

**MILITARY EXPORTS TO SOUTH AFRICA --  
A RESEARCH REPORT ON THE ARMS EMBARGO**

By NARMIC  
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INTRODUCTION

In theory, the United Nations arms embargo is supposed to carry full weight of law. In practice it does not. First passed by the United Nations in 1963, the embargo was made mandatory in 1977 when the Security Council voted to cut off all sales of "arms or related material" to Pretoria, a move supported by the United States.<sup>1</sup>

The arms embargo is one of the most tangible ways we can give expression to our abhorrence for the system of white-minority rule called apartheid. Beyond its important political symbolism, the arms embargo gives the U.S. and other nations considerable potential leverage against the South African regime. An effective international embargo would cripple the South African Defence Force (SADF) by freezing its access to all weapons and the technology to make them. In the absence of international compliance with the embargo, South Africa has grown to be an aggressive military power, capable not only of terrorizing its own population but also of invading and occupying neighboring countries such as Namibia and Angola.

Based on information released to us under the Freedom of Information Act, on interviews with government representatives and a survey of military industry publications and South African patent documents, we believe that the arms embargo is being seriously eroded. As this report shows, the U.S. government continues to authorize the export of commercial military technology to South Africa despite the international arms embargo. Likewise, considerable evidence indicates that corporations in other nations have maintained their contacts with South Africa's arms industry and that they continue to provide Pretoria with valuable military technology.

Late in November 1983, the U.S. Customs Service made headlines, announcing the seizure of an advanced U.S.-made computer system minutes before it was to be shipped to the Soviet Union from Sweden. A Customs official said the computer, made by Digital Equipment Corporation, was "super-hot stuff," capable of a variety of military functions, including operating a missile guidance system.<sup>2</sup>

One telling footnote to the story all but escaped mention: before being re-routed to the Soviet Union via Sweden, the sophisticated hardware had been shipped with U.S. government approval to a private company in South Africa, a country that is supposed to be barred from receiving military exports under the provisions of the United Nations arms embargo. A Customs representative said he was unable to say why the computer had been shipped to South Africa in the first place, even though, as Secretary of Defense Caspar Weinberger acknowledged, it was "identical to a number of highly classified American systems" that could be used to produce "faster, more accurate and more destructive weapons."<sup>3</sup>

In this instance, proof of Pretoria's access to military-capable techno-

logy from the United States came to light almost by accident. However, it is by no means unique.

When the Reagan Administration announced a new policy of cordiality toward South Africa shortly after taking office, supporters of the United Nations arms embargo against Pretoria had reason to be worried. Within months, the Administration had confirmed their worst fears, relaxing a ban on sales to the regime's security forces, authorizing the shipment of 2500 electric shock batons, advanced computers and nuclear technology to Pretoria, and facilitating police and military contacts with the South Africans.<sup>4</sup> It was clear that the Administration was gutting U.S. restrictions on trade with South Africa and undermining the mandatory U.N. embargo in the process.

It is now evident that the Administration has been presiding over a brisk flow of military technology to South Africa. The volume of this trade is much greater than has ever been reported, according to disclosures made to the American Friends Service Committee (AFSC) under the Freedom of Information Act in November 1983.<sup>5</sup> The information released shows that the State Department has authorized commercial sales of more than \$28.3 million worth of military equipment to South Africa during fiscal years (FY) 1981-83 -- the highest levels to South Africa on record (see Appendix I).<sup>6</sup>

#### EVOLUTION OF THE EMBARGO

Most weapons exports from the United States are handled on a government-to-government basis under the Pentagon's Military Assistance Program (MAP) or Foreign Military Sales program (FMS). These transactions are subject to potential public scrutiny. The record shows that there have been no FMS or MAP shipments to South Africa for several years. Yet, despite the apparent halt of official Pentagon arms transfers to Pretoria, the U.S. arms embargo has been far from airtight. Military trade with South Africa has become privatized and "invisible." Instead of FMS or MAP transactions, sales of military-related technology to Pretoria are conducted by U.S. corporations, operating away from public view behind a shroud of commercial secrecy. Rather than outright sales of large weapons systems, exports by U.S. corporations consist to a great extent of the building blocks of modern weaponry -- components, unfinished subassemblies and other technology that can easily be submerged in large wholesale transactions.

Commercial exports of any type must be licensed either by the Commerce Department or the State Department. The Commerce Department issues permits for most routine exports as well as items on the Commodity Control List, which covers sensitive dual-use commodities (technology with civilian and military applications), including large computers and other advanced technology. Under the Carter Administration, the Commerce Department for a time banned all sales to South Africa's police and military.<sup>7</sup> The Reagan Commerce Department reversed Carter-era controls, permitting sales of industrial equipment, chemicals and personal computers to the security forces on a virtually unlimited, unmonitored basis.<sup>8</sup>

The State Department is responsible for licensing corporate sales of U.S.-origin weapons and arms technology abroad. Any such commodities with specific military applications are "designated as arms, ammunition and implements of war" on the State Department's Munitions List, which codifies a

vast range of military goods and related equipment from missiles and jeeps to fuzes and flak vests.<sup>9</sup>

"There is a distinct effort to see to it that nothing of military value is supplied to South Africa," according to a State Department aide.<sup>10</sup> As the U.S. told the Security Council in 1979, "Since the passage in 1977 of the United Nations Security Council mandatory arms embargo, the United States Government does not license for sale to South Africa any 'arms or related material,' (i.e. items on the Munitions List)" (emphasis added).<sup>11</sup> Yet virtually unknown to the public, the State Department has continued to license the sale of Munitions List items to South Africa, as the documents released to AFSC under the Freedom of Information Act have shown.

The Carter Administration was successful in reducing the flow. In 1978, the State Department issued \$4.6 million worth of Munitions List licenses for sales to Pretoria, followed by \$25,000 in 1979; there are no licenses on record for 1980.<sup>12</sup>

The Reagan Administration has been able to reverse this trend without any adverse publicity to date; a dramatic jump in the value of State Department licenses for Munitions List exports to Pretoria has gone wholly undetected. According to disclosures made by the State Department's Office of Munitions Control (OMC), officials there authorized twenty-nine separate exports of Munitions List commodities to South Africa during FY 1981-83.<sup>13</sup> The licenses covered military goods worth over \$28.3 million -- far more than the total value of commercial military exports to Pretoria for the entire previous thirty years.<sup>14</sup>

The importance and scope of U.S. commercial military trade with South Africa becomes clearer when it is compared with similar sales to black African nations and U.S. allies in Central America. During the same three-year period in which U.S. companies got the green light to ship nearly \$30 million worth of equipment on the Munitions List to South Africa, Pretoria's frontline neighbors, Zimbabwe and Zambia, were authorized to receive only slightly more than \$1 million each in U.S. commercial military exports. Only \$1 million and \$3 million were authorized for Liberia and Kenya respectively. During the same period, the State Department authorized \$20.3 million worth of commercial arms sales to El Salvador, Honduras and Guatemala combined.<sup>15</sup> Although these countries receive other forms of military aid that South Africa does not, these figures underscore the significance of South Africa's access to commercial military technology.

