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Recommendations

The present study has shown that monitoring technologies are not yet "tools of the trade" in UN peace operations but that they can and should be. To accomplish this, a conscious effort is needed by the UN Secretariat, supported by member states, to incorporate appropriate technologies into peacekeeping operations (PKOs) and to raise technical awareness and standards generally. The following seven general recommendations offer ways to create progress.

General recommendations

General recommendation 1

The United Nations should update, develop and improve UN policies, doctrine and training materials to incorporate appropriate monitoring technologies

The generic documents used to develop and implement PKOs need to be updated to include modern technologies. Important guidance documents from the Department of Peacekeeping Operations (DPKO) include the "Capstone" document (DPKO and DFS 2008), the *Handbook on United Nations Multidimensional Peacekeeping Operations* (DPKO 2003) and the model Standard Operating Procedures (UNFICYP 2008b). The "New Horizon" paper (DPKO and DFS 2009) made an important step in recognizing technological need. Updating basic documents would help create a

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more advanced "common operating paradigm" for technology-enabled monitoring. Furthermore, a new training document could be produced to describe the range of possible technologies, including night-vision devices, radars, seismic and acoustic sensors, and aerospace reconnaissance.

To engage member states in a dialogue on the issue, as the Special Committee on Peacekeeping has encouraged, DPKO could organize seminars for both military and civilian personnel. For instance, the Military and Police Advisers Community at the United Nations in New York is one appropriate forum for DPKO and governments to discuss possible technological contributions to specific missions and to peacekeeping in general.

To help plan specific operations, a "menu document" containing a list of technologies could be developed to supplement the Table of Organization and Equipment. From such a list the appropriate technologies could be incorporated into the Concept of Operations and Force Requirements for specific missions.

General recommendation 2

To gain experience, the United Nations should test, deploy and evaluate sensor suites on a trial and operational basis

To evaluate which sensors are the most appropriate and effective in various circumstances, the UN departments involved in peacekeeping could select pilot PKOs or locations within PKOs to incorporate a variety of technologies from different vendors. Once the technologies are installed, the United Nations could evaluate the change in situational awareness. For instance, video surveillance equipment and unattended ground sensors could be deployed to monitor potential hotspots. A slightly more expensive approach would include thermal imaging cameras for increased monitoring of night activities.

To better prepare UN troops, military observers, police and civilians for deployments to new or rapidly changing areas, the United Nations should routinely provide peacekeepers with ground, aerial and satellite images. It should also provide them with access to geographic information system (GIS) databases filled with mission information to give them a greater sense of terrain, locations, events, and so on.

In the few cases where the United Nations has already deployed technologies in the field, such as the Interim Force in Lebanon, assessments should be made of the impact and effectiveness of these technologies. At present, there is no programme in place to systematically conduct such evaluations. The Contingent-Owned Equipment (COE) system provides for inspections to verify whether designated equipment is functional, not

whether it is being effectively used. The Peacekeeping Best Practices Unit of DPKO could conduct a more operational survey of current practice along with lessons to be learned. Case studies, similar to the ones presented in Chapters 6 and 7, would help develop practical knowledge.

In missions where there is already a clearly expressed demand for technology, such as the requirement of the United Nations Organization Stabilization Mission in the Democratic Republic of the Congo (DRC) for aerial surveillance over the eastern DRC, the United Nations could implement a trial programme. If this is successful, the capacity could be continued and eventually even handed over to the host state. More generally, in the United Nations Mission in the DRC (MONUC), DPKO should revisit and implement the recommendations of the Joint Assessment Mission on surveillance assets.

General recommendation 3

DPKO should identify countries that are capable of providing monitoring equipment and expertise to UN missions. It should invite them to share some of their technological expertise and experiences generally. More importantly, these nations should be encouraged to provide equipment for specific missions, on a loan or lease basis, possibly with crews to serve the equipment

Some developed nations might prefer to offer specialized expertise rather than large numbers of troops to the United Nations for peace operations. A small number of national specialists equipped with advanced technologies can make a significant positive impact on a mission. Such countries could be approached and their capacities evaluated before formal requests are made. DPKO could conduct a survey of such technologically equipped nations.

The use of national capacities makes more sense for larger-ticket items such as sophisticated monitoring systems for which the purchasing costs are prohibitive. However, when such a country is not available, the United Nations could seek an outsource vendor, who would take complete responsibility for the equipment and for project management.

In general, the United Nations has yet to move from personal equipment (for example, night-vision goggles) to mission-operated and crew-served monitoring systems such as unattended sensors and radars that offer the benefits of round-the-clock surveillance. Some UN-owned equipment could be operated by civilians directly under UN employment.

