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IDA PAPER P-2373

DEVISING AN ARMS CONTROL PROPOSAL
FOR TACTICAL AIR FORCES

John Tillson

March 1990

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Prepared for
Office of the Under Secretary of Defense for Acquisition
(Tactical Warfare Programs)

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

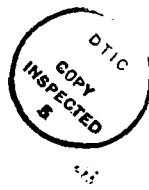
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 1990		3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE Devising an Arms Control Proposal for Tactical Air Forces				5. FUNDING NUMBERS C-MDA 903 89C 0003 TA-T-F6-720	
6. AUTHOR(S) John Tillson					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Institute for Defense Analyses 1801 N. Beauregard Street Alexandria, VA 22311				8. PERFORMING ORGANIZATION REPORT NUMBER IDA Paper P-2373	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) OUSD(A)/TWP The Pentagon Washington, DC 20301				10. SPONSORING/MONITORING AGENCY REPORT NUMBER FFRDC Programs 1801 N. Beauregard Street Alexandria, VA 22311	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This paper analyzes the current NATO and Warsaw Treaty Organization proposals for arms control of tactical air forces in the Atlantic to the Urals (ATTU) region and then devises a more comprehensive approach. This new approach is based on an attempt to meet all objectives of the CFE mandate and is specifically focussed on the effort to limit the capability for surprise, offensive attacks. The paper proposes to limit these capabilities by inhibiting the single role, deep attack aircraft on both sides.					
14. SUBJECT TERMS conventional arms control, CFE, tactical air forces, offensive counter air, surprise attack Vienna negotiations				15. NUMBER OF PAGES 30	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL		

IDA PAPER P-2373

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INSTITUTE FOR DEFENSE ANALYSES

Contract MDA 903 89 C 0003
Task T-F6-720

PREFACE

This paper was prepared by the Institute for Defense Analyses under contract MDA 903 89 C 0003, Task Order T-F6-720, "A Balanced Air-Ground Approach to Conventional Arms Reductions," for the Office of the Under Secretary of Defense for Acquisition/Tactical Warfare Programs. This paper analyzes the current NATO and Warsaw Treaty Organization proposals for arms control of the tactical air forces in the Atlantic to the Urals (ATTU) region. It then devises a more comprehensive approach. This new approach is based on an attempt to meet all objectives of the CFE mandate and is specifically focused on the effort to limit the capability for surprise, offensive attacks.

This work was reviewed by General William Minter, General William Momyer, General W. Y. Smith, Dr. Victor Utgoff, and Mr. T. Christie.

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DEVISING AN ARMS CONTROL PROPOSAL FOR TACTICAL AIR FORCES

The negotiations on Conventional Armed Forces in Europe (CFE) between the nations of NATO and the Warsaw Treaty Organization (WTO) now underway in Vienna consist of two separable aspects--the efforts to limit ground forces and the efforts to limit tactical air forces within the Atlantic to the Urals (ATTU) region. Each has been handled differently, and as a result, each has experienced a different degree of success in the negotiations.

Ground force reductions between NATO and the WTO have been the subject of extensive negotiations over many years. The ground force element of the current proposal was subject to extensive deliberations within NATO before it was introduced at the Vienna talks. As a result of this preparation, the ground force element of the NATO proposal is widely accepted within NATO and the WTO. In contrast, air force reductions have not been the subject of extensive NATO/WTO negotiations and have received little attention within NATO. The air element of the proposal was submitted to the Vienna talks without the same degree of review as the ground element. As a result, there is little agreement on this issue between NATO and the WTO.

This paper outlines an approach to an arms control proposal for tactical air forces that is designed to conform to the objectives of CFE. The approach is based on the same principles NATO used in building a proposal for ground forces. The paper points the way to balancing the two aspects of the current Vienna talks and to devising a proposal for the next set of negotiations. The paper first describes the WTO and NATO operational strategies that guide the development of the force structures and the war plans of the opposing air forces. It then identifies the force elements that are most worrisome to the opposing side and shows how those elements could be limited. It then analyzes the current NATO and WTO proposals and other factors that have not been included in the proposals. It demonstrates how NATO can preserve its nuclear delivery capability and how many of the definitional difficulties in the CFE talks can be resolved. A new arms control is outlined, which includes the best aspects of the current NATO and WTO proposals and additional elements designed to meet the goals of the CFE mandate. The paper

demonstrates why surface-to-surface missiles (SSMs) should be included in the air force proposal, identifies areas that require further study, and sets forth some conclusions.

I. OPERATIONAL STRATEGY OF NATO AND WTO AIR FORCES

Constructing an arms control proposal for tactical air forces requires an understanding of the size, structure, and operational strategy of both NATO and WTO air forces. This knowledge provides the basis for understanding how each side views the intentions and capabilities of the other and provides insights that allow for the creation of workable arms control proposals. This section summarizes the size and structure of the two air forces and describes their operational strategies.

A. The Opposing Forces

Table 1 shows the classic profiles of the two opposing forces. WTO has more total aircraft and an advantage in bombers and air defense fighters, while NATO has more ground attack aircraft. The table, which is limited in scope, reflects the level of detail reached in most NATO arms control discussions. Unfortunately, this level of detail does not allow for categorization of aircraft that would be useful for arms control. This paper details the strategy and the structure of the opposing forces as a basis for developing a specific arms control approach.

Table 1. NATO and WTO Air Forces in the ATTU

	NATO	WTO
Bombers	18	285
Ground attack	3,210	2,510
Air defense/fighters	1,200	4,240
Other ^a	2,300	6,000
Total	6,700	13,000

Source: *The Military Balance, 1989-1990*, International Institute for Strategic Studies, 1989.

^a This line is the arithmetic difference between the sum of the first three lines and the total NATO and WTO aircraft numbers contained in the NATO proposal in Vienna.

