Introduction and Summary 1

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INTRODUCTION

As part of a study of the role of technology in peace operations, the Office of Technology Assessment conducted a workshop on "Improving the Prospects for Future Peace Support Operations: Tactics, Technology and Training." The workshop was held from June 12–16, 1995 at the Rockefeller Foundation's conference center in Bellagio, Italy.

The workshop helped OTA obtain the views of practitioners, policymakers, technologists and analysts on the potential benefits and limitations of technology in enhancing the effectiveness and reducing the risks and collateral effects of such operations. Accordingly, OTA assembled a small but highly distinguished international panel of experts that included the senior military commanders and civilian directors or their senior aides responsible for several recent or ongoing operations, notably Bosnia, Somalia, Cambodia, Macedonia and the Sinai. Perspectives on technology were presented by high-level representatives from U.S. national laboratories and by European technical specialists. Issues of strategy and policy were addressed by senior American and foreign officials and analysts, several of whom are or have been responsible for directing or advising on such operations. A complete list of participants appears in the front of this report.

This summary presents workshop discussion highlights, identifying observations and findings that were broadly endorsed by the participants. Issues on which a significant divergence of opinion was evident are also noted. Readers should be aware that there was no attempt to poll the panel formally on their views. These contents represent the rapporteurs' summary of the major issues as the panel discussed them. The summary is

intended to complement, not substitute for a reading of the papers presented during the meeting that are the bulk of this report.

The following workshop highlights deal first with the panel's view of policy issues, which sets the context for the equipment and technologies that may, as a result, be required in future peace operations. After defining these issues, this report presents those highlights dealing with the relationship of technology to peace operations and the prospects for newly developed equipment to improve future performance of international peace forces.

The views expressed are those of the panelists and do not necessarily represent the views of the Office of Technology Assessment, the Technology Assessment Advisory Council, or the Technology Assessment Board. Individual panelists are not cited directly in their views, a policy deliberately taken by the workshop organizers to encourage openness among the panel.

WORKSHOP HIGHLIGHTS—THE CONTEXT

Demands for International Involvement in Peace Operations Will Persist

Workshop participants agreed that, following the end of the bipolar, post-Cold War period, the world community will continue to encounter situations where conflicts and disasters arise that will create pressures for international intervention. These situations will range in character.

Some will be consensual in nature. In such cases, the parties to a dispute may look to other countries or to international organizations to provide: a) their good offices and influence to help resolve outstanding differences; and, b) the organizational and technical expertise and the technology and personnel required to monitor and otherwise carry out a peace agreement. The Multinational Force and Observers (MFO), which operates in the Sinai in support of the Israel-Egypt Peace Treaty of 1979 is a current example. In the near future, there may be demands for a similar mission in the Golan Heights, should the ongoing negotiations between Israel and Syria bear fruit.

Some of these situations will be humanitarian in character. In the face of natural and, increasingly, manmade disasters, countries and international organizations will be compelled to respond to demands for outside assistance. The manmade famine in Somalia and the epidemic that followed the genocide in Rwanda are two recent examples. With this era of instant global communications and imagery, the world's attention may increasingly be drawn to catastrophic situations by the news media. Outside parties may feel compelled by the outcry of domestic opinion to act, responding more to the horrors conveyed in television images than by pleas for help from the victims or their spokespersons.

Other cases will involve conflicts between and within states that require outside intervention to reestablish calm and create an environment for immediate conflict avoidance and eventual conflict resolution. Such intercessions may require both diplomacy and a force of well-equipped observers and peacekeepers. The long civil war in the former Yugoslavia may be a case in point.

Yet other cases will involve situations in which public safety and political legitimacy need to be restored, if peace is to be firmly implanted after a long period of conflict and insecurity. The conditions surrounding the United Nations Transitional Authority in Cambodia (UNTAC) may fall into this category. UNTAC was intended to serve as a catalyst for national healing in Cambodia, under a political agreement, by underwriting stability and safety for a free and fair election and by providing technical expertise and resources to ease socioeconomic recovery.

Finally, other instances may involve proactive engagement in regions in conflict. The desire to defuse tensions and to prevent the spread of a conflict may lead to calls for intervention by outside parties. The intervention may include the insertion of observers, equipped with monitoring capabilities and, possibly, with weapons. The preventive deployment of United Nations military observers to Macedonia in 1993 is an example of this category of intervention. Macedonia

contains many competing and, sometimes hostile, ethnic groups found in the Balkans. The unstable situation elsewhere in former Yugoslavia caused concern that, unless a protective buffer of peacekeepers were sent to Macedonia, the Bosnia conflict could spread there, or, worse, become the ignition point of a wider European war.

Often, not one but a hybrid of several challenges will confront the world community in a given location. This could increase pressure on outside parties to intervene. Some participants argued that in cases of extreme violence and human suffering, pressures on individual governments and the United Nations to act could prove determinant. As the above suggests, participants believed that the news media are increasingly playing a significant role in giving immediacy to conflicts and tragedies occurring in remote regions, continents away.

In helping OTA assess the role of technology, workshop participants spent considerable time addressing the requirements of effective peace operations. To this end, workshop deliberations sought to identify the key questions that must be addressed whenever events that may demand intervention appear on the horizon.

According to participants, *whether to intercede* is a question that cannot be fully answered without also determining:

- *when to intercede*; that is, when does an action need to be launched to be effective?
- *how to intercede*; that is, what form should the intervention take to be effective?
- *who should intercede*; that is, which party or parties and organizations are best suited to lead and/or contribute to an operation?

Some participants appeared to believe that in the recent past, the international community and its constituent parts have moved too quickly to intervene in places or in ways that were less than appropriate, although others felt that they often moved too late.

A Clear Definition of the Situation and its Challenges

Conferees agreed that **clarity in defining a situation, including a grasp of its causes, is vital to the success of any intervention** that hopes to improve human conditions, while simultaneously limiting the risks faced by peacekeepers.

An accurate understanding of the situation is vital to structure mission mandates that incorporate realistic operational goals, develop military doctrine appropriate to the specific circumstances, and arrive at a full appreciation of the possible consequences of particular courses of action before the fact. In addition, thought must be given at this stage to the problems of reconstruction after resolution of the conflict. Deficiencies in this area have been evident at the United Nations.

Sometimes the absence of clarity may be due to political differences among members of the Security Council. However, panelists agreed that the absence of clarity has often been the product of a lack of: a) solid intelligence; b) adequate awareness of historic and cultural contexts; and, c) sound military advice reaching the highest decision-making levels of the United Nations at which operational mandates are written. Two remedies to these problems recommended by several conferees appeared to have the panel's endorsement: 1) when feasible, preparation of a joint technical survey for predeployment planning purposes; and, 2) establishing the post of Senior Military Adviser to the United Nations Secretary General and Security Council. Panelists suggested several means for effectively instituting each remedy.

A Joint Technical Predeployment Survey

Preparation of a joint technical survey for predeployment planning rests on having time to conduct this exercise in advance of action. Participants recognized that time may not always be available, but, given foresight in identifying situations where future intervention might be required, it would often be possible to gain time

for planning. Making predictions on future trouble spots is in itself a product of solid intelligence.[1]

Preparing a thorough planning survey requires the participation of all components that would be involved in executing a prospective operation, including military advisers, civilian governmental and non-governmental organizations, political experts who understand the politics and cultures involved, and representatives of contributing countries. Participants agreed that a predeployment planning survey should address all the following elements:

- the nature of the conflict and its root causes;
- the historic and cultural context;
- the full range of military requirements for intervention;
- the costs of intervention—financial and otherwise;
- the possible consequences of intervention;
- a plan for post-conflict reconstruction, including its requirements; and
- a list of mission-specific assets, identifying sources of specialized skills, capabilities, and equipment.[2]

Post-Conflict Reconstruction

One participant thought it vital to emphasize the importance of having a plan for post-conflict reconstruction in hand before deployment. This would help assure that those who write mission mandates, for example, at the United Nations Security Council, recognize from the outset the long-term commitment of resources needed to bring an operation to a successful conclusion.

