to define the types of TVDs and their role in a modern war. The driving force of his argument was the existence of nuclear weapons. He defined three types of TVDs: Continental, Intercontinental, and Oceanic. Furthermore, he discussed the subdivisions within a TVD which he defined as a strategic region or axis. He defined a strategic axis as:

> . . . a wide strip of terrain within a certain theater of military operations leading to the most important administrative-political and industrial-economic centers of the enemy, the struggle for which might be the basis of a strategic operation.[25]

Andreyev laid the ground work for the definition of the TVD in an era of global nuclear war. Later, in 1965, the definition of the theater was standardized in the Dictionary of Basic Military Terms.[26]

Andreyev also discussed the evolution of the TVD in light of changes in the "means of armed conflict." He declared:

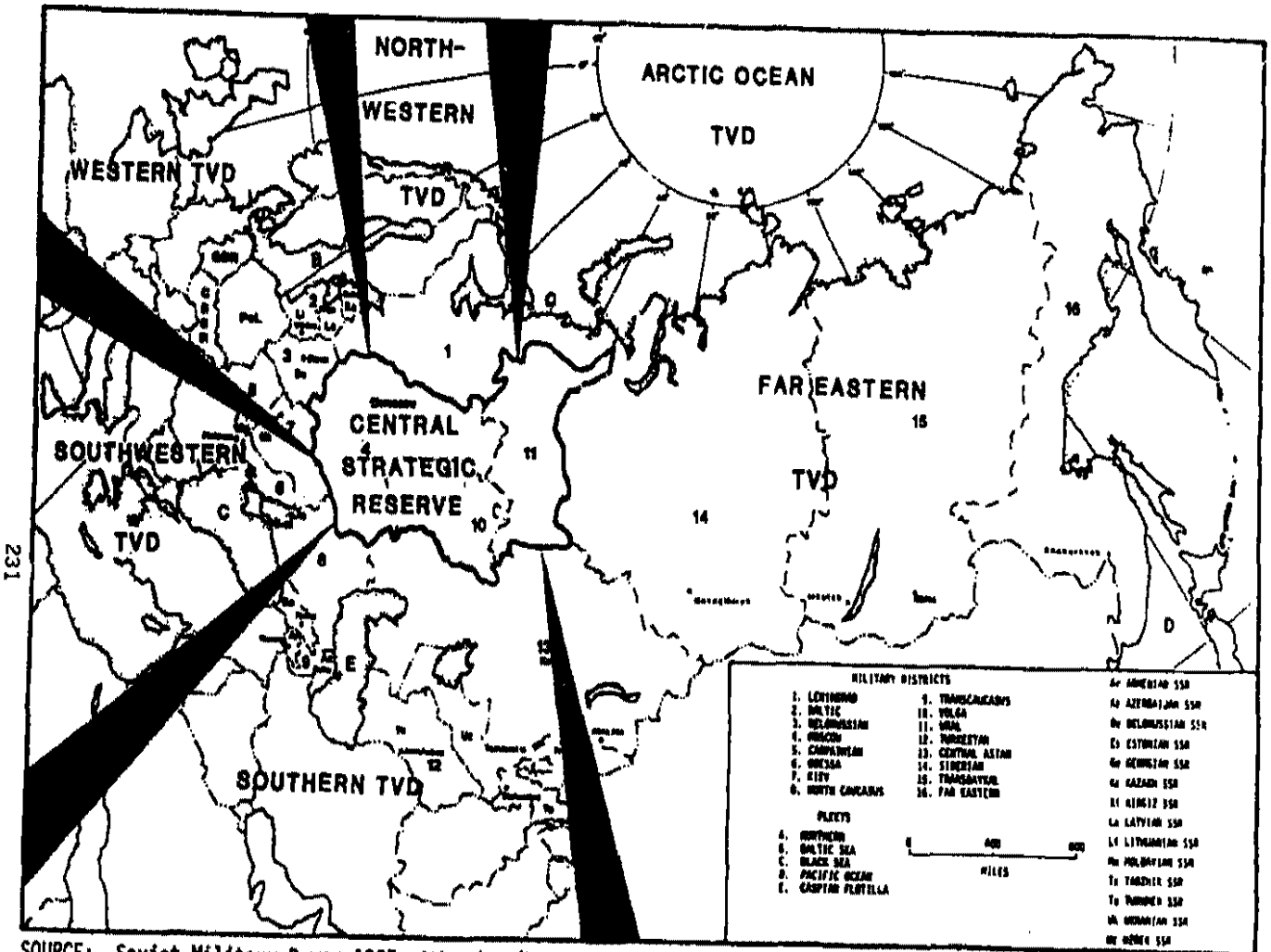
> With the increase in range of effectiveness of the means of armed conflict, there naturally follows an increase in the size of theaters of military operations. An area which formerly was a theater, now, in many cases, might be classified as a strategic region, a part of a TVD.
>
> Also, the division into land and sea theater no longer fits modern conditions, since theaters encompass continents or parts of continents, including inland seas and coastal waters, and also oceans with their islands and shores. It is more correct to classify theaters as continental and oceanic.[27]

The essence of Andreyev's presentation was the increased scope of military operations in the nuclear era. In the twenty years that followed the publication of this article, Soviet authors have debated the role of the TVD, first in a period of Global Nuclear War and then after 1968, in a period with an ever increasing conventional focus. Primarily, this

discussion of the nature and relevance of the TVD centered around the dilemma of the nuclear threshold. Nuclear weapons compelled conventional forces to disperse in order to present as small a target as possible. The existence of battlefield nuclear weapons precluded the use of traditional tactics.

Today, the Soviets see the TVD as the basic operational-strategic echelon with which to plan and to conduct a theater campaign as described by Marshal N. Ogarkov in 1982.[28] Further, evidence indicates that since the early 1960s, and no later than the mid-1970s, the Soviet General Staff had partitioned the earth into approximately seventeen theaters: four oceanic, six continental, five intercontinental, and at least two maritime.[29] Not all of these TVDs have field forces assigned; in some cases they serve as planning regions for contingency operations by the Soviet Armed Forces. (See Figure 1)

The current definition of a TVD as published in the Military Encyclopedic Dictionary is remarkably similar to that found in the Soviet Military Encyclopedia and the Dictionary of Basic Military Terms. Fundamentally, the only changes which have occurred center around the scale of operations and in the creation of a command-in-being to control a TVD in peacetime. The final element of the postwar evolution of the TVD involves the militarization of space.



SOURCE: Soviet Military Power 1985, 4th ed., (Washington, D.C.: Government Printing Office, 1985) pp. 12-15.