B. WTO Operational Strategy

The aims of a WTO air operation are as follows:

- Destruction of enemy aviation groupings in the theater of strategic military action (TSMA);

- Destruction of enemy operational and strategic reserves in the TSMA;
- Prevention of enemy operational and strategic movement of forces in the TSMA;
- Destruction of the enemy's military and economic potential by long-range aviation.¹

In Western terminology, the first priority of a WTO air operation is the establishment of air superiority by destruction of enemy air power. According to the Voroshilov Lectures:

The aim of an air operation is achieved by the accomplishment of the following vital tasks:

- Destruction of enemy aircraft and flight personnel at airfields;
- Destruction of enemy aircraft and flight personnel in air combat;
- Destruction of enemy naval strike aircraft in their combat maneuver areas or at their bases;
- Destruction of enemy control and air navigation systems;
- Destruction of enemy nuclear ammunition depots, fuel depots, ammunition and material-technical supply depots;
- Destruction and mining of enemy runways and airfields.

The lectures state that an air operation has the following characteristics: decisive aim, mass use of all types of aircraft and combat arms, and short duration of the operation (36 to 48 hours). These characteristics result from the

need to destroy enemy air forces on their airfields in a short period of time, deny the enemy the ability to restore the combat power of destroyed air forces, and deny the enemy the chance to reestablish air bases on its rear airfields. (*Voroshilov Lectures*, p. 319.)

Meeting these requirements calls for

delivering surprise massed strikes on the airfields where the main groupings of enemy aircraft are concentrated. This is the most effective and decisive

¹ These goals are stated in Soviet doctrine and are described in the recent publication of the Voroshilov Lectures, classified lectures presented in the Voroshilov General Staff Academy and brought to the United States by an Afghan officer who attended the academy. This discussion of WTO operational strategy is taken almost entirely from these lectures; however, it is consistent with other descriptions of the WTO air offensive. *The Voroshilov Lectures*, National Defense University Press, 1989.

form of conducting air operations, and requires the destruction of enemy aircraft in the shortest time and the destruction of runways, depots, and command posts on the airfields. This form requires the use of large numbers of front aviation and Long-Range Aviation groupings. (*Voroshilov Lectures*, p. 332)

The relationship between the air operation and the ground offensive is clearly stated in the lectures:

An air operation to destroy enemy aviation groupings may be initiated and conducted under various and very difficult conditions. It can be initiated simultaneously with the commencement of an attack by front forces or can precede it. It is recommended that the air operation for purposes of destroying enemy aviation groupings does not last more than 36-48 hours. The reason is that by the time for commencement of the attack by Ground Forces, front air armies will have to cover and support the front forces during their attack. (*Voroshilov Lectures*, p. 328)

During this 36- to 48-hour period, the WTO plans to mount several massed strikes. The first strike will be designed to weaken NATO air forces and destroy surface-to-air missile (SAM) assets to ensure safe passage of WTO air forces through NATO air defenses. The mission of the second strike will be to destroy the enemy's main aviation groupings, and the mission of the third strike will be to complete the destruction of enemy aviation.

According to the lectures, large numbers of aircraft, SSMs assigned to ground forces, and electronic warfare systems will be used to accomplish these goals. Although not specified in the lectures, the full range of WTO aircraft can contribute to the first strike since it is focused on destroying NATO's SAM defenses that are relatively close to the inter-German border. The second and third strikes will require the use of longer range aircraft capable of reaching NATO airbases. Soviet SU-24 Fencer and TU-26 Backfire aircraft will provide the main elements of the second strike. Only when NATO defenses are thoroughly disorganized, either late in the second strike or in the third strike, could the WTO reasonably consider using its older and more vulnerable Badger and Blinder bombers.

Once the air offensive is concluded, the WTO air forces will shift to support ground forces. This support will include all of the missions of close air support, battlefield interdiction, and deep interdiction. The WTO has large numbers of short-range attack aircraft and an increasing number of attack helicopters to conduct the close air support and battlefield interdiction missions. Deep interdiction strikes in support of ground forces will

be organized like the major strikes organized to attack NATO's air capability. At all times, the WTO air forces will defend their own air space.

Although the lectures do not cover defensive operations, in recent years Soviet commentators have begun to speak about conducting defensive operations in the face of a NATO surprise attack and then shifting to the offensive. According to these commentators, once the NATO offensive has been blunted, the goals of the air offensive will then be pursued. Non-Soviet WTO aircraft generally will not participate in the air offensive. These aircraft are primarily for defensive counter air missions and support of ground forces.

C. NATO Operational Strategy

In response to the WTO threat, NATO has devised a defensive strategy that calls for first achieving air superiority and then providing support to NATO ground forces that are expected to be outnumbered by WTO ground forces. Although NATO aircraft will be under NATO--rather than national--command in wartime, a nationally based analysis of NATO's operational strategy is necessary because national force structures, operating styles, and training differ. By understanding these operational strategies, it is possible to *understand the meaning of an overall NATO air superiority strategy.*

The F-16 A/B is the centerpiece of the Belgian, Danish, and Dutch air forces, and the forces contain a total of about 300 aircraft. These air forces are structured and trained to use about 50 percent of their airplanes for interceptor roles and 50 percent for ground support roles. These nations, with a relatively small number of aircraft and limited training times, focus their air superiority efforts on defensive operations over friendly territory. They focus their ground support efforts on providing direct support to ground forces rather than on deep interdiction. In U.S. Air Force terms, these operational missions are defensive counter air, close air support and battlefield interdiction. None of these aircraft has a nuclear role.

In contrast, the United Kingdom and the Federal Republic of Germany, with much larger air forces, are prepared to conduct a wider range of operational missions. In pursuit of the air superiority goal, both air forces are capable of conducting defensive counter air missions over NATO territory and conducting offensive counter air missions over WTO territory. British Tornado F-3 and British and German F-4F aircraft perform interceptor missions, primarily over friendly territory. Both nations plan to use their Tornado GR-1

aircraft to attack WTO air bases. The British Tornado aircraft also have a nuclear strike mission.