OMC Director William Robinson said his office denied six applications for munitions exports to South Africa and returned 25 applications without action. Seven applications for proposed military exports to Pretoria were pending in November 1983.<sup>16</sup>

An aide in the State Department's Bureau of Politico-Military Affairs said OMC authorized the Munitions List exports to South Africa because the equipment had civilian uses. Most of the licenses were for electronic devices for commercial systems, according to OMC chief, William Robinson. The exports included data encryption equipment, navigation gear, image intensifiers and technical know-how, according to Robinson. "Only commodities on the Munitions List with inherent commercial applications have been approved," he added.

Despite the State Department's insistence that the sales did not breach the arms embargo, these commodities fall under Munitions List headings that are explicitly military, including categories for fire control, guidance and auxiliary military equipment and "Military and Space Electronics," which covers products "assigned a military designation or specifically designed, modified or configured for military application..." The State Department refuses to identify most of the South African end-users. But Robinson acknowledged that the recipients included private firms and two government-run installations, the National Physical Research Laboratory and the National Institute for Aeronautics and Systems Technology, both of which do classified military research.<sup>17</sup>

Though these licenses for Munitions List exports make up only a small portion of the dollar volume of U.S. trade with South Africa, trends visible in other categories of sensitive exports further underscore the fact that Pretoria has a friend in the White House. Many of these commodities are officially non-military. But their potential for use by the local security forces or in the arms industry is self-evident. For example, export statistics made available to the AFSC by the Bureau of Census show that U.S. corporations shipped well over half a million dollars worth of "non-military arms and ammunition" to South Africa during 1981 and 1982 (see Appendix II). There were no such exports on record for 1980.<sup>18</sup>

In addition, U.S. companies sold South Africa more than \$556 million in aircraft and related parts that are not on the Munitions List during 1980-82 (see Appendix III).<sup>19</sup> Although direct sales of military aircraft to the SADF are not officially sanctioned by the U.S., parts from several large companies are sold by distributors in South Africa. These U.S. companies include Avco, Teledyne, Raytheon, Bell and Goodyear, which sells a range of "products serving commercial, military and private aviation" in South Africa, according to a trade directory.<sup>20</sup>

#### PRETORIA'S MILITARY POTENTIAL

South Africa has invested heavily in local arms production in the wake of the arms embargo. While the regime seldom misses an opportunity to boast about its supposed self-sufficiency in arms production, some of South Africa's international critics contend that Pretoria is still overwhelmingly dependent on foreign arms-suppliers. The truth probably lies somewhere in between.

What is clear is that Pretoria's military prowess is unmatched in sub-Saharan Africa. While keeping its own population at bay, South Africa has been able to occupy Namibia, mount its largest military mobilization since 1945 for an invasion of Angola, and conduct aggressive operations against its other neighbors.<sup>21</sup> Such demonstrable achievements would be unthinkable without a steady supply of weapons. According to the State Department, South Africa has grown to be the tenth-largest arms-maker in the world.<sup>22</sup> Pretoria's state-owned arms conglomerate ARMSCOR claims to have the largest military communications and ammunition plants in the Southern hemisphere.<sup>23</sup>

While it is impossible to establish exactly what proportion of South Africa's weapons are made with imported parts and know-how, U.S. and European corporations undoubtedly play a pivotal role in the supply of components and technology. Regardless whose name appears as the end-user on an export

license, once military-related equipment or parts are shipped to South Africa it is axiomatic that they become available to the local arms industry. U.S. multinationals acknowledged this to State Department officials, according to a cable from former Secretary of State Vance obtained by the AFSC under the Freedom of Information Act. "In most cases," the cable said, "they [the U.S. corporations] contend that they are unable to control the distribution of the commodities or the products of their technical data once these commodities or products reach South Africa."<sup>24</sup> A South African military journal recently put it even less ambiguously, "Most of the imported parts still used by ARMSCOR are components that are freely available on the commercial market, making it unnecessary for ARMSCOR to produce them locally."<sup>25</sup>

## LOOPHOLES

A few recent examples of what the South Africans call "embargo-busting" show how not only small components but even larger technology and entire aircraft can find their way into Pretoria's arsenal. Two cases that have not previously been reported outside international arms trade circles involve the transshipment of equipment to Bophuthatswana and Ciskei -- two desolate homelands that South Africa has turned into pseudo-states and outfitted with counter-insurgency equipment.

According to one report, the Ciskei Defence Force recently received two Skyvan STOL (short take-off and landing) air transports from a civilian source in South Africa.<sup>26</sup> Made by a British government-owned company, the Skyvan is powered by an engine manufactured by Garret-AiResearch of Los Angeles.<sup>27</sup> Africa News recently reported that Ciskei had also obtained U.S.-made Mooney light aircraft via a source in Israel.<sup>28</sup>

In a similar case, two U.S.-made and one European-made aircraft were transferred from an unnamed civilian source in South Africa to Pretoria's puppet source in Bophuthatswana. In March 1982, the Bophuthatswana air wing received two Helio Courier planes made by a division of the General Aircraft Company of Bedford, Massachusetts.<sup>29</sup> More than 130 Helio Couriers are in the U.S. Air Force inventory, some of which have been assigned to the Tactical Aircraft Command for counter-insurgency use.<sup>30</sup>

The following month, the force acquired an Italo-West German police surveillance aircraft, powered by an Avco-Lycoming engine which is supposedly subject to U.S. export controls.<sup>31</sup> Since U.S. diplomatic personnel in South Africa are responsible for monitoring the end-use of U.S. exports there, it appears that the State Department and the Commerce Department skirted their own embargo regulations.

One other reported embargo violation involves Pretoria's new Minister class fast naval attack craft which is modelled on a similar Israeli vessel. According to an account in the journal, Naval Forces, the Minister is outfitted with chaff launchers manufactured by Hycor, a company based in Woburn, Massachusetts.<sup>32</sup> A Hycor official denied selling the chaff launchers to South Africa, which, if true, suggests that Pretoria was able to acquire them from a company in a third country fronting for the military.<sup>33</sup>

In addition to these naval and air systems, U.S. technology is also being used in military ground equipment in South Africa. The South African Police

rely on Ford for operational vehicles, and one local company is using the suspension, axles and engine from the Chrysler Rustler to make a light military transport dubbed the Trax, which, although not currently in the SADF inventory, is available "for a variety of military applications."<sup>34</sup>

Sales of police gear to Pretoria are supposed to be off-limits but if the export of 2500 shock batons (which the government claims was a "mistake") is any indication, restrictions on crime control exports to Pretoria are meaningless. The private police industry is booming in South Africa because, as a local security manual puts it, "...industrialists have repeatedly been warned of the inability of the police and armed forces to provide adequate protection for industrial complexes."<sup>35</sup> There is no doubt where the threat comes from, according to the police industry, "'Pathologies' in the environment must be identified -- unemployment, the growth of 'black power' movements in the country and events in neighboring countries which have a profound impact on the aspirations of our black population."<sup>36</sup>

In addition to shock batons, local private police apparently have access to weapons and other technology from U.S. companies. For example, Colt and Browning weapons are in use at a commercial "anti-terrorist" training center on the Cape Coast, according to one recent U.S. visitor.<sup>37</sup> Ads in local security journals make it clear that a range of U.S. police gear is available on the open market, including electronic sensors, infrared detectors and tracking equipment. U.S. security companies represented in South Africa include Technipol International, Racon and Raytek.<sup>38</sup>

