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**MOZAMBIQUE**  
**DEMINE REPORT**  
**(OPERATIONAL PHASE)**

**MOZAMBIQUE DEMINE PROJECT**  
**(USAID CONTRACT 656-0247-C-00-3036-00)**  
**(PROJECT 656-0235-3-30007)**

**SUBMITTED TO:**

**USAID/MOZAMBIQUE**  
**MAPUTO, MOZAMBIQUE**

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## TABLE OF CONTENTS

	<u>Page</u>
<b>HIGHLIGHTS</b>	<b>i</b>
<b>I. SUMMARY AND BACKGROUND</b>	<b>1</b>
<b>A. Summary</b>	<b>1</b>
<b>B. Background</b>	<b>1</b>
1. The Setting	1
2. The Peace Accord	2
3. The Cost of Relief and Rehabilitation Work	2
4. Estimates of Mines and Extent of Problem	3
5. National Policy and Strategy of Demining	4
<b>II. OBJECTIVES AND APPROACH</b>	<b>6</b>
<b>A. The Demining Contract</b>	<b>6</b>
<b>B. The RONCO Approach and Experience</b>	<b>6</b>
<b>III. OPERATIONAL SETTING AND OPERATION</b>	<b>8</b>
<b>A. Organizing Demining Operations</b>	<b>8</b>
1. DTOF	8
2. Training	8
3. Integrating Teams	8
4. Logistics and Deployment	9
5. Retraining	9
<b>B. Progress in Operations</b>	<b>9</b>
<b>C. UXO Found</b>	<b>12</b>
<b>D. Operational Issues</b>	<b>12</b>
1. Conditions of Roads	12
2. Weather Conditions	13
3. Frequent Base Camp Movement and Logistics	13
4. Survey and Quality Assurance	14
5. Medevac Capability and Safety	15
6. Missed Ordnance	15

	<u>Page</u>
<b>IV. PRODUCTIVITY AND COST EFFECTIVENESS</b>	<b>17</b>
<b>A. Productivity</b>	<b>17</b>
1. Starting from Scratch	17
2. The Political Balance	17
3. Operational Exigencies	18
4. Physical and Climatic Environment	18
5. Impact on Productivity	18
<b>B. Cost Effectiveness</b>	<b>19</b>
1. Costs	19
2. Amortized Costs	19
3. Cost Perspective	20
4. Productivity and Cost Effectiveness Comparisons	20
5. People Affected	21
<b>IV. LESSONS LEARNED</b>	<b>22</b>
<b>V. CONCLUSIONS</b>	<b>25</b>

## ANNEXES

**ANNEX 1 and 2 – Roads Cleared by the USAID RONCO Demining Project**

**ANNEX 3 – Base Camp Sites**

**ANNEX 4 – Demining Incident Details**

## HIGHLIGHTS

- From May 1994 through July 1995, RONCO cleared 2,177 kilometers of roadway in Central Mozambique with 84 deminers and 32 mine dogs/handlers.
- At a minimum, in area terms, RONCO cleared 17,400,000 square meters or 17.4 square kilometers of roadway.
- RONCO's cost of clearance was \$0.44 per square meter with all expenditures fully charged. When accounting for the continuing useful life of the Demining Training and Operations Facility (DТОF), vehicles and equipment, mine detecting dogs and trained Mozambican handlers and deminers, amortized costs were only \$0.32 per square meter.
- RONCO's cost effectiveness was exceptional. The standard in Afghanistan, said to be "one of the world's most cost effective," was \$1.00 and in Mozambique estimates of other operations range from \$1.10 to \$2.50 per square meter, fully three to six times as costly as RONCO.
- With RONCO's twelve demining teams averaging 0.73 kilometers per demining day per team, RONCO could have cleared just under 3,000 kilometers by July 24, 1995, had extraordinary delays in training and deployment and exceptionally heavy rains and unforeseen mobility requirements not occurred. At the same rate of clearance, over 4,100 kilometers could have been cleared by December 31, 1995.
- The RONCO safety record is unsurpassed. The demining team suffered only one mine accident with two minor injuries, the most serious a slightly broken foot. Four mine detecting dogs died of disease and two lost demining effectiveness and had to be retired.
- RONCO missed two mines during the operational period, both most likely because they had been deeply buried and worked toward the surface as the roadway eroded. Both detonated without injury.
- RONCO has left in place over 100 well-trained Mozambican deminers/dog handlers and 32 mine detecting dogs to expand Mozambican long-range indigenous demining capability.
- Over one million Mozambicans regained access to the rest of the country as a result of RONCO's road clearing operations. The amortized cost per person was about \$5.00, a cost undoubtedly much lower than the economic and social benefits resulting from reopening a substantial part of Mozambique's historic bread basket.

## **I. SUMMARY AND BACKGROUND**

### **A. Summary**

RONCO completed operational field work on the implementation of a contract with USAID to remove mines and other unexploded ordnance from rural roads and tracks in Mozambique on July 23, 1995. RONCO worked on this activity in Mozambique for about 20 months, including a 5 month startup and training phase and an actual demining operational phase going on over 15 months. The contract (contract # 656-0247-C-00-3036-00) was signed effective September 30, 1993 with a completion date of October 31, 1994. This 12 month contract targeted the clearance of landmines from 2,100 kilometers of rural roads in central and northern Mozambique. It was amended to extend the completion date to December 31, 1994 due to startup delays beyond the contractor's control. A further amendment increased funding when the Department of Defense agreed to contribute funds for humanitarian demining in Mozambique and activity completion was rescheduled to end on June 30, 1995, a date that was further extended to July 31, 1995. Finally, a fourth amendment to the contract increased funding to a total of \$8,708,412 and set the completion date as January 31, 1996 for a transition phase of the project.

The current phase, provided by the fourth contract amendment, concentrates on a transition with support to other demining groups in Mozambique and a phase out of RONCO's field demining activities. After July 23, 1995, RONCO provided no actual demining and has been in a strictly support and transition role. No institutional development was planned nor has any taken place under this contract. RONCO has, however, developed extensive Mozambican capacity in the field of demining, dog handling, medical and paravet support and logistics support through the training and deployment of some 130 Mozambican deminers and dog handlers. At the end of July, 1995, USAID requested that RONCO shift the focus of its operation from demining toward institutional development and technical and physical support of other organizations undertaking demining in the country. This phase is scheduled through January 31, 1996. This report focuses on the operational phase of the RONCO contract, and will address operations, results, issues and lessons learned up through July 31, 1995.

### **B. Background**

#### **I. The Setting**

Although Mozambique has considerable economic potential, more than two decades of war have devastated the country, and the result is a country with the lowest per capita income in the world. Mozambique was the recipient of one of Europe's earliest colonies, and over almost 400 years, the country moved from one having a few coastal trading posts and a vast hinterland little explored or known by the Europeans to one with very large European commercial agricultural, industrial and trading sectors and a European controlled government. In 1964, African Mozambique initiated an armed campaign against Portuguese colonial rule, which finally resulted in independence in 1975. Unfortunately, GNP declined by 17 percent in the last five years of Portuguese rule and an additional 25 percent in the first four years of independence. A civil war -- or "the emergency" began almost immediately after independence with an armed insurgency (RENAMO) fighting against the government (FRELIMO). This "emergency" led to further declines in the economy of the country. The exodus of European farmers, businessmen and professionals began shortly after the 1964 conflict began, and continued up through the year of independence and after. This exodus, coupled with the continual civil war lent to a further and rapid deterioration of economic activity,

decline of services and lack of maintenance of infrastructure. Public safety could no longer be assured by the government in many parts of the country, and travel for any purpose, when at all possible, was extremely dangerous and costly. Normal commerce almost ceased in the central and northern parts of the country, and was increasingly difficult elsewhere.

RENAMO was a guerilla force carrying out hit-and-run raids, with its principal targets being government and economic installations, and civilians became common victims. The insurgency led to indiscriminate killing, destruction of buildings and infrastructure, finally driving the civilian population out of many areas. Mines were laid in roads, fields, and buildings throughout the country. Government estimates indicate almost one million persons were killed between 1986 and 1990 from civil war, half of whom were children. More than 2,000 schools and 1,000 clinics were destroyed. Five million people fled conflict-torn areas of Mozambique to neighboring countries or secure areas within the country.

The 1992 drought had a further negative impact on the economy, decimating agriculture in many areas, compounding problems by increasing the number of internally displaced people and refugees to neighboring countries. At the beginning of 1992, there were two million internally displaced and 1.5 million refugees; at the end of the year, the number had climbed to 5 million displaced people, with 1.7 million refugees outside the country, almost all requiring assistance.

## 2. The Peace Accord

A peace accord was signed October 1992, and since that time, FRELIMO, RENAMO, and the donor community have been working to establish a viable and effective peace-time government, repatriate refugees, resettle the displaced, and demobilize and resettle soldiers. When the implementation of the demining project began, people were just beginning to return home, and the belligerent armies had just been demobilized. For many people, peace was not at all a certainty. After years of neglect to roads, transportation was difficult, made more so by mines laid on roads and fields. For the people who had been gone for some time, conditions in their home areas were unknown and uncertain.

The General Peace Agreement signed in October 1992 fundamentally altered the setting in which humanitarian assistance was provided to Mozambique by the international community from what had occurred over the past decade. First, assistance would be provided to all of the people regardless of the support or sentiments during the war period. Second, a clear shift was called for in re-orienting assistance to support the return to normalcy. This redirected aid programs, that had been almost solely relief oriented, to focus on restoration of basic services and re-establishing the conditions for rural production and commerce.

## 3. The Cost of the Relief and Rehabilitation Work

According to the UNHCR, since the signing of the peace agreement of October, 1992, an estimated requirement of \$703.8 million was needed to support the displaced persons in Mozambique, and up to April 6, 1993, a total of \$322.8 million had been committed by the donor community for food and non-food aid to Mozambique. However, these figures did not include the costs of operating the refugee camps in the neighboring countries, which cost well over \$300 million per year at that time.

These exceedingly high costs were fueled by the logistics difficulties of refugees trying to return home over roads and paths suspected of being mined and by the inordinate costs of trying to supply food over demined and often non-existent roads or in some extreme cases, airlifting food and other supplies. The demining and reconstruction of roads were thus seen as absolutely vital initial steps in the rebuilding of any semblance of normalcy to people's lives in central Mozambique.

#### 4. Estimates of Mines and Extent of the Problem

When the belligerents signed a cease fire in 1992, Mozambique had been in an almost continuous state of war for 25 years. The use of mines as both offensive and defensive weapons was common by all sides during this period, and the wide geographic dispersion of battles meant that unexpended ordnance was scattered all over the country. This detritus of war presented a massive problem for the reintegration of the country after the cease-fire. People that had been absent from their villages did not know where the mines had been placed, making life in the villages hazardous and rendering many agricultural fields unusable. Traveling on the roads to home villages from refugees camps was difficult to organize by those encouraging reintegration into the countryside where so many roads had been mined or were considered to be mined. Mines had been planted around schools, hospitals, police stations and government offices, surrounding power stations, bridges, dams, and other installations, making repair and maintenance of these installations difficult and dangerous. To put the economy back on a growth pattern, and to try to bring some normalcy back into rural Mozambique, the removal of this ordnance was paramount.

In 1993, the UN Office for Humanitarian Assistance Coordination (UNOHAC) commissioned a British NGO, Halo Trust, to survey the situation of mines in the country. This survey eventually resulted in a series of reports<sup>1</sup> detailing the situation of mines in each Province. The reports, produced in June, 1994, gave some detail on the known or suspected existence of mines by District and location within the Provinces. However, the survey team emphasized that the reports could not be verified, and several sites probably did not contain mines whereas other sites, not reported to Halo Trust, could well have been mined. The raw information was available for review by active demining operations, but detailed maps and lists were not available when demining operations started in 1993. Generally at this time, it was estimated that somewhere between 1.5 and 2.0 million mines existed in Mozambique, although this figure was not verified by any government or military source, and could not be confirmed by preliminary survey data.

The situation in 1993 required some urgency in undertaking demining activities, and could not wait for the final results of the UN mine situation survey. A cease fire was in force, but action leading toward a firmer reconciliation of belligerents was needed to ensure that the cease fire led to a permanent peace. This required not only reintegrating the people back into the countryside, but also helping them to settle in a more permanent and productive lifestyle. Further, it was necessary to establish the conditions for elections in order to create a more representative government that would hopefully offer some political stability to the country. Road and other infrastructure rehabilitation was required in order to facilitate the re-integration of people, assure the electoral process, and get

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<sup>1</sup> United Nations Department for Humanitarian Affairs, United Nations Operation in Mozambique, Office for Humanitarian Assistance Coordination, *Mozambique National Mine Survey*; June, 1994 [Report of Halo Trust].