Both nations also plan to conduct a full range of missions in support of their ground forces. British Harriers and Jaguars plan to conduct close air support and battlefield interdiction missions. German F-4F and AlphaJets plan to perform these missions today. But as these aircraft are dropped from the inventory in coming years, the German Air Force will concentrate increasingly on deep targets, and these close support missions will be taken over by German Army helicopters and tactical missiles. British and German Tornado GR-1 aircraft plan to perform deep interdiction missions with some additional support provided by F-4F and Jaguar aircraft.

The U.S. Air Force has a greater number of modern combat aircraft deployed in the ATTU than any other NATO member. These aircraft perform the full range of NATO missions. To meet air superiority goals, the U.S. Air Force plans defensive counter air operations over NATO territory and offensive counter air attacks against WTO air bases. U.S. F-15 and F-16 aircraft will perform defensive counter air missions. In offensive counter air missions, the U.S. Air Force will employ a full range of aircraft. F-15s and F-16s will conduct escort missions; F-4G Wild Weasels and EF-111s will conduct SAM suppression and electronic warfare escort missions; and F-111s, F-16s, and F-4s will conduct the actual attack missions. These aircraft operate in relatively large attack formations to provide mutual support and the benefits of mass.

The U.S. Air Force will also provide a full range of support to NATO ground forces. U.S. A-10s and F-16s will perform close air support and battlefield interdiction missions. Deep interdiction missions will be performed in much the same way as air base attack missions and will employ a full complement of US aircraft operating in large attack formations. In some cases, F-111s may operate singly or in small groups to conduct airbase attack or deep interdiction missions, especially at night.

While the overall air campaign goals of NATO and the WTO may differ, their operational strategies and their planned air operations contain many similarities. Both sides' air forces argue that air superiority is necessary, and both believe that offensive counterair operations will meet their air superiority goal more effectively than defensive counterair operations. In support of these concepts, both NATO and WTO airmen argue that offensive operations will produce an effective defense faster than purely defensive operations. They believe that offensive operations are superior to defensive operations because they allow the attacker to retain the initiative and because they maintain great

pressure on the enemy. U.S. Air Force doctrine calls for aircraft capable of contributing to destruction of the enemy air forces to be committed to that task as top priority. Both sides view the 1967 Israeli surprise attack on the Egyptian Air Force as a modern model of the most effective type of air superiority operation. Many airmen on both sides believe that defensive operations can result in a draw, at best.²

Operationally, both sides conduct offensive and defensive counterair operations, and both sides conduct close air support and interdiction operations. For NATO and the WTO, the offensive counterair attack is *the* most threatening and destabilizing element of the opposing side's air operations. Paradoxically, each side plans to attack enemy airbases--especially airbases on which deep attack aircraft are located, primarily to defend against an enemy attack on its own airbases. The vulnerability of both sides to this type of attack means that significant advantages will accrue to the side that attacks first. This is especially true if, as in the Israeli attack on the Egyptian air force in 1967, the attacker believes he will catch the other side's air force unprepared and on the ground. For these reasons, the pressures on the WTO to initiate a first strike in a crisis could be overpowering.

Another important factor in the air campaign on both sides is the role of SSMs. Both sides have SSMs that can contribute to the battle in support of tactical air forces. SSMs can attack the full range of targets that aircraft attack--SAMs, communication sites, airbases, transportation nodes, and ground forces. Table 2 shows that the WTO currently has a significant advantage in SSMs, yet both sides are improving their SSM force. Future SSMs could take on a much larger portion of the air offensive, particularly if future arms limitation agreements limit the attack capability of air forces but do not constrain SSMs.

Table 2. NATO and WTO Surface-to-Surface Missile Launchers in the ATTU

NATO		WTO	
LANCE (70 km)	70	FROG SS-21 (70 km)	592
Pluton (120 km)	32	Scud (300 km)	500

Source: The Military Balance 1989-1990, International Institute for Strategic Studies, (London), 1989

² Col. John A. Warden III, *The Air Campaign*, National Defense University Press, 1988, p. 26.

II. ARMS CONTROL CONSIDERATIONS

The second step in devising an arms control proposal is to consider each side's operational strategy in light of the arms control objectives of the CFE mandate. Doing so will help identify specific aspects of the opposing forces that need to be controlled to meet the CFE goals.

A. Objectives of the CFE Mandate

The CFE mandate sets forth the following objectives:

- The establishment of a secure and stable balance of conventional forces at lower levels.
- The elimination of disparities prejudicial to stability and security.
- The elimination of the capability for launching surprise and for initiating large-scale offensive actions.

B. Analysis of Current Proposals

To meet these objectives, NATO has called for equal limits on the number of tactical aircraft on each side at levels below each side's current inventories. This step appears to meet the first objective, to the extent that it would achieve a balance of forces at lower levels. The question arises as to whether the NATO proposal is consistent with the other objectives.

With each side free to choose the aircraft it will eliminate, the WTO will be able to retain its overall advantage in numbers of modern aircraft and retain the aircraft that are essential to maintaining its surprise, large-scale offensive capability. They can do this by simply eliminating obsolete or training aircraft. Thus, the implementation of the NATO proposal could result in forces on both sides that are even more oriented to offensive capabilities than they are today, which could lead to instability, particularly in a crisis.

The WTO argues that its proposal to limit the number of strike aircraft will overcome the problems associated with the NATO proposal.³ By limiting the number of strike aircraft, the WTO asserts that its proposal limits the most worrisome aspects of the

³ The WTO definition of strike includes both attack and multi-role aircraft but not fighter interceptor aircraft. NATO defines strike aircraft as aircraft used to conduct nuclear strike operations. The WTO definition is used in this paper.

air offensive capability. But the WTO proposal, like the NATO proposal, does not truly limit the capability of either side to conduct surprise, large-scale offensive attacks.