#### POLICE AND MILITARY EXCHANGES

In a corollary to the arms embargo, the Carter Administration reduced visits by South African security forces to the U.S. Yet under the current Administration, police and military contacts with South Africa are once again beginning to flourish (see Appendix IV). In the summer of 1983, for example, the Administration opened the doors of the Federal Law Enforcement Training Center in Glencoe, Georgia, to a South African vice and drug officer.<sup>39</sup> With State Department approval, the U.S. Drug Enforcement Administration trained Pretoria's nominee in "drug law enforcement techniques," the first such contact since 1975 when the DEA trained 180 officials in South Africa.<sup>40</sup>

Since 1981, the Coast Guard has also trained three South African naval officers in search and rescue techniques. Asked about the program, a Coast Guard official declined comment and said, "We just do what the State Department asks us to do." A State Department aide maintained that the training would benefit the U.S. merchant marine. He acknowledged that some of the techniques the South African naval officers learn in the U.S. were of potential military benefit but he said he was not aware that the U.S. had placed any restrictions on the South Africans' use of the training.<sup>41</sup>

U.S.-South African police exchanges continue under the embargo. In 1982, for example, a South African police major was hosted by the police in Chicago where he participated in a law enforcement training course on police-media relations.<sup>42</sup> A representative of the Detroit police visited several police installations in South Africa, according to a police journal article in April 1983, which quoted the policeman as saying the, "South African police are better trained, better disciplined and make a better force than many in the

United States.<sup>43</sup>

The South Africans followed suit a few months later, visiting Detroit for a police convention hosted by the city's police chief, William Hart. The South Africans' presence at the Detroit gathering of the International Association of Chiefs of Police (IACP) drew heavy criticism from the NAACP and the local black officers' league, whose representative denounced the visit, "The police in South Africa are used to maintain a system that clearly oppresses blacks," said Willie Bell.<sup>44</sup> Membership in the U.S.-based IACP was quietly opened to South African police and security officials a few years ago. The organization currently has 31 members in Namibia and South Africa.<sup>45</sup>

Shabby as it is, the United States' record of compliance with the arms embargo is matched by many other U.N. members. South African security forces have been able to continue relationships with their counterparts in other nations, including the Netherlands, Switzerland, Greece, the Federal Republic of Germany, and -- perhaps less surprisingly -- repressive countries like Chile, Paraguay and Argentina.<sup>46</sup> In 1983, for example, the police chief of Baarn, Holland, visited South Africa and toured several police facilities.<sup>47</sup> A high-ranking Pretoria police official visited West Germany in 1982 and ten South African police were invited to visit Munich in 1983.<sup>48</sup>

Pretoria's police and military forces have been scorned the world over as the bulwark of white-minority rule in South Africa. While contacts between South Africa's security forces and their foreign counterparts may appear commonplace, they are extraordinarily valuable to Pretoria. Meetings of this type provide the opportunity to exchange police know-how. Perhaps just as importantly, they give the security forces a mantle of respectability and boost their morale.

The number of international police exchanges involving South Africa is expected to rise dramatically: In June 1982, the South Africans pulled a quiet public relations coup, wrangling admission to the International Police Association (IPA), which is currently headquartered in the United Kingdom.<sup>49</sup> The South Africans' admission to IPA is especially ironic because the association has official NGO status at the United Nations through the U.N. Economic and Social Council.<sup>50</sup> The South Africans' membership in IPA has apparently gone unnoticed at the U.N. At a meeting of the new South African IPA chapter last year, a police official praised the "unwritten brotherhood of policemen of all forces and countries." Police General Mike Geldenhuys stressed the significance of the move, "Becoming a member of an international organization like IPA is a highlight in these times of isolation experienced by South Africa."<sup>51</sup>

#### OTHER CONTACTS

In some countries the "open-door" policy extends to South African weapons-makers as well as the police. In 1982, for example, seven South African weapons specialists rubbed shoulders with international military experts at a seminar at the Fraunhofer Institute for Propellants and Explosives in Karlsruhe, the Federal Republic of Germany. The high level gathering included a number of military and civilian participants from U.S. weapons facilities and representatives from European arms companies such as Oerlikon-Bührle and Messerschmidt. The South African officials represented Kentron, Naschem and Somchem, all of which are subsidiaries of the secret

state-run weapons company, ARMSCOR.<sup>52</sup>

Little is known about the South Africans' participation in this gathering and others like it. However, it is clear that meetings of this type play an important role in helping South Africans stay abreast of western military developments. Face-to-face contact with foreign military contractors pays off in the long run. Several foreign governments and corporations seem at least as willing as the United States to outfit Pretoria with parts for its weapons. For instance, Israel is widely believed to have helped South Africa develop nuclear weapons capability.<sup>53</sup> South Africa's naval fast attack craft reportedly contain Israeli electronics and guns from Italian and Swiss companies (in addition to the U.S. technology reported above).<sup>54</sup>

West German-origin equipment has found its way into a number of systems in South Africa's arsenal. For example the SADF's new nuclear-capable 155mm G5 howitzer (modelled after a similar U.S.-made system) is based on a power-pack from the West German company Magirus-Deutz.<sup>55</sup> The motor is used to move the howitzer into position, spread its trail legs and raise and lower the firing platform. ARMSCOR's new mobile 127mm Valkiri missile system is based on a chassis from the West German Unimog company. South Africa's proxy force in the homeland of Bophuthatswana was recently outfitted with a sparkling new mobile military communications center. The system is based on a teleprinter from Siemens and a vehicle made by the West German company MAN.<sup>56</sup>

From all appearances, South Africa is coming into its own within the international fraternity of arms-makers. Although details about Pretoria's weapons developments seldom reach the general public, South Africa's arms achievements are increasingly being trumpeted within the arms industry and in trade journals.

The international arms trade has always thrived on secrecy. But in the wake of the arms embargo and widespread international condemnation of South Africa's system of apartheid, corporations furnishing military technology to Pretoria have been doubly cautious about public scrutiny. For the most part, the public record yields few details about the transfer of corporate military know-how and products to South Africa.

One of the most notable and revealing exceptions, however, are records of South African patent awards which are published by the Pretoria government. An AFSC survey of South African patents issued during the last few years shows that several weapons-makers -- many of them based in Europe -- have applied for and received South African patents. These awards cover a range of inventions with specific military applications such as ordnance, radar and military vehicles. These fields are of considerable interest to ARMSCOR and the patents suggest that the companies named may be involved in providing design information, know-how or even hardware to the South African government.<sup>57</sup>

The award of a patent by the South African government does not necessarily mean that the product is currently being sold in South Africa. But it does indicate that the patent-holder expects to manufacture, sell or license the product, according to a U.S. expert in international patent law. "It is practically axiomatic" that corporations holding arms-related patents in South Africa intend to market or use these products locally, he said.<sup>58</sup>

Our review of South African patents turned up several internationally recognized weapons-manufacturers whose links to South Africa have gone undetected (see Appendices V and VI). In 1982 and 1983, for example, the Swiss arms conglomerate Oerlikon-Bührle received a number of South African patents for incendiary weapons, fuzes and projectiles. Two Italian companies were awarded South African patents for an "explosive mine with anti-removal device," and a safety device for a gas pump shotgun. Chartered Industries of Singapore received numerous South African patents for a new 7.62mm automatic rifle developed to Pentagon specifications.

