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RADIO RURALE IN GUINEA:
A STUDY OF THE INSTITUTION'S NEEDS
AND USAID/GUINEA'S INTEREST IN PROVIDING ASSISTANCE

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EXECUTIVE SUMMARY

The value of rural radio

Established only in 1990, Guinea's Radio Rurale has become an important rural institution. It is the only way of reaching large numbers of people directly with information to improve their lives. It has also become a significant means of helping people communicate with each other.

The staff at each station produces programs of high quality which are credible to the rural people. Though there is no statistical evidence that radio messages have effected behavioral change at a significant level, many development agents have witnessed changes that convince them that people do indeed take heed of what they hear on radio.

Thus, Radio Rurale has become an active tool of development. As a means of communication among local people, it is also a potential instrument of democracy.

The current structure and capacity of Radio Rurale

Radio Rurale is a directorate in the new Commissariat of Information, Culture, and Tourism. It is on the same organizational level as Radio-Television Guinea and Agence Guinéene de Presse.

The system consists of one station serving each of Guinea's four natural regions. Each station has a staff of six who are on the payroll of Radio Rurale and a volunteer staff of between seven and twenty. Each also contracts locally for an accountant, janitor, and chauffeurs. The stations are supported in Conakry by a director and his staff of four.

The production equipment at each station is spartan but of professional quality and very adequate. But electrical power is not reliable at any station, from either the municipal source or the station's own generator. Each station has two vehicles and two motorcycles (Kindia has only one motorcycle left) for travelling around the region to produce programs. The level of studio equipment maintenance is inadequate in at least two stations (Kankan and Labé).

Transmission equipment varies considerably from station to station. Nzérékoré shares airtime with Radio National, using its local FM transmitters in five préfectures that are linked together through the national microwave system, and covers about 40 percent of Guinée Forestière. Kankan covers about 30 percent of Haute-Guinée, using an old and unreliable 25

KW, AM transmitter once used by the PTT. Labé covers about 80 percent of Moyenne-Guinée with a 50 KW transmitter previously used by the PTT; it is the most powerful AM transmitter of all the stations. Kindia shares two local low-power FM transmitters with Radio Nationale, covering less than 20 percent of Basse-Guinée.

Constraints to full operation

There are five principal constraints to Radio Rurale's functioning as a robust channel of communication in rural Guinea:

Inadequate transmission of the radio signal

Unreliable studio electrical power supply

High costs of operation

Insufficient sources of revenue

Insufficient competence in station management, marketing, and production equipment repair.

Inadequate transmission. The constraints on transmission vary among the stations. Those in Kindia and Nzérékoré have limited airtime because they have to share with Radio National. The transmitter in Kankan is so old that it could cease to operate soon. To preserve its strength as long as possible, it is only operated four hours a day. The transmission system in Labé is more adequate, but very expensive to operate.

Unreliable studio electrical power supply. The electrical power used to feed studio equipment comes from two main sources: the studios' own generators and local utilities, which also uses generators or hydro-electricity. In all cases, frequent failures, very unstable voltage, peak and surge are a part of every day operation. Worse, when studios are powered by the utility, lightning is discharged through the network, such phenomena being the main reason (more than 95 percent) for electronic equipment failures. All stations used voltages stabilizers to try to keep under control all those problems but it is not sufficient.

High costs of operation. The highest costs of operating the four radio stations are fuel for running the generators that feed the transmitters (about 20 percent of operating expenses), fuel for the generators that feed the studios when municipal power is absent (about 8

percent), and salaries for employees (about 15 percent). The cost of salaries would be far higher if every employee actually working were paid, and if all were paid enough to cover the cost of living.

Inadequate revenues. Revenues are inadequate to operate at full potential. The director's office estimated in its 1994 budget that the stations would generate about one-sixth of the estimated 610 million guinean franc budget from services contracted at a national level and those purchased at the regional level. The rest has been financed by the government and by capital investments in production equipment and training from the Swiss government and the Food and Agricultural Organization (FAO). Annual revenues barely cover recurrent costs and do not support equipment replacement funds or other capital investments.

Insufficient competence in station management, marketing, and production equipment repair. Although the staff at each station do an excellent job of producing radio programs on development, they have never had to be concerned with running the stations as self-sufficient business operations. In addition, they are not trained well enough in technical matters to keep the studio equipment operating at full capacity and to repair it when necessary.

Solutions

We see two ways for Radio Rurale to resolve these constraints. One is to invest in a transmission system that uses more appropriate technology, which would dramatically reduce fuel costs and provide more flexible use of airtime. The other is to decentralize the fiscal management of Radio Rurale for the purpose of improving the use of resources and providing incentives to market services more vigorously.

Appropriate transmission technology. The cost of fuel for the operation of a transmitter increases exponentially as the geographic are covered increases. To barely triple the radius of a broadcasting area, one must increase the power output by a factor of 100. Thus, while the cost of fuel for operating a 500 watt transmitter is less than fifty cents per hour, the cost of fuel for operating a 50 KW (50,000 watts) transmitter is $35 per hour. Yet the more powerful transmitter covers only about three times the radius as that of the lower powered one--at 100 times the cost.

An alternative technology, newer, but also more appropriate for Guinea's needs, is that of a system that links many small transmitters by new, very affordable, all digital compressed audio satellite service. Using small transmitters greatly lowers the cost of fuel for their operation, probably making it affordable for each community in which a transmitter is

placed. Satellite service should be available in West Africa within a year or two. And satellite technology is developing so rapidly that within three years, something even more advanced will be available, and at a lower cost.

This technology also provides far more airtime, as the satellite signal is available 24 hours a day, and a more flexible system, as each transmitter can be used to provide a local, community signal as well as to carry the regional station's signal and even Radio Nationale's signal. Because of their low power requirements, these transmitters and satellite receiving equipment can be easily powered by a photovoltaic (PV or solar) power system. PV power systems can also be used to solve the problem of unreliable electrical power supply for generators used at the studios.

Finally, the new technology requires less mechanical operation and is much easier to maintain and repair. Each community should be able to maintain its own transmitter.

Decentralization of management and finance. The second way to resolve constraints is to decentralize the fiscal management of each station. This should help to raise revenues from services. Once the regional stations do not need to depend on the central government to operate transmission systems and pay their fuel costs, they will be in a better position to manage their own resources. Greater control of management will also give them more incentive to raise revenues and thus improve operations.

Decentralization, however, will require that regional staff receive extensive training in running their stations as a business, including training in marketing their services and repairing equipment.

USAID/Guinea's interest

At present, five of USAID/Guinea's programs and projects use Radio Rurale to reach beneficiaries: Social Marketing of Contraceptives, Natural Resources Management, Agricultural Marketing Investment, Education Sector Reform, and Rural Enterprise Development. Each of these uses the system for somewhat different purposes, ranging from announcements of meetings to social marketing of products and services.

Several projects are considering uses of radio that Radio Rurale could not effectively implement at present because of its limited available airtime. In addition, the system is not flexible enough now to function as local radio, which would greatly enhance the process of democracy building, in which USAID/Guinea now has a strong interest.

Issues

In considering a significant increase in the level of support that USAID/Guinea gives to Radio Rurale, four main issues arise:

> Can the institution sustain its operations without indefinite support and heavy government funding?
>
> What are the costs of the new transmission technology?
>
> Will the Guinean government permit freedom of the airwaves for Radio Rurale?
>
> Should the system be privatized in order to ensure sustainability and editorial independence?
>
> Can the institution permit participation of the people in its governance and use?

Sustainability. The long-term financial viability of the stations depends on their ability to generate revenues from services to cover a significant share of their costs of operation. We believe that by introducing a transmission system based on a technology that reduces fuel costs drastically will bring operation costs down to a level that the regional stations can eventually cover. If they are decentralized and become capable of marketing their already excellent services, they should be able to sustain their operations with perhaps a small government subsidy.

Transmission costs. The new transmission system that we are proposing entails some costs that we can only estimate right now. In any case, however, the cost of this more appropriate technology should be less than that of the existing high-power transmitters.

Freedom of the airwaves. Radio Rurale already enjoys much editorial independence. The concern with controlling what is said on the air is of far greater importance in Conakry, where political opposition parties may pose a threat, than in rural areas, where the government is promoting grass roots political institutions. The *Haut Commissaire a l'Information* has drafted legislation that will give every Guinean the right to own and operate a radio station. He expects the law to be finalized and take effect within a matter of months. Thus, it appears that the government is moving in the right direction. In addition, the director of Radio Rurale and the commissaire support giving more autonomy to the four regional stations, and this autonomy should make them quite independent of any editorial

control.

Privatization. The option of privatization arises as a means of both creating self-sustaining institutions and ensuring editorial independence. If the radio stations become private however, they might well lose all government support and thus depend on significant support from the private sector (as well as on fees for services from government and other development agencies). Extensive commercial support might change the nature of programming, retreating from its focus on rural development and becoming, instead, entertainment. Moreover, opinion is mixed about the current capacity of the private sector in rural areas to support commercial programming. We think that privatizing the rural radio stations should not become an objective unless they fail to gain more autonomy while still within the government.

Participation. Adopting a transmission technology that places small transmitters within many, many communities allows people to participate directly in an important communication network within their own community. Each community will depend on its own system, not only to receive proper broadcast services but also to provide local community radio services. Each community will then have chance to become proud of and responsible for its own local broadcast service, making it more likely that they will maintain the system and use it.

Recommendations

Our overall recommendation is to support Rural Radio's adoption of transmission technology that links small transmitters in almost every community by satellite. This is definitely a long-term solution, but one which should bring operational costs down to a manageable level, increase the independence of not only regional but also local radio stations, and make Guinea' radio network more flexible, serving national, regional, and local needs.

In the short term (roughly two years), we recommend that USAID/Guinea:

> Assist Radio Rurale in making the best use of resources it already has by providing extensive training in management, marketing, and technical maintenance and repairs.
>
> Help to finance the purchase of photovoltaic (PV) power units at each station to power its studio, thus overcoming the lack of reliable, stable electrical power during airtime. Excellent production facilities without the ability to go on the air have little value.

Supply the stations with some minor production equipment and additional motorcycles that will enhance their ability to produce program segments throughout the regions they serve.

Condition short-term support on the commissariat's following through with its announced intention to make stations more autonomous.

In the long-term, we recommend that USAID/Guinea:

Work closely with the commissariat of information to plan for and invest in the transmission technology we have described.

Encourage Radio National to share the costs of a new transmission system with Radio Rurale and any donor support Radio Rurale might receive.

Collaborate with other donors to share in the financing of Radio Rurale's contribution toward the new transmission system.

Condition long-term assistance on the creation of a parastatal or other form of network of independent rural radio stations that receive some government subsidies.

Persuade Radio Rurale to build its new transmission system one region at a time, learning from the early experiences lessons that improve the later ones.

Conditions. Until USAID/Guinea has established the goals and purposes of whatever programs or projects in which it intends to provide assistance to Radio Rurale, specific conditions for assistance cannot be drafted. Conditions must flow directly from goals and purposes. An education project, for example, which has purposes of improving the quality and equity of basic education, would impose different conditions on Radio Rurale than a democracy and governance project, which has purposes of grass-roots democratic-institution building.

At this time, prior to any actual project or program designs, we can only suggest some broad lines of conditionality in terms that would help Radio Rurale become a stronger, more effective rural institution, for purposes of both development and democracy, and some conditions that might apply to various project or program purposes.

INTRODUCTION

Background

Guinea.[1] Situated in West Africa in the inter-tropic zone, Guinea covers an area of 95 thousand square miles stretching along 300 miles of Atlantic coastline. The population is approaching 7 million people, about 1 million of whom live in the capital city, Conakry. Although there are over 20 ethnic groups, three of them, the Malinke, the Fula, and the Sousou represent about 75 percent of the population. Each of these groups inhabits one geographic region of the country, and the fourth is populated by a mixture of other groups. The large majority of the population (90 percent) is Muslim. There is presently a large refugee population (over 500 thousand), the result of civil war and strife in both Liberia and Sierra Leone.

The population of Guinea is young. About 42 percent are children under the age of 15. About 75 percent of the people live in rural areas; the rest are in Conakry or much smaller urban centers within the interior of the country.

The country has great potential wealth in its natural resources. It holds over 65 percent of the world's bauxite reserves, large iron ore deposits, and significant reserves of diamonds and gold. Other unexploited resources include a rich and varied agricultural base, fishing and forest resources of high commercial value, and high hydroelectric potential.

Following decades of French colonial rule, in 1958 Guinea became the first African colony to declare its independence from France. Sekou Toure became the president of the First Republic and governed an increasingly centralized and tightly controlled economy. Desertion by the French and Toure's economic policies resulted in the abuse of resources and a decline in the well-being of the people. After Toure's death in 1984, a bloodless coup by the military brought in Lansana Conte as president. Under his regime, the government accepted the terms of a structural adjustment negotiated with the International Monetary Fund and the World Bank to bring new financing of development activities.

Since 1984, the Second Republic has adopted policies of administrative decentralization and has taken measures to strengthen community level institutions and their representative bodies

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[1]The first three paragraphs of this section are adopted from the 1993 LearnTech feasibility study.

on the subprefecture and prefecture levels. The government has privatized many of its former enterprises, and those that remain within the government have been subject to civil service and other reforms.

USAID/Guinea.[2] U.S. assistance, which remained at a low level until the end of the Toure rule, began to grow as the U.S. government saw Guinea liberalize agricultural-related markets and develop private enterprises.

The current USAID/Guinea development strategy was initiated in FY1992 to cover the period through FY1996. It is based on a thorough analysis of the cross-cutting constraints to Guinea's development, including inadequate economic policies and implementation, too few educated and trained people, a poor infrastructure of roads, communications, and energy supply, deficient public and private sector institutions, and a high annual population growth rate of 2.8 percent. To address these key constraints, USAID/Guinea is employing a closely linked set of policy dialogue and program-level interventions.

The goal of the current program is to improve economic and social well-being of all Guineans in a participatory society. In order to achieve this goal, the USAID/Guinea program is focussed on three strategic objectives:

> To increase growth and efficiency in agricultural markets
>
> To increase the ability of families to determine household size
>
> To increase enrollment in primary school, with emphasis on rural female participation.

USAID/Guinea's interest in rural radio. USAID/Guinea's interest in rural radio was sparked in early 1992, when the acting Human Resources Development Officer (HRDO), and other mission staff met with Cheick Sylla, his assistant, Bashir Bah, and Swiss technical advisor, Bernard Feller, about the possibility of USAID/Guinea support to Radio Rurale, which had just begin operations at its third regional station, in Kindia. After visiting Kindia, the HRDO recommended that USAID/Guinea contract with the LearnTech project of the Educational Development Center, Inc. to study the feasibility of USAID/Guinea support for

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[2]This section is adopted from U.S.G. assistance program to Guinea through the U.S. Agency for International Development, April 24, 1994.

Radio Rurale.

LearnTech funded the study and, in the meantime, the Mission moved the project from the HRDO to the general development officer (GDO) and contracted an assistant, DeShawn Dominique Jenkins, for one year to pursue possibilities of USAID/Guinea support.

The LearnTech study team recommended at the end of its visit in October 1993 that the mission "seriously consider investing in the system," conditioned upon measures to decentralize its administration and on further technical studies and a more elaborate design for assistance.

Leading up to the feasibility study, the mission hosted on the mornings of July 30 and September 23 two round table discussions of several hours each. The first was intended by international donors and USAID/Guinea contractors who had worked with Radio Rurale, including UNICEF, UNESCO, UNDP, FAO, Population Services International (PSI), and *Programme Integre pour le Developpement de l'Entreprise* (PRIDE). The participants agreed that their respective organizations should work together to help Radio Rurale become a self-sustaining institution. They drew specific conclusions about enhancing programming on rural radio and means for improving the stations' management and operations.

At the second round table, most of the same participants met with representatives of other government agencies and non-governmental organizations (NGOs) working in rural regions. The National Director of Information Services, Bambun Kaba, attended, along with Sylla and Feller. The participants discussed the progress and needs of Radio Rurale, and the meeting concluded with the understanding that USAID/Guinea would continue to take the lead in bringing donors together in order to coordinate support to Radio Rurale. Subsequent to LearnTech's study, however, USAID/Guinea's attention was distracted by other matters, including the upcoming presidential election in December.

As a result of the U.S. government's disappointment with the election procedures, the USAID program in Guinea was cut back, and funds that might have been used to support a rural radio project were no longer available. It was not until ten months later that our team arrived in Conakry, under the auspices of the LearnTech project, to pursue the mission's interest in Radio Rurale.

The purpose of this study. Our purpose, as described in the scope of work for the second phase of the Guinean rural radio feasibility study, is to report to USAID/Guinea on the "possibility of upgrading the current rural radio network" and the "feasibility of integrating a

rural radio component into existing projects." Thus, in this report, we are proposing a framework for supporting rural radio that address problems identified with the existing system. We are also using this report as a means of consolidating for future reference the data that we have come across in our study.

Organization of the report. Following this introductory section, our report is organized into sections addressing these questions:

> What is the value of Guinea's rural radio system to its sustainable development and emerging democracy? (Section 2)
>
> What is Rural Radio's present capacity for providing this value? (Section 3)
>
> What constrains Rural Radio from meeting its full potential, and how can these constraints be addressed? (Section 4)
>
> What stake does USAID/Guinea have in helping Rural Radio improve? (Section 5)
>
> From USAID/Guinea's perspective, what are the issues pertaining to its support of Rural Radio? (Section 6)
>
> What do we recommend that USAID/Guinea do to support Radio Rurale? (Section 7)

In presenting our description and analysis of Rural Radio, we clearly acknowledge the limited perspective that one can acquire in three weeks. When information is generally known and undisputed, we present it as such. But when opinions come from single sources, or when we have heard conflicting opinions, we point that out. We rely heavily on what other people have written, though we have often confirmed these statements through our own interviews and visits to each of the four radio stations. Lists of people we interviewed and documents we read are attached (Annexes A and B).

THE POTENTIAL VALUE OF RURAL RADIO TO GUINEA'S DEVELOPMENT AND DEMOCRACY

Before launching into a detailed description of the rural radio system and the issues surrounding its support by USAID/Guinea, we will take a few pages to emphasize the potential of rural radio in the processes of development and democracy building in Guinea.

The rural areas of Guinea suffer from a scarcity of communication channels. Radio is the only mass medium that can reach large numbers of people. After three years of broadcasting, there is ample evidence that people do listen to Radio Rurale and that they act on what they learn. Thus, radio has an exciting potential as a tool of development and as an instrument of an emerging democracy.

The scarcity of communication channels

Nearly everyone who has worked outside of Conakry, where more than 85 percent of the people live, attests to the difficulty of communicating both within and between communities. First, many different languages are spoken. Each of the three major ethnic groups has its own language (Sousou, Malinke, and Fula), and the variety of languages spoken in Guinea Forestière brings the total up to over twenty. Yet radio and television broadcasts, as well as newspapers, are in French, which few people outside of urban areas understand.

Second, about 70 percent of Guinea's people are illiterate, and the illiteracy rate is even higher in rural areas and among women. Thus, communication by means of print materials--newspapers, books, instructional brochures, and so on--is largely impossible.

Third, the poor condition of the physical infrastructure--primarily bad roads and very inadequate networks for distributing supplies, power, and telephone, and mail--exacerbates the problem of moving information.

Radio Rurale's unique role

Although efforts are being made to support a rural press, Radio Rurale is at present the only mass media channel in rural regions, and it does not reach all the people all of the time. Because the telephone network is almost nonexistent, radio also serves the purpose of point-to-point communication.

For the most part, a Radio Rurale station broadcasts in the language of the people it serves.

The station in Kindia serves the coastal region (Basse Guinée), where most people speak Sousou.

The station in Labé serves the Fouta Djallon (Moyenne Guinée) in the center of the country, where most speak Fula.

The station in Kankan serves upper Guinea (Haute Guinée) in the northeast, where Malinke is spoken by most.

The station in Nzérékoré serves the forested area in the southeast (Guinée Forestière), where many languages are spoken.

Since radio is so much more efficient than sending messages by word of mouth or distributing print materials, it is no surprise that it has rapidly become a popular and well used institution in the rural regions.

Listeners

What evidence do we have that people listen to the radio? More important, what evidence is there that what they listen to has an effect on what they do?

We came across only one formal survey of listeners, but many anecdotes support the widespread belief that people are actively engaged in programs they hear. The survey, *Enquete demographique et de sante* (Guinée, 1992) was conducted by the Direction Nationale de la Statistique et de l'Information, PSI, and the U.N. Population Fund (UNFPA) primarily for the purpose of collecting data on demographics and health. It included, however, a component on access to media which reveals that, in 1991-1992, prior to the full implementation of the rural radio network, 35.8 percent of rural women and 65 percent of rural men listened to the radio. Even at that time, 32.6 percent of rural women and 17.8 percent of rural men listened to Radio Rurale (The relevant section of the survey is in Annex C.)

We are almost certain that those percentages have increased dramatically since these data were collected three years ago. Radio Rurale itself conducted a very informal survey in the town of Labé, where its staff found that 60 of the 64 households it visited were listening to Radio Rurale. Other such surveys indicate that 60 percent of the people in Moyenne Guinée and 35 percent of those in Guinée Forestière listen to radios (Sylla).

Some of the development agencies that use Radio Rurale to broadcast messages, notably those working in health and education, have instituted listeners' groups for the purpose of, among others, monitoring the extent to which people attend to these messages. They find that in most cases, people do listen and do believe what they hear on the radio. UNICEF has conducted an evaluation during each of the past three years it has used Radio Rurale; it has found that its messages are well received by the people who are intended to hear them.

Finally, staff members of each station report that they receive numbers of letters each week (remarkable in such an illiterate society), as well as personal visitors, whose comments attest to their interest in radio messages. When they visit villages to produce programs, people pay them the same respect they would a well regarded government official, and what the villagers say reveals their familiarity with the radio programs that have been broadcast.

We thus think there is ample evidence that Radio Rurale has an attentive audience wherever it reaches.

Actual and potential uses

What potential does Radio Rurale have in Guinea's processes of development and democratization? In Section 5 we will discuss specifically USAID/Guinea's uses of Radio Rurale. In this section, we wish only to establish the theoretical boundaries of its use.

First, Guinea's rural radio network has already demonstrated its ability to serve as a tool of development. Ministries and the foreign donors and contractors that provide them technical assistance have been working hand in hand with the staff at each station to produce programs that carry the messages of development in health, population, education, agriculture, and private enterprise development. The kinds of programs produced range from simple "spots," such as advice on how to sterilize cooking utensils, to complex partnerships, such as regular and frequent communication throughout the country of market prices and availability of a wide variety of agricultural produce.

Second, the network has a barely tapped potential to become a critical instrument of Guinea's process of becoming a democracy. In Fall 1993, just prior to the presidential elections, the four rural stations used funds provided by the Swiss government to explain to their rural audiences the meaning of democracy. The producers used their social marketing skills to produce programs that addressed negative views on democracy (it places the old and young on equal footing; it is only the affair of men, not women) and to reinforce positive views of democracy (it is what we already do in our villages; it involves understanding and

compromise). The campaign also broadcasted basic information on how to register and how to vote (LearnTech, 1993).

But this kind of information and marketing is only one way radio is used to promote democratic society. Without prompting from the central government or foreign organizations, the regional radios have already been used to facilitate communications among disputing parties. In Kankan, prior to the elections, the radio station quelled fomenting riots by bringing together on the air representatives of conflicting groups to discuss and resolve their differences. In this way, rural radio in Guinea played a role on local terrain that is taken for granted in mature democracies: it allowed people to use mass media to air their political differences face to face and before an audience. It was not simply a tool to inform them of how they are governed (for better or for worse). Rather, it gave people a voice in resolving their own issues. This use of radio to air and help resolve disputes has continued since the elections, as radio programs and the staff that produce them are recognized as legitimate arbitrators among their listeners.

Summary

Radio Rurale is an established institution that has the potential to contribute significantly to the processes of development and democracy building. It is the only channel of communication that presently reaches the rural people directly in their own languages. People listen and respect what they hear on Radio Rurale.

We will turn now to look in more detail at how the institution operates. How was it conceived, and how has it been nourished so far up? What does it look like now?

A DESCRIPTION OF THE SYSTEM

Goals

As stated in the first five-year plan for Radio Rurale (*Plan de dévéloppement quinquenal, 1992–1996*), the organization has specific goals:

To popularize new techniques of agricultural production

To encourage the creation of groups, associations, and cooperatives in farming

To fight the degradation of the environment and mobilize participation in campaigns for reforestation and proper collecting and treatment of household waste

To contribute to the implementation of programs in health and sanitation

To invigorate programs in education and adult literacy training

To stimulate the local cultures of rural areas

To support policies of decentralization in order to build up the power of local political organizations

To foster and support the vertical and horizontal movement of information and develop a permanent channel of information between the rural world and the central administration, and among rural people

To train citizens to participate in democratic government.

These goals clearly reflect the development-oriented agenda of Radio Rurale. They also echo the government's policies of democratization and decentralization of power and administration, and they acknowledge the importance of the flow of information to and among people in rural areas.

To what extent has Radio Rurale been able to implement these goals? We will start with a brief account of the short history of the organization.

History

By the end of the 1980s Guinea had a national radio and television network. Television reached the urban centers of each of the four natural regions, and radio reached even deeper into the rural areas. But almost all programming was in French; only a few minutes a day were broadcast in any of the languages spoken by most people in rural areas.

In January 1989, with about $35,000 in support from UNESCO, the Ministry of Communications convened a round table on the subject of rural radio in Guinea. Representatives of rural radio stations in other African countries were invited along with donors and government officials. Based on what they learned in these meetings, the minister and his staff established the Direction of Radio Rurale. Their plan envisaged a central administrative office in Conakry and four stations throughout the country.

The Swiss government, through its development project, CIRTEF, and FAO subsequently agreed to supply the funds and technical assistance needed to equip a production studio at each of the four stations and train staff to operate the equipment and produce programs. The government of Guinea agreed to furnish, maintain, and operate equipment for diffusion. By April of 1990 the Swiss had begun to install production equipment in buildings supplied by the government of Guinea at two of the four selected sites: Kankan and Labé, and FAO had begun its training program.

The ministry selected 30 staff members for the stations from among the journalists and engineers working at Radio-Television Guinea (RTG) and from other ministries engaged in development, including eight from the ministries of education, six from the ministry of agriculture, and two from health and population. Technicians were drawn from RTG and l'Agence Guinéenne de presse (AGP). The designated director was a senior journalist at RTG, and his deputy was a journalist and formerly employed in the ministry of education. Producers were tested for their ability to write (as radio journalists) and to project their voice well (as announcers).

To fulfill its agreement to provide diffusion facilities and equipment, the government agreed to let Radio Rurale share with RTG the transmitters at Labé and Nzérékoré, and to share with Post-Telegraph-Telephone (PTT), the transmitters at Kindia and Kankan.

FAO's training program, which involved funding of about $225 thousand, entailed three training sessions three to five months each. Feller, the Swiss expert who also provided much technical assistance to the new director and his staff of Radio Rurale, was the principal trainer. The staff at each station received theoretical and hands-on training in both rural development and radio production. They learned how to create programs of varied formats,

ranging from brief "spots" to hour-long round-table discussions, which addressed the development issues in the regions they served. Thus, the areas of expertise that they acquired ranged from the nature of development in health, agriculture, and other sectors to the mechanics of operating and maintaining audio production equipment.

Although FAO had intended to hold six-week training sessions for each of the four radio teams, delays in equipping studios caused them to alter the timing and duration of these sessions. During the course of the sessions, two of the stations began operations and their staffs were thus able to benefit from some on-the-job training.

In June 1990 the station at Kankan began operations. The station at Labé went on the air over a year later, in August 1992. Kindia began programming on a limited basis in December 1992, and eventually increased its programs. Nzérékoré was the last to begin operations, in April 1993. The delays in opening stations was due largely to difficulties in assigning government facilities for production.

Donor support ended in mid-1993, when the Swiss completed their project. Additional support from the European Community and German donors is anticipated to upgrade transmitters, but it has not arrived yet.

Institutional structure

Radio Rurale in Guinea is a relatively young system in Africa, and its institutional structure benefits from lessons learned in other countries. What distinguishes the system in Guinea is, first, program production and diffusion is decentralized among the four regions, and, second, within the ministry, its administration is on an equal level with--not subordinate to--the administration of national radio.

In 1994, the former Ministry of Communications was split into an organization for post-telephone-telegraph (PTT) and a Ministry of Information, Culture, and Tourism. The government has put the PTT organization up for sale. In August, the information side of the ministry became the *Haut Commissariat a l'Information*, a direct arm of the Presidency.

In addition to its administrative branch, the *haut commissariat* has four divisions: Radio-Television Guinea (RTG), Agence Guinéenne de Presse (AGP), Horoya (the national daily newspaper), and Radio Rurale. According to summary budget figures published by the ministry in 1993, RTG receives the largest share of the budget, and Radio Rurale the smallest--about one-quarter of that of RTG.