Figure One: The TVDs of the Eurasian Landmass

Soviet Views on the Military Use of Outer Space

Since the early 1960s the Soviets have devoted many articles in their journals to the discussion of the potential military use of outer space. In only a few cases, however, have they directly described their own programs for the military use of space. Fundamentally, as an indirect means of discussing military developments in their own country, the Soviets use selected and "distorted" extracts from the Western press. Obviously, articles based on the foreign press can be simply expositions on developments in the West, however, at times these articles are clearly descriptions of Soviet views placed in the mouths of unnamed "Western military experts." Regardless, the Soviets use the foreign press to stimulate the dialectic process within their own military. Using this indirect approach, Soviet authors continue to explore the role of outer space in support of military operations.

Militarization of Space

In December 1959, Krushchev created a fifth branch of the Soviet Armed Forces -- the Strategic Rocket Forces. The mission of this new branch was to conduct military operations in the strategic depth of a theater, utilizing the then new ICBMs. Complementing the Strategic Rocket Forces, and providing the defensive shield for offensive operations, was PVO strany (Air Defense of the Nation). "This service of the armed forces was created for the purpose of anti-air (PVO) and anti-missile (PRO) defense of the country."30 The creation of the Strategic Rocket Forces and its primary weapon, the ICBM, altered the spatial and temporal nature of war within a TVD and for the first time, introduced outer space into the military

calculus of war. However, Marshal Sokolovskiy, in the 1962 edition of Voyennaya strategiya (Military Strategy), made no mention of the need for anti-space (PKO) defensive operations by PVO strany. Marshal Sokolovskiy concentrated instead on the need to track developments in the West in order to prevent technological surprise. Marshal Sokolovskiy stated:

> Because in recent years the imperialist aggressors have devoted great attention to a study of the possibilities of carrying out military actions in space and through space, Soviet military strategy cannot ignore this fact and must also study the possibilities opening up in this sphere of military action.[31]

Later, in the 1963 edition Sokolovskiy incorporated anti-space defensive operations into the missions of PVO strany, when he stated:

> The rapid development of spacecraft and specifically of artificial earth satellites which can be launched for the most diverse purposes, even as vehicles for nuclear weapons, has put a new problem on the agenda, that of defense against space devices -- PKO.[32]

In a discussion of the scale of a future nuclear war, Sokolovskiy stated: "The concept of 'geographic expanse' of war in the future will require a substantial supplementation inasmuch as military operations may embrace space."[33]

In the early 1960s Soviet military analysts, in the context of Voyennaya strategiya, began to discuss the role of space in military operations. They concentrated their efforts on enhancing communications, navigation, weather forecasting, reconnaissance, and surveillance activities in support of ground operations. They were forced to deal with these issues in the context of a global nuclear war.

In 1969, Soviet authors began to discuss the role of space in military operations, again using the foreign press, citing that:

> U.S. military theorists devote considerable attention to the elaboration of operational-strategic concepts on space as a possible area of military operations. The substance of their

> conclusions is that near space can be used primarily for armed forces support and for battle against the space missile systems of the probable enemy.[34]

By the late 1970s, this concept was further developed by Yu. Galich and N. Kocheshkov. Writing in Morskoy sbornik, they attributed to the author of an article, which appeared in the U.S. Naval Institute Proceedings, the following:

> National survival is now dependent upon land, sea, air and space power. Neglect of any one of these concepts will only lead to disaster. . . . In order to insure our ability to survive, we must direct our energies toward the establishment of supremacy in space.[35]

According to the American translators of this Soviet article, the last sentence quoted above was not in the Proceedings piece. Therefore, this author concludes that the "establishment of supremacy in space" is a Soviet goal.

Military Space Geography

Soviet writings also included an analysis of the militarily significant regions within the Earth-Moon system, as military analysts attempted to define the various subdivisions of outer space with respect to their military utility. In the early 1960s attention focused on the following regions: "near outer space,"[36] "circumlunar space,"[37] and the Moon[38]. By the 1970s, new terms began to appear in this "debate," to include: "circumterrestrial space, near space, and outer space."[39]

In the 1980s this discussion expanded to encompass the libration points originally described by the renowned mathematicians Euler and Lagrange in the 18th Century.[40] The interest shown in the libration points in various Soviet journals stems from the unique character of these zones

with respect to the Earth-Moon system. A. Brykov, in an article in Aviatsiya i kosmonavtika in July 1981, provided a detailed description of these libration points and the gravitational advantage these points and zones have relative to the Earth-Moon system. The "triangular libration points" are in effect the "high ground" of the Earth-Moon system.[41] Objects placed in these zones will tend to remain in a fixed position relative to the Earth and the Moon. If you think of the Earth as being located at the bottom of a 4,000 mile deep gravity well, the Moon would then be located at about 95 percent of the distance to the top of this well. The libration points, on the other hand, would reside on the "plateau" at the top of this gravity well. Given these parameters, we can tentatively describe the zone of militarily significant space as: (A) "circumterrestial space," 60-160 kilometers in altitude; (B) "near space," up to possibly 130,000 kilometers, which encompasses the militarily significant region of geosynchronous orbit; and, (C) "outer space," out to 900,000 kilometers, which includes the Moon, circumlunar space, and the libration points.[42] (See Figure 2)

These zones in space represent, if you will, the military "space geography" of the Earth-Moon system, which includes several other important zones. One of these, the volume from the Earth's atmosphere to geostationary orbit, is presently the area of greatest human activity in space. From the point of view of time and distance this volume represents, in this author's opinion, the tactical and operational-tactical depth of a space theater. The strategic depth of the space theater is then represented by the Moon and the libration points.

The significance of this analysis by Soviet military theorists stems from their propensity to define the regions and subdivisions within