In this panelist's view, an operation is not truly finished until it restores a country to membership in the community of nations. This goal must be borne in mind from the beginning of the conflict resolution process. Among reasonable goals of a restoration plan would, therefore, be to reestablish "the normal conditions of law and order." This plan should be executed by "a preordained structure," put in place during an early phase of an operation—and well ahead of a conflict's end.

Further, again in the view of this panelist, a reconstruction plan in effect provides an exit strategy. Too often in the past, the UN has found it easy to get involved but impossible to disengage, even, in some cases, after decades. Citing the ongoing UN mission in Cyprus as a case in point, this panelist argued that open-ended peacekeeping commitments are failures. A viable reconstruction plan, that allows a country to function without a foreign crutch, should be given equal weight to military requirements in intervention decisions.[3] Using the restoration of normal law and order as the criterion, this panelist judged that UNTAC left work unfinished. The Transitional Authority ended after the formation of the constitutional authority to which the elections, staged by UNTAC, had led. But elections alone did not restore normality to Cambodia—the instability persists. Ongoing international involvement is still required, although in a different form.

One way to assure that post-conflict reconstruction receives the attention it deserves, in the context of a given peace operation, is to establish a Director of Reconstruction—as a standard feature of the organizational structure of peace operations, this participant argued. The panelist envisioned this director as having equal standing with the force commander and the humanitarian relief coordinator.

A key role in preparing predeployment surveys would be played by an independent senior military adviser, discussed below.

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[1] Operational intelligence requirements—as distinct from indications and warning—are in the next section of this summary.

[2] For instance, the list could be used to identify countries and organizations that are sources of essential, operation–specific communications systems, mission unique surveillance assets, transportation vehicles, demining systems, runway repair and other engineering tasks, and, if required, specialized warfare skills and warfighting assets, including weaponry.

[3] Several participants shared this assessment of Cyprus and other ongoing long term operations. They thought these open ended commitments drained limited resources and undermine support for intervention in cases where the need is more urgent. Other participants disagreed. They thought that operations that continued for lack of alternative mechanisms for maintaining peace were worth the investment.

Senior Military Adviser

Participants noted that while there currently is a military adviser for peacekeeping at the United Nations, he reports to an Under Secretary General and not directly to the top echelon of the organization (i.e., the United Nations Security Council and Secretary General). The UN Charter does, in fact, provide for a Military Staff Committee (Articles 45-47), which has never been allowed to function. The Military Adviser could, it was proposed, be the Chair of this reestablished Committee. The Committee itself could consist of Chiefs of Staff of nations contributing to UN missions, with each mission overseen by the subset of members that from the nations active in that particular mission. The force commander should have a direct relationship with the Chair and the relevant members.

Currently, by the time military advice reaches senior mandate writers, it potentially has undergone an organizational and bureaucratic filtering process that may alter its content and reduce its relevance to and impact on senior decision-makers. Furthermore, military advisers serving at the United Nations are on temporary loan to the UN Secretariat from member states. This can fetter their ability to render truly independent advice—if not in fact, then at least as perceived by recipients. Raising the adviser's position to serve directly the Secretary General and making the adviser a direct hire of the United Nations are key to obtaining military advice that is responsible and responsive to the Secretary General and Security Council.

Participants cautioned that the influence of the senior military adviser would not rest on independent status and position within the UN hierarchy alone. The appointee's military standing and stature with the major powers who sit on the Security Council is equally important. Without such recognition, his assessments would likely be ignored.

Military participants, in particular, felt strongly that military advice rendered to the Secretary General and Security Council needs to address clearly the operational consequences of a proposed mandate. These participants asserted that at the United Nations, mandates are often written in an operational vacuum by civilians who may not fully appreciate the military implications of undertakings made with immediate diplomatic and political considerations in mind. The commitment to defend a series of so-called "safe areas" in Bosnia was cited as a case in point. Several participating military officials thought that had United Nations mandate writers recognized the operational difficulties posed by safe areas, including the size and character of the forces required to protect them, they might have had second thoughts and moved to adopt other less militarily challenging objectives.

Participants also felt that mandates built on a clear understanding of the situation on the ground and a militarily realistic view of operational realities were the best guarantee of avoiding "mission creep"—an incremental widening of mission objectives, without an appreciation of their advisability or practicality.

The Commanders' Requirements for Operational Intelligence

Once a mandate has been written, a mechanism for assuring a continued flow of intelligence throughout the course of an operation must be established. Given the sensitive nature of intelligence sources and methods, countries have been reluctant to provide intelligence to foreign nationals involved in multinational operations. This is reinforced by doubts among potential intelligence providers that the information would be used in ways they consider appropriate.

One panelist called for the routine preparation of "Commander's Critical Intelligence Requirements" (CCIR) as a way to overcome reticence by intelligence providers. This procedure has been developed within NATO and includes political, as well as military, information. The CCIR would identify the intelligence that the Commander regards as indispensable to mission operations, and not just nice to have. In this view, governments would more readily supply intelligence on a Commander's priority list.

Procedures for protecting sensitive information transferred to the UN are also crucial in gaining intelligence support for peace operations. As one participant put it, this requires a change of attitude away from the notion that "the UN has no secrets." However, there are secrets and the UN must learn to manage sensitive information, if potential providers are to be forthcoming. One illustration of the problem was the trunk of classified documents reportedly found by US Marines, after having apparently been abandoned by UN personnel in Mogadishu.

Preventive Action

The question of the appropriate time for peacekeepers to intervene was addressed by several participants. Opinion was divided between those who saw great danger in intervening too late to make a difference, potentially foregoing an action that might stop the cancer before it grows out of control, and those who saw grave risks in intervening too early, potentially taking a step that would compound the problems.

Those who saw a quick reaction to crisis as posing the higher risk were concerned that peacekeepers would be deployed and committed to a mission before a situation was sufficiently understood. This could expose the force to a danger for which it is not appropriately trained, deployed or equipped. Others who favored erring on the side of caution warned that a precipitous dispatch of forces in and of itself could have the adverse effect of igniting the hostilities that the deployment was intended to contain.

One former commander strongly disagreed, arguing that these considerations have weighed too heavily in United Nations response to several recent crises. The result has been an overly cautious reaction to situations where early action could have made a difference. In emergencies, such as Somalia and Rwanda, getting involved "too much, too early" would have been the wiser course, this participant asserted. In his view, it is easier to "fine tune" a deployed robust force than to introduce or augment forces after conditions deteriorate. Several other panelists appeared to share this assessment.

As a middle position, several participants suggested that, in many instances, intermediate measures could be adopted as the initial response, which might avoid the dangers of either a premature or a belated force deployment.

Some panelists thought that preventive diplomacy was one step that should be taken as an alternative to inaction during the initial phase of a crisis. Preventive diplomacy held the potential of defusing the conflict, perhaps making other forms of intervention unnecessary. Failing that, preventive diplomacy would at least buy the time needed to evaluate the situation and learn which further measures were best suited as a remedy.

Alternatively, humanitarian assistance—by governments, international organizations or private non-governmental organizations—is, in some instances, a potent form of preventive action. Often conflicts arise from competition for scarce resources in which potentially manageable environmental conditions or repairable economic difficulties are to blame. These problems might improve through a proactive program of assistance, a panelist held.

