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# Verifying Conventional Force Reductions

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*Pragmatic steps toward ideal objectives*

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Portrait of Henry L. Stimson as Secretary of State courtesy of the National Portrait Gallery, Washington, D.C.

# VERIFYING CONVENTIONAL FORCE REDUCTIONS

by

Lynn Hansen*

## Introduction

At the NATO Summit meeting in May 1989, President George Bush asked the Western Allies to join in proposing the most far-reaching conventional arms reductions ever offered in any negotiation. Moreover, he urged that agreement be reached within six months to a year and that reductions be accomplished by 1992 or 1993. This challenge will not be easily met since the issues still to be decided are fraught with political and technical complexities.

Agreeing on what forces are to be reduced and by how much will prove to be a daunting undertaking. But the task of negotiating a verification regime which is acceptable to all 23

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participating states is even more complicated. There is more at stake than monitoring residual forces. Fundamental national geostrategic interests, both political and military, are entwined in the bargain. In designing a verification package for the conventional armed forces in Europe (CFE) talks, each state will both represent and confront differing political objectives and initiatives. In this context, there is not Europe; rather, there are 21 European states plus the two North American countries, each representing specific cultural and historical experiences.[1]

In these negotiations, the Soviet Union must now contend with the newly found autonomy of its Warsaw Pact allies. The United States must also recognize that its allies will insist on playing an increasing role in managing European security issues emerging from the arms control process. As a result, verification of a CFE agreement will be a multilateral undertaking in which each of the sixteen NATO countries will play a vital role.

Since individual allies must consider both the political and security implications of unprecedented conventional force reductions, each will insist on defining the limits of intrusiveness acceptable in the various monitoring schemes to be negotiated. Moreover, each will want to be an active and full participant in the monitoring and verification process. For its part, the US cannot impose its verification standards upon the

European allies who will bear the brunt of whatever intrusive measures are agreed.

The resulting multilateralization of conventional arms control verification will break new ground for much of the verification community in the United States. National Technical Means (NTM) of intelligence-gathering, which undergird the American approach to verifying nuclear and bilateral agreements, cannot be the sole determinant in an Alliance-wide verification strategy. In some Western political circles there is suspicion that the United States has used its satellite monitoring capabilities for political purposes. For this and other reasons, security analysts and politicians alike are looking to the acquisition of a European-based capability for monitoring multilateral arms control agreements. As a result, cooperative measures such as on-site inspections and aircraft overflights will play a much more important role in verifying a CFE agreement than will the utilization of technical means. Nevertheless, cooperative measures will complement NTM, for the latter will, as Jonathan Dean states, remain the most important single resource for verifying a CFE agreement.[2] As part of this process, a mechanism will have to be found to share appropriate data from each alliance member's NTM with its allies.

Defining Verification

Verification is a continuum of arrangements and events which involve human factors, objective events, technical capabilities, a pinch of trust, and wise political judgment. Despite the complexity of the process it can be divided into four categories: 1) identifying treaty requirements, 2) harmonizing and implementing monitoring mechanisms, 3) analyzing information, and 4)judging compliance. A fifth step would encompass actions to be taken if non-compliance is judged to have occurred. Indeed, if a CFE agreement is to retain its validity, there must be no doubt but that a breach would generate an appropriate response that either imposes some penalty or neutralizes any possible advantage gained by non-compliance. (This fifth step, however, is beyond the scope of this paper.)

Verification requirements for a CFE Treaty can be defined in juridical terms or in terms of military significance. A juridical approach to verification is reflected most clearly in an October 1984 report, "A Quarter Century of Soviet Compliance Practices under Arms Control Commitments: 1958-1983", issued by the Arms Control and Disarmament Agency's General Advisory Committee. This report concluded there had been seven Soviet violations of commitments under the Strategic Arms Limitation (SALT) Agreements and ten breaches of other arms control commitments. It also identified additional areas where there

were suspicions of Soviet violations but inconclusive evidence.

The conceptual framework for reaching these conclusions rested on the norms of international law: The authors used the 1969 Vienna Convention on the Law of Treaties and decisions of the International Court of Justice as the legal basis for analyzing Soviet compliance. This analysis, however, went beyond traditional legal norms to prove guilt. It also dealt with breaches of oral commitments and practices incompatible with the essential objectives of agreements.

A juridical approach to verification contains political as well as legal elements. It demonstrates the difficulty of achieving sound agreements to which the parties are legally bound and can be held accountable. The General Advisory Committee's report did not, however, attempt to define the degree to which the security of the United States was put at risk by Soviet misconduct. For example, the recurring transit of Soviet aircraft carriers through the Turkish Straits violates the Montreux Convention of 1936; the threat it represents to NATO's collective interests is not due to passage through the Straits, per se, but should be judged on the basis of other factors.

The methodology of the General Advisory Committee report is appropriate to determining the political advisability of entering into agreements with a negotiating partner deemed less than

trustworthy. It is, however, an extremely difficult way to deal with compliance issues in the North Atlantic Alliance. Nor does it provide a defensible basis for entering into arms control agreements during a period when the Bush Administration has indicated that U.S.- Soviet relations have moved past containment to cooperation.