The proposed limit of 1,500 strike aircraft, including the U.S. F-111 but not the Soviet Backfire bomber, does not specify which type of aircraft to be limited and, therefore, does not ensure that the air offensive capability of either side will be limited. Moreover, by focusing on strike aircraft only, with no overall ceiling, it leaves both sides free to build or maintain advantages in other aircraft such as electronic warfare escorts or fighter interceptors. Finally, given the current WTO advantage in SSMS, the WTO proposal allows the WTO to maintain a significant advantage in offensive, surprise attack capability.

The ground force proposals being negotiated in Vienna do not suffer from these weaknesses. In applying the CFE goals to the proposals for ground force reductions, NATO and the WTO have agreed upon the specific kind of weapons that contribute most to an offensive, surprise attack capability and have agreed that these weapons will be reduced. Both sides have also agreed that different limitations will be applied to each category of weapon. It is these agreements on defining and limiting the weapons that contribute most to the offensive, surprise attack capability of ground forces that makes significant reductions in ground force offensive capabilities possible. No such agreement has been reached in the negotiations on tactical air forces.

C. Applying Operational Criteria to An Arms Control Proposal

With an understanding of the operational doctrines of both sides and of the views each side has of the other side's air operation, it is possible to identify aircraft and other elements of both NATO and WTO air capabilities that represent "disparities prejudicial to stability and security" and that contribute most to "offensive, surprise attack capabilities."

This identification is made in the operational, rather than the tactical or technical, context. In the technical context, any aircraft capable of carrying bombs or other air-to-ground munitions, or any aircraft supporting these aircraft, can be considered offensive. In the tactical context, any aircraft organized in units that are equipped, manned, and trained to carry on combat operations could be called offensive. In the operational context, offensively oriented aircraft are those whose capabilities are most specifically tied to the conduct of large-scale attacks deep into the other side's territory, against his airbases and aircraft. It is these large-scale, operational counterair attacks that each side sees as central to the conduct of a strategic offensive against itself. In many ways, these large-scale,

operational attacks are the conventional equivalent of the strategic nuclear counterforce attack that most concerns strategic planners.

Achieving air superiority through effective conventional attack of another side's airbases, aircraft on those bases, and supporting infrastructure requires large-scale, repeated attacks involving thousands of sorties. These attacks are necessary because neither side can count on obtaining complete strategic surprise--the WTO probably believes that NATO's intelligence is sufficient to provide warning, and NATO has explicitly eschewed the idea of a surprise attack on the WTO. Thus, neither side can expect to easily penetrate the opposing defenses. Nor can it expect to find the enemy's aircraft lined up on the runway where they make good targets.

In addition, neither side can expect any single attack to be decisive--both sides have so many heavily defended airbases and so many aircraft shelters that large numbers of aircraft delivering large quantities of munitions are essential for an effective counterair attack. It is in this context that some aircraft, because of their ability to carry large loads over long distances, are far more important to the air offensive than others. While other aircraft, such as electronic warfare and interceptor aircraft, are essential as escorts and contribute to the air operation by suppressing defenses and killing enemy interceptors, the key to the WTO air offensive and the NATO counterair offensive remains the aircraft with the greatest range/payload capability.

1. Single-Mission Deep-Attack Aircraft

The aircraft most critical to the WTO air offensive, yet having the least credible defensive mission, are modern single-mission deep-attack aircraft. These aircraft represent the primary WTO capability for delivering large munitions loads over long distances. Large numbers of these aircraft are essential for conducting effective air base attack missions and deep interdiction missions. Limiting the number of these aircraft could drastically reduce the WTO offensive, surprise attack capability regardless of what happens to other aircraft in the WTO inventory.

Fencers and Backfires are the WTO aircraft with the greatest capability of carrying large loads for long distances over enemy territory. They represent approximately 75 percent of the WTO modern, long-range bomb-carrying capability, making them the most important element of the WTO air offensive. They represent the primary WTO airbase attack capability.

The F-111, the Tornado, the Jaguar, and the Mirage 2000N are the primary aircraft in the ATTU capable of implementing the attack portion of NATO's counterair offensive. These aircraft represent approximately 60 percent of NATO's modern long-range bomb-carrying capability and are central to NATO's capability to conduct a major attack deep into WTO territory. They also compose much of NATO's nuclear delivery aircraft forces. The Mirage 2000N is generally regarded as a nuclear delivery aircraft only.

2. Electronic Warfare Aircraft

Electronic warfare (EW) aircraft conduct both electronic jamming and SAM suppression missions. They are essential to the WTO air offensive and have only a limited defensive role. Individual WTO attack aircraft have on-board EW systems for self-protection and may be capable of penetrating enemy air defenses without specialized EW aircraft; however, on-board systems are generally insufficient for large-scale attacks. EW escort aircraft that are specially designed for deep-attack missions add significantly to the effectiveness of the WTO air offensive.

U.S. forces in the ATTU also depend on EW escort aircraft in the conduct of their deep operations. Both the WTO and the NATO have other ways of conducting EW operations in support of air superiority operations over friendly territory or in support of ground forces. Aircraft such as the NATO AWACS and the WTO MOSS do not penetrate enemy territory and are not included in this category.

3. Multi-Role Aircraft

Although multi-role aircraft are important to both alliances and have the range and the bomb-carrying capability to contribute to the attack of deep targets, long-range, single-role attack aircraft are more essential for mounting an offensive, surprise attack. Both sides have fewer multi-role aircraft than single-role, deep-attack aircraft, and neither side has sufficient numbers to mount a decisive offensive, surprise attack. Many multi-role aircraft are not assigned deep-attack roles, and they are not capable of rapidly assuming such roles. However, if either side increases the number of aircraft with multiple capabilities, or if single-role, deep-attack aircraft are limited, this category of aircraft will become more important in arms control.

4. Other Aircraft

Both sides have large numbers of other aircraft that contribute to and support the air offensive. For example, shorter range attack aircraft would conduct SAM suppression

attacks close to the border, and fighter interceptors would escort the attack aircraft. These aircraft do not have the range/payload capabilities that would allow them to become central to the air offensive.