7

the normal economic and commercial activities back into action, as well as to reduce the tremendous cost of carrying for refugees and displaced persons in camps.

With this, USAID, along with other donors, decided to launch demining activities under the coordination of the United Nations. In early 1993 USAID requested proposals from private companies to undertake demining and eventually contracted with RONCO to carry out demining of roads. RONCO was requested to mobilize its activity within 30 days of being chosen as contractor with certain caveats. Under the Terms of the contract RONCO was to start activities in Mozambique only after a mobilization order from the UNOMOZ was received. Delays caused by bidder disputes and a delay in obtaining the mobilization order retarded startup until late in 1993 when these issues were resolved. Consequently, RONCO leased premises and established a training and operations center in Beira beginning on November 1, 1993.

## 5. National Policy and Strategy on Demining

Government strategy on demining in Mozambique was not well articulated prior to 1995, and appears to have been left, to the most part, in the hands of the United Nations and the donor community. Although there were some statements from government officials about the need to clear mines and explosives from the Mozambican countryside, a clearly articulated statement of policy concerning demining and placing this activity within a priority framework for development planning and action was clearly lacking. The real test of commitment to demining by the government should have been seen in the efforts put forward by government services and agencies, (customs, port authorities, police, immigration, etc.) to assist the efforts of the demining agencies and groups, and to smooth the way for movement of people and supplies for demining efforts. This was far from the case, and although part of this can be placed on the disorganization of government during the transition phase to reintegrating the belligerents and establishing elections, much of the chaos was the direct result of not having direction from Department heads to provide maximum support.

The handling of procedure and policy by the UN was a necessary approach in the first days after the cease fire was established and peace returned to the rural areas. The donors, for the most part, concentrated on road demining in an effort to reduce costs of supplying refugees in camps, to prepare for road rehabilitation, and to help encourage refugees and displaced persons to return to their former homes and take up productive work once again. That approach has worked well to date, and over 4,000 kilometers of roads have been cleared by various organizations.

Up to this time, there has been very little effort to create any local or indigenous capacity to carry out demining once the current experts leave. Initially, The United Nations had proposed establishing a demining training and operations center for this purpose, but the plan was not supported by the donor community, largely because the design threatened to establish a government organization that could have become excessively bureaucratic, and require continued donor support for many years. RONCO had proposed, initially to the U.S. government and later to the U.N., setting up an indigenous NGO to be developed while active demining was in progress and to take over demining functions from the expatriate experts and firms. This suggestion was not acted upon, and the present situation is to continue to rely on foreign assistance for demining. The main efforts are being carried out by the United Nations and the NGO/PVO community. Commercial contract demining has ceased altogether in Mozambique.

Training of deminers did not take place under previous demining operations, and has not been taking place under many of the demining operations on-going in Mozambique. The United Nations, with donor country support, trained about 400 Mozambican deminers. NPA trained and continues to employ about 300 local deminers, and Halo Trust employs 120 deminers. RONCO trained about 100 Mozambican deminers and 36 mine detection dog handlers to clear roads. RONCO's operation is either being turned over to NGOs or used in support of their activities. However, little work has been done to train supervisory and management staff, or to prepare organizational systems to operate without foreign technical support.

In 1995 the government, through assistance and support by the UN and donors established a National Commission on demining to help develop a national strategy and to formulate government policy on this issue. This organization has been operational for almost one year, but is effectively just getting started. It will be some time before a national strategy will be developed and policy articulated on the future directions for demining in Mozambique. Unfortunately this does not obviate the fact that there remain a large quantity of mines in the country that continue to represent hazards to people and economic development and will have to be removed or at least delineated and isolated from normal living functions.

## **II. OBJECTIVES AND APPROACH**

### **A. The Demining Contract**

RONCO entered into a contract for its demining activity in Mozambique with USAID on September 27, 1993. This contract was amended on October 24, 1994, to continue through June 30, 1995, extended again to the end of July, 1995, and was further amended to provide support services for demining through the end of January, 1996. Funds for this effort have been provided by the Agency for International Development (AID) and the Department of Defense (DoD) of the United States. The cost of the contract, as amended is \$8,708,412, including a letter of commitment for commodity procurement of \$1,956,748. Contract expenditures as of July 31, 1995, the concluding date of this report, stood at \$7,766,000.

In Mozambique the priority for mine clearance was placed on roads. Determination of the roads to demine was designated by the U.N. according to a priority listing within a coordinated system among all participants. Of first concern were those roads that would facilitate the re-integration of people - refugees - into the country. Many people had gone to camps either inside or outside the country during the period of conflict. The combination of caring for these people and their loss of productivity had a very high economic cost, and justified the expenditure of funds to permit these people to return to their home villages. The second concern was to open the road network to commercial traffic, both to lower the cost of taking care of people in the refugee camps and to enhance the economic activity in the countryside. By doing this it was also believed that a secondary benefit would arise, creating the conditions in the countryside that would stem the mass migration of rural people to the urban areas, where provision of services and maintenance of security and order have become increasingly difficult.

### **B. The RONCO Approach and Experience**

RONCO has developed an integrated demining approach that uses trained mine detection dogs controlled by dog handlers in combination with deminers using metal detectors to locate ordnance for removal and disposal. Under this system, specially trained mine detection dogs, handled by trained personnel are used to locate mines, artillery shells, mortars, grenades and other unexploded ordnance ahead of trained, manual deminers equipped with Schiebel metal detectors, which complete the location of ordnance. Working in teams, the operation proceeds down roads that have been suspected or known to have mines. When mines are located they are exploded in place in most instances, and other ordnance that is located is usually removed for disposal. Under the system developed and used by RONCO, local recruits are trained to handle dogs, carry out manual demining and perform other functions essential to the demining operation such as operate communications radios, handle logistics of supply control and distribution, act as paramedics and paravets and perform other functions. This insures that, should the funding agency desire, the demining operation can become an indigenous operation with some added management, demolitions and quality control training.

This system, proven through many years of work in Afghanistan, was deemed to be an appropriate and cost effective method for Mozambican conditions. Consequently RONCO, together with Global Training Academy, which provides the trained mine detection dogs, developed a plan of providing the dogs, and recruiting Mozambicans as dog handlers and deminers. RONCO brought in

its international experts in demining, explosives and ordnance, dog training and handling, logistics and administration, and management to assist its permanent professional staff to set up and manage this project.

RONCO began operations in November, 1993 by leasing land and established a Demining Training and Operations Facility (DТОF) in Beira, Mozambique. After refurbishing the facilities and constructing dog holding kennels, explosives bunkers and trainee housing and living facilities, a training program was developed for dog handlers and deminers. The facility in Beira contained, in addition to administrative, logistics and trainee living areas, about 400 acres of land that was designated for mine detection and disposal training.

RONCO shipped the first group of 8 pre-trained dogs from GLOBAL's training facility near San Antonio, Texas to Mozambique in January 1994. Mozambican recruits were provided by FRELIMO and RENAMO from among de-mobilized soldiers<sup>2</sup>. These recruits were screened according to their medical condition, as well as physical and mental dexterity and given training as dog handlers and deminers at the Beira DТОF. Training and assignment to teams was done on an integrated basis, without regard to previous military affiliation. After successful completion of training, selected personnel were assigned to demining teams for deployment on road demining activities under supervision of the international team of trainers and supervisors. All of these expatriate personnel had extensive in-the-field experience in demining in active mine fields. Support to the field operations was provided by the DТОF in Beira. RONCO trained and employed 135 Mozambicans as dog handlers and deminers, 95% of whom are de-mobilized soldiers of the FRELIMO and RENAMO military.

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<sup>2</sup> By the terms of the contract, RONCO was forbidden to use military personnel, consequently only de-mobilized soldiers or civilians could be recruited.

11

### III. OPERATIONAL SETTING AND OPERATION

#### A. Organizing Demining Operations

##### 1. DTOF

The Demining Training and Operations Facility (DTOF) served as RONCO's project headquarters. The project refurbished existing buildings into offices, classrooms, and storerooms, established kennels to house the mine detecting dogs, set up temporary housing (tents) for trainees, constructed a sand bagged bunker to house explosives necessary for demining training and developed a 70 hectare deminer and dog/handler training course (see photo).

##### 2. Training

RONCO was required to select an equal number of candidates for deminer and dog handler from ex-combatant lists provided by FRELIMO and RENAMO. In the initial training, RONCO trained 94 deminers and 8 dog handlers. Attrition rates, especially for dog handlers, was very high. It took approximately three candidates to be screened for every successful graduate of the training courses.

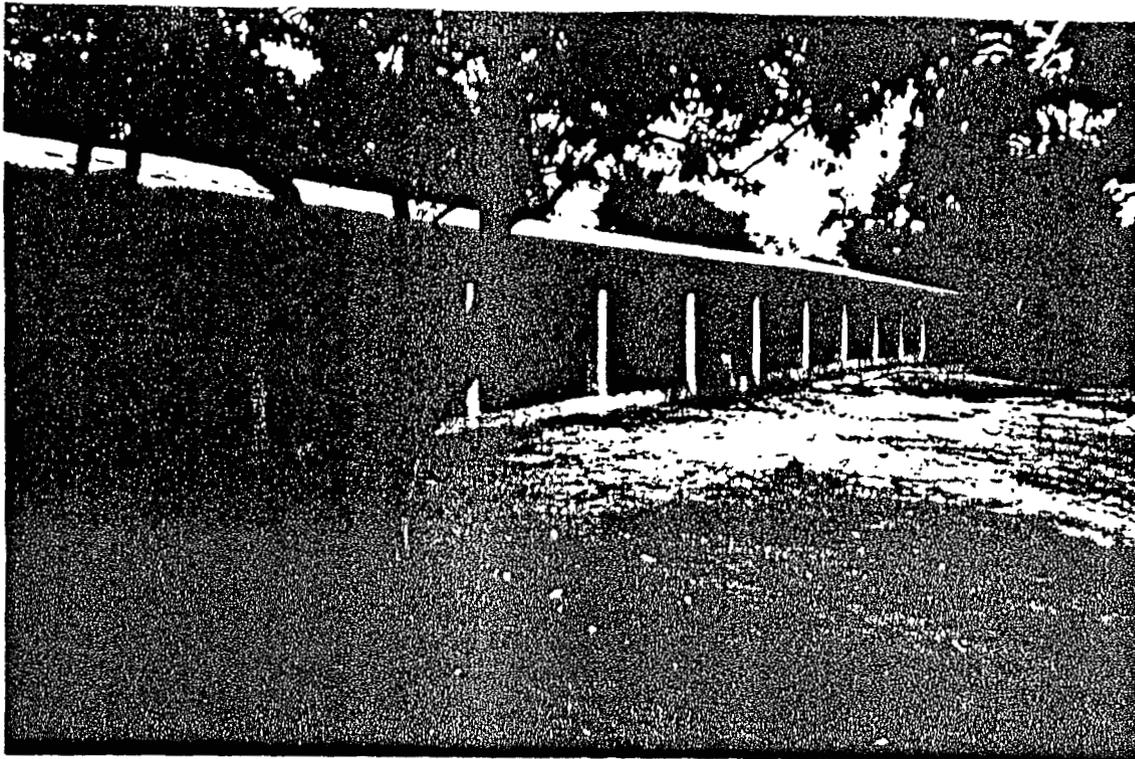
Deminer training lasted four weeks and taught deminers: how to use and maintain Schiebel mine detectors; search patterns for mines; and probing technologies; and how to mark mines for later detonation.

Dog handler training lasted eight weeks during which time the dog became closely bonded to the handler. In addition to learning how to control the dog in its search for mines, including careful instruction on search patterns and how to interpret the dog's actions in the field, handlers were taught how to groom and care for their dogs and how to read warning signs that the dog was becoming overheated or losing focus or in some other way not performing to expectations. RONCO trained three waves of handlers to reach the ultimate force strength of about 90 deminers and 32 dogs formed into 12 demining teams.

##### 3. Integrating Teams

At the completion of deminer and handler training, the handler/dog sets and deminers were trained together for two weeks to create a true team of deminers. During this period, each team member was taught to understand that the success of the team and each individual member's safety was dependent on all team members functioning according to his training. The average team size was 2-3 dog handlers/dogs matched with 7 deminers.

This integration period was used to create an esprit de corps which developed a sense of pride in the important work the team was doing. The team was constituted with a mixture of FRELIMO/RENAMO ex-combatants. The training and building the sense of a team caused these former foes to work exceptionally well together.