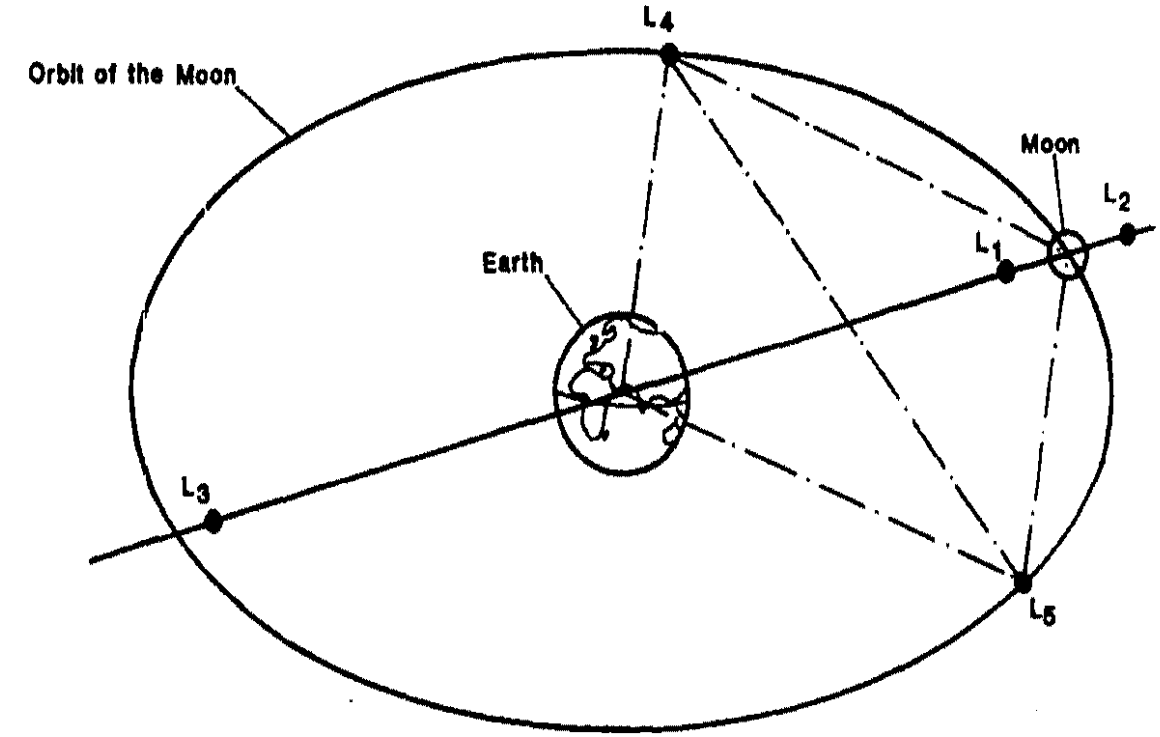


Figure Two: The Libration Points of the Earth-Moon System

Source: A Brykov, "A Station at a Libration Point," Aviatsiya i kosmonavtika, #7 July 1983, pp. 42-43.

theaters, for the purpose of establishing a common basis of understanding within the military establishment.

Space Theater of Military Operations

With this background on the "space geography" of the Earth-Moon system, another facet of Soviet writings becomes important. That is, the Soviet use of the term TVD in the context of outer space. The earliest uses of outer space in relationship to the theater concept are found in the 1960s. In this period, however, these references dealt almost exclusively with distinct systems in space for direct support of theater operations on Earth.[43] The tone of these writings began to shift around 1968 towards viewing outer space as a potential theater of military operations in its own right. The 1968 edition of Sokolovskiy's Voyennaya strategiya stated that:

> The problem of research and the military mastery of space are widely and quite openly discussed in the American press, where it is emphatically stressed that "space is the strategic theater of tomorrow."[44]

Soviet views on a "space theater" grew more confident in the decade of the 1970s, but still the emphasis was on the potential development of space into a theater of military operations, a view which continued to be presented through the prism of the foreign press.[45] In 1971, Major General I.I. Anureyev writing in Weapons of Antimissile and Antispace Defense, surmised:

> It is quite possible, the American press has announced, that in two or three decades, the moon, in terms of its military significance, will have in our eyes as much value as the various key regions on the earth for which the basic military clashes have been fought for their possession.[46]

When he wrote this the "key regions" were areas which were -- and are presently -- covered by various TVDs, both continental and oceanic. At the same time, the Soviets also insisted on the need to keep space from being turned into a TVD. Captain 1st Rank P. Milovskiy writing in Morskoy sbornik in April 1973, stated that: ". . . the study and the use of space can be turned to the good of mankind only if it is not converted into a theater of operations. . . ."[47]

With the coming of the 1980s the debate in Soviet journals on space as a TVD grew in volume and significance. The fundamental reason behind this interest in space seems to have been the growing awareness within the Soviet military of the significance of space in any future war. The Soviets date the transformation of the U.S. civilian space program into an "exclusively" military space program to the occupancy of the White House by President Carter.[48] With the election of Ronald Reagan, and especially after his Strategic Defense Initiative speech of 23 March 1983, the number of Soviet articles concerned with the U.S. militarization of space became even more prolific. G. Sibiryakov, quoting Business Week magazine, stated in 1980: "Whoever can seize control of space -- that main arena of future wars -- will be able to change the correlation of forces so decisively that it will be tantamount to establishing world supremacy."[49]

In 1982, A. T. Timofeyev, quoting from Mother Jones magazine, insisted that: ". . . on 1 September 1982, the Pentagon declared circumterrestrial space to be a potential "theater of military operations."[50] [emphasis added] Other than a reference to the Moon as a "theater of nuclear rocket war,"[51] this reference by Timofeyev is the first mention of an actual area of outer space as a potential TVD. In 1983, Colonel V. Viktorov expanded

the scope of this discussion concerning a space TVD, when he described ". . . outer space as a potential theater of military operation. . . ."[52] [emphasis added]

This is not to say that the Soviets see two or more theaters in space, although this is possible. Instead, what we may be observing is an attempt by Soviet military theorists to define the terminology applicable to a space theater. Persuant to this effort, A. Rudev, in Aviatsiya i kosmonavtika, in March 1983, bluntly stated: "The ruling circles of the U.S.A. view space as one of the Theaters of Military Operations."[53] Rudev seems to be treating space, in general, as co-equal with the other planetary TVDs. In May 1983, two months after the so-called "Star Wars" speech, E. Buynovskiy wrote: "In recent times, reports on the preparations being made in the United States for the creation of a new Theater of Military Operations -- the space theater -- have begun to appear more and more frequently in the Western press."[54] Additional clues on the evolution of Soviet views on a space theater were provided by G. Zhukov of the U.S.S.R. Academy of Science, writing in Izvestiya in January 1984, when he described "near space as a theater of military actions."[55]

A final ingredient in the evolution of the Soviet space theater concept can be found in an article in Aviatsiya i kosmonavtika in 1983 by L. Tkachev in which he states, "In the future space will become the principal theater of military operations."[56] The term "principal theater of military operations" is the translation of the Russian phrase: glavnyy teatr voyennykh deystviy. This term was defined in 1965 as:

> The theater in which the main strategic groupings of belligerent powers are deployed and operating, both as a result of an emerging international arrangement of forces and by virtue of prevailing economic, military, political, and geographic conditions. The main military-political and strategic goals in the armed conflict are attained in the main theater of military

operations, as a result of which there is usually a rapid change in the course of the war.[57]

Tkachev concludes his description of the main TVD in space with the statement: "In the author's opinion, combat operations on the Earth will commence after one of the opposing sides gains supremacy in space."[58]

Combined Arms in Space

Given the Soviet emphasis on space as a TVD, and in the future as the main TVD, what can be said concerning the roles and missions of such a TVD? Further, what types of weapons systems might be found in such a TVD?