These aircraft have other missions they will perform if they are not needed in the air offensive. Shorter range attack aircraft will provide air support to ground forces. Interceptors will conduct defensive air operations. In this context, short-range attack and interceptor aircraft fit the definition of offensive aircraft only if they are linked to other aircraft, such as Fencers or F-111s, that are essential to the air offensive. By themselves, these aircraft do not have the capabilities to meet the demands of a major air offensive.

Although a limit on total aircraft inventories is a useful arms control step, many aircraft on both sides do not contribute to disparities prejudicial to stability and security and are not capable of contributing to a surprise offensive. Among the reasons these aircraft are of little arms control interest are their location and the organization, training, manning and equipping of the units to which the aircraft are assigned. These factors limit the offensive, surprise-attack capability of these aircraft even though, in a technical or tactical sense, they could possibly contribute to an air offensive. While, many of these factors could change, the changes would provide warning, and appropriate responses could be made.

For example, Spanish, Portuguese, Italian, and Greek aircraft and Soviet strategic air defense (PVO) and shorter range attack aircraft based in the Soviet Union are deployed far from the main point of confrontation and would have to redeploy to contribute to a surprise attack. Other aircraft have missions, training, and readiness levels that keep them from the major areas of concern. Belgian, Danish, and Norwegian F-16s and Canadian F-18s have neither missions nor training and readiness levels that would allow them to contribute effectively to a surprise attack. Similarly, most non-Soviet air forces are of little concern because they focus on air defense and do not train in air offensive operations. Both sides have significant numbers of combat capable training aircraft that are in units that do not train for air offensives and are not trained, equipped, or manned for such missions. While any of these conditions could be changed, these changes would not occur quickly or secretly, and appropriate responses would be possible.

5. Modern Aircraft versus Older Aircraft

The most significant generational change for NATO aircraft occurred in the early 1970s when the F-15, F-16, and A-10 were introduced. This generational change occurred somewhat later for the WTO. Given the history of both alliances, modern aircraft can be

defined as aircraft with an initial operating capability (IOC) of 1974 or later or as aircraft that have undergone major modernization since 1974. EW aircraft on both sides have modern EW equipment even though the aircraft themselves may not be modern.

The new aircraft are much superior to their predecessors. Only the modern deep-attack aircraft have a substantial capability for effective deep attack. Older attack aircraft are much more vulnerable to modern SAMs, and their attrition rates in deep attack would be prohibitive. For example, older Soviet bombers, such as Blinders and Badgers, would be unlikely to reach NATO airbases unless they had been preceded by Fencers and Backfires to soften the defense and they were escorted by EW aircraft to protect against SAMs. Although no commander can ignore combat capable aircraft, these older aircraft worry NATO commanders much less than the modern aircraft that are replacing them.

6. Helicopters

Helicopters have not been included in this analysis. They generally belong to the realm of ground forces rather than tactical air forces. In the realm of tactical air forces, helicopters might be seen as potentially contributing to the air offensive in much the same way as short-range, single-role attack aircraft. They may provide some limited support for the air offensive but are not central to its success and are more effectively used in other missions in support of forces. The role of helicopters in supporting operational-level offensive or defensive ground operations is left for a future analysis.

7. NATO and WTO Aircraft in the ATTU

Table 3 lists the aircraft inventories of both sides. It is designed to help identify the aircraft that most directly meet the arms control concerns laid out in the CFE mandate. The grand totals provided in the table are those submitted by NATO at Vienna. The uncertainty in these totals is demonstrated by the number of aircraft categorized as "other," for both NATO and the WTO. The modern aircraft category should be reasonably accurate, however.

Table 3. NATO AND WTO AIRCRAFT IN THE ATTU^a

MODERN AIRCRAFT			
	NATO		WTO
Single-Role Deep-Attack	1,054		1,081
F-111 (US)	140	TU-26 (Backfire)	255
Jaguar (FR & UK)	264	SU-24 (Fencer)	826
Tornado IDS (GE, IT, UK)	620		
Mirage 2000N (FR)	30		
Electronic Warfare Deep-Attack	48		190
F-4G (US)	36	YAK-28 (Brewer)	90
EF-111 (US)	12	TU-16 (Badger)	100
Single-Role Attack	207		890
A-10 (US)	108	MIG-27 (Flogger)	715
AV-8 Harrier (UK, SP)	99	SU-25 (Frogfoot)	175
Single-Role Interceptor	239		650
Tornado ADV (UK)	125	MIG-25 (Foxbat)	400
F-15 (US)	114	MIG-31 (Foxhound)	250
Multi-Role	861		725
F/A-18 (CA, SP)	103	SU-27 (Flanker)	225
F-16(BE, NL, DN, NO, US)	683	MIG-29 (Fulcrum)	500
Mirage 2000 (FR)	75		
Total Modern Aircraft	2,400		3,500

^a The table is based primarily on an analysis of the data contained in the *The Military Balance 1989-1990* published by the International Institute for Strategic Studies. This is the primary public data base that provides detailed information on aircraft by type and location.

Table 3. NATO AND WTO AIRCRAFT IN THE ATTU (CONT.)

OLDER AIRCRAFT			
	NATO		WTO
Single-Role Deep-Attack	59		365
Buccaneer (UK)	59	TU-22 (Blinder) TU-16 (Badger)	140 225
Single-Role Attack	699		1,155
A-7 (GR, PO)	99	IAR 93 (RO)	30
Mirage 4 (FR)	47	MIG-17	225
G-91 (IT, PO)	194	SU-17, 20, 22	900
Alphajet (FR, GE)	274	(Fitter C)	
MB-339 (IT)	85		
Single-Role Interceptor	279		360
Mirage F-1(FR,GR)	279	SU-15 (Flagon)	360
Multi-Role	1,661		3,360
F-5 (GR, NL, NO, TU, UK)	339	MIG-21 (Fishbed)	1,560
F-4 (GE, SP, TU, UK)	592	MIG-23 (Flogger)	1,800
Mirage III+V (BE, FR)	193		
F-104 (GR, IT, TU)	496		
Draken (DN)	41		
Other Aircraft	1,600		4,300
Total Older Aircraft	4,300		9,500
Total Modern and Older Aircraft	6,700		13,000

The table leads to a number of important conclusions. NATO and the WTO are almost at parity in the number of modern, single-role, deep-attack aircraft, and both sides have a relatively small number of EW aircraft. The WTO has a significant advantage in modern, single-role attack and interceptor aircraft, while NATO has a minor advantage in modern multi-role aircraft. The WTO has more than 1,000 more modern aircraft than NATO.