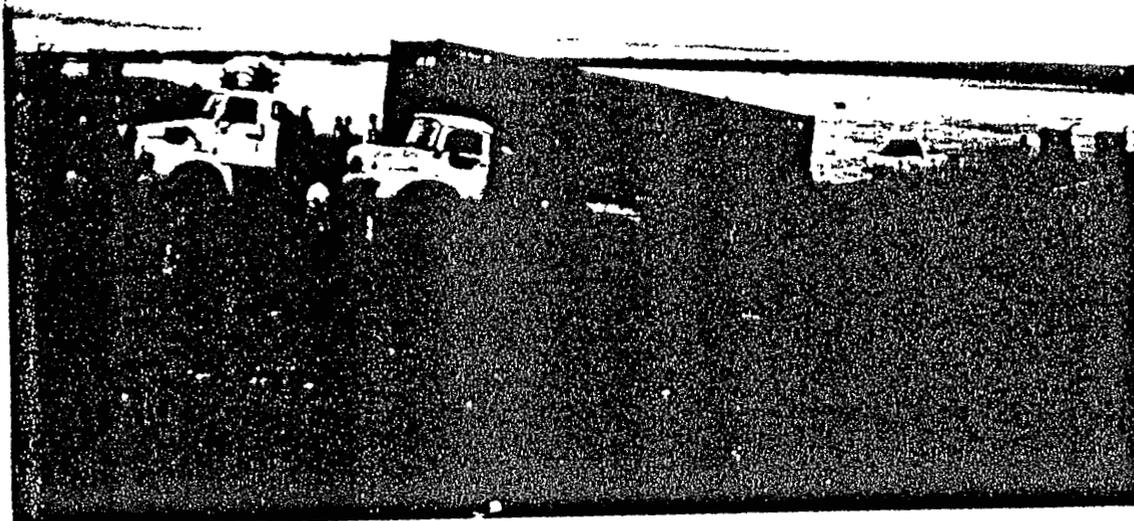
Kennels at the DTOF - Beira



Demining of a Sofala Road

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Cala Ferry



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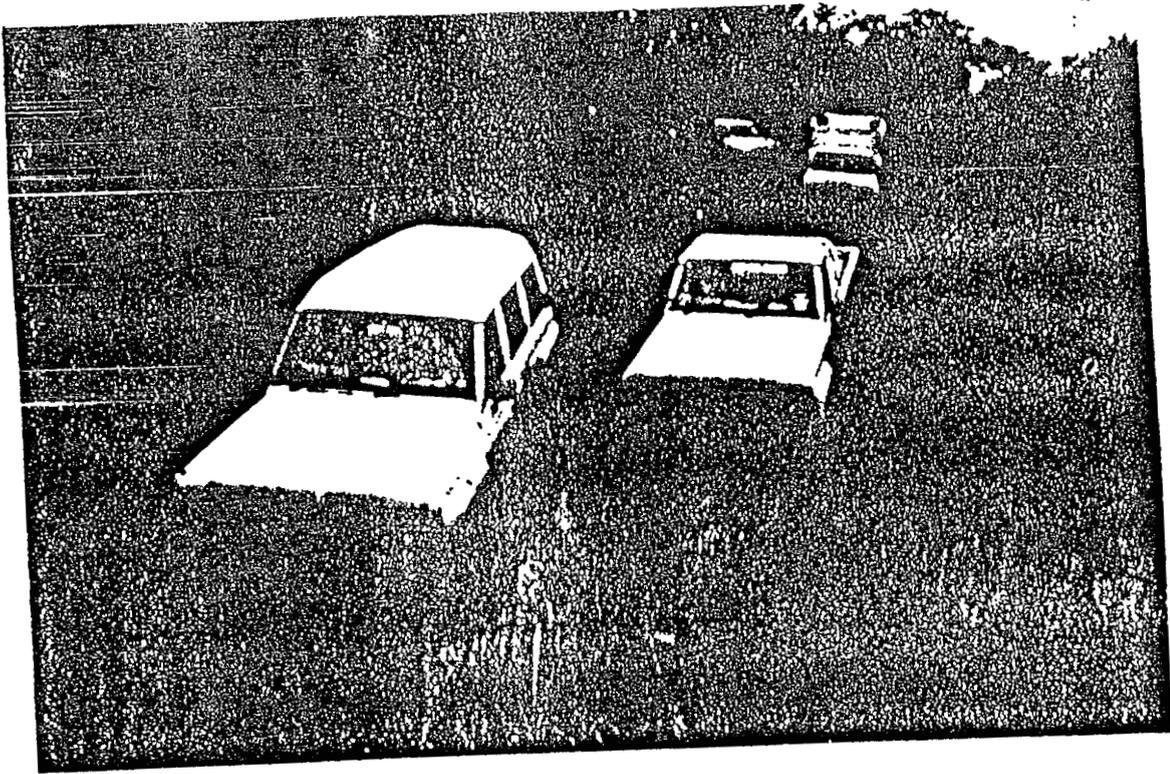


Demining on Sofala Roads



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Zambezia Rainy Season Roads



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#### 4. Logistics and Deployment

Teams were deployed in groups depending on the number of base camps operating at a particular point in time. Teams at a base camp came under the supervision of an expatriate instructor who managed the field demining and provided on-the-job training when necessary.

Each base camp had a coterie of support staff including drivers, cooks and paramedics/paravets. At all times, there was professional medical backup available with doctors on call if a serious medical problem arose. Likewise, a veterinarian was available to treat dogs for diseases or accidents and to periodically monitor the general state of mine dog health. As of July 1995, four dogs had died of tick fever or other diseases and two dogs had to be retired because their motivation to work had waned to the point of being ineffective. These two dogs remained on duty in July.

#### 5. Retraining

At about three month intervals, on a rotating basis, demining teams would return for two weeks to the DTOF for rest and for formal retraining. At this point in time, lessons learned from field experience were incorporated into the retraining, as well as reinforcing the original training to ensure that teams did not become lax.

##### B. Progress in Operations

RONCO was initially tasked with the clearing of 2,100 kilometers of roads in the central and northern parts of Mozambique. This level was later raised to include up to 4,000 kilometers of roads and tracks, mostly in the central and northern Provinces of Mozambique, with the intention that this level of tasking should be completed by the end of 1995. Deployment of the first teams took place in May 1994, and during a field operational phase that lasted until July 23, 1995, a total of 2,177 kilometers of rural roads and tracks was cleared. These roads were located primarily in the Provinces of Sofala and Zambezia. The actual roads and tracks cleared are delineated by town or village end points in Annex 1 and the distance in kilometers cleared is given together with the date clearance of the road segment was completed. Annex 2 contains maps of roads demined.

On April 28, 1994 RONCO deployed into the field with 94 manual deminers, 8 mine detection dogs and their handlers complete with 6 expatriate staff and various support elements such as paramedics, cooks and logistics people. In the early period of demining, RONCO was tasked with roads in Manica and Sofala Provinces, with first concentration on the northern part of Sofala Province, and the first deployment was to the village of Chemba. At that time it was planned that the entire operation would stay in this general location for 6 to 8 weeks, and clear tasked roads in the general vicinity of Chemba. The original concept for the demining operations was that UNOHAC in Maputo would develop the tasking for road demining with concurrence from USAID. However, difficulties arose in receiving tasking from UNOHAC because of political disagreements between FRELIMO and RENAMO, and consequently the USAID Project Officer took over tasking assignments. The first assignments from USAID were for clearing 300 kilometers in the northern part of Sofala Province.

Part of the reason for the choice of areas to concentrate demining activities was that USAID was concentrating its economic, humanitarian and disaster assistance funds in the Zambezi River Valley

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and north into Zambezia Province. One effort that USAID was making was the rehabilitation of rural roads to enable people to return home from refugee camps, and to begin the process of opening up the interior to commerce and trade. Basil Reed, a South African company that was contracted to rebuild some of the roads encountered problems with mines on a stretch of road that was under construction. As a consequence they stopped work, and invoked a clause in their contract that allowed them to collect \$7,000 per day until the road alignment was demined. Therefore, USAID felt that it was imperative that RONCO re-deploy to demine this road as quickly as possible.

The redeployment meant moving part of the operation north across the Zambezi River into the Zambezi Province. This caused problems as the demining teams were not yet considered to have attained maximum efficiency in demining, and the new tasks meant moving further from the support base at Beira. In addition, it meant crossing the Zambezi River which further complicated logistics support of resupply, medical evacuation, communications and supervision. To help alleviate some of the logistics problems and to facilitate the move, Basil Reed had agreed to provide support for the move. For the most part, this support did not materialize, and RONCO was required to find its own way to the new assignment. This was a serious problem, as at the time, the ferry at Caia was not operating, the rail road bridge at Sena had been blown, and the only way to move vehicles across the river was to travel around to Tete and Malawi, some 1,000 km out of the way. Use of the Sena bridge was possible by pedestrian traffic, and much of the equipment was moved across the river by head load.

After the move was effected, RONCO worked in direct support of the Basil Reed operation for about 3 months. During this time, RONCO had two demining teams deployed in Zambezia Province, and was able to maintain demining operations well ahead of the construction work, preventing any further delays for the road contractor.

The move across the Zambezi River and the concomitant logistics problems necessitated a streamlining of operations, reorganizing the system to make the operation far more mobile and able to maintain demining in the face of uneven logistics support. This coupled with the opening of two river ferry sites helped to increase mobility and permitted RONCO to work in both Sofala and Zambezia Provinces at the same time.

In many cases the roads tasked had been out of use for several years, and often they were completely overgrown with trees, bushes and high grass. Road maintenance had not been done for many years, and although in some cases this had preserved the road beds, in other cases it meant that the roads had completely washed out, becoming in effect, temporary streams during the rains. Bridges and culverts had washed out or were destroyed making stream crossings difficult if not impossible and because these roads had not been in regular use, this was often not known until the demining teams arrived. In February 1995 it was estimated that the operation would be able to demine about 80 kilometers of road per week as the rains should have ended in March. Unfortunately, normal circumstances did not prevail in the March through June period. Excessively heavy rains, lasting much later than normal for the northern part of Mozambique coupled with extremely difficult terrain combined to slow the operation so that progress was extremely limited. Through June 30, 1995, RONCO had demined 2,000 kilometers of road, and the projected road clearance of 3,100 kilometers by June 30 was short of the mark. On normal roads in good condition, the targets set for RONCO may have been achievable, but under the circumstances these could not be accomplished. Factors working against this were the extremely overgrown nature of

the roads, missing bridges and culverts making river crossings impossible in many cases, the fragmented nature of the tasked roads, and the long distances from supplies further accentuated by the fact that many roads that would normally be used for resupplying the demining crews had been cut due to lack of bridges.

Road access to 21 towns in Sofala and Manica Provinces south of the river and 25 in Zambezia and Tete Provinces north of the river were opened up due to RONCO's demining efforts. These are listed below:

**Sofala (and Manica) Provinces:**

Chemba	Sena	Molina
Chiramba	Inhaminga	Casa Banana
Chirimazi	Inhamacala	Munaza
Dondo	Maringue	Canxixe
Molina	Subwe	Nhamacolomo
Matondo	Mazamba	Piro
Gorongozo	Chiramba	Tambala (Manica Province)

Over 1,000 kilometers of road were cleared in Sofala Province before the operation completely moved north of the Zambezi River and into Zambezia Province entirely. The remainder of the 2177 kilometers of roads were cleared in this Province.

**Zambezia Province:**

Mutarara (Tete Province)	Inhagoma	Vila Nova (Tete Province)
Traquino	Tembe-Tembe (Tete)	Pinda
Morrumbala	"O" point	Caia ferry
Mopeia	Campo	Megaza
Nagoa	Mocubela	Maria
Mulevala	Morrua	Mugeba
Olinga	Mocuba	Licero
Tacuane	Lugela	Gurue
		Errego

RONCO has also cleared small areas, in addition to roads, on request from Provincial officials and the United Nations. This can often be quite rewarding in terms of the local economy. In Inhaminga, for example, RONCO spent two afternoons clearing a field in exchange for local assistance. The result was that about 30 acres was opened for cultivation, land that had been idle for several years. Other points such as around wells, schools or other village or town sites have also been cleared on occasion by RONCO teams. These clearing jobs often result in greatly improved assistance and support for the work of the deminers, and in the long run helped reduce time and cost of the work of setting up camps or moving on roads.



case, roads were cleared in four different locations. In only one of them was heavy vegetation encountered and except for "potholes" on one road, no other major barriers were encountered.

During periods of low productivity, more than 50 percent of "demining time" was often consumed cutting through vegetation, repairing bridges, and upgrading the road surface so that project vehicles could safely navigate them. These road conditions were exacerbated during the end of 1994 and beginning of 1995 by an extraordinary rainy season in Zambezia Province that lasted six months, turning roads into quagmires and causing severe erosion (see photos).