Radio Rurale itself has five departments: the director general's office in Conakry and the four regional stations. The five-year plan states that the director's office is responsible for:

Assessing needs and planning development of the organization

Evaluating the performance of regional stations and coordinating their activities

Organizing meetings of the interministerial commission concerning rural radio

Coordinating the activities of Radio Rurale with those of other media and institutions

Publicizing information about stations' activities

Maintaining a center of analytical reports and other files prepared by the regional stations.

The central office administers the roster of government-salaried personnel, negotiates contracts at a national level, does the financial accounting for most operations, establishes budgets, purchases and distributes supplies, and manages the flow of government-supplied goods and services. In addition, it supplies substantive support in programming by working at a national level with ministries and development agencies who work in the rural regions and thus cooperate--actually or potentially--with Radio Rurale.

Facilities and equipment

Audio equipment. The four stations each have basically the same audio production equipment, supplied mainly by Studer, a Swiss company. The equipment is spartan compared to North American standards, but has everything needed for professional level broadcast production.

Each studio comprises:

- One small stereo mixer (console), ten channels, two outputs
- A wooden table for console and ancillary equipment
- One telephone interface for the mixer
- Two cassette machine
- Five reel-to-reel tape deck (one with telephone interface)
- One professional tuner

- Patch bay
- Line and power amplifiers, speakers, compressor
- Microphones, headphones and related studio equipment
- Reporting equipment
- Public address equipment
- Test equipment for maintenance and repair and spare parts.

Two reel-to-reel machines are installed in a production room, while the rest of the equipment is located in the "on air" control room and studio.

Buildings. Each station is housed in a building supplied by the government. Most are residential houses (averaging 80 to 100 square meters) that have been adapted for daily radio use. Kindia is the exception, built specially for the purpose of radio use. It is the only one which has enough working space. All the other buildings are crowded, Nzérékoré being in the worst. Each building looks good and seems to be in good shape, housing a studio with some acoustic treatment and a viewing window in the wall dividing the studio and the control room. A desk and table have been installed where needed and everything is clean and well set up. Kankan is the only exception, with more dust and dirt--not kept as clean.

Electrical energy. The generators that power the stations in Kindia (15 KVA) and Nzérékoré (15 KVA) are almost new, but one phase out of three is burned and not working in Kindia. The old Russian generator in Labé (5.6 KVA) is presently out of order (a broken cylinder) and parts have not yet been found, while the 1991 generator of Kankan (5 KVA) seems to be performing well.

All equipment and lights are powered by their own generator except when the local utility generator is in service, which is normally in between 19:15 and 00:00. But in some cases, even this service is available only two evenings out of three or only during the rainy season. During the day in all seasons (except Labé during the rainy season), and during frequent utility power failures, they must use their own generators.

Maintenance and repairs. Nzérékoré enjoys the best maintenance situation. Equipment is in good working order and only one portable tape recorder was in Conakry for repair at the moment of our visit. Spare parts for almost every important piece of equipment are in stock and well classified. The technicians complain about lack of training, but they seemed to cope well with all problems that arise.

Kindia has almost the same situation, except perhaps with more equipment failures, but

everything has been fixed so far without much delay. Complaints about lack of training were numerous also, but people seem to cope.

The situation in Kankan was somewhat different. A monitor amplifier, one Studer tape recorder, a remote control for one reel-to-reel, a lines amplifier--all these components have failed but are not under repair. There is no workbench in the shop room, lots of dust, and unclassified parts. A serious lack of training seems to greatly impair the maintenance of this station.

Labé is not much different. One telephone hybrid unit has not worked since the opening, the monitor amplifier is working on one channel only, one Studer is under repair, the AM band on the Philips receiver no longer works, and, most serious, the console itself has three channels out of order. A smaller console has been bought to replace the dysfunctional one, which will be shipped to Switzerland for repair as soon as money is presently available for transport. A serious lack of training seems to have greatly impaired the maintenance section of this station too.

Transmitters. The main differences between the technical operation of the four stations is in the way they transmit their programs.

Nzérékoré does not have its own transmitter. In order to respect its agreement with Switzerland that it would provide the transmission for Radio Rurale, the government gives the station access to the local FM transmitter (500W, 93,4 FM) used by Radio Nationale. This broadcasts within the city and the surrounding area (50-60 Km). The Radio Rurale modulation signal is brought to the PTT building through a buried cable, from where it is also sent by micro-waves on the national telephone network to the préfectures of Macenta (FM-300W), Kissidougou (FM-40W), Guékédou (FM-40W), and, very soon, Beyla (FM-300W). From these sites, the signal is broadcast on the local Radio Nationale FM transmitter on a shared time basis, as in Nzérékoré. This daily operation seems to work well and to reach a good portion [40 percent?) of Guinée Forestière inhabitants.

Kankan is using an old 2 X 25 KW AM (1305 KHz) transmitter (linked together for a total of 50 KW) located in the nearby PTT building. A buried cable links the two building. This equipment was given by Czechoslovakia in 1978 but sat outside exposed to sun and rain till 1986. It was installed and used by Radio Nationale till 1990, when, to respect their agreement with the Swiss, the government transferred the use of this equipment to Radio Rurale. The generator, fuel, maintenance and staff are all supplied by the government. Since spare parts have not been available from Czechoslovakia, only one 25 KW transmitter

remains on duty; the other has been cannibalized for parts.

Even so, the remaining transmitter is always on the edge of failure, its tubes being old and degraded. Performance is impaired, and day range is limited to an average of 100-120 Km. The operation of this transmitter is not reliable at all, and is even dangerous, as no fence surrounds the antenna and the exposed feeder cable. The technical director at the Conakry's PTT office has confirmed that purchase orders have been sent to potential suppliers of spare parts for this transmitter (copy where shown) and that money as been budgeted for it. Repairs should be underway in the coming months.

Labé is using also an old 50 KW AM (1386 KHz) transmitter, given by the Chinese in the early 1970's to Radio Nationale, located 3 Km form the studios. It was not installed until the late 1970s and has been under operation only since 1981. Under a long-term agreement with the Chinese government, which supplies an engineer and his interpreter as well as all parts for maintenance and operation, the transmitter was used to rebroadcast Radio Nationale programming till May 1990, when its use was given to Radio Rurale.

This transmitter is in good working order and performing satisfactorily. The day service area extends to about 150 Km, though it can be heard as far as Sénégal and Mali and even in Spain at night. But it is costly to operate, drinks a lot of fuel (40-45 Litres/hr) from an old generator (1981), and the agreement with the Chinese ends in December. If the agreement is not renewed, no one knows how it will be maintained.

The audio link between the Radio Rurale studio and transmitter site is via the phone system, and seems to work properly most of the time.

Kindia, like Nzérékoré, has no transmitter of its own and shares the use of two FM transmitter with Radio Nationale. One transmitter (300 W, 96,3 FM) is located in the PTT office nearby (300 m) and the other one (300W, 90,3 FM) is located atop Coliadi mountain, four kilometers from the radio station. This set-up allow the station to reach an area of roughly 50-60 kilometer.

A telephone line is used as an audio link to the PTT office. This line is sensitive to excess humidity and has its share of off air periods. An FM receiver tuned to 96,3 (PTT transmitter) is used at Coliadi to feed the on-site transmitter.

Management and administration

The personnel in Conakry consists of the director, his deputy, a technician, personnel specialist, and an administrator/accountant. Their role appears to be more one of support to the four stations of than supervision and control. The one exception is in the area of finance: as we will discuss in this section, the Conakry office manages the largest part of the budget.

The director of Radio Rurale and his deputy are experienced journalists who have received various kinds of formal education and training throughout their careers. They are not primarily managers. The chief technician is said to be experienced and competent, but we were unable to meet him and verify this.

Among the staff at the radio stations, there are three categories:

Those in the civil service and on the payroll of Radio Rurale

Those on contract to the local station

Those not paid at all.

This third category seems to consist of some who are civil servants officially assigned to other agencies and some who are simply volunteers. At some stations, this group is called the "trainees," though some have been there at least two years and are as competent as their paid counterparts. Others are novices.

The entire civil service staff of Radio Rurale numbers about 30, and the unpaid staff about 60. The station manager (*director*), the program director, four or five producer/announcers (*journalistes/animateurs*), and one or two technicians are hired directly by Radio Rurale. The accountant, chauffeurs, and janitor are on contract. The number of "trainees" (or volunteer staff) varies from station to station. Labé is the smallest with three additional producers and two additional technicians. Kankan has a total of ten trainees, and Kindia has 17. Nzérékoré has about 22 trainees who help the station produce programs in six different languages.

Few staff members are women. Nzérékoré has nine women; Labé and Kindia have three, and Kankan has only one--a trainee.

Only those staff members who are on the payroll of Radio Rurale received the basic training in production funded by FAO. Others have received training on the job from their colleagues and from some of the development agencies with whom they work in partnership. This latter

training, however, is primarily in the content area of sectors in which programs are to be produced (health, animal husbandry, democracy building, and so on).

The station members received a three-day workshop in management sponsored by the Swiss and conducted by a specialist in rural radio from the *Centre International d'Éducation en Radio Rurale a Ouagadougou* (CIERRO). Technicians received two weeks of training in Labé. Others, on an individual basis, have attended other workshops and seminars, some at CIERRO. The station director at Labé attended a ten-day workshop in management training offered by PRIDE in Guinea.

It is worth noting that almost every staff member on the payroll has been there since the opening of the station. Only in Nzérékoré has one person left. In every case morale is high. Staff report each morning to produce, and in some cases, transmit programs; they take a break in the afternoon, and some return in the evening to transmit. Although their civil service salaries are low, by all accounts they are dedicated and enthusiastic. We heard no complaints about low pay, though upon asking, we learned that most of them do not make enough to support themselves. Like many others in Guinea, with the help of family they make ends meet.

Some stations are managed better than others. The one at Labé seems to operate most efficiently, perhaps because it receives more resources from providing local services. The Kankan station does not seem as well managed as the others. Staff are reportedly late from time to time in meeting schedules, and the staff does not appear to work as enthusiastically as those at other stations.

Programming and production

The number of hours each station broadcasts daily is determined by the amount of airtime and transmission power available to it.

Kankan broadcasts from 6:00 to 10:00 each evening.

Kindia is on the air from 8:00 to 11:00 in the morning and from 6:00 until 7:40 in the evening.

Labé broadcasts from 6:00 to midnight each evening.

Nzérékoré is on the air from 6:00 to 9:00 in the morning and from 6:00 to 10:00 in

the evening.

Many programs are one of three formats:

Magazines tématique that run for 45 minutes to an hour and cover topics such as agriculture, music, oral traditions

Emissions publiques, which are games or round-table discussions on rural development subjects

Micro-programmes educatifs, which are spots of two to four minutes, often designed using social marketing techniques to some degree.

But these kinds of programs do not fill the whole broadcast day; they consume less than 25 percent of the airtime. About half the airtime is devoted to messages generated from the communities themselves, including announcements by local groups of meetings, notifications by individuals of the deaths of family members, events, and other messages that people have little other means of communicating. Local governments also use rural radio for announcements.

Much program material is traditional stories, legends and rites, histories of particular families and communities. Some programs are for women and some for youth. Each week includes a program of letters from listeners. Each day, RTG retransmits its daily news program, in French, from Conakry, on each regional radio station.

The most popular programs in Kankan are accounts of daily local events (*faits divers*); special reports on current issues (*sur le tapis*), and a regular visit to one or another locations in the region (*la balade rurale*). The most popular programs in Nzérékoré are those that concern the people's way of living and working--their villages and families. They like to hear about old ways as well as the present. Kindia listeners particularly enjoy a program sponsored by UNICEF in which children take the microphone and exercise their talents. In Labé, which is in the Fula region, people use the radio extensively to communicate messages about family and community members to their relatives who are living in neighboring Sénégal and Ivory Coast as well as within Moyenne Guinea.

Some programs are produced in the studio. Others are taped outside of the studio, when the staff goes into town or travels to villages and other towns in the region. There they engage people in discussions, games, and other activities as part of development-oriented programs.

Producers use the social marketing skills they have acquired in their initial training and through their work with agencies like UNICEF and PSI, which generally make training a part of their contractual agreements with Radio Rurale.

Those who work with the radio staff to produce programs agree that the quality of production is excellent. One representative of an international organization, who himself is an experienced radio journalist, avows that the quality of regional radio productions is ten times as good as that of RTG radio productions (Barry).

The program schedule is almost uniform among the four stations. But each station creates its own program content. People who live or work in proximity to the regional stations are said to be involved in decisions about program content. A weekly program is devoted to exchanging ideas with listeners on programming.[3] Overall, the impression of those who have visited the regional stations is that community support, participation, and involvement in programming is clearly evident.

The advent of rural radio has changed patterns of communication. People are now less likely to walk from village to village to spread the word of family and village events; instead they purchase a short spot on the radio. In terms of development, both Radio Rurale staff and those who work with development agencies have seen changes in behavior related to the messages they air. While no formal attempt has been made to link the use of radio with changes in behavior desired by development agents, anecdotal evidence points to such links. In Kankan, the radio staff said that more people are going to health centers since PSI and the Association for Family Well-Being (AGBEF) have been advertising the centers over the radio waves. When people are asked to share new techniques with each other by participating in radio programs, they do so eagerly, and others follow their advice.

Relationships with users

Radio Rurale is a government agency and functions as a public service in carrying out its mandate to support the development of rural Guinea. It serves three different clientele:

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[3]In contradiction to this general impression, we learned that Kindia gets permission from Conakry to deviate from the uniform program line-up. Also, one account mentions complaints in Kindia that the programming committee was ineffective because the station had to get clearance from the National Programming Committee in Conakry to change its lineup (Jenkins). But we heard nothing else about programming committees.

Individuals and local community groups within range of regional stations who use the radio to communicate

Development agencies that use the radio as part of their social marketing strategies to change the behavior of people in health, agricultural, educational, entrepreneurial, resource management, family management, and other practices related to their economic and social well-being

The national government, which uses rural radio stations to transmit their news broadcasts daily, in French.

Development agencies use the regional radio stations to communicate directly with their intended beneficiaries. They establish a relationship with radio rurale in one of two ways. The simplest is to pay the station to broadcast announcements or to cover an event on a one-time basis. The more complex is to negotiate contract for services with the director's office in Conakry. The contract specifies which stations will produce programs, on what subjects, in what format, quantity, and time frame.

Each agency then develops a relationship with the regional stations to meet its particular needs. In some cases, the stations' producers are left to create programs within the guidelines of the contract. In other cases, the development agency's staff at the regional level works more closely with the producers to develop particular programs.

UNICEF and PSI have the longest history of contracts with Radio Rurale. Since 1992, each of them has entered into a continuous series of six-month contracts for services. They include in the terms of their contracts some training for Radio Rurale staff in the substance of their goals and strategies in order to ensure that the staff has a clear understanding of what messages they are to deliver. Most of these programs seem to be based on the procedures of social marketing. Reports on how skilled the producers actually are in social marketing research are mixed. They probably depend on the development agents for these skills (LearnTech; UNICEF; PSI; PASE).

Radio Rurale presently has contracts with the ministries of education (MEPU), health, animal husbandry, and the interior (for voter education). The development agencies with whom it works, in addition to UNICEF and PSI, include the U.N.F.P.A., the German Friedreich Ebert Stiftung, some local non-governmental organizations (NGOs) that have support from Belgian agencies, and with USAID/Guinea-supported NGOs such as PRIDE and AGBEF.

The representatives of Radio Rurale's highest paying users, UNICEF and PSI, with whom we talked, said that the costs they paid for programming were satisfactory, and they would be willing to pay more. UNICEF, however, has raised the point that it invests in the training of producers as part of its semi-annual contracts, yet apparently receives no adjustment for this benefit. But Radio Rurale's contractual agreements with development agencies, clearly, are not simply business transactions. They are also a form of donor support.

In Section 4, we will describe at greater length how those agencies affiliated with USAID/Guinea are using Radio Rurale's services.

Financing

While we did not make a thorough study of Radio Rurale's finances, we were able to piece together the size of its budget, costs of operations, and sources of revenues. We wanted to learn about the general processes used in planning, budgeting, and accounting and whether non-government sources of revenue might be raised.

The budget. At this time, Radio Rurale does not have the authority to manage its own budget. It simply keeps track of salaries paid by the ministry of finance to permanent employees and forwards bills for operations to the ministry of finance for pre-payment or reimbursement. We could not determine the relationship between revenues generated for the government by Radio Rurale, such as those from contracts for services and those from donors, and its allowed expenditures.

Radio Rurale prepared a budget for 1994 and is in the process of preparing one for 1995. It has two parts: one part is administered at the director's office in Conakry, and the other at each of the regional stations. Annex D displays the 1994 budget.

The line items of the budget administered in Conakry include the major expenses of operating the stations: fuel for operating transmitter generators, purchase of studio equipment, provision of studio facilities, utilities, production supplies, and vehicles. This part of the budget also includes salaries of permanent employees. Altogether, it represented 64 percent of total budgeted expenditures in 1994.

The largest single item in the total director's budget is fuel for transmitters (20 percent of the total).[4] Salaries consume 15 percent of the total budget, and fuel for operating vehicles and

[4]The second largest item is for studio equipment, which was donated directly by the Swiss.

the studio generator are the third largest item at 8 percent.

The four stations administer the other part of the budget: funds equal to the other 36 percent of their total expenditures[5]. The line items in their budget are: contract personnel; purchase and rental of office equipment and furniture; office supplies; vehicle maintenance and fuel; studio generator maintenance and fuel; building maintenance; production costs (travel, lodging); and training and special events.

Sources of revenue. Radio Rurale receives funds from four sources:

Cash and in-kind services from the government

Capital investments from donors (both equipment and training)

Payment for services with ministries and development agencies that are negotiated and paid in Conakry

Fees for services to individuals and local organizations that are negotiated and paid at each of the stations.

Our best estimate is that Radio Rurale has received about $1,760,000 in gifts from foreign donors. This includes $1,500,000 from the Swiss for studio equipment, $225,000 from FAO for training, and $35,000 from UNESCO for the 1989 round table meeting, to which representatives of rural radio stations in other West African countries were invited. It is not clear which, if any of these donations were given in funds and which were given in goods and services.

We were given a year-to-date account of revenues generated from contracts with ministries and other development agencies, which amounts to about 34 million guinean francs[6]. Although this account seems to be almost complete, we know that it does not reveal all such sources. For example, we are aware that Radio Rurale also received what we estimate to be about 15 million francs from UNICEF in 1993 that covers some services in 1994.

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[5]This is the 1994 budget, in which the line items are somewhat different than those of 1995. But since the 1995 budget is still in preparation, we cannot determine what portion of the total budget these items are expected represent.

[6] One U.S. dollar is roughly equivalent to 1,000 guinean francs.

Each station appears to receive about 250 thousand francs each month for services to local individuals and groups. These transactions are made at the stations. The exception is Labé, which receives about 1.5 million each month, because it is fortunate to have a powerful transmitter that allows the diaspora of Fula people to communicate with their families in Guinea. The Labé station benefits financially from this large service area, even though the area extends beyond the boundaries of the people it is chartered to serve as a development agent.

The 1994 budget projects that the stations will contribute about 112 million francs to the cost of operations. Yet, each station files a monthly financial account (along with all records of transactions) to the central office, and Conakry's records show that the four stations, together, had received only about 12.7 million francs by the end of August. Thus, we estimate that they will contribute about 20 million francs this year. And, if Labé did not receive so much additional income from the greater Fula community, the stations would generate no more than about 12 million.

When a station does not generate from local services enough to cover current costs, it either borrows the money locally or reduces its operations--local hire contracts, use of vehicles, and so on. It does not get additional subsidies from Conakry.

The government contributes the remaining portion of funds and in-kind goods and services to the 610 million franc budget.

Production costs. We have several sources of information about production costs, with little consistency between them. Based on the total 1994 budget, the director's office calculated the cost of one hour of production at about 70 thousand francs. The calculated cost of production per minute was about 1,160 francs.

A list of charges published by the director's office in 1993 includes the following:

A *table ronde* of one hour costs 350.5 thousand francs.

A 15-minute *magazine* costs about 190.5 thousand francs.

A *micro-programme*, which usually runs two to four minutes, costs 92 thousand francs.

A spot costs 50 thousand francs.

Charges are not based directly on the cost per hour calculated in 1994. There is considerable difference between costs per hour (70 thousand francs) and charges per hour (350.5 thousand francs).

The stations charge at far lower rates for airtime they offer directly to individuals and community groups and organizations. An announcement can run between 3 thousand and 7 thousand francs, and community program around 10 thousand francs. These rates seem to be closer to the 1994 budget-based actual costs of just over 1 thousand francs per minute.

Conclusion. Radio Rurale has diverse sources of revenue, but most of the budget is financed and managed by the government. At present, by no account do local revenues appear to cover local expenses, yet the stations continue to operate. They do not operate at full speed, because they do not always get the resources they expect--whether these be fuel, supplies, or personnel. On a day-to-day basis, if they have the resources, they go on the air; if not, they don't.

CONSTRAINTS AND SOLUTIONS

Summary of strengths

We begin this section by briefly reiterating the strengths in the operation of this relatively new institution in order to put its constraints into perspective. Radio Rurale has been functioning for four-and-a-half years in Labé and Kankan, nearly two years in Kindia, and one-and-a-half years in Nzérékoré. It makes full use of the airtime available to each station, and could easily fill more. The quality of the programs it produces is excellent, and its production staff is intimately familiar with the people and their development needs of the communities they serve.

In spite of low salaries, all but one of the original staff of about 30 is on the job today. In addition, many others are working without pay. The stations operate six or seven days a week. The stations manage reasonably well the small budgets over which they have control, their clients are pleased with the programs produced and the partnerships they have formed, and it appears that most people within range of the signals listen to the programs.

In sum, the staff of Radio Rurale has made it a credible source of information about development. But the stations suffer severe constraints that keep them from growing and improving.

Constraints

There are five principal constraints to Radio Rurale's functioning as a robust channel of communication in rural Guinea:

Inadequate transmission of the radio signal

Unreliable electrical power sources for studio operations

High costs of operation

Insufficient sources of revenue

Incompetence in entrepreneurial management, marketing, and technical maintenance.

Inadequate transmission of the radio signal. As we have described, transmission equipment and capacity varies considerably from station to station. All are limited severely in the amount of airtime they can operate and the portion of the service area they actually reach.

> Nzérékoré shares airtime with Radio National, limiting its airtime to four hours each evening. The signal covers only about 40 percent of Guinée Forestière.
>
> Kindia also shares airtime with Radio Nationale, and covers no more than 20 percent of Basse-Guinée.

In both cases, special circumstances or equipment failures elsewhere in the Radio Nationale network force Radio Rurale to shorten its airtime even more, as Radio Nationale has priority.

> Kankan covers about 30 percent of Haute-Guinée. The reliability of the transmitter is so low that operation periods of longer than four hours are not allowed by its technician.
>
> Labé covers about 80 percent of Moyenne-Guinée; it is the most powerful transmitter of all four stations, but its maximum reach (day service) is still not farther than 150 Km and is not sufficient to cover the whole of Moyenne-Guinée. Operation of this transmitter is so expensive that expansion of broadcasting hours cannot be considered.

The night range of these two transmitters is quite broad (Spain and Portugal have been mentioned), but it can vary considerably with varying weather conditions.

Each station would like to broadcast all over its region, requiring a reach from 250 Km to 400 Km.

Unreliable studio electrical power supply. All stations share the same electrical power problems. Whether they use their own generators or local utilities (which have evening service only), the same problems of unreliable and very unstable voltage arise. The main cause of electronic equipment failure seems to be lightening that is discharged through power lines when studio equipment is connected to a local utility. All stations used voltages stabilizers to try to keep those problems under control but it is not sufficient.

Generators for studio operation bring the same problems as those described in relation to generators for transmitters: high cost, spare parts, maintenance, and so on.

High costs of operation. The highest costs of operating the four radio stations are fuel for running the generators that feed the transmitters (about 20 percent of operating expenses), fuel for the generators that feed the studios when municipal power is absent (about 8 percent), and salaries for employees (about 15 percent). The cost of salaries would be far higher if every employee actually working was paid, and if all were paid a decent wage.

Transmitter operation

High power transmitters are not only expensive to purchase, they are also very costly to operate. A 50 KW all solid state, latest-generation transmitter requires more than 100 KW of electricity to operate. In developing countries, where other sources of power are often not available, a huge generator (125-150 KVA) is usually needed to provide this amount of electrical power. Such a generator will consume an average of 35 to 37 liters per hour, bringing the annual cost of a four-hour daily operation to nearly $40 thousand.

But fuel cost is not the only problem with generators. High maintenance costs, hard-to-find competent mechanics, fuel storage and delivery, heat generation, pollution, short useful life, poor voltage regulation and stability, low reliability, poor availability of spare parts all impair the use of large generators. These expenses (including capital) can easily bring the cost of each kilowatt produced to 30 or 40 cents (compared to 4 to 12 cents in North America). (See Annex E)

High power transmitters have other disadvantages as well. The heat they generate requires sophisticated ventilating equipment; they create an hazardous working environment; they depend on the availability of costly spare parts and require competent, full-time technicians for maintenance. Add to this the requirement of a huge antenna system for proper performances and the sophisticated transmission cable. (See Annex E)

Many of these costs are recurrent, so adding more broadcasting hours significantly raises the cost of operation.

Studio operation

Generator problems are exactly the same than those for transmitter operation.

Salaries

According to the 1994 budget, salaries constitute about 15 percent of total costs. About 30 of

the more than 90 people working at Radio Rurale are on the civil service payroll. A dozen or so others are on local contract, and the rest receive nothing for their service at the station. At Radio Rurale, civil servants are poorly paid, as elsewhere, but this does not appear to affect the performance of employees, and thus, at present, does not constrain operations.

The government has begun a civil service reform to rationalize salaries so that people are paid more in line with their responsibilities, have incentives to work harder and get promoted, and disincentives to pocket government money in order to supplement their salaries. But reforms that would raise salaries significantly are not in sight (World Bank). When civil service salaries are rationalized and raised, this cost will become more of a constraint.

Insufficient sources of revenue. As we have said, Radio Rurale has four sources of revenue: the central government, foreign donors, services contracted at the national level, and services paid for at the local level.

Government

These revenues are inadequate to operate at full potential, and as long as the government is the main source of revenues, they will probably continue to be so. Despite its wealth of natural resources, Guinea's present ability to invest in capital improvements in the public sector and to cover recurrent costs of government operations is severely limited. Although improvements are projected as a result of the structural adjustment imposed by the International Monetary Fund (IMF) and World Bank, Radio Rurale cannot expect to see larger sums available from the government in the near future.

The director's office estimates in its 1994 budget that the government funds about five-sixths of Radio Rurale's 610 million franc budget.[7] Our own estimate is that it funds about nine-tenths.

Donors

At this time foreign donors are not investing in Radio Rurale except as users of airtime and production services. In spite of three round table meetings on Radio Rurale, at which donors

[7]We have noted that the government's budget includes amortization of the Swiss investment in production equipment.

agreed on the importance of the institution and the need for cooperation in donor support, nothing has come since the generous contributions by the Swiss and FAO. At present, both Radio Rurale and other donors such as UNICEF and UNESCO are expecting USAID/Guinea to step in. But even if foreign donors do invest more, it will likely be in the form of capital (equipment and/or training), and will not address the problem of recurrent costs.

Services

The four regional stations generate between one-tenth and one-sixth of Radio Rurale's budget from services contracted at the national level and those purchased at the regional level. National-level contracts are far more lucrative than regional-level purchases. The former produce about 50 million francs annually and the latter about 20 million.

As we described earlier, the director's office calculates the rate of fees for services on the basis of the annual budget. The problem with this calculation is its assumption that all four stations are able to charge for six hours of programming per day. In fact, they do not charge for every hour of programming. And, even if they did, they would not be able to collect, because, over the course of a year, many, many hours of airtime are lost, due to technical problems. In addition, even though the regional stations charge local governments for their significant use of airtime in making announcements and covering events, they never receive payment for these services.

In addition to the problem of inadequate airtime is the problem created by the centralized fiscal management of Radio Rurale. Because all the large contracts for services are negotiated at the central level, the regional stations cannot manage the relationship between their income and the services they provide. They do not know, for example, what portion of their programming in population is paid for by PSI, what part is paid for by UNFPA, what part is paid for by the ministry of health, and what part is subsidized by other sources in the government.[8]

Insufficient competence in station management, marketing, and production equipment repair. By and large, the stations are already being well managed, though fiscally, they are small operations. The main weaknesses in station management are the result of the managers'

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[8]Nor do they know what portion of funding is being paid for programming in each sector. In fact, if more health agencies contract with Radio Rurale than do education agencies, for example, the former may subsidize the programming of the latter, because program time seems to be allocated fairly evenly among sectors--not on the basis of actual contracts.

brevity of training in operating full-scale radio stations, the staffs' total unfamiliarity with the concept and practice of marketing services, and an inability of most of the technicians to troubleshoot and repair production equipment.

Because Guinea's development was retarded by decades of colonial rule and over 25 five years of centralized socialist policies that discouraged entrepreneurship, people are only now learning to operate a business. The station managers of Radio Rurale are no exception. They appear to be bright, capable people, eager to learn and to make their stations succeed, but so far they lack the opportunity and training.

