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A RAND NOTE

**Verifying Conventional Stability In Europe:
An Overview**

Thomas J. Hirschfeld

April 1990

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Verifying the obligations in the prospective Conventional Forces in Europe (CFE) treaty will be far harder and more expensive than verifying those in the Intermediate-Range Nuclear Forces (INF) treaty, or in other previous arms control agreements. This Note presents a qualitative overview of conventional arms control verification issues, including (1) monitoring force levels calibrated in major items of equipment and personnel, in a large production area that makes concealment possible; (2) watching force withdrawals, restructuring, or disbandments involving removal, reexport, or destruction of thousands of heavy equipment items; (3) monitoring the post-agreement stasis of the largest and most complex force concentration in peacetime history; and (4) meshing these observations with the concurrent need to monitor unilateral Warsaw Pact force reductions and force changes on a massive scale.

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PREFACE

This Note provides a qualitative overview of conventional arms control verification. It is intended to supply orientation and focus to those wishing to assess in more detail specific verification problems, as well as to provide a sense of the important general issues bearing on the subject. Analyses of Conventional Forces in Europe (CFE) verification problems that emerge during negotiations will contain statements and allusions that are out of date at the time of publication. This study is no exception. Because exactly what is to be verified can not be known until the final treaty text is concluded, this Note attempts to identify those generic verification problems emerging from the ongoing CFE process.

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SUMMARY

Verifying the obligations in the prospective Conventional Forces in Europe (CFE) treaty will be far harder and more expensive to verify than those in the Intermediate Range Nuclear Forces (INF) treaty, or in other previous arms control agreements. Verifying conventional force changes implies: (a) monitoring force levels calibrated in major items of equipment and probably personnel, in a large area full of concealment opportunities that is also a production zone; (b) watching force withdrawals, restructuring or disbandments involving removal, reexport, or destruction of thousands of heavy equipment items; (c) monitoring the post-agreement stasis of the largest and most complex force concentration in peacetime history; and (d) meshing these observations with the concurrent need to monitor unilateral Warsaw Pact reductions and force changes on a massive scale. And these jobs will need to be accomplished to the continuing satisfaction of 23 governments.

Any hope of success for so complex an enterprise depends on formulating agreement obligations to maximize their verifiability, concentrating verification resources on militarily significant force changes (rather than on worries about "cheating"), and negotiating enough information exchanges, oversight rights, and cooperative measures, especially for the forward areas, to increase confidence in adequate warning. Success also depends on reducing public expectations for exact verification standards. That essentially political process means sensitizing legislators and the public to the differences between familiar verification requirements for agreements involving comparatively small numbers of nuclear weapons, and an agreement involving hundreds of thousands of items belonging to 23 countries.

The most difficult verification problems will arise once changes in the size, disposition, and location of forces have been agreed and when forces have been restructured following withdrawals or disbandment, whether unilateral or negotiated. At that point the problems of verifying an unfamiliar situation will add to the immense difficulties of verifying specific force levels. On the one hand, no one will want to accept constraints on future force structure; on the other, each side will want assurance that its own understanding of the opponent's forces remains detailed and sophisticated, regardless of structural modifications. This may require more continuing *droits de regard* than either side is willing to allow.

These verification problems (and a host of others) will be further complicated by the need to verify agreed exceptions to established ceilings, by regional arrangements, and by the characteristics of particular treaty limited items like aircraft and personnel. Reducing aircraft means differentiating aircraft missions among aircraft types and models, and could require agreed global ceilings to protect against circumvention, although neither side wants global ceilings now. And verifiers will have to assure that particular components of forward based adversary forces, like forward deployed munitions or fuel stocks, remain in stasis. Although nuclear issues have been specifically excluded, their consideration in some related framework is only a matter of time. Looking at those verification problems should begin now. We would discover that verifying tactical range Surface to Surface Missile (SSM) launcher levels, even if they were zero, would in itself be harder than INF verification, because of the larger number of SSMs, their smaller size, and their relatively greater mobility.

These complications foreshadow and justify a need for a profound, detailed and continuing understanding of adversary force structure. Such understanding can be achieved only with the cooperation of both sides. This means detailed information exchanges, formal structures for a continuing East-West dialogue, and negotiating rather intrusive oversight rights for both sides. Yet we and our European Allies may resist these sorts of *droits de regard* almost as much as Warsaw Pact countries would.

As outlined in Sec. IV, verification tools and procedures available include National Technical Means, more attaches and increased access for them, liaison personnel with adversary units, more cooperative Military Liaison Mission (MLM) procedures, aircraft and Remotely Piloted Vehicle (RPV) overflights, reducing the number of storage sites, various types of controlled storage, and inspection of declared and suspect locations. Also needed is continuous monitoring of production for controlled major items of equipment, either by adversary personnel or some combination of personnel and sensors. Tagging technology may be helpful too. And both sides will have to decide what force components or activities each might be willing to make continuously visible or audible to the other, to increase transparency and mutual confidence. Finally, keeping track of some 135,000 potentially controlled items and hundreds of thousands of personnel, not only overall, but within specified regions, means a very elaborate and very expensive monitoring system.

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I. INTRODUCTION

Many say that the military confrontation in Europe is stable because there has been no war in Europe since World War II. What both sides claim to want from a Conventional Forces in Europe (CFE) agreement is similar or improved stability at lower cost, and lower force levels. The range of potential force changes has now been outlined in the positions of the two sides in terms of national and alliance-wide force limitations (see below) expressed as ceilings on six force components. The ceilings would apply from the Atlantic to the Urals and in subregions as yet to be agreed. They were proposed as consistent with the agreed objectives expressed in the CFE Mandate to eliminate disparities prejudicial to stability and security, with priority to the elimination of surprise attack and the ability to initiate large-scale offensive action. The Mandate specifies that these objectives are to be achieved through militarily significant measures which are to apply to the whole of Europe and include reductions, limitations, redeployment provisions, equal ceilings, and "related measures." Measures are also to apply in a way precluding circumvention.

The East-West agreed-upon CFE Mandate highlights verification and compliance by requiring that the provisions of any agreement be verified through an elaborate and strict verification regime which among other things will include On-Site Inspection (OSI) as a matter of right. The Mandate also provides for exchanges of information in sufficient detail to allow meaningful comparison of force capabilities on both sides, and to provide a basis for the verification of compliance. The negotiating process itself is to specify the nature of the verification regime, the way information is to be exchanged, how much, and in what order.

So far, the views of both sides on verification are not far apart, at least in principle. NATO has proposed that verification measures should include an exchange of detailed data about forces and deployments, the right to conduct on-site inspections and other (as yet unspecified) measures to assure compliance, and annual notifications of holdings of Treaty Limited Items (TLIs) and associated personnel in both combat and combat support units. The Warsaw Pact side has proposed exchange of data on manpower levels, number of conventional armaments and deployment of "military formations," and "verifying data, including on-site inspection;" to monitor compliance through land and air on-site inspections "without right of refusal," and to establish checkpoints to monitor entry-exit, and to establish an international verification (consultative) commission with

representatives of participating states, with the power to observe, inspect, and consider disputes. Although the high degree of seeming agreement on previously contentious points (e.g., on-site inspection, overflights) bodes well, the devil, as usual, will be in the details. Also, the verification regime depends primarily on what is supposed to be verified.

Both sides have put forward proposals. Both reach for a negotiated outcome of overall limits and sublimits on specific items of heavy equipment (Treaty Limited Items), and somehow, on personnel. The Warsaw Pact has accepted the West's overall framework for negotiations with its emphasis on deeply asymmetrical reductions to equal ceilings, and subceilings that have the effect of limiting offensively oriented forces. Most of these are Soviet forces. Under the agreed scheme each side would be entitled to one half of the overall ceiling in each weapons system covered.

Both alliances have now agreed that the goal of the initial CFE agreement will be to achieve equal ceilings in six conventional force components from the Atlantic to the Urals (ATTU) and in subregions. These are tanks, artillery, armored troop carriers, helicopters, aircraft, and personnel. The basic approach is to establish an overall ceiling on each component for each alliance, a limit on what any one country may have, and one on what any one participating state may deploy outside of national territory. Significant differences remain, however, about how to define each force component covered by the treaty. There are also differences about how to count them for purposes of inclusion in the ceilings, and from where. Key differences that affect verification are identified in the table on p. 3. Key East-West differences concern the ceiling in permitted units of account each side and each participating country may have, in each of the permitted categories, as indicated.¹

Both sides also agreed in the Mandate that there would be geographic subzones. Both sides have now presented schemes for what these would be and how they would operate.