Soviet authors state that at least three classes of "space" weapons systems exist in theory: (1) space-to-surface, (2) space-to-space, and (3) surface-to-space systems.[59] The first class of weapons systems take the form of satellites or spacecraft equipped with directed energy weapons, missiles, or bombs capable of hitting targets on the ground or at sea.[60] The second category, the space-to-space systems, includes space stations for the defense of satellites against enemy antisatellite systems (ASAT);[61] and, orbital battle stations equipped with lasers and particle beams for striking enemy satellites or ICBMs as well as equipped with interceptor spacecraft.[62] The final category, the surface-to-space systems, include: ASAT, manned transatmospheric vehicles, ground based or space based ABM systems utilized for intercepting satellites and orbital combat stations, and "space mines" armed with conventional munitions for the destruction of enemy systems in space.[63]

Coupled with these three categories of "active means" of space warfare, are military "support systems" employed in direct support of planetary operations. Leningradskaya pravda in August 1982, described

military support systems in space as, ". . . reconnaissance, communications, navigation, meteorological and topographic support and others. . . ."[64] The Soviets also describe the use of electronic warfare and maskirovka techniques to protect friendly systems and to disrupt hostile systems in space.[65]

Several authors called attention to the logistical requirements for manned space stations in circumterrestrial space,[66] describing maintenance and supply bases (located in far space) designed to support three 1,000 ton, nuclear powered, laser equipped orbital battle stations, each "manned by a crew of up to 1,000 men."[!][67] These combat and logistical systems would be augmented by intelligence collection and battle management or command posts in space. In 1971, for example, Anureyev described a ground based "command point" with a back up in orbit.[68] In 1982, S. Stashevskiy and G. Stakh provided more detail when they discussed the military role of the US space shuttle:

> The shuttle is to be used for the creation of orbital military stations, which will be manned by 10-14 individuals and should function permanently as space based command points (in addition to the aircraft used for these purposes) and reconnaissance stations for the observation of objects on earth, in the air, and in space.[69]

This Soviet command and control system also incorporates naval "command-telemetry stations" at sea for operational control of orbital facilities.[70]

A final element of combined arms operations within a space TVD was provided by Y. Tomilim in 1984, when he described a space arms race:

> . . . first one side to be followed by the other, or the two sides simultaneously develop antisatellite weapons capable of attacking spacecraft both at high and low altitudes, thus posing a threat to early warning satellites, i.e., satellites designed to detect ICBM launches. Then the other side either develops a

> system capable of attacking the enemy's new antisatellite weapons systems or produces a combat space station capable of defending satellites. Or it may create both. Then the other side devises a system to attack this weaponry of the enemy. And the story repeats itself all over again.[71]

IMPLICATIONS AND CONCLUSIONS

The Soviets have written about the militarization of space for twenty-five years. They have concentrated on the influence of circumterrestrial and near space on military operations on Earth. They foresee a time, as with the evolution of air power, when space superiority will become a prerequisite for ground superiority. Furthermore, they seem to suggest that circumterrestrial space, and possibly near space, can be viewed as the "coastal" zones of a space theater, similar in concept to the maritime zone of a continental or oceanic TVD. Thus, we may be seeing the development, within Soviet military science, of a space analog to the maritime TVD. Such a zone in space would be responsible for space combat operations in support of planetary operations, and would form a secondary theater directly subordinated to the main planetary theater.

By implication, once space operations extend beyond a critical distance from the Earth -- possibly beyond geostationary orbit -- space forces would no longer fall under the direct control of the main planetary TVD; but, would instead -- again using the analog of an oceanic TVD -- become an independent theater, pursuing independent missions under the direction of Stavka. Once an independent space theater becomes feasible, the prediction of Tkachev should reach fruition -- space should then become the main TVD.

Another factor to consider is the possible existence of a "command-in-being" to deal with the day to day operation of a space theater. Such

an organization may possess the associated military district structure found within a surface TVD in peacetime.

Currently, the Soviet Union might be in the early stages of forming a space TVD. This TVD, once created, should possess various offensive and defensive weapons systems and military support systems for conducting combined arms operations in space. The next phase in development of a space TVD might include the building of a permanent orbital space station derived from modules. The Soviets describe these modules as being similar in size and mass to that of the Salyut-6.[72] Coupled with the development of a large modular station, the Soviets describe a requirement for "ultra-heavy transports" for placing payloads of up to 500 tons in low earth orbit.[73] Finally, Soviet long range goals may include but are not limited to: operations in lunar space; construction of space stations at the libration points; and, orbital battle stations for dominance of outer space.[74] The net result of such developments would be the creation of the basic structure necessary to conduct offensive and defensive operations in space, which would eventually lead to the creation of the "decisive arena of future war" -- the space TVD.

Looking to the future, Sibiryakov predicted in 1980: "Whoever can seize control of space -- that main arena of future wars -- will be able to change the correlation of forces so decisively that it will be tantamount to establishing world supremacy."[75]

END NOTES

The Soviet books, journals, and newspapers used in the preparation of this report were translated from the original sources by various agencies.

1. A. Radziyevskiy, ed. Dictionary of Basic Military Terms (A Soviet View), Translated by DGIS Multilingual Section, Translation Bureau, Secretary of State Department, Ottawa, Canada (Washington, D.C.: Government Printing Office, n.d.), 220.

2. Sovetskaya voyennaya entsiklopedia [Soviet Military Encyclopedia] 1980 ed., S.V. "Teatr voyennykh deistviy," by M. M. Kozlov.

3. Ibid.

4. Ibid.

5. John Erickson, The Russian Imperial/Soviet General Staff, College Station Paper 3 (College Station, Texas: Center for Strategic Technology, Texas A&M University, 1981), 66.

6. M. V. Frunze, Sobr. Soch. [Collected Works], Vol. 1, (Moscow-Leningrad: Gosizdat, 1929) p. 203. Quoted in I. Bagramyan and I. Vyrodov, "The Role of Representatives of Stavka VGK During the War Years: Organization and Methods of Their Work," Voyenno-istoricheskiy zhurnal, 8 (August 1980): 27.

7. Ibid.

8. Ibid.

9. M. N. Tukhachevskiy, Voprosy sovremennoy strategii [Problems in Contemporary Strategy] (Moscow: Voyennyy vestnik, 1926), p. 9.

10. V. Ivanov and A. Arkhipov, "Leadership of Military Operations in Theater of Military Operations: Based on Experience of World War II," Voyennaya mysl' 4 (April 1967): 71.