In particular, while they provide excellent services, they do not market these services. Because contracts are negotiated on a central level, they have had no experience in conducting market research, pricing services, or selling them. Without the ability to market, they cannot survive as viable businesses.

Finally, most of the technicians, while able to maintain and operate the production equipment, cannot troubleshoot and repair it. Technicians at each station have been trained in electronics, but are not up-to-date in troubleshooting, and lack depth of experience with European-made equipment. Some equipment has been defective since it arrived yet never repaired. Other equipment is scheduled to be sent abroad for repair, yet, parts and test equipment are available, and trained, qualified staff should be able to fix all equipment on site, or, at worst, in Conakry. (We note, however, that the Swiss supplied a sophisticated piece of audio test equipment, that they cannot operate because the only instruction manual available is in English.

Spare parts and supplies are poorly managed, both at the stations and in Conakry. Spare parts should be managed by the station's chief technician and orders should be submitted to the station director only for approval. Follow-up should also be the chief technician's duty. But though the actual situation is different at each station, no technician has set up a system to manage parts availability. At one station the director is responsible for parts; at another it is the technician. It gets worse when orders finally arrive in Conakry. No one technically competent seems to be in charge of fulfilling the orders, and they fall into the hands of the accountant, who cannot determine if the proper parts have been received.

Summary. Full operation of Radio Rurale is constrained by high costs--primarily those of operating transmitters--and low revenues, resulting from insufficient airtime available to meet demand, and a lack of training in entrepreneurial management, marketing, and technical maintenance.

Solutions

We see two, complementary, solutions to these constraints. One is to invest in a transmission system that uses more appropriate technology, which would dramatically reduce fuel costs and provide more flexible use of airtime. The other is to decentralize the fiscal management of Radio Rurale for the purpose of improving the use of resources and providing incentives to market services more vigorously.

Replace the transmission system with more appropriate technology. The solution to the transmission problem that is currently on the table is to use higher power transmitters for broadcasting on the AM band. But wide areas like those of Guinea's four natural regions cannot be covered with 50 KW AM transmitters. Even 500 KW transmitters would not cover the wider regions. In a city near the country's border, like Nzérékoré, almost half the signal coverage would be lost in neighboring countries (see map). The cost of this solution, even for only four 50 KW transmitters, which will not cover the regions, will be more than $4 million. And shaded areas, fading zones, and other related problems will still be unresolved.

An alternative solution is to install local low-power AM transmitters in communities (FM transmitters are also valid) throughout the country and link the transmitters in each region by satellite, thus creating four regional networks (see Annex E).

Low-power transmitters

How can low-power transmitters replace high-power transmitters? In order to barely triple the service area of a transmitter, its power output must be multiplied by a factor of 100 (see Table 1 in Annex F). Thus, to cover an area with a radius of 150 Km (70,685 Km^2), we would use a 50 KW (50,000 watt) transmitter. Or, we could use seven 500-watt transmitters, each of which covers 55 Km in radius (9,503 Km^2), and, when linked together, cover almost the same area as the 50 KW transmitter (see Annex F2). This is a theoretical situation. On the ground, the location of these small transmitters can vary considerably, permitting them to be placed in the centers of communities and not in uninhabited areas.

The main cost advantage of a low-power transmitter network is the savings it permits in electrical power consumption. As we have discussed, a 50 KW, all solid-state, latest-generation transmitter consumes more than 100 Kw of electricity, which is a huge expense to operate by a diesel-fuelled generator. A 500-watt transmitter, in contrast, consumes only 1 Kw of electricity, so that seven transmitting sites together consume only 7 Kw. Therefore far less fuel is required to cover about the same area with comparable quality of service.

Low-power transmitters have other technical advantages: low heat generation, freedom for work environmental hazards, easy availability of spare parts, unattended operation, simple antennas that can be installed on a wooden pole or a simple self-supporting tower, and the transmission line is a simple coaxial cable (See Annex F).

Satellite networks

Since satellite services have become commercially available, methods of transmitting have evolved--and continue to evolve--at a rapid pace. Only a few years ago the rental fee for a space segment to transmit an audio signal by satellite averaged $25 to $30 thousand a year in North America. But with the advent of compact disc technology, audio signal coding in digital format has become very efficient and inexpensive, and the development of compression technique by the use of psycho-acoustic algorithm has reduced by a factor of eight (and even more with new algorithm being developed) the amount of data needed to transmit a digital audio signal. To transmit then the same audio signal in digital compressed format requires a much smaller space segment on the satellite, one which can now be rented for less than $8 or $10 thousand in North America.

Such a network requires three pieces of equipment:

An uplink to the satellite at each regional radio site. This is a low-power transmitter with ancillary dish antenna of small or medium size, which uses low electrical power, typically less than 200 Watts.

A satellite dish of the same size with a suitable receiver at each low-power transmitting site. Such receivers typically used around 40 Watts.

As many low-power transmitting sites as desired or needed to cover the entire region. The transmitting power at each site can vary from as low as 0.5 watt FM in a small, isolated village (up to 3 to 5 Km in diameter) to a 100 Watt or even 500 Watt AM or FM transmitter in a larger city and its surrounding area (taking into account the probability of higher industrial noise).

In addition to lowering fuel costs, there are other potential cost savings from the satellite system:

The signal is available 24 hours a day; to save money, two regional stations could even share the same satellite channel.

Small receivers are reliable and easy to maintain. Each community can take care of its own.

Operations can be controlled remotely.

With improving digital technology, equipment costs continue to go down; equipment is computer controlled and software updatable (See Annex H).

Photovoltaic power

The process of generating electricity by mean of photovoltaic solar panels is well known and well establish. Such system has proven to have quite better performances than generator and at a lower cost per kilowatt on the long term. They generate totally stable and reliable electrical power, almost without any maintenance. No need for fuel and all related problem.

Small sites will require as little as 50 Watts of electrical power, and large sites up to 1.2 KW. Most of them will be perfectly suitable for photovoltaic (PV) operation (solar panels), as the cost of generating solar electricity comes down in relation to the power required. The higher-power-consumption sites can also be PV powered if they receive lots of sunshine. At some sites, a PV power and a small generator can be combined to function throughout periods of low sunshine. The generator would then be used to charge the battery, operating at almost its rated output, maximizing its efficiency. By doing so, the load is always taking its voltage from the battery bank which is then tampering all overvoltage excursions and other peak and surge coming through the generating system. It then become quite more easier to get rid of the remaining transient with standard protection equipment.This would ensure stable voltage to electronic equipment at all time. All of these operations can be fully automatic.

Photovoltaic system are competitive and affordable for low power demand only, they can be used only to power the studio equipment. High power transmitter cannot be powered by photovoltaic system, price of such equipment being astronomical.

Photovoltaic systems can solve some of the financial and technical problems presented by generators: they have almost no operating cost (sun being free to every one), low maintenance cost, no fuel storage or delivery problems, no heat generation, no pollution, long useful life, very good voltage regulation and stability, high reliability, easy access to inexpensive spare parts and easily expandable. (See Annex I)

Social and economic advantages of newer technology

One value of this alternative technology that it permits local communities to own and operate their own radio stations. Each transmitter can be used by the community for its own programming as well as to transmit regional and national signals. We will discuss the implications of this for democratization in the next session.

Another important advantage for Radio Rurale created by this system is the opportunity it offers to share the costs of purchasing transmission equipment with Radio Nationale. This transmission system can carry two independent signals without adding equipment, allowing both Radio Nationale and Radio Rurale to use it simultaneously. They can both use the same uplink to send their signal to the satellite (each using its own space segment), and the same receiving equipment for the downlinks. By retransmitting their own signals through their own local transmitters, they can both cover the whole country.[9] Even if transmission equipment is shared, each operation is totally independent of the other one.

In addition, the regional networks can be linked together in a national network, and other components can be installed for fax or data transmission, or expansion to stereo service. Since the satellite system is carrying data, it can be use for other purpose than audio signal transmission. For sure, at the beginning of operation of such a network by Radio Rurale, they will not use the network 24 hours a day, so time will be available for other broadcasting or data transmission purpose. Already, a private business man has shown interest on buying airtime on the network or in participating financially to its implementation and share the use of it. A letter confirming its interest is included in the annex section.

Decentralize management. The second solution is to decentralize the management of each station. Once the regional stations do not need to depend on the central government to operate transmission systems and pay their fuel costs, they will be in a better position to manage their own resources. Partly because of the original intent to decentralize rural radio, and partly because distances and poor infrastructure make centralized control impractical, the four stations already operate with much autonomy. What they are missing is financial autonomy. If each station manager had control of his budget, he would have the freedom to decide how to use the money made from lucrative contracts with national and regional development agencies as well as from smaller-scale services to local people and institutions.

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[9]One of the main advantages for Radio Nationale of the satellite system, which broadcast directly to each transmitting site, is the elimination all those hops and steps through the micro-waves system; whenever one hop is missing, the remaining chain fails.

Small central support

Decentralization would still require some central support. First, because the components of studio equipment are probably not available where the regional stations operate, and perhaps not always even in Guinea, the stations will a central supply source. Next, the stations will continue to need central support to coordinate some activities with ministries and other development agencies. Even when contracts for services provide funds directly to the stations, it will be more efficient to have one or two people in Conakry working on a day-to-day basis with the offices of these clients in the capitol.

Training

Finally, the staffs, particularly the station directors and some of their permanent staff will need training in how to run the stations like a business. They must learn to manage a larger operation, and they must learn to market their services. And the technical staff will need to become expert in repairing equipment, in order that operations run as efficiently as possible.

Fortunately, resources for training in rural radio are available in West Africa, and resources for training in management and marketing are available in Guinea. The *Programme Integre pour le Developpement de l'Entreprise* (PRIDE) is a local NGO, supported by USAID/Guinea's Rural Enterprise Development project, that offers training in management and marketing for small businesses. PRIDE's directors met with USAID/Guinea in April to discuss the role its organization could play in training the staffs of Radio Rurale. PRIDE offers two types of training and assistance: regularly scheduled Entrepreneurship workshops (two Radio Rurale staff members have already participated in these), and in-house training in management and marketing, using modules it has developed.

We believe the radio station managers will also need considerable direct technical assistance in the specific skills they need to better manage their resources. PRIDE may be open to supplying such assistance.

Other training and technical assistance resources available in West Africa is the *Centre Interafricain d'Etudes en Radio Rurale de Ouagadougou* (CIERRO). CIERRO, which is an arm of membership organization of francophone African national radio and television stations and receives support from UNICEF, FAO, and the *Agence de Cooperation Culturelle et Technique* (ACCT), provides a two-year training program for rural radio producers and technicians. Radio Rurale in Guinea has already sent people through this program, and has contracted with CIERRO consultants for training in Guinea. This is a probable source of

further training in production equipment maintenance and repair.

USAID/Guinea also has available the considerable resources of LearnTech, a centrally funded project that provides a wide range of communications technology assistance to development projects.

In any case, private enterprise development is a competitive advantage that USAID/Guinea offers, and training and technical assistance in this area, which are required for Radio Rurale's sustainability, should not be hard to find.

Summary. Just as the constraints to full operation are interrelated, so are their resolutions. The key to reducing constraints is a technical one: replace the current transmission system with one that is more appropriate to Guinea's needs. A network of many low power transmitters serving every community in the country and connected by satellite will reduce the total cost of fuel required to generate transmission power and make the cost of powering its own transmitter affordable for each community.

Once the costs of fuel have been reduced and placed in the hands of local communities, the four regional radio stations will be in a position to manage their own business. By decentralizing the management of finances, personnel, equipment, and supplies each station can market its services and benefit directly from the quality and quantity of production it provides. Local training resources are available.

USAID/GUINEA'S INTEREST IN SUPPORTING RADIO RURALE

USAID/Guinea already supports Radio Rurale in a small way through contracts for services with some of USAID/Guinea's contractors and counterpart organizations. But the potential of the institution to help the mission meet its strategic objectives has hardly been tapped.

Actual uses

Five of the mission's projects now use Radio Rurale to some extent. Only the Social Marketing of Contraceptives project and the Education Sector Reform project have contracts at the national level. The others pay regional stations to broadcast announcements and occasionally cover events.

Social marketing of contraceptives. The health and population office collaborates with AGBEF, the ministry of health, and the National AIDS Committee to increase the availability, accessibility, affordability, acceptability, diversity, quality, and use of family planning and STD/AIDS prevention products and services. The project supports health centers in the Haute Guinée and Guinée Forestière regions, and it works with Radio Rurale to broadcast programs that promote the use of these centers for family planning. The project also works with Radio Rurale in Guinée Moyenne to broadcast information about preventing AIDS and STDs.

Population Services International (PSI), the project's implementing agency, has had a series of six-month contracts with Radio Rurale that began in August 1992. In February 1993, it contracted with each of three stations (Kankan, Labé, and Nzérékoré) to produce six *magazines*, six *tables rondes*, 12 *spots*, and 12 *micro-programmes*. For a six-month period, PSI paid a total of about 15 million francs.

PSI is pleased with the services it receives from Radio Rurale. Both at the national and regional levels it has developed good working relationships with the radio staff. PSI spent some time training these staff in precisely the areas of its interest so that the programs they produced would be on target. They work with them during the early months of programming and help them pretest messages. PSI has trained about 25 Radio Rurale producers, some of whom were already experienced public health professionals, in its specific areas of interest.

The contract specifies that Radio Rurale will collaborate with PSI in evaluating the impact of its radio messages, and that PSI will get a copy of each taped program an a certified account of actual broadcasts. PSI only began this summer to prepare for a full-fledged evaluation of

the impact of its information, education, and communication (IEC) efforts, including the use of radio. But it does have some information on the value of its radio communications. In a survey of over 80 women who visited health centers during a 16-day period, PSI found that about 40 percent of them got information about family planning from the radio. Radio is the most often cited source of information; the second is word of mouth from friends, which is also a function of radio broadcasts, since those who hear tell others.

In addition, PSI gets feedback from the listening groups it forms to monitor broadcasts and stimulate discussion and action. These groups help them determine that the messages are meaningful and relevant to the intended audience. Other USAID/Guinea supported projects also use listening groups for the same purposes.

PSI also has other anecdotal data that indicates the importance of rural radio in moving toward its strategic objectives. For instance, when in March 1993 the family planning agents met resistance in Labé from within the Muslim community, they persuaded an influential imam to participate in a discussion with listeners on the air. He gave his support to the measures being promoted for preventing AIDS and STDs, and the resistance ceased.

In general, the PSI staff who work with Radio Rurale believe that radio is credible to the rural people; they believe what they hear. The Radio Rurale staff works with good will, talent, an openness to new ideas, and respect for their partners in production. They conduct interviews well, and the audio quality of their productions is excellent.

PSI and its partners would like to be able to use more airtime than Radio Rurale can make available to them. One representative said they would be willing to pay more, because they currently value the service at more than they are charged. What is not satisfactory, however, is the failure of the signal in Nzérékoré to reach the entire region; they cannot get radio messages to reach some of the communities served by health centers.

Natural Resources Management. This project works with the National Forestry Service to improve the management of natural resources in the three target watersheds in the Fouta Djallon Highlands for profitable and sustainable agricultural production. The implementing agencies are Chemonics and the Wisconsin Land Tenure Center. Although most of the area served is in Guinea Moyenne, some of it reaches into the Basse Guinea region.

The project has only begun to work with Radio Rurale. Its first program was broadcast in June. This was a 30-minute program in which the acting director of the responsible government agency described the project's aims and activities. The program was rebroadcast

once, and the limited feedback received was positive (first six-monthly report of 1994). In July, Radio Rurale broadcast a second program of 15 minutes on the benefits of animal traction.

Project staff have created two listening groups in each of two of the target watershed regions. The listening groups serve both to help villagers listen to the programs, as not all of them own radios, and to help staff find out about the appropriateness of messages.

Agricultural marketing investment. The Rural Development office works with the Agricultural Marketing Foundation and the Ministry of Agriculture to increase the growth and efficiency of agricultural markets. The implementing agency is Sheladia, Inc. The project is established in all four rural regions through its membership of over 400 farmers.

The Agricultural Marketing Foundation has worked with Radio Rurale on a regional level one year ago--in October 1993--to announce its general assembly and to cover the main events of that meeting. During the past year it has announced and covered regional meetings as well. Radio Rurale has also conducted interviews with staff at the foundation and with members as a means of informing more farmers about the organization and inviting them to join.

The foundation also plans to use Radio Rurale to help in its marketing and distribution efforts. We will discuss this just below.

Education Sector Reform. The Human Resources Development office works with the Ministry of Pre-University Education to achieve two purposes: (1) a level of staff and organizational performance within the ministry that promotes a continuously improving quality of schooling to a continuously increasing percentage of the school-age cohort, and (2) equitable access to girls and rural children through support in the implementation of the government's National Education Policy Reform (PASE). Although USAID/Guinea uses no implementing agency, it has personal service contracts with a few individuals to give technical assistance to the ministry.

The ministry has established a Committee on Equity to plan and implement strategies to persuade parents and communities to send girls to school. The committee is working initially in eight pilot prefectures, two in each of the four regions. They have employed two people in each pilot area to work as campaign promoters. USAID/Guinea provides a media consultant to the campaign. The promoters hired by the committee have established listening groups to increase listenership and to help people discuss what they hear on the radio and act on it.

USAID/Guinea's consultant has worked with the promoters to study the constraints to girls' entering and staying in school and, on the basis of this study, to create messages for the campaign.

During the second half of 1993, the committee worked with Radio Rurale to explore the use of radio in its campaign. In January 1994, it contracted for a series of programs to be broadcast at each station over a six-month period. These include 10 *magazines*, five *tables rondes*, four *emissions publique*, and eight *micro-programmes* and *spots*. The cost of this activity was just over 6 million francs. USAID/Guinea used PL480 money to purchase airtime.

The media consultant, who has worked more closely than others in the committee with Radio Rurale, was pleased with the quality and impact of the radio programs and wants to renew the contract. But Radio Rurale's lack of coverage of all rural areas poses a problem for the project. In Kindia, the signal does not reach either of the pilot prefectures. In Kankan, the broadcasts are not aired reliably because of transmitter problems. In Nzérékoré the signal is sometimes not strong enough to reach the target audience. Only in Labé is the transmission system reliable, and even that shuts down from time to time when power is cut temporarily.

The committee would very much like to see Radio Rurale improve its transmission system, because its broadcasts are the best source of information to parents. In addition, the ministry has considered using rural radio for a different purpose--interactive radio instruction in existing schools and in communities where there are no schools. We will discuss this below.

Rural enterprise development. This project works through PRIDE, a local office of Volunteers in Technical Assistance (VITA) to encourage and promote the development of viable, rural-based, small-scale enterprises. PRIDE trains, supports, and makes loans to managers of micro-enterprises and promotes the vitality of the private sector as a healthy environment for new small enterprises.

The organization has regional offices in Kindia, Kankan, and Labé and has established a rapport with the Radio Rurale staff in those regions. It would like to develop programs for two purposes. One is to raise awareness of its own goals, strategies, and services. The other is to broadcast in the three regional languages the training modules it has developed in marketing and management.

So far, the project has only begun to talk with Radio Rurale staff about providing services for either of these purposes, the second of which we will discuss as a potentially new kind of

service: broadcasting somewhat more formalized training courses for adults in rural areas.

Potential uses

In addition to the uses that USAID/Guinea projects are presently making of Radio Rurale, project managers and those with whom they work in Guinean institutions have raised the possibility of several new, more extensive uses of rural radio.

Education sector reform. The project with potential to make the most extensive use of rural radio is the one in Education Sector Reform that will be designed later this year to continue some of the activities of the current education program and to introduce new activities. These activities will center on measures to improve the quality of instruction: textbook development, curriculum reform, assessment and testing, and in-service teacher-training and support (Tietjen, DeStefano).

At this time, it is conceivable that the new project could include a sizeable radio component to bring lessons directly into the classroom or into learning groups that are organized where schools are not accessible. Instructional radio is a strategy that directly addresses the need for curriculum reform and related qualitative improvements. Moreover, USAID/Guinea has a particular competitive advantage in this area: AID has introduced interactive radio instruction (IRI) in South Africa, Kenya and Cape Verde as well as many countries in Latin America and some in Asia (USAID, *Interactive Radio Instruction*; Moulton, *Interactive Radio Instruction and New Learning Theories*). Ghana is actively considering its use.

The education sector reform in Guinea may be well suited to an IRI component, which has proven to be an effective basic education strategy in places where many children live too far from a primary school to commute daily or where schools exist but teachers are barely competent and textbooks or other learning materials are scarce. Radio lessons provide substance to the curriculum and help teachers give instruction in basic math, language, and science.

In addition to the likelihood that an instructional radio component would be a technically sound strategy in Guinea, the institutional structure for it seems to be in place. According to the deputy director of Radio Rurale, his directorate has had a good working relationship with the ministry of education, particularly the *Institut National de Pedagogie*, which is now responsible for distance education. Key individuals in several education organizations (the Committee on Basic Education for All (CONEBAT), the Committee on Equity, the National

Pedagogic Institute (IPN)[10], have been working with Radio Rurale for several years in efforts to make more use of radio to education rural people and to persuade them of the value of schooling.

The ministry of education envisions other uses of rural radio as well. In August-September of this year, representatives of several government and donor organizations involved in education and media, including those just mentioned, met in Pita at a seminar sponsored by UNESCO on community media and basic education. There they adopted specific recommendations on how education and media agencies should work together to help meet the goals of Education for All.[11]

The recommendations include broadening the scope of radio programs to include:

Pre-service and in-service teacher training (micro-teaching)

Community literacy programs

Expanded support for the equity campaign.

These same key individuals, plus the local UNESCO representative for communications, constitute a committee for implementing the recommendations that came out of the Pita seminar.

This group has also collaborated in planning an instructional radio project. In 1992, UNDP sent a Canadian consultant to help design an IRI project in basic education. For reasons we do not know and that deserve more investigation, UNDP did not fund the project, but a 60-page design document sits on the shelf.

Introducing an instructional radio component to the new education project would give USAID/Guinea a rationale for significant support to Radio Rurale, including improvements in

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[10]The committee members are Bashir Bah of Radio Rurale, Baldet Diallo of CNG/UNESCO, Mamadou Aliou Sow of IPN, Mamadou Kebaly Sow of CONEBAT, and Cisse Passy Kourouma of the Comittee on Equity.

[11]This seminar was the national-level follow-on to a regional seminar on education and the media that is part of a UNESCO project.

its transmission system that would be required to broadcast to classrooms during the day and to reach more areas of the country. But this rationale would not make sense unless a radio component flows from the design--the logical framework and various analyses that will be undertaken next month. To force such a component on the project for the sake of justifying investment in radio would be letting the tail wag the dog.

Democracy and governance. USAID/Guinea is now exploring the feasibility of a new project in democracy and governance. This might also become an opportunity to provide significant support to Radio Rurale within the context of a project.

Radio Rurale offers people in rural Guinea opportunities to participate in the governance of the country's emerging democracy at three levels:

> As listeners, who get information about what is happening in their government and education about how to vote and be an active citizen. An extensive series of programs on how to participate in the electoral process was developed with Swiss support and aired prior to the presidential elections.
>
> As speakers, who have access to radio stations in their communities or to program producers who visit their villages. Radio Rurale has already been used to air and resolve local political conflicts.
>
> As those who govern and operate radio stations. In other countries, some radio stations set up formal means of participation, such as program advisory groups. An advisory group was set up in Kindia, and though it has not yet been very active, Kindia does have a weekly program that allows listeners to express their views on program content.

Radio Rurale has already broadcast an extensive series of messages on the electoral process, financed by the Swiss government. But except for some instances, it has not been used specifically to help people communicate with each other about issues and decisions in governing their own communities. Radio Rurale might play an important role in a democracy and governance project, especially if such a project takes place at the local level and entails a strategy that democratic decision-making in communities. In this case, the project might warrant a substantial investment by USAID/Guinea in local (community) radio stations.

Agricultural marketing investment. The executive director of the Agricultural Marketing Foundation is planning to use Radio Rurale on a larger scale and has talked briefly with its

director in Conakry and the station director in Kankan about this possibility.

The foundation intends to use rural radio for two purposes in addition to its current one. The first is to teach people how to increase agricultural production by using fertilizers and other locally available supplies, where to purchase these supplies, and how and where to sell their produce. For this purpose, Radio Rurale would produce informational and educational programs.

The second is to help farmers, wholesalers, and distributors get information on the location, quantity, quality, and storage prices of produce ready for market. At present, because the difficulty of providing timely communication in rural areas, some agricultural products go to waste, and some people who would consume them go without. With better and timely information about crops, markets, and storage, all those involved would be better able to move produce from where it is grown to where it can be consumed or transported to regional and export markets. The same kind of information could be communicated about the availability of seeds, fertilizers, and other agricultural production inputs.

In this respect, Radio Rurale would extend its role beyond that of a mass medium to more general populations to that of a direct channel between individuals working in the agriculture market.

Rural enterprise development. We mentioned that PRIDE wants to use Radio Rurale to broadcast in rural areas its training components on small enterprise management and marketing. This kind of programming would constitute another new use of Radio Rurale: that of more structured nonformal education. These courses would be targeted to limited audiences: rural entrepreneurs who prefer to take their training in their own language rather than French and to remain in their region rather than travel to Conakry for training.

This kind of programming poses a new issue for Radio Rurale: while a contract with PRIDE might be a good source of revenue, it would also requiring dedicating significant amounts of airtime to a very limited audience.

Capacity required

The USAID/Guinea project that currently use the services of Radio Rurale are more than satisfied with the production quality--both content and technical--of the programming that is produced. They find that the value of the radio channel is well worth the cost of directly

reaching large numbers of beneficiaries with credible messages in their own languages. They are also satisfied with their business relationships with Radio Rurale, both at the national and regional levels.

They are not satisfied, however, with the limited transmission of the programs. The signal does not reach all the health centers with which PSI works in Haute Guinea and Guinea Forestière. Nor does it reach the all the prefectures in which the education reform program is establishing its pilot equity projects. This is a particular constraint on the educational equity project, because it cannot use a radio component at all in key pilot areas. Instead, it must carry tapes of messages from one community to the next. The other technical constraints that affect USAID/Guinea projects are the limited airtime and the failure of transmission due to periodic power failures.

These are the problems with USAID/Guinea's current use of rural radio as a tool of development. If one or more of the projects considers expanding its activities in the ways we described (offering instructional radio, communicating marketing information, and providing more structured nonformal education and training), the constraints on the present system will pose even more problems.

> To institute instructional radio, the ministry of education will require a signal that reaches most schools, at least in a pilot area, during daytime hours.
>
> To provide timely information on agricultural marketing, the foundation will need more complete coverage of the rural regions.
>
> To offer training courses to entrepreneurs, PRIDE may demand enough airtime to necessitate Radio Rurale's expansion of its programming hours.

Finally, to become an instrument of democratization, rural radio would benefit from the capacity to function as local radio as well as regional radio. Regional radio covers distances that are too large to permit anyone who is interested in coming to the station to speak on the radio. Only those in proximity to the station can do so. Local radio, by virtue of being in smaller communities, permits more people and organizations to speak as well as to listen. It allows more people to engage in decision-making about how they are governed.

Alternative modes of support

Currently constrained by factors such as the U.S. government's decision to keep aid to

Guinea at a reduced level until the presidency improves its election procedures, USAID/Guinea does not have the option of creating a sizeable project to support Radio Rurale. Yet, it might be able to support the new institution through some of its existing projects, in the short run, and then increase support in future fiscal years, if U.S. policy permits.

Other than the support of a single project, we see five alternative modes of support, using project or other funds available to the mission.

> Continue to support operations on a small scale by contracting with Radio Rurale to produce and transmit programs that help meet the goals of various USAID/Guinea projects.
>
> On the same basis, trade equipment and training for production and transmission services, rather than paying for them.
>
> Invest on a small scale in capital improvements: limited transmission equipment, and/or training of staff in management, marketing and equipment repair. Condition donations on more autonomy for the regional stations.
>
> Invest on a large scale in capital improvements, requiring conditions for such an investment. These would include decentralizing management of budget and operations, and a commitment by the government to share in the purchase of a more appropriate technological transmission system.
>
> Work more actively with donors to find means of cooperating with others in making significant capital investments.

Capital investment could come from either education or democracy and governance project funds, if either of these develops a large-scale component that requires improved radio services.

Summary

Within the few years that Radio Rurale has existed, more than half of the projects and programs in USAID/Guinea's portfolio have begun to use its services. But these uses have only tapped the potential of rural radio, and a few projects are considering activities that would make more extensive use of the system, including formal schooling, structured

nonformal education, and multi-point communications. In order for these uses of radio to be effective, constraints on transmission power and on local programming must be addressed.

USAID/Guinea has a number of options for supporting Radio Rurale in both the short term and the long term. Such support would enable Radio Rurale to meet the mission's strategic objectives.