Several participants felt that the proactive deployment of peacekeepers should itself be viewed as a potent tool of preventive diplomacy. As one participant argued, what better way to show the interest and resolve of the international community than the deployment of peacekeepers? Another panelist added that preventive deployment can serve as a tool for obtaining the ground truth required to better "inform the diplomatic process."[4]

To be effective as an arm of diplomacy, much depends on how the force is configured, the manner in which the deployment is executed, and the way the force and its mission are portrayed. The intervention in Macedonia was offered as a les-

[4] One panelist included arms control of land mines and conventional weapons that could fuel the escalation of conflict as another form of preventive action.

son in how peacekeepers can be effectively used to bolster diplomacy.

The successful deployment of peacekeepers for preventive action rests on operational transparency, to assure all parties of the force's impartial and nonbelligerent status. Conducting briefings on the force's mission and arranging visits to peacekeeping units for all parties is essential in establishing the non-offensive character of the force. Limiting the force's weaponry to light arms and establishing ongoing communications channels with the parties on the ground are also keys in winning their confidence.

Training that prepares soldiers for a "change in mind set ... from warfighting to peacekeeping" and alters military operating posture from defensive to "visible and vulnerable" is essential for preventive peacekeeping, a participant asserted. Some U.S. military experts have stated, in fact, that up to six months is required for training soldiers to participate in peace operations and then to retrain them again for warfighting (although the time estimates are somewhat controversial). The panel took note that the Nordic countries have specialized in training forces for this class of peace operations.

Peacekeeping and Peace Enforcement: Operational Continuum or Dichotomy?

Throughout the course of workshop deliberations, participants repeatedly returned to address the differences between peacekeeping and peace enforcement. The expression "Mogadishu line"—alluding to the shift in Somalia from peacekeeping and humanitarian relief to an operation to subdue Somali warlords—became shorthand for addressing differences between the two types of operations and their distinctively different operational requirements. The resulting consequences are often radically different in the two cases.

Some participants warned that the division between peacekeeping (operating with the consent of all the parties) and peace enforcement (operating without the consent of some or all the parties) amounted to a firebreak that should not be breached lightly. Once crossed, the impartial peacekeeper becomes a co-belligerent in a conflict and prospects are slim of ever reestablishing the perception of impartiality. Other panelists further argued that violence has a dynamic of its own. Once used in a peacekeeping operation, the use of force can spiral out of control as violence breeds more violence.

But after further exploration, panelists who had earlier drawn a divide between peacekeeping and peace enforcement seemed to adopt a more qualified assessment. In their view, peacekeeping should not be equated with passivity. **In some circumstances, the resort to force may be required to maintain the ability of UN peacekeepers to fulfill their mission.** What is crucial is that the use of force be confined to the following circumstances. It must be used basically in self-defense, although the definition of what constitutes self-defense may be stretched. One participant emphasized that a clear consensus by all parties on this point will be required. Force cannot be used in offensive operations. Further, it is to be used strictly in response to violations of pre-agreed understandings among all parties on what constitutes acceptable and expected forms of behavior. Also, the use of force should be limited in scale and duration and be unambiguously connected with fulfilling peacekeeping and humanitarian relief objectives.

For instance, force was used, without compromising the peacekeeping mission, in Cambodia against threats to the electoral process that UNTAC was committed to safeguard. Several participants noted that even in Bosnia, force has been used without damaging the neutral standing of peacekeepers, in instances where it was a last resort in removing threats against activities that are unambiguously connected to the peacekeeping mandate. Strikes against mortar positions responsible for attacks on food convoys constitute an example.

One participant attempted to sum up the panel's thinking with the following observations: between peacekeeping and peace enforcement one will often find a gray area—"soggy zone." In this zone, force may be selectively applied in

response to direct challenges to the peacekeeping mission.

Panelists suggested that problems arise when force is used against targets that do not directly threaten the international peace operations, say, a remote arms storage site. However, one participant cautioned, that even when these guidelines are followed that the risk of falling into a quagmire would remain. Another panelist added that an attempt to operate simultaneously in both regimes in one area—such as imposing a "no fly zone" in the air over Bosnia, or in announcing the creation of "safe areas" and weapons exclusion zones, while attempting peacekeeping on the ground directly below—confuses the situation and can compromise the ground force's neutral status.

The United Nations Should Keep the Peace; Enforcement Is Best Left to Powers and Coalitions

This appears to be a controversial conclusion, but, in fact, seemed to be the universal feeling of the panelists. Peacekeeping and warfighting each dictate different types of leadership, organization, and participation in executing a mission. Each also sets different parameters for mission training, force posture and equipment. Accordingly, the panel broadly agreed that from the outset of any operation an understanding of whether an operation would be confined to peacekeeping or whether it could involve substantial enforcement activities was crucial.

The panel strongly believed that **the United Nations is best suited for traditional peacekeeping, including humanitarian relief,** rather than other peace operations. The United Nations Charter is a document that reflects the shared views of 185 countries. This gives the organization a special license to troubleshoot worldwide and offer its good offices and humanitarian assistance, among other things. As one panelist noted, the UN is especially effective in sponsoring peace operations in which the weight of its broad membership is brought to bear, such as the 34-nation contingent UNTAC operation.

Outside the UN, specialized bodies and regional organizations can also play a role in managing peacekeeping operations. The panel specifically considered the work of the Multinational Force and Observers, an organization created specifically to monitor the Israel-Egypt peace accord. Discussions suggested that it is adopting cost-effective practices that the UN would do well to follow, including staffing, training, and procurement.

Regional organizations likely have an understanding of local conditions, including a familiarity with language, customs and personalities, and the operational environment in their region, unmatched by countries from outside. On the negative side, regional groupings sometimes carry political baggage that could make them unacceptable to one or more of the parties to a conflict. Further, countries in developing regions may lack basic resources for peacekeeping.

The United Nations' Strengths are a Liability for Peace Enforcement

The disturbing experiences in Bosnia and Somalia formed a persistent theme throughout workshop deliberations. Participants repeatedly looked to those cases for lessons on what can go wrong in peace operations. **Reflecting on that experience, participants concluded that the UN is structurally and organizationally ill-prepared to be an arm of peace enforcement.**

According to several participants, the very thing that is the source of the UN's unique strengths in peacekeeping—the organization's broad and diverse membership—is a liability for peace enforcement. With 185 disparate members, each with distinct and often incompatible military capabilities and practices, resource limitations, and competing stakes and interests in any particular situation, the organization is not realistically able to conduct warfighting operations under Chapter VII of the UN Charter.

In theory, at least, the United Nations is a club of coequals. In practice, the equality may be restricted to the five permanent members of the Security Council. But, even if only at this level,

decision–making is consensual in nature. This state of affairs is incompatible with effective military operations that require a hierarchical command structure. Further, many organizational components in the UN system appear to feel that they have a right to override orders by direct appeal to the Secretary General. Every national military contingent of a UN operation can ignore military directives (and many have done so, although the practice may be frowned upon by UN officials) by contacting its national capital and invoking national command prerogatives.

Several panelists argued that such breakdowns in command are not only possible but inevitable in UN-led operations, since different countries supply contingents for different purposes and with different interests in mind. For instance, in UNOSOM II—the UN-mandated enforcement operation in Somalia—few UN member states were willing to serve in policing operations, and fewer still were prepared to participate in peace enforcement. Even countries that initially claimed a readiness to join in enforcement operations failed to do so when asked. Some made commitments that were clearly limited in length of time of participation. A few countries even withdrew their military contingent when difficulties arose, midway through an operation, leaving their partners terribly exposed to dangers. Were it not for the fact that the Somali gangs "couldn't shoot straight," many more UN troops would have been killed, a participant claimed.