11. V. Gurkin, "Certain Questions from the Experience of Establishing and Operating Troop High Commands of the Sectors in the First Period of the Great Patriotic War," Voyenno-istoricheskiy zhurnal 7 (July 1984): 1.

12. Ivanov and Arkhipov, "Leadership of Military Operations," 71.

13. Gurkin, "Operating Troop High Commands," 7 and 9; Ivanov and Arkhipov, "Leadership of Military Operations," 71.

14. Bagramyan and Vyrodov, "Role of Representatives," 28.

15. John Erickson, The Road to Stalingrad: Stalin's War with Germany (Boulder, Colorado: Westview Press, 1984), pp. 372-374.

16. Ibid., 373.

17. Bagramyan and Vyrodov, "Role of Representatives," 29.

18. Ibid.

19. S. A. Tyushkevich, ed., The Soviet Armed Forces: A History of Their Organizational Development (A Soviet View), trans. DGIS Multilingual Section, Secretary of State Department, Ottawa, Canada (Washington, D.C.: Government Printing Office, n.d.), p. 348.

20. David Glantz, August Storm: The Soviet 1945 Strategic Offensive in Manchuria, Leavenworth Papers no. 7 (Washington, D.C.: Government Printing Office, 1983), pp. 3 and 73.

21. Gregory Baird, "Glavnoye Komadndovanie: The Soviet Theater Command," Naval War College Review 3 (May-June 1980): 43.

22. From an article in Krasnaya zvezda cited by G. Reinhardt, "Atomic Weapons and Warfare," in The Red Army, ed., B. H. Liddell Hart (New York: Harcourt, Brace and Company, 1956) pp. 433-434.

23. "Month by Month," Ordnance 195 (November-December 1952): 452.

24. V. Andreyev, "The Subdivision and Classification of Theaters of Military Operations," Voyennaya mysl' 11 (November 1964): 15.

25. Ibid., 19.

26. Radziyevskiy, Dictionary of Basic Military Terms, p. 220.

27. Andreyev, "Classification of Theaters of Military Operations," 20.

28. N. Ogarkov, Vseyda v gotovnosti k zashchite otechestva [Always in Readiness to Defend the Homeland] (Moscow: Voyenizdat, 1982), pp. 34-35.

29. The estimation of "seventeen" Soviet TVDs is based on analysis by Kevin D. Stubbs, using Soviet Military Power 1985, 4th ed. (Washington, D.C.: Government Printing office, 1985), pp. 12-15 and V. Suvorov, "Strategic Command and Control: The Soviet Approach," International Defense Review 12 (December 1984): 1813-1820.

30. V.D. Sokolovskiy, Soviet Military Strategy, trans. and ed. with analysis and commentary by Harriet Fast Scott (New York: Crane Russack, 1984), p. 250.

31. Ibid., p. 463.

32. Ibid., p. 251.

33. Ibid., p. 205.

34. I. Rognedin, "Space and Problems of its Conquest," Voyennaya mysl', 6 (June 1969): p. 57.

35. Yu. Galich and N. Kocheshkov, "U.S. Naval Forces and Space Program," Morskoy sbornik 4 (April 1979): 68.

36. V. Anyutin, "Surveillance of Outer Space," Voyennaya mysl' 3 (March 1968): 40.

37. N. Kamanin and I.I. Anureyev, "Ten Years of the Exploration of Space," Voyennaya mysl' 10 (October 1967): 62; Sokolovskiy, Military Strategy, p. 89.

38. Sokolovskiy, Military Strategy, p. 89; Yu. Listvinov, "The Moon and the Pentagon," Voyennaya mysl' 6 (June 1969): 72-79.

39. I.I. Anureyev, Weapons of Anti-rocket and Anti-space Defense (Moscow: Voyenizdat, 1971), pp. 62-63.

40. A. Brykov, "A Station at a Libration Point," Aviatsiya i kosmonavtika, 7 (July 1981): 42-43.

41. Ibid.

42. Anureyev, Antispace Defense, pp. 62-63.

43. Yu. Chubarov, "Communications through Space: Opportunities and Prospects," Voyennaya mysl' 8 (August 1966): p. 58.

44. Sokolovskiy, Military Strategy, p. 85.

45. Rognedin, "Space and Problems," p. 57.

46. Anureyev, Antispace Defense, p. 104.

47. P. Milovskiy, "The International Legal Regime Relating to Outer Space," Morskoy sbornik 4 (April 1973): p. 83.

48. G. Sibiryakov and A. Khabarov, "In a Dangerous Orbit: United States Accelerating the Development of Space Weapons," Krasnaya zvezda, 19 March 1980, 3.

49. Ibid.

50. A. T. Timofeyev, "The Pentagon Burst into Space," Leningradskaya pravda, 4 August 1982, 3.

51. Anureyev, Antispace Defense, p. 102.

52. V. Viktorov, "The Development in the USA of Weapons for Destroying Objects in Space," Zarubeznnoye voyennoye obozreniye 4 (April 1983): 138.

53. A. Rudev, "The Space Shuttle and Space Law," Aviatsiya i kosmonavtika, 3 (March 1983): 36.

54. E. Buynovskiy, "The Pentagon is Dying to get into Space," Aviatsiya i kosmonavtika 5 (May 1983): 75.

55. G. Zhukov, "To Prevent the Militarization of Space," Izvestiya, 2 June 1984, 5.

56. L. Tkachev, "U.S. Militarist Arrogance," Aviatsiya i kosmonavtika 11 (November 1983): 86.

57. Radziyevskiy, Dictionary of Basic Military Terms, p. 59.

58. Tkachev, "U.S. Militarist Arrogance," 86.

59. S. Vol'nov, "Space and Electronic Warfare," Voyennaya mysl' 9 (September 1966): 75; "Kosmicheskaya voyna" [Space Warfare], Sovetskaya voennaya entsiklopediya [Soviet Military Encyclopedia], s.v. (Moscow: Voennoe izdatel'stvo, 1977) Vol. 4, p. 380.

60. G. P. Lavrik, "Gospodstvo v kosmose" [Supremacy in Space], Sovetskaya voennoe entsiklopediya [Soviet Military Encyclopedia], s.v. (Moscow: voennoe izdatel'stvo, 1976), Vol. 2, p. 620.

61. Y. Tomilin, "To Avert the Threat of Militarizing Outer Space," International Affairs 6 (June 1984): 134.

62. Tkachev, "US Militarist Arrogance," 86.

63. Chubarov, "Communications Through Space," 58; Vol'nov, "Space and Electronic Warfare," 78-79; Yu. Chubarov, "Lasers in Communications and Range-and-Detection Systems," Voyennaya mysl' 3 (March 1967): 36; Sokolovskiy, Military Strategy, 85; S. Stashevskiy, "The USSR in the Struggle for a Peaceful Outer Space," International Affairs 7 (July 1981): 83; and, S. Stashevskiy and G. Stakh, "Outer Space Must be Peaceful," Mirovaya ekonomika mezhdunarodnyye otnosheniya 2 (February 1982): 97.