An overly juridical approach to CFE verification would split the Atlantic Allies, create a moribund negotiation, and recreate the Mutual and Balanced Force Reduction (MBFR) Talks. Apart from a relatively few verification professionals, most experts agree that the proper standard for verification is Western ability to identify the risk to security, respond effectively, and deny any significant advantage to the violator. This "military significance" criterion was the basis for the Reagan Administration's approach to verification of the Intermediate Nuclear Forces (INF) Treaty. As Paul Nitze has said, "[T]he proper standard [for verification] is to be confident that, if the USSR moves beyond the limits of the treaty in any militarily significant way, we would be able to detect such a violation in time to respond effectively and thereby deny the Soviets the benefit of the violation."[3]

By focusing on the criterion of military significance, we can avoid descriptive phrases like "adequate" or "effective" verification. These adjectives easily lose their meaning since

the verification process is not a pure science and since there are no widely accepted criteria for establishing adequacy or effectiveness.[4] Instead, ascertaining compliance is an analytical task involving incomplete and often piecemeal data, sometimes tinged by political considerations.

In attempting to craft a definition for verification of conventional force reductions in Europe, it will be impossible to exclude legal and political aspects. But these considerations should not be allowed to dominate the process. Getting sixteen different NATO governments to assign the same political value or legal judgment to an arms control verification issue is a senseless, time-consuming project. The military significance criterion for verification avoids the pitfalls of a juridical approach while correlating nicely with NATO's objectives of securing a balance of conventional forces at lower levels, eliminating disparities prejudicial to stability and security, and eliminating the capability for surprise attack.

## Defining the Task

NATO initially identified the systems to be limited as tanks, armored troops carriers and artillery. At the NATO Summit in May 1989, President Bush moved to "lock in" Eastern acceptance of Western proposals for limits on three systems: 20,000 tanks and 28,000 armored troop carriers for each side, and between

16,500 and 24,00 artillery pieces. In addition, the North Atlantic Council agreed to add three more categories subject to reductions. The West proposed that each side reduce its attack helicopters and land-based combat aircraft to a level fifteen percent below current NATO totals. President Bush also proposed that both the United States and the Soviet Union reduce the total number of their ground and air force personnel stationed outside national territory in Europe to 275,000.

To compound the problem of ascertaining compliance with residual ceilings in six categories of forces mentioned above, these categories will be further limited by zones and rules. Both East and West have proposed that the Atlantic to the Urals area be subdivided into four zones, and there is to be agreement on establishing a limit on the number of forces any state may station outside its own territory. One aspect of the complexity of this problem can be illustrated by using the example of tanks. If Eastern Europe were to be divided into three zones, the tank ceiling of 20,000 will be distributed among the three zones and the verification task will be to ascertain that no more than the agreed allotment is present at any time in a specific zone. Moreover, it must also be determined that the agreed complement of "stationed" tanks is not exceeded and the totals of all zones must still add up to not more than 20,000. In this context, it may also be necessary to distinguish between those tanks assigned to active units and those in storage or with non-active units.

Still another dimension to this problem is monitoring tank production in the Atlantic-to-the-Urals area to ensure that the allowed ceilings are not exceeded.

A juridical approach to CFE verification would indicate that monitoring mechanisms must be capable of counting with exactness the number of weapons systems in each zone to ascertain compliance with negotiated limits at any given time. It is, however, difficult to conceive of a verification approach that can meet the challenge of monitoring simultaneously 20,000 tanks, let alone one that is politically acceptable. In theory, "tagging" schemes might provide such exactitude, but they can easily lose their appeal when considerations of intrusiveness and cost are involved. Similar considerations apply for artillery pieces, especially in light of the fact that many European armies have a variety of towed artillery. Juridical verification approaches become even more hopeless when confronting the issue of manpower. The MBFR experience has already demonstrated the illusion of verifying manpower by counting individuals. As Ambassador Dean reminds us, "All soldiers have to do is to take off their uniforms and put on civilian clothing and they are virtually undetectable."[5]

Attempts to categorize aircraft as either defensive or offensive would make a mockery of verification, as most, if not all, "defensive" aircraft can become "offensive" with minor

modifications. (A MiG-23, for example, can quickly exchange its air-to-air missiles for air-to-ground rocket pods.) Even without such distinction, verifying aircraft is a complex, intrusive undertaking which will be addressed later in this paper. Helicopters may be even more difficult because of the proliferation of civilian models similar in appearance to military models. Helicopters, too, will be discussed in greater detail below.

Monitoring and Information Exchanges

The MBFR negotiations were obstructed throughout most of their history by disputes over data. The reluctance of the Warsaw Pact to exchange complete, disaggregated data coupled with NATO's inability to propose acceptable solutions to the discrepancy between Eastern aggregate figures and Western estimates hopelessly compounded the difficulties of ever reaching agreement.

The key to preventing similar impasses in the future is for all parties in the negotiation to exchange detailed and disaggregated information on the forces to be monitored in the verification process. Disputes over data can be avoided if participating states exchange information on the organization, structure and disposition of their forces, rather than an exchange of aggregate data on each element of the forces to be

reduced and limited. Judging from a host of Soviet pronouncements, the provision of disaggregated data should no longer be a problem. The greater the detail, the better for verification purposes. Ideally, the exchange should provide details on the entire table of organization and equipment (TO&E) down to the level of regiment and/or brigade.