ISSUES PERTAINING TO USAID/GUINEA'S SUPPORT

In considering the constraints and opportunities present in Radio Rurale as an emerging rural institution, we see five issues pertaining to USAID/Guinea's support:

> Can Radio Rurale sustain its operations without indefinite support and heavy government funding?
>
> What does the new transmission technology cost?
>
> Will the Guinean government permit freedom of the airwaves for Radio Rurale?
>
> Should the radio stations be transformed into privately owned entities?
>
> Can the institution permit participation of the people in its governance and use?

Although these five issues are closely interrelated, we will discuss them one by one.

Sustainability

Radio Rurale's capacity to sustain its operations as the rural regions develop will require it to lower operating costs and raise revenues.

We have concluded that Radio Rurale's present capacity to endure depends heavily on the government to pay recurrent costs and probably on donors to cover a good portion of capital expenses. The main constraint to the institution's financial viability is a technical one: an inadequate and costly to operate transmission system. If this system is replaced with one such as we have described, which requires far less fuel and maintenance, we believe operating costs can be lowered to the level at which the station's can cover much of them.

On the revenue side, it is clear that Radio Rurale offers a vital service to rural communities and to those who want to reach rural people with information and education about development. We believe that, if the organization is decentralized so that each regional station has much more control over its finances, the stations can market their services more vigorously and raise revenues significantly.

The stations already cover from services they provide locally all of their operating costs except transmitter fuel, salaries, and utilities (which, of course, are the big items). But they

have no direct control over the services they provide to national or regional development agencies.

Fees for local services, which seem to be based on actual costs of operation, may be difficult to raise if individuals and small local groups cannot pay more. But other clients can and should pay more. First, fees for services with ministries and other development agencies could probably be raised significantly. Some of representatives of development agencies with whom we talked said they would gladly pay more for the good service they receive.

Second, each of the stations provides services to local governments (prefectures, subprefectures, CRDs) at the low local rate, but are unable to collect anything from them. The commissar of Information has recently decreed that these organizations must pay, and if they do, they will raise the stations' revenues significantly. Third, stations have not explored other possible sources of revenue such as contributions from local businesses, whose success depends on the well-being of people in the region or payment by such businesses for commercial advertising.

Questions of finance, however, should not be allowed to overshadow Radio Rurale's remarkable asset: its highly competent and remarkably dedicated staff. These people work long hours, and since their pay is only that of a civil servant, or in many cases nothing at all, their motivation appears to come from the rewards of the job itself. In an environment where a severe constraint to sustaining institutions is often lack of motivation and dedication of the work force, Radio Rurale stands out as one hopeful exception.

Staff members will require extensive training, not in program production, but in managing a radio station that, once it is decentralized, will become a far more complex operation. They need assistance in managing a larger budget. Equally important, they need training in marketing their services. As we have described, resources for these kinds of training are available in Guinea and elsewhere in West Africa.

In the very long term, once Guinea's physical infrastructure is developed, Radio Rurale will compete with the press and other communications channels for an audience. When that time comes, it may disappear as a rural development institution. But right now it has a monopoly on rural audiences and programmers, and with more efficient transmission, decentralized management, and sufficient training, it should be able to take advantage of the demand for its services to sustain its operation.

Transmission system costs

The cost of the new alternative technology remains an issue because there are still some unknowns. We will describe these and then provide some comparative estimates (See Annex K).

Transmitters. Instead of using high-power transmitters, using local low-power transmitting sites linked through a satellite network would bring Radio Rurale's annual cost of transmission down from $160 thousand for fuel only (and only four hours of daily operation)[12] to about $40 thousand plus the minor cost of some fuel for local generators, which in most cases could be paid for by local communities that use the stations. Available airtime will increase from four hours a day up to 24 hours a day. And the maintenance costs of transmitters and generators, as well as fuel storage costs, etc, will decline dramatically (see Annexs F and G).

The cost of purchasing a low-power transmission system is also lower than that of a high-power system. For any configuration in an equivalent broadcasting area (on paper), the purchase cost of a low-power transmission system will be cheaper than a 50 Kw transmitter, even if PV power equipment is installed throughout. The cost of a specific configuration, however, would have to be determined by a study of various options.

Satellite service. The biggest unknown cost at this moment is that of a digital compressed satellite service in Western Africa. Our preliminary research in North America failed to give us price quotes for such service on the KU band, not because such service is not available (C band only at the moment), but because it has not yet been priced. At least one provider seems ready to offer compressed digital service (KU and C) in 1995 but the tropical zone is unlikely to be served in KU band. C band will thus be mandatory. The most likely providers seem to be Arabsat, Panamsat and Immarsat. But more research is needed here.

The uncertainty about this cost makes it hard to put an exact cost on the network. The satellite footprint and band of operation (C or KU) determine the size of the dish needed at both the transmitting and receiving site and the related cost of uplink equipment. Satellite receiver prices are the same for either band.

PV power. The cost of a PV power system must be computed locally, based on how much sunlight is available, load condition, total hours of use, period of use (day or night), and so

[12] Based on the cost of fuel for latest-technology high-power transmitters.

on. Assuming eight hours of day use and four hours of night use (which is three times the current use) and average monthly sunshine hours for the country, we can estimate costs with enough accuracy for comparison purposes.

We make our comparison between the currently used high-power transmission system and two different low-power satellite systems. One of these assumes relatively high-cost equipment, the other relatively low-cost equipment (see Annex K).

> The 50 Kw transmitter, with antenna system, feeder and generator to power it, will cost $1,000,000 to $1,200,000 (see Incomtel study in the annex section).
>
> The high-cost satellite system option operates on the C band (which requires a bigger dish), and uses seven receiving/transmitting sites with full PV power. It costs about $900,000 (see Annexes J and L)
>
> The low-cost satellite system option operates on the KU band and uses seven receiving/transmitting sites with a small generator. It costs about $435,000 (see Annex J).

Thus, the cost of transmission equipment for the satellite technology that we propose will probably cost less than high-power transmitter equipment, even if a more expensive option is selected.

Freedom of the airwaves

In its support of democracy building among developing countries, the U.S. government wants those countries to which it gives financial and technical assistance to strengthen one of the pillars of democracy--freedom of the press and the airwaves.

Freedom of the press in Guinea is abundantly evident. There are more than a few privately owned newspapers, in addition to the government organ, and they are allowed to be critical of the government. Freedom of the airwaves is not as evident, but the government seems to be moving in the right direction.

At present, the regulations that permit private ownership and operation of a radio station are restrictive. The Compagnie Guinéenne de Bauxite in Basse-Guinée has what might be called a corporate or community station serving its employees and their families. We heard of one recent instance of a private radio station being shut down by the government after six days of

operation. One rumor circulates that the owners of the station are backed by political opposition groups now living outside of Guinea. The commissar of information says that the station is only being delayed in its operation until regulations are in place to permit private ownership of radio, including provisions to allocate broadcasting frequencies.

The commissariat has drafted a *projet de loi*, which should loosen restrictions on private ownership and operation. The central provisions of the new law are as follows:

> Any Guinean can own and operate a radio or television station in accordance with regulations. A station cannot advocate the dominance of any one race, ethnic group, religious sect, region, or political party. Transmission coverage should be local, covering a city or a prefecture, and should contribute to the development of national cultures.
>
> All private stations must be licensed by the commissariat of information, as must equipment added subsequently to the station. Anyone importing radio equipment must be licensed. The commissariat regulates technical standards and has the right to inspect equipment at any time. Stations are not allowed to scramble the signals of other stations (*Projet de loi relatif à l'implantation et à l'exploitation de stations de radiodiffusion et de télévision privées*, 1994 draft).

The commissaire says that the new law will take effect within a matter of months, once detailed technical regulations are finalized. Its main provisions indicate that the government intends to prevent the use of radio and television as means by which a single group of people try to dominate others. These kinds of measures are more restrictive than what is allowed in most industrialized countries and reflect the government's concern that ethnic groups do not struggle for political control.

The government's concern with preventing political parties from capturing the airwaves does not seem to extend outside of Conakry. Its policies on radio (and television) reflect its broader policies on allowing people to express their political will. Namely, while the government is still cautious about allowing national political opposition parties a great deal of activity in Conakry, it not only tolerates, but--at least in principle--fosters democratic institutions at the grass roots level in rural areas.

> Important elements within the military are still reluctant to establish a political system based on multiparty competition due to fears of exacerbating interethnic rivalries. The regime has also resisted pressures to permit and promote national political institutions

> as part of the democratization process.
>
> Instead, the regime opted to create institutions at the grassroots level as part of a program of political and administrative decentralization (*Social and Political Profile*, October 1991).

The goals of Radio Rurale explicitly support development, decentralization of government, and democratization. In line with this mandate, the regional stations are supposed to be apolitical and not to broadcast messages of political candidates or parties (LearnTech). Yet this restriction seems to be in support of a policy of neutrality, like that of public radio in the United States, rather than of control. Even Radio Nationale allowed political candidates from each party to speak during the campaign preceding presidential elections (Baha).

The staffs of the regional stations of Radio Rurale do not feel stifled by government control. They see themselves as agents of rural development and channels of communication among rural people. We have not heard of any instances in which freedom of speech has been an issue. It might be said that the test case has not yet arisen, but at present there are no indications that the government at any level will stand in the way of programming decisions made at the stations.

The director's office of Radio Rurale does impose some uniformity in program formats and scheduling. But this appears to be more a matter of technical guidance than of controlling content. Within their formats and schedules, each station airs content that is approved only at the station. It is not even apparent that the station directors listen to taped programs before they are aired. We conclude that, under present conditions, freedom of the airwaves should not be a significant concern to USAID/Guinea.

Privatization

The option of privatization arises as a means both of creating financially viable institutions and of ensuring editorial independence.

In regard to financial viability, on the favorable side, privatizing each of the regional radio stations would allow them to break away from the civil service and compensate employees at their level of productivity. Privately owned stations would also, in theory, provide more incentive than publically owned stations to maximize revenues and minimize costs. As profitable investments, they could attract money from the private sector.

But the risk of privatizing stations is that they would lose the security of government financing, and they may not be able to attract private sector funding, either through selling commercial airtime or through investments in ownership. We heard very mixed opinions, both within USAID/Guinea and outside of it, on whether the private sector in rural Guinea is dynamic enough to support private radio stations. Some say that both cash and credit are available to new enterprises in rural areas. Others say that people are still locked into a socialist attitude and not yet ready to invest in private enterprises. Still others say there is not enough competition in rural markets to warrant advertising on regional radio.

We must also consider that, while low civil service wages are often a cause of unmotivated work forces, in the case of Radio Rurale, this is not true. Without suggesting that salaries should not be raised, we would not recommend taking employees off the government's payroll to solve a problem that does not seem to be critical. There are options for supplementing civil service salaries in decentralized operations.

The question of editorial independence is also murky. What the regional stations may gain by becoming financially independent of government control, they may lose by becoming financially dependent on commercial control. The entire *raison d'être* of Radio Rurale is to help develop Guinea's rural areas. Commercial sponsors and private investors may find that other program content is more entertaining--more lucrative. In Lesotho, for example, development-oriented radio stations that compete for attention with radio stations in South Africa that are slicker and more entertaining do not fare so well. As long as Radio Rurale is the only station broadcasting to people in their own languages, we think it would be a mistake to change its focus for the sake of financial independence.

In addition, some commercial messages may undermine development messages. The conflict between public health agencies that urge people not to smoke and tobacco companies that try to persuade them otherwise are well known. The battle between Nestles infant formula advertising and campaigns to encourage breastfeeding have the same notoriety.

We conclude that trying to privatize the regional radio stations in the near future would be risky and might cause as many problems as it solves. There seem to be other means, which we have discussed, of helping the stations to sustain their operations and to control their editorial independence.

Participation

Participation in democratic decision-making processes is tightly linked to participation in using communications channels that support those processes.

> Democracy and communication are two key processes in creating and sustaining change. Democracy is concerned with popular participation in making or influencing decisions. It implies having a voice in a dialogue about choices, and having access to information in order to make good decisions. Participation is thus supported by communication, and participation in communication--having access to communication channels and the skills to use them--is as important as participation in decisions. The two are reciprocal in their effects on each other (Laflin).

Both modes of participation--in democratic processes and in communication processes--are most efficacious at a local level, and more so on a regional level than on a national one.

We have noted that the government of Guinea is attempting to decentralize government and support CRDs (rural development communities) and other local government institutions. Guinea's rural radio system is regional, not local. Regional radio provides the opportunity for people to receive programs in their own language that concern their own lives, and it allows some people to speak. But only local, or community radio allows many people to take responsibility for operating the station and participating in decisions about programming.

The new transmission technology we have described would put radio stations into communities all over the country. Adding a small mixer with two or three microphones and a cassette deck to any transmitting site will instantly create a local radio station. The cost of such equipment is between $500 and $1,000, depending on its reliability. There is no need for additional PV power for such minor equipment.

ACCT is planning to install three small community radio stations in the Guinean cities of Mamou, Kissidougou and Boké in the near future (January 1995). These radios are low power (100 watt) FM station who broadcast locally in range of around 50 Km. Studio equipment is quite elaborate and almost equivalent to those of actual Radio Rurale station, thus permitting good level of programming.

Such radios stations could be easily integrated in the Radio Rurale network by simply adding a satellite receiver. Since ACCT is implementing such community radios all over francophone Africa, synchronization of all radios rurale or locale projects should be made at

an international level to permit the fastest expansion of these network.

These local stations would allow people not only to hear regional and national broadcasts that inform them about their government but also to participate more actively in the democratic processes of their own communities.

RECOMMENDATIONS

Our overall recommendation is that USAID/Guinea support Radio Rurale's adoption of transmission technology that links small transmitters in almost every community by satellite. This is definitely a long-term solution, but one which should bring operational costs down to a manageable level, increase the independence of not only regional but also local radio stations, and make Guinea's radio network more flexible, serving national, regional, and local needs.

We have discussed both the technical and managerial aspects of these recommendations with a number of people in Guinea, including most of the staff of Radio Rurale. They seem to react positively to the suggestions. We have also talked with technically competent people who know Guinea, including the engineer at Radio Nationale and the chief engineer at PTT. They think these solutions would be practical.

Short-term support

In the short term (roughly two years), we recommend that USAID/Guinea:

(1) Assist Radio Rurale in making the best use of resources it already has by providing extensive training and technical assistance in management, marketing, and technical maintenance and repairs. Emphasize entrepreneurial training and business management, and use resources that are available in Guinea and elsewhere in West Africa. Much of the training and assistance should be on-the-job.

(2) Help to finance the purchase of photovoltaic (PV) power units at each station to power its studio audio equipment, thus overcoming the lack of reliable, stable electrical power during airtime. Excellent production facilities without the ability to go on the air have little value. If Radio Rurale aggressively markets its services, it will not be able to tolerate unplanned gaps in its available airtime and will need more production time.

PV power will provide for very stable voltage, therefore protecting the electronic equipment and eliminating the main cause of failure: unstable voltage and lightning discharge coming through the utility network.

(3) Supply the stations with some additional motorcycles and mobile production equipment that will enhance their ability to produce program segments throughout the

regions they serve.

Mobility is fundamental to rural radio. We recommend that each station be equipped with a small FM, battery and/or AC operated, portable transmitter with a simple whip antenna, for a range of one to four Km in radius. The whole unit is installed in a backpack and can easily be carried by someone on a mmotorcycle. This will permit live broadcasting inside all small villages and remote broadcasting in the regional capital (through the standard FM receiver already installed in each station).

To improve the recording of music in the field, we recommend supplying each station with a multitrack portable audio-cassette recorder with integrated mixer and equalizers (two for Nzérékoré)and four cardioid microphones.

Each station has two motorcycles for six producers. We recommend providing at least two more for each station, and four for Nzérékoré.

(4) Supply the stations with some limited studio production equipment. Needs for equipment are quite modest, and the producers did not ask for much (see Annex P).

Microphones are in short supply for outside broadcast or recording. We recommend that each station get at least six omni-directional hand-held microphones, and that Nzérékoré get ten.

To help in the airing of short repetitive programs (advertising, community announcements, music themes), we recommand providing each station with one digital cartridge machine. New digital equipment has far fewer mechanical parts and offers more flexible use without the need for buying or replacing tape cartridges.

To help with daily administrative and programming task, we recommend the provision of one lap-top computer with printer for each station.

(5) Condition short-term assistance on the commissariat's following through with its intention to make stations more autonomous in financial management. Discuss with him directly USAID/Guinea's preferred terms of autonomy and constraints he may face in other government offices (such as the ministry of finance or the civil service regulations) in granting it. Negotiate conditions that serve USAID/Guinea's strategic objectives and that he can implement.

(6) In designing the new education sector reform project and exploring a democracy and governance project, consider radio components, but only if they support the goals and purposes of the projects

Long-term support

In the long term, we recommend that USAID/Guinea:

(1) Work closely with the commissariat of information to plan for and invest in the transmission technology we have described:

Low-power transmitters in communities throughout the country

Regional networks of these transmitters linked by satellite

Photovoltaic power for studio operations.

We think that this option is the best viable solution in the long term for the following technical, financial, and social/economic reasons:

The cost of operation is reduced mainly to space-segment rental, which is available 24 hours a day and does not depend on the maintenance, repair and replacement of imported mechanical or electronic parts.

Operation and care of the system is almost totally transferred to the community. If people are really proud of their radio and they feel that they need it, they will take care of it.

The network can begin with just one or two receiving-transmitting sites and expanded and modified at any pace and for a wide variety of purposes.

(2) Encourage Radio Nationale to share the costs of a new transmission system with Radio Rurale and any donor support Radio Rurale might receive. We must not forget that Radio Rurale agreed with the Swiss in 1989 to furnish the transmission system for its operation. The government did not invest much in that equipment, and we think it is still the government's obligation to do so. A funding strategy that involves Radio Nationale (which can use the same equipment at only the cost of additional satellite space) might be more attractive to the government.

(3) Collaborate with other donors to share in the financing of the new transmission system. This technical collaboration needs to begin soon, because the commissariat has already been talking with other donors about supplying new parts to the existing high-power transmitter system. In spite of several round tables among donors, there appears to be little information exchanged right now about who is doing what. USAID/Guinea should retake the initiative to insist that the government and donors not work at cross purposes in equipping the transmission system.

(4) Condition long-term assistance on the creation of a parastatal or other form of network of independent rural radio stations. We do not recommend urging the government to privatize regional stations right now. Instead, USAID/Guinea might help them design something like the U.S. model of a corporation for public broadcasting, which is able to operate with a network of affiliate stations. The goals of the institution would continue to be support for development and democracy in rural areas. Its corporate status would allow regional stations autonomy in management, but with a center of support in Conakry and the possibility of funds from the government.

(5) Finally, we recommend that USAID/Guinea persuade Radio Rurale to build its new transmission system one region at a time, learning from the early experiences lessons that improve the later ones. Much will be unexplored, in both their technology and operation, and opportunities for trial and error should be maximized.

Conditions

Until USAID/Guinea has established the goals and purposes of whatever programs or projects in which it intends to provide assistance to Radio Rurale, specific conditions for assistance cannot be drafted. Conditions must flow directly from goals and purposes. An education project, for example, which has purposes of improving the quality and equity of basic education, would impose different conditions on Radio Rurale than a democracy and governance project, which has purposes of grass-roots democratic-institution building.

At this time, prior to any actual project or program designs, we can only suggest some broad lines of conditionality in terms that would help Radio Rurale become a stronger, more effective rural institution, for purposes of both development and democracy, and some conditions that might apply to various project or program purposes.

For the sake of developing the institution of Radio Rurale, in terms of its own goals, we

would suggest that USAID/Guinea require the *haut commissariat* to:

> Codify Radio Rurale's current objectives of promoting development and democracy in the rural regions and specify that, to meet these objectives, each of the four stations acquire financial, managerial, and editorial autonomy. (For example, each station can contract directly with ministries and other development agencies to provide services.)
>
> Reform the central office of Radio Rurale so that it becomes a support organization for regional and local stations but has no direct control over their finances or operations. (For example, the central office can negotiate interregional contracts for services, but it must allocate each station its share of the revenues from those contracts.)
>
> Provide an annual supplement to the four stations that is based on the cost of salaries of current staff, fuel for transmission, and utilities (in other words, the current share of Radio Rurale's budget that is funded by the government).
>
> Design a new transmission system based on the technology we have described. Develop equipment specifications and make them available to all potential investors, including Radio Nationale and foreign donors.
>
> Allocate the costs of the new system between Radio Nationale and Radio Rurale, with Radio Rurale (and its donor support) contributing no more that 50 percent).
>
> Convene regular meetings with donors to coordinate both capital investments and ongoing support of Radio Rurale's systems and operations.
>
> Inform USAID/Guinea in detail of training and technical assistance available in West Africa with which Radio Rurale is already familiar.

Specific conditions that are presented in terms of USAID/Guinea projects or programs would based on different rationales, depending on the project's or program's purpose. For example:

> To promote development: Give each station autonomy so it can be more responsive to the people in the region it serves and more effective in meeting their development needs.
>
> To promote democracy: Working incrementally, one region at a time, finance simple

production equipment at local stations so they can function as community radios--channels of communication in decision-making.

To promote free expression: Codify the operating guidelines of regional stations to ensure that each one has editorial independence and the freedom to promote political debate.

To promote rural enterprises: Share in the cost of training and technical assistance that improves the capacity of each station to operate as a self-sustaining business enterprise. If desirable in the long-term, write governing code that allows stations to operate as private businesses.

Conclusion

Radio Rurale offers exciting potential for the development and democratization of Guinea. It is critical that the institution begin to invest in a transmission-system and power-supply technology that is appropriate for its needs and for conditions in Guinea. We recommend that USAID assist Guinea in planning and developing this system. In addition, we recommend that it help Radio Rurale decentralize the management of its four rural radio stations and train the staffs of those stations to run them as self-sufficient operations.

ANNEXES

RADIO RURALE IN GUINEA:
AN ANALYSIS OF THE INSTITUTION'S NEEDS
AND USAID/GUINEA'S INTEREST IN PROVIDING ASSISTANCE

LearnTech
(A Project of the Educational Development Center, Inc.)

Dominique Guay
Jeanne Moulton

October 1994

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ANNEX A: INTERVIEWS

USAID/Guinea

Bah, Miriama, Social Marketing of Contraceptives Project Officer
Fofana, M., Private Enterprise Project Officer
Lohof, Andy, General Development Office Assistant
Parks, Tom, Deputy Director
Reddy, S.K., Rural Development Officer
Rippey, Helene, Population project officer
Sharp, Sally, Program Officer
Son, Dr., Natural Resources Management Project Officer
Thomas, Wilbur, Director
Welsh, Judd, Agriculture Marketing Investment Project Officer
Wright, Sarah, Human Resources Development Officer

Government of Guinea

Daba, Mamadou, Haut commissaire á l'Information

Sylla, Cheick, Director, Radio Rurale
Bah, Bashir, Director Adjoint, Radio Rurale
Camara, Ousmamae, Conseil au director
Kieta, Alpha Kabene, Chef de la Division Cooperative
Diallo, A., Administrateur, Radio Rurale
Koultoumi, Albert, Technical Director, Radio-Television Guinée
Cissé, Nabi Ibrahima, Telecommunications Director, PTT
Institut de Topographie et de Cartographie
Direction Nationale de Météorologie

Sy Savané, Mamadou, Director, Radio Rurale at Kankan, and his staff
Camare, Mohamed Tondon, Director, Radio Rurale at Kindia, and his staff
Bah, Thierno Maadiou, Director, Radio Rurale at Labe, and his staff
Donzo, Mathias, Director, Radio Rurale at Nzerekore, and his staff

Passy Korouna, C., MEPU, PASE, Comite d'equite
Bolongo, Tintin, MEPU, PASE, Communication

NGOs and USAID contractors in Guinea

Bayo, Limine, PRIDE
Diakite, Ismail, Agriculture Marketing Foundation
Diop, Ousman, Agricutlure Marketing Foundation
DuConge, Jean-Patrick, PSI
Momat, Eddy, PSI

Rippey, Paul, PRIDE
Soure, Ismail, Natural Resources Management project (Chemonics, Labe)
Vaughn, Viola, PSI

International organizations in Guinea

Baldi, Mme., UNESCO
Barry, Almamy, UNICEF
Diallo, Alphomo, UNESCO
Garland, Greg, Director, USIS
Souliye, Christine, World Bank

USAID/Washington

DeStefano, Joe, HHRAA/Education
Tietjen, Karen, HHRAA/Education
Esposito, Diana, AFR

LearnTech/Washington, D.C.

Laflin, Michael
Anzalone, Steve

ANNEX B: DOCUMENTS CONSULTED

USAID and its contractors

Trip reports of DeShawn Dominique Jenkins:
July 27, 1993: Trip to N'Zerekore
October 8, 1993: Trib to Kindia
December 13, 1993: Trip to Kankan
August 8, 1994: Trip to Labe

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ANNEX C

ENQUETE DEMOGRAPHIQUE ET DE SANTE

GUINEE 1992

Rapport national de synthèse

Direction Nationale
de la Statistique
et de l'Informatisation

Population Services
International (PSI)

Fonds des Nations Unies
pour la Population (FNUAP)

Tableau 25 Heures d'écoute préférées pour la radio

Pourcentage de femmes et d'hommes qui écoutent habituellement la radio selon les heures d'écoute préférées (premier choix), par caractéristiques socio-démographiques, EDS Guinée 1992

Caractéristique	Heures d'écoute préférées						Total	Effectif
	6h - 8h	12h - 13h	16h - 18h	19h - 21h	Autres	Aucune		
FEMMES								
Milieu de résidence								
Urbain	16,8	6,0	8,9	20,0	7,0	41,3	100,0	1184
Rural	6,4	2,8	6,5	22,1	1,8	60,3	100,0	1549
Région								
Conakry	19,2	8,3	9,0	21,5	7,5	34,4	100,0	653
Basse Guinée	14,2	5,3	8,7	20,3	4,4	47,0	100,0	587
Moyenne Guinée	3,6	2,3	4,4	21,1	2,2	66,5	100,0	943
Haute Guinée	8,9	1,2	8,7	23,4	2,4	55,4	100,0	324
Guinée Forestière	12,1	1,3	11,6	19,6	3,7	51,8	100,0	226
Niveau d'instruction								
Aucun	6,3	3,5	6,2	23,0	2,5	58,4	100,0	1905
Primaire	19,6	4,7	7,9	17,1	6,8	43,8	100,0	430
Secondaire ou plus	24,0	6,6	13,5	16,3	8,7	30,9	100,0	393
Ensemble des femmes	10,9	4,2	7,5	21,2	4,1	52,1	100,0	2732*
HOMMES								
Milieu de résidence								
Urbain	32,5	6,9	11,3	16,2	15,4	17,6	100,0	507
Rural	31,8	3,5	16,2	14,3	6,3	28,0	100,0	640
Région								
Conakry	34,0	8,7	9,4	18,3	19,6	10,0	100,0	294
Basse Guinée	15,8	4,9	14,6	16,4	6,4	41,9	100,0	216
Moyenne Guinée	17,0	5,2	18,9	14,3	6,1	38,4	100,0	263
Haute Guinée	31,0	1,6	21,3	19,2	5,8	21,1	100,0	183
Guinée Forestière	69,4	2,3	6,9	6,1	10,6	4,6	100,0	191
Niveau d'instruction								
Aucun	28,4	2,5	15,7	15,3	8,6	29,6	100,0	614
Primaire	27,6	8,0	10,6	11,5	16,2	26,1	100,0	188
Secondaire ou plus	41,1	7,8	13,2	16,7	10,4	10,8	100,0	343
Ensemble des hommes	32,1	5,0	14,0	15,1	10,3	23,4	100,0	1147*

* Y compris les non-déclarés

2. Stations de radio écoutées

Aux personnes qui avaient écouté la radio la veille de l'enquête (soit 12 pour cent des femmes et 35 pour cent des hommes interrogés), on a demandé quelles stations de radio ils avaient écoutées. Le tableau 25 indique que les stations de radios locales (nationale et rurales) sont les plus écoutées : 81 pour cent des femmes et 85 pour cent des hommes écoutent la radio nationale. Les radio rurales sont écoutées par 20 pour cent des femmes et 12 pour cent des hommes. Ce faible taux d'écoute, au niveau national, se justifie par le fait que deux des quatre régions ne disposaient pas, au moment de l'enquête, de station de radio rurale.

Les radios africaines sont écoutées par 17 pour cent des hommes et seulement 7 pour cent des femmes. Chez les hommes, les radios africaines sont moins écoutées que les autres radios internationales (17 pour cent contre 21 pour cent).