64. Timofeyev, "The Pentagon," 3.

65. Vol'nov, "Space and Electronic Warfare," 75.

66. V. P. Mishin, "The Road into Orbit," Aviatsiya i kosmonavtika 11 (November 1980): 45; K. P. Feoktistov and M. M. Markov, "Evolution of Salyut Orbital Station," Zemlya i vselennaya 5 (September-October 1981): 10-11.

67. Tkachev, "US Militarist Arrogance," 86; V. Rykunov, "The Laser Terrorists," Sotsialisticheskaya industriya, 16 May 1984, 120.

68. Anureyev, Antispace Defense, p. 222.

69. Stashevskiy, "Outer Space Must be Peaceful," 97.

70. G. Tamkovich, "On Space Patrol," Aviatsiya i kosmonavtika 6 (June 1983): 44-45.

71. Tomilim, "Militarizing Outer Space," 134.

72. V. I. Sevast'yanov, "Earth-Space-Earth," Sovetskaya estoniya, 5 December 1979, 3; B. Fedorov, "Comments on Future of Soviet Space Program [Excerpts] Ekonomicheskaya gazeta, 4 January 1981, 24.

73. R. Akhemetov, "Energy from Orbit," Sotsialisticheskaya industriya, 22 October 1981, 4; Mishin, "The Road into Orbit," 50.

74. Brykov, "Libration Points," 42-43; Milovskiy, "Legal Regime," 85; and, Tkachev, "US Militarist Arrogance," 86.

75. Sibiryakov, "In a Dangerous Orbit," 3.

SOURCES CONSULTED: Development of the Concept of a Theater of Military Operations

Alferov, S. "Strategic Deployment of Soviet Troops in the Western Theater of Military Operations in 1941." Voyenno-istoricheskiy zhurnal 6 (June 1981): 30-39.

Alkhimenko, A. "Operational Organization of Ocean and Sea Theaters of Naval Operations." Morskoy sbornik 1 (January 1980): 11-18.

Andreyev, V. "The Subdivision and Classification of Theaters of Military Operations." Voyennaya mysl' 11 (November 1964): 15-20.

_____. The Geographical Factor and Strategy." Voyennaya mysl' 4 (April 1969): 30-39.

Bagramyan, I. and Vyrodov, I. "The Role of Representatives of Headquarters Supreme High Command During the War Years. Organization and Methods of Their Work." Voyenno-istoricheskiy zhurnal 8 (August 1980): 27-36.

Baird, Greyory. "GlavnoKomandovanie: The Soviet Theater Command." Naval War College Review 3 (May-June 1980): 40-48.

Dzheleukhov, Kh. "Combating Strategic Reserves in a Theater of Military Operations." Voyennaya mysl' 11 (November 1964): 2-14.

Erickson, John. The Soviet High Command: A Military-Political History 1918-1941. New York: St. Martin's Press, 1962.

_____. The Russian Imperial/Soviet General Staff. College Station Paper 3. College Station, TX: Center for Strategic Technology, 1981.

_____. The Road to Berlin: Continuing the History of Stalin's War with Germany. Boulder, CO: Westview Press, 1983.

_____. The Road to Stalingrad: Stalin's War with Germany. Boulder, CO: Westview Press, 1984.

Erickson, John; Hansen, L.; Sella, A.; Volgyes, I.; Westwood, J.; Woff, R. Organizing for War: The Soviet Military Establishment Viewed Throuyh the Prism of the Military District. College Station Paper 2. College Station, TX: Center for Strategic Technology, 1983.

Glantz, David. August Storm: The Soviet 1945 Strategic Offensive in Manchuria. Leavenworth Papers no. 7. Washington, D.C.: government Printing Office, 1983.

Gurkin, V. "Certain Questions From the Experience of Establishing and Operating Troop High Commands of the Sectors in the First Period of the Great Patriotic War." Voyenno-istoricheskiy zhurnal 7 (July 1984): 1-11.

Ivanov, V. and Arkhipov, A. "Leadership of Military Operations in Theaters of Military Operations: Based on the Experience of World War II." Voyennaya mysl' 4 (April 1967): 70-82.

Karpov, V. and Zubkov, N. "On Certain Trends in the Development of the Theory and Practice of Offensive Operations by Groups of Fronts." Voyenno-istoricheskiy zhurnal 10 (October 1983): 7-15.

Kulikov, V. Akademiya general'nogo shtaba [Academy of the General Staff] Moscow: Voyenizdat, 1976.

Lomov, N., ed. Scientific-Technical Progress and the Revolution in Military Affairs (A Soviet View). Translated by the United States Air Force. Washington, D.C.: Government Printing Office, n.d.

"Month by Month." Ordnance 195 (November-December 1952): 452-454.

Odom, William. "Soviet Force Posture: Dilemmas and Directions." Problems of Communism 4 (July-August 1985): 1-14.

Ogarkov, N. Vsegda v gotovnosti k zashchite otechestva [Always in Readiness to Defend the Homeland]. Moscow: Voyenizdat, 1982.

Radziyevskiy, A., ed. Dictionary of Basic Military Terms (A Soviet View). Translated by DGIS Multilingual Section, Translation Bureau, Secretary of State Department, Ottawa, Canada. Washington, D.C.: Government Printing Office, n.d.

Reinhardt, G. "Atomic Weapons in Warfare." In The Red Army. Edited by B. H. Liddell Hart. New York: Harcourt, Brace and Company, 1956.

Sokolovskiy, V. Soviet Military Strategy. Harriet Fast Scott, ed. New York: Crane, Russak and Company, 1975.

Soviet Military Power 1985. Fourth ed. Washington, D.C.: Government Printing Office, 1985.

Sovetskaya voyennaya entsiklopediya, Vol. 8, 1980. S.V. "Teatr voyennykh deystviy," by M. Kozlov.

Suvorov, Viktor. "Strategic Command and Control: The Soviet Approach." International Defense Review 12 (December 1984): 1813-1820.

Titov, K. "The Operational Equipping of the Pacific Theater of Military Operations." Morskoy sbornik 3 (March 1972): 61-71.

Tukhachevskiy, M. Voprosy sovremennoy strategii [Problems in Contemporary Strategy]. Moscow: Voyennyy Vestnik, 1926.