Clearly there are disagreements between the proposals of both sides as they emerge, although the degree of convergence so far is surprising. Examination of the headings for the NATO and Warsaw Pact positions reflected in the table above shows how each side tries to generate advantageous numbers of systems by varying the definition of the categories of items included under each ceiling. Disputes about what should be permitted in the geographic subzones also reflect attempts by each side to

¹Source: The Arms Control Association. Personnel not included.

Tanks		
	NATO "Main battle tanks"	Warsaw Pact "Tanks"
Each alliance	20,000	20,000
Any one country	12,000	14,000
Outside of national territory	3,200	4,500
Artillery Pieces		
	NATO	Warsaw Pact
Each alliance	16,500	24,000
Any one country	10,000	17,000
Outside of national territory	1,700	4,000
Armored Troop Carriers		
	NATO	Warsaw Pact
Each alliance	30,000	28,000
Any one country	16,800	18,000
Outside of national territory	6,000	7,500
Aircraft		
	NATO "Combat aircraft"	Warsaw Pact "Strike aircraft"
Each alliance	5,200 (15% below NATO level of 6,700)	4,700
Any one country	3,320	3,400
Outside of national territory	NA	350
Helicopters		
	NATO "Attack and assault"	Warsaw Pact
Each alliance	1,900	1,900
Any one country	(15% below NATO level of 1,140)	
Outside of national territory	NA	1,500
	NA	600

generate larger cuts of adversary forces, or to shield its own resources from reduction. NATO wants limits in each subregion on equipment "in units." The Soviet formula, on the other hand, specifies "including stored equipment," in an attempt to capture Western prepositioned and war reserve TLIs.

The verification aspects of these disputes concern:

1. **Defining the ceiling.** Defining ceilings means identifying and counting what will be included under the ceiling in each category (e.g., "tanks" vs. "main battle tanks," "combat" vs. "strike" aircraft). The results include some and exclude others, and are numerically expressed. Both tank and aircraft disputes will result in an arrangement where there will be either more items and fewer types (e.g., "tanks" instead of "main

battle tanks”), or the reverse. In crude terms, a larger number of items in a broader category may be easier to verify than a larger number of small categories based on the differences between types. Defining what is included also defines what is excluded—essentially, the uncontrolled residual force of similar systems. By defining what is included, the two sides agree on what is to be verified for the long term. Defining what is included numerically under each category also identifies the goal of the reductions.

2. Getting to the ceiling. The reductions themselves must also be expressed numerically (even if they need not be agreed on formally). For example, how many tanks must be eliminated to arrive at some to-be-agreed ceiling within some to-be-agreed region is something each side should be sure of, before they agree to the ceilings themselves. Deciding on how much to cut per force component, by region, requires a detailed understanding of what each national baseline is now, from which we derive what it would be at the time of treaty signature. If both sides have different perceptions of what adversary forces now hold in each category and region, the reductions each takes to get to the agreed ceiling could fall short of expectations. Judgments about whether or not agreed ceilings have actually been achieved depend in some measure on adversary judgments about whether each participating state took the reductions necessary to get there. Thus, observing those reductions, and assuring that they take place, becomes the most important short-term verification problem.

The process of getting to the ceilings and making sure they are being complied with is complicated by the continuing changes in the forces on both sides. Such changes complicate the ability of adversaries to monitor each other’s forces because they change baseline calculations and affect the confidence countries have in the validity of their own estimates. The most recent case in point are the unilateral force changes in Europe announced by Gorbachev. On December 7, 1988, Gorbachev announced prospects for *unilateral* Soviet reductions of 10,000 tanks, 800 aircraft, 8500 artillery tubes from the ATTU area, personnel reductions of 500,000 overall, and a more defensive restructuring of Soviet forces by 1991. Five thousand of these tanks, 50,000 men, and six tank divisions will be removed from Central Europe. Four of these are to come out of the Group of Soviet Forces in Germany (GSFG), and the other two from Soviet forces in Hungary and Czechoslovakia. These changes are under way and should ease the asymmetries Western proposals seek to adjust. The reductions could represent some 18 percent of Soviet tanks, 27 percent of Soviet artillery, and 18 percent of Soviet aircraft totals, using figures from the International Institute for Strategic Studies (IISS). Finally, as part of this avowedly “defensive” restructuring, assault landing troops and assault

landing units (presumably Soviet rapid action forces and bridging units) would be removed from the forward area.² For that matter, other Warsaw Pact Countries—the Poles and Czechs and Hungarians—have hurried to announce intended unilateral force reductions, too.³

From the positions of the two sides, the agreed objectives, prospects for regional application, and anxieties about circumvention, it is possible to adduce some need to verify:

A. Force levels, ceilings, and perhaps interim no-increase commitments on agreed units of account, such as tanks. (Agreement on ceilings requires a broader, common East-West understanding of equipment-related order of battle details, to allow confident judgments about whether the agreement is being circumvented.)

B. Force withdrawals, or other forms of partial or total force component removal or elimination.

C. Stasis means continued conformity to agreed patterns of deployments, exercises, and so forth to build confidence and enhance warning. For example, sudden large withdrawals of artillery rounds from an announced and observed depot or several simultaneous exercises of large Soviet formations become additional warning indicators.

This study speculates about what significant verification problems could arise in verifying typical or likely examples of force levels, force withdrawals, and monitoring post-agreement stasis.

²See inter alia, Les Aspin, "Gorbachev Delivers the Beef," *The Baltimore Sun*, December 9, 1988.

³See "Poland to Cut Military, Defense Minister Says," UPI report published in *Washington Post*, January 4, 1989, "Two More Soviet Allies Announce Arms Cuts," *Washington Post*, January 24 1989, and "East Germany to Reduce its Armed Forces," *Washington Post*, January 24, 1989.

II. NUCLEAR ISSUES

The text of the objectives agreed to by both sides on December 24, 1987, mention the word "conventional" twice, to assure that the Conventional Stability Talks would exclude nuclear weapons, and nuclear weapons are specifically excluded in the Mandate. That reflected a NATO preference for nuclear exclusion, strongly supported by major allies, the United States, Britain, and France. Yet other allies, notably the West Germans, refused to delay negotiations about tactical nuclear weapons until after CFE and agreement on chemical weapons, as the United States, Britain, and France preferred. So in its May 1989 Brussels Communique, NATO agreed to begin negotiations on short-range nuclear forces (SNF), after an agreement on conventional forces has been reached and "implementation" of the nonnuclear reductions is under way. Gorbachev criticized NATO's failure to enter into early negotiations about SNF, and took issue with the allied formula about considering only "partial reduction" of battlefield nuclear weapons. Speaking in Strasbourg in July 1989, Gorbachev offered additional unspecified unilateral SNF reductions to those promised earlier in connection with his unilateral force withdrawal offer, provided NATO would engage in prompt negotiations to "reduce or eliminate" SNF. Although the West rejected that offer, it is now clear that the SNF issue has been joined, if delayed.

The relationship between SNF negotiations and CFE is still unclear. Yet even if the forums are separate, the substance tends to tie them together, as would the verification problems. Several of the force components under discussion (artillery tubes, aircraft) are dual-capable launchers. Surface-to-surface missiles (SSMs), which the East has wanted to include but whose inclusion NATO resists, are also dual capable. In limiting any of these launchers in the CFE forum, the two sides will be affecting nuclear capability by reducing launcher numbers and limiting residuals.

A few considerations should be kept in mind in planning to verify CFE agreement obligations affecting dual-capable launchers. First, almost all delivery systems are potentially dual-capable. Once tested or demonstrated in a nuclear role, prudent intelligence analysts normally ascribe dual capability to all launchers of the type tested. For example, the number of Soviet or Non-Soviet Warsaw Pact (NSWP) artillery tubes identified as nuclear-capable launchers may be much larger than the number of those actually having nuclear roles, i.e., the number for which nuclear loads are available. Second, the asymmetry in SSMs will figure more prominently in Western CFE

calculations, once SNF negotiations are more immediately in prospect. For example, the Soviets have a 13 to 1 superiority in numbers of tactical SSMs. It may be hard to avoid dealing with this asymmetry because the Soviets may offer to adjust it by removing *all* tactical SSMs, to the consternation of NATO governments, and one suspects, the cheers of allied publics. In those circumstances, we will have to plan on verifying the removal and subsequent absence of all the FROG, SCUD, and SS-21 launchers now deployed with Soviet and NSWP forces from the Atlantic to the Urals. This is, in itself, a more complex verification job than INF verification was, because of the larger number of launchers, their smaller size, and their greater mobility in comparison with the SS-20. On the other hand, it is easier than verifying the absence of only some residual SNF, the task at hand if, as the West prefers, both sides retain some SNF forces.