## 2. Weather Conditions

The weather conditions encountered during the operation were also a dominant factor affecting progress. The first eight months saw on average good weather for demining apart from some days when it was extremely hot causing heat problems for mine dogs. To combat extremely high temperatures, demining activities started at daylight and often stopped before noon depending on the day's temperature. Frequent rest periods for the dogs were mandated to keep them from overheating. When the temperature reached 40° Celsius, the dogs would be retired for the day. Weather problems really began with a vengeance as the whole operation moved to Zambezia Province coinciding with the start of the wet season towards the end of December 1994.

An example of the effects of weather was the erratic functioning of the Caia ferry. At that time, the Caia ferry, so crucial for the operation, was still going through teething problems with engine failures, bad navigation, etc. Coupled with this was the fact that the river water level was constantly changing due to the opening and closing of an upstream dam and flash flooding inland. This meant that the ferry crossing was closed for days at a time, and when it would happen could not be predicted. Even the river banks at Caia used to load and off-load vehicles onto the ferry were affected by bad weather, and delays of up to hours at a time were normal (see photos). To try to alleviate this problem, RONCO supplied some equipment (generators) and using its own vehicle winches, helped to off-load vehicles from the ferry to enable RONCO vehicles to proceed. One expatriate was stuck at the ferry crossing for 4 days and eventually drove an extra 1,000 kilometers via Malawi to get to his destination.

The rains in Zambezia were extraordinarily heavy and lasted for at least two months beyond their normal cessation. Rain and flash flooding for the first five to six months of 1995 was sometimes so torrential that whole roads were washed out, base camps were swamped with water (up to a depth of one meter in one instance), waterways up to 30 meters wide across roads appeared where the day before there was nothing but dry roadbed (see photos). All RONCO deminers were cut off from base camp by such flooding. Equipment was waterlogged for days at a time. It is obvious that this severely affected RONCO's capability to demine at any reasonable rate. These extraordinary rains and the erosion they caused were probably responsible for two of the six incidents involving lethal ordnance that occurred under the contract (see section 6 below).

## 3. Frequent Base Camp Movement and Logistics

The demining operation required great mobility to meet the priority needs of the country. In all, base camps were moved 39 times during the operational period (see Annex 3). Frequent moves caused great wear on project vehicles and equipment and were a major source of lost demining time.

The frequency of moves was sometimes a result of weather or road conditions rendering demining impossible. This happened on the road from Casa Banana to Gorongosa where a major river could not be crossed and the demining teams had to be relocated to another demining task (this was the only case during the operational period in which RONCO had to leave an assignment unfinished).

In other instances, moves were essential to meet unforeseen priorities. The most prominent example of this occurred when a USAID financed road reconstruction contractor could not proceed because the road to be rehabilitated had not been demined. Demining teams were immediately dispatched to clear the road even through this meant RONCO would be operating simultaneously on both sides of the Zambezi River. That entailed extraordinary logistics arrangements (see inset).

These frequent moves and the often scattered nature of the base camps put great stress on RONCO's logistics capacity. The operational sites were often very isolated with almost no goods or services available locally. Several of RONCO's vehicles were pressed into continuous use just trying to resupply bases with goods both from Beira and Harare. Overall road conditions and the fact that base camps were as much as 600 kilometers from Beira and detours could add hundreds of kilometers to a trip. Given this, vehicles had very short useful lives and required constant maintenance. The logistics requirements translated into a larger vehicle fleet than the contract originally envisaged. The additional vehicles and the much greater than anticipated mileage put on the vehicles added substantially to project costs.

#### 4. Survey and Quality

##### Assurance

Mine surveys available to RONCO deminers for Sofala and Zambezia provinces were extremely rudimentary and of little or no value. As a result, RONCO teams had little advance knowledge of the conditions they were likely to encounter during operations. The teams themselves had to pursue their own intelligence

The following report submitted June 28, 1994 from Mozambique describes the type of difficulties encountered.

Mutarara-Tembe-Tembe Road - This road is located on the opposite side of the Zambezi River where our deminers have a base camp and are under the direction of Steve Brown. This stretch of road is very overgrown with seven foot tall grass. There is no footpath in existence that follows the original road alignment. Information gathered from the local residents tells that the first two kilometers are mined with approximately 150 anti-personnel mines (in fact, there were none). Attempts were made to burn the grass without success. The local administrator was asked to help burn the grass, but he is not interested in helping. The weather has also been a problem, due to the occasional rains and cloudy skies not allowing the grass to dry out enough to be burned, and there is a lack of wind to drive the flames.

Steve has walked the footpath to the center of the old road, and can see nothing but tall grass in both directions. Steve has spoken to an employee of Basil Read, a road construction company, who actually flew along the old alignment and he told Steve that very little of the road is visible. Steve stated that he will use the following demining method: One man will have to cut the grass down to the ground level in a one meter wide path, clear it with a mine detector, move forward and repeat the process over and over. He will have two men clearing the center lane for a two meter wide access path. Every one hundred meters a one meter wide base line will be cleared a distance of 6 meters either side perpendicular to the road direction. This is because of safety considerations. The safety vehicle will never be more than 300 meters from the farthest deminer. This access path will also allow Steve to burn the grass when it becomes possible.

Another major problem that we have encountered in Mutarara is resupplying their camp with food and other needed items. Boats that cross the river have refused to transport our supplies across the river even though we offered additional money. so it leaves us with no alternative but to bring our deminers on foot from Mutarara across the bridge's pedestrian walkway to Sena where they have to carry back the heavy sacks of supplies on their backs. This bridge is infested with crocodiles and several people have been attacked and killed at those locations.

The height at the collapsed sections from the top of the bridge to the bottom is ten meters, and the deminers have to lower the sacks and boxes of food and other supplies with ropes to the base of the bridge. They then have to transport the supplies, on their backs, to the vehicles at the road about 3 km away. Our demining personnel are reluctant to do this task due to the extreme dangers involved, but are doing it in spite of the dangers. Whenever a resupply has to be done, all deminers deployed in Mutarara lose one day of work demining because they must be involved in the resupply effort. It is expected that demining will continue out of this base camp until at least 30 August.

gathering from local inhabitants as to what was likely to be found. This lack of adequate surveys, combined with the short lead time for demining assignments, left RONCO with little information to forward plan its operation and to estimate requirements for particular assignment.

Quality assurance work by Mozambique or UN authorities was virtually non-existent. For the first eight months of demining, no incidents were reported on RONCO-cleared roads. When, however, during the heavy rains of 1995, incidents were reported, RONCO initiated its own quality assurance operation wherein some of RONCO's demining capacity was directed to rechecking roads already cleared by its teams even though this reduced the front line demining capacity. It was initially thought this might not be successful due to the fact that the quality assurance team was part of the RONCO operations. In fact, this created a positive effect on the operation as a whole, because the demining teams did not want to be found lacking. In no case was lethal ordnance found by the quality assurance teams.

## 5. Medevac Capability and Safety

Medevac procedures are extremely important to an operation as isolated and dangerous as demining Central Mozambique is. During the 1994 demining period, the UN provided helicopter evacuation capability that was fortunately never required.

When that coverage ended, USAID and RONCO agreed to continue with project financed helicopter medevac support. There was some disagreement over the need for helicopter as opposed to fixed wing aircraft medevac support but with the marginal difference in cost and the much greater flexibility of helicopters, that option, with Contract Officer approval, was selected. When another demining organization working near RONCO suffered two demining accidents within two days of each other, the contract helicopter quickly medevaced both victims, probably saving the life of one victim. Ironically, the accidents occurred while clearing a runway that would have had to be used by fixed wing aircraft. RONCO had one incident that required the use of the helicopter when a driver and deminer were slightly hurt while riding in a vehicle that hit an anti-personnel mine, which likely had been placed by a disgruntled Mozambican after the road had been cleared (see Annex 4). The helicopter crashed immediately after take off but no further injuries were sustained.

While the costs of aircraft support for demining operations is not cheap, it proved essential in isolated areas both to save lives and to engender a greater sense of security among deminers who daily risk their lives. Without such backup, morale, and demining effectiveness can be negatively influenced.

RONCO's safety record in its Mozambique demining operation is unsurpassed. Over the 15-month operational period and while clearing 18 square kilometers of area, only two minor injuries, the worst a slightly broken foot, were sustained, both in one incident.

## 6. Missed Ordnance

There were six reported incidents involving lethal ordnance which were raised during RONCO's demining operation. In two cases, RONCO's investigation indicated that mines were missed by RONCO teams. In one instance, an anti-personnel mine was probably buried well below the road surface. On this small stretch of road where the incident occurred, the mine dogs were not used

because the dogs needed to be cooled down from excessive heat. Only metal detectors had been used, an admitted breach of RONCO's procedures. In the second incident, an anti-tank mine had been deeply buried and it is believed that the vibration from a passing RONCO vehicle set it off from several meters away. In neither case were there any injuries.

In the other four instances, including the one in which RONCO personnel were injured, RONCO's investigations indicate that ordnance was not missed by RONCO. The details of the incidents are contained in Annex 4.

#### IV. PRODUCTIVITY AND COST EFFECTIVENESS

##### A. Productivity

The commonly accepted standard by which demining productivity is measured is the area cleared. RONCO cleared 2,177 kilometers of roads during the period May 1994 to July 1995. Over that time, weekly productivity varied greatly depending particularly on the conditions of roads and the weather. Full deployment of the demining teams occurred in November 1994. Of the 39 demining weeks (exclusive of scheduled retraining and holiday periods) between November and July, RONCO cleared an average of 67.5 kilometers/week in the most productive 20 weeks and 22 kilometers/week in the remaining 19 weeks. Overall, RONCO productivity ranged from 10 to 100 kilometers of road cleared per week. The explanation for this variance is discussed in the issues and cost section of this report.

At a minimum, RONCO cleared roads to a width of eight meters. In many instances, roads required clearances to 10, 12 or more meters to meet the contract standards. Using the eight meter minimum, the clearing of 2,177 kilometers amounts to 17,400,000 square meters or 17.4 square kilometers of area cleared at the very minimum. In fact, area cleared certainly exceeded 18,000,000 square meters or 18 square kilometers.

The contract productivity was heavily influenced by several factors in the Mozambique environment: the need to start from scratch; the need for FRELIMO, RENAMO balance; operational exigencies; and the physical and climatic environment under which operations proceeded.

1. **Starting From Scratch:** The humanitarian demining had to start from scratch from two perspectives. The first was the war torn nature of the central Mozambican economy. Symptomatic of this, RONCO attempted to contract in Beira for the refurbishing of the DTOF and for building dog kennels. The bids received were exorbitant and RONCO did the refurbishing and construction itself. That entailed going to Zimbabwe, a 300 mile round-trip to get virtually all construction materials.

The second perspective of starting from scratch had to do with the underdeveloped policy framework and support system for demining in Mozambique. RONCO experienced a six week delay between the arrival of the first contingent of dogs and their field deployment because UN and Mozambican authorities took six weeks longer than promised to provide defused mines for training.

RONCO was not the only demining operation to be affected by this environment. A Dutch deminer trainer program funded by the UN ostensibly started six months (?) before RONCO's contract. By the time the DTOF was serviceable, the Dutch had still not been able to conduct deminer training because of a lack of facilities. With USAID approval, the DTOF was used as an interim training site for the Dutch.

2. **The Political Balance.** The first wave of demining teams was deployed in April 1995 and training for the second wave was to commence immediately with equal numbers of FRELIMO and RENAMO participants as the first wave had. This political need for balance caused a six week delay in starting the second round of training as RENAMO did not provide a list of

trainees during that time and the UN decided that RONCO should not proceed until trainees from both FRELIMO and RENAMO were available. This delay in the spring of 1994 delayed deployment of the second wave of dogs/handlers by six weeks which, when combined with the six week delay for wave one, meant that the second wave was deployed three months later than anticipated. This three month delay also applied to the third wave of trainees as their training could not commence until the second wave of deminers had been deployed.

**3. Operational Exigencies:** Operational exigencies refer to the fact that there was not an agreed upon priority list of roads to be demined in toto by RONCO. The initial understanding was only that the roads were to be in Manica, Sofala, and Zambezia provinces. Given the relative dearth of national demining policy and program leadership, such a situation is to be expected.

The consequences of this more ad hoc approach to demining assignments was that serious logistics inefficiencies were introduced. During the 15-month operational period, RONCO moved base camps 39 times (see Annex 3) and at times had base camps widely separated from each other.

Had USAID and RONCO had the luxury to plan the entire demining operation and proceed more systematically, the number of base camp moves could have been reduced and the logistics costs, both in terms of vehicle numbers and mileage, could have been substantially lower than they were.