General recommendation 4

The United Nations should revise and update the technical documents, particularly the COE Manual, so the requirements are clearer, more detailed and more specific

The important COE Manual provides the basis for the Memorandum of Understanding (MOU) between the United Nations and the contributing nations. The 2008 Manual (United Nations 2008) includes the most detailed treatment of monitoring technologies of any UN peacekeeping document, but there is still much to correct and improve.

In the self-sustainment category, the categories of observation and identification are poorly defined, leading to many uncertainties. Nations and even COE inspectors do not know what quantity or quality of equipment is required to meet the vague COE standards.[1]

In future updates of the Manual by the COE Working Group, these monitoring technology sections should be rewritten to provide greater detail and precision and to remove ambiguities. An annex should be added to these sections to list specific requirements. In the interim, UN field missions should specify and clarify their observation and identification requirements.

Other technical documents that need updating are the Tables of Organization and Equipment (DPKO (n.d.[b]), and the Standard Cost Manual (DPKO 2005a).

General recommendation 5

The United Nations should build on recent progress in developing geographic information systems

The Cartographic Section at UN headquarters and the GIS units in the field produce excellent paper maps using modern software and advanced satellite imagery (in some cases high-resolution). But the United Nations has yet to move from cartography to geomatics, in which users in the field can access and update maps and other information through shared electronic databases. If users could input data directly into networked databases, a new wealth of up-to-date geospatial information would become available. For example, UN military observers could submit their reports to a centralized database, allowing future observers and visitors to view all previous reports relating to specific villages or areas. This would facilitate the rapid transfer of information between neighbouring areas in the mission and up to (and back down from) mission HQ. For such types of application, commercial GIS database software, with user-friendly interfaces to input new information, is now widely available. Some parts of the database could be open for public input, allowing for "crowdsourced" information. The database could also draw from social media to help identify the latest developments.

The United Nations lacks a centralized database of the imagery that is ordered commercially and of the GIS paper products that are produced

in the missions. It does not even have a catalogue using thumbnails. The DPKO intranet, established in 2006, could serve as a platform for the database, providing access mission-wide and at UN headquarters. Other DPKO databases are well established.[2]

General recommendation 6

UN reports should include imagery, both still and video links, and provide electronic access to primary source data from the field

Peacekeepers are only beginning to incorporate digital (still) imagery in their reports from patrols, visits or after-action reviews of operations. This practice is not yet used in the situation reports that are sent to UN headquarters. In the future, imagery could be included through links to GIS databases from which analysts and decision-makers in the field and at UN headquarters could get a clearer picture of conditions and activities in the field. Video clips could also be included, provided that wider-bandwidth communications channels are available. To gain maximum benefit, experts in image analysis should be deployed to the field, particularly within the Joint Operations Centre and Joint Mission Analysis Centre structures.

General recommendation 7

The United Nations should increase the capacity of UN headquarters to select, stockpile and maintain technologies and to apply truly innovative methods of technical monitoring

The United Nations need not become self-reliant in all technologies because troop-contributing countries and contractors can help fill the gaps. It should, however, have a basic stockpile of technologies upon which it can draw, as and when required. For instance, it should increase the number of night-vision goggles available (currently fewer than 500 goggles of an older generation) both for quick deployment and for contingents without adequate night-vision equipment (NVE). The stockpile should include thermal imagers and third-generation image intensifiers. To procure such devices, it may be necessary to obtain export licences from some leading manufacturing states. The member states should be able to grant special permits to the United Nations, given that the equipment is for peacekeeping.

A small team of specialists could be assembled at UN headquarters with familiarity of monitoring methods and technologies. They could be part of a new monitoring technology service or technology support office. This resident capacity would keep abreast of recent advances in technol-

ogy and fill the need at UN headquarters in much the same way that the Communications and Information Technology Service (CITS) fulfils that function. The individuals could also become familiar with the specialized technological capacities of the national contingent so that they could advise on which nations to approach for technical contributions. For UN equipment purchases, they could develop specific selection criteria, including the principles of modularity and flexibility, so that equipment could be moved between missions as conditions warrant.

A UN team of technical experts at a technology support centre would create institutional memory on technical monitoring, so that lessons learned about equipment and techniques would be applied to future operations. The team could conduct capability/equipment performance reviews so that better sensors would be purchased. They could also assist with technical assessments during mission start-up.