Tableau 25 Stations de radios écoutées

Proportion de femmes et d'hommes qui ont écouté au moins une station de radio spécifique, la veille de l'enquête, par caractéristiques socio-démographiques, EDS Guinée 1992

	Femmes					Hommes				
Caractéristique	Radio nationale	Radio rurale	Radios africaines	Autres radios	Effectif de femmes	Radio nationale	Radio rurale	Radios africaines	Autres radios	Effectif d'hommes
Milieu de résidence										
Urbain	88,9	11,3	10,1	7,6	428	85,9	6,6	14,9	26,3	304
Rural	68,6	32,6	2,2	0,7	299	83,0	17,8	20,1	14,8	239
Région										
Conakry	95,5	2,8	12,2	9,5	290	92,3	1,1	11,9	27,0	211
Basse Guinée	94,3	5,3	1,3	2,3	156	84,5	7,8	12,1	8,7	89
Moyenne Guinée	45,5	56,6	2,8	1,3	187	64,0	43,2	26,2	26,0	101
Haute Guinée	76,7	37,0	2,2	1,8	62	91,7	9,2	23,5	15,1	88
Guinée Forestière	90,7	1,8	17,6	0,8	32	81,2	2,7	18,7	20,5	54
Niveau d'instruction										
Aucun instruction	76,1	25,6	1,4	0,7	449	90,6	10,4	13,8	6,1	251
Primaire	80,6	15,9	7,0	2,6	111	71,9	19,2	9,7	10,2	93
Secondaire ou plus	92,4	8,3	21,4	17,4	166	82,8	9,3	25,0	45,6	198
Ensemble	80,6	20,1	6,8	4,8	727*	84,6	11,5	17,1	21,2	543*

* Y compris les non-déclarés

3. Heures d'écoute préférées de la radio

On a demandé aux femmes et aux hommes enquêtés, ayant l'habitude d'écouter la radio, quelles étaient leurs heures préférées d'écoute. Le tableau 26 donne les heures indiquées comme premier choix.

Plus de la moitié des femmes (52 pour cent) n'ont émis aucun choix, alors que seulement 23 pour cent des hommes n'ont aucune préférence. Pour les femmes, les heures d'écoute préférées se situent entre 19 et 21 heures (21 pour cent), suivies de loin par des horaires compris entre 6 et 8 heures (11 pour cent). Les femmes instruites font exception puisqu'elles écoutent plus fréquemment la radio entre 6 et 8 heures. De même, c'est tôt le matin, entre 6 et 8 heures, que la plus forte proportion d'hommes écoutent la radio (32 pour cent); viennent ensuite ceux qui préfèrent écouter la radio entre 19 et 21 heures (15 pour cent) et entre 16 et 18 heures (14 pour cent).

VII. ACCES DES FEMMES ET DES HOMMES AUX MEDIAS

1. Ecoute de la radio et de la télévision

Les femmes et les hommes de l'échantillon ont été interrogés sur la possession d'équipements d'information (radio et télévision) par au moins un membre du ménage, et sur leurs habitudes d'écoute de l'information. Ce chapitre analyse les données sur l'accès des hommes et des femmes aux média, la station de radio écoutée la veille de l'enquête et les heures d'écoutes préférées pour la radio et la télévision.

Parmi les femmes enquêtées, 45 pour cent ont déclaré avoir l'habitude d'écouter la radio, au moins une fois par semaine (tableau 24). Ce pourcentage est de 74 pour cent chez les hommes. Que ce soit pour les femmes ou les hommes, la radio est plus fréquemment écoutée en milieu urbain qu'en milieu rural, à Conakry que dans les autres régions, et par les personnes les plus instruites.

Environ 17 pour cent des femmes et 25 pour cent des hommes ont déclaré avoir l'habitude de regarder la télévision au moins une fois par semaine. Les plus grandes fréquences s'observent en milieu urbain et surtout à Conakry. La raison en est que, au moment de l'enquête, la télévision ne couvrait que la ville de Conakry, la ville de Kankan, en Haute Guinée, et la ville de Labé, en Moyenne Guinée. Les villes industrielles de Fria et Kamsar, en Basse Guinée, et le village aurifère de Gbenko bénéficient d'installations d'antennes paraboliques. De ce fait, certaines localités, aux alentours de ces différentes installations, ont la possibilité de voir des images télévisées. Par ailleurs, la région de la Guinée Forestière n'était pas couverte, mais on parvenait à y capter la télévision ivoirienne.

Tableau 24 Accès aux media

Pourcentage de femmes et d'hommes qui habituellement regardent la télévision, ou écoutent la radio au moins une fois par semaine, par caractéristiques socio-démographiques, EDS Guinée 1992

	Femmes			Hommes		
Caractéristique	Regarde la T.V.	Ecoute la radio	Effectif de femmes	Regarde la T.V.	Ecoute la radio	Effectif d'hommes
Milieu de résidence						
Urbain	54,6	68,0	1740	63,4	90,0	564
Rural	2,4	35,8	4325	3,3	65,0	985
Région						
Conakry	91,0	84,5	773	86,8	97,1	303
Basse Guinée	14,3	48,0	1222	22,7	78,4	276
Moyenne Guinée	5,8	59,0	1598	11,1	81,6	323
Haute Guinée	5,8	30,9	1049	10,1	69,4	263
Guinée Forestière	1,5	15,8	1423	0,5	49,7	384
Niveau d'instruction						
Aucun	10,1	39,8	4791	12,8	71,0	864
Primaire	30,7	55,7	773	23,7	62,7	300
Secondaire ou plus	69,9	84,2	466	54,3	90,4	379
Ensemble	17,3	45,0	6065	25,2	74,1	1549

Budget 1994

ANNEX D

RUBRIQUES	2 Kindia	Labé	Kankan	4 Nzé	DG	Total	%	
CHARGES								
Personnel non permanent								
a) contractuels	2640000	2640000	2640000	2640000	1680000	12240000	2,01	
b) pigeS	4860000	4860000	4860000	7290000		21870000	3,58	
c) correspondants	3650000	3650000	3650000	5475000		16425000	2,69	
Frais de déplacement								
a) reportages	2244000	2244000	2244000	2244000		8976000	1,47	
b) service	84000	84000	84000	84000	504000	840000	,14	
c) maintenance					336000	336000	,06	
Bandes/fongibles		5459200	5459200			10918400	1,79	
Pièces de rechange	9920000	9920000	9920000	9920000		39680000	6,50	
Entretien groupe élec	760000	760000	760000	760000		3040000	,50	
Entretien véhicules	884000	2360000	2360000	884000	2640000	9128000	1,50	
Carburant								
a)groupe	12775000	12775000	12775000	14052500		52377500	8,58	
b)essence	1264250	1832250	2057250	2225250	6275250	13654250	2,24	-10
c)lubrifiant	354000	366000	386580	400000	502000	2008580	,33	
Emissions publiques	2400000	2400000	2400000	2400000		9600000	1,57	
Matériel de bureau	350000	350000	350000	350000	9000000	10400000	1,70	
Entretien bureau	129000	221000	221000	129000		700000	,11	
Fournitures de bureau	225000	225000	225000	225000	600000	1500000	,25	
Imprimés divers	248400	248400	248400	248400	248400	1242000	,20	
Entretien bâtiments	400000	400000	400000	400000	800000	2400000	,39	
Stages et séminaires					2733800	2733800	,45	
Total I partiel	43187650	50794850	51040430	49727150	25319450	220069530	36,06	
Payés par l'Etat								
a) salaires	16080000	16440000	15720000	16080000	22260000	86580000	14,19	-15
b) amortissements								
-bâtiments	2300000			2300000	2300000	6900000	1,13	
-véhicules	4600000	4000000	4000000	4600000	10460000	27660000	4,53	
-studios	31000000	31000000	31000000	31000000		124000000	20,32	
c)téléphones,eau,etc	3000000	3000000	3000000	3000000	7000000	19000000	3,11	
Emetteurs carburant		71540000	53655000			125195000	20,51	20
-lubrifiant		450000	450000			900000	,15	
Total II général	100167650	177224850	158865430	106707150	67339450	610304530	63,94	
% par station	16,41	29,04	26,03	17,48	11,03			
Prix de revient heure émission (T II: 6h/jx4)		69669,47						
Prix à la minute		1161,16						
PRODUITS								
Avis et communiqués	7300000	10950000	5475000	3650000		27375000	24,51	
Publicité (gov control)	1200000	1200000	800000	800000		4000000	3,58	
Publireportage	960000	960000	960000	960000		3840000	3,44	
Emissions publiques	13824000	13824000	13824000	13824000		55296000	49,50	
Magazines	4578240	4578240	4578240	4578240		18312960	16,39	
Disques des auditeurs	720000	720000	720000	720000		2880000	2,58	
Total	28582240	32232240	26357240	24532240		111703960		

En % des dépenses Total I	50,76	Diff charges/produit	108365570
En % des dépenses Total II	18,30	En frs	161739,66

ANNEX E: RADIO WAVES PROPAGATION AND TRANSMITTERS

Let's talk briefly about AM and FM radio waves propagation and their behavior. Earth conductivity determines to a large extent the service rendered with AM transmission, which means that for a properly chosen frequency and antenna, the coverage area will depend on transmitter power and values of ground conductivity. The values for Guinea range from 5 mmho/m to 1 mmho/m. For our comparison purpose, we will use the worst case condition as a minimum.

Let's assume the following conditions:
-Very poor ground conductivity.
-Perfect match antenna (1/4 wave vertical radiator)
-Frequency 1 Mhz
-Signal to noise ratio: 20 db (This value is generally considered a satisfactory service in rural area where little else is in the way of desired programming).

Under these conditions, it is generally renowned that for "x" watts of transmitting power, an AM transmitter will give a reasonable daytime grade of service in a radius of "y" kilometer as per the following table (#1):
- 100 Watts -> 30 to 45 Km
- 500 Watts -> 40 to 55 Km.
- 1,000 Watts -> 50 to 65 Km.
- 10,000 Watts -> 75 to 95 Km.
- 50,000 Watts -> 120 to 150 Km.

The situation for FM propagation is somewhat different. In this case, the reach of an FM radio wave is mostly referred to as a sight reach, i.e, you must almost see the transmitting antenna to capture its signal. In fact, the antenna should be installed on the highest possible tower sitting on the highest peak of the surrounding area.

The distance of the reach is then dependant on the transmitter output power and antenna height relative to average ground, as per the following table, assuming these conditions:
-Omni-directional antenna.
-Antenna height: 20 meter
-Hilly terrain
-Level of service: 50 microvolt (reasonable in rural area).

Under these conditions, it is generally known that for "x" watts of transmitting power, an FM transmitter will give a reasonable grade of service in a radius of "y" kilometer as per the following table (#2):

- 50 Watts -> 15 to 25 Km
- 500 Watts -> 30 to 40 Km.
- 1,000 Watts -> 38 to 45 Km.
- 10,000 Watts -> 60 to 70 Km.
- 50,000 Watts -> 90 to 100 Km.

It must be noted however that AM transmission is quite a bit more sensitive to atmospheric and industrial noise, while FM is almost not disturbed by such phenomenon.

ANNEX F: LOW-POWER V. HIGH-POWER TRANSMITTERS

Advantages of low-power transmitters:

- Low power consumption: For the coverage of an area reduce by a factor of only seven, unit will consume at least a hundred times less electrical power.

- Low maintenance cost: Low power transmitter are all solid-state unit, built around few transistor. Units are very small (2 or 3 times a home video recorder) very easily to unplug and set back, therefore being easily replaced on the field with a spare unit by low skilled staff. Defective unit can then be sent to main workshop for repair by skilled technician.

- Low heat generation: Low power consumption means very little wasted power, therefore low heat generation.

- Safe working area: All voltages are inside closed box which does not need to be opened by local maintenance staff.

- High availability of spare parts: A complete kit of spare parts can be maintained in stock at low cost. A complete unit for field replacement can be in stock for every 5-10 systems.

- Unattended operation: Unit can operate without any monitor system or human supervision.

- Antenna are simple mechanical units that can be installed on a wooden pole or a simple self-supporting tower.

- Transmission is simple coaxial cable without any other accessory.

Inconveniences of high-power transmitters:

- High power transmitter are highly sophisticated pieces of electronic equipment and huge unit requiring lot of room space. Main disadvantages can be listed as follow:

- High electrical power consumption: Even the best, state of the art, all solid-state unit will consume slightly more than twice its power output in watts. Tube type unit will consume even more.

- High maintenance cost: Tubes type require frequent tubes replacement (+/- 1,500 hrs). All solid-state type use thousands of transistors which multiply by the

same factor the probability of failure. Either system are very sophisticated and complicated pieces of equipment requiring highly skilled, very competent technician, most of the times available in very big cities only.

Heat generation problem: High power transmitter generate a lot of heat which must be evacuated trough mechanical system, which in turn need maintenance and repair, therefore adding to the global power consumption and operating cost. Failure of such evacuating system during transmitter operation very often lead to failure of the transmitter itself.

Dangerous working area: High power transmitter operate at high voltage and antenna and transmission line are cautious area. Only competent and trained staff must be admitted in transmission room.

Availability of spare parts: Large stock of spare parts must be maintained at high cost if one wants to insure continuity of operation. Otherwise, spare parts come from abroad, meaning long off-air period.

Complicated operation: Operation must either be under competent technician monitoring or sophisticated remote computer monitoring operation.

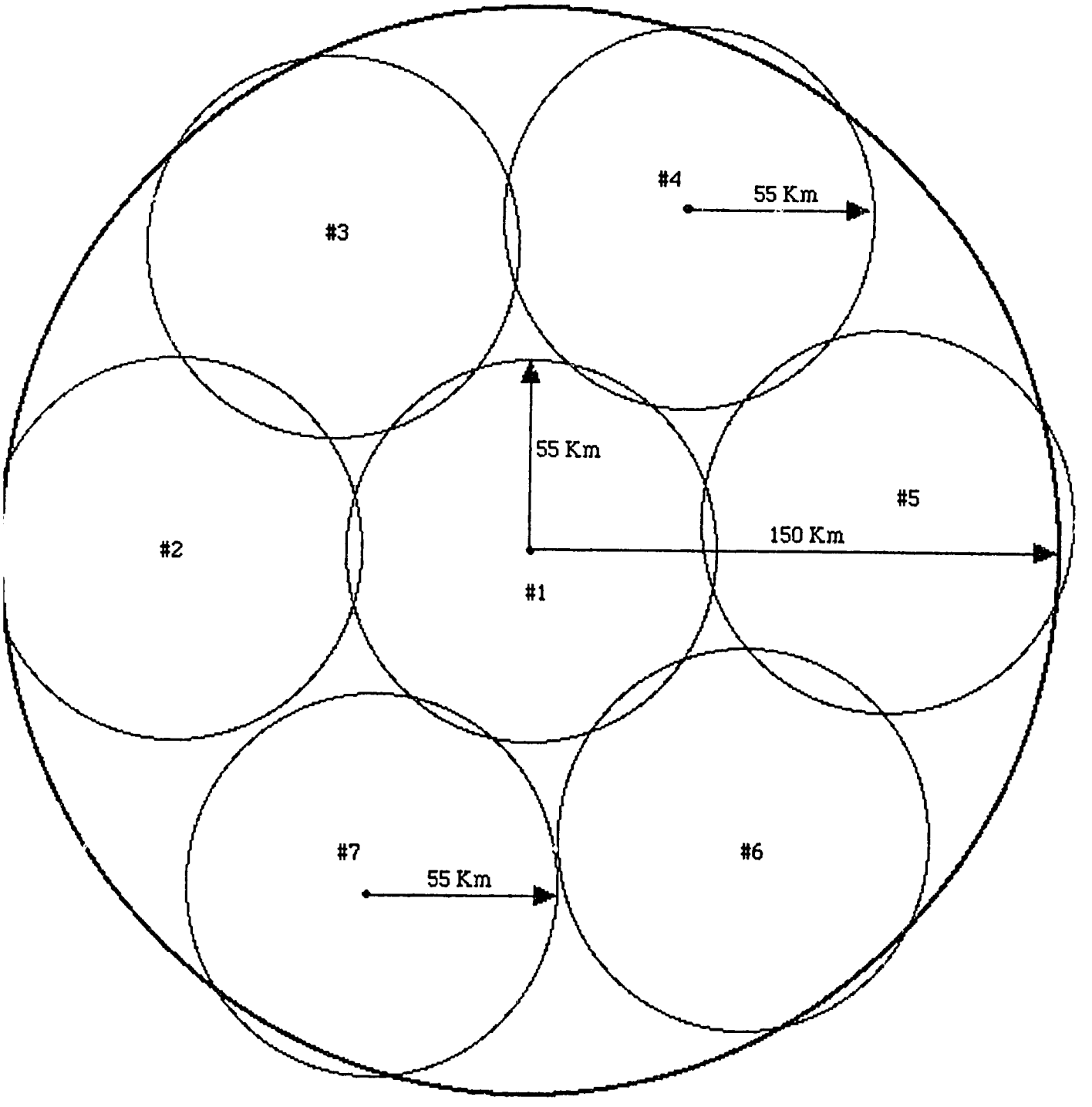
Antennas for such transmitter are very huge unit, often many hundred feet high requiring costly wide ground surface area.

Transmission lines between transmitter and antenna are also very sophisticated pieces of equipment, requiring system for pressurization and desiccation of such lines (using more electrical power), still adding to global cost.

Such transmitter are usually located far from the studio and an audio link must then be installed. This link being through buried cable, telephone line or microwave, it always introduce additional possibilities of failure.

ANNEX F2

DIAGRAM #1



AREA = ΠR^2

$= 3.1416 \times (150\ Km)^2 = 70{,}685\ Km^2$

$= 3.1416 \times (55\ Km)^2 = 9{,}503\ Km^2 \times 7 = 66{,}523\ Km^2$

Scale: 1/4" ≈ 10 Km

ANNEX G: GENERATORS: INCONVENIENCES AND ADVANTAGES

- Generators of 100 KVA and more are heavy pieces of equipment which require a lot of attention in order to maintain operation.

- High operating cost: In Guinea, at actual fuel cost (diesel 700 FG/L), a KW/h produced by generator average $0.20 to $0.25 (125 KVA unit). Adding all other related cost (maintenance, fuel storage, repairs, capitalization), it can almost double the figure, for instance, $0.30 up to $0.40 per KW/h.

- High maintenance cost: High consumption of lubricating oil, frequent oil change, fuel and air filter replacement, coolant replacement, etc.

- High repairs cost: Parts come from abroad, are expensive and hard to find. Complex repairs require competent mechanics.

- Fuel storage problems: High capacity tank needed, highly flammable liquid, risk of spill.

- Fuel delivery problem: Hampered by road access, road condition, sometimes very difficult during the rainy season, irregular delivery, risk of spill.

- Pollution: Generates CO_2 that contributes to the so-called green house effect.

- Short useful life: In harsh condition like in Guinea, useful engine life average 10,000 to 12,000 hrs. A complete overhaul is then needed.

- Poor voltage regulation and stability: A voltage regulator is mandatory for safe operation of electronic equipment.

- Poor reliability: Long list for cause of failure like lack of fuel, mechanical failure, water in fuel, parts not available, irregular maintenance, etc.

- Availability of spare parts: Main spare parts are available in the capital city only, meaning long off-air period for parts to get in.

- Heat and noise generation problem.

Advantages:

- Low capital investment

- Availability of fuel is under human control.

ANNEX H: ADVANTAGES OF A SATELLITE NETWORK

- Availability of the transmission channel 24 hours a day.
- On demand, creation of a national Radio Rurale network--at any time, the signal from one Radio Rurale station can be picked-up by the other three stations (trough existing equipment) and rebroadcast in their own region therefore allowing whole country coverage by one station for special events.
- Broadcasting can take place in any part of the country from any rural radio station
- Possibility of multiple remote control operation through the satellite carrier.
- Satellite receivers are small pieces of equipment. Spare units can be kept in stock for easy field replacement of a defective unit by low trained staff.
- Simple equipment means high reliability.
- Satellite fees will become less expensive as more satellites are brought into service.
- Technologies are continuously improving and costs are still going down.
- To economize, one space segment can be used for two regional stations.
- All receivers are controlled through a computer terminal and can be programmed locally, via modem, or through the satellite carrier.
- New receiver software can be downloaded locally, via modem, or through satellite carrier.
- The same dish and block down-converter can be used to hookup other receiving equipment for other kinds of data (faxes, computer files, etc.).
- The quality of the signal transmitted can be improved from standard AM broadcast level (7.5 Khz) to full stereo compact disc quality, but will use more space segment.
- Small structure, easy to install and to maintain.
- Digital format is becoming the standard in every domain from video to photography to geographical survey.

ANNEX I: SMALL PHOTOVOLTAIC SYSTEMS: ADVANTAGES AND INCONVENIENCES

Advantages:

- Almost no operating cost: Sunlight is free, and no other input is needed.

- Low maintenance cost: Maintenance is reduced to regular cleaning of accumulated dust on solar panels and topping off the batteries, which have a life expectancy of 5 to 10 years and are the only elements who needs regular replacement.

- High useful life: Solar panels are guaranteed for 10 to 20 years and life expectancy of at least 30 years is standard.

- Very good voltage regulation: Since regulators are integrated part of the system, very good voltage regulation is obtained, therefore assuring reliable operation of connected electronic equipment.

- High reliability: No moving parts, very simple regulating electronic component has a high mean time before failure (MTBF).

- Availability of spare parts: One regulator, a few solar panel and some batteries can be keep in stock for every 5-10 system at a very low cost. All repairs consist of replacement of the whole defective unit, and can be done on the field by low skilled staff.

- Easily expandable: Only new panels and batteries must be added.

- No fuel storage and delivery problems; no heat generation; no pollution.

- A small (300-400 Watts) generator can be use to recharge the batteries during long unexpected cloudy period. By doing so, generator is under full load at any moment of operation and work under most efficient condition. This kind of operation can be fully automated and a sufficient amount of fuel can be easily maintained in placed.

Inconveniences:

- High capital investment

- Availability of sun is unpredictable.

ANNEX J: SATELLITE NETWORK COST

Option # 1:

Satellite network in "C" band, including seven (7) receiving/transmitting sites with full PV power.

-Uplink to the satellite (installed) $60,000
(One needed per rural radio station)
(in KU band, uplink is $40,000)

-Receiving site: $7,000 x 7 = $49,000
(In KU band: $5,000)

-Transmitter and antenna $20,000 x 7 = $140,000
(500 Watts AM)

-Photovoltaic system $60,000 x 7 = $420,000

-Standby generator (2 KVA) $3,000 x 7 = $21,000

-Installation $15,000 x 7 = $105,000

-Miscellaneous: $3,000 x 7 = $21,000
(timer, automatic recharge, accessory)

-Contingency (10 %) $81,600

TOTAL: $897,600

Option #2:

Satellite network in "KU" band, including seven (7) receiving/transmitting sites with small generator.

-Uplink to the satellite (installed) $40,000
(One needed per rural radio station)

-Receiving site: $5,000 x 7 = $35,000

-Transmitter and antenna $20,000 x 7 = $140,000
(500 Watts AM)

-Standby generator (2 KVA) $3,000 x 7 = $21,000

-Installation $15,000 x 7 = $105,000

-Miscellaneous: $3,000 x 7 = $21,000
(timer, automatic recharge, accessory)

-Contingency (10 %) $81,600

TOTAL: $434,400

Cost for a low power receiving site:

-Satellite operation in KU band, one (1) watt FM transmitter.

-Receiving site: $5,000
(C-band add only $2,000)

-Transmitter and antenna $1,000
(1 Watts FM)

-Photovoltaic system $2,000

-Standby generator (not needed) Nil

-Installation $2,000

-Miscellaneous (timer, accessory) $500

-Contingency (10 %) $1,000

TOTAL: $11,500

Cost for a medium power transmitting site.

-Satellite operation in KU band, one hundred (100) watt FM transmitter.

-Receiving site: $5,000
(C-band add only $2,000)

-Transmitter and antenna (100 Watts FM)	$8,000	
-Photovoltaic system	$15,000	
-Standby generator (300 W)	$ 500	
-Installation	$6,000	
-Miscellaneous (timer, accessory)	$1,000	
-Contingency (10 %)		$3,550

	TOTAL:	$39,050

Note: "KU" band operation is relatively sensitive to fading under real heavy rain condition and will not insure operation 100 % of the time, depending on the satellite footprint. But in Guinea interior, such heavy rain are scarce, of short duration, very localized and most often at night. For Radio Rurale service, such conditions does not have that much importance since it will probably assure service for 99 % of the time in 98 % of location (and will save money). But if 100 % guaranteed service is required, then "C" band must be used.

ANNEX K: NEW EQUIPMENT COSTS

Photovoltaic power system:

Average $60,000 / station (varies with available local sunshine hours) except N'Zérékoré: $85,000

Total for 4 systems:	$265,000
Sub-total:	$265,000

Mobility:

-Portable transmitter/mixer: $4,500 each Total for 4 units:	$18,000
-Multitrack audio cassette recorder: $1,000 each (including carrying case) Total for 5 units:	$5,000
-Microphone for above: $240 each -Accessory - Windscreen: $40 - Adapter: $75 Total for 20 units:	$7,100
-Motorcycles: $2,000 each Total for 10 units:	$20,000
Sub-total:	$50,100

Studio equipment:

-Microphones and accessory: $175 each Total for 28 units:	$4,900
-Digital cart machine: $5,000 each Total for 4 units:	$20,000
-Computer and printer: $2,500 each Total for 4 units:	$10,000
Sub-total:	$34,900
TOTAL:	$350,000

ANNEX L: PHOTOVOLTAIC POWER GENERATION SYSTEM REQUIREMENTS

PV system will be used to provide electrical AC power to audio equipment only and to one fluorescent each in control room, studio room and production room only.

- Average electrical consumption: 1,000 Watt
  Except Nzérékoré: 1,400 Watt
- Voltage of operation: 220 VAC, 50 Hz
- Hours of utilization: 12 hours / day
- Period of utilization:
  - -Day time: 8 hours
  - -Night time: 4 hours
- Autonomy: 2 days
- Maximum power consumption: 1,900 Watt (peak)
  Except Nzérékoré: 2,800 Watt (peak)
- Battery output voltage / inverter input voltage: 24V or 48V
- Availability of utility power:
  - -Nzérékoré: Each evening, 19.30 hrs to 00.00 hrs. Also generator 15 KVA on site.
  - -Kankan: Each evening, 19.30 hrs to 00.00 hrs. Also generator 5 KVA on site.
  - -Labé: All day and evening from June to December (incl). Also generator 5.6 KVA on site.
  - -Kindia: Each evening from 19.30 hrs to 00.00 hrs from June to December (incl). Also generator 15 KVA on site.
- High and low battery voltage alarm: remote to radio control room.

In all cases, utility network is unreliable, unstable and cannot be used for more than 75% of the period. Both utility and on site generator can be used to recharge the batteries and supply the load during low sunshine condition.

The goal of the system is to insure that at all time, the voltage supply to the load (radio station electronic equipment plus some lighting) is drawn from the batteries through the inverter. The batteries are mainly charged by the solar panels when sunshine is available. Utility power (when available) is used trough a charging system to supply the load and recharge the battery, mainly during evenings and for those low sunshine months of the rainy season. Generator is always in standby in case of low battery charge. Switching of all these is fully automated.

This setup will insure that at any moment, the voltage supply to the electronic equipment will be perfectly stable and free of transients, regardless of the power source.

PHOTOVOLTAIC POWER SYSTEM GENERAL SPECIFICATIONS

Systems must be heavy-duty and must be suitable to work in a harsh environment with few maintenance by low trained staff. They must be reasonably resistant to vandalism. All equipment and special tool for normal maintenance must be included.

Computer aided design must be used to match the average monthly output of array with the load. Temperature derating, dust factor and wiring losses must also be taken in consideration.

The whole system must be able to operate in the African Tropical Zone conditions, with temperature ranging from 0 to +55 °C and relative humidity up to 100% . It must also be properly grounded and fully protected against lightning.

