
Second Session
Geneva, 15-26 July 2002

**Information on Technical Measures Related to AV Mines:
Detectability and SD/SN/SDA**

Prepared by the United States of America

KEY TERMS

(The following explanations do not modify in any way existing definitions. They are provided purely to assist in understanding key terms of the discussion.)

Detectable mine: Detectable mines can be detected by commonly available technical mine-detection equipment and provide a response signal equivalent to a signal from 8 grams or more of iron in a single coherent mass.

Self-destruct (SD): With a self-destruct mechanism the mine blows up automatically at a pre-set time.

Self-neutralize (SN): With a self-neutralize mechanism the fuse or another component of the mine is rendered unworkable at a programmable, pre-set time.

Self-deactivation (SDA): With self-deactivation mechanisms the mine can no longer function because of exhaustion of an essential mine component, such as the battery.

CONCEPTS

Why undetectable mines are a problem technically -- Undetectable landmines hinder clearing efforts. Without an appropriate metal content, they are difficult to find even in marked and monitored minefields. The proposed standard of 8 grams improves markedly the chances that a mine can be detected in a variety of soil conditions and by mine-clearers who may have less than optimal training or equipment.

Self-destruct -- A mine with a self-destruct device has some kind of mechanism either internally or externally that automatically destroys the mine at a pre-set time. SD mines continue to give the commander a

greater degree of flexibility against the enemy. By using these mines against deep targets, a commander can dictate the terms of the battle he wishes to fight. In close combat, it allows the commander a greater freedom of manoeuvre. Additionally, it decreases the amount of hazardous items to be encountered both by military forces and civilians. Further, from a humanitarian perspective, SD mines present only a short term problem, whereas mines without SD or SN and SDA are a persistent long term threat.

Self-neutralize – Self-neutralization (SN) is an alternative or additional requirement to self-destruction. In principle, it means that the mine turns off or is rendered unserviceable. This happens when the pre-set or programmable fuse time limit is reached. Self-neutralization may be used to allow friendly forces to lift hand-emplaced mines and render them serviceable again (reusable) by exchanging the fuse without posing a threat to friendly personnel. Importantly, as this can generally be done only with industrially manufactured “new” fuses, the enemy (or a civilian) cannot readily replace the fuse and make the mine serviceable. Gathering up remotely-delivered mines when they have been emplaced more than 30 km away is, however, unlikely. Thus, the reason for including self-neutralization as an alternative to self-destruction does not involve simply the intention to re-use remotely delivered mines. SN provides an option of reducing any threat that may be posed by a detonating mine, although even a “neutralized” mine may have to be cleared and treated as hazardous in the process.

Self-deactivation -- The self-deactivation feature is essentially a backup, fail-safe feature. Self-deactivation works, in the words of the protocol, by automatically rendering a munition inoperable by means of the irreversible exhaustion of a component, for example, a battery, that is essential to the operation of the munition. That is, if the self-destruction mechanism fails, self-deactivation ensures the mine won't function as a mine. Batteries, as we all know, irreversibly discharge over time. If the battery is essential to the operation of the mine, the mine will not operate when (not a question of if) the battery fails. Essentially, the mine will no longer function because its internal battery power has run out.

COSTS

Detectability: Material costs for 8 grams of metal is about 8 cents for the U.S.

SD/SN and SDA devices: Estimates are that SD/SDA or SN/SDA meeting CCW specifications can be incorporated into a new mine design at an incremental cost of less than \$20. The cost is substantially less than the cost of clearing a mine after it is laid. The technology for reliable SD/SDA devices for AV mines is exactly the same technology as that required for AP mines.

**WHAT IS NOT ADDRESSED IN PROPOSALS FOR DETECTABILITY
AND SD/SN and SDA TECHNICAL MEASURES**

AP Mines – Anti-personnel mines are not addressed.

Stockpiles – Issues of stockpiling are not addressed. Current proposals on detectability and SD/SN and SDA could be adopted without having to change, modify or destroy stockpiles.

AV Mines already in the ground – If a state already has non-detectable mines in the ground, current proposals do not require they be removed.