UN involvement in enforcement operations undermines its credibility in peacekeeping and related activities—a regime in which its expertise is unchallenged. One commander made a particularly forceful case in this regard. In his view, the United Nations' credibility in peace operations rests on having "no enemies but parties and partners." Accordingly, UN participation in enforcement operations is an action of virtual suicide for the organization's impartial status. Furthermore, given the relatively vulnerable posture required for peacekeeping, wisdom dictates that peacekeepers should be withdrawn, once warfighting takes over. To "operate a peacekeeping force ... somewhere between peacekeeping and large-scale enforcement is madness," this panelist argued. This remark was seconded by others.

Among the countries that have shown a readiness to join in UN-led enforcement operation are the world's developing states. But contingents provided by many of these countries often lack rudimentary tools and training to seriously contribute to operations. For instance, some states contribute troops who have never operated an automobile to serve as drivers. Other contingents arrive without essential fighting gear, expecting the UN and wealthier nations to equip them and provide on-the-spot training in weapons use. Occasionally, some even arrive without appropriate clothing.

Many panelists emphatically held that, once a peace enforcement operation is mandated, a single power, or else a small coalition of powers, should lead it. Improvisation can be deadly in enforcement operations. While countries may prefer to act in coalition rather than alone—allowing countries to share resources and spread the risks—coalitions should be built around countries with well-established military links, panelists said. Countries with shared memberships in defense alliances, e.g., the North Atlantic Treaty Organization (NATO), are obvious candidates for executing enforcement operations.

Participants felt that even if enforcement is best performed outside the United Nations structure, a mechanism for handing-over operations to, as well as from, the United Nations needs to be established. Given the organization's special qualification for undertaking peacekeeping and post-war reconstruction, a process for disengaging and re-engaging the institution and its resources when conditions warrant needs to be instituted.

It is through the mandate-writing process that a link between the UN and peace enforcement is most effectively created, a participant said. The UN may have limitations in conducting enforcement operations but, as discussed earlier, the organization is uniquely suited to determine when intervention is warranted and the form it

should take. Participants appeared to agree that the Security Council's authority under Chapter VII of the Charter to mandate enforcement operations and then assign the execution to a lead nation, a small group of nations, or a regional organization needs to be sustained. For those charged with conducting enforcement operations, having a UN mandate to invoke is an invaluable instrument in legitimizing their mission.

Operational Unity is Key to Mission Success

Panelists strongly agreed that operational unity is indispensable for both peacekeeping and peace enforcement. Conference participants identified the absence of operational unity as a common denominator of failed operations. The breakdown of operational unity in UNOSOM II in Somalia has been mentioned in this context.

For military commanders, firm and unambiguous command authority is a fundamental rule of operation. This holds equally for peacekeeping and peace enforcement. Assuring that troops do not compromise mandates by taking unilateral actions that stray from agreed missions objectives is vital in either type of operation. In particular, a tight rein on peace enforcement is key to the precise orchestration of operations that are successful, while keeping the use of force and the dangers faced by troops to a minimum.

Peace enforcement is not intended to subjugate any of the parties. Its purpose is to create conditions where nonviolent forms of conflict resolution and the restoration of normality are possible. The controlled use of minimum force is more promising than the unleashing of massive violence in keeping the door open to cooperation.

Operational unity is most easily achieved by unity of command. However, unity of command is practical only in operations where a single power, with a clearly defined command structure, dominates. In multinational coalitions, where countries will likely retain control of national contingents, "unity of purpose" is a more realistic operational goal, according to participants.

Among other things, unity of purpose requires agreements among coalition partners, reached before a deployment, that commanders of national contingents will not at every turn seek to renegotiate the terms of their participation with the UN (or other lead) force commander, or worse—appeal to their respective capitals to overrule the force commander whenever it suits them.[5]

Both civilians and military members of the panel added that effective civil-military coordination is no less important in achieving unity of purpose. Peace operations typically involve major civilian components. In some operations, civilians are in charge, as in Yugoslavia. Accordingly, there can be little hope of achieving unity of purpose unless coordination encompasses both civil and military components in the field. In past UN operations, civilian and military staff have sometimes never met before the inception of an operation.

As has already been suggested, some participants were troubled that the UN operates as "a stove-pipe operation." Whether civilian or military, everyone who works for the organization routinely contacts UN headquarters in New York to make decisions and resolve disputes. Participants believed that, at a minimum, there should be one person in the field with the authority to coordinate the activities at least of all UN elements, if not also of the independent non-government organizations associated with an operation.

Another panelist suggested that "diplomatic unity" was yet another ingredient necessary for mission success. Behind diplomatic unity is a commitment by the governments (responsible for initiating an operation) and the military authorities (responsible for executing it) to work in unison.

[5] The UNTAC Commander attempted to avoid the latter problem by asking all contingent commanders to keep him informed of developments in their countries relevant to the mission. The results of this initiative were mixed.

Parties to a conflict may, at one time or another, be dissatisfied with a peace mission and its objectives. In those instances, they may seek to exploit fissures between coalition partners to sabotage an operation. A sustained, unified diplomatic front is key to maintaining the pressure on all parties on the ground. The common front of the major powers and interested regional states in support of UNTAC was indispensable in bringing the mission to a successful conclusion, a participant observed.

To address the various aspects of unity of purpose in peace operations, panelists held that the following requirements had to be met:

- a single command authority directing an operation;
- a clear and agreed set of rules of engagement for all forces;
- a preexisting civil-military organization that could rapidly be moved to the field to serve as headquarters staff;[6]
- a single command, control, communications and intelligence structure (C3I), including the technology to support it;
- a unified doctrine, even if less than perfect, addressing roles and responsibilities at strategic, operational and tactical levels of command;[7] and
- serious commitments in advance by countries participating in an operation to stay the course, under the mandate, and not abandon their peacekeeping partners, should conditions deteriorate.

Panelists viewed UNOSOM II as a lesson of what can go wrong in a peace operation when unity of purpose and the political and organizational underpinning are absent. UNTAC was viewed as offering lessons in how unity of purpose can be established, sustained and effectively put to use.

Gearing Up for Peacekeeping

The panel was divided on how peacekeepers should be equipped. As previously noted, some commanders felt that the manner in which a force arms itself sends a message to parties on the ground. Vulnerability is proof of impartiality and this should be transparently obvious. Accordingly, troops should be deployed with light weapons needed for peacekeeping, and not much more. Otherwise, there is a risk that "excesses will occur" or that the force may be drawn into becoming a belligerent.

Other commanders took exception to this perspective. Peacekeepers may arrive with peaceful intentions but this is no guarantee that all factions will share in the goodwill. Accordingly, peacekeepers would be advised to be prepared for "the worst case." This means being equipped to fight, if necessary. Recalling the earlier discussion on the "Mogadishu line," a commander added that since most situations tend to be messy, operations rarely fit neatly into boxes marked "peacekeeping" or "enforcement." Given the uncertainties inherent in peacekeeping, in this view, prudence dictates arming the deployed force.

Sharing Responsibilities and Dividing the Labor

Participants appeared to agree on the need for a division of labor among countries in participation and contribution to peace operations. One non-American panelist argued that the inclination to look to the United States to lead and/or partake in every operation had to be curtailed. Over-reliance on the US is not advisable, for, in the longer term, it could heighten American aversion to foreign involvement. The US has specialized and often unique capabilities, including transportation, communications, intelligence and special operations. Expecting the US to solve every world crisis risks exhausting resources

[6] Participants strongly argued that practice rather than improvisation is essential. Accordingly, this organization should consist of people with extensive experience working as a unit. Such experience takes months to acquire. Days or weeks are not enough.