A knowledge of organizational structure is key to understanding Warsaw Pact military art and strategy (or military doctrine, in Western terms). If modifications in the Eastern approach to warfare in Europe are occurring and if Soviet forces are being reconfigured from an offensive to a defensive posture, that will be reflected in the way forces are structured at the strategic, operational, and tactical organizational levels, corresponding to the hierarchical scheme of Soviet and Warsaw Pact military art.

Military doctrine is not being negotiated in CFE. Nevertheless, it is as germane to military capability as are individual items of military hardware. The most obvious indicators of doctrine are military organization and force disposition. Numerical data on military equipment is important, but the focus of Western monitoring efforts must be in unit structure, which is the best measure of military capability. West German Foreign Minister Hans-Dietrich Genscher has succinctly stated the reason for this approach:

> Equal ceilings for some weapon categories, even if they could be coupled with manpower restrictions, would still not be an adequate indicator of the true balance of military power. It is the combination of weapons and military personnel in formations which determines either side's capability for attack and defense. Thus if we want to subject the capability for invasion to arms control, we shall have to find a suitable way of bringing units and other formations into the calculation. This is particularly true with regard to verification since restrictions of weapons, but especially of manpower, are difficult to verify except on that basis.[6]

Every unit has a table of organization and equipment or its equivalent. It is here that the treaty-limited equipment (tanks, artillery and armored troop carriers) are identified in relationship to personnel and other combat and combat support equipment. As a rule, Soviet and Warsaw Pact combat units have standard levels of equipment. In such a standard unit, the table of organization and equipment can be used in the monitoring process as a template against which every unit can be evaluated.

This evaluation is not meant to provide the basis for a juridical approach to verification: If, for example, a random inspection of a particular unit finds that it has three more tanks on hand than the standard TO&E would suggest, it does not necessarily follow that on that particular day Soviet tanks within the Atlantic-to-the-Urals area are three over the 20,000

level. Indeed, other random inspections could uncover some units that are modestly below strength. As it will be impossible to visit all 20,000 tanks on one day, random inspections and statistical techniques will be required to verify compliance, to correlate Soviet military doctrine with capabilities in the field, and to monitor changes over time that could be of military significance.

Take, for example, a typical Soviet Motorized Rifle Regiment. (See Figure 1).[7] Usually it contains 40 tanks, 18 self-propelled artillery pieces, and 152 armored troop carriers. Engineering equipment and radio gear as well as various small weapons are also indicative of unit capability. The personnel aggregate is 2,225 troops. It is not unreasonable to assume that, because of the relatively small size of a regiment, it will be housed together in the same barracks. This may not be true for a larger unit, such as a division. The regiment is, therefore, a significant but relatively small military unit which lends itself to measurement. Inspectors can count 40 tanks at one time; they cannot count 20,000.

To assure oneself that the 20,000 limit on tanks is not being exceeded, it would theoretically be necessary to conduct some 500 inspections simultaneously to monitor each of our notional regiments with 40 tanks. By inspecting 100 of the theoretical 500 regiments at random (with minimum or no advance

notice and no discernible pattern of inspection), and by applying a standard sample size equation, it is possible to calculate that 98 of the 100 regiments subjected to on-site inspection were typical.[8] Intelligence estimates might help identify what units should be inspected, thereby facilitating the monitoring process.

In this calculation, one must determine what constitutes an acceptable confidence factor, tied to agreed criteria reflecting military threat or capability. In the example used, the confidence factor has been calculated to be just over 98%. This means that there is a lower than 2% likelihood that the random sample would be in error. The monitoring process should create a hedge against atypical regiments by combining on-site inspection with other monitoring means. This is especially significant for stationed forces and those located in the forward military districts where factors of time and distance are part of the calculus. The point to be made, however, is that it may be possible to calculate a different acceptable confidence factor on the basis of capability. In such a calculation one would judge whether it is 2% of 20,000 tanks that changes capability and threat, or whether it is some higher figure.

Whatever confidence level is desired from random inspections, the results of the statistical analysis would then be applied against the template information provided in data exchanges. This, in turn, would be integrated with other

information to be analyzed. A resulting analytic estimate would then be utilized in the process of judging compliance.

A key conceptual element to the template approach is that the monitoring task requires checking the authenticity of the information provided by the other side, not the validity of one's own estimates of opposing forces. After reductions, information provided by a side must tally up to be no more than agreed residual ceilings. Stated differently, NATO would hold the Warsaw Pact accountable for the data it provided, instead of interminably wrangling over the validity of the data, as was the case in MBFR.