The Belgian arms-maker, PRB, received a South African patent for a fragmentation device embedded with shrapnel-forming metal. Pretoria officials awarded a U.S. inventor a patent for his design for a new telescopic gun sight. The French companies Hispano-Suiza and Creusot-Loire received South African patents for "Military Equipment Comprising a Turret Carrying an External Large Caliber Gun," and a military reconnaissance vehicle, respectively.

Our survey also indicated that even the British and French governments have taken out military-related patents in South Africa in recent years. According to entries in the Patent Journal, the British Defence Ministry received three South African patents for small arms technology in 1982. The French "Delegue General Pour l'Armement" applied for and received a South African patent for ammunition propellants in 1980.

Although it is impossible to verify whether these products are currently in production in South Africa, the weight of the evidence indicates that their manufacture there is very likely -- probably under license to ARMSCOR or a private South African weapons company. Applying for a South African patent involved an informed and deliberate decision on the part of the corporations and governments named, a step they would not likely have taken unless a market for their inventions in South Africa were available.

#### PROSPECTS FOR THE EMBARGO

All members of the United Nations are morally and legally obliged to prevent military technology from reaching South Africa. For its part, it is clear that Washington could make its own embargo against South Africa work. The enforcement machinery is in place. Products with military potential have been identified and the U.S. has demonstrated that it can collaborate with other governments to stop the flow of illicit exports to proscribed destinations. The only thing missing is the will to make the South African arms embargo stick.

As exemplified in the case of the computer bound for the Soviet Union that was seized after having been shipped to South Africa, U.S. companies are permitted to sell to Pretoria much sensitive equipment that is barred from export to Eastern Europe. Operation Exodus, a federal program to interdict technology shipments to the Soviet Union, has resulted in 2330 seizures of Munitions List items and dual-use technology. In their zeal, Customs officials have also netted a few illegal shipments to South Africa but these are apparently regarded as an embarrassing, unintentional by-product.<sup>59</sup> "South Africa is not on the priority list..." said a Customs representative. In contrast to seizures of equipment destined for Eastern Europe which have received heavy play in the press, the public affairs staff at Customs are not

allowed to discuss illicit exports to Pretoria.<sup>60</sup>

Although South Africa has weathered the embargo to date by means of local production and legal and covert imports of parts and technology, the stakes are getting higher. Pretoria urgently needs helicopters and new transport aircraft as well as replacements for its fleet of eleven-year-old maritime reconnaissance aircraft which are to be withdrawn in 1984. The SADF would dearly like to replace its aging combat aircraft and expand its navy.<sup>61</sup> Developments of this scale are likely to necessitate even greater and more visible transfusions of U.S. and other western arms technology for which Pretoria is willing to pay handsomely.

Thus far, criticism from the Third World has not deterred U.S. and other western corporations from discreet trade in "invisible" military technology with Pretoria. Nor has it kept the U.S. and other governments from winking at, and, in some cases, fostering this trade. The U.N. arms embargo against South Africa will undergo its most severe test during the next few years. The Reagan Administration is evidently committed to an expansion of commercial military sales and exports of sensitive dual-use equipment to Pretoria. Congress could go far in forcing the Administration to live up to the U.N. embargo. But the legislators have been unable to mount an effective challenge to the Reagan embargo policy to date.

Unless the U.N. develops specific, binding, multilateral guidelines which prevent all exports of militarily-significant technology to South Africa, and agrees to apply sanctions against those who ignore them, the arms embargo is likely to be eroded even further. As the saying goes in South Africa, "You can't read an embargo document through a gold coin."

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## APPENDIX I

COMMERCIAL MILITARY EXPORTS TO SOUTH AFRICA  
LICENSED UNDER THE ARMS EXPORT CONTROL ACT

(Fiscal Years)

1950 - 1980 (Total)	\$18,630,000
1981	521,990
1982	9,866,716*
1983	<u>17,951,557</u>
1950 - 1983 (Total)	\$46,970,263

Exports to South Africa licensed during 1981, 1982 and the first three quarters of 1983 fell under four categories of the U.S. Munitions List: XI. "Military and Space Electronics;" XII. "Fire Control, Range Finder, Optical and Guidance and Control Equipment;" XIII. "Auxiliary Military Equipment;" and XVIII. "Technical Data."

\*Includes licenses worth \$86,591 for munitions list commodities destined for Namibia.

Sources: Department of Defense; Department of State, Office of Munitions Control.

## APPENDIX II

U.S. EXPORTS OF "NON-MILITARY" ARMS AND  
AMMUNITION TO SOUTH AFRICA

(Calendar Years)

CY 1980	\$ -0-
CY 1981	127,542
CY 1982	<u>598,836</u>
Total	\$726,378

Source: Department of Commerce, Bureau of the Census, Foreign Trade Division

## APPENDIX III

U.S. EXPORTS OF AIRCRAFT AND  
RELATED EQUIPMENT TO SOUTH AFRICA

(Calendar Years)

CY 1980	\$246,838,992
CY 1981	210,250,754
CY 1982	<u>249,037,458</u>
Total	\$706,127,204

Source: Department of Commerce, Bureau of the Census, Foreign Trade Division

## APPENDIX IV

## U.S. - SOUTH AFRICAN POLICE AND MILITARY CONTACTS

Summer 1983	South African vice and drug officer trained under a U.S. Drug Enforcement Administration program in Georgia
1981 - 1983	Three South African naval officers trained in the U.S. by the Coast Guard
October 1983	Two South African representatives participate in the annual gathering of the International Association of Chiefs of Police in Detroit
1983	Member of Detroit Police Force visits South African police installations
March 1983	Lt. General Johann Coetzee (Chief of Security Police) visits State Department
1982	South African police representative participates in police-media relations training program in Chicago
November 1982	Major General Lothar Neethling (Chief of Police Forensics) and Major General H.V. Verster (Head of Counter-Terrorism Unit) participate in the annual gathering of the International Associate of Chiefs of Police in Atlanta
September 1982	CIA Director William Casey visits South Africa for meetings with government and military officials
August 1982	State Department officials meet with General P.W. van der Westhuizen, Major General Charles Lloyd (Commander of South African forces in Namibia) and Lt. General Jamie Geldenhuys (Chief of the Army) in Washington
March 1981	U.S. Ambassador to the United Nations Jeanne Kirkpatrick meets secretly with General P.W. van der Westhuizen (Chief of Military Intelligence)

Sources: Information supplied by the Drug Enforcement Administration, the U.S. Coast Guard, the Washington Office on Africa, the Department of State, and Servamus (various issues)