These technical experts could also help UN officials and conflicting parties, when requested, to incorporate optimal technical monitoring solutions into the design and implementation of peace agreements. They could help explore "cooperative monitoring" by developing protocols for regular sharing of technical results with parties. Possible information-sharing arrangements have been listed in Chapter 9.

Specific recommendations

> This mismatch between the scope of modern peacekeeping and its tools is creating serious strains for UN Peacekeeping at a time when it is being asked to do more.
> DPKO and DFS (2009: 4)

Many specific technological tools can and should be introduced into the field. The following recommendations, naming over 30 technologies, are made in point form for brevity, grouping technologies into three cost categories (low, medium and high). Illustrative and typical purchase prices per device are provided in US dollars. The costs for signal transmission (wires or wireless), analysis and operators (including training) are not included. Similarly, the costs over the equipment lifecycle for supplies, maintenance, storage and disposal would be additional. In some cases, these other costs can be significant. However, as many of these technologies are increasingly commercialized, these lifecycle costs, like the prices of the devices themselves, will probably decrease in coming years.

Low-cost technologies ($50–$10,000 per device)

- Provide digital still and video **cameras** (camcorders) to peacekeepers tasked with monitoring; for example, one for each UN military observer

or team in most missions.[3] These can capture images or clips from the field that can be added to UN reports or referenced in them to a database. Of course, rules for image-taking are needed, depending on the situation and local sensitivities. The typical cost of a still-image camera is $300. A quality video camcorder is about $500.

- Employ **remote video cameras** to monitor hotspots even when no peacekeepers are present. The United Nations Peacekeeping Force in Cyprus made pioneering use of surveillance cameras to monitor opposing forces along the Green Line in Nicosia (see the case study in Chapter 6). The United Nations should employ cameras in many other hotspots where it has a mandate to monitor conflicts and protect civilians. In some missions this would mean flash points, threatened towns, protected sites (for example, refugee camps) or across large conflict regions. Cameras can be installed to help prevent trespassing and the illegal trafficking of arms, natural resources and human beings. Each remote camera with connection could cost as little as $500. The data could be sent in real time or downloaded by passing patrols, depending on the urgency. Means to protect the cameras from theft and vandalism would need to be used in some cases.

- Deploy "**dummy cameras**" (camera housing without the expensive electronics inside) for short periods to deter violators and to test the vulnerability of cameras to vandalism, theft and destruction. Cost: $50.

- Equip selected peacekeepers with **helmet cameras**, which have become standard kit in many militaries (and are now even used by mountain bikers). They could be useful for UN operations. The view seen by a soldier can be recorded in a pocket device and even transmitted in real time to other soldiers and commanding officers, as well as to higher-ups in the headquarters. This could be a valuable information-gathering tool. Cost: $500 and upwards.

- Use **night-vision devices** of various kinds in areas where night violence is a concern. These include cameras with low-light sensing (image intensifiers) and cameras for infrared detection. In some locations, floodlights or infrared illuminators could be added. The recording capability for night vision could be useful for evidence gathering. Cost for low-light cameras (<10 lux): $1,000. Infrared cameras: $2,000 and upwards.

- Illuminators and cameras can be triggered by **motion detectors** to warn trespassers and alert the watchkeeper of any movements or changes. This would show potential trespassers that there is a UN monitoring "presence". In areas with no available power, solar-powered detector/illuminator systems can potentially be deployed. Illuminated signs

could warn trespassers that they are entering an out-of-bounds, dangerous or monitored area. Solar-powered illuminators with motion detectors are available for under $100 each. Ruggedized versions will be more expensive.

- Install computer **software** to aid in the interpretation of signals, especially for motion detection, pattern recognition and filtering out false alarms. Such software is readily available, some with cameras. Typical cost: $500 per licence.
- Create a system to inspect and test the **night-vision equipment** of contributing countries. An example would be to verify a contingent's ability to detect the movement of a participating person at intervals of 100 metres. The COE Manual standard to detect/categorize persons at 1,000 metres is unlikely to be attained by most contingents in the field. So an assessment of the range for detection could help establish new levels. Units can be presented with the results of their tests. This would allow the United Nations to identify when the NVE is substandard and how much the COE technology needs to be improved. It would encourage units to bring better night-vision equipment. In cases where NVE is essential (for example, Special Forces operating in jungles) and the contingent is unable to provide it (especially contingents from developing countries), the United Nations should be capable of doing so.
- Use **microphones** attached to remote video cameras to record sounds in the most sensitive areas. Unusual sounds could also trigger alerts at the operations centre. Microphones are included with many cameras. Otherwise the cost to add can be small: $100.
- Use **laser range-finders** to detect trespassing across borders or into restricted zones. Cost: $100 and upwards. Maximum ranges: 1,000 to 20,000 metres. Some laser range-finders are combined with GPS units so the exact position of distant objects can be determined.
- Use powerful (eye-safe) visible laser pointers or **laser designators** to let potential combatants know that they are being watched and can be targeted if they resort to violence or otherwise violate the peace. Caution should be exercised in the application because some combatants may become nervous and aggressive if they assume they are being targeted. Cost: $100–$1,000.
- Upgrade the United Nations' capability from "cartography" (mapmaking) to true **geographic information systems** (GIS). Satellite imagery should be purchased to properly geo-reference the areas and sites where peacekeepers are deployed. A GIS system needs to be developed in which UN observers and liaison officers can enter data and