AV Mines emplaced by hand – Current proposals would require SD/SN and SDA devices only on remotely-delivered mines. Therefore, they do not require SD/SN and SDA devices on, for example, hand-emplaced mines that may be used in long-term border minefields.

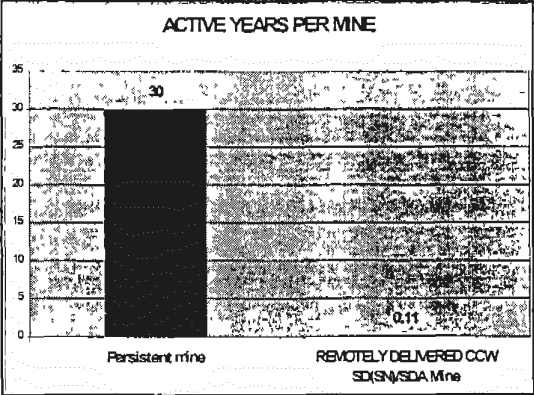
Reliability Requirements – Current proposals do not increase the reliability standards from what is already required in the 1996 Amended Mines Protocol.

SHELF LIFE

Many mines and munitions generally have a shelf life (stockpiles) of about 30 years. Thus, many remotely-delivered mine systems fielded in the 1970's could be nearing the end of their expected shelf-life.

<p style="text-align: center;"><u>LIMITING</u> LANDMINE PERSISTENCE</p>	<p style="text-align: center;">WHY LIMIT LANDMINE PERSISTENCE?</p> <ul style="list-style-type: none"> • Humanitarian - reduce loss of <ul style="list-style-type: none"> - Lives - Limbs - Land <p><u>Budgetary-</u> mine removal much more expensive than mine production</p> <p>Military</p> <ul style="list-style-type: none"> - Minimize risk to friendly troops - Maintain freedom of movement
<p style="text-align: center;">AVL HUMANITARIAN WEEKEND ACTIVITIES</p> <p>"A land mine killed 13 bus passengers and six others were injured in the central Afghan province of Bamiyan...Saturday morning....The bus driver had been told by villagers to take a detour because of the risk of landmines <i>planted during years of fighting</i>.... Mines...in some areas... are preventing refugees from returning home and cultivating the land".</p> <p style="text-align: right;"><i>Reuters, July 21, 2002</i></p>	<p style="text-align: center;">MILITARY ISSUE: AREN'T PERSISTENT REMOTELY-DELIVERED AVL NECESSARY?</p> <p><u>Remotely-delivered mines</u> needed for <u>rapid emplacement</u> on a <u>fluid battlefield</u></p> <p>Where <u>hostile forces</u> are at the time <u>mines are emplaced, friendly forces</u> may need to go within <u>hours or days</u></p> <p>Remotely-delivered mines need to <u>remove themselves</u> to permit movement <u>of friendly forces</u></p>
<p style="text-align: center;">HOW LIMIT LANDMINE PERSISTENCE?</p> <ul style="list-style-type: none"> • <u>SD: Self Destruct (alarm clock)</u> <ul style="list-style-type: none"> - Mine self-removes - Precise timing • <u>SN: Self Neutralize (microwave oven)</u> <ul style="list-style-type: none"> - No explosion - Precise timing • <u>SDA: Self Deactivate (flashlight)</u> <ul style="list-style-type: none"> - Very reliable even with weak quality control 	<p style="text-align: center;">CCW RELIABILITY AND DURATION</p> <ul style="list-style-type: none"> • SD (or SN): 90% (no more than one in ten remaining) at 30 days after emplacement • SDA combined with SD (or SN) 99.9% (<u>no</u> more than one in a thousand remaining functional) at 120 days after replacement • <u>Required</u> of remotely-delivered mines