The most telling example occurred when RONCO had to redeploy some demining units to the north bank of the Zambezi River in support of a road rehabilitation effort. At the time, in the summer of 1995, there was no bridge or ferry across the Zambezi. Vehicles had to divert 1,000 kilometers via Malawi and supplies had to be head loaded via a dangerous crossing over the severely damaged and dysfunctional 3.8 kilometer long Sena Railway Bridge. Working on both sides of the Zambezi at that time effectively required a substantial increase in RONCO vehicle support.

**4. Physical and Climatic Environment:** The cost of clearing roads is, of course, determined by how rapidly demining proceeds. RONCO demining productivity was bifurcated. During normal climatic conditions and with discernable roads to be demined, in about half the demining time once full deployment was reached in November 1995, RONCO cleared an average of 67.5 kilometers per week. In the periods where roads had to be hacked out or downed bridges rebuilt, or where inordinate amounts of rain fell, only 22 kilometers per week were attained. On the whole, RONCO conservatively estimates that 15 percent of demining time (not counting retraining, holiday periods, and normal redeployment) available was lost because of unforeseen factors. Of these time losses, destroyed bridges and other road barriers accounted for 45 percent; 30 percent resulted from inordinate rains and the remaining 25 percent occurred due to incidents ranging from vehicle hijacking and roadblocks to work stoppages to medevac Halo Trust demining casualties.

**5. Impact on Productivity:** When all of these factors are taken into account, delays and lost work time consumed: In terms of demining accomplished, a RONCO demining team averaged conservatively the clearance of 0.73 kilometers per team demining day. This is an average figure, of course, because the configuration of teams varied. Moreover, it is conservative both because the estimates of lost time were conservative; thus the actual number of team demining days was probably less than has been calculated and the resultant kilometer per team demining day

would have been lower. The lost productivity due to delays in training amounted to six weeks for four teams (the first trainees) and 12 weeks for eight teams (the second and third waves). On a six day work week that amounts to 144 team days lost by the first group (6 days/week x 6 weeks x 4 teams) and 576 lost team days (12 weeks x 6 days/week x 8 teams). To convert from team days to team demining days, we reduced the team days by the amount of rest and retraining given the teams. That was 13.5 percent of total operational time. Thus the number of team demining days lost because of the delay was  $[(.865 \times (144+576))]$  or 623 team demining days. At the average demining rate of 0.73 kilometers per team demining days, about 455 kilometers of road could have been cleared.

The number of missed team demining days because of the extraordinary operational problem is estimated at 450 team demining days. That comes to an additional 328 kilometers.

In all this, we estimate that an additional 783 kilometers of road would have been cleared by July 23, 1995, without the delays or a total of 2,960 kilometers, when added to the actual distance cleared. That is not far short of the 3,100 kilometers goal.

Using the same type of analysis, had the operational part of the contract continued until December 1995 as originally anticipated, between July 24 and December 31 an additional 1,046 kilometers could have been cleared conservatively. In all, had RONCO been able to utilize all the team demining days theoretically available to it, by December 1995, 4,106 kilometers of road could have been cleared, a figure which is above the project objective.

## **B. Cost Effectiveness**

While external factors that affected the productivity, the real test of a project's success is its cost effectiveness. Even though over one quarter of potential demining time was lost due to external factors, the evidence available indicates that RONCO's demining efforts were extremely cost effective.

1. **Costs:** From project inception to the end of the operational demining period in July 1995, contract expenditures totaled \$7,766,000. This encompasses all costs for training and operations. The only additional support to the project not counted in contract costs were some defused mines provided by the UN for training purposes and UN helicopter medevac support for the 1994 period of the contract.

2. **Amortized Costs:** While total costs were \$7,766,000, a more realistic estimate of the costs of RONCO demining in Mozambique, however, recognizes that at the end of the demining period, substantial capacity for demining remained within the country. For example, the mine detecting dogs have an estimated six year useful working life and an average only worked one year. The vehicle fleet remains available for demining as does the DTOF and demining gear such as metal detectors. A cadre of trained demining staff remain available

Amortized costs were calculated as follows for the various categories of expenditures For rehabilitation of the DTOF, the center was assumed to have a ten year life, with 18 months of that life used With regard to training and training costs, deminers and dog handlers were assumed to be able to use that training for eight years with 18 months having been utilized The

useful life of mine detecting dogs is six years with one quarter of their useful life employed in this project. In the case of equipment, vehicles were assumed to have a two year useful life and other equipment useful lives ranging from two to eight years (household furniture).

When these "assets" are taken into account, i.e. the training and equipment costs are amortized, the cost of RONCO's demining effort was \$5,626,000. By July 1995, the monthly ongoing operational expenditures had fallen to \$185,000 per month. Had the operational life of this contract been extended, the unit costs of operation would have surely continued to decline significantly, particularly if area rather than road clearance had been emphasized.

3. **Cost Perspective:** Using the minimum 17,400,000 square meters as the productivity basis, RONCO's full demining costs came to \$0.44/square meter. Using the amortized cost estimates, the most meaningful measure, RONCO demined Mozambique roads for \$0.32/square meter. Operational costs over the last six months of the contract were \$0.19/square meter. In the few instances in which RONCO engaged in area clearance, the productivity of demining teams in terms of area cleared was about triple that of road clearance. That equates to an amortized cost of about \$0.10/square meter for area clearance of the type RONCO was asked to perform.

On a per kilometer basis, demining costs were as follows:

Full costs	\$3,567/km	
Amortized	\$2,584/km	
Recurrent	\$1,503/km	(based on first 6 months of 1995)

4. **Productivity and Cost Effectiveness Comparisons:** In the abstract, these cost data may not mean much. How productive RONCO's Mozambique operation has been requires comparing it to other operations. Clearly, each situation is different and direct comparisons can be unfair, but the Mozambique operation has been sufficiently complex and the circumstances so difficult that it cannot be considered one of the easier operations. Moreover, RONCO's operations have been much more peripatetic than most other operations. A major cost of RONCO's humanitarian demining in Mozambique is directly related to the constant relocating and far-flung operations. Vehicle procurement alone accounts for ten percent of RONCO's costs. In addition, RONCO did not have the luxury to choose its demining locations as some operations had. RONCO went where it was directed to go.

The U.S. State Department's Hidden Killer's Report that summarizes demining issues and operation worldwide quotes the Afghan mine clearance program manager as reporting "the program is one of the world's most cost effective, at one dollar per square meter cleared." By that standard, RONCO demining operations have been highly productive.

International cost comparisons have obvious drawbacks. Prices can vary greatly from country to country and conditions are difficult. Nevertheless, even at full costs, RONCO's humanitarian demining expenditures were less than half of "one of the world's most cost effective."

Unfortunately, little information is available for comparison with other Mozambican humanitarian demining operations. What information is available indicates that one other road clearance operation demined about the same length of road as RONCO: no cost information on that operation is available for comparison.

Other humanitarian demining operations in Mozambique cleared far less area than RONCO despite the fact that they have operated over a longer period of time and have more deminers. None of them had achieved even 2,000,000 square meters cleared as of April 1995. RONCO's clearance was therefore more than eight times the area cleared by any of these other demining entities. Information on costs are unavailable but given the number of deminers employed, rough cost estimates can be made. Giving these entities the benefit of the doubt on costs, their per square meter costs have had to run between \$1.10 and \$2.50 per square meter. That equates to 2½ to 5 times RONCO's full costs, even conservatively estimated, and almost four to eight times RONCO's amortized costs. Almost certainly, at the lower \$1.10 figure, that would have to represent amortized costs as well.

From the evidence available, it would appear that RONCO humanitarian demining has been highly successful from a cost effectiveness perspective. This conclusion is further strengthened by another comparison. One well established demining operation in Mozambique in April 1995 estimated that it would take twelve months for them to clear an important food relief road near Macuarro, Zambezia Province. In June, RONCO teams undertook and completed the task in just six days.

5. **People Affected:** Central Mozambique, particularly Zambezia, is the most densely populated part of the country, save for the environs of Maputo. Given the population densities in the districts in which RONCO road clearance operations occurred, it is sure that the humanitarian demining operations carried out under this contract opened up road access and reconnected more than one million Mozambicans to the rest of the nation. The demining operation cost (amortized) about \$5.00 per capita for the population reconnected to the nation. The economic impact in terms of the movement of people and goods that reopened access entails almost certainly indicates that this has been a project with a handsome benefit cost ratio.

#### IV. LESSONS LEARNED

Humanitarian demining using the dog technology employed by RONCO has only been used once before--by RONCO in Afghanistan. The parameters for forecasting the time it takes to accomplish an objective and the costs incurred cannot yet be an exact science. Herewith are some of the lessons we believe will be useful for future humanitarian demining efforts, particularly efforts that require great mobility. Much is specific to Mozambique but much can be generalized to other situations.

- **The productivity of humanitarian road demining depends much more on the road quality and the climate than it does on the density of mines.**

During the seven months of full deployment of deminers, there were two distinct productivity levels. In the weeks during which road courses could at least be defined and there were not inordinate barriers to movement and in which there was not more than eight days of rainfall (half of the time), the demining teams cleared, on average, 68 kilometers per week. In periods of heavy rainfall or where roads could not be well-defined because of a decade or more of disuse, clearance rates averaged less than one third as much at 22 kilometers per week.

The density of UXO was not once considered a cause for slowdown in clearance rates. Conceivably, one could encounter exceptionally dense concentrations that could slow progress, but from our knowledge of the density of mines and other UXO found throughout Mozambique by all demining groups, this would not occur in Mozambique.

- **Because logistics is both a very costly and time consuming process, the number of camp moves should be minimized.**

Mozambique's demining operations have not had a strong planning and prioritization effort associated with them. As a result, there were a greater number of camp moves than anticipated. Such moves were necessitated by suddenly identified priorities that required making changes. In all, camps were moved 39 times. Probably a full month of what could have been demining time was lost just from inordinate delays in the movement of deminers and supplies. Had USAID and RONCO had the luxury of knowing exactly which roads were to be demined under the contract, a more cost effective ordering of the clearance tasks would have been possible.

- **Open lines of communication between the client and the contractor is particularly necessary in demining efforts.**

This may seem to be a trite statement but it is particularly important for demining work. There can be a fairly wide chasm in both technical understanding and viewpoint between USAID staff and a demining community that generally comes from a military background. When USAID constructs infrastructure, it has engineering staff to monitor and communicate with engineering companies. The same goes for humanitarian food relief or the mainstream technical areas that represent the bulk of USAID's work. There is no such USAID counterpart for deminers, therefore, a natural tendency arises for the two sides to be less communicative than in other activities; yet because demining is so dangerous and because deminers are not the usual USAID contractor staff, and USAID staff are less conversant with demining work, greater openness in communications is required.

- **An approach to demining that incorporates mine detecting dogs, when compared to other approaches in use, can be exceptionally safe and cost effective.**

The use of mine detecting dogs is certainly not the complete answer to demining problems but it has been demonstrated to be a very useful addition to the demining communities tool kit. On the issue of safety, there is an element of luck associated with whether or not serious accidents occur; but safe operators are far more a matter of training and precautions. In its entire demining operation, RONCO had one incident occur in which there were two minor injuries, the worst, a minor broken foot. Not one of the other Mozambican demining entities has a better safety record and several have had serious injuries and deaths.

On the issue of productivity and cost effectiveness, this USAID/DoD funded activity accomplished the original project objectives at a higher cost than was initially anticipated. However, by international standards and in comparison with other demining operations, the mine detecting dog approach in Mozambique has proven very cost effective. Costs per unit of area cleared range from about one third to one sixth that of Mozambique demining operations that do not use the dogs. Moreover, the areas cleared under this project were logistically very difficult as noted earlier.

- **Stronger follow-up and documentation on incidents and daily operations are needed to expand the knowledge base of how to continually improve demining effectiveness.**

The project envisioned that the UN would provide the quality assurance and incident investigation for this and other demining activities. That did not happen in any systematic manner. There appears to be very little documentation of this or other demining activities in Mozambique to help everyone understand better how to make demining operations safer, and more productive. In Mozambique, there is almost a secrecy surrounding demining operations that offers little insight and often much innuendo, into operations, accidents, etc. Since much of the effectiveness of "mining" is the psychological effect of the possibility of mines, and much effort is expended trying to increase mine awareness, it is strange that more sharing of information by all parties on a formal, regular basis is not demanded. RONCO has learned from this lack of documentation by designing for its use in other demining operations, a daily report and special incident report format to provide details of each mine or lethal UXO discovered.

- **For profit companies can do humanitarian demining.**

There is an undercurrent in the humanitarian demining world that is distrustful of entities that are not PVOs as if only "voluntary" organizations are worthy of humanitarian demining. One such PVO has gone so far as to assert that non-PVO deminers, by definition, cannot be doing "humanitarian" demining in Mozambique. The attention in humanitarian demining must be on results and what entities can get the tasks accomplished in the most productive and cost effective way. Allowing ideological biases to slow demining efforts is troublesome when host country people's lives and livelihoods are at stake.