Photovoltaic panels array:

-Flat panels only; no concentrator or reflector.
-Blocking diode or other protection included.
-Single crystal or polycristalline silicon solar cells.
-Must be virtually unbreakable
-All panels must be sealed against dust, humidity or other pollutant and fully weatherproof.
-Self-cleaning, highly transmissive (low iron content), tempered glass superstrate.
-Module frame must be bronze-anodized extruded aluminum
-Weatherproof junction box, corrosion resistant terminal.
-Protective aluminum backplate.
-Support structure must be extruded aluminum.
-Proper reinforced concrete foundation must be used
-Must resist to the following condition:

- Wind speed: up to 180 km/h
- Altitude: 1,000 meter
- Dust, sand and heavy rain

Batteries:

-Expected life: 3,000 cycle, 20% depth of discharge(DOD)
-Sealed, maintenance free.
-Self discharge: 2% / month max.
-Charge efficiency: >97% up to 50% battery charge, >94% up to 100% battery charge.
-Heavy-duty construction.
-To extend battery life, passively cooled battery box should be used

Controller / voltage regulator:

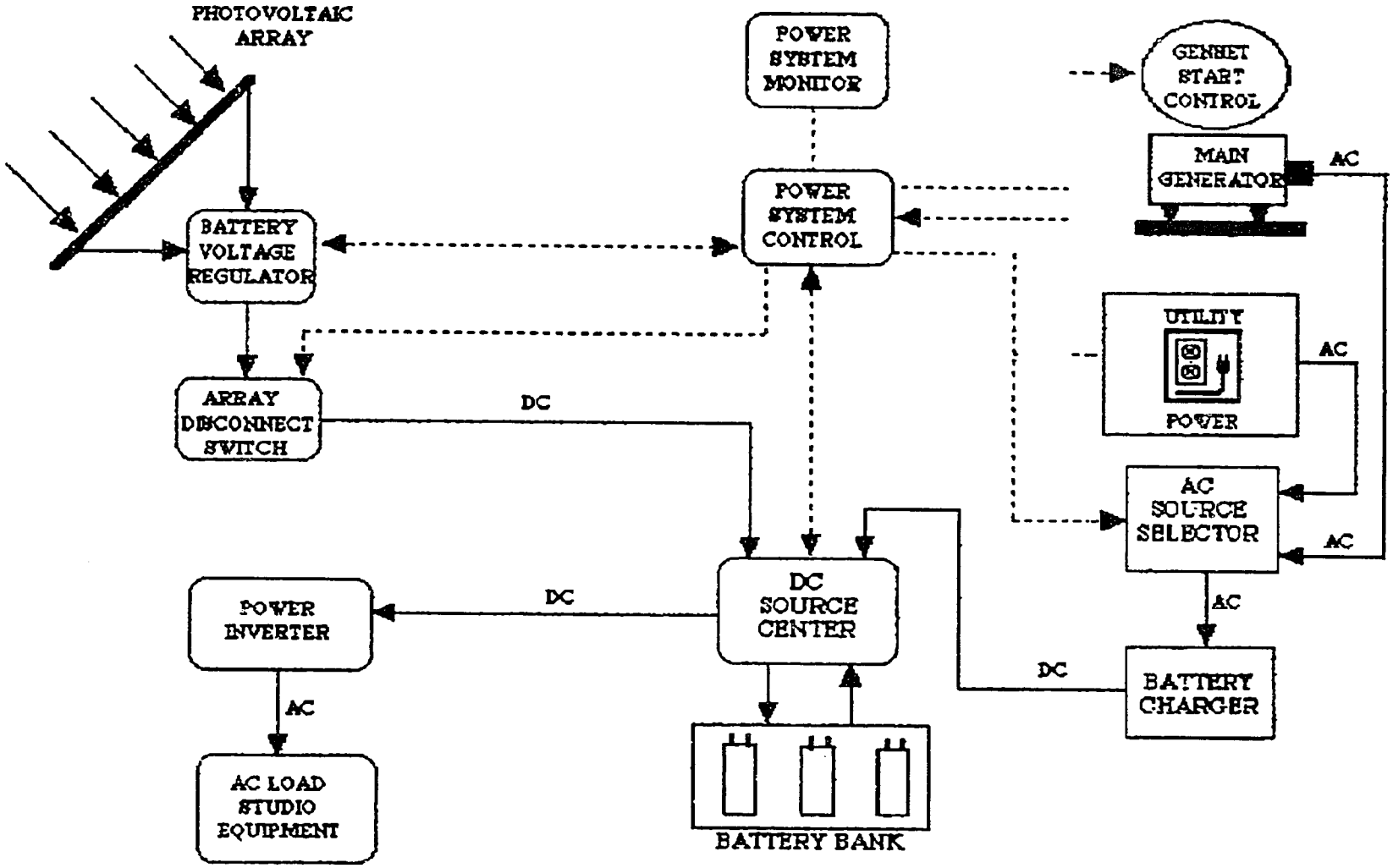
-Array current, load current and battery voltage meter, 5% accuracy
-External temperature compensation.
-Overload protection.
-Lightning/transient protection.
-Blocking diodes for individual array protection.
-Generator start relay to trigger back-up generator.
-Alarm relay (High and/or low voltage).
-Two stage charging circuit to insure optimal charging
-Severe environment enclosure.

Inverter:

-Input voltage: PV system battery working voltage
-Output voltage: 220 VAC, regulated
-Output frequency: 50 Hz ± 0.01%
-Output waveform: Quasi-sine wave, regulated
-Efficiency: Up to 95%
-Automatic short-circuit protection
-Automatic over temperature shutdown
-Automatic surge overload protection
-Automatic low battery shutdown
-Output circuit breaker
-Lightning/transient protection
-LED indication of inverter "on", low battery, overload, over-temperature
-Remote control with status light panel

Charging system:

-Output voltage: PV system battery working voltage
-Output current: Must be able to supply full load current (average value) plus suitable charging current for batteries.
-Automatic regulation of battery charging
-Input voltage: 220 Volts. Must have automatic switching from generator output to utility network (when available and stabilize) .
-Voltage regulator of sufficient capacity must be used at input.
-Lightning/transient protection
-Automatic short-circuit protection
-Automatic over temperature shutdown
-Automatic surge overload protection
-Output circuit breaker



PHTOVOLTAIC ELECTRICAL GENERATION TEM

COMPONENTS OF A PV / GENSET / UTILITYSTEM

ANNEX M: DIRECT DIGITAL BROADCASTING FROM SATELLITE

A new option might also be available soon that will make obsolete all this discussion. The WorldSpace satellite system, which is scheduled for several launches in 1997, 1998 and 1999, will provide dozens of channels of digital audio programming directly to consumer radios built for the system.

The WorldSpace system uses technology similar to that popularized today in hand-held satellite navigators, called GPS receivers. However the WorldSpace system operates at a much higher capacities, enabling the reception of digital audio programming with compact disc quality. Probably that channels at lower capacities (and lower cost) will be available for other use than entertainment.

The new WorldSpace consumer radios called StarMan receivers, will be hybrid multimedia products including and LCD display for textual information, interfaces for FAX receptions, electronic mail and interactive services. StarMan receivers chip sets will be made available to electronics manufacturers worldwide for assembly and production into a wide array of consumer electronics products. No one can foretell today the price of such receivers, neither what will be the price for renting a channel on such a system. However, the electronic industry has proven many times that cost of new system can become really cheap after a few years on the market. One has only to refer to CD player or video recorder. And already many broadcasters, like Voice of America, Radio Netherlands, Kenya Broadcasting Corp. and MultiRadio of France have signed channel reservation agreements on the WorldSpace satellite system.

The purpose of bringing in this new technology is not to put a hold on developing a satellite re-broadcasting network for the Guinean Rural Radio but to demonstrate that using high power transmitters in a country like Guinea is probably a totally obsolete technology. Satellite services are becoming very common, very diversified and less and less expensive. Waiting a year or two for diversified and low-cost satellite services to become available over this part of Africa will probably permit to choose a less awkward technology, quite more efficient and sustainable.

ANNEX N: TECHNICAL DATA ON REGIONAL RADIO STATIONS

Nzérékoré:

Population:
Unknown; the flow of refugee from Liberia has more than double the population of the city.
Languages:
Pélé, Krisie, Loma, Mano, Konianké, Lélé, Français.
General topography:
Mountainous area, covered by tropical forest.
Location:
Latitude: 7° 45' North
Longitude: 8° 50' West
Climate:
Hot and humid; monsoonal type rainy season (April to December) with southwesterly winds; dry season (January to March) with northeasterly winds.
Distance from ConaKry:
1,000 Kilometer
Access:
Paved road for 900 Km; dirt road for the remaining; can become tricky during the rainy season.;average driving time: 2 days.
Other mean of transportation:
Airplane; one way fare from Conakry is 61,000 FG; daily flight except Thursday, Saturday; distance to airport: 17 Km
Local radio station:
Radio Nationale and Radio Rurale share the same FM transmitter (93,4 MHz).
Radio receivers:
Easy to find; average receiver has AM, FM and at least two shortwaves band, costing 20,000 to 22,000 FG; almost every family owns one.
Battery:
Standard one (Zn) can be find every where from 250 FG to 800 FG depending of size; alcaline type mostly not available, even impossible to find; rechargeable one (Ni/Cd) unknown.

Electrical energy:
Available in the city area only, from 19.15 hrs to 00.00 hrs two evenings out of three in each district; diesel generator.

Radio Rurale station location: City center.

Space for solar panel: More than sufficient.

KanKan

Population:
400,000 inhabitants.
Language: Malinka
General topography:
Area of plains, liable to flooding.
Location:
Latitude: 10° 20' North
Longitude: 9° 17' West
Climate:
Hot and humid; monsoonal type rainy season (May to October) with southwesterly wind; dry season (November to April) with northeasterly harmattan winds.
Distance from Conakry:
800 Kilometer
Access:
Paved road; average driving time: 13 hours.
Other mean of transportation:
Railway from Conakry but no service since a few years and mostly not usable any more.
Airplane; one way fare from Conakry is 51,000 FG; daily flight; airport is located right in town.
Local radio station:
Radio Nationale (FM) and Radio Rurale (AM 1305 KHz)
Radio receivers:
Easy to find; average receiver has AM, FM and at least two shortwaves band, costing 20,000 to 22,000 FG; almost every family owns one.
Battery:
Standard one (Zn) can be find every where from 250 FG to 800 FG depending of size; alcaline type mostly not available, even impossible to find; rechargeable one (Ni/Cd) unknown.
Electrical energy:
Available in the city area only, from 19.00 hrs or often later to 00.00 hrs; diesel generator.
Radio Rurale station location:
Administrative center, western part of the city.
Space for solar panel:
Sufficient space

Labé

Population:
300,000 to 400,000 inhabitants.
Language: Fula
General topography:
Hilly.
Location:
Latitude: 11° 19' North
Longitude: 12° 17' West
Climate:
Hot and humid; monsoonal type rainy season (June to December) with southwesterly wind; dry season (January to May) with northeasterly harmattan winds.
Distance from Conakry:
440 Kilometer
Access:
Paved road; average driving time: 6 or 7 hours.
Other mean of transportation:
Airplane; one way fare from Conakry is 30,000 FG; flight every Tuesday, Thursday and Saturday; airport is located three kilometer from town.
Local radio station:
Radio Nationale (FM 87,5 MHz), also in Limboko, 17 Km from Labé (FM 96,2 MHz) and Radio Rurale (AM 1386 KHz)
Radio receivers:
Easy to find; average receiver has AM, FM and at least two shortwaves band, costing 20,000 to 22,000 FG; almost every family owns one.
Battery:
Standard one (Zn) can be find every where from 200 FG to 800 FG depending of size; alcaline type mostly not available, even impossible to find; rechargeable one (Ni/Cd) unknown.
Electrical energy:
Available in city area only, all day long but during the rainy season only; hydro-electricity.
Radio Rurale station location:
City center.
Space for solar panel:
Sufficient space

Kindia

Population:
200,000 inhabitants.
Language: Sousou
General topography:
Hilly.
Location:
Latitude: 10° 3' North
Longitude: 12° 51' West
Climate:
Hot and humid; monsoonal type rainy season (May to November) with southwesterly wind; dry season (December to April) with northeasterly harmattan winds.
Distance from Conakry:
135 Kilometer
Access:
Paved road; average driving time: 2 hours.
Other mean of transportation:
Railway from Conakry but no service since a few years and mostly not usable any more.
No airport.
Local radio station:
Radio Nationale and Radio Rurale share the same FM transmitter (96,3 MHz) at PTT office and another one up Coliadi mountain, 4 Km away (FM, 90,3 MHz).
Radio receivers:
Easy to find; average receiver has AM, FM and at least two shortwaves band, costing 20,000 to 22,000 FG; almost every family owns one.
Battery:
Standard one (Zn) can be find every where from 200 FG to 800 FG depending of size; alcaline type mostly not available, even impossible to find; rechargeable one (Ni/Cd) unknown.
Electrical energy:
Available in city area only, all day long but during the rainy season only; hydro-electricity.
Radio Rurale station location:
Administrative center, western part of the city.
Space for solar panel:
Not that much space. Solar panels will have to be installed on the side and the back of the building and raised two feet to overcome the shadow from the building.

ANNEX P: NEW STUDIO EQUIPMENT SPECIFICATIONS

MOBILITY:

Portable transmitter/mixer:

Power output: 0.6 Watt
Frequency range: 88 to 108 MHz.
Frequency stability: +/- 1,000 Hz
RF harmonics: 50 dB below carrier
Maximum modulation deviation: +/- 35 KHz
Audio distortion at +/- 35 KHz:
    50 - 100Hz: 1.5 %
    100 - 7,500 Hz: 1.0 %
    7,500 - 10,000 Hz: 2.0 %
Frequency response: +/- 2 dB, 100 Hz-10,000 Hz
Audio inputs: 3
    -3 microphone input
    -1 line (consumer or hi-fi level)
Power: 220/240 VAC or internal battery
Battery autonomy: 4 hours
Antenna: Whip type, adjustable from 80 to 120 cm. With ground stand and cable 15 meter with plugs.
Accessory: Carrying case (backpack style).

Suggested model: Petrie Telecommunication model PTS-1-1

Multitrack portable audio cassette recorder:

4-track recording system:
- 12 VDC operation or 220 VAC with adapter.

Mixer section;
- 8 inputs: 4 mic/line + 2 stereo line input
- HI and LOW equalizer + effect send on each mic/line input
- L-R/cue assign switch on each stereo line input

Recorder section:
- 4 track, 4 channel format
- 3 tape speed: 9.5 cm/s, 4.8 cm/s, 2.4 cm/s
- Logic-controlled transport operation
- Built-in DBX noise reduction, switchable.

Accessory: Heavy-duty carrying case

Suggested model: Tascam 424
Quantity: Five (5)

Microphones for above:

Type: Dynamic
Frequency response: 90 - 13,000 Hz
Pattern: Supercardioid
Impedance: 150 ohms
Output: -56 dB
Case: Steel
Cable: 15 feet. Must be supplied with male and female XLR-3 at respective end.
Included: Stand clamp
Accessory: Windscreen
Transformer for low-Z mike to hi-Z input.

Suggested model: EV RE10 with 312 clamp, 314 windscreen and 502CP adapter
Quantity: Twenty (20)

Motorcycles:

Type: Touring or road model.
Engine: Two cycle, 100 cc, two cylinders.
Lubrication: Oil injection

Suggested model: Yamaha Twinjet 100
Quantity: Ten (10)

STUDIO PRODUCTION EQUIPMENT:

Microphones:

Type: Dynamic
Frequency response: 80 - 13,000 Hz
Pattern: Omnidirectional
Impedance: 150 ohms
Output: -55 dB
Case: Steel

One cable: 15 feet. Must be supplied with male and female XLR-3 at respective end.
Second cable: 5 feet. Must be supplied with XLR-3 female at one end and miniphone 1/8 " at other end.
Included: Stand clamp
Accessory: Windscreen

Suggested model: EV 635A with 312 clamp and 314E windscreen and two cables as described.
Quantity: Twenty-eight (28)

Cartridge machine:

Power: 210 to 240 VAC, 50 Hz
Bandwidth: +/- .5 dB, 10 Hz to 20 KHz
Quantization: 16 bit linear
Sampling frequency: 48K, 44.1K, 32K, stereo or mono
Dynamic range: 92 dB
Distortion (THD+N): .005% ref. to full scale
Crosstalk: >90 dB at any frequency
Input/output circuit: Electronically balanced, XLR-3 connector
Input Z: 40K ohms
Output Z: 100 ohms
Removable cartridge: Bernoulli magnetic disk cartridge
65, 105, 150 Mb capacity
Internal hard disk: 240 Mb minimum.
Display: 2 line x 20 large character fluorescent

Suggested model: 360 System, model DigiCart II
Quantity: Four (4)

Portable computer and printer:

Processor: 386SL / 25 MHz minimum
Memory: 4 Mb minimum.
Hard drive: 120 Mb minimum.
Display: 9.5" SuperVGA, monochrome.
Keyboard: Bilingual (French - English)
Trackball: Included
Expansion: Two PCMCIA Type III slots
AC adaptor: 220 VAC
Battery life: 3.0 hours minimum.
Internal diskette drive: 3.5", 1.44 Mb

Pre-installed software: MS-DOS 6.x , WINDOWS 3.x , Microsoft
(French version) Office 4.x (x = latest version)

Printer: Type: Inkjet
Resolution: 300 dpi minimum
Power: 220 Vac

Quantity: Four (4)

IMPORTANT:
All equipment must be supplied with french instruction manual

ANNEX Q

	RADIO RURALE REGIONALE STATION		
	EQUIPMENT INVENTORY		
			DATE:
	N'ZÉRÉKORÉ		**OCTOBER 11, 1994**
ITEM NO	DESCRIPTION	QTY	COMMENTS
	Control room equipment		
1.1	Console Studer 961 - 10/2, 10 in / 2 out	1	
1.2	Wooden table for console and equipment	1	
1.3	Studer telephone interface	1	
1.4	Connectors panel	1	
1.5	Studer equalizer 2 channels	1	
1.6	Studer line amplifier (2 ch)+ limiter (2 ch)	1	
1.7	Studer patch bay	1	
1.8	Reel-to-reel Studer A-807-1 MKII	6	2 carts with rollers missing
1.9	Reel-to-reel Studer A-807-VUK	2	With V.U. panels, prod. room
1.10	Cassette tape deck Revox C-115	2	
1.11	Multiband pro. receiver Philips D-2999	1	
1.12	Studer telephone interface (on A-807-VUK)	1	
1.13	Studer stereo amplifier 40W	1	Service manual missing
1.14	Studer control room monitor speaker	1	
1.15	Revox studio monitor speaker	1	
1.16	Beyer headphones DT-100	5	Some ear cushion missing
1.17	Studer studio mike control box	1	
1.18	Studer studio connector panel	1	
	Microphones and accessory		
2.1	Sennheiser Microphones MD-421	4	
2.2	Sennheiser Microphones MD-214	1	
2.3	Sennheiser table stand MZT 441	4	
2.4	Sennheiser table stand MZT 100	1	
2.5	Sennheiser floor stand SEM 3136	4	
2.6	Sennheiser boom stand SEM 3138	4	
2.7	Microphones cables with XLR-3 connectors	6	
	Portable equipment		
3.1	Portable cassette recorder Grundig CR-105	6	
3.2	Portable digital receiver Sony ICF-7600	1	
3.3	Portable Tape recorder Nagra Kudelski	4	One with intermittent problem
3.4	Microphone and accessories for Nagra's	4	
3.5	Portable cassette rec. Marantz PMD-222	1	
	Public address system		
4.1	Horn speaker Toa TC-301A	2	

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4.2	Amplifier Toa WA-520	1	
4.3	Wireless microphone Toa WM-220	1	Broken antenna
4.4	Wireless receiver Toa WT-700	1	
	Workshop equipment		
5.1	Toolkit case	1	A few tools missing
5.2	Audio test set Neutrik A-1	1	English instructions only
5.3	Double trace scope Philips PM-3050	1	
5.4	Multimeter Fluke 29	1	
5.5	Drill Bosch with accessory	1	
5.6	Jiggsaw Bosch with accessory	1	
	Other equipment		
6.1	Votage regulator 220 V Trident CVR-3000A	1	
6.2	Generator Lombardini 15 KVA, diesel	1	Consumption: 5 to 7 L/hrs
	3 phases, 220/380 V - 50 Hz		
6.3	Telephone set	1	
6.4	Fax Brother 160	1	
6.5	Vacuum	1	

RADIO RURALE REGIONALE STATION

EQUIPMENT INVENTORY

KANKAN

DATE: OCTOBER 13, 1994

ITEM NO	DESCRIPTION	QTY	COMMENTS
	Control room equipment		
1.1	Console Studer 961 - 10/2, 10 in / 2 out	1	
1.2	Wooden table for console and equipment	1	
1.3	Studer telephone interface	1	
1.4	Connectors panel	1	
1.5	Studer equalizer 2 channels	1	
1.6	Studer line amplifier (2 ch)+ limiter (2 ch)	1	Line amp + limiter bypassed
1.7	Studer patch bay	1	
1.8	Reel-to-reel Studer A-807-1 MKII	3	One with defective remote
1.9	Reel-to-reel Studer A-807-VUK	2	One under repair.
1.10	Cassette tape deck Studer A-721	2	
1.11	Multiband pro. receiver Philips D-2999	1	
1.12	Studer telephone interface (on A-807-VUK)	1	
1.13	Studer stereo amplifier 40W	1	Serv. man. ? + 1 ch. defective
1.14	Studer control room monitor speaker	1	
1.15	Revox studio monitor speaker	1	
1.16	Beyer headphones DT-100	6	All ear cushion missing
1.17	Studer studio mike control box	1	
1.18	Studer studio connector panel	1	
	Microphones and accessory		
2.1	Sennheiser Microphones MD-421	4	
2.2	Sennheiser Microphones MD-21U	1	
2.3	Sennheiser table stand MZT 441	4	
2.4	Sennheiser table stand MZT 100	1	
2.5	Sennheiser floor stand SEM 3136	4	
2.6	Sennheiser boom stand SEM 3138	4	
2.7	Microphones cables with XLR-3 connectors	6	
	Portable equipment		
3.1	Portable cassette recorder Grundig CR-100	5	
3.2	Portable digital receiver Sony ICF-7600	1	Broken down, not repaired.
3.3	Portable Tape recorder Nagra Kudelski	4	
3.4	Microphone and accessories for Nagra's	4	
	Public address system		
4.1	Horn speaker Toa TC-301A	2	
4.2	Amplifier Toa WA-520	1	

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4.3	Amplifier Tca CA-40	1	
4.4	Wireless microphone Toa WM-220	1	
4.5	Wireless microphone Toa DM-503	1	
4.6	Wireless receiver Toa WT-700	1	
	Workshop equipment		
5.1	Toolkit case	1	No tool missing
5.2	Audio test set Neutrik TT-402A	1	English instructions only
5.3	Double trace scope Philips PM-3050	1	
5.4	Multimeter Fluke 75	1	
5.5	Drill Bosch with accessory	1	
5.6	Jiggsaw Bosch with accessory	1	
	Other equipment		
6.1	Votage regulator 220 V Trident CVR-3000A	1	
6.2	Generator Kubota 5 KVA, gazoline	1	Consumption: 2 to 3 L/hrs
	220V - 50 Hz		
6.3	Telephone set Socotel S-63	1	
6.4	Fax Brother 160	1	
6.5	Vacuum	1	
6.6	Fans	2	
6.7	Air conditioner	1	
6.8	Fire extinguisher	1	

RADIO RURALE REGIONALE STATION

EQUIPMENT INVENTORY

DATE:

LABÉ

OCTOBER 17, 1994

ITEM NO	DESCRIPTION	QTY	COMMENTS
	Control room equipment		
1.1	Console Studer 961 - 10/2, 10 in / 2 out	1	3 channels out of 10 defectiv
	To be replaced temp. by a 8 in / 2 out. Will be shipped in Swiss for repair		
1.2	Wooden table for console and equipment	1	
1.3	Studer telephone interface	1	Defective since 1992.
1.4	Connectors panel	1	
1.5	Studer equalizer 2 channels	1	
1.6	Studer line amplifier (2 ch)+ limiter (2 ch)	1	Repaired recently
1.7	Studer patch bay	1	
1.8	Reel-to-reel Studer A-807-1 MKII	3	Frequent pinch roller replac.
1.9	Reel-to-reel Studer A-807-VUK	2	One defective, fixed later
1.10	Cassette tape deck Studer A-721	2	
1.11	Multiband pro. receiver Philips D-2999	1	AM band defective
1.12	Studer telephone interface (on A-807-VUK)	1	Defective since the beginning
1.13	Studer stereo amplifier 40W	1	Serv. man. ? + 1 ch. defective
1.14	Studer control room monitor speaker	1	
1.15	Revox studio monitor speaker	1	
1.16	Beyer headphones DT-100	4	Broken ear cushions
1.17	Sennheiser headphones HD-450	2	
1.18	Studer studio mike control box	1	
1.19	Studer studio connector panel	1	
	Microphones and accessory		
2.1	Sennheiser Microphones MD-421	4	2 mikes broken down
2.2	Sennheiser Microphones MD-210	5	
2.3	Sennheiser table stand MZT 441	3	
2.4	Sennheiser table stand MZT 100	1	
2.5	Sennheiser floor stand SEM 3136	7	
2.6	Sennheiser boom stand SEM 3138	2	
2.7	Microphones cables with XLR-3 connectors	6	
	Portable equipment		
3.1	Portable cassette recorder Grundig CR-105	12	
3.2	Portable digital receiver Sony ICF-7600	1	
3.3	Portable digital receiver Sony ICF-300L	1	
3.4	Portable digital receiver Sony ICF-SW-20	1	
3.5	Portable Tape recorder Nagra Kudelski	4	

3.6	Microphone and accessories for Nagra's	4	
3.7	Portable cassette rec. ITT C-215	1	
	Public address system		
4.1	Horn speaker Toa TC-301A	2	
4.2	Amplifier Toa WA-520	1	
4.3	Wireless microphone Toa WM-220	1	
4.4	Wireless receiver Toa WT-700	1	
	Workshop equipment		
5.1	Toolkit case	1	2-3 screwdriver missing
5.2	Audio test set Neutrix TT-402A	1	English instructions only
5.3	Double trace scope Philips PM-3050	1	
5.4	Multimeter Fluke 29	1	
5.5	Drill Bosch with accessory	1	
5.6	Jiggsaw Bosch with accessory	1	
5.7	Multimeter Yinfung YF-14A	1	
	Other equipment		
6.1	Votage regulator 220 V Trident CVR-3000A	1	
6.2	Old Russian generator 5.6 KVA, gazoline	1	Consumption : 3 to 4 L/hrs
	220 V - 50 Hz	Broken down (cylinder) parts ??	
6.3	Telephone set	3	
6.4	Fax Brother 160	1	
6.5	Vacuum	1	
6.6	Fire extinguisher	1	

RADIO RURALE REGIONALE STATION

EQUIPMENT INVENTORY

KINDIA

DATE:
OCTOBER 19, 1994

ITEM NO	DESCRIPTION	QTY	COMMENTS
	Control room equipment		
1.1	Console Studer 961 - 10/2, 10 in / 2 out	1	
1.2	Wooden table for console and equipment	1	
1.3	Studer telephone interface	1	
1.4	Connectors panel	1	
1.5	Studer equalizer 2 channels	1	
1.6	Studer line amplifier (2 ch)+ limiter (2 ch)	1	
1.7	Studer patch bay	1	
1.8	Reel-to-reel Studer A-807-1 MKII	3	
1.9	Reel-to-reel Studer A-807-VUK	2	With V.U. panels, prod. room
1.10	Cassette tape deck Revox C-115	2	
1.11	Multiband pro. receiver Philips D-2999	1	
1.12	Studer telephone interface (on A-807-VUK)	1	
1.13	Studer stereo amplifier 40W	1	Serv. man. ? + 1 ch. defective
1.14	Studer control room monitor speaker	1	
1.15	Revox studio monitor speaker	1	
1.16	Beyer headphones DT-100	5	Some ear cushions missing
1.17	Studer studio mike control box	1	
1.18	Studer studio connector panel	1	
	Microphones and accessory		
2.1	Sennheiser Microphones MD-421	4	
2.2	Sennheiser Microphones MD-21U	5	
2.3	Sennheiser table stand MZT 441	4	
2.4	Sennheiser table stand MZT 100	1	
2.5	Sennheiser floor stand SEM 31 6	4	
2.6	Sennheiser boom stand SEM 3138	4	
2.7	Microphones cables with XLR-3 connectors	8	
	Portable equipment		
3.1	Portable cassette recorder Grundig CR-105	6	
3.2	Portable digital receiver Sony ICF-7600	1	
3.3	Portable Tape recorder Nagra Kudelski	4	
3.4	Microphone and accessories for Nagra's	4	
	Public address system		
4.1	Horn speaker Toa TC-301A	2	
4.2	Amplifier Toa WA-520	1	

4.3	Wireless microphone Toa WM-220	1	
4.4	Wireless receiver Toa WT-700	1	
	Workshop equipment		
5.1	Toolkit case	1	Soldering iron missing
5.2	Audio test set Neutrik A-1	1	English instructions only
5.3	Double trace scope Philips PM-3050	1	
5.4	Multimeter Fluke 29	1	
5.5	Drill, Bosch with accessory	1	
5.6	Jiggsaw, Bosch with accessory	1	
	Other equipment		
6.1	Votage regulator 220 V Trident CVR-3000A	1	
6.2	Generator Lombardini 15 KVA, diesel	1	Consumption: 5 to 7 L/hrs
	3 phases, 220/380 V - 50 Hz		One phase broken (burned)
6.3	Telephone set	3	
6.4	Fax Brother 160	1	
6.5	Vacuum	1	
6.6	Air conditioner	4	One broken (compressor)

ANNEX R

MONTHLY HOURS OF SUNSHINE

KANKAN

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1989	276	231	277	258	---	---	---	---	---	---	---	---
1990	266	255	254	203	258	257	---	172	216	277	264	281
1991	270	261	235	267	193	223	166	148	236	227	237	253
1992	229	239	263	243	239	---	157	170	215	266	239	---
1993	284	258	266	236	224	227	232	170	195	268	263	---
1994	239	221	236	180	236	236	154	172	---	---	---	---
TOTAL	1564	1465	1531	1387	1150	943	709	832	862	1038	1003	534
MEAN	261	244	255	231	230	236	177	166	216	260	251	267

MONTHLY HOURS OF SUNSHINE

N'ZÉRÉKORÉ

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1989	182	117	160	170	187	121	79	73	111	157	150	129
1990	209	188	198	130	---	128	44	93	106	152	---	137
1991	205	166	151	135	99	142	90	69	80	110	152	175
1992	187	181	174	151	108	105	63	63	120	147	164	---
1993	---	---	154	131	152	129	87	101	99	153	159	157
1994	180	138	147	117	127	128	73	75	---	---	---	---
TOTAL	963	790	984	834	653	753	436	474	516	719	625	598
MEAN	193	158	164	139	131	126	72.7	79	103	144	156	150

MONTHLY HOURS OF SUNSHINE

LABÉ

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1989	297	254	302	293	244	212	163	101	181	235	242	265
1990	283	269	251	229	224	211	130	191	175	213	256	276
1991	247	245	304	306	249	185	139	132	166	201	225	244
1992	221	211	241	258	199	179	145	131	184	228	222	237
1993	271	248	303	247	225	200	175	170	203	198	224	275
1994	---	---	---	---	---	---	---	---	---	---	---	---
TOTAL	1319	1227	1401	1333	1141	987	752	725	909	1075	1169	1297
MEAN	264	245	280	267	228	197	150	145	182	215	234	259

MONTHLY HOURS OF SUNSHINE

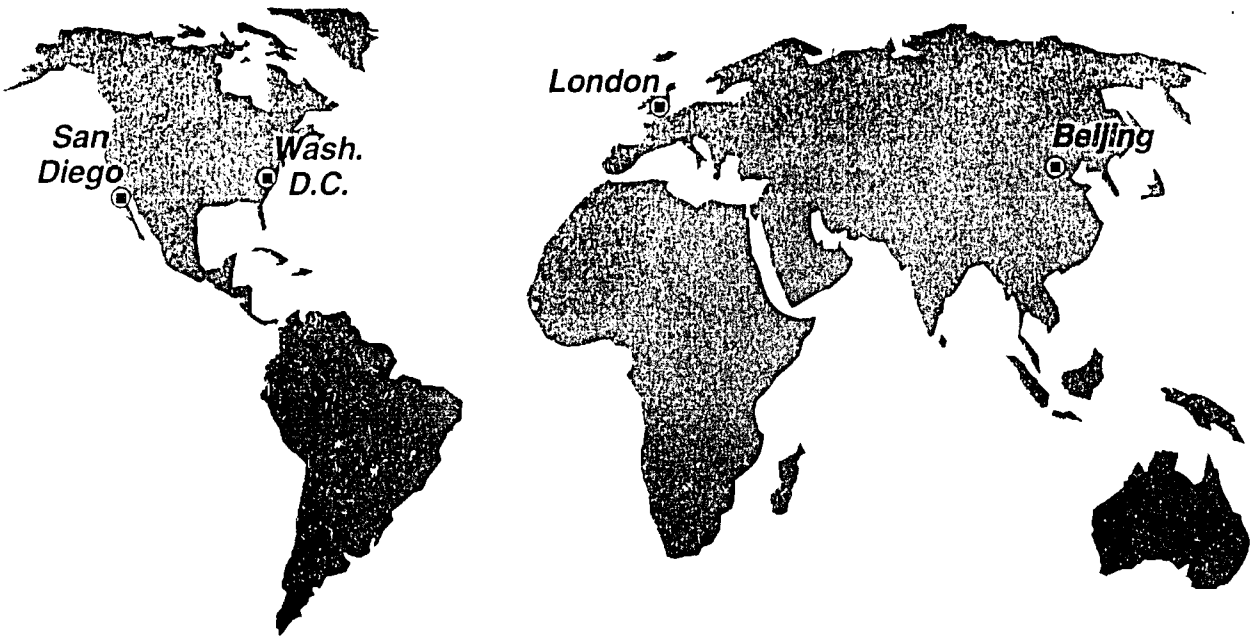
KINDIA

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1969	240	251	272	224	197	136	86	70	103	98	221	258
1970	278	238	277	213	182	201	115	55	---	---	---	---
TOTAL	518	489	549	437	379	337	201	125	103	98	221	258
MEAN	259	245	275	219	190	169	101	62.5				

ANNEX

ComStream

Bringing Satellite Technology Down to Earth



ComStream supports an international customer base from four offices worldwide.