reports directly into a spatial database and access it from anywhere in real time. Cost for a typical GIS software licence: $400. GIS server (computer): $10,000.

- Purchase **smartphones** for all field missions where data as well as voice transmission is possible through existing cell phone networks. This will allow the peacekeepers to have access to a world of data (for example, the Internet), as well as to transmit new information through web-based applications and email. Typical cost: $300 per device plus $70/month per subscription.
- Deploy **acoustic/seismic sensors** near sensitive areas to detect the movement of personnel or weapons. These sensors could trigger cameras and/or patrols. They can be both a security measure and a means of verification of peace agreements. Cost: $300.
- Equip selected peacekeepers and liaison officers with portable **DVD players** to show recordings to leaders or representatives of conflict parties and local communities, especially when entering into negotiations or scrutinizing incidents. Charges of wrong-doing are much more convincing when imagery evidence is shown. Cost: $100.

Medium-cost technologies ($10,000–$100,000)

- Deploy **suites of sensors** on ground vehicles (land cruisers) to key locations of immediate concern. Cost for surveillance suite (day camera, infrared, radar): $50,000.
- Place **ground surveillance radars** (GSRs) to help detect movements into and within sensitive areas. This will greatly improve night-time awareness. GSRs can be a valuable protection measure around UN camps, field units and refugee camps. GSR (radar range for person >5 km): $20,000 and upwards.
- Acquire **maritime radars** for use on patrol boats and on shore to spot boats moving along or across rivers. They can be programmed to emit an audible signal (for example, a series of beeps) when a boat approaches within a pre-programmed distance. Cost (entire system, radar range >30 nautical miles): $5,000 and upwards.
- Deploy tethered balloons holding day/night video cameras to provide a high and wide view of areas around UN locations. An **aerostat** marked with UN letters could also serve as a useful landmark or boundary demarcation point. However, the United Nations must be prepared to repair or replace the balloon and camera should it be shot down.

Compartmentalized and self-sealing aerostats can mitigate some of the costs of repair. Balloon cost: $10,000 and upwards.

- Provide a **live network link** to regional, mission and UN headquarters from UN cameras, whether they are on aircraft, ground vehicles or fixed, attended or unattended. Currently UN missions have little or no capacity to link live to command-and-control elements or higher units. With modern network technology, it should be relatively easy, provided the bandwidth is increased, to provide leaders in Force HQ and Sector HQ with the ability to see what is going on in their area of responsibility. This would help a Quick Reaction Force to be aware of incidents in areas to which they are about to deploy. Airborne imagery could also be transmitted in real time to soldiers on the ground with remote video terminals and to sector headquarters. In particularly dangerous/hostile areas, possible ambushes can be identified in this way. Cost: $50,000 and upwards.

High-cost technologies ($100,000 – millions)

- Deploy **armoured reconnaissance vehicles** with various sensor suites (for example, radars, infrared and electro-optical). This would greatly increase the mission's day/night surveillance capacity, especially in dangerous zones where people need to be protected. The vehicles could possess extendable masts equipped with a variety of sensors (day/night cameras and radars). The ability to transmit imagery from the sensors to both headquarters and units would be valuable. Reconnaissance units are ill equipped in most UN missions, except in the United Nations Interim Force in Lebanon. The Coyote reconnaissance vehicle deployed by Canada in the United Nations Mission in Ethiopia and Eritrea during 2000–2001 proved to be of immense value in monitoring the Temporary Security Zone. Cost for vehicle: $500,000 and up; sensor suite: $50,000 and up.
- Deploy **reconnaissance aircraft** equipped with gyro-stabilized camera pods for high-resolution videography. Make use of the night-vision (forward-looking infrared) cameras in daytime as well as at night. Cost for stabilized pod with day/night camera: $50,000; aircraft use: $1,500/hour.
- Deploy **artillery-tracking radars** to detect and track projectiles (mortars, rockets, bombs, missiles) moving through the air. The trajectories can be traced back to their point of origin or forward to the point of impact. These radars can be used for self-defence or for verifying a

cease-fire and determining who shot first. Their presence can serve as a deterrent to first use of artillery. Cost: $100,000 and upwards.