Tyushkevich, S., ed. The Soviet Armed Forces: A History of Their Organizational Development (A Soviet View). Translated by DGIS Multilingual Section, Translation Bureau, Secretary of State Department, Ottawa, Canada. Washington, D.C.: Government Printing Office, n.d.

Vasilevskiy, A. "Memoirs: Supreme High Command Headquarters and Leadership of the Armed Struggle During the Great Patriotic War." Novaya i novyeshaya istoriya 2 (March-April 1982): 1-16.

Zemskov, V. "Characteristic Features of Modern Wars and Possible Methods of Conducting Them." Voyennaya mysl' 7 (July 1969): 19-27.

SOURCES CONSULTED: Soviet View on the Military Use of Outer Space

Akhemetov, R. "Energy from Orbit." Sotsialisticheskaya industriya, 22 October 1981, 62-65.

Aleksandrov, B. and Yur'yev, A. "Air and Space Reconnaissance in Armed Conflict." Voyennaya mysl' 10 (October 1965): 1-14.

Anureyev, I. I. Oruzhiye protivoraketnoy i protivokosmicheskoy oborony [Antimissile and Space Defense Weapons]. Translated excerpts by Joint Publication Research Service. JPRS 57378. Arlington, VA.: JPRS, 1972.

Anyutin, V. "Surveillance of Outer Space." Voyennaya mysl' 3 (March 1968): 35-44.

Avduyevskiy, V. S.; Grishin, S. D.; Leskov, L. V.; Ablekov, V. L.; and Yevich, A. F. "Prospects for Power Engineering in Space." Zemlya i vselennaya 6 (November-December 1981): 62-70.

Brykov, A. "A Station at a Libration Point." Aviatsiya i kosmonavtika 7 (July 1981): 42-43.

Buynovskiy, E. "The Pentagon is Dying to Get into Space." Aviatsiya i kosmonavtika 5 (May 1983): 75-78.

Buynovskiy, E. and Tkachev, L. "Star Weapons." Aviatsiya i kosmonavtika 8 (August 1984): 11-16.

Chubarov, Yu. "Communications Through Space: Opportunities and Prospects." Voyennaya mysl' 8 (August 1966): 56-70.

_____. "Lasers in Communications and Range-and-Detection Systems." Voyennaya mysl' 3 (March 1967): 33-43.

Dmitriyev, A. S. and Koshelev, V. A. "Self Contained Propulsion Systems." In Space Propulsion Systems of the Future. Moscow: Izdatel'stvo znaniye, 1982.

Fedorov, B. "Comments on Future of Soviet Space Program." Ekonomicheskaya gazeta, 4 January 1981, 24.

Feoktistov, K. P. and Markov, M. M. "Evolution of the Salyut Orbital Station." Zemlya i vselennaya 5 (September-October 1981): 10-17.

Galich, Yu. and Kocheshkov, N. "U.S. Naval Forces and Space Program." Morskoy sbornik 4 (April 1979): 68-71.

Grisenko, V. "Reconnaissance From Space." Morskoy sbornik 11 (November 1979): 91-94.

Kalugin, Ye. "The Nature of Combat Operations of Air Defense Troops." Voyennaya mysl' 1 (January 1968): 43-52.

Kamanin, N. and Anureyev, I. "Ten Years of Exploration of Space." Voyennaya mysl' 10 (October 1967): 55-64.

Kondrat'yev, A. "The Development of U.S. Satellite Communication Systems." Zarubezhnoye voyennoye obozreniye 9 (September 1981): 63-67.

_____. "The Militarization of the American Space Program." Voyennaya mysl' 6 (June 1968): 75-83.

Listvinov, Yu. "The Moon and the Pentagon." Voyennaya mysl' 6 (June 1969): 72-79.

_____. "No Weaponry in Outer Space." Soviet Military Review 12 (December 1981): 45-47.

Mikhaylov, Yu. "For Space Weapons." Aviatsiya i kosmonavtika 12 (December 1983): 44-45.

Milovskiy, P. "The International Legal Regime Relating to Outer Space." Morskoy sbornik 4 (April 1973): 83-86.

Mishin, V. P. "The Road into Orbit." Aviatsiya i kosmonavtika 11 (November 1980): 42-44.

Radziyevskiy, A., ed. Dictionary of Basic Military Terms (A Soviet View). Translated by the DGIS Multilingual Section, Translation Bureau, Secretary of State Department, Ottawa, Canada. Washington, D.C.: U.S. Government Printing Office, n.d.

Rognedin, I. "Space and Problems of its Conquest." Voyennaya mysl' 6 (June 1969): 50-58.

Rudev, A. "The 'Space Shuttle' and Space Law." Aviatsiya i Kosmonautika 3 (March 1983): 36-37.

Rykunov, V. "Washington's Space Goals." Sotsialisticheskaya industriya, 15 March 1984, 4.

_____. "The Laser Terrorists." Sotsialisticheskaya industriya, 16 May 1984, 4.

Sevast'yanov, V. "Earth-Space-Earth." Sovetskaya estoniya, 5 December 1979, 3.

Shishov, L. "The Strategy of Adventurism in Space." Aviatsiya i kosmonavtika 2 (February 1984): 18-19.

Shvetsov, Yu. "The Target -- Space." Sovetskaya Rossiya, 29 January 1983, 3.

Sibiryakov, G. and Khabarov, A. "In a Dangerous Orbit: The United States Accelerating the Development of Space Weapons." Krasnaya zvezda, 19 March 1980, 3.

Sitnikov, A. "Prevent the Militarization of Space: Disarmament is a Demand of Reason." Pravda, 24 September 1984, 4.

Sokolovskiy, V. D. Soviet Military Strategy. Third edition. Translated and edited with analysis and commentary by Harriet Fast Scott. New York: Crane, Russak, 1975.

Stashevskiy, S. "The USSR in the Struggle for a Peaceful Outer Space." International Affairs 7 (July 1981): 62-69.

Stashevskiy, S. and Stakh, G. "Outer Space Must be Peaceful." Mirovaya ekonomikai mezhdunarodnyye otnosheniya 2 (February 1982): 15-24.

Sovetskaya voennoe entsiklopediya [Soviet Military Encylopedia], Vol. 2. Moscow: Voennaya izdatel'stvo, 1976. S. v. "Space Warfare," by G. P. Lavrik.

Sovetskaya voennoe entsiklopediya [Soviet Military Encyclopedia], Vol. 4. Moscow: Voennaya izdatel'stvo, 1977. S. v. "Supremacy in Space."

Tamanskiy, V. "Ground Radar Stations of the North American Aerospace Defense System." Zarubezhnoye voyennoye obozreniye 11 (November 1983): 47-55.

Tamkovich, G. "On Space Patrol." Aviatsiya i kosmonavtika 6 (June 1983): 44-45.