## INSPECTIONS USING THE TEMPLATE APPROACH

With trained inspectors, an on-site inspection team could use the template concept to gain an understanding of an individual unit's capability and to count the numbers of treaty-limited equipment (TLE) assigned to it. After arriving on site, the inspection team would have to seal the perimeter of the site. It would then check the number of TLE present against both the information exchanged for the unit and the unit's own books. The inspection team would need to be sufficiently large to be able to split into subgroups in order to count tanks in sheds, in local training areas, railheads, or in any other location used by the regiment. Procedures for photographic evidence negotiated for

inspections

Figure 1

ILLUSTRATIVE TEMPLATE FOR A SOVIET MOTORIZED RIFLE REGIMENT (BMP)

| | Rgt Hq | MR Bn | Tk | Arty Btry | SAM Co | Anti -T | Rec | Eng | Other | Totals |
|---|---|---|---|---|---|---|---|---|---|---|
| Personnel | 65 | 1290 | 165 | 220 | 60 | 40 | 55 | 60 | 270 | 2225 |
| Tanks | | | 40 | | | | | | | 40 |
| ARTY/2S1 | | | | 18 | | | | | | 18 |
| Mortar-120mm | | 18 | | | | | | | | 18 |
| SA-9/SA-13 | | | | | 4 | | | | | 4 |
| SA-7/SA-14 | 3 | 27 | | | | | | | | 30 |
| ZSU-23-4 | | | | | 4 | | | | | 4 |
| ATGM launcher | | | | | | 9 | | | | 9 |
| RPG-16 | | 99 | 2 | 18 | | 9 | 4 | 4 | 4 | 140 |
| Grenade Launcher | 18 | | | | | | | | | 18 |
| RPK-74, LMG | | 108 | | 18 | | | 3 | | | 201 |
| ACV | | | | | | | | | | |
| BTR/BRDM/BMP | | 9 | 2 | | 3 | 4 | | | 3 | 21 |
| ACV Reconn | | | | | | | | | | |
| BMP 1976 | | | | | | | 1 | | | 1 |
| AMRP/BMP | | | | 1 | | | | | | 1 |
| APC BTR | | | | | | | | | | |
| 50/60/70 | 2 | | | | | | | 3 | | 5 |
| APC FAC | | | | | | | | | | |
| BTR-60 PA | 1 | | | | | | | | | 1 |
| ASC BRDM | | | | | | | 4 | | | 4 |
| AICV BMP | | 108 | | | | | 3 | | | 111 |
| ACRV M1974 | | | | 8 | | | | | | 8 |
| Bridge MT/55 MTU | | | | | | | | 1 | | 1 |
| Bridge TMM | | | | | | | | 4 | | 4 |
| Dit. BTM/MDK | | | | | | | | 1 | | 1 |
| Dozer BAT | | | | | | | | 1 | | 1 |
| Excavator | | | | | | | | 3 | | 3 |
| Mineclearing Plow | | | | | | | | 9 | | 9 |
| Mine-roller Plow | | | | | | | | 3 | | 3 |
| Minelayer | | | | | | | | 3 | | 3 |
| Radio R-104M/107 | | | | | | | | 4 | | 4 |
| Radio R-104M | | | 2 | | | | | 1 | 3 | 6 |
| Radio R-130 | | 6 | 5 | | | | | 1 | 2 | 14 |
| Radio R-118 | | | | | | | | | 1 | 1 |
| Radio R-126 | | 42 | | | | | | | | 42 |
| Radio R-107 | 3 | 39 | 1 | 10 | 2 | 3 | 3 | | 10 | 71 |
| Radio R-123 | 2 | 117 | 41 | 28 | 11 | 13 | 7 | 4 | 12 | 235 |
| Radio R-311 | | 3 | 1 | 2 | 3 | | 1 | | 3 | 13 |
| Relay R-401/405 | | | | | | | | | 2 | 2 |

under the Stockholm Accord, signed in September 1986, could be applied to CFE as well.[10] Rules would need to be formulated against altering or obliterating individual TLE identifying marks, such as turret numbers.

In the Stockholm Document, sensitive points can be exempted from inspection per se, provided such areas and points are not where notifiable activities take place.[11] This principle could also be usefully applied to on-site inspection procedures for CFE, where sensitive installations, such as nuclear storage sites, must be exempt from obligatory inspections. As with the Stockholm Document, a CFE Agreement should take care not to exclude facilities where TLE could be stored.

By expanding the template concept from regiment through each structural echelon (e.g., division, corps, army, groups of forces, military district), one can construct a model against which to ascertain compliance with zonal ceilings. In this way, existing organizational entities such as the Groups of Soviet Forces in the German Democratic Republic, and military units in Poland, Czechoslovakia and Hungary, as well as the relevant military districts in the Soviet Union, can be satisfactorily observed.

Other Monitoring Mechanisms

For the sake of completeness in judging capability and threats to stability, on-site inspections should be complemented with information and insights provided by other measures, such as the Military Liaison Missions (MLM). The military missions -- both Western and Soviet -- have served the interests of peace and stability in Europe for 42 years. The expertise they develop by being on the ground in the two Germanies provides them with an in-depth understanding of what constitutes routine military operations. One authority has characterized the MLM as a mutual inspection system, assuring both sides that unusual military build-ups were not taking place or that large numbers of troops were not being moved into an attack posture.[12]

Drawing on the experience of the military missions, NATO could propose that roving observers be permanently assigned to specific regions or zones.[13] These observers would have a different assignment than the military missions, but they could develop a similar expertise in monitoring the security situation on a day-to-day basis. Even though their assignment would not be to enter military facilities, their presence on the ground with negotiated rights to travel freely would make it extremely difficult to conceal significant changes in force posture in the specific area to which they are assigned.