[7] As one participant put it, an imperfect doctrine is preferable to no agreed doctrine. See the paper of Lt. Col. Damien Healy and Lieutenant General J. M. Sanderson for a detailed discussion of the strategic, operational and tactical levels of command in peace operations.

(and good will) best kept in reserve for selective use. The same can be said of overdependence on the other major powers.

The provision of equipment is another area where a division of labor is not only possible but essential. Communications systems were at the very top of the list of technologies viewed by panelists as being critical to effective peace operations. Panelists warned of the dangers inherent in routinely deploying operations that lack interoperable communications. Similarly, we cannot afford the cost and inefficiencies of expecting troops to operate and maintain a host of different types of equipment, and somehow stock spares and repair gear associated with each. This problem runs the gamut of provisions, from major items, such as tanks, to expendable ones, such as ordnance.

What one participant termed "a lead country model" should be adopted for the provision of assets. Under this concept, specific countries would be given responsibility for the provision of specific items or classes of items.

Professionalism in Training and Hiring

Panelists spoke repeatedly about the importance of training and professionalism, viewing the current system as an Achilles' heel of peace operations. They suggested several remedies for the problems.

First, senior officers, especially those expected to operate in headquarters, should exercise and, where possible, work together in advance of operations. Such familiarization is vital for smooth operations. As for senior commanders, they should, at a very minimum, have the opportunity to confer before they are dispatched to the field. This would provide a much needed opportunity to reach consensus on appropriate responses to possible challenges in advance of their occurrence. Currently, senior officers of different nationalities charged with running an operation together typically meet one another for the first time in the field.

Second, junior officer training is equally important, in the panel's view. Junior officers are the front line of the mandate of any peace operation and are expected to shoulder a considerable burden. They are typically given responsibility for carrying out a mandate over large areas with relatively small units. Their job requires mastery of a variety of skills. Junior officers must have the interpersonal and negotiating skills to defuse conflicts and the restraint to avoid unnecessary violence that would sabotage a peace operation, whether by crossing the "Mogadishu line" in peacekeeping or by an unwarranted escalation in Chapter VII operations. Training must also prepare junior officers to undertake tasks unique to peacekeeping, including establishing and operating checkpoints and roadblocks.

Officer training for peace operations should be international in character, ideally involving the United Nations. International training is key to promoting familiarity with foreign counterparts and their practices and to establishing standard operating procedures for officers designated for assignment to future peace operations. It should also expose officers, particularly those from less technologically advanced nations, to new equipment that may offer tactical advantages in peace operations.

Conscript training is also important. The ethos and, often, the practice of peace operations are often closer to law enforcement than to warfighting. Accordingly, conscripts will need to learn to act with appropriate restraint. The workshop discussion indicated that necessary conscript training should rest with contributing nations.

Civilians taking part in peace operations should also participate in predeployment training. Civilians, as well as soldiers, can provide the language and cultural skills that are essential for headquarters operations. Often civilians are charged with administrating field operations. Training before operations is essential in promoting effective coordination between civilian and military staffs that have no tradition of working in tandem. Creating a rapidly deployable headquarters staff, with extensive experience working together in advance of emergencies, was previously noted as a way to promote smooth civil–military collaboration. One participant suggested using political–military wargames as another

training device for both civilian and military personnel.

Panelists were quick to add that training is no substitute for real-world experience. Longevity of service in the field is the best training tool. Unfortunately, many nations that contribute to operations routinely reassign officers just when they have gained the practical knowledge to be of added value to a mission. A difficulty arises when a nation has more serious commitments than peacekeeping. This may then require retraining soldiers back and forth from one mode of operation (peace) to another (war).

Hiring practices are important to civilian professionalism in peace operations. The place to start is to depoliticize the hiring process at the UN, panelists held. Personnel need to be hired for skill, not by means of a national job quota system. Incompetence cannot be tolerated, especially in the field where it can endanger a mission. The same holds for military personnel. If national contingents are not up to the task, they should be sent home, a commander emphatically urged. Another military panelist cautioned, however, that the diplomatic and practical implications would have to be weighed heavily in such a case.

Finances and Resources

Lack of finances is a major hindrance to future operations. Panelists noted the negative mood in the US toward funding international programs in general and peace operations in particularly. This perspective pervades Congress.[8] Support for even the most successful operations is waning for reasons of finance and use of significant manpower. The MFO is not immune from these pressures. Good or bad, it is viewed by some as a persistent drain on resources, which has led to calls for the US "to declare victory and walk away from the Sinai."

Even prior to recent demands for greater efficiency, the MFO adopted many practices that could serve as a model for other organizations. Among other things, the MFO:

- uses commercial sources, selected on a competitive basis, for the provision of supplies to avoid receiving inferior or outdated items from contributing countries;
- limits the number of suppliers for any one item to the smallest number possible to ease training, and operations and maintenance;
- contracts operations and maintenance activities to commercial firms, able to provide a local work force;
- is reducing personnel, and using technology where applicable as a substitute; and
- focuses on predeployment training and "training the trainers."[9]

Further, creating a regional headquarters for several operations in any one region was suggested as another potential cost saver.

Where Technology Can Make a Difference: A Survey of Practitioners

Some interesting survey results were obtained by the United Nations Institute for Disarmament Research, as part of their project on Disarmament and Conflict Resolution are relevant to the question of what technologies would be most useful for international peace operations. These results were reported upon by Virginia Gamba, who is director of the project. A detailed questionnaire, regarding many aspects of UN peace operations was given to a large number of individuals with personal experience in them. These included commanders, other military personnel, and civilian practitioners. Several questions were related to the potential or actual use of technologies, and the responses provide a useful indication of what may be needed in the field.

First, a strong minority (about 40 percent) of those responding reported the use of sensors for verification. In general, these individuals were from technologically advanced countries. Also,

[8] See Steve Simon's paper on the growing resistance to funding international programs.
[9] K. Scott Gudgeon's paper provides a further discussion of MFO practices.

some 40 percent reported being trained at home in verification technologies. Equipment used included radar and infrared sensors, intelligence-gathering equipment, communications systems, countermine equipment, and intelligence fusion aids.

Second, when asked whether on-site and remote sensing equipment was adequate for verifying weapons control and disarmament missions within peace operations, the response was evenly divided between yes and no; an interesting note was that the more technologically advanced the country of the respondent, the **less** satisfied he/she was. However, respondents overwhelmingly supported the potential benefit of sensor systems in support of peace operations. Likewise, a great majority of respondents reported the view that satellite surveillance has a role to play in peace operations.

Of greatest import to this conference, however, was the list, reported by the practitioners, of the roles which sensor technologies could play in peace operations. These included what one might imagine: **force protection; monitoring and detecting weapon caches; monitoring of truce agreements and cease-fires; monitoring and controlling troop and weapon movements; providing night vision capability to international forces; monitoring crowds; and aiding in perimeter defense of installations.**

Where Technology Can Make a Difference: The Panel

Conference panelists identified several areas where they agreed technology could make a difference in peace operations. Panelists hoped that the workshop marked the start of a much-needed dialogue that promotes "cross-talk" between practitioners and technologists. An ongoing exchange would serve two purposes. First, it would make practitioners aware of technology that holds the potential of enhancing operations. Second, it could give direction to technologists in developing systems that address practical problems faced by operators.