APPENDIX V

SELECTED PATENTS AWARDED BY THE SOUTH AFRICAN PATENT OFFICE

<u>COUNTRY OF ORIGIN</u>	<u>AWARD DATE</u>	<u>DESCRIPTION</u>	<u>APPLICANT/INVENTOR</u>
Belgium	4/14/83	A fragmentation explosive device	PRB (subsidiary of Belgian Defence Industries)/Michel Renson
Fed. Rep. Germany	11/1/82	A driving means for a heliostat	Messerschmitt-Bölkow-Blohm Heinrich Schäfer and Karl-Heinz Ott
France	4/14/81	Device for mechanical and electrical coupling of loads, particularly military loads	Thomson-Brandt Jean Pierre Rouget and Edmond Roustant
France	6/4/81	Military Equipment Comprising a Turret Carrying an External Large Caliber Gun	Hispano-Suiza Raoul Henri Dumez
France	4/8/81	Device and method of transporting and dropping a plurality of charges in a novel container and container equipped with such a device (applicable to a "military load")	Thomson-Brandt Roger Crepin
France	7/9/82	Submarine periscope	Société d'Optique, Precision Electronique et Mechanique (SOPELEM) Jacques Ragain and Marc Prevost
France	4/8/81	Safety device for dropping a charge suspended from an aircraft and load equipped with such a device (particularly "applicable to the transport ation and dropping of military loads.")	Thomson-Brandt Noel Fulchiron and Bernard Naillon
France	3/20/80	An armoured vehicle (applies to military vehicles for liaison or reconnaissance purposes)	Creusot-Loire Jean Giraud Richard Laigneau
France	3/11/80	Propellant Charges of ammunition with or without metal casing	Etat Français Delegeue general pour l'armement Christian Cannavo and Henri Gens
Israel	7/19/82	Bomb disposal device	EBD International Yaakov Yerushalmi

<u>COUNTRY OF ORIGIN</u>	<u>AWARD DATE</u>	<u>DESCRIPTION</u>	<u>APPLICANT/INVENTOR</u>
Israel	9/7/82	Apparatus for sensing and locating vibrations	Israel Aircraft Industries
Italy	6/25/80	Explosive Mine with anti-removal device	Valsella S.p.A. Pio Lauro
Italy	8/28/82	Safety device for the trigger mechanism of a shot-gun of the gas pump type	Luigi Franchi S.p.A. Leonardo Ottolini
Singapore	9/82	Numerous patents for gas-powered automatic gun components (sear actuator, drum magazine, bolt assembly, etc.)	Chartered Industries of Singapore Leroy James Sullivan and Robert Lloyd Waterfield
Switzerland	8/6/82	Incendiary composition containing a metallic fuel formed of the group IVB of the periodic table of elements	Oerlikon-Bührle A.G. Eduard Daume and Jürg Sarbach
Switzerland	6/25/82	Safety apparatus for spinning projectile fuze	Oerlikon-Bührle A.G. Robert Apotheloz
Switzerland	11/4/82	Impact fuze with flight time-dependent detonation delay	Oerlikon-Bührle A.G. Klaus Muenzel
Switzerland	6/28/82	Assembly formed by a projectile and the means for launching this projectile	Valinor S.A. Robert Bornand
Switzerland	3/28/83	Connection arrangement for sabot projectile	Oerlikon-Bührle A.G. Rudolf Rossman
Switzerland	3/28/83	Method to attach ballistic hood to projectile	Oerlikon-Bührle A.G. Rudolf Rossman and Jacques Mariaux
Switzerland	3/28/83	Projectile design	Oerlikon-Bührle A.G. Rudolf Rossman
Switzerland	2/21/83	Shattering or explosive incendiary projectile	Oerlikon-Bührle A.G. Paul Cahannes, Eduard Daume and Jürg Sarbach
Switzerland	2/21/83	Spinning projectile fuze safety apparatus	Oerlikon-Bührle A.G. Rudolf Rossman and Paul Cahannes

<u>COUNTRY OF ORIGIN</u>	<u>AWARD DATE</u>	<u>DESCRIPTION</u>	<u>APPLICANT/INVENTOR</u>
Switzerland	3/22/83	Dummy ammunition	Oerlikon-Bührle A.G. Franz Moser
U.K.	5/6/81	Radar Signal Simulator	Marconi Co. Ltd./Michael John Burrows
U.K.	10/18/82	Firearms with rotary magazines	Sec. State for Defence, Her Majesty's Govt. Norman Brint and Jack Comley
U.K.	6/2/82	Actuating mechanisms for small arms	Sec. State for Defence, Her Majesty's Govt. Norman Brint and Jack Comley
U.K.	10/18/82	Firearms with re-chargeable magazine	Sec. State for Defence, U.K. Govt. Norman Brint and Leon Willams
U.S.	8/6/82	Telescopic gun sight	Daniel Shepherd

Source: Patent Journal/Patentjoernaal, various issues, 1980 - 1983. Published by the Patent Office, Pretoria.

**Key:** 21 Application 22 Application date 43 Award date  
51 Class 54 Title of Invention 71 Applicant 72 Inventor  
33 Country (i.e. FR = France; IT = Italy; CH = Switzerland, etc.)

**Note:** The date below each entry is the date of publication.

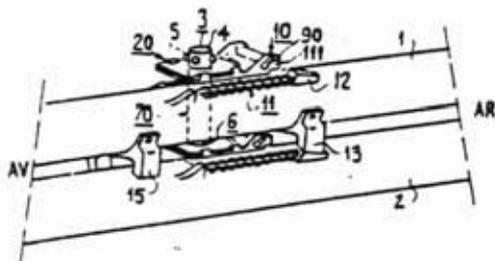
21: 80/3382. 22: 6/6/80. 43: 14/4/81.  
51: B 64 D. F 42 B. F 41 F.  
71: Thomson-Brandt.  
72: Jean Pierre Rouget and Edmond Roustant.  
33: FR. 31: 79 14591. 32: 7/6/79.  
54: DEVICE FOR MECHANICAL AND ELECTRICAL COUPLING OF LOADS. PARTICULARLY MILITARY LOADS.  
(X): 25.

June 1981

57: The invention relates to a mechanical and electrical coupling device for loads, especially for military loads.

Such a coupling consists of the combination of means of attachment, of securing and of electrical connection, so arranged that the locking of the means of attachment simultaneously and automatically—without the need to resort to regulating operations—ensures the securing, in all positions, of the carried load relative to the carrying load, as well as ensuring their electrical connection. A plurality of loads can thus be firmly fixed to one another for the purpose of being carried under an aircraft, and can subsequently be ejected one by one, starting with the load furthest removed from this aircraft.

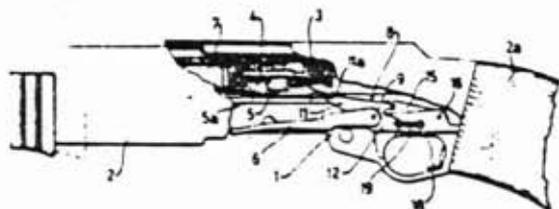
The invention is applicable to the dropping of sticks of projectiles.



21: 81/7290. 22: 81.10.21. 43: 28-9-82.  
51: F41C.  
71: LUIGI FRANCHI S.p.A.  
72: LEONARDO OTTOLINI.  
33: IT. 31: 25858 A/80. 32: 80.11.10.  
54: SAFETY DEVICE FOR THE TRIGGER MECHANISM OF A SHOT-GUN OF THE GAS-PUMP TYPE.  
(X): 17.

Nov. 1982

57: A safety device for the trigger mechanism of a gas-operated-automatic pump-action-manual shot-gun comprises an over-centre thrust spring assembly pivotally connected at one end to a fixed point on the gun and at the other end to a stop member defining lever. The thrust spring assembly is pivotable between a first position, in which it biases the said lever into an operative position, bearing against the breechblock carrier, and a second position in which it stabilises the said lever in an inoperative position, out of the path of movement of the breechblock carrier, preventing rebound of stop member defining lever into the said path.