In a similar vein, the Stockholm Document specifies that all ground force activities involving 13,000 troops be predicted on an annual calendar. These activities are to be notified in detail 42 days in advance. Whenever such an activity exceeds 17,000 troops, observers from the 35 states participating in the conference on Security and Cooperation in Europe (CSCE) will be invited to observe them. Neither the observers nor the notifications themselves fulfill a basic verification task. Nevertheless, they help provide for security and maintain stability in Europe. More relevant for verification purposes is the right, without an inspected party's refusal, to conduct an on-site inspection of any military activities. This provides another opportunity to observe and record the utilization of military hardware in the field, including tanks, artillery and armored troop carriers.

More than 20 such inspections have been conducted, including several by U.S. inspection teams.[14] Inspections also have been conducted by teams from several other countries, including the United Kingdom, the Federal Republic of Germany, Turkey, the Soviet Union, Bulgaria, and the German Democratic Republic. To date, these inspections have proceeded without significant difficulty, and they are widely viewed as contributing to stability in Europe. Again, CDE inspections constitute only one form of monitoring. While this form is not definitive in the overall process of verification, it provides additional data

points.

The Stockholm Document also provides the opportunity for aerial observation during an on-site inspection of a military activity or suspected military activity. While the Stockholm Document excludes "sensitive points" from both inspection and aerial observation, such exclusion areas cannot be areas where notifiable military exercises take place. An expansion of aerial observation provisions as part of a strengthened confidence- and security-building measures (CSBM) regime in Europe would create additional opportunities to monitor the security situation. One approach, whether in the CSBM area or in CFE itself, would be AWACs-type aircraft with synthetic aperture radar and pertinent aspects of the joint surveillance/target attack radar system (JSTARS) technology. This, too, would be compatible with NATO's objectives in the CFE Talks.

Although at this writing the details are yet to be finalized, Soviet receptivity to President Bush's "Open Skies" proposal provides another avenue to strengthen confidence that CFE limitations are not being violated. An aircraft with the right to fly at reasonably low altitudes has a degree of flexibility to make key observations that a satellite does not. It can not only fly beneath the clouds, but also operate at altitudes and distances which create observation angles which allow a line of sight into open sheds and storage facilities.

Aircraft can also respond to suspicious sightings by making multiple passes over an installation or activity.

President Bush has also proposed "open lands" which would permit, for the first time, uninhibited travel for all Soviet and American diplomats throughout each other's country. This is similar to a proposal which has often been considered for the Conference on Security and Cooperation in Europe (CSCE) negotiations on CSBM. That proposal had focused on lifting travel restrictions on accredited military personnel. Assuming President Bush's concept includes such personnel, it goes even further and creates a greater climate of openness which is essential for successful arms reduction treaties.

Permanent observers assigned to key nodes in the European transportation network are another possibility. This issue requires additional analysis and study, but it is now clear that the rail transhipment points are candidates for permanent observers. At these points the railroads from the Soviet Union change gauge from the Soviet system to that employed in non-Soviet Warsaw Pact states. In essence, this means that all rail shipments from the Soviet Union to Eastern Europe must be channelled through these nodes. Additional analysis might also identify appropriate junctions in the road network and even airfields where a permanent presence could contribute significantly to the monitoring/verification task.

In the MBFR negotiations, both NATO and the Warsaw Pact agreed on the utility of permanently monitored exit and entry points. As a complement to permanent observers at key transportation nodes, well defined exit and entry points for the different zones which are to be agreed on could be a useful addendum to the overall monitoring scheme.

Storage Sites

Several countries will presumably have a requirement to place some TLE in some form of storage. These TLE should fall under overall ceilings and thus be subject to a definitive monitoring scheme. In addition to tanks, artillery, armored troop carriers and other TLE, a comprehensive stability regime for Europe might also include additional constraints -- not limits -- on bridging equipment and minelaying gear. Chemical weapons decontamination equipment might also be subject to constraints. Compliance with such constraints would also have to be monitored.

Whether dealing with equipment limited by treaty or constrained by a stability measure, the most effective means of monitoring would be via permanent monitors. Such a mechanism would in itself also be a stabilizing measure because of its potential to increase warning time. If a permanent presence with

full access were judged too intrusive to be acceptable, some limited form of perimeter monitoring with periodic rights to inspect inside the storage area could be examined.

Production

In the juridical approach to verifying a CFE agreement, it would be necessary to keep a constant accounting of aggregate totals for every tank, artillery piece, armored troop carrier, aircraft, and combat helicopter throughout the whole of Europe. It would also be necessary to devise some means of counting stationed U.S. and Soviet combat troops. These exacting requirements would pertain in each of the zones, including careful monitoring of the production facilities which manufacture the TLE. Experience to date indicates the most effective method for accomplishing this task would be to establish permanent perimeter-portal-monitoring (PPM) systems. As devised in the INF Treaty, this means restricting the facility's exit point by means of a permanent physical barrier and then monitoring, on a full-time basis by personnel and sensors, treaty-limited items leaving the facility.

The difficulty with such systems is not their feasibility or the contribution they make to the verification process, but the cost and intrusiveness of a permanent Warsaw Pact presence on civilian industries in Western Europe. The potential for mischief

created by PPM teams at a large number of Western Europe's military production plants probably outweighs the rationale for their presence. Additionally, the political awkwardness of U.S. advocacy of perimeter-portal-monitoring when its own industry would be exempt provides cause for looking at a different approach. Our NATO Allies would object to such arrangements on political grounds alone.