A brief look at technologies addressed by practitioners (as opposed to the technologists) follows. Much of the technology judged of highest value by practitioners is available off-the-shelf. Therefore, from the perspective of the user, appropriate technology, instead of high technology, should be the goal.

Communications

Communications systems were at the top of many participants' list of essential technologies. Communications are vital for rapid decision–making and maintaining tight reins over delicate operations. The biggest problems are to assure interoperability of communications among units in the field, and to facilitate high speed and secure communications between the field and authorities overseas.

Commanders can expect to find the communications infrastructure in the field to be inadequate or nonexistent. This makes a self-contained and rapidly fieldable communications system an essential piece of technology for peace operations. Regarding field operations, panelists noted deficiencies in both ground-to-ground and air-to-ground communications. Also noted were deficiencies in communications links between official personnel and non-governmental organizations in the field. Remedies are to be found in a change of procurement practices as well as in technological advances.

Sensors

Sensor systems were viewed as another category of critical technologies for peace operations. Sensors are especially useful, for example, in peace monitoring. They hold promise in allowing some missions to reduce personnel and associated costs. Some sensors could allow small peacekeeping elements to patrol large parcels of territory by detecting approaching intruders. In this way, it may be possible to construct a quickly deployable defense perimeter for peace operators.

Sensors are also important to intelligence collection in the field, providing effective situa-

tional awareness for commanders who cannot be at all places at all times. For intelligence purposes, it is essential to have 24 hour wide area coverage that can quickly spot trouble and determine the veracity of intelligence claims, a participant suggested. One promising approach is to use airborne systems, including unattended aerial vehicles (UAVs) and helicopters. Panelists agreed that airborne assets are likely beyond the financial reach of international organizations. Here, reliance on a lead country supplier to draw these systems from national inventories when needed, makes sense.

Demining

Demining systems received considerable attention from participants. Panelists were interested in systems designed to locate mines intended to harm peace operators and slow their movement, and technologies that might be used in post-conflict restoration of mined areas for habitation.

Interfacing with the Media

Many developing countries are "oral societies," a participant noted. Getting the peacekeepers' message out to the population is often best achieved by the deployment of a radio transmitter and the distribution of cheap portable radios to the population. The use of video recorders is another media tool with proven utility in peace operations.

In both Cambodia and Somalia, UN officials resisted field commanders' requests to set up a public radio system. Initially, officials in New York reflexively viewed the dissemination of information as engaging in a propaganda campaign and feared that UN-sponsored radio broadcasts would be seen as psychological warfare. Later, when New York's political inertia was overcome, the UN Finance Committee balked at the cost and slowed the process further. In Somalia, the delay gave warlord Farah Aideed a considerable lead in getting out his message, undermining the UN operation. On the other hand, once distributed by UNTAC in Cambodia, radios and videos aided in convincing the Cambodian people to trust the electoral process and vote. UNTAC broadcasts have even been credited with producing Khmer Rouge defections.

Crowd Control

In the wake of UNOSOM II, the ability to operate against hostile forces that have no inhibition in using civilians as shields has emerged as a concern. In response, systems that allow peace operators to separate combatants from women and children and provide means for breaking up crowds without harming the innocent are a priority.

Training

Tools that would allow commanders and civilians from around-the-world to train together without traveling to a single location, such as distributed/interactive simulations were suggested as both cost cutters and time savers. Other training tools noted in discussions included the use of CD-ROM for disseminating data on culture, language and conditions in operating areas, and the use of simulators for job training and mission rehearsal purposes.

WORKSHOP HIGHLIGHTS—THE TECHNOLOGIES

Introduction

Peace operations, including both peacekeeping and peace enforcement, impose a broad set of requirements for equipment and capabilities. A rich field of emerging technologies exists that could have many applications for these operations, if equipment based on these new possibilities can be brought to fruition in operationally practical modes.

Although much equipment already exists, there have been several cases (e.g., UNOSOM II in Somalia) where even such fundamental off-the-shelf equipment as telephones were not always available in adequate supply to the international force commanders. There has been a major problem with the distribution and deployment of necessary equipment for many interna-

tional operations, including some humanitarian relief efforts (e.g., Rwanda). Apparently, the United Nations has not been optimally organized in carrying out peace operations. As an extreme, but not uncommon example, some contingents even arrive in the field without adequate clothing, let alone weaponry. Such problems are due both to insufficient resources and lagging contributions from member states in support of peace operations on the one hand, and to inadequate managerial tools and organization on the other. The difficulty shown by the UN in deploying and properly employing established and well-understood technology raises doubts about its capacity in dealing with entirely *new* types of equipment. **If the UN is to be able to employ usefully radical new tools in future peace operations, radical improvements will be necessary in the organization's management ability. Further, minimal levels of supply for each contingent, must be assured.**

This workshop, nevertheless, concerned itself with discussing equipment and capabilities that technology may provide for peace operations *in the near future*, and with the question of how such items may fit into likely scenarios for their use in the field. Technology can provide both improved and new capabilities for a wide variety of equipment. Such equipment includes sensors, weapons (including "less-than-lethal" weapons), and mine detection and clearance techniques. Some categories may be more useful for traditional peacekeeping, others for more proactive operations.

The goals of applying technologies for peace operations are several:

- to increase the effectiveness of the operation;
- to reduce the costs of the operation;
- to reduce the number of personnel needed; and
- to reduce casualties, among the international force and civilians, but potentially, even among adversaries, for both humanitarian and political considerations.

Although technologies primarily raise technical, rather than political, questions, policy issues connected with technologies will, on occasion, also arise. There are several kinds of policy issues that may arise.

First, increased prospects for success of an operation may increase the prospects for the intervention itself. Second, the availability of more technical solutions to military problems would present a military commander with more options to pursue in a given situation. Third, in the case of less-than-lethal weapons, use might be read as a sign of weakness by an adversary, possibly resulting in a rapid escalation to lethal means. Fourth, the use of some technologies, notably chemical and biological agents, and also less-than-lethal laser weapons, may violate current or near-future international arms limitation agreements, and thus would likely be unacceptable for an international peace operation. Finally, some technologies may easily be replicated (or reverse engineered) by many countries, not necessarily only advanced technical ones. The possibility of new military or peace enforcement tools proliferating and being employed against the international forces (or against the nation developing the technology) must be reckoned with. Occasionally, mini-arms races, involving countermeasures and counters to those counters, might occur. A related issue, raised by one participant, is the possibility of an entirely new set of arms races starting, if the United States, as a world leader in weapons research, begins to develop and deploy some of the suggested devices, especially laser weapons. The resistance of technologies to countermeasures may be a major criterion to consider in deciding whether to pursue a given line of research.

From the purely operational viewpoint, a number of factors need to be considered in deciding whether or not to develop a technical solution to a military or police problem arising from peace operations. One is the likelihood of the technology succeeding, at least on a laboratory level. If the likelihood of success within a reasonable time is remote, the technology cannot be considered as a basis for planning in the near- to mid-term.

Secondly, even if the proposed equipment is demonstrated in the laboratory, a clear military

application must be conceptualized. The equipment must be developed into a military item that has a well-defined doctrinal use. It must function not just at normal room temperature and controlled humidity, but under a variety of environmental extremes. Also, if it needs substantial amounts of power, the mating of the equipment with the power source in the field must be accomplished in an operationally feasible way.

Third, the cost must be affordable. In fact, the proposed new equipment would be more acceptable if it could be shown to reduce, rather than increase costs, as noted in the first set of criteria, above. Cost will be a major factor in determining the likely application of a given new tool to peace operations.

