Appendix 3

Possible sensing technologies for peacekeeping, categorized by type of signal detected

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Table A3.1 Possible sensing technologies for peacekeeping by type of signal measured

Technology	Quantity measured	Examples of use
Electromagnetic sensing (passive)	Electromagnetic radiation, emitted or reflected, of wavelength ...	
Visible light imaging (using film or charge-coupled device)	0.4–0.7 μm	Photograph or video troops, tanks, vehicles in a demilitarized/conflict zone
Infrared (IR) imaging (i.e. heat sensing)		Locate operating vehicles, warm bodies moving across cease-fire lines or prohibited areas at night, aid to patrols
Near infrared	0.7–1.4 μm	
Short wave (SWIR)	1.4–3.0 μm	
Mid wave (MWIR)	3.0–9.0 μm	
Long wave (LWIR)	9.0–12.0 μm	
Far-IR	12.0–300.0 μm	
Radio-wave monitoring	>30 cm (HF: 3–30 MHz; VHF: 30–300 MHz; UHF: 300 MHz – 3 GHz)	Receive and monitor radio and cellular communications
Electromagnetic sensing (active)	Electromagnetic radiation, originating from the sensor system and reflected by object, in the wavelength range ...	
LIDAR (Light Detection and Ranging)	0.4–1.1 μm	Determine vehicle speed, location of combatants' positions
RADAR (Radio Detecting and Ranging)		
Ground surveillance radar	3–30 cm (X-band: 8–12 GHz; K-band: 18-26 GHz; K_a band: 26–40 GHz)	Detect person entering monitored zone
Ground-penetrating radar	0.3–10 m (30–900 MHz, typically)	Find buried weapons or mass graves
Wall-penetrating radar	3–30 cm (1–10 GHz)	Detect people inside rooms (e.g. hostage situations)
Doppler radar	0.1–100 cm	Determine vehicle speed
Synthetic aperture radar	3–50 cm	Spot weapons and deployments, day and night and in all weather conditions

Aerial surveillance radar	3–50 cm	Detect planes violating no-fly zones
X-ray detection and imaging	0.03–3 nanometres	Identify weapons inside metal/wooden cases or beneath personal clothing
Magnetic (and quasi-static electric field) detection	Magnetic field perturbations due to large ferromagnetic objects	Detect mines in fields, vehicles passing on roads
Acoustic wave sensing		
Seismic sensing (long-range) using a seismometer	Elastic waves travelling through the Earth's interior and along its surface	Detect underground explosions (e.g. in explosives testing and in mining)
Seismic detection (short-range) using a geophone	Elastic waves travelling along the Earth's surface	Detect vehicle or combatant intrusion into restricted areas
Sonar (Sound Navigation and Ranging) detection	Acoustic waves, in water, of wavelength 10 cm – 1 km (passive), 0.1–30 cm (active)	Observe ship passage into restricted areas or presence of sea-mines
Ultrasound probing	Sound wave frequency >20 kHz	Probe artillery shells for chemical weapon agents
Microphone	Sound waves in air of frequency 20 Hz – 20 kHz (wavelength 1 cm – 20 m)	Determine which side/party fired first; provide alert if tanks are travelling along roads or removed from storage
Pressure and strain sensing	Pressure (or strain) applied on contact with . . .	
Strain sensitive cable	A cable (fibre-optic or piezoelectric) or pneumatic tube	Detect vehicles moving on monitored roads, e.g. before or near checkpoint
Weight scale	Pressure-sensitive plate	Weigh truck passing atop scale for sanctions monitoring