- Deploy unmanned aerial vehicles (**UAVs**) for surveillance. These can be of many sizes and capabilities, including mini-UAVs that are hand-launched and sub-tactical UAVs that are virtually invisible at higher altitudes, as well as tactical UAVs with long ranges. Cost for mini UAV: $50,000; for sub-tactical UAV: $500,000; for tactical UAV: $2 million.

For the United Nations, most of these high-cost technologies would be leased as major equipment through the COE programme. In MONUC, the Lama helicopters are leased from India by the United Nations for about $250,000 per year and the Mi-35s are leased at $950,000 per year.

Further recommendations

To help incorporate the technologies listed above, a series of broader activities could be carried out, including the following:

- Develop the United Nations' internal capacity for **maintenance** of technologies (cameras, sensors, and so on). An existing organization, such as CITS, could be expanded or a new service could be created.
- Increase the internal **connectivity** of remote cameras and sensors to the United Nations' computer network. It is possible to transmit streaming video to wireless devices. For a future camera system, use standard formats, not software specific to the camera.
- Launch a second low–medium-cost **project** with a longer timeframe (more than one fiscal year).
- Launch a **pilot project** for remote surveillance of a hotspot using a variety of technology types. This could result in a longer-term commitment for appropriate and tested equipment.
- Develop a **monitoring technology policy**. As the United Nations Special Committee on Peacekeeping Operations has requested, a policy on monitoring and surveillance technology is being developed. It can serve a useful purpose as UN headquarters and the field operations struggle with the application of such devices.
- Include **imagery** in reports from the field and move away from text-limited messages. Imagery adds a sense of the environment that words alone cannot convey.

- Employ **image analysts** in the field. Basic analysis can be done by regular military/civilian personnel, but for results of higher resolution and deeper interpretation, especially when conflicting parties are trying to hide objects or activities, trained experts are needed.
- Adjust the basic **mission planning documents** (Force Requirements, Concept of Operations and Intelligence directives) to include monitoring and surveillance capabilities.
- As a confidence-building measure, consider sharing some video imagery with the opposing forces, either periodically or in real time. This might not be appropriate in "hot" conflicts in which the protagonists are resistant or might misuse information or misinterpret it. But, if the protagonists act responsibly, it can be a tremendous boost to the peace process. New technologies can provide many ways to share imagery and data from sensors and cameras. The United Nations could retain "shutter control" to cut off the signal feed if need be. Such "**cooperative monitoring**" arrangements could create transparency and instil confidence that the provisions of a peace agreement are being respected. It could also provide early warning when the provisions are being violated.
- For each technological application, consider the four types of **technology provider**: contributing countries; the United Nations Secretariat for purchased equipment; contracted services; and partnerships with other organizations (regional organizations or alliances or coalitions).
- Beyond hardware and software, develop "**peopleware**" by hosting seminars on the utility and challenges of various technologies. Further integrate staff, tools, processes and information flows so that monitoring and surveillance effectiveness are maximized.
- The United Nations should host a **conference** of high-ranking military officers who have served on UN missions that utilized technology. The purpose of the conference would be to develop a list of the highest-priority items of equipment that the United Nations would seek to purchase to augment the monitoring and surveillance capacity and general situational awareness of its missions.

Notes

1. The COE Manual does not give any sense of the required number or type of night-vision devices, and does not specify how this issue is to be resolved (for example, through mission-specific standards). The Manual, for instance, makes no distinction between image intensifiers and thermal imagers. Similarly, the recording devices listed in the identification

category are not defined. Indeed, the section title "Identification" is a misnomer; it should really be titled "Recording" because it is about capturing images for processing and dissemination. The section could, at least, list the capability for recording night-vision images. Being the result of outdated versions, the 2008 COE Manual does not recognize the new capacities of digital cameras and computers (for example, laptops) for storage, photo editing and databasing.

2. The COE unit has a well-developed COE Database that is accessible from the field, incorporating scanned copies of all the MOU with contributing states, for consultation by COE inspectors, and the verification reports from COE inspections.
3. It is also recommended that the COE Manual specify the number of such devices to be deployed per unit of troops or police (for example, per company or per 100 personnel).