Fourth, it must be feasible to train the personnel of an international force to use the equipment effectively within a few weeks at most (a few days would be preferable). It is likely that some soldiers who have not received advanced technical training will have to operate the equipment. In fact, some contingents that have participated in peace operations have not received or, at least, not demonstrated a high level of technical training. (As an aside, such problems are *not* confined to third-world contingents; in fact, some such contingents have displayed highly proficient levels of technical capabilities.) While, presumably, all are able to learn to operate many sorts of standard military equipment, a "hi-tech" device, if not appropriately user friendly, may take considerably more training effort. Techniques for training all potential users may have to be developed in parallel with deployment, but a new item will be far more probable to be useful if it is, in fact, reasonably user friendly.

Finally, the measure-countermeasure game must be thought out. How would the peace force be able to respond to the use of such equipment against them and how could they respond to possible countermeasures developed by their adversaries? Further, there seems universal agreement that, if non-lethal weapons and devices are used, they should always be backed up by lethal weapons, both to protect international forces and to maintain a necessary, healthy respect for them by potential adversaries.

Technical Viewpoints

Several papers dealing with specific technical issues applicable to peace operations were presented at the workshop. One, by Mr. Courregelongue, defined the problem and context of mine clearing requirements, a principal concern for peace operations and post-conflict reconstruction. He provided a summary description of the variety of anti-personnel mines employed in the world, the magnitude of the problem, and the many potential candidate technologies that may help solve this massive, worldwide problem. Another, by Col. Roland-Price, discussed "non-" or "less-than-lethal" weapons, in terms of their application to peace operations, listing a large number of generic applications—some devices are already available and have been used by the military, but most have not yet reached this stage of development. A table in this paper lists different types of these weapons, with respective uses and disadvantages. Two other technical experts, Dr. Milton Finger from Lawrence Livermore National Laboratory and Dr. Gerold Yonas from Sandia National Laboratories, presented an intriguing variety of emerging technologies and devices, covering mine detection, sensors, less-than-lethal weapons and information and communications.

Mine Clearance

Regarding mine clearance, there are several techniques that show promise in a variety of situations. However, there is no single "magic bullet" that will solve the problem of finding mines in all, or even most, environments. The eventual solution is, therefore, likely to be a combination of technologies, each of which will work in a specified set of conditions.

There are currently estimated to be roughly 100,000,000 mines buried in the world and about 2,000,000 new ones are emplaced each year, while only around 100,000 are removed. One political means of dealing with this matter in the

long term would be to achieve a global agreement to produce only mines that automatically deactivated themselves after a relatively short (say, one year at most) period. Even if guerrillas and renegade states did not comply, the size of the problem would still eventually be greatly reduced, if such an accord were reached.

The classic method of detection, employing personnel who use nonmetallic earth probes, is labor-intensive, time-consuming, and dangerous. Metal detectors, usually magnetometers, only work when the mine contains metal. Some all-plastic mines now exist, and many others only use a few grams of metal. For these mines, it is better to detect either the explosive, which is a unique characterization of mines or other unexploded ordnance, or the anomaly in the soil, due to the emplacement of a foreign object.

In many cases, explosives may be directly detectable due to the minute amount of their vapors leaking out of the mine. Dogs are very sensitive detectors, probably 100-1000 times as sensitive as any electro-mechanical device. They have been used for many years to detect explosives as well as trace quantities of molecules exuded by contraband materials (including drugs). A mine detection system relying on canines has been developed by commercial firms in South Africa and the United States. It has been used in South Africa and Mozambique and will probably be used in Angola in the near future. A certain amount of success has been reported; apparently, this system is especially useful for clearing roads. One method is to take air samples over the road, using a vehicle that minimizes danger to its operators. The dogs, at another location, sniff the samples, and may be later transported to the site to home in on any positive detections among the samples. Another method that looks directly at explosives, being developed at Sandia National Laboratories, uses backscattering from x-rays, which can differentiate between the lighter elements present in explosives and the heavier elements present in most soil.

The two scientists from the U.S. National Laboratories discussed other mine detection options in various stages of development. One technique uses multispectral analysis of radiation in the infrared region to detect changes in the soil's emissivity and temperature, where it has been disturbed by a (more or less recently) emplaced mine. Ground penetrating radars of several types have been tested. Anti-personnel mines, the greatest danger to people, are relatively small (perhaps 10 cm in diameter), however, and hard to detect by radar, although they are only located 5–10 cm below the surface. Moist soil serves as a conductor and hampers or stops ground penetrating radars. Nevertheless, one technique, a microimpulse radar (using a broad range of wavelengths at high radio frequencies), has, in tests, detected metallic and plastic surrogate mines at depth of 5 to 10 cm in moist soil.

The problem of mine deactivation is an entirely different one. At present, the U.S. military insists on exploding mines to get rid of them, sometimes after they are dug up by large plows. One technique recently developed can clear areas up to about an acre, using several small shaped charges deployed on a net. Other techniques, using helicopters or large vehicles (often remotely operated) that drag plows, rollers, or flails, are in existence or are being developed.

Less-than-Lethal Technologies

Many "less-than-lethal" technologies were described in the various contributions. Uses of these techniques in peace operations are described in Col. Roland-Price's paper. Obvious potential uses could be for crowd control (especially when armed adversaries are interspersed with women and children); special operations to disable adversary equipment; protection of enclosed perimeters, such as observation posts of the international force or refugee camps. In many contexts, a principal advantage of such weapons would be the option to use less-than-lethal, but effective, force in a situation where the infliction of casualties by a peace force could further inflame a situation, leading to an escalation of

violence. **Panelists frequently cautioned, however, that less-than-lethal force should always be supported by proximate lethal capability, to deter an adversary from taking advantage of perceived restraint by a peace force.**

Less-than-lethal weapons may be divided into anti–personnel and anti–materiel categories. As one example of the latter, Dr. Finger suggested that high power microwave weapons, delivered by munitions, may be effective against an adversary's military electronics and may be soon feasible for operational use. Regarding anti-personnel possibilities, he suggested that the employment of acoustical weapons, causing nausea or discomfort, but not permanently disabling, was a near-term possibility. There is a multitude of other examples, some already in existence, others only in early laboratory testing. Sandia National Laboratories developed "sticky foams" years ago for protecting fixed, highly sensitive sites. These are able to immobilize intruders in enclosed areas, although there has been some investigation into their possible application for crowd control purposes. Other anti-materiel weapons mentioned were superlubricants (which, if spread on the ground, would make it difficult for many vehicles to operate or even for people to stand upright and move about); supercaustics; chemicals that can jellify petroleum products; chemicals to disable internal combustion engines (considered a very difficult problem); chemicals to attack many organic compounds, such as rubber; and metal embrittlement chemicals. Effective utilization for most of these suggested technologies would require the development of specialized delivery systems, except in the case of covert deployment by special forces.

Anti-personnel items include laser weapons (for dazzling or blinding adversaries, or for disabling electro-optic equipment), acoustic weapons (which may cause severe nausea or other extreme gastrointestinal distress), radio frequency weapons, entangling equipment, and sublethal munitions. The last are highly developed and in the arsenal of many nations, mostly for domestic police use.

There are also items that fit into the class of less-than-lethal weapons by some definitions, but are difficult to regard as real weapons. Equipment to aid in "psyops," or psychological operations, may include banal technologies such as radios, for example. Automated language translators, which may soon become practical, would greatly ease the problems experienced by many "blue berets" of the UN in dealing with local parties, often at relatively low ranks, on both sides.

It was not clear whether some of the above-mentioned possibilities, currently researched at the laboratory level, would be available for operational use in the near future. In the past, some items that appeared promising in the laboratory were not workable in the field. For example, some superlubricants were rejected for use in Northern Ireland by British forces, because the material rapidly washed away in the rain.