- **Without building local institutional capacity and planning, demining operations are more costly and will delay the final solution to the demining problem.**

Demining in Mozambique has been going on for over three years with little indigenous capacity to plan, organize and manage a demining program having been established. While hundreds of Mozambicans have been well-trained in the techniques of demining, the broader institutional capacity has not been installed.

In the case of this project, neither USAID nor RONCO could plan demining assignments much in advance. As a result, more time and money was spent on unanticipated moves and the stretching out of logistics systems.

In any country with a serious demining problem, it will be very cost effective to establish strong indigenous capacity to operate the demining system. While this appears to be almost a trite conclusion, it is a lesson still unlearned in several demining operations around the world.

## V. CONCLUSION

RONCO's approach to demining that joins well-trained indigenous deminers and indigenous dog handlers teams with mine detecting dogs into integrated teams has been proven highly productive, safe, and exceptionally cost effective in the Mozambican environment. Clearing land mines to allow Mozambique's economic assets to again generate economic livelihoods for Mozambique's people has certainly been a critical factor in the rejuvenation of Central Mozambique's economy. RONCO takes pride in the role it has played in bringing new life and hope to some of the world's poorest citizens.

## ANNEX 1 and 2

### ROADS CLEARED BY THE USAID/RONCO DEMINING PROJECT

The following set of maps has been compiled to illustrate, in a visual context, the roads that were cleared of mines by the USAID/Ronco Demining Project between May 1994, and July 1995. Altogether a total area equal to over 2,100 kilometers of roads was cleared during the operational phase of the Demining Project.

The maps used in this presentation should be regarded as an approximation of the actual routes and distances that were cleared by the USAID Ronco Demining Project and should be used in conjunction with the Final Demining Summary which is attached.

USAID/RONCO DEMINING PROJECT  
FINAL DEMINING SUMMARY

	DATE	ROAD	MAP ANNEX	KM CLEARED	A/P FOUND	A/T FOUND	UXO FOUND	FRAG FOUND	DESTR. IN SITU
1	9/8/94	Completed Chemba/ Molima	D	45.30	9		444	2,799	9
2	7/5/94	Completed Chemba/ Chiramba	D	49.70			409	2,494	
3	7/17/94	Completed Chemba/ Sena	D	42.03			548	2,816	
4	7/2/94	Completed Mutarara/ Inhagoma	E	21.00			511	190	
5	6/8/94	Completed Mutarara/ Vila Nova de Fronteira	E	17.04			219	2,613	
6	6/11/94	Completed 300x300M for UNHCR		11.25			0	0	
7	6/13/94	Completed 400x600M for UNHCR		21.00			0	0	
8	8/20/94	Completed Traquino/ Tembe-Tembe	E	12.20			180	2,536	
9	9/10/94	Inhaminga/Casa Banana (Completed w/ # 22 below)	D	69.17	2		616	2,805	2
10	9/1/94	Chirimazu/Maringue (Not completed)	D	33.66	3		99	608	3
11	8/27/94	Completed Inhaminga/ Nhamacala	D	36.90	1	1	525	1,161	2
12	9/7/94	Completed Pinda/ Morrumbala	E	46.25			62	2,674	
13	8/24/94	Completed Tembe-Tembe/ Pinda	E	5.00			0	0	
14	9/24/94	Completed Inhaminga/ Dondo	C	159.30		1	1,674	7,166	1
15	9/19/94	Area Clearance Inhaminga	C	12.00			20	40	
16	10/22/94	Maringue/Casa Banana (Not completed)	D	55.40			455	2,925	
17	10/6/94	Completed Chiramba/ Nhacolo	D	52.10			82	3,089	
18	10/6/94	Completed Morrumbala/ "O" Point/Caia Ferry	E	18.00			100	2,298	
19	10/16/94	Completed Maringue/ Canxixe	D	60.60			541	2,938	
20	10/15/94	Completed Molima/ Canxixe	D	48.60			76	2,260	
21	11/13/94	Casa Banana/Subwe (Not completed)	D	65.70		1	300	1,955	1
22	11/4/94	Completed Maringue/ Inhaminga	D	32.30			891	3,356	
23	11/20/94	Completed Matondo/ Nhamacolono/Maringue	D	54.00			464	2,255	
24	11/20/94	Completed Casa Banana/ Mazamba/Inhaminga	D	36.60	6		291	1,656	6
25	11/20/94	Completed Piro/ Nhamacolono	C/D	42.20		1	800	2,503	1
26	11/4/94	Matondo/Nhamacolono/ Maringue (diversion)	D	5.30			28	394	
27	11/14/94	Matondo/Nhamacolono/ Maringue (AREA CLEARANCE BRIDGES)	D	5.10			33	57	
28	12/11/94	Completed Mopera Campo	E	100.20			312	1,614	
29	12/11/94	Gorongosa/Subwe (Not completed)	C	84.60	3		98	212	3

35

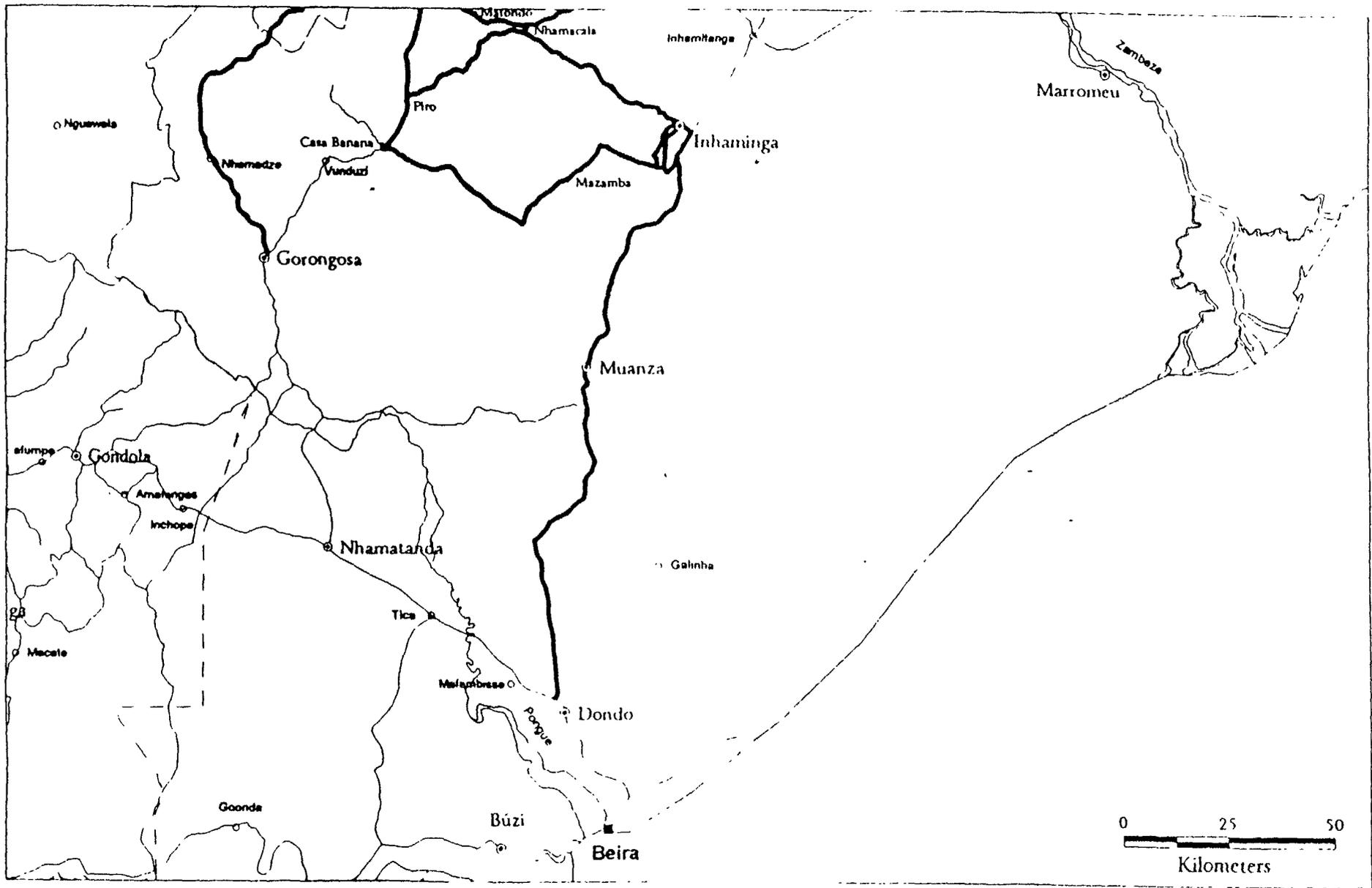
30	1/15/95	Completed Morrumbala/ Megaza	E	41.00			1,504	2,366	
31	1/22/95	Completed Campo/Nagoa	E	58.60			670	1,890	
32	2/23/95	Completed Mocubela/ Maria/Mulevala	F	199.80			2,510	5,150	
33	3/12/95	Completed Mocubela/ Morrua	F	131.30			1,865	4,450	
34	3/12/95	Morrua, 100 x 100 M (AREA CLEARANCE)	F	20.00			475	1,770	
35	4/16/95	Completed Mugeba/Maria	F	18.70			235	1,619	
36	5/21/95	Completed Olinga/Mocuba	E	143.70	1	1	2,325	4,780	2
37	6/20/95	Completed Licero/Tacuane	F	90.10	1		937	3,524	1
38	6/18/95	Completed Tacuane/Licero	F	5.76			250	610	
39	5/7/95	Licero/Megaza (Not completed)	F	26.42			190	480	
40	6/4/95	Megaza/Licero (Not completed)	E	19.20			335	1,043	
41	7/02/95	Completed Tacuane/ Lugela/Mocuba	F	90.00	4		106	1,253	4
42	7/23/95	Gurue/Muabanama (Not completed)	F	49.00			139	1,151	
43	7/23/95	Errego/Gurue (Not completed)	F	25.00	1		60	490	1
44	7/23/95	Sale/Correia (Not completed)	F	15.20					
				2,176.27	31	5	21,378	85,890	36

# REPUBLIC OF MOZAMBIQUE



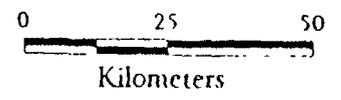
REPUBLIC OF SOUTH AFRICA





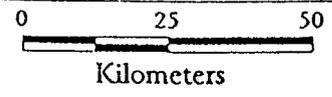
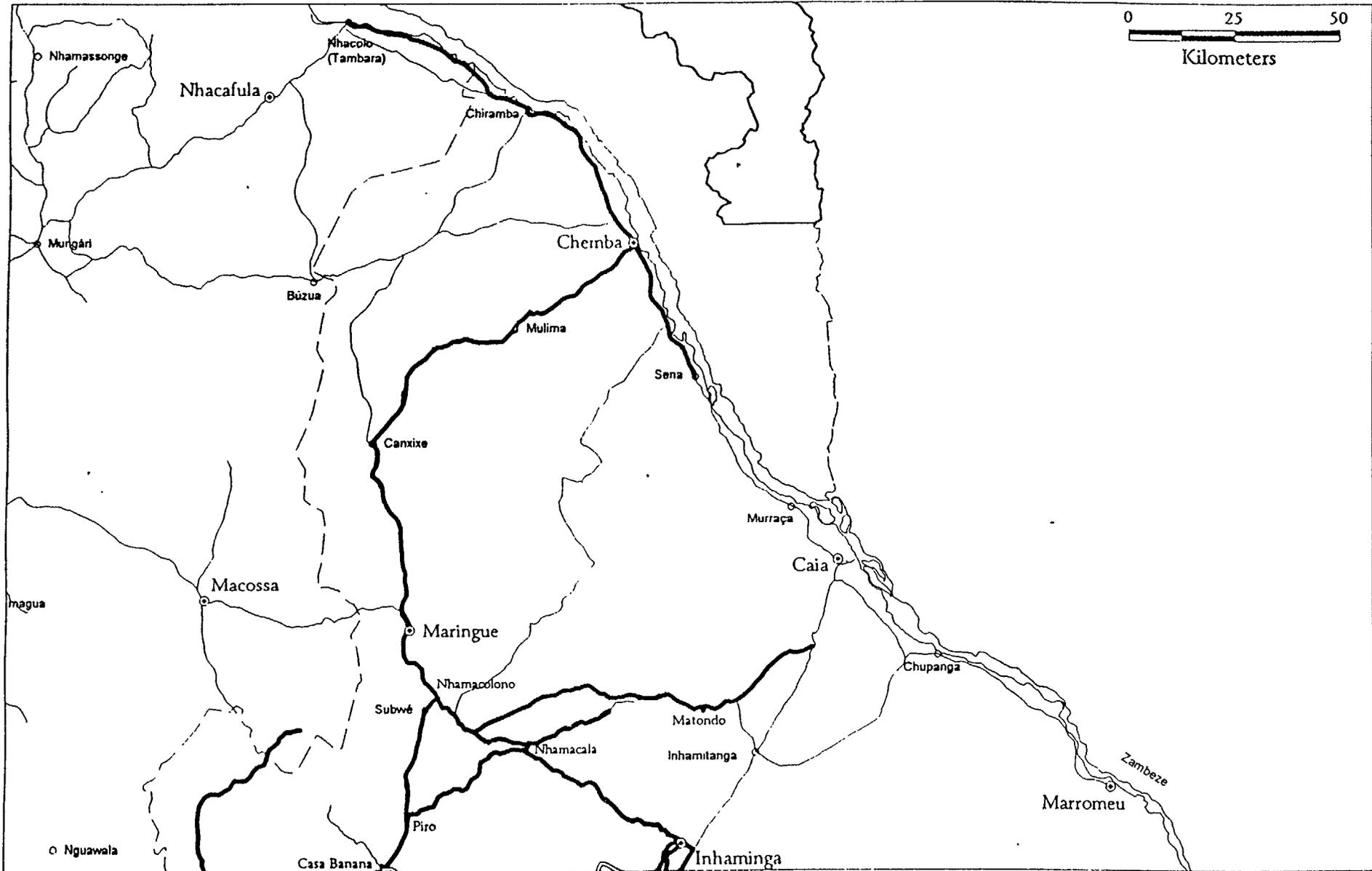
— Cleared road  
 ● District seat