One alternate approach to dealing with production monitoring would be to look not at production itself, but rather at exchange and storage. Monitoring exchange would again put the focus on military structure as a measurement of capability and threat. In accordance with a reporting requirement, the introduction of new equipment items such as tanks would be pre-notified a certain period of time in advance. At the same time, the disposition of the old equipment would also be announced. Whether the exchange of new equipment for old takes place in units or in storage, each time a new TLE is consigned to a defense ministry in the zone, it requires destruction of a like, if older, item. Each pre-notification of equipment exchange (modernization) might be accompanied by an automatic right to inspect the garrison and/or storage facility involved in the exchange.

This kind of monitoring scheme would not require permanent presence or a production accounting system. It could be supplemented by agreed procedures for aircraft surveillance. The

entire set of procedures involved need not interfere with the export of military hardware. Ideally, production facilities in the zone would be subject to suspect site or challenge inspections to deter or detect any possible clandestine storage within the grounds of the production plant, although this may not be possible because of resistance to such highly intrusive measures.

Aircraft

Monitoring aircraft ceilings is a thorny problem. Nevertheless, some methodology must be found to monitor and verify these limitations if combat aircraft are to be included in a CFE Treaty. The complexities of verifying aircraft ceilings are such that it might be well to harken back to the original CFE negotiating objectives set by the NATO alliance: aircraft monitoring provisions would be geared and compliance would be viewed in the context of threats to stability, capacity for surprise attack, and capability to seize and hold territory. The objective would not be to count each aircraft, but rather to utilize all the information available and obtainable over time to draw specific conclusions about overall military capability.

A juridical approach to verifying aircraft must be abandoned for at least three reasons: 1) the high-speed movability of aircraft, 2) the intrusiveness of permanent monitors and 3) the

incredibly high volume of air traffic in the relatively condensed airspace of Europe.

There is virtually nothing that can be done about how fast aircraft can be moved from one location to another. In theory, one could impose regional constraints on where aircraft could and could not operate. This would need to be accompanied by a scheme for keeping track of aircraft entering and leaving the designated area. In practice, this would require establishing one or two airfields as entry points through which all exits and entries would be logged. This concept is impractical since it imposes further constraints and additional monitoring complexities, while doing little to solve the fundamental problem of verification.

In verifying aircraft numbers, even more than the case of tanks or armored personnel carriers, some form of baseline on-site inspection appears to be inevitable. For in the case of aircraft, unlike ground force equipment, capability is embodied in the TLE themselves, as opposed to the capability of the units to which they are assigned. As a result, the only way to deal with aircraft numbers is to count them.

Counting is anything but simple, since aircraft bort numbers in the Warsaw Pact forces are routinely duplicated in both color and number. Moreover, counting by aircraft number is of marginal utility unless all aircraft within the zone are counted

simultaneously. This argues for an agreed stand-down period where no military aircraft fly. During this stand-down period, airfield inspection teams would count each aircraft using standardized counting rules and procedures. (Such teams might have to visit between 30 and 40 airfields in the GDR alone.)

Even these extraordinary procedures, by themselves, would only confirm that during the stand-down period a certain number of aircraft were present on designated airfields in the zone. This "snapshot" of aircraft status could be radically altered, given the speed and mobility of the combat aircraft to be monitored. The most obvious remedy for this situation would be to place permanent monitoring teams at main operating bases.

By logging takeoffs and landings the team could keep fairly accurate tabs on aircraft at its airfield. To be complete, all permanent teams would need to be able to transmit data to each other on a frequent and unimpeded basis. At this stage, however, it remains uncertain that any state would wish to have a permanent foreign presence on its most sensitive airbases.

If permanent monitors are unacceptable because of their intrusive nature, then the search for a solution is thrown back into the lap of technical means. It is here that one encounters the third problem, that of extremely high air traffic density over Europe. Radar tracks provide some help, but they are far

from definitive for the purposes of verification. It is, however, theoretically possible to make each aircraft individually identifiable via technical means: Each aircraft could be outfitted with a special transponder which would transmit a unique, pre-assigned signature signal. Such a transponder would need to be permanently set at its pre-assigned frequency. It would also have to be tamper proof. Moreover, it would need to be permanently affixed as a hedge against the possibility of removal or alteration. A third condition would be that it would begin to transmit whenever the aircraft was in operation.

In such case, each aircraft in the zone would have its own transponder code which would be listed in a catalogue as part of the CFE regime for exchanging information. Obviously, every combat aircraft in the zone would have to be "tagged" with its own transponder and included in the information exchange. In addition to whatever national technical means might be available to various countries, it might be possible to install Identification Friend or Foe (IFF)-type interrogator receivers in Airborne Warning and Control System (AWACS)-type aircraft to assist in the verification process. Special rights for the flights of monitoring aircraft could be negotiated to enhance further this capability. A quota of on-site inspections to check that the transponders had not been tampered with would also be required. Further consideration would need to be given to

aircraft in transit within the zone or entering for a limited period for exercise purposes.