It is very difficult to separate tactical nuclear roles from conventional roles for dual-capable launchers. The most efficient way is the total elimination of nuclear storage, in some agreed-upon forward area. Successful implementation of such arrangements would depend in large measure on knowing the location of *all* Warsaw Pact nuclear storage sites in the proscribed area. These considerations justify the hope that detailed review of CFE's potential nuclear aspects will not be required soon.

III. VERIFICATION AND COMPLIANCE STANDARDS

It will become obvious that no verification system we can devise and negotiate can prevent Soviet cheating. At best we will be able to avoid militarily significant infractions. We are back to "adequate" verification. Those who hold that because an arms control agreement is a legal contract and that therefore any unanswered questions, perceived infractions, or minor violations are serious issues independent of their military significance, will have to lower their expectations. We can devise machinery to discuss and resolve some points at issue, but not to everyone's satisfaction, and far less than was the case in INF. It will be important for Congress and the public to understand from the beginning that the compliance standards we will be able to negotiate in CFE will be less stringent than those we asked for in INF, and should require in START. This is because the sheer volume of items, installations, organizations, and activities to be monitored is far larger than the number to be monitored in any nuclear agreement and the opportunities for concealment are correspondingly greater. It is also because of the limitations on monitoring imposed by considerations of reciprocity, i.e., the stringency of inspection schemes we might wish to impose on the Soviets will be limited by what we and many of our allies might accept for our own forces or territories.

For such reasons, limited and stretched verification resources should concentrate on discovering those violations that make a military difference. Loading the verification system with opportunities for collateral intelligence windfalls (which the opposition can usually spot) or measures intended to serve political purposes, like inhibiting Soviet action in Eastern Europe, desirable as such measures may be, are likely to produce system overload.

An early effort to define and if possible rank order what is militarily significant would pay handsomely, recognizing that such analysis is no simple task. It has proven very difficult in the nuclear realm as shown by our inability to identify suitable proportional responses to the many arms control violations which the United States asserts the USSR has committed. Yet some sophisticated understanding of what adversary force characteristics matter most and being able to argue those judgments would go far to formulating security-wise allied negotiating positions. Such an analysis would also help convince Congress that the allied negotiating position makes sense and that the verification system is helpful in security terms, even if it cannot prevent all "cheating." To illustrate, the characteristics of opposing conventional forces presumably

reduce to some finite list like firepower, unit mobility, reinforcement rates, sustainability, etc. An examination of the deployed forces for those characteristics might identify other potential units of arms control account, and help specify the extent to which these need to be limited. For example, heavy weapon holdings are presumably a key element in calculating firepower, mobility, sustainability and reinforcement rates. These have already been identified for reduction to numerical parity. Knowing that tank numbers, for example, are far lower in the post-agreement forward area, and confidence that this reduced number cannot change by more than X in thirty days without clear warning bells, could become the minimal measure of the effectiveness of a verification system for tanks.

IV. WHAT IS TO BE VERIFIED?

As noted above, even if we cannot now identify all of the agreement obligations that will need to be verified, the mandate, the agreed goals, and the positions of the two sides suggest arrangements relating to (1) the removal and post-removal levels of accountable equipment items and personnel, (2) the absence or presence of forces, force components, or equipment at some spot or area, and (3) continuing conformity to agreed patterns of behavior. It is possible to reduce such arrangements to broad categories (e.g., ceilings) and to identify under each the issues which could arise in verifying them.

CEILINGS

Verifying ceilings is the hardest verification job. The function is essentially the same whether a permanent or some interim obligation like a no-increase commitment is to be verified, although some TLIs, notably aircraft and personnel, pose special difficulties. Using the most familiar and easiest item to verify—tanks—even agreeing on what the ceiling shall be involves daunting verification and monitoring problems. To illustrate, the West presently hopes to reduce the East-West asymmetry in tanks. The East has agreed that such an asymmetry exists. The West wants to achieve East-West parity in tanks by cutting the Warsaw Pact tank numbers down to NATO size, after NATO has cut its own tank numbers by some 10 percent, to 20,000. Surprisingly, the East has agreed, at least in gross terms. But the size of the reductions each side should take to get to the agreed numerical ceiling for tanks will have to be justified on some numerical basis. Logically, that should be the relative size of the *existing* tank forces. (How else can one argue that the size of the cuts one asks the adversary to take are justified, unless the resulting ceiling is somehow proportional to what was there to begin with?). Yet there is a discrepancy between the number of tanks the East participants admit having, and the number of tanks the West ascribes to Warsaw Pact forces. Although both sides agree that the Warsaw Pact has more tanks, there is no consensus on how many more (published Soviet figures concede a 2:1 tank advantage in the ATTU area; NATO numbers indicate 3:1). In many ways, that discrepancy is analogous to the data discrepancy that dogged the MBFR negotiations now cancelled after 15 fruitless years. Yet for that very reason (fear of more endless debate about the precise relative size of forces in place) the 23 participants have agreed to avoid having to agree on a prereduction ceiling to calculate from, and to concentrate instead on agreeing on what the

final ceiling should be. It is not yet clear whether they would have to agree on the size of the cuts to get there. Yet unless there is tacit common understanding of what those reductions should be, the agreed ceilings will never be achieved. This suggests that both sides will have some interest in narrowing the discrepancies to the point where the differences between our understanding of their tank numbers, and the numbers they profess to have, are trivial.

Furthermore, without an internationally accepted definition of a "tank" or "main battle tank" (repeated attempts since 1931 have failed), the conference will either have to derive its own definition or list the types of armored vehicles that both sides can agree are tanks for CFE purposes, by type and model (Leopard II, for example). Then negotiators will have to decide whether agreement obligations like ceilings refer only to tanks in active units, or to those in storage, those in reserve units, those in production, and those warehoused for export as well. If, for example, each side should keep the same number in storage, say, 4000 of the 20,000 permitted overall as one Western proposal suggests, verification will be improved for both sides because stored vehicles are easier to account for than those in units or in transit. The verification system will have to assure that the categories specified in the agreement (e.g., medium tanks in active units) are counted that way, and that all the others, including tanks in transit, are monitored too, to avoid circumvention.

The sheer size of the area from the Atlantic to the Urals is another problem.⁴ Tanks are smaller and more easily concealed than INF missiles, for example. Built-up areas containing hundreds of thousands of structures and vast wooded regions where armor could easily be concealed would need to be monitored. And even with agreement on tank definitions, there are many types of armored vehicles including self-propelled artillery that at some distance or angle will suggest a tank to overhead observation. Deriving an exact count that will satisfy most observers may be impossible. Even in central Europe where the largest number of active tank units are, and where our understanding of the opposing force is sophisticated and detailed from years of close observation, deriving an exact count may be very hard, given the many opportunities for concealment, and the changes which are expected from the unilateral Soviet force changes announced by Gorbachev.

⁴Jonathan Dean, "The NATO Warsaw Pact Confrontation in the Twenty First Century," paper delivered at meeting of the American Committee on U.S.-Soviet Relations, May 23, 1988.

Furthermore, the two alliances may want to exempt particular areas from inspection, or at least from direct on-site inspection (OSI). It is not clear, for example, that the stated Soviet willingness to accept OSI "without right of refusal" means no excluded areas. Having excluded areas could mean many hundreds of vehicles that are not counted. The verification system should stress minimizing significant dangers by (1) concentrating on accounting for the most modern and dangerous vehicles, those positioned forward in active units and (2) assuring that the adversary force would have difficulty bringing any concealed vehicles to bear, once the initial count has been agreed upon. That objective could be accomplished through measures like tagging, controlling storage, and by reducing the number of permitted storage sites.

Although prudence suggests assuming Soviet intent to cheat, the size, location, and diversity of the forces on both sides also suggest more pedestrian problems, like mistakes or different ways of counting similar items, whether the Soviets are cheating or not. One cannot exclude the possibility that our own estimates of Soviet and other Warsaw Pact overall tank numbers are in error. With large figures some mistakes or misapprehensions seem inevitable. We have made mistakes in counting our own equipment. It seems hard to believe that the Soviets have not occasionally done the same.⁵ These examples suggest that such differences should be discussed to see how each side is counting and justify a detailed data exchange.