21: 81/7001. 22: 1981-10-09. 43: 6/8/82.  
51: C 06 B. F 42 B.  
71: Werkzeugmaschinenfabrik Oerlikon-Bührle A.G.  
72: Eduard Daume and Jürg Sarbach.  
33: CH. 31: 8116/80-9. 32: 1980-10-31.  
54: Incendiary composition containing a metallic fuel formed of the group IVB of the periodic table of elements.  
00: 12.

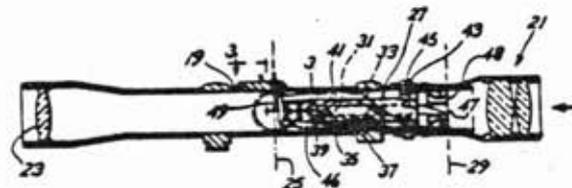
Sept. 1982

57: The incendiary mass comprises a zirconium or titanium powder containing a mean grain size of 15-50  $\mu\text{m}$ , to which there is added less than 2% by-weight of an organic binder, in particular polyvinylacetate because small binder concentrations have a favorable effect upon the action or effect pattern of the combustions or burning metal particles, i.e. upon the combustion time and length of the flight trajectory.

21: 81/7588. 22: 3 November 1981. 43: 26/8/82.  
51: F 41 g. G 02 b.  
71: Daniel R. Shepherd.  
72: Daniel R. Shepherd.  
33: US. 31: 206,668. 32: 13 November 1980.  
54: Telescopic gun sight.  
00: 26.

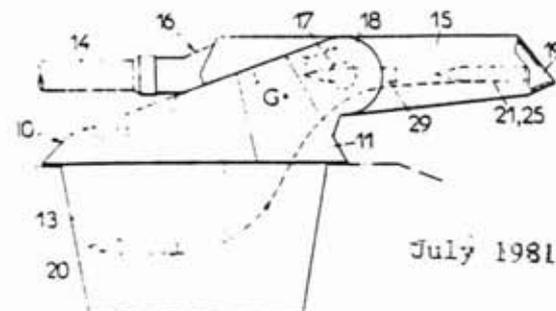
Oct. 1982

57: A telescopic sight including primary and secondary reticules separately disposed within separate image planes formed at respective opposite ends of an inverting tube. The secondary reticule is selectively retractable between a first position lying within the field of view of the scope and a second position lying outside the field of view of the scope. A pair of control knobs provide independent adjustability to relatively position the separate reticules with respect to the image viewed through the scope. The secondary reticule is mounted for selective presentation of one of a plurality of reticule surfaces carried by the reticule, with each reticule surface bearing engraved indicia for determining target range and for compensating for bullet drop.



21: 80 4497. 22: 25.7.80. 43: 4.6.81.  
51: F 41 H. F 41 f.  
71: Hispano-Suiza.  
72: Raoul Henri Dumez.  
33: FR. 31: 79 19401. 32: 27.7.79.  
54: MILITARY EQUIPMENT COMPRISING A TURRET CARRYING AN EXTERNAL LARGE CALIBER GUN.  
00: 21.

57: A turret mounted for rotation about a vertical axis carries a large caliber gun through bearings located on both sides of said gun and defining an elevation axis transverse to the vertical axis. The gun is located out of and above the turret and provided with a separate shield which co-operates with one of the bearings to define a protected passage for a gun loading system arranged to supply rounds of ammunition one at a time to the gun from a location inside the turret.



July 1981

21: 81/4544. 22: 3 July 1981. 43: 2/6/82.

51: F 41 C, F 41 D.

71: The Secretary of State for Defence in her Britannic Majesty's Government of the United Kingdom of Great Britain and Northern Ireland.

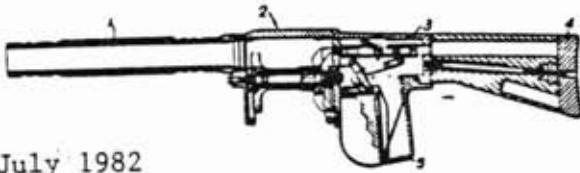
72: Norman Trevor Brint and Jack William Comley.

33: GB. 31: 8022929. 32: 14 July 1980.

54: Actuating mechanisms for small arms.

00: 34.

57: A self-loading firearm for firing rubber bullets and the like has an actuating mechanism comprising a toggle linkage which is straightened on operation of the trigger against its spring bias. Initial straightening of the toggle linkage moves the breech block forward to locate a round of ammunition in a short socket at the chamber end of the barrel. As the toggle linkage moves over centre it locks the breech block forward and displaces a sear to release the firing pin. The round is fired with its case virtually unsupported. On release of the trigger the toggle mechanism is bent so withdrawing the breech block and the spent round which is automatically ejected. The firing pin is simultaneously re-cocked. Rotary and vertical stacking rechargeable magazines are described, from which a fresh round is automatically fed to the breech on ejection of a spent round.



July 1982

21: 81/8065. 22: 1981-11-20. 43: 9/9/82.

51: F 41 D.

71: Chartered Industries of Singapore Private Limited.

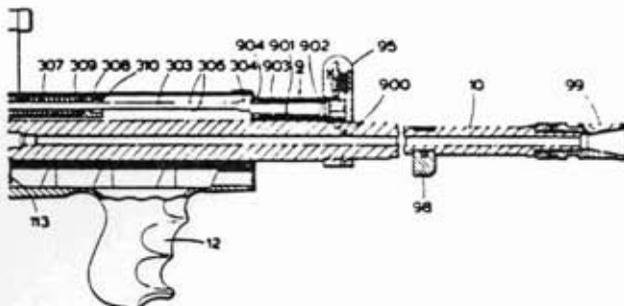
72: Leroy James Sullivan.

33: GB. 31: 8039746. 32: 1980-12-11.

54: Gas operated automatic or semi-automatic guns.

00: 47.

57: A gas operated gun having a receiver (1) including a rear wall (100) at one end and a barrel (10) at the other end and a bolt carrier assembly (3) reciprocal within the receiver is arranged to co-operate with a main drive spring (307) that urges the bolt carrier assembly toward the barrel. The gun is designed so that in one aspect of the invention on an automatic cocking cycle the bolt overtravels the cartridge feed station by an amount equal to or greater than the overall length of a live cartridge. In a further aspect, the gun is additionally designed using parameters calculated such that a substantially constant reaction is felt by a user. The parameters involved are essentially the product of sprung weight (the total weight in kg. of all components driven by the main spring) x springing force (an average value of spring force that accelerates and retards the sprung weight) x cycling distance (the length of allowable travel of the bolt carrier assembly in meters) is equal to  $(0.51)^2 \times 0.5g \pm 15\%$  where  $l$  is the cartridge impulse and  $g$  is the acceleration due to gravity. The length of allowable travel of the bolt carrier assembly is arranged such that the assembly does not impact a positive stop (100).



Oct. 1982

21: 82-4202. 22: 82-06-15. 43: 21-2-83.

51: F 42 B.

71: Werkzeugmaschinenfabrik Oerlikon-Bührle AG.

72: Paul Cahannes; Eduard Daume; Jürg Sarbach.