The WTO also has a significant advantage in numbers of older aircraft. Its Badger and Blinder bombers represent a major capability to deliver large loads over long distances. With the exception of this advantage, the older aircraft on both sides do not seem to represent a significant threat to the airbases of the opposing side.

III. ELEMENTS OF AN ARMS CONTROL AGREEMENT

The preceding considerations suggest an expanded approach that would include the following aspects. These aspects can be included in the current CFE negotiations or can serve as the basis for the next phase of the negotiations. In either case, if arms control for tactical air forces is to remove the threat of the WTO air offensive and meet all of the objectives of the CFE mandate, provisions--in addition to common ceilings--must be imposed.

A. Establish a Secure and Stable Balance of Conventional Forces at Lower Levels by Limiting the Total Number of Combat Aircraft

This principle of the CFE approach is as important for air forces as it is for ground forces. The concept of parity in numbers is widely accepted and is essential to the political viability of any agreement. However, the NATO proposal to limit total aircraft on each side does not go far enough. At the levels under consideration in Vienna, the WTO will still be capable of launching a surprise air offensive. Moreover, WTO acceptance of this proposal may require that steps be taken to respond to some of these WTO concerns:

- The failure of the NATO proposal to include sea-based aircraft in which NATO has a significant advantage;⁴
- The concern that the vast majority of WTO air power is included in the ATTU, including its strategic aircraft and its training base, while a major portion of NATO's airpower is outside the ATTU and is thus exempt; and

⁴ NATO, including France, outnumbers the WTO about 13:1 in sea-based aircraft.

- The belief that NATO has placed relatively greater emphasis on offensively oriented attack aircraft while the WTO has placed greater emphasis on defensively oriented interceptor aircraft. (A demonstrably incorrect argument when only modern aircraft are considered; see Table 3).

In accord with these concerns, the WTO argues that any agreement should include sea-based aircraft and should limit offensive--but not defensive--aircraft.

NATO responded to these concerns in February 1990 and offered to allow the WTO to exempt some of its strategic air defense and training aircraft in return for a lower overall ceiling. Initial response from the WTO indicates that these two concessions may not be enough for an initial CFE agreement. An additional concession may be necessary for an initial agreement or for an agreement that goes beyond the initial NATO or WTO proposals. One possible concession is to recognize that *modern* aircraft make the primary contribution to the air element of an offensive, surprise attack capability and to accept a short term WTO numerical advantage in older, less capable aircraft. Specifically, the concession might be an agreement on parity in modern aircraft and a time limit for the WTO to eliminate its rapidly declining advantage in older aircraft.

B. Limit the Capability for Launching Surprise Air Attacks and Initiating Large-Scale Offensive Actions

1. Place a Sub-Ceiling on Modern, Single Role, Deep Attack and Electronic Warfare Aircraft

As discussed in the preceding paragraphs, each side's plan to achieve air superiority by conducting offensive counterair attacks against the opposing side's airbases is destabilizing. Attacks of this nature portray an offensive intent that is counter to the defensive goals that have been expressed by both sides. As Secretary of State Baker recently stated:

The main goal of arms control is to reduce the risk of war. We hope to prevent war by working toward a stable, predictable strategic relationship. Stability requires military forces and policies such that no one can gain by striking first even in the worst crisis . . . We seek reductions in first-strike surprise attack capabilities. We seek stability through proposals to reduce those capabilities most suited for offensive, blitzkrieg-style actions and preemptive first strikes . . . We want to see Soviet defensive military

operations made habitual. We want to see the new thinking concretely built into the Soviet force structure.⁵

To meet the goals stated by Secretary Baker, a CFE agreement should limit the aircraft that contribute most to the WTO capability to conduct offensive attacks deep into NATO territory and least to the WTO defensive capability--the modern, single-role, deep-attack, and electronic warfare aircraft identified in Table 3. A NATO proposal to limit these aircraft would be based on the same concepts as the NATO proposal for limiting the most offensive weapon systems in ground forces. Such a proposal would also be consistent with the WTO proposal for limiting tactical air forces--limiting the strike capability on both sides. By focusing on specific aircraft, a sub-ceiling would avoid most of the counting rule problems that have plagued the effort to place an overall ceiling on combat aircraft.

Placing a sub-ceiling on a specialized portion of each side's inventory would limit directly the offensive capability that most worries the other side. Limits should be set to constrain the ability to conduct a decisive counterforce attack. As the limits on the offensive counterair capability are increased, the fear of attack will decline. As the fear of attack declines, the perceived need for an offensive counterair capability to respond to attack from the other side should also decline. Thus, progressive reductions in the offensive counterair capability on both sides should progressively reduce the fear on both sides of a surprise offensive and should increase stability overall.

Any sub-ceiling should seek the elimination of EW aircraft that are central to the WTO air offensive and have essentially no other mission. As each side improves its air defenses over its own territory, the ability of the other side to disrupt those defenses electronically becomes more important. The elimination of EW aircraft would limit the ability of attacking aircraft to suppress the defender's SAMs and his other air defenses and would raise the potential attrition on any deep attack. Thus, elimination of EW escort aircraft would make deep attack more expensive and would make an offensive, surprise attack less likely. Moreover, by eliminating an entire class of aircraft, both sides will be making an important symbolic change in their operational strategies.