The number and location of tanks or other units of account could fluctuate continuously because of production, exports, and force reorganization. Thus data exchanges about tanks assigned to units, whether active or reserve, should be disaggregated to the lowest possible level. Battalion level would be ideal. Unit designation, location, subordination, manning levels, and tank holdings by type and model should be exchanged. Early, continuous, or frequent information exchanges are particularly important because of the announced unilateral changes anticipated for the Soviet force by 1991. Also, to assure confident monitoring of current and post reduction tank levels, or reliable interim no-increase undertakings, each side should also be required to announce tank storage and production by location, type, and volume. Furthermore, the agreement could specify that neither side has tanks within the area located outside of specified units, depots, or other facilities except for preannounced exercises and alerts. Tanks discovered elsewhere would be in violation.

⁵Don Oberdorfer, "U.S. Informs Soviets of Goofs in Counting INF Treaty Items," *The Washington Post*, January 3, 1987.

Western ability to track changes in Warsaw Pact tank numbers depends on detailed understanding of the force structure within which those vehicles operate. This seemed implicitly recognized in the Mandate's call for data exchanges to allow a meaningful comparison of the force capabilities on both sides. The need to keep track of adversary force changes was clearly the Western reason for proposing such a formula. For example, our understanding of an equipment ceiling, once agreed, would rapidly erode, were the size, shape, and location of the future Warsaw Pact force to change in conformity with some clearly different, if avowedly more defensive, table of organization and equipment, as foreshadowed by Gorbachev's December 7, 1988 United Nations General Assembly (UNGA) speech. So it would help both sides to have an established right to ask each other questions from the beginning, justified by the continued need to avoid the development of a more threatening adversary force structure.

Questions could be legitimately inspired by the introduction of new generations of controlled equipment items, changes in the location and manning levels of major formations, or the introduction of new classes of weapons, because of circumvention considerations. Satisfactory answers to such questions would assure adversaries that transparency compensates for inevitable changes in force structure and equipment holdings. Whether the right to question perceived force changes is exercised through a 23-nation Standing Consultative Commission adapted to CFE circumstances or by an informal running dialogue at conference sites, is less important than the right to check intelligence by asking questions which sustain each side's confidence that the agreed ceilings are not being circumvented. This is less than installing verification procedures from the beginning, as many on our side would like, but much more than taking what the Soviets provide on faith. If Warsaw Pact countries agree to a dialogue of this kind, we can expect them to work hard to confine our permitted questions to the precise subject matter.

Were the agreed tank limits confined to tanks in identified major units (rather than all "tanks") on both sides, we could not necessarily be sure of those tank levels over time. Although NATO might be reasonably certain of the arrival of a new unit into the Atlantic to the Urals zone, finding piecemeal increments of tanks or other controlled equipment items to existing units would be a problem. If, to take a worst case,⁶ six Soviet divisions

⁶Robert Blackwill, "Conceptual Problems of Conventional Arms Control," *International Security*, Spring 1988, Vol. 12, No. 4, p. 40.

moved East of the Urals with their verified complement of 1800 tanks, the residual number of 20,000 Warsaw Pact tanks in all of Europe could mask their return.

This suggests that the Western goal of parity may be unverifiable in fine detail. The presence or absence of units with tanks or their major equipment items can be established. The holdings of those units could be known; the location of equipment parks or other storage facilities may be announced as well. These can be inspected and monitored. The number of storage depots can be reduced by agreement. Export, destruction, and announced transit can be monitored by direct observation; so can withdrawals. Production can be monitored, assuming the right cooperative measures. Discrepancies between what the East admits to and what we count can be discussed, and presumably the differences can be resolved, on paper. Yet if all these procedures work, would they be enough to discover the gradual covert redeployment forward in violation of an agreement of tanks or artillery tubes or other agreed units of account previously withdrawn?

Particular Ceilings

Aircraft. Aircraft and personnel both pose special problems. All participants have now agreed that the TLI list will include aircraft. NATO has proposed a 15 percent cut in its own inventory down to an overall ceiling of 5700 combat aircraft, a number which includes most categories. The Soviets for their part claim that the West has superiority in "strike" aircraft, a category which may approximate the Western term "attack aircraft." According to the Warsaw Pact definition, this category includes "aircraft designed to conduct combat operations in support of ground forces and against targets on land, fitted to employ air to surface guided weapons." The Soviets claim that their other aircraft serve defensive roles and should therefore not be counted. That would leave some 6000 more aircraft unconstrained, an unlikely outcome.

Counting all aircraft is far easier than counting some category, or some type or model. An illustrative attempt to accommodate the Soviets could show how difficult aircraft categorization is. IISS counts 2855 "attack aircraft" for NATO and 2330 for the Warsaw Pact from the Atlantic to the Urals. Those numbers mask qualitative superiority on the Western side and the nuclear capable character of most attack planes. Categories would have to be worked out first on the Western side among national air forces, and then East-West. Many of the aircraft covered by the "attack" category (e.g., F-16s) are multi-role, and primary roles for the same aircraft type vary between NATO countries. Furthermore, distinctions between attack and bomber aircraft, and between fighter and

fighter-ground attack roles, cannot be drawn with certainty.⁷ This is an important consideration—if fighter aircraft were included in any aircraft calculation, and thus added to the “attack” aircraft count, as the West would insist, then 4432 aircraft would be added to the Eastern side and only 1178 to the West. That would change the force ratios from 1:1.23 to 1:3.76.

Answering the categorization question resolves only the “what shall be counted” question. To the extent that the chosen category does not include all aircraft, the verification system must differentiate between the types to be included under the ceiling. As for verifying aircraft force levels in addition to agreeing on the types of aircraft to be covered, parties would need to identify their locations and specify the future permitted locations for those types. It may be necessary to agree on visible external characteristics for each type, for verification purposes. Because aircraft are highly mobile, some method to deal with surges seems desirable, if only to increase warning. One possible method might be to require each side to file flight plans with the other before accountable aircraft enter the ATTU area or some agreed subregion. More effective monitoring would presumably not be possible without a comprehensive, global aircraft count by model and type, plus counts for the Atlantic to the Urals, and for the peripheral subregion or regions. Neither side seems to want that, at present. Some concerns about surprise attack could be eased by monitoring shelter construction and munition and fuel storage at forward airfields.

Personnel. Personnel ceilings are the most difficult. At the moment the West wants a ceiling of 225,000 on U.S. and 195,000 on Soviet air and ground personnel stationed outside national territory. The Warsaw Pact wants an overall ATTU limit on “ground troops” (a category that includes air force personnel “associated with strike aircraft”) of 1,350,000, with a maximum number in this category of 920,000 for any one participant. The Warsaw Pact includes the forces of the 22 other CFE participants in the accountable number.

Even if the minimalist NATO position were adopted, there is no identifiable way to assure that an *actual* force level of 225,000 air and 195,000 ground personnel was being maintained by either the United States or the USSR outside national territory in the ATTU area. To get to that level, the reductions would require the removal of some 370,000 Soviet troops, vice 80,000 for the United States, according to U.S. figures for what the Soviets and we have on the ground at present. Taking cuts of that size assumes

⁷*The Military Balance, 1988-1989*, International Institute for Strategic Studies, London.

that U.S. figures are accurate or that the Soviets accept them whether they are or not. If there were no dispute about the size of the cuts, each side could assure the other that the number of authorized personnel spaces in the units mutually identified and located geographically and by subordination amounted to some particular number. Inspection could verify that some periodically inspected number of these units appeared to have something like the manning levels ascribed to them on the day of inspection. The units most inspected would presumably be those posing the greatest threat—the maneuver elements of the major formations. The more amorphous support elements, the so-called logistics “tail,” would presumably get less attention. Yet even on the Soviet side, some 30 percent or more of the personnel to be verified could presumably be found in that part of the force.

Furthermore, the personnel ceiling to be verified would represent the new, post-CFE Soviet force, one presumably composed of reorganized units, rather than the same familiar units that had been observed opposite NATO for the last four decades. In these circumstances, it may be hard for either side to assure national authorities that either knows how many countable personnel the other has with any precision. With a better count on the key weapon systems, that may not matter as much as it did in MBFR, when personnel were the principal unit of account and personnel ceilings the most significant potential outcome.

Exceptions to Agreed Ceilings

Agreed exceptions to negotiated ceilings present additional problems. Both sides conduct exercises; Eastern exercises are usually smaller and more frequent. NATO exercises tend to be large annual or semi-annual events, although their frequency and scope are declining as civilian tolerance for military disruptions erodes. In negotiating exceptions to agreed ceilings, such as tank ceilings to accommodate training and exercises, the East will argue for smaller NATO exercises, to reduce U.S. and British reinforcement capabilities. These exercises, like the annual *Reforger*, unite designated U.S. divisions (among others) with their forward-deployed divisional equipment, including divisional tanks. These NATO tanks then join the active forces for the period of the exercise, a considerable increment to the total force.