<p style="text-align: center;">US SD Reliability</p> <p>√ 35,093 SD APL and 31,165 SD AVL have been tested at proving ground under full range of conditions</p> <p>√ Live mines left after 15 days –</p>	<p style="text-align: center;">US SD Reliability</p> <p>√ 35,093 SD APL and 31,165 SD AVL have been tested at proving ground under full range of conditions</p> <p>√ Live mines left after 15 days – ZERO</p> 
<p style="text-align: center;">COMBAT EXPERIENCE</p> <ul style="list-style-type: none"> • In Gulf war, US used 165,030 SD/SDA mines • 1% were later found on the field and destroyed by mine clearance teams <ul style="list-style-type: none"> - Zero mines functioned after SD time - Zero mines self-destructed late - Zero known civilian or friendly casualties • Mines broke, never activated. <ul style="list-style-type: none"> - Non-activated mines are harmless - SD failure possible but very unlikely - If there were an SD failure, SDA would have rendered mines harmless - Even assuming improbable worst case, mines exceeded all CCW requirement 10X 	<p style="text-align: center;">SD vs. SN</p> <ul style="list-style-type: none"> • <u>SD advantages:</u> <ul style="list-style-type: none"> - Unambiguously removes the mine - De-miner's job is reduced to verifying absence of mines • <u>SN advantages:</u> <ul style="list-style-type: none"> - No explosion • Bottom line: For <u>APL</u>, SD far superior. For <u>AVL</u>, could go either way.
<p style="text-align: center;">WHY NOT SD OR SN ALONE?</p> <ul style="list-style-type: none"> • 90% required reliability leaves one mine in ten active. • Even with 99.9999% reliable SD or SN, possibility of catastrophic failure remains. • SD and SN are active mechanisms. If they fail, the mine remains lethal. • SDA always works. SDA component failure leaves mine SAFE. ULTIMATE RELIABILITY. 	<p style="text-align: center;">WHY NOT SDA ALONE?</p> <ul style="list-style-type: none"> • Longer active life (120 days vs. 30) • Leaves mine in the field (disadvantage relative to SD) • Military disadvantage: No precisely predictable near-term safe point.

<p style="text-align: center;">THE AVL SOLUTION</p> <p style="text-align: center;">SD (<u>or</u> SN) + SDA</p>	<p style="text-align: center;">PROPOSAL</p> <ul style="list-style-type: none"> • NO requirement to clear mines in the ground • NO restrictions on stockpile; use regime only • NO SD, SN, or SDA required for directly emplaced mines • NO increase in reliability requirement over AMP • NO impact on APL 						
<p style="text-align: center;">SD(SN) TECHNOLOGY IS NOT DIFFICULT OR ADVANCED</p> <ul style="list-style-type: none"> • U.S. 99.9999% reliable SD began production in 1978 • More advanced technology is available to any country on the commercial market • More advanced technology now being produced in many developing countries • 90% SD requirement for remotely-delivered APL already in force - <u>technology is the same</u> 	<p style="text-align: center;">SD(SN)/SDA IS AFFORDABLE</p> <ul style="list-style-type: none"> • CCW requires only 90% reliability • SD/SDA or SN/SDA meeting CCW specifications can be incorporated into a new mine design at an incremental cost of <\$20 • Trivial compared to <ul style="list-style-type: none"> - Mine life-cycle cost - Mine clearance cost 						
<p style="text-align: center;">HUMANITARIAN BENEFIT</p>	<p style="text-align: center;">How to measure landmine civilian risk?</p> <ul style="list-style-type: none"> • Raw numbers of mines used is a poor measure • Hazard is directly proportional to duration of active mine life • MINE-YEAR is the relevant measure CCW SD(SN)/SDA reduces persistence & humanitarian risk 99.6% 						
 <p style="text-align: center;">ACTIVE YEARS PER MINE</p> <table border="1"> <thead> <tr> <th>Mine Type</th> <th>Active Years</th> </tr> </thead> <tbody> <tr> <td>Persistent mine</td> <td>30</td> </tr> <tr> <td>REMOVELY DELIVERED CCW SD(SN)/SDA Mine</td> <td>0.11</td> </tr> </tbody> </table>	Mine Type	Active Years	Persistent mine	30	REMOVELY DELIVERED CCW SD(SN)/SDA Mine	0.11	
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