Although the EW mission could be performed by other aircraft carrying electronic jamming equipment or anti-radiation missiles, they most likely would not perform the job as well as specialized aircraft. In addition, the aircraft that assume the EW mission are unavailable to perform other parts of the air offensive.

⁵ Address to the Commonwealth Club, San Francisco, CA, October 23, 1989.

If EW escort aircraft are eliminated, the effect of even small reductions in single-role, modern attack aircraft will be increased. In accord with the NATO proposal, for example, reductions of 15 percent below the lowest level on either side (to approximately 850 aircraft) would help to enhance the confidence of both sides. If EW escort aircraft are not eliminated, or if alternatives to them are developed, a 15 percent reduction in single-role, deep-attack aircraft would be less significant. In such a case, larger reductions in these aircraft could be necessary.

A sub-ceiling of this kind could result in the elimination of all of the EW escort aircraft in the ATTU--approximately 48 NATO and 190 WTO aircraft. It also would involve the reduction of WTO SU-24 Fencer and TU-26 Backfire aircraft and NATO F-111, Jaguar, and Tornado aircraft.

Limiting the sub-ceiling to specific aircraft with specific capabilities would help to resolve the multi-role and verification problems. For example, the supposed NATO advantage in multi-role aircraft is easily surpassed by the WTO advantage in modern, multi-role aircraft combined with either short-range attack aircraft or single-role interceptor aircraft (see Table 3). Verification of small numbers of specific aircraft types would be easier than verification of a large number of aircraft of all types. The EW aircraft included in this proposal have many functionally related observable characteristics that make them easy to identify. Modernization problems would remain if either side built new aircraft with capabilities similar to the capabilities constrained by the agreement.

A sub-ceiling is also quite likely to enhance NATO's posture should war arise. Preliminary analysis using the IDA TACWAR theater-level model indicates that arms control agreements that limit the capability for conducting airbase attack missions lead to outcomes that favor NATO. This is so when both sides limit airbase attack missions and when only NATO limits its airbase attack missions. The improvements in the war outcome include less territory lost to the WTO attack and more NATO aircraft remaining at the end of the war. The primary reason for these improvements in the outcome is the significant increase in the number of aircraft available to conduct defensive counterair, close air support, and battlefield interdiction missions. This increase in aircraft availability comes about because of the reduction in aircraft losses that occurs when aircraft cease flying into the face of the other side's airbase defenses.

2. Place Controls and Limits on Airbases and Munitions

There are two other ways of limiting the offensive, surprise attack capabilities of the opposing air forces: (1) increase the distance that aircraft must fly to reach their targets by restricting airbases near the inter-German border; and (2) limit the munitions available for air base attack by eliminating them, by moving them, or placing them in supervised storage. The first approach is similar to the proposal to limit ground forces in specific geographic zones. The second approach goes beyond the current proposal for limiting ground forces but is consistent with current discussions of ways to demonstrate the defensive intent of ground forces.

Limitations on airbases can help to limit the offensive capability of opposing forces. Limiting the total number of airbases would lead to reductions in the size of the force or to increases in the number of aircraft at each airbase. Reductions in the size of the opposing forces could enhance stability. Alternatively, reductions in the number of targets and increases in the value of each remaining target make the remaining bases more important and increase the incentive to attack. Without other constraints on numbers of aircraft, limits on the number of airbases appear likely to increase the incentive for a surprise attack.

The proliferation of airbases, on the other hand, will reduce the overall vulnerability of an air force and reduce the incentive for a surprise attack. The best way to limit the air force's vulnerability to attack while also limiting the air force's ability to attack is to have many airbases but to limit the attack munitions available at those airbases.

An approach to limiting the infrastructure that contributes to a surprise attack capability might be to eliminate or to restrict the capabilities of the main operating bases on both sides within some distance of the inter-German border (IGB). For example, eliminating main operating bases near the border could have a number of positive effects. It would provide a buffer that would give both sides limited but unambiguous warning of an attack on their airbases. It would exclude many aircraft from a surprise offensive due to range/payload limitations. It would force longer range aircraft such as the SU-24 Fencer to move away from the border. And it would force both sides to limit bases whose proximity to the IGB might provide an incentive to attack. Given the speed of modern aircraft, the WTO's much greater strategic depth would justify deeper exclusion zones on the WTO side than on the NATO side of the border. The return of Soviet aircraft to Soviet territory will meet this goal.

The exclusion of main operating bases from the vicinity of the inter-German border need not mean the elimination of all airbases in such a restricted military area (RMA). Aircraft that can operate out of less sophisticated bases could continue to operate. For example, close air support aircraft designed to operate out of forward locations could remain, especially if the munitions at these forward bases were limited. In the same way, interceptor aircraft that are dependent upon main operating bases for normal operations could use bases in the RMA for refueling and rearming of air-to-air munitions. Bases in the RMA that do not have large numbers of aircraft on the ground at any time and that do not have extensive maintenance facilities or munitions storage areas are much less threatening and provide a reduced incentive to attack.

In addition to limiting airbases, limiting munitions may also be useful. Aircraft attacking airbases employ specialized runway cratering and shelter busting munitions to increase their effectiveness against modern, protected airbases. The WTO air offensive also depends on establishing air corridors through NATO's SAM defenses. Anti-radiation missiles that attack SAM radars are essential to establishing these corridors. Thus, limiting the inventories of these munitions and placing the remainder in supervised storage could help to further reduce the fear of surprise attack.

In summary, a proposal to place a sub-ceiling on modern, single-role, deep attack and electronic warfare aircraft could include the elimination of all electronic warfare escort aircraft on both sides and a 15 percent reduction in single-role, deep-attack aircraft. It could also include limitations on main operating bases near the IGB and munitions specialized for airbase attack and SAM suppression.