Most Soviet tanks, even those in GSFG, are also in storage, although most are stored with their units. Significant numbers of Soviet tanks from GSFG out of storage

and unannounced would represent a key warning indicator.⁸ Regardless of what exceptions are negotiated, both sides will want assurance that any exceptions are not larger than permitted by agreement, and that the purpose of any exercise involving controlled items like tanks is as previously announced. Verification procedures for agreed exceptions to established equipment ceilings could include an annual calendar of exercises over a specified size involving controlled items of equipment, specifying the units involved, the location, size, and purpose of the operation, the duration of the event, and the number and types of the tanks that would participate. Simultaneous announcement of alerts could also help, although such announcements can be anxiety provoking or confidence building, depending on the circumstances.

REMOVAL FUNCTIONS

In the removal category are withdrawals, departures, disbandment, export, destruction, and other types of elimination. The withdrawal of equipment from particular areas, the abandonment and closure of storage areas, the departure of units and their subsequent disbandment, the destruction of specified items, or the export of controlled units of account all lend themselves to direct observation. Nevertheless, monitoring these activities fast enough, enough of the time, should be a formidable task. Eastern resistance to most removal functions could be minimal. Historically, the USSR has been least critical of observed withdrawals, often implying that monitoring withdrawals was the same as verifying reductions, thereby avoiding the more intrusive measures necessary to verify ceilings. Intrusive measures now seem to worry the USSR somewhat less.

Verifying withdrawals by formations containing the agreed units of account is the most reliable method. A standard unit (e.g., Soviet Motorized Rifle Regiment) which has a known number of tanks leaving the GSFG order of battle will be easy to count out through a specified exit point, where inspectors count controlled items and note the departure of other major heavy items of equipment. Some head count would be possible, too. From a verification point of view, it would be preferable for the reductions to be specified in terms of units, like battalions or larger, rather than major items of equipment. For example, the following designated divisions, consisting of subordinate regiments each with a specified number of tanks, will leave GSFG on dates X through points Y, accompanied by specified Combat Support and Combat Service Support elements. Even if that were done, however, it would not be possible to define the remaining force in

⁸Peter Almquist, "Moscow's Conventional Wisdom; Soviet Views of the European Balance," *Arms Control Today*, Vol. 17, No. 10, December 1987, p. 19.

terms of such units. Doing so would fix the residual force structure for an indeterminate future by treaty with the potential adversary, something military commanders on both sides seem unlikely to accept.

The best we may achieve is an East-West undertaking that TLIs, such as tanks, shall be withdrawn by units (if they are in units), leaving each alliance free to restructure the residual as it sees fit. Obviously, tanks in storage parks can only be withdrawn in groups or piecemeal. Some allies, like the Federal Republic of Germany, may resist withdrawals by units, noting the differences between forces of states within the area of reduction and those with territory outside, like the United States and the USSR. It may be possible to compromise by allowing states with all their territory in the Atlantic to the Urals region to reduce by items of equipment, but requiring the United States and the USSR to withdraw by units. European reductions would mean some combination of unit disbandment and storage or export of controlled units of account. Such activities and others, like transit, can be observed by inspectors or attaches, if they are prenotified according to an agreed schedule. Soviet unit disbandment, even disbandment of large units like divisions, would be hard to verify reliably, without cooperative measures such as identification of the point of disbandment inside the USSR, and identification of the points where the major accountable items would be stored, dismantled, destroyed, or otherwise disposed of. It may be possible (but expensive) to arrange for withdrawing units to be accompanied by observers to an agreed exit point from a reduction area.

STASIS

Broadly interpreted, stasis means continued conformity to agreed and familiar patterns not related directly to weapon ceilings. In particular, a condition of stasis should require controlled, permanent diminution of threatening elements useful for surprise attack. For example, a CFE treaty could inhibit surprise attack by eliminating certain items, types of units, or practices from a specified zone between the two alliances.

To illustrate, prohibitions on the exercise of chemical attack, the removal of forward based Soviet bridging equipment, the departure of specialized units designed for rapid assault (Soviet Operational Maneuver Groups, or OMGs), and cutbacks in forward positioned stockpiles of artillery, ammunition, and fuel, could all be Western desiderata⁹

⁹The second two were mentioned by Gorbachev in his December 7, 1988 UNGA presentation; the latter two figured among those mentioned in an informal statement by SACEUR (Supreme Allied Commander, Europe) to the Congressional Military Reform Caucus, July 13, 1988.

if applied to Warsaw Pact forces. Some prohibitions, like forbidding chemical attack exercises, imply subordinate requirements such as the removal of related equipment from the forward area. So, in addition to the elimination of chemical storage and an end to certain training practices, the Soviets might be asked to remove the large decontamination trucks that support chemical and nuclear attack. (These are essentially modified jet aircraft engines mounted on truck beds. The West has no comparable vehicles, and, after 1992, will have no chemical weapons in the forward area. Although the Soviets would argue that these vehicles are defensive, a chemical attack would be less likely were they all to be removed moved from the area.)

Such a cluster of illustrative measures applied in some narrow forward area, perhaps 50 or 100 km wide, seems sufficiently diverse to illustrate the verification problems of stasis. The narrower the area of application, the easier it will be to discover violations. And the total absence of some force component, like Soviet OMGs, of particular items of equipment like decontamination trucks, or the total absence of fuel or ammunition dumps, is far easier to verify than reduced stocks of fuel, fewer pontoon bridges, or reduced chemical stockpiles. Likewise, the total cessation of a prohibited activity in some narrow area is far easier to verify than conformity to some preannounced calendar of events. This is particularly true of the Eastern side, where exercises are usually small and the number of annual exercises tends to be large; we can be sure, on the other hand, that the absence or presence of Reforger would be noticed by the Soviets without special verification provisions. Banning chemical attack training altogether, for example, would be easier to verify than adherence to some calendar for training chemical units. Not surprisingly, stasis questions are harder to deal with in a broad area, even if the pieces and practices to be monitored and verified are familiar and clearly understood. There is just that much more to be covered.

SOME SIMPLE RULES

Because stability is supposed to be achieved by measures affecting the size, location, and behavior of forces through reductions, limitations, redeployment provisions, and equal ceilings, verification considerations may not always take precedence in the formulation of particular agreement provisions. Verifiers will argue that the phrase "related measures" was introduced to assure at least equal attention to verification and warning considerations, and that this phrase has been accepted by all parties. That principle may stick until the day when, having insisted that the Soviets withdraw tanks from the forward area by divisions, under observation, to a point beyond the Urals where

they are required to disband the tank units and destroy the tanks, the Soviets agree, provided the American and French armies do likewise. This example was intended to illustrate circumstances where verification considerations do not take precedence. Nevertheless, there are few situations where verification considerations will be ignored. What often happens is that an obligation formulated in a negotiating proposal put forward to the East represents some compromise between verification considerations and some competing requirement.

To assist in the design of monitoring and verification arrangements for a CFE agreement, designers might keep a few simple rules in mind as they formulate obligations relating to the size, composition, positioning, and future behavior of the force components being constrained. These are:¹⁰

- Total absence of controlled items (e.g., tanks) or activities (e.g., out-of-garrison exercises of specified scope) is easier to verify than negotiated limits on the same items or events.
- The narrower the geographic area of application for a particular treaty obligation, the easier it is to verify.
- The presence of units containing controlled items of equipment is easier to verify than numbers of equipment items.
- The presence of large units and formations is easier to verify than the presence or absence of small ones.
- The presence of familiar, standard combat units is easier to verify than new kinds of combat units, reserve units, or rear area formations.
- Conversely, the larger and more complex the unit or formation, the more difficult it is to establish holdings of major equipment items with precision.

The last two rules may be the most important. The reductions now on the table imply massive restructuring. In such circumstances, the verification plan would concentrate more on the postremoval residual, that is, what force replaces the Soviet tank armies in East Germany, than on assuring that the withdrawing force actually withdraws according to the terms of agreement. What remains behind will be reorganized as an essentially new and presumably continuous front opposite NATO, a partially unfamiliar

¹⁰See also Thomas J. Hirschfeld, *Intelligence and Arms Control, a Marriage of Convenience*, Chap. 1, Texas Monthly Press, February 1988, pp. 14-16.

force consisting of units formerly observed elsewhere but now in new locations and dispositions. This situation will require detailed disaggregated information on the unit holdings for controlled items, and information about unit location and subordination, to assure an adequate Western understanding of the reconstituted Soviet force. Such understanding is necessary for continued unambiguous warning of surprise.