Digital Data Distribution

Digital Audio Broadcast

Two-Way Modems & Earth Stations

Worldwide Customer Support

ComStream

ComStream Corporation provides digital satellite networking products for businesses and governments using wide area communications. ComStream network products are innovatively engineered for superior performance and low cost, and are widely recognized as industry standards.

The ComStream customer list includes more than 70 of the world's top companies, including international customers from North America, Asia, Europe, and Australia. Customers for ComStream include Reuters Information Services Ltd., AT&T, USA TODAY/Gannett, Kmart, GTE Spacenet, CBS Radio, MRFT (China), British Telecom (UK), IBM, ABC Radio, CAA (Australia), Telespazio (Italy), Vitacom, DBP Telekom (Germany), Redsat (Mexico), SAMART (Thailand), Macrotel (Philippines), and numerous others.

ComStream was founded in 1984 by Franz Birkner (chairman), Itzhak Gurantz (VP R&D), and Stephen Blake (VP marketing).

ComStream provides complete networks for the following applications:

- One-way digital data distribution
- Two-way digital networks for voice, data, and FAX services
- Digital audio broadcast

In addition, ComStream continues to innovate with its modular satellite modems. ComStream modems use field replaceable circuit card modules to easily and quickly change interfaces, add full compatibility with IDR, IBS, SMS standards, or upgrade to high performance Reed-Solomon coding, to name just a few available options.

ComStream has been delivering its satellite and data networking products since September, 1985. Customers get the benefits of satellite communication networks that provide end-to-end control, quick and easy expansion, proven reliability, flexibility of network architecture, high availability, and lower recurring costs.

ComStream employs over 160 people at its engineering, manufacturing, and administrative headquarters located on Sorrento Mesa (fifteen miles north of downtown San Diego, CA), a dynamic growth area for high-technology.

Field support offices are also located in the Washington D.C. metropolitan area, Beijing, and London to serve ComStream's geographically diverse customers.

Capabilities

The people at ComStream excel in product design and development. Many of the executives and engineers were pioneers in satellite transmission technology and they continue to lead the way in new developments for the industry as a whole.

The evolution of existing products and the development of new ones is an ongoing process at ComStream. The backbone or core technology of the company product lines is a set of several custom VLSI circuits designed and developed by ComStream engineers. These custom chips provide ComStream an unmatched competitive edge by making its products more innovative, flexible, compact, and power efficient than other equipment.

This proprietary circuitry embodies ComStream expertise in RF, analog, and digital signal processing. With this expertise, the company has blended an ability to conceptualize the high level needs of the user, and to design and implement the best available product level technical solution including hardware, software, and network management.

The result is high performance communications systems emphasizing bandwidth and power efficiency. The company has built a reputation for producing highly integrated solutions to complex network requirements, while maintaining the low-cost manufacturability of its products.

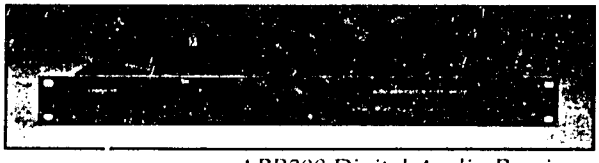
The first ComStream product was a codec implemented on a single VLSI chip.

Digital Data Distribution

The ComStream Integrated Data Distribution Network is a complete network for distributing data to multiple locations, or "remote" sites. This network consists of a single data uplink, many remote receivers, and a ComStream Network Management System (CNMS) for monitor and control.

The ComStream digital broadcast receiver, the DBR401, is the industry standard for high-speed, satellite-based data distribution networks. Three of the largest European PTTs have chosen ComStream for their data broadcast networks.

The DBR401 operates at Ku- or C-Band frequencies and is compatible with various satellite systems, including CONUS, EUTELSAT, and INTELSAT. The standard configuration includes a .75 to 1.8 meter antenna, a Low Noise Block downconverter (LNB), and a digital receiver. The DBR401 operates in a "clear channel" mode or with demultiplexing options to provide up to 12 data feeds from a single receiver.



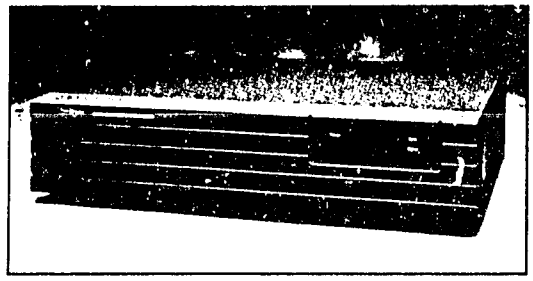
ABR200 Digital Audio Receiver.

Digital Audio Broadcast

The Integrated Digital Audio Network featuring the ABR200 Digital Audio Receiver sets a new worldwide standard for digital audio distribution. Significant satellite savings (35-65%) are achieved when compared to alternative distribution networks, through a combination of ComStream digital satellite receiver technology and the latest in ISO/MPEG digital audio compression.

The ComStream digital audio network can start small (offering a single monaural or stereo audio channel) and grow to a multichannel system (in excess of 50 channels) with no replacement of receiver hardware. The network is expanded by simply adding more ComStream codec/muxes and modems at the uplink. Quick Channel Access™ provides fast, easy selection of audio channels, either at the receiver or from the uplink.

Satellite resources and operating parameters are managed and optimized using the inherent network flexibility and control, and the Audio Network Management System (ANMS), providing a customized audio network.



DBR401 Digital Broadcast Receiver.

Two-Way Modems & Earth Stations

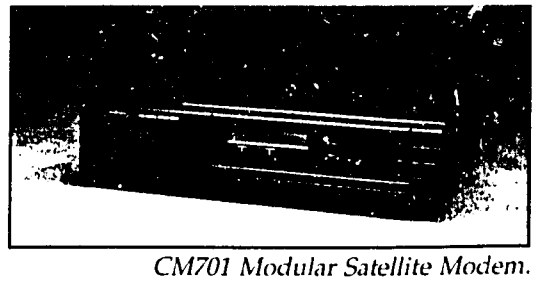
ComStream digital interactive networks offer quickly implemented solutions for digital data, voice and/or FAX communications, especially in areas where terrestrial infrastructure is limited. ComStream modems and/or earth stations are combined with the Star Network Management System (SNMS) to provide comprehensive monitor, control, and management of the network.

CM701 modems and DT7000 earth stations feature a modular design that allows upgrades or reconfiguration in the field for different operating modes, interfaces, or options. Included among these options is a framing unit module for IDR, IBS, SMS open network compatibility.

ComStream modems and earth stations operate at fixed, multiple or variable user data rates. Multirate modems allow the user to preselect four (4) data rates while the variable rate modems provide rate selection in 1 bit-per-second steps over the entire operating range. The operating range of data rates is from 4.8 Kbps to a high of 2.2 Mbps.

ComStream integrates the modem technology with an RF Unit and small antenna to provide the first truly integrated SCPC earth station. These earth stations can be ordered with either a 2 watt Ku-band or 5 watt C-band RF package.

Earth stations are used for point-to-point transmission of data, voice or video, or as low cost hubs for digital data or audio distribution networks.



CM701 Modular Satellite Modem.

Worldwide Customer Support

ComStream supports its customers and products with Customer Service Representatives and Field Engineers. The people working within these two specialized departments are the customer's direct link to ComStream after the order, making sure systems are delivered, installed, and kept running.

Customer service representatives follow through after the order to ensure on-time delivery, to answer non-technical questions, and to direct customers needing technical assistance. Field service engineers provide user/operator training and technical support, either over-the-phone or with an on-site visit to the installation.

Major Product Summary

DBR401	Clear-channel or multichannel Digital Broadcast Receiver for C- or Ku-band data transmission
DT7000	Two-way, low-cost earth station with 2 watt Ku-band or 5 watt C-band RF unit
DT5000	Ku- or C-band earth station with higher power RF options
CM701	Modular satellite modem IDR/IBS/SMS Open Network modem Variable, multirate (4 rates), or fixed rates
CM101/CP101	Burst modems
CX101 and CX801	1:1 and 1:8 modem protection switches
ABR200	Digital Audio Receiver for C- or Ku-band audio transmission
DAC	Digital Audio Codec/Mux for audio uplinks
Uplinks	Complete hub for data or audio networks
CNMS, ANMS, SNMS	PC-based Network Management System for Data, Audio, or SCPC/MCPC applications

Most Innovative New Product - The CBR101 (DBR401) captured that honor from Arthur Andersen Consulting and the UCSD "Connect" program for technology and entrepreneurship.

Management Summary

Ronald L. Derry, president & CEO
Stephen A. Blake, vice president marketing
Dr. Itzhak Gurantz, vice president research & development
Michael Blair, vice president sales
Scott Smull, chief financial officer
James Nixon, director of operations

The first ComStream location totalled 4,400 square feet. Today, the company occupies more than ten times as much space in two buildings, and maintains three additional field offices.

ComStream is a wholly-owned subsidiary of Spar Aerospace Limited, Toronto, Canada.

Headquarters: 10180 Barnes Canyon Road San Diego California 92121 (619)458-1800 FAX (619)552-0488
Eastern U.S.: P.O.Box 4010 Annapolis, MD 21403 (410) 267-8040 FAX (410)267-8039
Far East: 2309 China World Trade Center No.1 Jianguomenwai Beijing, China 100004 (86)1 505 4824 FAX (86)1 505 4842
Europe: Britannia House 5-6 Millmead Guildford, Surrey GU2 5BE UK (44)483 440 933 FAX (44)483 440 876

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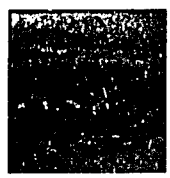
Satellite Digital Audio Networks

The unique capabilities of ComStream satellite digital audio broadcast products are demonstrated by the many applications users have found for them. Worldwide, these products are being used more than any other to transmit CD-quality digital audio from a central site to many remote locations . More than 3,000 receivers were installed in the first year.

ComStream
Digital Audio Products

Inside this brochure are a few success stories that illustrate the flexibility, quality and cost savings that result from ComStream digital audio networks. They'll show you some specifics of applications in use today. And we hope they'll help you to think about how these complete networks and products can fit your applications, today and tomorrow.

Radio Program Distribution



Worldwide Audio Broadcasting

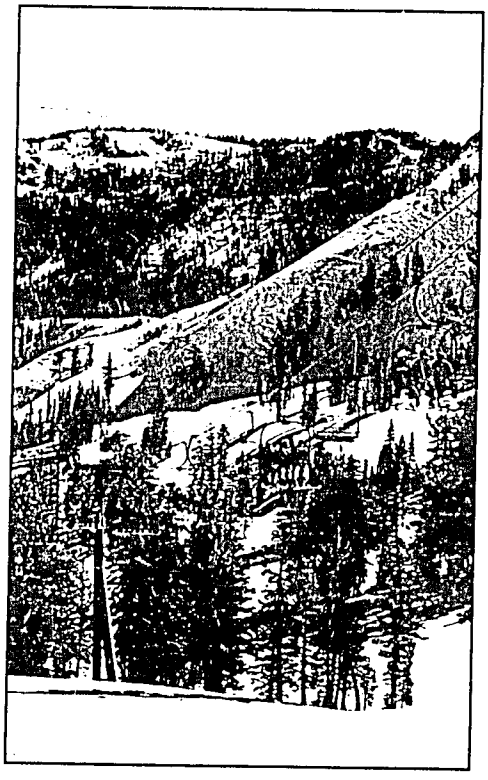
Business Music, Retail Advertising

Storage and Retrieval

Key Features

- Multiple Data Rates — User Selectable for Optimized Configurations
  64, 96, 128, 192, 256 kbps BPSK; 64, 112, 128, 192, 256, 384 kbps QPSK
- Worldwide Operation Using Ku- or C-band Satellites
- World Standard ISO/MPEG (MUSICAM) Audio Compression
- Exceptional Performance — Signal Level Audio Threshold Lowest in the Industry
- Full System Solution: Complete Uplink, Network Management, Automatic Redundancy Protection
- Expands Easily to Multiple Channels or Uplinks

Seven radio stations in seven remote mountain ski areas. All share a common listener profile and all are programmed 24-hours a day from a single studio. Front-office, commercial production, and programming are all centralized. Yet to the listener they sound local. That's what one broadcast group has accomplished with ComStream digital audio broadcast products in the Rocky Mountains of the Western United States.



At first the question was "Can it work financially?" The original answer was no. Group owners estimated satellite costs of $120,000 for the uplink and $22,000 a month in satellite transponder costs. But ComStream had a better answer in its SCPC digital audio transmission. The network became reality at an investment under $30,000 for the 2.4 M uplink and $2,400 per month for a 20 KHz stereo channel.

What this radio group got for its money was an uplink transmitting a single 256 kpbs stereo channel, plus ABR200 receivers for each affiliate station. Initially the channel carried live music, and then during commercial breaks, downloaded local weather, advertising, and community service announcements. With the success of the group, and ComStream network expandability, a second 128 kbps, 20 KHz mono channel has been added to take over the downloading function. All it required was another audio codec/mux and modem at the uplink.

In addition to audio, ComStream networks include RS-232 data at up to 4800 baud, and relay closure signals that make automated operations like this possible. The uplink combines all signals in a single channel and transmits to affiliates equipped with ABR200 digital audio receivers. The ABR200s demodulate and decode the signals, programming digital audio storage and playback systems, and triggering the operation of the remote studio equipment.

The result is a lucrative seven-station network, broadcasting 24-hour a day radio with local insertion of advertising, news, sports, and weather — at compact disc quality. And all received on small 2.4 meter antennas that are easily reached by satellite, despite the peaks and valleys of one of the largest mountain ranges in the world.

Current affairs or news programming can lose its punch if you have to wait a week to listen to it. Or if you can't hear it under a blanket of atmospheric static on short-wave radio. Yet until recently, that's how radio listeners in a European territory in the Caribbean got their native-language news from Europe.

But now, with ComStream compressed digital audio delivery via satellite, news and public affairs shows play within minutes or hours of the time they are produced. And at greatly increased audio quality.

The network replaces Intelsat service that fed programming to short-wave relay stations in the area, but it was expensive, and short-wave listening quality was being left far behind in comparison to FM radio and compact disc recordings.

In addition, with thousands of miles to cover, from one hemisphere to another, configuring the network required some creativity. A direct link from Europe to the Caribbean isn't possible, so a double hop is needed.

ComStream digital audio transmission was the choice again. ComStream products use the ISO/MPEG compression algorithm to compress audio data by a factor of up to 12:1, so a full 20 KHz stereo signal can be carried in as little as 128 kbps. That much reduction in satellite bandwidth can cut monthly transponder costs by a factor of 10.

Even with two uplink charges, this network paid for itself in 24 months. The European radio programmer pays space segment charges that are

We want quality, we want it inexpensive, we want it flexible.

We want it easy to operate. And by the way we want it installed in five months in more than 2,000 locations.

Done.

The ComStream digital audio network is a business music network too. For this retailer, a mix of music and advertising is broadcast to all its stores. Because of the flexibility built into the network, music and advertising can be customized by geographic region, by product, or by any other marketing segment.

The network includes a complete uplink rack, shipped as a unit and ready to plug-and-play. The rack includes four codec/multiplexer-modem pairs broadcasting four mono channels at 112 kbps each — for music and targeted advertising — with a fifth for backup. ComStream audio and modem protection switches monitor uplink performance and automatically swap in the hot standby within a few seconds of a fault. An ABR200 receiver in the rack provides off-air monitoring.

The broadcast originates right at the company's U.S. headquarters. There is no need for backhaul to a distant, and large, uplink.

Each channel includes a 20 KHz 112 kbps mono audio feed with room left over for a medium speed data stream. This data can be used to distribute product pricing, administrative traffic, customer service documents, and even computer files.

Receive site installation was quick and easy because the ABR200 accepts an RF signal from existing VSAT equipment.

The ComStream Audio Network Management System configures, monitors and controls the uplink and receivers from a single PC. When advertising insertions are made, the channel changes are virtually transparent because of ComStream's own Quick Channel Access℠.

And by providing manufacturer advertising on their "retail radio network" this retailer created a brand new profit center.

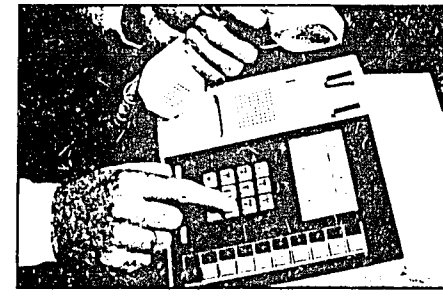
You can too. Just tell us what you want.

Information at your fingertips.

Do you need to deliver audio (and data) cost effectively for your business service offering?

One ComStream digital audio customer is using audio information storage and retrieval systems to provide sports, news, and retail service information. ComStream audio products broadcast to ABR200 receivers that feed storage devices. Customers of this information-age version of the phone book use a touch-tone phone to dial in and retrieve information.

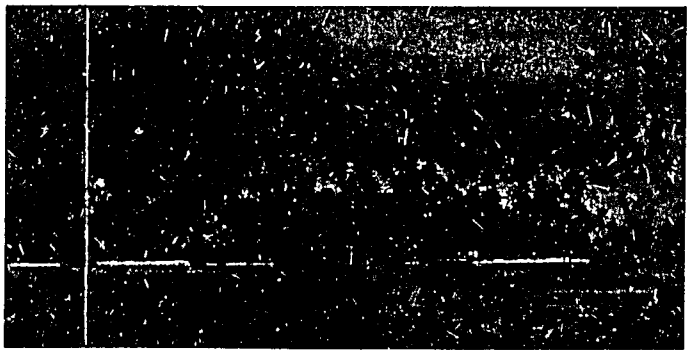
With space segment costs one-tenth that of FM² services, ComStream's narrow band digital SCPC approach provides dramatic operating cost savings, even when compared to other



SCPC alternatives. Also, low-speed RS-232 asynchronous data transmission is provided free. The same signal that provides digital audio carries data, relay, and receiver control signals.

Storage systems and other local equipment can be monitored by ComStream's advanced performance monitoring system. This user-programmable, "phone home" fault reporting system automatically notifies the uplink control computer of any alarm condition via telephone modem. Service availability is enhanced by assuring that fault conditions can be immediately addressed and acted upon.

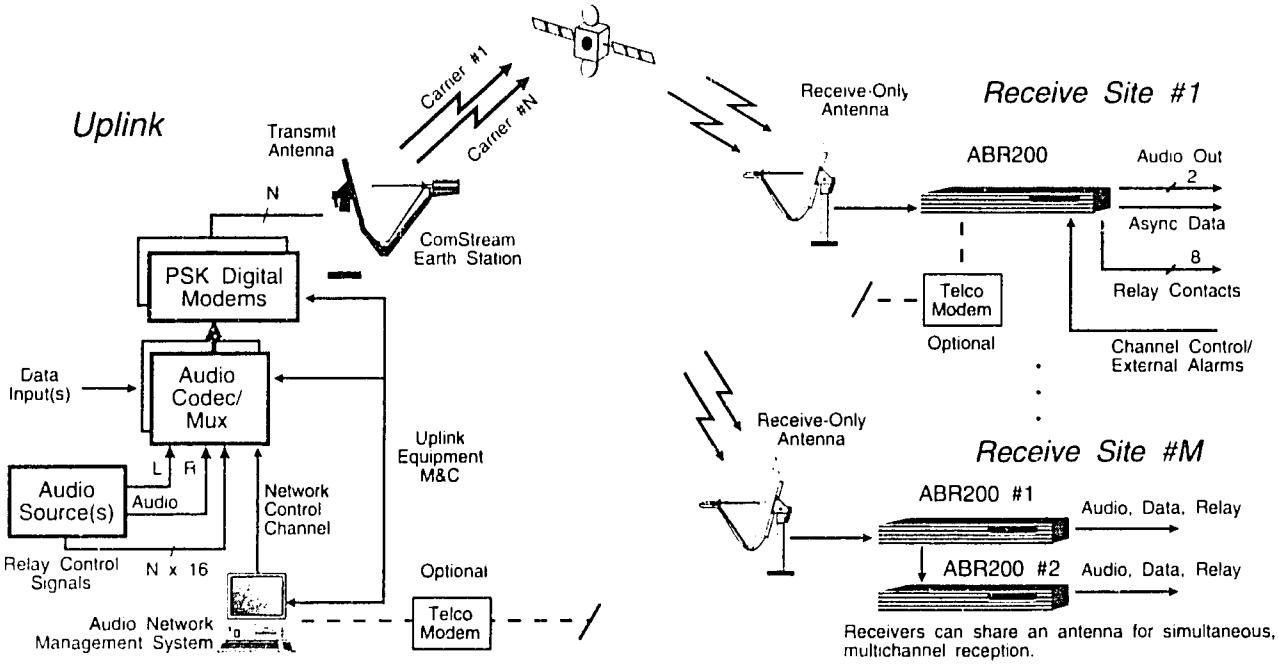
50% less than the fees paid for the Intelsat service it replaced.



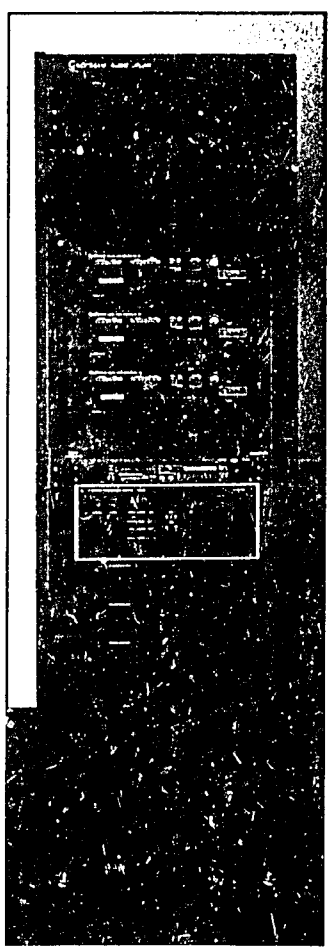
The 64 kbps, 10 KHz audio channel is transmitted using PanAmSat that carries both Ku- and C-band transponders. ComStream equipment uplinks at Ku-band in Europe, then turns it around at a relay point in the U.S. to C-band frequency for transmission to receivers at radio stations in the Caribbean. These radio stations broadcast to their listeners using FM or AM airwaves.

And because network data rates and capacity can be expanded with no hardware replacement, more programs in a variety of languages will soon be added.

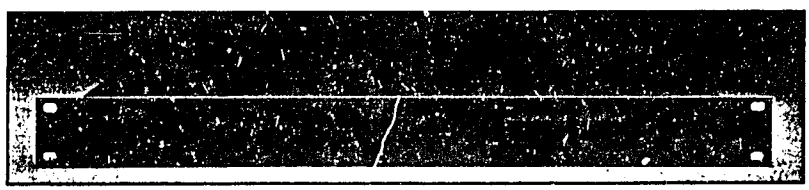
ComStream cost efficiency, CD-quality, and expandability — a combination that promises to help radio broadcasting keep moving ahead in all parts of the world.



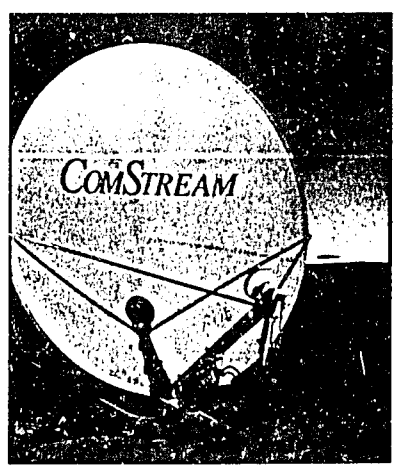
Products



Redundant uplinks are built into one small rack (as shown) with single or multiple channels and ComStream codec and modem protection switches.



The ABR200 Digital Audio Receiver features multimode/multirate operation, 4800 bps data output, and up to 8 relay (cue) closures for remote control of equipment.



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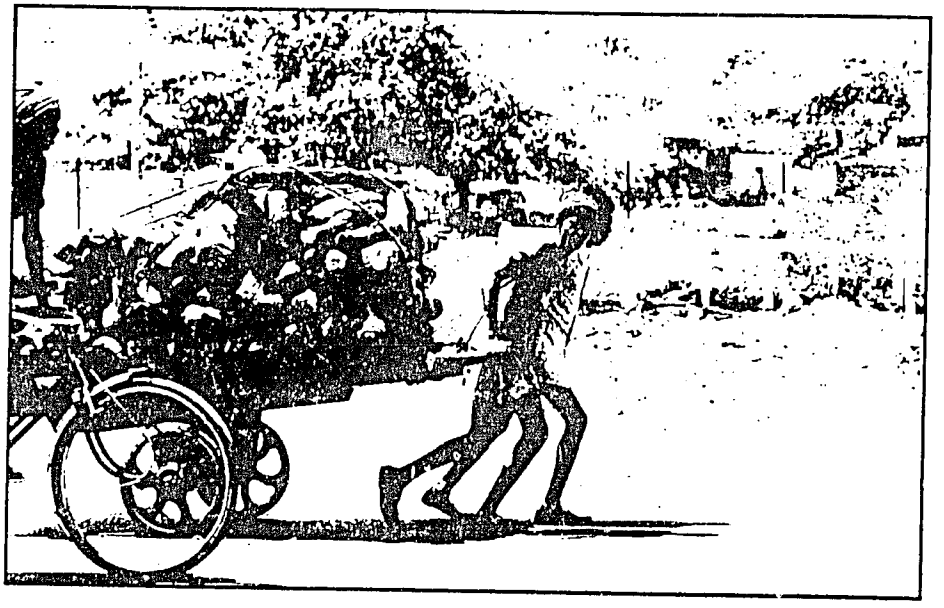
Sustainable Development

Marketing Solar: Developing World Perspective

by Steve Abbott



The experience of travelling repeatedly to work in developing countries leads me to an ever greater sense of desperation. I believe this is a logical result of the contradictions that one is forced to recognize when living and working in both worlds.