As is evident from this discussion, aircraft tagging schemes can be enormously complex. In addition to the intrusive nature of this type of monitoring design, there are other drawbacks. Transponders break. Like any component on a modern aircraft, maintenance would be necessary. This leads, in turn, to probable breakdowns in monitoring, as treaty provisions would have to allow for maintenance and replacement procedures. Moreover, to ensure that the transponder functioned any time the aircraft was in operation, it would need to be an integral part of some fundamental system. This has implications both for maintenance and safety.

Difficult judgments will have to be made concerning how verification provisions for combat aircraft can fulfill Alliance objectives. The best approach appears to be a combination of NTM, data exchanges, and limited forms of on-site inspection and other cooperative measures. The accumulation of data from these major sources could allow sufficient analysis and judgment concerning aircraft to ascertain the degree to which stability and security are threatened.

Helicopters

The problem of verifying limits on combat helicopters is analogous to that of monitoring ceilings on aircraft. Every obstacle which exists in monitoring fixed wing aircraft is also present with helicopters, although it might be possible to characterize helicopter bases as slightly less sensitive than regular airbases. The key differences between the two lies in the fact that combat helicopters are closely associated with ground forces. For instance, some Warsaw Pact helicopters have been assigned to specific divisions for organic support. But it is doubtful that this offers much real help, since helicopters organically assigned to an element of the ground force structure must depend on maintenance and other services from a special support unit.

The special relationship between helicopters and ground forces must nevertheless be identified in regular exchanges of information. In addition to the possible measures identified for aircraft, all on-site inspectors, permanent monitors, or roving observers can contribute information on helicopters to round out the overall picture which is essential to making verification judgments.

National Technical Means

The issue with NTM is not whether they aid the verification process, but how to manage the information they provide. At

present, only the U.S. and the Soviet Union possess sophisticated NTM such as high resolution photoreconnaissance satellites. In pursuing the best verification possible, no wise policy maker should consider creating verification mechanisms that jeopardize the sensitive nature of NTM. They are national means and should remain such. The moment, however, that NTM become part of the monitoring effort in a multilateral endeavor, pressure will mount for greater and greater information-sharing. These sensitivities were apparent at the Stockholm Conference, when the original, bland NATO proposal for noninterference with NTM was quickly, but resolutely, attacked by many who saw it as discriminatory.

A CFE agreement could nonetheless include some provisions which, while not explicitly aimed at facilitating NTM operations, could enhance their role in the verification process. For example, a stipulation that TLE cannot be present in installations or facilities not housing a unit in which TLE are organically assigned could be useful both to NTM and on-site inspection and observer teams. A provision which obligates parties to park TLE outside in the clear, or with storage shed doors open upon request could be another example. It might be also possible to prohibit some encryption of prearranged radio frequencies.

Given the sensitivities associated with the use of NTM in multilateral accords, it makes sense to leave NTM out of the

formally agreed process of monitoring a CFE Treaty. Rather, NTM can be viewed as informal supplements to Alliance-wide efforts, to be used judiciously by national authorities as circumstances dictate. In the CFE process, however, there can be only one class of Alliance member, and NATO's strategic integrity must be enhanced whenever possible. With regard to NTM, it follows that a mechanism must be created within which NATO countries have access to information gleaned from the total NTM capability of the sixteen.

Organizational Issues

An intra-alliance structure for monitoring and verification will almost certainly be required to deal with the complicated task of distributing monitoring and inspection tasks, collating and exchanging information from various sources (including NTM), and interacting with the North Atlantic Council (NAC) on all issues relating to verification. A relationship to the NAC somewhat analogous to that enjoyed by the High Level Task Force on Conventional Negotiations would seem advantageous, allowing technical experts to deal with verification/monitoring issues with direct input from national capitals and avoiding direct involvement of the NATO bureaucracy. While the independence of such an intra-alliance mechanism is highly desirable, it would still be necessary to interface directly with Alliance leadership. One possibility would be to establish an additional

(perhaps ex-officio) Deputy to the NATO Secretary General with appropriate political and verification credentials. His sole responsibility would be verification, and he could chair meetings of the intra-alliance group, when appropriate.

The question of an East-West Center to deal with verification issues is sure to arise. The requirement for such a Center from the technical point of view has not been demonstrated. Moreover, NATO should do its utmost to avoid consulting with the Warsaw Pact at the expert level on compliance issues. Normal diplomatic channels, perhaps combined with some appropriate (but periodic) review conferences of limited duration, should prove adequate to the task. An East-West Center established for the purpose of dealing with verification issues resulting from the implementation of a CFE agreement would take on a political life of its own. Expressed in the language of political sloganeering, it would give the Soviet Union more floor space than is warranted in the European house. The effect would be to impede the last, but vital, step in the verification process: to take remedial action in the event non-compliance is established.

## Conclusion

No arms reduction agreement yet concluded can match the CFE negotiations in terms of complexity and difficulty. Nonetheless,

the opportunity for achieving significant change in the security situation in Europe has never been greater. This combination of complexity and opportunity offers an unprecedented challenge.

In meeting this challenge, negotiators and policy makers need to follow the advice often given to aspiring athletes: keep your eye on the ball. The ball in this case is the overall objective of creating greater security and stability in Europe by achieving a major decrease in Soviet and Warsaw Pact capabilities for conducting surprise attack and initiating large-scale offensive operations.