The application of these simple rules to the formulation of a verification program for CFE can be illustrated by an extreme example. *The most verifiable* ceiling on tanks would apply in a narrow area. Within that area, no tank units would be stationed, stored, manufactured, prepared for export, or permitted to transit. *The next most verifiable* situation would be a wider area, where the number of tank units would be limited, by number, type of unit, and tanks per unit (e.g., V tank divisions consisting of W regiments formed by X battalions, and other units of specified kinds, each of which had Y tanks of specified types and models, forming a total of Z tanks). Tank storage, manufacture, export, and transit would be tightly controlled. No new types of units containing tanks would be permitted in the area. Using these rules, it is reasonably easy to describe a descending hierarchy of verification schemes for limiting tanks or other equipment items.

V. HOW TO VERIFY: VERIFICATION WAYS AND MEANS

Having speculated on what might need to be verified, and how difficult that might be, we turn to the tools and procedures available for the job. These tend to complement each other.¹¹ Their ability, in concert, to verify the still hypothetical terms of a CFE agreement remains to be tested.

NATIONAL (TECHNICAL?) MEANS

According to the Department of State's definition, "National Technical Means" (NTM) includes "photographic reconnaissance satellites, aircraft based systems such as radars and optical systems, as well as sea and ground-based systems such as radars and antennas for collecting telemetry."¹² NTM provide the inevitable starting point for the CFE verification system. NTM information provides the framework that is filled in by information from other sources. The precise characteristics and capabilities of NTM are carefully held (e.g., photographic resolution). It is a truism that NTM quality improves over time. Some of the limits on NTM effectiveness allegedly have more to do with resource allocation (system targeting and availability of satellites and launch resources) than with technical considerations. This implies that you get more if you spend more—that, for example, the intelligence community could, would, and should build and orbit a satellite to verify a CFE agreement if the money were there. Generically, NTM improvements often involve greater frequency of target coverage and accuracy of observations. For such reasons, neither side can be sure about what the other has access to. That is a disincentive for cheating, but also an incentive to test adversary systems by inspiring adversary complaints.

The term National Technical Means has no precise, commonly agreed meaning, yet both sides have agreed solemnly and repeatedly not to interfere with NTM. This agreement evolved from Khrushchev's explicit acceptance of satellite photography (and concurrent rejection of aircraft reconnaissance) in 1961, to broader if not always explicit understandings about the acceptability of other systems. The Soviets have, for example, seemingly tolerated U.S. radars and other equipment directed at the USSR from the

¹¹See Michael Krepon, "Verification Tools for Conventional Arms Control," *The Future of Conventional Arms Control in Europe*, Center for the Study of International Affairs, Department of State (FSI), September 1988, pp. 43-49.

¹²U.S. Department of State, Bureau of Public Affairs, *The Search for a More Stable Peace*, Washington, D.C., June 1983, p. 65.

territory of third parties. Likewise, the presence of ships or aircraft on such missions in international waters or airspace seems to be marginally acceptable. For that matter, aircraft with similar missions against some Soviet clients (e.g., Cuba), are not interfered with. And although our telemetry collection against Soviet missiles has not been trouble free, Soviet interference normally takes the form of encrypting Soviet missile telemetry rather than interfering with the emissions of U.S. systems. On the other hand, the Soviets have not tolerated violations of Soviet airspace or territorial seas.

In short, although NTM is a familiar term for both sides and non-interference with NTM is an accepted feature of most arms control agreement verification systems, there may be room to redefine and expand NTM to suit the requirements of an essentially different enterprise like CFE. Such a change could be justified by the large number of different potential units of account, the complexity and large number of obligations which the sides may undertake, and the much larger number of parties affected by the outcome. Those differences suggest an elaborate system and the participation of many national parties. For example, in these circumstances both sides may have to tolerate overflights by adversary manned aircraft or by remotely piloted vehicles (RPVs), to establish the presence of units with controlled items of equipment and to increase warning. Some international precedent exists for this function. The U.S. Air Force has conducted similar inspections for the United Nations Emergency Force (UNEF) in the Sinai, to the satisfaction of UNEF staff and of the conflicting parties, Israel and Egypt.¹³

To supplement on-site inspection, or follow up on inspections, the parties could consider beefing up the existing Military Attache system. One could broaden the meaning of NTM by dropping the "Technical," to allow attache personnel performing specified functions to be included. Military Attaches are national means, and could become national means of verification. They are expert military personnel under national control. Access for attaches is under the control of the host country. Permitting increases in the number of attaches assigned to the embassy of each participating country and broadening permitted access for attaches could:

- Allow more frequent access to specified installations, or to all territory, within some specified region, minus preannounced permanent or temporary exclusion zones or points. Attaches from each side could coordinate their

¹³See Ensio Siilasvuo, "Verification Activities in UNEF II in Sainai," in the *Report of the Symposium on Verification of Disarmament in Europe*, The Swedish National Defense Research Institute, Stockholm, 1985, p. 68.

efforts within each host country to assure optimal coverage. Inspection results could be fed regularly to an allied center organized for that purpose. The conditions of access and the conditions for denial could be agreed in the CFE process but would need to be formally expressed in bilateral arrangements between states sending and receiving attaches.

- Increased use of attaches could help involve allies with no NTM or rudimentary assets more directly in the verification system, and if properly managed, build NATO cohesion while limiting the need for U.S. assets. Smaller allies would have greater confidence in an intelligence product they understood by virtue of having participated in collection and local assessment.

COLLECTIVE (ALLIED AND EAST-WEST) MEANS

Only the United States and the Soviet Union have a full panoply of space-based surveillance equipment. Britain and several other European NATO countries have ground, sea, air, and some space based technical assets. France has a commercial photographic satellite system (SPOT), but is planning something better, to be called Helios. For reasons of security, the United States has not shared its NTM product with all allied security establishments as completely as many of these would wish. While acknowledging security problems, some more suspicious or envious allied officials ascribe U.S. reluctance to share intelligence products like satellite photographs more widely (rather than just analytical results) to American interest in dominating allied threat estimates through our unique technical assets. Such suspicions already fuel allied Euro-posturing in the form of interest in a "European" observation satellite system whose locally analyzed product would compete with ours. Such a system might be the prospective French Helios, or an as-yet-unidentified Euro-satellite.

Such developments are potentially divisive. Too many intelligence analysts often mean low-common-denominator results. Accurate interpretation of photographs or radar data takes more than good machinery. Experienced observers long familiar with the target are at least as important. We have them; the Europeans, by and large, do not. So analysis of CFE verification problems from the same data or the same imagery by many analysts of diverse background could generate more heat than light. For example, that process could increase the number of suspected violations. Aside from annoying possible future questions like whether or how to compare the U.S. overhead product with hypothetical Euro-photos of the same phenomenon, we may have to agree in NATO on

how all such images are to be interpreted. Once that is done, we will need to decide in concert how and to what extent information derived from NTM can be used with the other side in support of the CFE verification and compliance program.

Such questions could be decided in an intra-alliance Threat Analysis Center. Such a Center could manage the relationships that will develop between the warning and threat analysis systems that the alliance would have with or without CFE, and the CFE verification systems. Information flow from NTM (ours and allied) could be sifted, culled, interpreted, and coordinated there with other intelligence information and with verification compliance information from other sources. It is to be hoped that the increased volume of timely information suitably sifted would enhance warning and increase confidence in CFE compliance, rather than just add to confusion. Which effect a larger volume of timely information has may depend on how the Center handles information. The Center could also formulate NATO's questions to the East about compliance, and research the West's supporting arguments.

Such a Center could have resources under its own control, such as liaison officers assigned to and resident with the opposing forces. Naturally, the analogous Warsaw Pact Center would be sending out its own comparable liaison personnel. These Centers, like the somewhat analogous Nuclear Risk Reduction Centers in the INF context, would facilitate and organize adversary inspection arrangements according to agreed procedures. Continuing contact with adversary headquarters in the forward area and secure communications between liaison officers and the Centers could complicate a potential attacker's problems and increase the number of warning indicators. Even if having liaison officers at airfields and division headquarters is hard to negotiate, higher level resident personnel with the opposing force will be of some value. It would, for example, be difficult for an entire staff to dissimulate for long about a force change or policy change to a resident officer familiar with his assigned unit and its procedures. Ideally, with time and increased confidence, there could be more liaison officers, at lower levels.