Timofeyev, A. "The Pentagon Bursts into Space." Leningradskaya pravda. Interview by V. Morozov, APN Military Reviewer, 4 August 1982, 3.

Tkachev, L. "US Militarist Arrogance." Aviatsiya i kosmonavtika 11 (November 1983): 42-43.

Tomilim, Y. "To Avert the Threat of Militarizing Outer Space." International Affairs 6 (June 1984): 61-67.

Tyul'pankov, B. "The Use of Space Equipment in the U.S. Navy." Zarubezhnoye voyennoye obozreniye 3 (March 1982): 69-73.

Vasil'yev, A. "The Development of Military Space Systems and Equipment in the USA." Voyennaya mysl' 8 (August 1971): 99-107.

Viktorov, V. "The Development in the USA of Weapons for Destroying Objects in Space." Zarubezhnoye voyennoye obozreniye 4 (April 1983): 45-47.

Vol'nov, S. "Space and Electronic Warfare." Voyennaya mysl' 9 (September 1966): 74-86.

Yur'yev, Yu. "Artificial Earth Satellites in Reconnaissance Systems." Voyennaya mysl' 9 (September 1973): 54-67.

Zhukov, G. "To Prevent the Militarization of Space." Izvestiya, 2 January 1984, 5.

SECTION VI

Conclusions

Dr. Richard E. Thomas

The general results of the research effort which formed the basis for the papers contained in this volume are, of course, described in those individual documents and in the Overview. It is appropriate, nonetheless, to assemble those elements which, in the view of the author, constitute the major findings.

1. The Soviet concept of a Space TVD indicates that the U.S.S.R. intends to pursue a program, probably long term, to establish a capability to conduct the full range of military combat operations in space. Soviet thinking regarding such operations probably transcends that which has been done in the U.S.
2. The Sixth Soviet Law of War describes an increasing Soviet awareness of and appreciation for the impact of advanced technology in the conduct of military affairs. As a result it is expected that the Soviet Union will make a strenuous effort to increase the productivity and general efficacy of its scientific and technical community.
3. The Soviets appear to be developing the technologies which would enable them to design, produce and deploy high speed cruise missiles in a time-frame which would confront the U.S. with a new, unexpected weapons delivery mechanism.
4. The estimated technical/weapons (i.e. non-political) response to the SDI are as follows:

   Near term -- attack U.S. C3I assets to limit or reduce the target-handling capacity of the system and overload the system with decoys

Mid term -- utilize high speed cruise missiles to make an "end-run" around the SDI

Long term -- develop a capability for full scale military operations in space including offensive as well as defensive, reconnaissance and support activities.

SECTION VII

Biographical Data for the Authors

Dr. Jacob W. Kipp

Dr. Jacob W. Kipp is a Professor of History at Kansas State University and former associate editor of Military Affairs and the Aerospace Historian. Professor Kipp is a Texas Engineering Experiment Station (TEES) Fellow for 1984-1985, and a STRATECH Summer Fellow, 1982-83, 1983-84, and 1984-85. Among his numerous publications are Naval Art and the Prism of Contemporaneity: Soviet Naval Officers and the Lessons of the Falklands Conflict and the forthcoming Historical Analysis of tne Use of Mobile Forces by Russia and the USSR, both published by the Center for Strategic Technology.

Professor Kipp has held numerous graduate fellowships for research in Poland and the Soviet Union. Professor Kipp is fluent in Russian and Polish, with a reading knowledge of French and German. Professor Kipp served as a Scholar-Diplomat in the Department of State in the spring of 1982.

Dr. Alfred L. Monks

Dr. Alfred L. Monks is a Professor at the University of Wyoming, specializing in International Relations, Soviet Military and Foreign Policy, Soviet Domestic Politics, and Soviet Penetration of Central America. Dr. Monks served as chief translator at Oak Ridge National Laboratory, and is fluent in four languages: Russian, German, French, and Spanish.

Dr. Monks is the author of Soviet Military Doctrine: 1960 to the Present, (1984) and The Soviet Intervention in Afghanistan (1981). He has written numerous articles relating to the Soviet Military, including the annual review of the Soviet Air Forces published in Soviet Armed Forces Review Annual, Volumes 1-8.

Mr. Joseph Muniz

Mr. Joseph Muniz is a senior at Texas A&M University majoring in History and Political Science. He has had intensive Russian language training at the Monterey Institute of International Studies during the summer of 1984. This contribution by Mr. Muniz represents his first collaborative effort while employed at the Center for Strategic Technology. Mr. Muniz, upon completing his degree, plans to pursue graduate studies in Soviet Area Studies specializing in the Soviet Military at Georgetown University in Washington, D.C.

Mr. Kevin D. Stubbs

Mr. Kevin D. Stubbs is a Research Associate at the Center for Strategic Technology. Mr. Stubbs holds a Masters of International Relations from Wichita State and is a candidate for a Ph.D. in History from Texas A&M University. Mr. Stubbs served as a Missile Combat Crew commander (Titan II) while on active duty in the U.S. Air Force, and is currently a Captain in the Air Force Intelligence Service Reserve Program.

Mr. Stubbs has written papers dealing with the Role of the Soviet Navy in Ballistic Missile Defense, and coauthored a section on the Evolution of Soviet Mobile Forces with Dr. Charles L. Smith also from the Center.

Dr. Richard E. Thomas

Dr. Richard E. Thomas is the director of the Center for Strategic Technology at Texas A&M, and a professor of Aerospace Engineering. Dr. Thomas received his Ph.D. from Ohio State University in 1964, and wrote his first study of Soviet Weapons while at the Air Technical Intelligence Center in 1952, a study which correctly predicted the appearance of Soviet ICBMs in 1957.

Dr. Thomas has written extensively on U.S. and foreign military technology dealing with aircraft and space systems. In 1983, he published a report on Long Wave Infrared Research in the Soviet Union. Dr. Thomas has served on the NASA Lunar Base Steering Committee and the National Working Group on Strategy.

Mr. Ronald J. Wright

Mr. Ronald J. Wright is a Research Assistant at the Center for Strategic Technology. Mr. Wright holds a Master of Arts in History from Southwest Texas State University and is a Ph.D. candidate in Military History at Texas A&M University. Mr. Wright served in the United States Air Force with a tour of duty in Vietnam in 1969.

Mr. Wright's forthcoming book The Tough 'Ombres: A History of the 90th ("Texas-Oklahoma") Division in World War I, is being published by Presidial Press. Mr. Wright also coauthored and edited the Historical Analysis of the Use of Mobile Forces by Russia and the U.S.S.R., Center for Strategic Technology, September 1985.