C. Eliminate Other Disparities Prejudicial to Stability and Security By Expanding the Negotiations To Include Surface-to-Surface Missiles

If limitations are placed on deep-attack aircraft but not on surface-to-surface missiles that can perform many of the same missions, the objectives of CFE would not be met. The WTO currently has a significant advantage in numbers of conventional SSM missiles and launchers and many of these missiles could be used in the WTO air offensive. The fact that these longer range missiles could be used to attack NATO airbases may be particularly destabilizing.

In the absence of an arms control agreement, the SSM capability of either or both sides could be greatly expanded. If this expansion occurs in longer range missiles

designed for offensive counterair operations, the CFE objectives clearly will not be met, regardless of the agreements that might be reached for tactical air forces.

Alternatively, if the development of SSMs is confined to shorter range missiles (about 100-150 km) that have a more limited capability to contribute to an air offensive, SSM development may have a benign effect on the fear of a surprise air offensive, especially if main operating bases have been pulled back from the border. In this shorter range case, the development of SSMs with the ability to kill tanks and other mobile elements of a ground offensive might give both sides the additional confidence in their ground defense capability that will allow them to negotiate larger aircraft reductions.

Thus, if NATO is to guard against the possibility that SSMs will threaten stability and will raise the fear of a surprise air offensive, NATO should include SSMs in the CFE negotiations and should not leave them for SNF negotiations. In this context, the most important aspect of SSMs that should be limited is their range.

IV. PRESERVING A NUCLEAR DELIVERY CAPABILITY

NATO depends upon its air forces for a significant portion of its nuclear delivery capability. Some NATO members will likely resist efforts to limit nuclear-capable aircraft in a conventional arms control agreement. There are four considerations that may help to diminish these concerns:

- The proposal protects British and French single-role, deep-attack and US multi-role nuclear-delivery aircraft. Reductions of these aircraft can be addressed in subsequent Short-range Nuclear Forces (SNF) negotiations.
- If parity is achieved in ground and air forces in the ATTU, NATO should then be able to mount a strong conventional defense. Thus, NATO should not fear the possibility of a large-scale surprise attack that rapidly defeats its conventional defense and calls for a quick escalation decision. In the event of a conflict, there would be sufficient time to move additional nuclear capable aircraft from the United States to Europe. Regardless of what happens in the ATTU, the United States will retain large numbers of dual capable aircraft capable of moving to Europe within 24 to 48 hours.
- With the elimination of large numbers of WTO ground forces, the number of potential targets for nuclear strikes and, by definition, the number of delivery vehicles needed will decline.
- Should both sides resist the idea of destroying large numbers of their most modern and most capable attack aircraft, such as the Fencer/Backfire or the Tornado/Jaguar, it might be possible to move some of these aircraft to

supervised storage. Once in storage, they could not contribute to a surprise offensive but could be brought out of storage should a war begin. Alternatively, moving some aircraft outside the ATTU may be possible. For example, German Tornados might be moved to U.S. bases that are currently scheduled to be closed.

V. OTHER ISSUES TO BE ADDRESSED

A. Modernization

An arms control agreement that limits the offensive, surprise attack capabilities on both sides can be invalidated by modernization efforts that evade the constraints of the agreement. On the other hand, given the inevitable obsolescence of all aircraft, the threat of an offensive surprise-attack can be progressively reduced if limits are placed on the capabilities of new aircraft. In the absence of constraints on modernization, the natural tendency of technology will lead to development of aircraft with improved offensive, surprise-attack capabilities. Research is needed to determine whether it is possible to maximize the defensive capabilities and minimize the offensive counterair capabilities of modern aircraft.

B. Conversion or Modification of Threatening Aircraft

In recent years, NATO and the WTO have developed aircraft with both air-to-air and air-to-ground capabilities and both nuclear and conventional delivery capabilities. The presence of these multiple capabilities in individual aircraft makes the arms control process especially difficult and threatens to be destabilizing in a crisis. Making engineering changes in existing aircraft to emphasize their capabilities in one role or another may be possible. The conversion of the Tornado from the attack to the air defense version is one example of such a change. The elimination of four of the five bomb-carrying hard points from the F-16 is another. While such limitations would not be absolute and could be reversed if necessary, they would help to limit the surprise attack capabilities of existing aircraft. Specific analysis of these possibilities is required.

C. Alternative Ways to Meet WTO Sea-Based Aircraft Concerns

The WTO continues to express its concern for the exclusion of naval forces from CFE negotiations. NATO's advantage in sea-based air power is of particular concern to the WTO. A number of possible ways to accommodate these concerns are discussed in the

preceding paragraphs. Unfortunately, very little work has been done on the subject of naval arms control, and more research is required. For example, limiting the offensive, surprise-attack capabilities of the opposing navies might be as appropriate for naval forces as it appears to be for ground and air forces.

VI. CONCLUSIONS

It may be important to go beyond the current NATO proposal for tactical air forces.

- The objectives of CFE are to increase stability and reduce the threat of offensive surprise attack. Additional limits on tactical air forces may bring the two sides closer to meeting these goals.
- Negotiating large reductions in WTO ground forces may require that NATO agree to substantial reductions in its air forces. Achieving major WTO ground force reductions would reduce NATO's need for air power and allow NATO to give up a greater portion of its air capability.
- A defensive air strategy may prove more effective and less expensive, particularly when there are no CFE limits on ground based air defenses.

NATO can go beyond its current proposal by focusing its efforts on eliminating the threat of a surprise air offensive.

- The primary destabilizing factor is the emphasis both sides place on attacking enemy airbases. This threat to stability can be reduced by limiting the air capabilities best suited to this mission--single-role, deep-attack and electronic warfare aircraft.
- Additional steps that could reduce capabilities and incentives to attack preemptively in a crisis include limits on the capabilities of airbases close to the border, airbase attack munitions and long-range SSMs.

Additional proof-of-concept work would provide further support for these arguments.

- Strategic analysis of air and ground force interactions in a CFE context.
- The role of groundbased air defenses and other defensive force elements in achieving CFE objectives.
- Possibilities for developing new aircraft and modifying existing aircraft to enhance their defensive capabilities and reduce their offensive capabilities.

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