Finally, Center personnel could supply the Western component of yet another hypothetical multi-lateral structure, an East-West Risk Reduction Center. This East-West Center could deal with low-level incidents like border infractions or overflights before they become major issues, routine data exchange, and, if necessary, initial review of data discrepancies.

ON-SITE INSPECTION

For decades, on-site inspection (OSI) was a favorite requirement of Western officials frustrated by the Soviet penchant for secrecy. For their part, the Soviets chose to regard every Western OSI request as an espionage attempt, and routinely refused OSI out of hand. Beginning with the 1976 Peaceful Nuclear Explosion (PNE) treaty, the USSR accepted the principle of OSI on Soviet territory. With INF, the Soviets have accepted a broad range of OSI measures directed at Soviet forces on Soviet soil and beyond. In CFE, they have specifically called for OSI. Historically, Soviet policy toward OSI suggests continuity and change. Major points of continuity for all verification schemes since 1946 are insistence that any verification measure relate to some arms control arrangement like reductions or agreed ceilings, and that the verification system be somehow proportional to the disarmament obligations undertaken. There is no evidence that the Soviets have set these principles aside, despite Western enthusiasm for CFE arrangements confined to measures that promote the transparency of adversary forces. On the other hand, the acceptance of many different OSI arrangements in INF is an important precedent, comparable in significance to Khrushchev's acquiescence to overhead surveillance in 1961. So resisting OSI is no longer a matter of principle for the USSR. Rather, it may be a question of how little OSI they can get away with in each instance, a principle which will also apply to the West, in selected instances.

Limited experience to date suggests that OSI is no panacea. Most observers agree that OSI helps NTM monitor compliance with treaty obligations. In arms control agreements like INF and, presumably, START, OSI can verify declared numbers of treaty limited items and essentially rules out cheating at most announced sites and facilities. It is questionable whether OSI can do either for CFE, given the problems of verifying ceilings (see Sec. IV). Clearly, OSI can generate useful information, enhance warning, and confirm or deny the findings of other sources. Western enthusiasm for OSI has declined, as its limitations and inherent problems came into sharper focus with experience. In particular, enthusiasm for anytime/anywhere challenge inspections is on the wane, as the problems of reciprocal application come into sharper focus. Also, the costs and complexities of OSI arrangements are just beginning to be understood, as various DoD components grapple with the far simpler INF inspection system. It is becoming clear that the costs will be high of being prepared to inspect, inspecting, or continuously monitoring hundreds more declared and suspect sites in CFE than in INF. The Defense Department's On-Site Inspection Agency (OSIA) uses 133 headquarters personnel, some 200 inspectors, and almost 200 aircrew for baseline and closeout

functions involving 133 known sites, and need to have 200 more available for portal inspections at *one* production facility. Military Airlift Command (MAC) resources, already strained by INF requirements, may be stretched further by START, without the much larger demands that CFE may impose.

Breaking OSI down into CFE-related functions using headings adapted from INF and START could look as follows:

1. Post Agreement Baseline Inventory

Once the agreement is in force, there could be inspection of randomly selected units of ready divisions and of some lesser units to help verify the agreed ceiling. This sampling technique would build on earlier data exchanges. These exchanges will have formed Western ideas of Pact totals for individual controlled items by eliciting data on the equipment holdings of actual Warsaw Pact units and formations. Sampling maintains some confidence that agreed ceilings are being maintained by assuring warning of significant changes in the number of controlled items per unit. Inspectors would visit units of different kinds (tank battalions, repair units), within selected divisions, and check items counted against estimates and assumptions about those unit's holdings and those of their parent organizations. Important variation, especially in the forward area, would require prompt explanation. Storage and production sites would be declared and inspected. Controlled items could be left in the open where they *could* be counted from the air and random-checked on the ground.

Tanks not selected for destruction could be stored in reserve units (defined as Category III or IV divisions for Warsaw Pact forces) or in depots with turrets, guns, and tracks removed. Exported items could be controlled by designating the consignee and mode of transport, and observing arrival and departure. Production, storage, or deployment of controlled items at any site except declared sites (including units) would be a violation. Tanks would be transported only in groups of X or more, over distances of Y miles. Smaller numbers would be permissible for shorter trips.

2. Closeout or Elimination

NTM can usually determine whether or not a particular familiar unit, depot, or other facility is still in existence and functioning. In addition to checking these perceptions, OSI can accompany a unit to be disbanded from a point where it crosses a boundary to some designated area, thus confirming the unit's departure from previous locations, and monitor the transfer of controlled items of equipment of departing units to a depot. This requires the inspected party to designate the future storage site and the

point of disbandment for the unit. A more complex and perhaps more likely closeout operation would be the transformation of active units to reserve category, a process which may require more inspectors or more frequent inspection, at least initially, not to mention open storage of dismantled tanks and other controlled items.

Finally, destruction needs to be defined. For tanks, for example, destruction would presumably be something between quartering the chassis and removing the gun, turret, and tracks. Destruction, whatever the agreed definition, should take place at announced sites and could be directly observed.

3. Short-Notice Inspections

Short-notice inspections are no guarantee against cheating. Nevertheless, in combination with other measures, short-notice inspections increase the financial and opportunity costs of cheating and raise operational constraints and other practical difficulties for military commanders contemplating departures from agreed procedures.¹⁴

a. At declared facilities. Such inspections could help maintain confidence in an overall baseline for controlled items. Visits to particular units or declared depots, for example, can sharpen understanding of what is normal for the opposing forces, thus improving understanding of the overall pattern of Warsaw Pact practices. Improved understanding increases our ability to identify anomalies. Second, if the declared storage area or depot were under continuous control (meaning under peripheral observation by on-site personnel and/or unmanned sensors), visiting inspectors could identify local and generic problems, tighten procedures, and record anomalies. Over time, this practice would presumably standardize observations and results, thereby helping improve confidence that the agreed equipment levels were being maintained. Visits to selected depots or units also provide a way to spot check suspicious phenomena identified by other means.

Challenge inspections may be of some use in search of tanks or other controlled items of equipment in excess of agreed numbers. Inspectors could, in theory, rush to count forward area tanks in randomly selected battalions in three widely separated divisions, seeking evidence of a piecemeal tank buildup across the opposing force. Much larger than normal tank counts in these three battalions could confirm suspicions and provide sufficient evidence to justify challenge.¹⁵ That scenario assumes that forward

¹⁴See footnote 12.

¹⁵It is foolish to expect every Soviet unit of similar designation (e.g., tank regiment) to have the same number of controlled items. No real military unit normally does. Indeed, a

area divisions (or all units within which controlled items are stored) qualify as declared facilities open to challenge inspection.

b. Challenge inspections at suspect sites. In theory, challenge inspections could be particularly useful for checking on the presence of *banned* equipment in a narrow forward area, once the presence of such equipment was suggested by other means. For example, an inspection team with effective communications traveling rapidly by aircraft or helicopter might arrive at some point 50 or 100 km from the demarcation line in time to spot evidence of forbidden bridging equipment and report it. Yet that discovery depends on the non-location of the pontoon bridge at a "sensitive point" (a declared temporary or permanent off limits location); non-exhaustion of the inspecting country's annual number of challenge inspections; and non-exercise of the inspected state's putative right of inspection refusal. Although there is no requirement for the CFE verification system to include such inhibitors to efficient challenge inspection, we will need to plan for their inclusion, to safeguard allied and U.S. security interests. This is a possible effect of reciprocity considerations. One limited approach to the problem is a specific agreement provision to allow for the negotiation of more declared facilities, if necessary, after the agreement is in force.

The best known current example of temporary and permanent restricted zones frustrating inspection concern the Potsdam Military Liaison Missions (MLMs)—the former Western Occupying Powers still inspect Soviet forces in Germany, more or less, and Soviet inspectors look at allied forces in the FRG. It is possible that these missions could be made more useful, once CFE negotiations have actually begun, if the inspecting allies (and the Germans) wish it so. Greater freedom for MLMs (meaning fewer temporary and permanent restricted areas, for example) would mean better warning of movement or force changes in the forward area on both sides. Anytime/anywhere challenge inspections become even less useful away from the forward area, where distance weather and the questionable availability of the right transport may add significantly to delay.