○ Adm

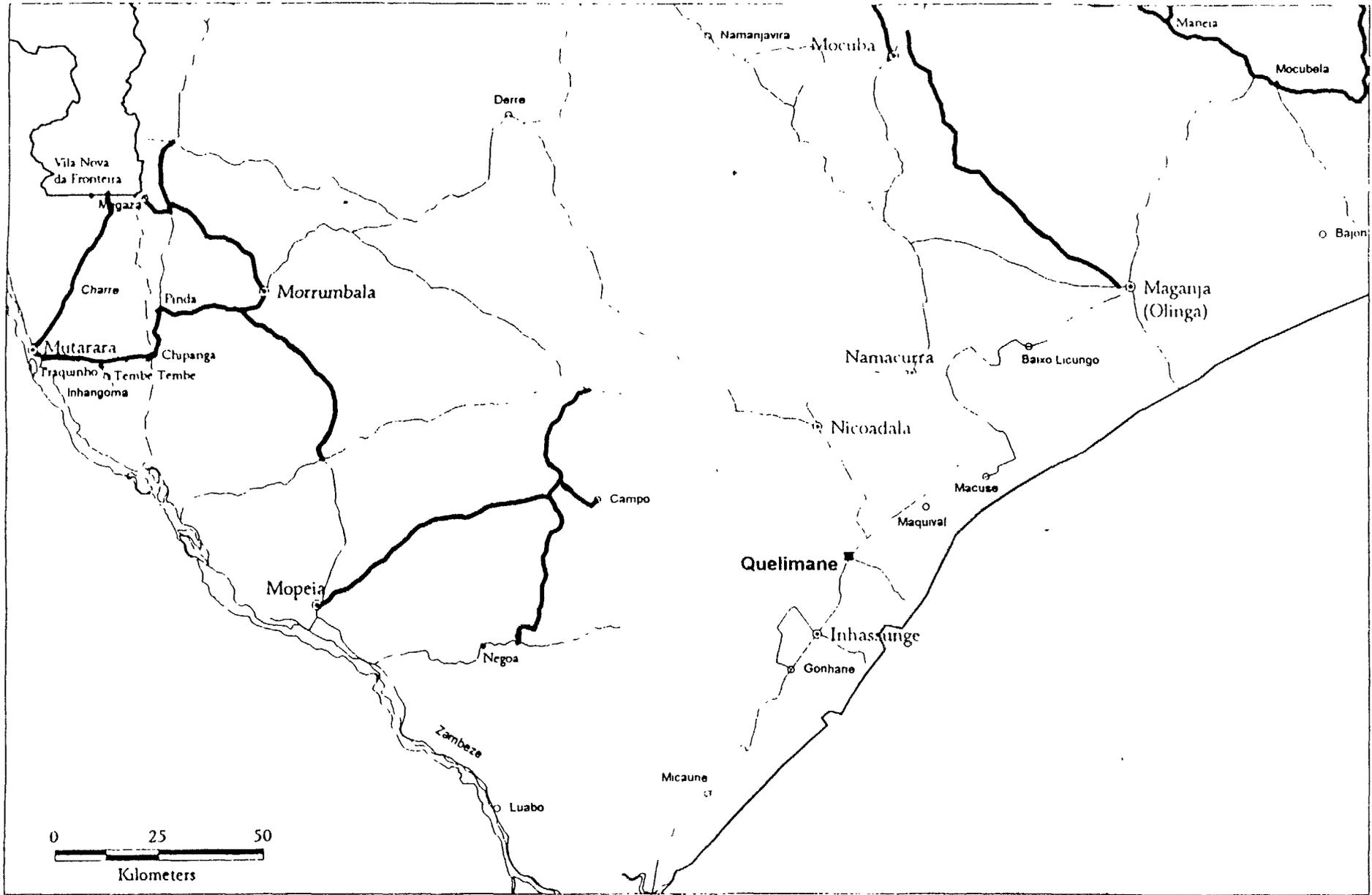


- - - Provincial boundary  
 • Other towns

39



- Cleared road
- District seat
- Other roads
- Administrative post
- - -** Provincial boundary
- Other towns

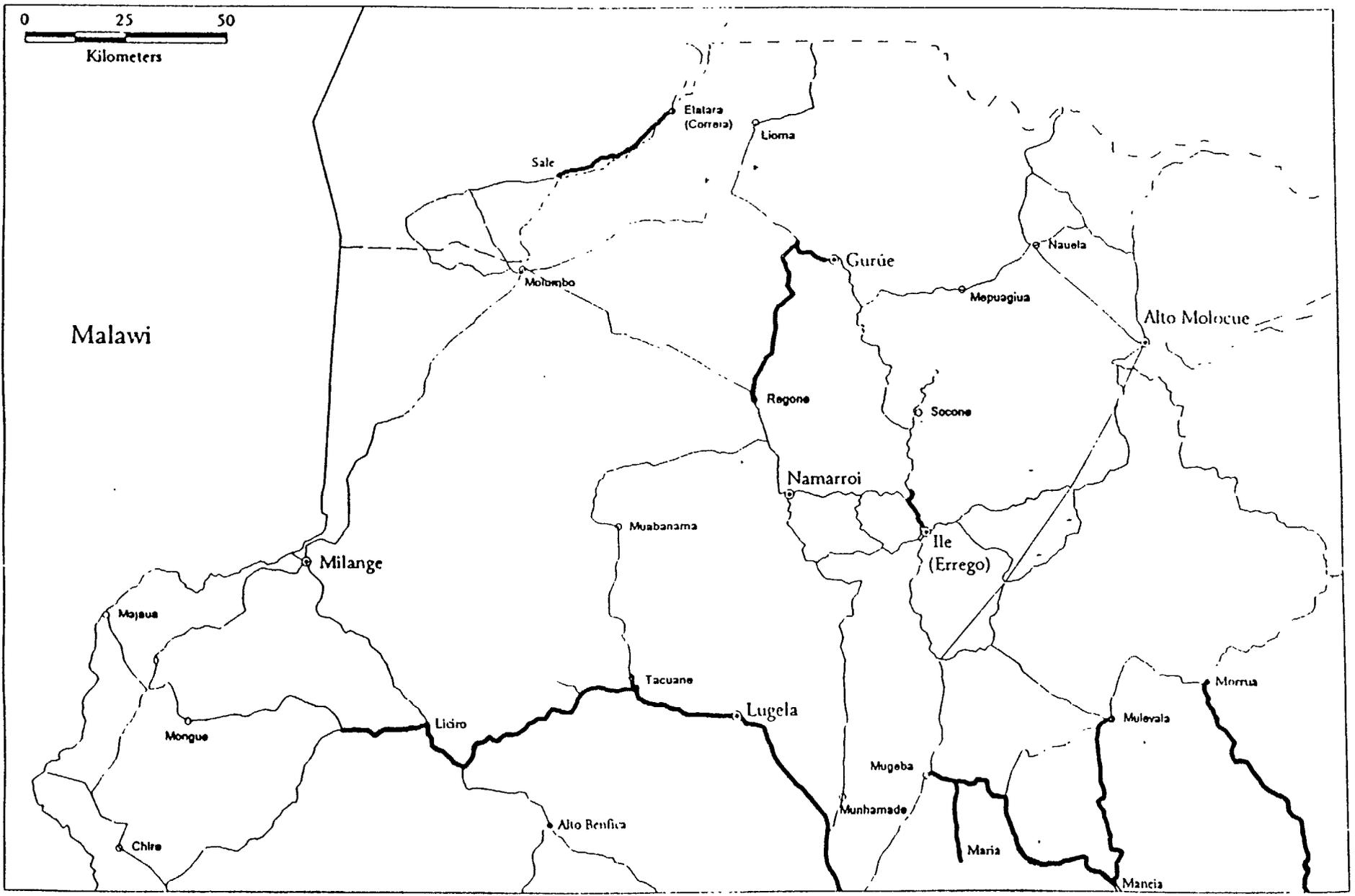


- Cleared road
- ⊙** District seat
- Other roads
- ⊙** Administrative post
- Provincial boundary
- Other towns

B2

41

42



- Cleared road
- District seat
- — — —** Other roads
- Administrative post
- - - -** Provincial boundary
- Other towns

**ANNEX 3**

**BASE CAMP SITES (with up to four moves to one site)**

Chemba  
Sena  
Mutarara  
Inhaminga  
Chirimazi  
Inhamitanda  
Pinda  
Maringue  
Morrumbala  
Casa Banana  
Matondo  
Mopeia

Gorongosa  
Mocubela  
Morropino  
Morrua  
Olinga  
Mocuba  
Mocuba-Olinga Road  
Licero  
Tacuane  
Megaza  
Gurue  
Errego

1. **Missed mines** - The most serious concern about Ronco's performance in route clearance is simply this: land mines have been discovered or accidentally detonated on roads after Ronco cleared them. While visiting with the demining teams for several days in Eastern Zambia, USAID learned of two very recent and potentially grave incidents where missed mines were unintentionally detonated by Ronco vehicles traveling a 'cleared' section while en route to the work area from the base camp.

a) In the first incident, an AP mine (probably type 72A) exploded as a project vehicle drove over it, causing damage only to the tire. The mine was apparently close to the surface, situated within the convergence of previous (Ronco) tire tracks and a local foot path. Heavy rains, and use of the road could well have displaced the earth that had covered the mine, allowing it to be exposed to the depth where it could be more readily detonated.

b) The second -- potentially much more lethal -- incident occurred in the same week of the previous incident, and in the same general vicinity. A notoriously volatile type of (Czech-manufactured) AT mine was detonated, apparently by the vibrations of a passing Ronco 6.5 ton vehicle, which contained about 17 Ronco Mozambican deminers and dog handlers en route to the work site. The mine was detonated roughly 150 yards from the base camp, about 60 meters along the road toward Mulovala, immediately after the intersection with the road heading toward Maria in one direction and Mocubela in the other. The mine was situated about 2 meters from the center of the road, which had been 'swept' using mine detectors only, as opposed to a combination of mechanical means and the mine detecting dogs (MDDs).

2. **Previous incidents resulting from mines probably missed by Ronco** - There have been other reports concerning the discovery or detonation of mines/ordnance on roads cleared by either Ronco or the UN contractors, Lonrho/RO/Mechem. Several of the reported incidents concerning Ronco have been proven to be unfounded (e.g.: UNHCR report of 'four mines discovered on the road between Morrumbala and Zero Mark'.) However, there have been between two and four other incidents, apart from those mentioned above, that can be considered credible reports of mines having been discovered on routes after clearance by Ronco.

a) In the first incident, a RPG-7 munition was discovered on the verge of the road recently cleared by Ronco. The ordnance should have been detected and destroyed. In the second incident, a World Food Programme vehicle detonated what was probably a live mortar shell on a recently cleared section of road between Maringue and Canxixe. The driver lost part of his leg as a result of the blast.

b) The third and fourth incidents occurred within the past two weeks, when -- according to an as yet unsubstantiated UNHCR report -- 2 AP mines and perhaps 1 AT mine were discovered separately during the rehabilitation of the road between Morrumbala and

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**ANNEX 4**

**DEMINING INCIDENT DETAILS**

This annex consists of a report to the Defense Department on the subject of missed mines. The Defense Department asked for RONCO's explanation of how the incidents are to be interpreted. The second part of the annex contains RONCO's response.