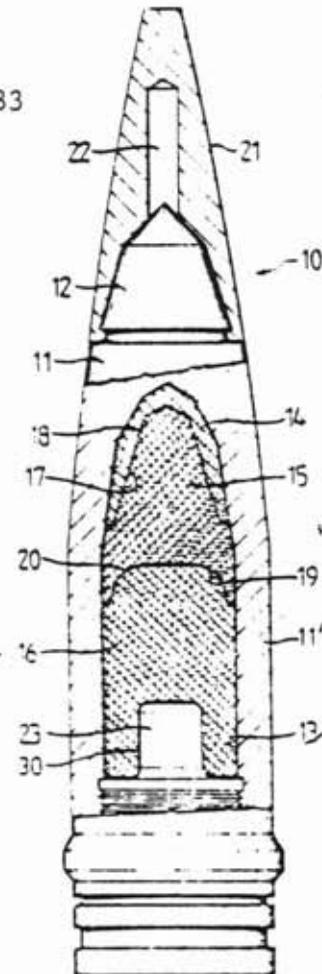
33: CH. 31: 4 184/81-2. 32: 81-06-24.

54: Shattering or explosive incendiary projectile or shell containing a projectile body.

00: 11.

57: In order to improve the incendiary effect of munitions to hollow compartment of an armour-piercing projectile body of an explosive incendiary projectile or shell, or grenade, is provided with an incendiary charge and two explosive charges. The incendiary charge possesses at its rear region or end a substantially funnel-shaped recess or cavity into which there protrudes a substantially conically-shaped tip of the first explosive charge of said two explosive charges.

April 1983



21: 79/1753. 22: 12/4/79. 43: 11/3/80. April 1980

51: F 42 B 9/14, C 06 B 21/00, 23/00.

71: Etat Francais represente par le Delegeue general pour l'armement.

72: Christian Cannavo and Henri Gens.

33: FR. 31: 78.10854. 32: 13/4/78.

54: PROPELLANT CHARGES OF AMMUNITION WITH OR WITHOUT METAL CASING;

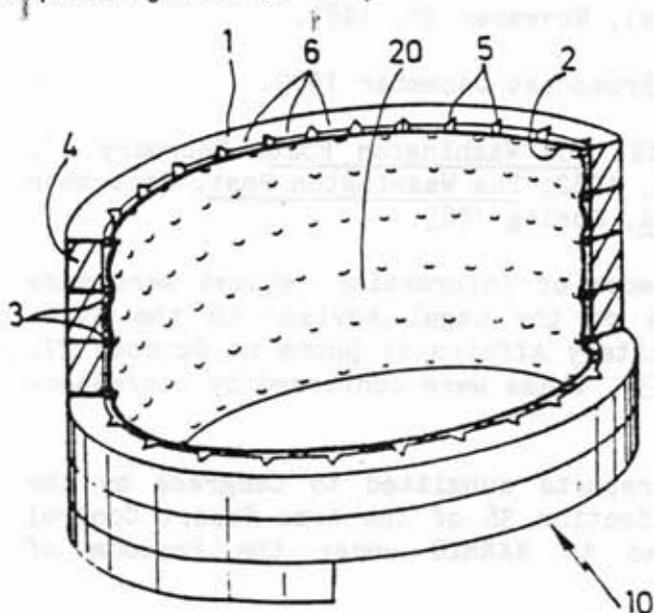
00: 15.

57: This invention relates to an ammunition propellant charge including two or three propellants. The charge can be obtained through the association, either of a coating material in a small proportion made of an oily binding or a polyisocyanate with a perforated propellant and a monotubular propellant in mass proportions of 70 to 85% and 15 to 30% respectively, or of a perforated propellant with a spherical grain propellant in proportions of 65 to 80% and 20 to 35% respectively, or of a perforated propellant with a monotubular propellant and a spherical grain propellant in mass proportions of 60 to 80%, 10 to 20% and 5 to 20% respectively. A loading density close to 1200 g/dm<sup>3</sup> is thus obtained.

21: 82/3940. 22: 82-06-04. 43: 14-4-83.  
 51: F 42 B.  
 71: S.A. PRB.  
 72: Michel Renson.  
 33: BE. 31: 0/205141. 32: 81-06-18.  
 54: An explosive device.  
 00: 9.

May 1983

57: A hollow controlled fragmentation head for an explosive device which comprises a double-walled cage (10) whose outer wall is constituted by a helix of wire (4) formed at regular intervals with notches (5) which extend over a fraction of the wire thickness and whose inner wall is a continuous wall (2) bounding a chamber adapted to receive an explosive charge, the outer and inner walls enclosing between them a plurality of shrapnel forming elements (3).



21: 79/1816. 22: 17/4/79. 43: 20/3/80.  
 51: F 41 H 7/02.  
 71: Creusot-Loire.  
 72: Jean Giraud and Richard Laigneau.  
 33: FR. 31: 78-11017. 32: 14/4/78.  
 54: AN ARMOURED VEHICLE.  
 00: 13.

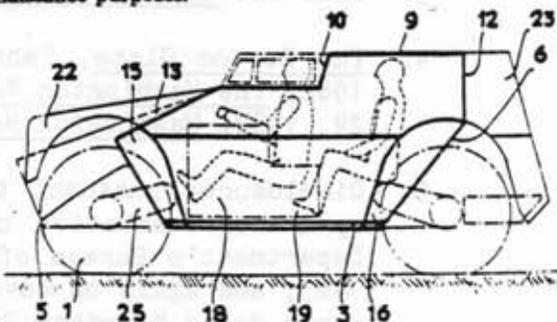
April 1980

57: Armoured vehicle having an engine, rolling means and means for transmitting movement to the rolling means. The vehicle comprises:

(a) A main central cell (3 to 16 or 32 to 38) which is strongly armoured and surrounds the occupants and the essential mechanical parts,

(b) a lighter external protection (22-23 or 44 to 46) surrounding the main cell and projecting beyond the rolling means.

The invention applies to military vehicles for liaison or reconnaissance purposes.



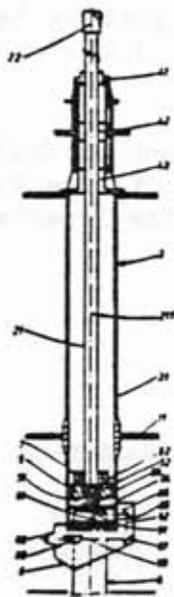
21: 81/5373. 22: 1981-08-05. 43: 9/7/82.  
 51: G 02 b, B 63 g.  
 71: Société d'Optique, Precision Electromique et Mecanique—SOPELEM.  
 72: Jacques Ragain and Marc Prevost.  
 33: Fr. 31: 80-17386. 32: 6/8/80.  
 54: Submarine periscope.  
 00: 14.

57: The present invention relates to a submarine periscope which can be used as a lookout or an attack periscope.

The periscope according to the invention comprises an observation head mounted at the top of a tube equipped with an optical system and vertically guided in bearings located above the pressure hull and equipped at its lower part with a suspension piece in which it is able to pivot about its axis, under the action of a motor, by which it can be vertically hoisted or lowered in:

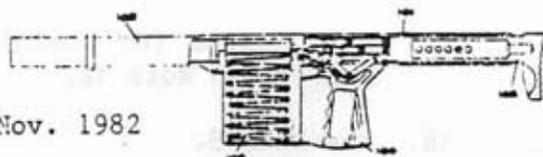
PATENTJOERNAAL, AUGUSTUS 1982

lock-chamber solid with the pressure hull and a fixed observation unit provided with an eyepiece receiving the beam at the exit of the tube through a unit and it is essentially characterised by the fact that it includes an actuator (6) mounted between the suspension piece (5) and a support located inside the pressure hull (11) at a lower level than this suspension piece (5) which bears on the rod (61) of the said actuator.