Sensors and Information

Advanced sensors will certainly be useful for purely peacekeeping operations as well as for any other type of military operation. When a cease-fire accord or peace agreement is in place, sensors could provide real-time information to both parties, ensuring that each will be convinced that the other is fulfilling his part of the bargain, for example, regarding limitations on the deployment of military equipment or troops near lines of demarcation. Suggestions have been made to use unattended ground sensors to facilitate a peace agreement between Israel and Syria that may include the demilitarization of the Golan Heights. These sensors might serve to make an agreement more acceptable to both parties and would reduce the number of third-party forces needed to police the agreement, making it easier to obtain the number of troops needed to carry out such an accord. Another zone of conflict in which sensors could serve to facilitate a peace agreement could be around the Siachen Glacier in Kashmir, where divisions of Indian and Pakistani soldiers face each other at altitudes over 5000 meters. The cost in resources and, even, in lives, of this stand-off is considerable. There is

some reason to think both sides would accept the presence of sensors, installed by neutral third parties, with output available to both sides, to assure each side of the other's compliance with a truce.

Sensors to monitor an agreement could also be mounted on overhead platforms, such as airplanes, unmanned air vehicles (UAVs), satellites, or even aerostats. The appropriate architecture to employ would depend heavily on the circumstances and on the physical environment governed by the agreement.

Dr. Yonas emphasized the importance of information and of controlling information flow, both in warfare and in peace operations. Sensors already exist that can transmit detailed information on both adversary deployments and the current battlefield situation. They may be placed on a variety of platforms, based in space, in the air, or on the ground (where they could be unattended most of the time). Sensors would operate over a broad part of the electromagnetic spectrum, including the visual range, near and far infrared, and microwave. Synthetic aperture radar is capable of providing high resolution data through cloud cover with resolution independent of altitude. A considerable advantage may lie in placing sensors on UAVs, if practical from the point of view of cost and power requirements. This addition to the arsenal of a commander could provide a powerful tool for obtaining reliable, real-time information from a relatively cheap platform that could be difficult for an adversary to detect and, therefore, to attack.

A unique promising sensor device is the SAFEGUARD system, developed at Lawrence Livermore National Laboratory. This system can detect a bullet or a mortar or artillery shell in real time by means of an infrared staring array. With the use of fast computing capability and clever algorithms, the device can locate the position of a sniper to less than a meter, *even before the bullet actually hits its target*. This system device has been tested outdoors under a variety of environmental conditions and needs to be tested under realistic military scenarios. Funding for this work has been limited thus far.

This system could facilitate countering snipers directly by means of either conventional munitions or, even (at least at night) a dazzling laser, which could prevent rapid refire. The last suggestion may be controversial, in that the use of lasers for this purpose could be countermanded by a future international convention; also, some countermeasures might be developed. But, whatever riposte is chosen, equipment that can locate a sniper virtually instantaneously would confer a great advantage on its possessor. Its utility in situations like those in Mogadishu and Sarajevo can be easily imagined.

Training Technologies

Finally, in the field of training, technologies to assist in training and simulation for the military do exist, and many more, of increasing sophistication, are being developed. A subset could easily be designed with the purpose of training peace operation forces in a number of relevant techniques, ranging from negotiations, to use of certain weapons and sensors systems, to operations in urban areas. Especially given the difficulty of some contingents (already noted) in learning to operate unfamiliar systems, the use of such techniques, especially if available in the field, would be of great use to many UN operations.

Conclusions on Technologies

A number of technologies and related equipment currently in existence have the potential to radically alter the course of peace operations, improving their chances for success. These include many forms of sensors, sensor platforms, less-than-lethal weapons, and information techniques (one key to improving sensor performance and to improve the ability to sift through massive amounts of data rapidly is to rely on remote pre–processing of information at the site of the unattended sensor).

As to the ultimate benefits of new technologies for future peace operations, there was some division of opinion on the panel. Many of the technologists among them were, quite naturally,

technological optimists. They appeared convinced that at least some, if not all, of the proposed technologies would turn out to be technically feasible, operationally practical, and cost effective in a variety of future operations, including peacekeeping and peace enforcement efforts and in war. Others were somewhat skeptical on a number of counts.

Skepticism was not directed so much at the ability of the technology to develop the required equipment: indeed, some of the items mentioned (e.g., in the less-than-lethal area, sticky foam, rubber bullets, superlubricants, and lasers) already exist, and some have been used operationally, although not always in the context conceived for peace operations. Rather, some of the problems seen were those implied in the criteria listed at the beginning of this section. First, the ability of peace forces (unless belonging exclusively to advanced industrialized powers) to purchase new, "hi-tech" equipment may be very limited, unless the devices turn out to be inexpensive. Second, the operational need for some equipment may not always be compelling. For example, crowd control, which is a police-type requirement that often surfaces during peace operations, may often be well handled by an appropriately trained and sized force without need for recourse to the products of new technologies. Further, concern was expressed that some contingents would have difficulty in handling adequately some of the advanced equipment envisioned, at least without a large amount of training. Moreover, some items could be quite lethal to children or the infirm, even though not lethal, under most circumstances to a healthy adult.

Finally, several panelists cautioned that some possible new weapons might be too susceptible to countermeasures, considerably reducing their utility. Further, other technologies could be appropriated by an adversary (by theft, or, in some cases, where the technology was not very difficult to reverse engineer, by indigenous manufacture) and lead to an escalation in violence, to the detriment both of the peace force and of the local population.

These cautions, however, did not imply a universal Luddite point of view. Rather, it meant that the employment, and, in some cases, the development of many possible new devices need to be thought out quite carefully in advance. Regarding laser weapons in particular, one panelist felt that a global prohibition on their use was, on balance, a desirable and a feasible end, notwithstanding the potential utility of such devices, e.g., dazzling enemy snipers. Further, the development of many less-than-lethal weapons could lead to their broad proliferation, and the world, including peace operations of the future, might eventually be the worse off for their development. The pivotal role of the United States was invoked, in that many other nations were likely to follow the U.S. lead in deciding whether or not to pursue many of these weapons. The conclusion, in the view of this panelist, was that the United States should be especially careful in choosing which path it should follow in developing new military tools, since the repercussions could extend far beyond direct U.S. concerns, but could have serious negative impacts on a global scale.

Therefore, no consensus on the use of various sorts of less-than-lethal weapons was expressed by the panel. On the one hand, a raft of near–term technologies appeared feasible, many of which could add substantially to the "kit" available to the commander of a peace operations force. Some appeared to have the potential for exciting and radical changes in the business of peace operations, especially in terms of protecting forces and civilians. On the other, for some of the possibilities and for some of the panelists, there were doubts that their application would be practical in most cases likely to arise.

Also, there was a view that the main problems that past peace operations have faced were not primarily due to a deficiency of available technologies or equipment but more to inadequate planning by the agency of intervention (usually the UN), confusing mandates from the UN Security Council, and to inadequate coordination among civilian and military commanders. In this view, technology may continue to play only a

minor role in determining success or failure of such missions.

However, regarding sensors, there was much less skepticism. A consensus appeared to exist that sensors were less likely to be provocative or to cause some of the problems that could arise from the utilization of certain less-than-lethal weapons by peace forces. There would be no issue of violation of international conventions or of triggering an arms race. The greater transfer of information to all parties, enabled by sensors, could well function to reduce tensions in many cases involving past or potential conflict by greatly increasing transparency. Further, the possibility that sensors can actually facilitate as well as help monitor future peace agreements has made their development and perfection for such purposes an attractive goal from any point of view.