One study suggests that in analyzing challenge inspections, calculations of the benefits and risks of such inspections should consider that although perhaps one out of every ten short-notice inspections in a CFE agreement would be a challenge at suspect sites, well over ten percent of all the complications arising from implementing a CFE

discovery that three Soviet tank regiments picked at random had exactly the same number of tanks could warrant suspicion that the inspector was being exposed to Potemkin's villages.

accord are likely to be generated by anytime/anywhere challenges.¹⁶ Although hardly conclusive, these findings, coupled with the other limitations touched on above, suggest that the CFE verification system could include challenge inspections but not depend on them.

4. Continuous On-Site Monitoring of Declared Facilities

a. Controlled storage. Continuous monitoring of three kinds of controlled storage could provide useful warning of intended surprise attack:

- i. Specialized equipment potentially useful for surprise attack: NATO observers could, for example, monitor storage of the Warsaw Pact's bridging equipment, tank transporters, pipe-laying equipment, mine-clearing equipment, and decontamination vehicles.¹⁷
- ii. Forward deployed fuel and munition storage sites.
- iii. Major items of controlled equipment from forward area disbanded units.

If a major formation from the forward area is disbanded in the forward area, rather than withdrawn from it (e.g., Volksarmee Divisions), then those major items of controlled equipment not destroyed or turned over to designated reserve units should be placed in controlled storage. Maximally controlled storage could mean a designated site of identified dimensions and characteristics (covered or open) where human observers assisted by manned and unmanned sensors have continuing access to the periphery. It might not be possible to negotiate an optimal system. Warsaw Pact states, or for that matter, NATO countries, might not tolerate that much adversary surveillance over their prompt access to military supplies.

For warning purposes, it is important to know that significant quantities of controlled items are going out of depot or into the forward area. Unmanned sensors around storage areas and monitoring exits may be enough, coupled with some requirement to pre-announce removal of controlled items in connection with training exercises or alerts.

¹⁶Sidney N. Graybeal and Michael Krepon, "The Limitations of On-Site Inspections," *Bulletin of the Atomic Scientists*, Vol. 43, No. 10, December 1987, pp. 22-27.

¹⁷This is an illustrative not exhaustive list.

Unmanned sensors such as those that have been used with success by the Sinai Support Mission for monitoring the presence of forces and equipment include seismic acoustic sensors, optical and infrared cameras, and strain sensitive cables.

b. Continuous monitoring of production. INF experience suggests that sensors can play an important role in monitoring production of controlled items of equipment, in conjunction with NTM and inspectors. The INF monitoring system may be adaptable for monitoring the production of tanks and other types of controlled equipment on-site. The Soviets seem willing to adapt the idea of inspecting production monitoring to contexts other than INF, although it remains to be seen whether they would be willing to agree to production inspection of conventional items.¹⁸ Production monitoring for tanks, for example, will be harder than for SS-20s or cruise missiles. The same is true for artillery tubes, armored personnel carriers, and aircraft. The quantities produced and stored at the production sites are far larger than SS-20 or cruise missile numbers. There are many more production sites for all of them. For that matter, there are many more such sites in the West for the Soviets to inspect and monitor. It would help to take Gorbachev at his word and ask how many tank plants will be converted to civilian use. Furthermore, as noted earlier, tanks, artillery, aircraft, and other major items of conventional equipment are also export items. So continuous monitoring can mean instruments and inspectors at production sites, ancillary depots, railheads, and ports, a tall order. How much either side will be willing to spend for a more exact count of artillery tube production (in contrast to cruise missile numbers) may ultimately have as much to do with the design of the production verification system as how well it is supposed to work .

5. Tagging

Enthusiasts have suggested tagging schemes for major items of controlled equipment. A tag would be a nonreplaceable, nonremovable tamper-proof plate with unique data identifying the tagged vehicle by number and unit. Records of the vehicle tagged could be retained by each side. Those discovered without tags would be in violation. Some centralized data base analogous to a commercial inventory would keep track of the tagged vehicles. This avenue is worth exploring although success seems to depend on a continuous flow of accurate corrective information about each TLI as it

¹⁸Jeffrey Smith, "Soviets Seek Cruise Missile Verification," *The Washington Post*, July 23, 1988. According to this description of the latest Soviet START proposals for cruise missile verification, Soviet negotiator Karpov has proposed that "US and Soviet Inspection teams would be stationed outside of every factory where cruise missiles are produced and conventional or nuclear warheads are installed."

changes location and unit. Failure to report promptly and accurately could mean large numbers of apparent violations. Even if tagging is feasible, it hardly represents a complete solution. Our best hope lies in synergy, the idea that some combination of verification measures and added resources will assure that the postreduction ceilings of major items of equipment are being maintained to the extent that they matter militarily. If there are unaccounted-for tanks somewhere in the area, the verification system should be adequate to discover them before their presence adds significantly to the threat, especially the threat of surprise attack.

6. Prohibition of Concealment Measures

Perhaps both sides can agree not to camouflage controlled storage areas, factories, export depots, railroad cars bearing controlled equipment items, and if applicable, air bases. Because both sides' deployed forces will continue to exercise normal caution in the face of potential adversaries, it becomes hard to identify what else either side should deliberately make visible or audible to the other, much harder than in INF or START. What that might be could be a subject for early East-West discussion, once the West has figured out what it would be willing to reveal on a continuing basis about its own forces. Not surprisingly, the West is reluctant to provide adversary forces with an evidential basis for asking questions. Yet unless it does, it will be difficult to get the more secretive Warsaw Pact to reveal enough to allow effective monitoring of Eastern forces. As Eastern forces change in size, composition, and configuration through reductions and redeployments, effective monitoring becomes more important.

VI. CONCLUSIONS

If we can negotiate acceptable versions of these verification tools and arrangements, our hope for their success lies in synergy and in common sense. The verification system would be primarily concerned with the postreduction situation when the goals of CFE have been achieved to the satisfaction of both sides, at least by definition. The participants will, after all, have signed the agreement. Among these goals is "eliminating" the ability to launch a surprise attack or mass attack. The Soviets have claimed that they would agree to (a) deep asymmetrical reductions; (b) measures that inhibit behavior of forces; and (c) vastly increased adversary oversight that increases transparency. So for a postreduction situation we should imagine conditions where the USSR and her Warsaw Pact allies have agreed to arrangements which greatly increase the financial and opportunity costs of attack preparations, and of cheating. Having made their own lives considerably more difficult, how plausible is it for them to organize a surprise attack or massively prepare for one?

In combination, the above described measures and techniques could uncover important changes in the adversary force, especially in the forward area, more quickly than we can now. Tight monitoring of forward area forces will be required until the reduced forward area forces have become as familiar to adversary observers as the predecessor units were. The longer verification measures and techniques are in use, the more reliable they should become. Nevertheless, reduced risk of surprise attack and improved warning will not be enough. So long as both sides pursue precise obligations like equipment and personnel ceilings, we will need to assure that the ceilings are being maintained, if only in gross terms.

Gross terms may be all that is possible. The very size and complexity of the verification job will force choices that gradually eliminate merely desirable verification tasks in favor of necessary ones. Designing and costing out a comprehensive verification system could show that the costs of capturing minor infringements to the established ceilings are disproportionate to the benefits. It should become clear that a continuous watching brief on all the treaty limited items and personnel, even if technically feasible, would cost a great deal. Therefore, optimal verification resource allocation could mean more precise counts for ceilings in the militarily significant forward regions than for the ATTU area as a whole. Such emphasis could also hedge against significant piecemeal

forward area reinforcement. We would need to be sure that Soviet forward depots and deployed battalions, for example, were not gradually growing.

The difficulties of verifying a CFE agreement precisely are gradually entering public discourse, as more articles appear specifying how complex CFE verification could be. Public discussion should gradually sensitize readers and legislators to the differences of scale between verifying limitations on strategic forces and verifying CFE ceilings. The latter involve many, many more units of account, each of which is far less significant than a strategic missile or bomber. Over time, general awareness of these essential differences should increase political tolerance for a CFE verification system more focused on military security than on cheating.

Finally, NATO partners should decide early on how to factor information from the verification system into the broad stream of normal warning information so that it adds knowledge rather than confusion. And both sides have data issues to discuss from the beginning. These questions arose with the first major discrepancies between official Eastern and Western data on their respective holdings of prospectively controlled equipment. They will now arise again with the introduction of personnel ceilings. Agreed procedures for coordinating responses on the Western side and for resolving them with the East will be needed early, even without a need to agree on the size of prereduction holdings. Having these procedures grow into an institutionalized East-West dialogue empowered to discuss and resolve adversary questions about orders of battle and force structures may be a lasting benefit of CFE. It could even be worth all the other aggravation, although that may not become apparent for a while.