21: 81/4546. 22: 3rd JULY 1981. 43: 18.10.82.  
 51: F41C F41D.  
 71: THE SECRETARY OF STATE FOR DEFENCE IN HER BRITANNIC MAJESTY'S GOVERNMENT OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND.  
 72: NORMAN TREVOR BRINT  
 LEON JOHN WILLIAMS.  
 33: GB. 31: 8022931. 32: 14 JULY 1980.  
 54: FIREARMS WITH RE-CHARGEABLE MAGAZINE.  
 00: 23.

57: A firearm especially for firing large calibre rounds such as rubber bullets and having a magazine in which a plurality of rimmed rounds may be stacked in contact with one another, the magazine being rechargeable at any stage of depletion. The firearm includes a catch mechanism which locks a round in the breech on insertion, permits the rim of a round to ride forward over the rim of a previously-inserted round without fouling, and the extraction of a spent round rearwardly without its rim fouling a previously-inserted round. Mechanism for firing, automatic feed, and automatic extraction and ejection of spent rounds is described.



Nov. 1982

## ENDNOTES

1. For background, see Richard Leonard, South Africa at War, Lawrence Hill, 1983.
2. The Sun (New York Times News Service), November 21, 1983.
3. Ibid and MacNeil/Lehrer News Hour, Broadcast December 1983.
4. The Boston Globe, February 28, 1982; The Washington Post, February 27, 1982; The Washington Post, August 8, 1982; The Washington Post, September 24, 1982; Washington Notes on Africa, Spring 1983.
5. Disclosures pursuant to AFSC's Freedom of Information request were made by a representative of the office of the Legal Advisor to the State Department's Bureau of Politico-Military Affairs by phone on October 27, 1983, and again on November 10, 1983. These were confirmed by correspondence dated November 28, 1983.
6. Unpublished quarterly and annual reports submitted to Congress by the Department of Defense pursuant to Section 36 of the Arms Export Control Act -- various issues. Released to NARMIC under the Freedom of Information Act.
7. Commerce Department export regulations, the Commodity Control List and the Carter-era controls are detailed in Export Administration Regulations, 15 CFR, U.S. Department of Commerce, International Trade Administration, October 1980.
8. See: Multinational Monitor, April 1982.
9. The Munitions List and State Department responsibilities for arms licensing are outlined in International Traffic in Arms, Title 22, U.S. Code, Subchapter M.
10. Department of State, Interview with NARMIC, November 17, 1983.
11. "Report of the Security Council Committee Established by Resolution 421 (1977) Concerning the Question of South Africa," U.N. Security Council S/13721, December 31, 1979.
12. Unpublished quarterly and annual reports submitted to Congress by the Department of Defense pursuant to Section 36 of the Arms Export Control Act -- various issues. Released to NARMIC under the Freedom of Information Act.
13. See Note 5.
14. See Note 12.
15. All figures for Munitions List exports to these countries are from the sources in Note 12.
16. See Note 5.

17. Details released pursuant to AFSC's Freedom of Information request, see Note 5. For background about agencies involved in military R&D in South Africa, see: Automating Apartheid-- U.S. Computer Exports to South Africa and the Arms Embargo, NARMIC 1982.
18. Information provided by the Department of Commerce, Bureau of Census, Foreign Trade Division, November 15, 1983.
19. Ibid.
20. Interavia World Directory of Aviation and Astronautics, 31st edition, 1983.
21. Survival, International Institute for Strategic Studies, March/April 1983.
22. Testimony of Mr. William B. Robinson, Director, Office of Munitions Control, Department of State, to the Subcommittee on Africa of the Committee on Foreign Affairs, House of Representatives, March 30, 1982.
23. See Note 1; and The Apartheid War Machine, International Defence and Aid Fund.
24. Secretary of State Cyrus Vance, Cable to U.S. Embassy, Pretoria, September 21, 1978.
25. Paratus, July 1983.
26. Milavnews, Aviation Advisory Services, August 1983.
27. Janes All The World's Aircraft, 1980-1981.
28. Africa News, November 21, 1983.
29. Milavnews, Aviation Advisory Services, January 1983; and Janes All The World's Aircraft, 1976-1977.
30. Janes All The World's Aircraft, 1972-1973.
31. Milavnews, Aviation Advisory Services, January 1983; and Janes All The Worlds's Aircraft, 1981-1982.
32. Naval Forces, No. 5, 1981.
33. Hycor, Interview with NARMIC, November 1983.
34. Servamus, June 1983; and Janes Military Vehicles and Ground Support Equipment, 1982-1983.
35. Security and Protection Handbook 1982, Thomson Publications SA (Pty) Ltd.
36. Ibid.

37. Combat Illustrated, April 1983.
38. The Security and Protection Handbook 1982 shows that security products from a number of U.S. corporations are available in South Africa. These include APD Security Systems, LCN Sentronics, Schlage Electronics, Stellar Systems, Telsar, Von Durpin, Napco, Silent Knight, Arrowhead, Colorado Electro Optics, Detection Systems Solfan and United Security Products.
39. Drug Enforcement Administration, Interview with NARMIC, November 7, 1983.
40. Ibid; and SARP Magazine for the South African Police, January 1976.
41. Department of State, Interview with NARMIC, November 17, 1983.
42. Servamus, November 1982.
43. Servamus, April 1983.
44. Detroit News, September 29, 1983.
45. The Police Chief, September 1982 and September 1983.
46. Servamus, April 1983; Servamus, August 1983; Paratus, January 1983; Servamus, October 1982; Paratus, July 1982; Paratus, December 1982; Paratus, January 1983; Revista de la Escuela Superior de Guerra, October 1981.
47. Servamus, April 1983.
48. Ibid.
49. Ibid.
50. "What is the IPA?" International Police Association South African Section, updated.
51. Quotes from Servamus, July 1983.
52. South African and other participants are listed in the program, "Internationale Jahrestagung 1982 30. Juni - 2. Juli. Verwendung von Kunststoffen für Trieb- und Explosivstoffe." Fraunhofer - Institut, Karlsruhe 1982. Provided by the Anti-Apartheid Bewegung, Bonn.
53. For further background, see South Africa's Nuclear Capability, World Campaign Against Military and Nuclear Collaboration with South Africa, February 1980, and; Defense Electronics, February 1983.
54. See Note 32.
55. See Armed Forces, December 1982 and Janes Defence Review Vol 4 No. 1, 1983. The G5 is modelled on the 155 mm howitzer made by the U.S.-Canadian Space Research Corporation. The International Defense Review

(No. 3 1983) reported that the computer used in the G5 artillery control system appeared to be of U.S. origin.

- 56. Armed Forces December 1982 and Janes Defence Review Vol. 4 No. 1, 1983.
- 57. Details about South African patents are all from: Patent Journal/Patent Joernaal, published by the South African Patent Office - various issues 1980-1983.
- 58. Max Millman, Interview with NARMIC, September 16, 1983.
- 59. Background material on Operation Exodus from U.S. Customs Service.
- 60. Ibid.
- 61. South Africa's evolving military needs are discussed in Milavnews, Aviation Advisory Service, November 1982; Armed Forces, September 1982; Armed Forces, May 1982; Armed Forces, April 1982.

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