Verification is an integral and indispensable element in pursuing these objectives, but it is not the whole ballgame. Whether seen as a juridical process or as one which focusses most acutely on the military significance of an agreement, verification must ensure that the achievements of a CFE accord are not voided through non-compliance.

Creating more and greater openness is the key to fulfilling the verification task. On-site inspections to validate the baseline information exchanged as part of an agreement are one part of this endeavor; monitoring reductions and destruction is another. The primary challenge will come later in ensuring that residual force limits are not exceeded. This will require not only a wide variety of on-site inspections, but increased

openness and transparency in all spheres of military endeavor relevant to the restrictions and limitations imposed by treaty. Attachés, accredited observers, military liaison officers, and perhaps even cooperative measures to facilitate NTM observation will all form part of an extensive multilateral monitoring and verification effort.

Clearly, the verification provisions of a CFE agreement must be acceptable to the 23 states involved in the negotiations and must pass muster with the United States Senate. Negotiations in this multilateral forum will break new ground in the verification equation, a process that needs to be managed with skill, including a careful airing of important issues with representatives of the U.S. Senate. Armed with a comprehensive understanding of what is possible and what is more problematic, all players in the verification game can move smartly toward designing and negotiating a CFE verification regime that ensures early discovery of non-compliance and thus deters any militarily significant violation.

## ENDNOTES

1. Despite the autonomous nature of the CFE talks, France has rejected any bloc-to-bloc negotiation. At the root of this rejection is French concern that a bloc-to-bloc format would give the major power in each alliance a droit de regard over European security with the potential to impede the evolution of an autonomous new European order of states. In the view of many Europeans, the French position corresponds well to the new political dynamism in Eastern Europe.

2. Jonathan Dean, "Verifying Conventional Force Reductions and Limitations," Conventional Arms Control and East-West Stability, (Durham, NC and London: Duke University Press, 1989), p. 289.

3. Quoted in Thomas J. Hirschfeld, "The Toughest Verification Challenge: Conventional Forces in Europe," Arms Control Today, March 1989, p. 16.

4. As Senator Jesse Helms said to former Secretary of Defense Harold Brown during the SALT II hearings, "The repeated use of the qualification 'adequately' bothers me. And I guess Mrs. Brown would be a little suspicious of you if you were to come home tonight and tell her that you were adequately faithful to her, wouldn't she?" Quoted in James A. Shear, "Verifying Arms Agreements: Premises, Practices and Future Problems," Arms Control, December 1982, p. 86.

5. Dean, Op. Cit., p. 284.

6. "Conventional Stability in Europe - The Central Problem of European Security," Frankfurter Rundschau, 7 April 1988. (English translation courtesy of Embassy of the Federal Republic of Germany, Washington, D.C.). Ambassador Dean has expressed the same thought more succinctly: "It is the combination of trained manpower, weapons and their organization into coherent units which creates combat power; one element alone is insufficient." Op. Cit., p. 287.

7. The Soviet Army, Troops, Organization and Equipment, (Washington, DC: Headquarters Department of the Army, 1984), Field Manual No. 100-2-3 (Unclassified), pp. 4-27 to 4-30.

8. $n = .25 (Z/.05).^2$ n = 500 regiments; .25 is a worst case assumption factor; .05 is the assigned acceptable error, plus or minus 5%. Solving the equation, Z = 2.23 which means that the actual error is calculated to be plus or minus 1.3% or a calculated confidence factor of 98.7%. This is the simplest calculation; it may be possible to reach acceptable confidence factors for individual regiments with either more or less than 100 inspections. There may also be more sophisticated and more suitable statistical methods available. This one is used only for illustrative purposes.

9. The abbreviations used for a Soviet motorized rifle regiment are as follows: Rgt Hq = Regimental Headquarters; MR Bn = Motorized Rifle Battalion; Tk = Tank Battalion; Arty Btry = Self-Propelled Howitzer Battalion; SAM Co = Antiaircraft Missile and Artillery Battery; Anti-T = Antitank Missile Battery; Rec = Reconnaissance Company; Eng = Engineer Company; Other = Signal Company, Chemical Defense Company, Motor Transport Company, Maintenance Company, Medical Company, Supply and Service Platoon.

10. See Don Stovall, "A Participant's View of On-Site Inspections," Parameters, US Army War College, June 1989. Colonel Stovall details the events of the first CDE inspection of a Soviet military activity conducted by a U.S. team in the Byelorussian Military District and describes the first Soviet inspection of a Western military activity in Turkey.

11. Paragraph 74.

12. P.G. Skowronek, "U.S.-Soviet Military Liaison Missions since 1947," (Ph.D. Dissertation), University of Colorado, 1976, pp. 162-163. Also see Lynn M. Hansen "Confidence-Building in Europe: Problems and Perspectives," in Confidence-Building and East-West Relations, Karl E. Birnbaum (ed.), (Vienna: Universitäts Verlag, 1982).

13. Ambassador Oleg Grinyevskiy, the Soviet CFE chief negotiator, is reported as saying that the Soviet Union would be willing to allow permanent stationing of NATO inspectors in its territory. R. Jeffrey Smith, "NATO Delays Conventional Arms Plan," Washington Post, 8 June 1989, p. A31.

14. Don Stovall, Op. Cit., p. 14.