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45

Megaza, one and a half months after Ronco cleared the 35 km stretch of road. This crucial section of road is serving as the primary repatriation route for refugees returning from Malawi during the rainy season. This report is currently being investigated, which will determine the accuracy of the initial report. In any event, as many as six and perhaps more mines, or significant pieces of ordnance, have been discovered on roads that have been cleared by Ronco, along the 1,600 kilometers of combined routes cleared -- in addition to the 29 mines detected and destroyed by Ronco. The current number of missed mines and ordnance is probably a conservative estimate, i.e. it is likely -- particularly during route renovation -- that additional mines will be discovered or detonated on routes that have previously cleared. Why?

3. Causes of 'missed' mines - There are a number of plausible explanations why Ronco has failed to detect some mines or ordnance. Chances are that the causes can be attributed to a combination of some or all of the factors discussed below.

a) There can of course be human error, resulting from lapses in concentration or vigilance, more likely during times of discomfort during operations, including intense heat or prolonged periods of rain. The reasons may also be associated with geological or environmental conditions, i.e. high metallic content of the soil, heavy siltng followed by severe erosion which may expose previously buried mines, that are more apt to be discovered subsequently or else unintentionally detonated. Reconstruction of roads should be expected to unearth mines which were either deeply laid, or silted over through the years. Some of the mines are buried so deep as to render them, for all intents and purposes, undetectable. Currently there is no fool-proof, 100% method of mine detection that could be expected to locate all mines which may be present.

b) The possibilities for human error are probably more likely in areas where the metallic content of the soil is particularly high, rendering mechanical methods of detection less reliable. This has been the case in several operational areas, and is the case in the Mocubela area. Deminers must reduce the sensitivity of their metal detectors in these areas in an attempt to reduce ambient or background readings as opposed to the readings one would expect from a detonator or another metallic component of a mine. The reduced sensitivity of the mine detector also makes it more difficult to detect those mines with very little metal content, like those that were missed in the Mulevala area (Type 72 AP or PTMA 1-A-B II Czechoslovakian AT mines).

c) The presence of mines in areas already cleared can be attributable to one or more of the following reasons: a) mines were replanted -- which in the cases mentioned is highly unlikely; b) mines were so deeply situated as to be virtually undetectable; c) technology is not adequate to the task; d) standard operating procedures were either not followed; or, e) were followed and proved inadequate.

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Although the purpose of the MDDs is, in part, to be utilized as a redundancy, they are also intended to serve as a supplement to mechanical means for detecting mines (with low-metal content, and/or soils with high metal content). The MDDs were not used in at least the area where the AT mine went undetected. In the Gorongosa area, it was an MDD and his handler which alerted demining teams to the presence of the same type of AT mine missed in the Mulevala area. The high metallic content of the soil and the incredibly low content of metal in the particular type of mine, means it is conceivable that the MDDs might have detected the mine had they been utilized.

**4. Effects of missed mines** - The immediate potential effect of a mine accident or the discovery of ordnance along a previously cleared route, apart from any casualties or physical damage, is that access may be once again restricted due to the fear of additional mines.

**5. Response to missed mines** - When such incidents have taken place, either on roads cleared by Ronco or other contractors, the general response has been to conduct an investigation and area mine survey to rapidly determine the probable cause of the incident and check if any additional mines are present in the vicinity.

a) This type of response has proved to be adequate so far, though some modifications should be implemented. For example, the composition of the investigative team, the speed with which they react, and the nature of the investigation and mine survey should be standardized to the extent possible. Standard incident reports should be completed as soon after the event as possible. A team trained in quality assurance (QA) and surveying should be devised from existing capacity and employed in testing operations and operators, so as to minimize the chances of an incident, and to investigate when there is one.

b) A greater degree of assurance could be gained by having a road grader or bulldozer to follow the mine clearance teams, do basic repairs, and unearth additional deeply laid mines or ordnance that may have gone undetected.

c) When a number of lapses are observed, in individual or team performance, demining operations are temporarily halted and refresher training and testing is done in the field. Quality control mechanism will help to identify operational problems and implement adequate responses.

d) Dissemination of mine information and mine awareness materials should stress that 100% degree of certainty with respect to mine clearance is unlikely, despite disingenuous claims to the contrary.

**6. Suspended Operations** - Poor weather conditions and the existing conditions of the transport infrastructure were attributed as the reasons for suspending clearance operations in:

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\* Southern Zambezia, South of Mopeia (Lusbo - Chinde, 90 kms);

\* North-Central Sofala (Nhamadzi - Nhamocolomo, 30 kms).

North of Gorongosa - just beyond the turn-off toward Mocussa for about 30 km toward Nhamocolomo/Subwe area, and beyond toward Matondo/Caia.

The first unfinished task will be completed toward the end of the rainy season. The second task will be completed if this section of road is considered to be the probable alignment for EN-1. However, if the preferred alignment is to be through Vanduzi, which has already been demined, I would recommend the second task be rescinded.

7. Anticipated Rate of Clearance - The current rate of clearance is below the Contractor's original and twice downwardly refined estimated rate of clearance. It is conceivable that with less disruptive weather conditions and tasks along routes with less vegetation, downed bridges, washed out roads, etc., that a higher rate of clearance could be achieved.

Bad weather, washed out or non-existent roads, destroyed or dilapidated bridges and surging rivers, coupled with periods of poor health -- primarily malaria -- among a large number of the deminers, have been given as reasons for rates of clearance that have been between 15 and 20 km/week lower than clearance rates that were anticipated as recently as October.

However, even under better conditions (e.g. after the rainy season), the rate of clearance would probably not exceed 80 or 90 kms/per week. The result is that Roaco is unlikely to achieve the clearance of more than an additional 1,000 kms from this point for a cumulative total of roughly 2,600 or 2,700 km of road by the expiry of the current contract funds in July or August.

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48



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Colonel Rafael DeJesus  
OASD (SO/LIC) HRA  
The Pentagon  
Washington, DC

Subject: Mozambique Demining

Dear Colonel DeJesus:

This is to respond to your June 14 letter concerning the demining incidents that have occurred in RONCO's Mozambique program. We do appreciate the opportunity to clarify points made in the USAID Mozambique report and your ongoing interest in the demining program.

RONCO's responses to the incidents identified are organized to match the order in which the incidents were raised in the USAID report:

- 1.(a) *This AP mine type 72A was missed during the clearance process.* Our investigation indicates that during the clearance process, this mine was probably about six inches below the road surface. Following RONCO clearance of the road, very heavy rains occurred causing severe erosion of the road surface, thereby reducing the six inch cover. Large and small vehicles had used the road continuously for the seven days between clearance and the incident. RONCO methods have uncovered such high plastic content mines in the past. Unfortunately, the mine dogs were not used on the small stretch of road where the incident occurred. Clearance occurred late on an extremely hot day and the dogs needed to be cooled down. In an effort to complete the small stretch of road remaining, demining continued with metal detectors only.
- 1.(b) *This PTM BA III Czech mine was missed during the clearance process.* Contrary to the report, mine dogs were used on the portion of the road where this mine detonated. The mine only partially exploded but left a deep crater indicating that it was deeply buried. Unfortunately, too deep for either the Schiebels or the dogs to detect it.
- 2.(a) *We do not believe this RPG - grenade was missed during the clearance process.* The ordnance in question was found on the surface of the road and had very heavy metal content.

49

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It would be highly unlikely that such a grenade would be missed. While our investigation was taking place, a local Mozambican brought three more of the same type RPG to the side of the road to show us; all were destroyed by RONCO. We conclude that this was obviously not a missed item but that it was discarded by a Mozambican, whether by accident or design, after the clearance was completed as the other three would have had they not been turned over to RONCO.

*We strongly believe that the incident on the Maringue-Canxixe road was not a missed mine or UXO. RONCO cleared the Maringue to Canxixe road (approximately 70 km) over a four week period. We drove the road daily with two or our large trucks and several small vehicles. Six weeks after leaving the area and fairly heavy daily use of the road, a report came from the World Food Organization in Beira that one of their trucks had hit a mine. The accident was immediately investigated and at first, it was thought that the vehicle had struck a mortar because of metal fragments recovered from the scene. However, it was determined that this metal came from the brake drum and that because of the shallow crater and the green plastic residue in and around it, we determined that the vehicle had struck what was probably a T72 Anti Tank Mine. The incident area was in total flood due to very severe rains over the preceding two weeks and fast flowing water crossing the road. We think it highly likely that the mine was washed onto the road. The shallow crater indicates that the mine was on the surface of the road and, given the road condition, would have been difficult to miss during clearance. Given the volume of traffic using the road and the shallow crater, if it were there during clearance, it should have detonated sooner.*

- 2.(b) *We do not believe the "mines" on the Morrumbala-Megaza road were missed. Rather, there are strong indications that they could have been incidents manufactured by local road crews seeking increased compensation from the UNHCR due to "hazardous" work conditions. The RONCO investigation team discovered a small crater in the middle of the road seven kilometers north of Morrumbala believed to be caused by a partially exploded PTM-BA-III AT mine. This appeared to be a surface blast and was located in the center of the road rather than in the track, an unusual mine placement on a narrow tracked road.*

The two reported AP mines had been discovered by the local road rehabilitation team. The person who found these "two small round objects," reported that he set fire to them using diesel fuel and later presented two pieces of burned plastic to UNHCR in Morrumbala. UNHCR discarded them before RONCO had opportunity for identification.

Discussions with very cooperative UNHCR management during the investigation and the fact that local road teams were agitating for higher pay, leads us to believe the incidents were caused by disgruntled local Mozambican(s).

#### Additional Incident

There has been one additional serious incident since the USAID report. *We do not believe this was a mine we missed.* At approximately 0600 hrs on the 5th of June 1995, a large RONCO truck traveling to the work site, hit an Anti-Tank mine two kilometers from Megaza. This road had

previously been demined on two occasions and had been frequently trafficked. The driver of the truck and one passenger were slightly injured. To be safe, it was decided to casevac by helicopter the casualties from Megaza to Beira hospital for x-rays. Consequently, at approximately 0630 hrs on the same morning, both casualties were put on board the helicopter with a medic in attendance. Shortly after takeoff, a crash was heard and search parties soon located the helicopter some 600 M from the original takeoff site. Both the medic and the pilot suffered minor lower back injuries and the two original casualties, apart from shock, received no further injuries.

By using another stand-by helicopter, the four casualties were flown to Morrumbala where they were picked up by two Air-Serv fixed wing aircraft and flown to Beira and then transferred to the main hospital by ambulance. All were subsequently released from the hospital.

The helicopter accident is being separately investigated by the Civil Air Authorities and the charter company concerned. Hopefully, an initial report will be produced in the next week although it would appear at this moment not to be mechanical failure.

This AT mine detonated in a very well defined two-tire track on hard ground with no evidence of washing. The road was heavily traveled by RONCO since clearance about 10 days previously. One week prior to the incident, one of RONCO's dogs got caught in a large animal trap. Upon freeing the dog, the trap was destroyed. The police and people of Megaza town are suspicious that the owner of the trap set the mine in retaliation. The owner of the trap has disappeared and the police are searching for him. The police investigation continues at this time. We and the people of Megaza believe that the mine was placed deliberately.

## CONCLUSION

The USAID report to DoD will give the reader some erroneous impressions. Our concern is best illustrated by a statement on page 8. We quote, "In any event, as many as six and perhaps more mined, or significant pieces of ordnance, have been discovered on roads that have been cleared by RONCO, along the 1,600 kilometers of combined routes cleared--in addition to the 29 mines detected and destroyed by RONCO. The current number of missed mines and ordnance is probably a conservative estimate, i.e. it is likely--particularly during route renovation--that additional mines will be discovered or detonated on routes that have previously cleared." This is a complete inaccurate and gross misrepresentation of RONCO's performance in Mozambique to date.

- Clearly two mines were missed by RONCO over the 2,150 kilometers cleared as of June 25, 1995. Unfortunately, we can't guarantee that we won't miss more.

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- Although questions in some cases remain, the other incidents all seem to indicate that other factors were at work, either from the heavy rains washing mines onto roadways from floods, or from human action after demining was completed. This latter point is disturbing because if people are using mines as weapons or in ways to seek additional compensation, there will continue to be incidents of the above variety.

Live mines and UXO are one of the realities of Mozambique today. Unfortunately, the actions of others are beyond RONCO's control.

Sincerely,



Stephen J. Edelman  
Executive Vice President