In very brief, the under-developed world would like to develop as we have. This is not possible for the simple reason that there are not enough resources on the planet to support all six billion people of the world consuming as Canadians do. Canadians, on the other hand, tend to believe that we cannot live with any reduction in our own consumption.

Many of their politicians demand that our development projects aim at reproducing in their countries, the same luxuries that we enjoy in ours. Many of our own development workers cannot imagine any alternatives to our own consumptive forms of development. The poor of those nations have a different goal which commonly involves subsistence at the most basic level.

Solar and other alternative technologies may provide the bridge that brings subsistence more within the grasp of the poor, while also providing relatively non-consumptive luxuries and prestige to the politicians and powers of those nations. Unfortunately our own rejection of devices that seem less convenient than our usual flick-of-a-switch machines, brands these technologies as third-rate devices suitable only for second-class people.

One prerequisite for the acceptance of solar technologies in the developing world is our own acceptance of them. I suspect that we must overcome a great deal of inertia and propaganda in order to see the very real values that solar energy and other conservation technologies can offer us.

Third World's Aspirations

Simply put, the development strategy of most "third world" politicians is to acquire the supposed luxuries and security of development...like us! In a moral sense that aspiration seems fully justified. Why should the developed world drive cars, have refrigerators and air conditioners, cook with gas, and light our empty streets, if they may not?

The reality of these countries is shocking. Young women carry loads of water that most of us could not lift, for many miles without pause, and they may do several trips daily. People spend whole days gathering head-loads of firewood from dwindling forests, so that they can cook their food or stay warm. Vaccines are spoiled by warmth and delay before they can be used. Medical instruments are improperly sterilized for lack of power and equipment. True development, then, would begin with finding solutions to some very basic survival needs.

Real Limits to Growth

The reality, of course, is that they cannot develop as we have. If the six billion people of the world consumed oil as Canadians do, all known reserves would be exhausted in less than a decade. If they used electricity as we do, the world would need about 4,000 Darlington-sized nuclear plants to meet the demand. How many Chernobyls is that? Remember that even Canadian construction supervisors at the nuclear plant in Romania did not make public their concerns over quality control (or slave labour for that matter) until the old regime fell.

If present rates of pollution are threatening the ecosystem, consider what more than seven times those rates would do!

If there is to be any equity in the world, then the limits of growth are not fast approaching. We have passed them long ago.

Our Own Perceived Needs

How often have we heard people loudly declaring that we can not return to the caves? This protest usually follows the merest suggestion that we should moderate our consumption of energy or other resources. The simple truth, of course, is no one is asking us to. We are a civilization that glorifies fast cars, boats, and snowmobiles,

large houses, and brightly-lit streets. Television commercials condition us to equate these things with success.

Many of these prestigious things are exempt from our commercial morality. That is the morality which causes us to be embarrassed at making an investment that does not pay. Items outside the exempt class have to pay for themselves in two to five years or they are considered a poor investment.

Different Approach In Europe

Many of us in the solar industry have been frustrated over the years, at the relatively slow acceptance of the devices that we develop. Most prospective buyers eventually ask the question "how soon will it pay for itself?" If something does not pay for itself in two to five years, you can forget it. This seems to be the prevailing attitude in North America. We are not consistent in this attitude, of course. How long does a house or its furniture take to pay for itself? Why should an entirely different set of rules apply to furnaces and appliances? It is because these are not prestige items while the house and furniture are.

It is interesting to compare our society with the European one where slightly different limits are set on the exempt class. Where our furnaces must pay for themselves in say three years, the furnace in a German house seems to be exempt, being a part of the house. More than one German home owner has led me downstairs to admire their furnace. It is a prestige item. While we scrimp and cut corners to sell a solar domestic hot water (DHW) system for under $2,000, the German industry sells high-tech ones for $5,000. That too is a prestige item.

It seems to me that along with our very sound "development research", we have to figure out how to make a solar heater, DHW system, cooker, or widget a thing to be proud of. Urgently!

SESCI director Steve Abbott will present two papers on his work overseas at the SESCI conference in Edmonton on Wednesday, July 8. For more information: Energy Options, RR#2, Oro Station, Ontario L0L 2E0 705/835-2249.

Books

The Solar Electric House

by Steven J. Strong, Rodale Press, Emmaus, PA.

by Per Drewes

Steven Strong dispels the myth that technical people cannot put ten words together without making a grammatical error or at the very best, making it dry and boring. Steven Strong has a flair for writing. His book is enjoyable to read while it still conveys all the information required to embark on a photovoltaic system design project.

The book commences with a standard chapter on the history of photovoltaics. By now every reader is probably aware that the first practical PV cell was developed at the Bell Labs and it was the American space program which provided the necessary application for development of this technology. This is all mundane stuff, but Strong's style makes it readable.

In his discussion of the nature of light he writes "with the possible exception of gravity, no physical phenomenon has as great a constant effect upon us as light. Through photosynthesis, light primes the workings of the food chain. It also makes possible the perception of the colours, dimensions, and relative distance of objects." The book steps beyond being just a technical manual. The subject is dealt with in a scientific, scholarly manner.

Again following the tradition of many other PV textbooks, chapter two discusses overall system options and economics. Here Strong shows his extensive experience with photovoltaic technology. He gives his philosophy on system design, but he does it without preaching. There is no discussion of life styles. There is no mention of good solar guys and bad electrical utilities. Levelized playing fields do not enter the picture. Instead Strong describes the system design options available and illustrates them with working examples.

Following chapters describe the photovoltaic system component by component. The material is presented in a logical manner following roughly the "energy path" of the system. In this natural order he commences with the photovoltaic module. Performance and array sizing are clearly explained with examples. Next comes the regulator. Here the examples do reveal the age of the book. While five years is not a long time, in the rapidly developing world of photovoltaics, many products have come and gone. The discussion of batteries which follows, including sizing remains relevant. However, the next chapter on inverters, including the discussion of DC or AC choices, again reflects a five year old time frame.

Subsequent chapters discuss the components required to complete the photovoltaic system design.

The book closes with a chapter on installation and a chapter on maintenance. Again Strong offers his advice. "I recommend that the installation and wiring of batteries be done only by electricians. Don't overload an inverter." The section on wiring types is very helpful. However, do not expect step-by-step instructions such as "Connect the black wire to terminal A etc." These will all come with product manuals if you proceed with the purchase of a photovoltaic power supply.

Thumbs Up

In critiquing a book, the implication is that one should be critical in the review. However, it is difficult to find fault with Steven Strong's book. It is well written and presents all the information required by a photovoltaic system designer. This book would rank high on a list of materials to read for anyone contemplating the installation of a photovoltaic power supply, whether in the role of a do-it-yourselfer or as an educated buyer of professional services.

Per Drewes is the Alternative Energy Specialist at Ontario Hydro.

Promoting Earth-Friendly Radio Receivers

Most of the workers at the Chengdu TV and Electrical Corporation in the central Chinese city ride to work each day on bicycles, which have been long recognized as among the most efficient and environmentally sound means of transportation.

Those same workers are now engaged in a new venture at green technology: the mass production of an inexpensive and efficient solar-powered radio.

The project, undertaken in collaboration with a private foundation led by Bahá'ís, seeks to promote the use of the radios as both an aid to village-level development and a solution to the pollution problems that come with batteries.

"For the so-called First World, the issue here is environmental impact," said Dr. K. Dean Stephens, who developed special circuitry that he says allows the radio to be more efficient than any solar-powered consumer radio yet produced. "Batteries in their manufacture require about 80 times the energy they store. And, after they are thrown away, they continue to pollute, contaminating the ground for years with heavy metals."

"What we are trying to do is pioneer a technology that is going to be more earth friendly," said Dr. Stephens, who is also director of the Vanguard Trust, a not-for-profit foundation that is coordinating and promoting the project.

"With regard to the developing world, the main point is that the cost of batteries ends up being far greater than the cost of a radio, and they are a great drain on the income of many villagers," Dr. Stephens added.

"We have calculated that in a country like Tanzania, for example, about 10 percent of a worker's salary would go to buying radio batteries if he replaces them every month. So the difference in using a solar radio is quite remarkable."

Although small solar-powered radios have been produced before, Dr. Stephens said, none has risen above novelty status because they were either too expensive or worked only under ideal conditions, such as in bright sunlight.

"This radio has totally redesigned circuitry that enables it to play even in ambient light—sitting beside a window or even next to a gasoline lantern at night," said Dr. Stephens. "In the past, you had to practically bake solar radios in the sun to get them to work."

Trial production run

Dr. Stephens also said the radio is much less expensive than previously produced solar radios. Low cost is achieved both by the radio's efficient design and the decision to produce it in China, where labor costs are low. The first radios, made in a trial production run of 100 units, are being sold for US$25. Later, as production runs grow larger, they should sell for less.

"Ultimately, the cost will be about US$17 apiece," said Dr. Stephens. "That turns out to be the price of just the solar panel anywhere else."

This combination of high efficiency and low cost has drawn considerable interest among a number of radio broadcasting companies and development agencies. Both the British Broadcasting Corporation and Danish national radio corporation (Danicom) are evaluating preliminary models of the radio, Dr. Stephens said.

Several international development agencies, as well, have ordered radios for testing and trials.

"The concept I think is quite wonderful," said Judy Brace, the vice president for development information services at the Academy for Educational Development in Washington, D.C. "The whole problem of having to replace batteries in a developing country is very difficult. So Vanguard's efforts are certainly commendable."

The first production models of the radio, named the Vanguardia SR-2, use a series of crystalline silicon solar cells, connected in a panel on the back of the radio, as the primary power source. The radio is capable only of medium-wave

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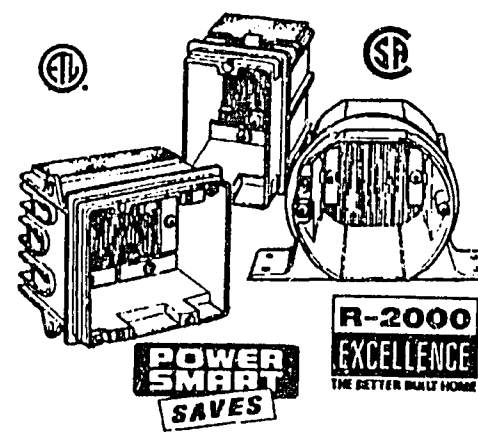

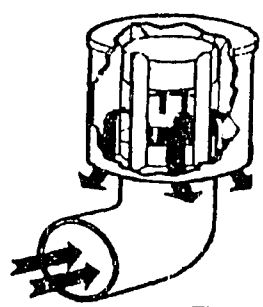

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(AM) band reception. Offering FM or shortwave bands would unnecessarily drive the price up, Dr. Stephens said. "We are planning future, multiband models for other markets," he added.

The radio is also fairly large for a modern portable radio, standing 15 cm high by 28 cm wide by 6.5 cm deep. "It's meant to be a table radio," said Dr. Stephens, "something that can sit on somebody's table or by the window and provide sound for an entire household. And, the four-inch speaker and relatively large solar panel on the back also dictate its size."

Innovative circuit design

The new circuitry designed by Dr. Stephens can drive that speaker on just 1/25th of a watt. "That is about ten times the efficiency of most radios," said Dr. Stephens, whose credentials as an electronics pioneer include responsibility for the design of an ultra-compact color television camera for the Apollo space missions to the moon.

Dr. Stephens believes it is important that China is involved in the production of this radio. "The Chengdu TV and Electrical group has been extremely flexible in working out the final details of the design and manufacturing," said Dr. Stephens. "I am very happy with with our relationship—and can say that they are extremely interested in the principles of the Trust."

The first production run, completed in May 1992, was just 100 units. "This run was a test for us," said Dr. Stephens. "The next step will be either a thousand or ten thousand. Our hope is to interest a philanthropic individual or a development agency to invest in purchasing or underwriting such an order, so that we can then make the radio widely available."

The production of solar-powered radios is a key plank in the Trust's overall effort to promote village-level radio. The Trust was created to develop and promote useful and appropriate technologies for the developing world, and one of its major aims has been to create affordable technology for village-level radio systems.

village radio system

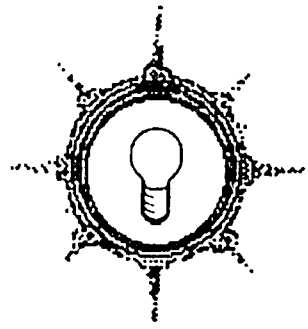
There have been successful experiments at creating village radio systems, and there is a good deal of interest in them among development specialists," said Dr. Stephens. "The idea is to set up a miniature radio station that can allow a village to serve itself with with local broadcasts."

But in other words, village radio is a tool for villages. It is a tool for consultation. It is a tool for the preservation of various traditions and cultural expressions. And, in an era when information is power, village radio is also a form of grassroots empowerment. It puts information directly into the hands of the people," Dr. Stephens said.

The Vanguard Trust recently published a small booklet entitled Village Radio Owner's Manual, which outlines both the technology and the organization that can be used to establish a village radio station. And the Trust has experimented extensively with a small-scale solar system designed by Dr. Stephens, using it to provide light and refrigeration at a Bahá'í training center in Puerto Rico.

"Our particular interest is to assist in the development of technologies for the developing world," said Prof. Kenneth Kalantar, who is an associate professor of chemistry at the Inter American University in San German, Puerto Rico, and a Vanguard board member. "But although the Trust was founded by Bahá'ís and is operated on Bahá'í principles, membership is open to anyone who has similar goals." He said the Trust currently has a small but widespread membership of people concerned with issues of appropriate technology.

Reprinted from ONE COUNTRY, *the newsletter of the Bahá'í International Community.*



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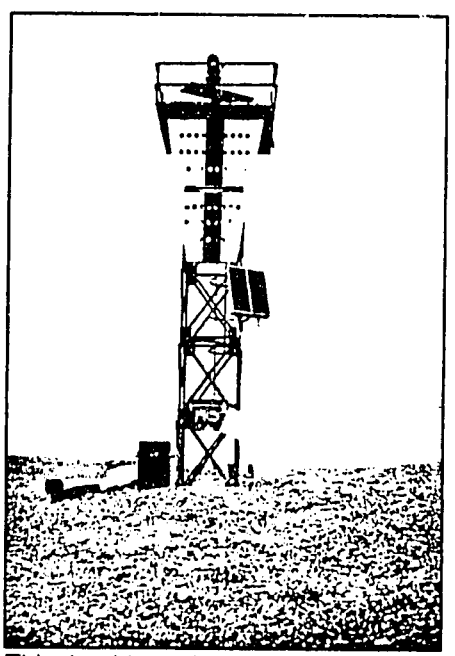
Solar At Sea: Reliable And Cost-Effective

by Ruth McKlusky

Quietly and unobtrusively, one man has turned the Canadian Coast Guard into Canada's largest photovoltaic (PV) user, earning a merit award from Canada's Auditor General in the process.

Since the early eighties, Acting Superintendent of Engineering and R&D Sonny Leung has been systematically converting first small land- and then marine-based navigational aids to PV power. (Future plans include the conversion of 22 larger diesel systems up to 2.4 kW in size.)

Under Sonny's direction, 87 per cent or 3,400 of the Coast Guard's land-based navigational aids have been converted to PV. Averaging 40-50 W in size, these systems offer a payback period of less than three years. Leung is convinced that if the systems were installed today, the payback period would more likely be two years.



This land-based 70 Wp PV system powers a range light and is located in Resolute Bay, Arctic.

Never having calculated the energy savings of these measures; Leung is sold on PV because it is cost-effective and reliable. "We learned the most economical way of supplying power to remote locations was with PV. The systems are low-maintenance, and even allowing for a wide safety margin to ensure reliability they are still more cost-effective than using batteries which have to be changed every year."

The Coast Guard was spending between $1 and 1.2 million a year on batteries alone for land-based navigational (visual, audio and electronic) aids. In the last decade, Leung's vision has saved taxpayers approximately $12 million; which did not escape the notice of former Auditor General Kenneth Dye who commended Leung in his 1989 annual report.

Marine-Based Systems

With the conversion of land-based systems nearing completion, Leung is tackling marine-based systems which also offer tremendous cost-saving potential. "Servicing buoys 500 miles out by ship is much more expensive than using helicopters, which we use for land-based systems. It can cost up to $8,000 a day," says Leung who can't fathom why other government departments, such as National Defence, have yet to increase their adoption of PV.

Prior to 1991, 100 test projects were set-up. Based on the successful test results, 300 systems, averaging 40 W are being installed in fiscal year 91/92 with an additional 300 marine systems scheduled in fiscal year 92/93.

With 100 test systems under his belt, Leung's learning curve has peaked. The ambitious project is proceeding as planned and Leung hasn't experienced the problems people feared.

"You're limited to two module configurations with marine systems. We install the modules horizontally for systems operating year-round with no ice and vertically for systems where ice is a factor," explains Leung.

The advent of sealed lead-acid batteries has also made life easier, since conventional wet batteries can leak onto both servicemen and the buoy itself, causing corrosion.

Leung attributes his success to using only high quality and extensively tested modules capable of operating reliably in demanding marine environments. To this end, the Coast Guard maintains a test facility in Cardinal, Ontario.

And what modules meet the Coast Guard's stringent specifications? Solarex modules, distributed in Canada by long-time SESCI corporate member Lenbrook Industries Ltd.

Based in Pickering, Ontario, Lenbrook's solar division is thriving. According to Energy Product Specialist Eric Kalmbach, sales in the first four months of 1991 surpassed total 1990 sales.

There's no secret to Lenbrook's success. It's due to a reliable product, exemplary customer service and staff willing to go the extra mile to please the customer. Says Lenbrook's Technical Coordinator Graham Langford, "We've custom-built modules with a special finish and a clear anodized frame, we've stamped Canadian Coast Guard on the module itself ... we've even fabricated custom-sized modules."

Wary of giving away too many trade secrets, Langford does mention one of Leung's more unusual specifications that Solarex met. Modules for buoys are often reinforced on the back with a metal plate to provide extra protection against vandals who use solar buoys for shooting practice.

Lenbrook also supplies the Coast Guard with regulators and controllers. Says Langford, "In response to Coast Guard specs, Solarex developed and now manufactures a simple custom-made fail-safe shunt regulator."

Another Coast Guard specification, that raises eyebrows at first glance, is Leung's requirement for special junction boxes, which did not pose a challenge to Lenbrook. "People working in frigid temperatures often wear gloves

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hree hundred marine-based avigational systems are in the rocess of being converted to PV.

ecessitating larger than normal junc-on boxes," explains Langford.

uture Plans or Transport Canada

Leung is a man in motion, spending any hours in helicopters overseeing e implementation of his systems. hen the marine-based system con-ersions are completed, he plans to onvert 22 land-based diesel systems, veraging 1.5 kW in size.

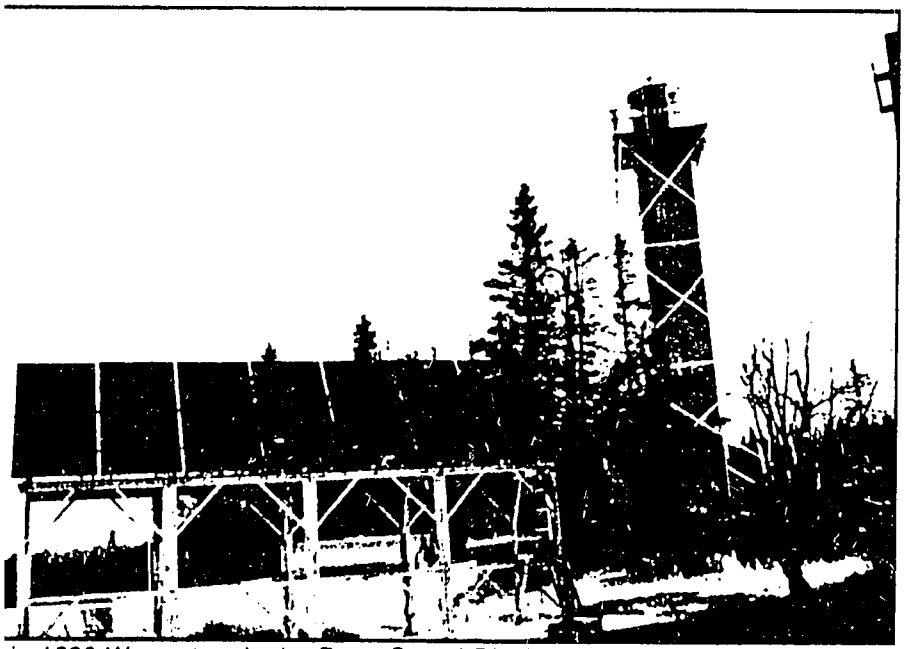
Concurrently, Transport Canada will soon initiate a monitoring project to more effectively measure the amount of insolation at various off-shore sites. According to one insider "anyone familiar with coastal processes knows that there can be a big difference from on-shore insolation measures even as little as 200 yards off-shore."

Resulting data will aid the Coast Guard in carefully estimating optimal system size, hence allowing for lower safety margins and the realization of capital cost saving advantages due to smaller systems. Knowledge gained might lead to mixed feelings among module suppliers, but will nonetheless be heartening news to taxpayers.

And Lenbrook? Although the Coast Guard is an important and valued customer, this up-and-coming firm is increasingly focusing on international projects.

Clearly, with more than 3,500 cost-effective PV powered navigational aids operating reliably from coast to coast, and as far north as Resolute Bay, in conditions worthy of a Timex commercial, this is one PV niche application that all SESCI members should be proud to promote.

For more information: Sonny Leung, Canadian Coast Guard 613/998-1390; Graham Langford, Lenbrook Industries 416/831-6333.



is 1680 Wp system in the Parry Sound District powers the main nagivational acon, the lights, a monitoring system, the fog detector and horn, as well as ergency lighting and communication systems.

Industry

Mazda Canada Goes Solar With The 929 Serenia

As part of a "premium package", Mazda now offers 1992 929 Serenia purchasers a solar-powered ventilation system consisting of a sliding glass moonroof with integral solar panels and trunk-mounted ventilation fans.

The ventilation system for this luxurious $40,000 vehicle has three main functions: it automatically ventilates the parked car as soon as interior temperature exceeds 25°C; it expels dust and cigarette smoke from the car; and it charges the car battery as long as the parked vehicle's interior temperature remains below the pre-set level.

The Mazda 929's solar ventilation system can be manually overridden in case of dusty conditions outside the parked car, and the battery-charging mode activated, compensating for battery self-discharge and voltage loss.

Amorphous Silicon Cells Follow The 929's Curves

The moonroof, manufactured by Sanyo (see page 20 for Sanyo's other solar cooling applications), utilizes amorphous silicon photovoltaic cells. Fabricated of thin-film material, amorphous silicon cells enable easy installation into the moonroof's curved glass, offer mass production advantages, and keep transparency the same as a regular moonroof.

Promotional literature for the Mazda 929 lays claim to the perfect driving environment.

According to Solar Energy Society of Canada Executive Director Ruth McKlusky, it's encouraging to see a mainstream company like Mazda promoting solar technology. "Solar is being brought to the public eye – it's wonderful to open Mcleans magazine and see a double page ad extolling solar."

For more information: Greg Young, Mazda Canada, 400-2075 Kennedy Road, Scarborough, ON M1T 3V3 416/609-9909.

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Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
4	1	**GROUPE ELECTROGENE 125 kVA** y compris : - 1 groupe électrogène à 125 kVA refroidis à l'air type KHD - 1 baie B.T. avec système de commutation manuelle entre deux groupes électrogèn. - 1 lot de câble B.T. entre deux groupes électrogènes et le tableau B.T. - 1 réservoir journalière de gasoil pour 8 heures - 1 système d'échappement - 1 système d'évacuation d'air d'air chaud - 1 résevoir principal de 4000 litres		53.240,00
5	1	**BAIE DE CONTROLE ET D'ENTREE DE PROGRAMME** Baie de contrôle et d'entrée de programme équipée comme suit : 2 récepteurs VHF/FM type EBU 3156 avec une antenne YAGI 1 distribution B.T./220 V/50 Hz 1 HARRIS AM90 moniteur de modulation/démodulation 1 amplificateur de distribution 1 limiteur de modulation d'amplitude (AM) type CRL PMC-450 1 amplificateur de contrôle 1 unité de haut-parleur 1 oscillateur d'audiofréquences de précision type POTOMAC AT51 1 oscilloscope d'audiofréquences - [illegible] acoustique et connecteurs 1 lot de matériaux divers trousse d'équipement d'assemblage, de câblage et d'essai		74.430,00

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Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
6	1	**SYSTEME DE CABLE COAXIAL** type : HF CU2Y 3" 50 Ohms y compris : - 150 m de câble coaxial diélectr. à air, d'un diamètre de 3" - brides de raccordement et éléments de couplag - système dessicateur / de pressurisation La RTG devra effectuer les travaux de génie civil pour le système de câbles coaxiaux à sa charge selon plan du fournisseur INCOMTEL.		28.405,00
7	1	Système d'antenne OM de 50 kW omnidirectionnelle type : INCOMTEL y compris : - 1 pylône haubané de 94 m - 1 cabine d'adaptation d'antenne/ de transformateur de balisage de nuit - 1 système de réseau de mise à la terre - 1 lot matériel d'installation La Radio Rurale devra effectuer les travaux de génie civil pour les fondations du pylône à sa charge selon plan Incomtel.		102.300,00
8	1	Liaison VHF/FM y compris : - 1 émetteur VHF/FM 100 W, type E - 1 antenne dipole avec fixation - 2 x 15 m câble coaxial avec connecteur et fixation		16.240,00

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Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
9	1 lot	**APPAREILLAGE D'ESSAIS + OUTILS** y compris : 1 voltmètre numérique 1 fréquencemètre 1 lot de connexions d'essai et de bornes 1 wattmètre 2 trousses à outils		9.800,00
10	1 lot	**PIECES DE RECHANGE** pour le système émetteur et accessoires decrit ci-dessus (voir liste annexée)		43.060,00
11	1 lot	**DOCUMENTATION TECHNIQUE** en langue anglaise ou française		5.100,00
		PRIX TOTAL DES SYSTEMES D'EMETTEUR FOB PORT MARITIME ALLEMAND ET ANGLAIS		.....
12		**SERVICES D'INSTALLATION, DE MISE EN FONCTIONNEMENT ET DE FORMATION** Les services d'un ingénieur spécialisé en émetteurs et antennes pour effectuer le relevé du terrain Formation et récette en usine pour deux ingénieurs pendant 10 jours ouvrables Les services d'équipes spécialisées en émetteurs, antennes et énergie pour installer l'équipement décrit dans cette proposition Formation de 10 jours ouvrables aux centres mêmes pour trois ingénieurs, assurée par un ingénieur spécialisé en émetteurs		222.480,00

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Facture proforma n° 7314A/9.

Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
13		FRAIS DE TRANSPORT MARITIME ET D'ASSURANCE depuis la RFA, les Etats Unis et la Grand Bretagne jusqu'au port maritime de CONAKRY hors tout droits de douane, impôts et taxes présents et à venir dans la REPUBLIQUE DE GUINEE		45.020,00
		PRIX TOTAL CAF PORT MARITIME DE CONAKRY		1'017.735,00

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FACTURE PROFORMA N° 7314A/94

RADIO RURALE
REPUBLIQUE DE GUINEE

LISTE DES FOURNITURES ET DETAILS DES PRIX

ALTERNATIVE 1

Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
		RECAPITULATIF		
		FOURNITURE ET INSTALLATION DES EQUIPEMENTS DE RADIODIFFUSION DANS LA PREFECTURE DE KAN KAN		
		SYSTEMES EMETTEUR O.M. AVEC ACCESSOIRES COMME DECRIT DANS CETTE PROPOSITION (POSITIONS 1-11) FOB PORT MARITIME ALLEMAND ET ANGLAIS		851.175,00
		FRAIS DE TRANSPORT MARITIME ET D'ASSURANCE (POSITION 13)		51.070,00
		PRIX TOTAL DE L'EQUIPEMENT CAF PORT MARITIME DE CONAKRY		902.245,00
		SERVICES D'INSTALLATION, DE MISE EN FONCTIONNEMENT ET DE FORMATION (POSITION 12)		242.480,00
		GRAND TOTAL CAF PORT MARITIME DE CONAKRY		1'144.725,00

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Facture proforma n° 7314A/

Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
		ALTERNATIVE 2		
		PROPOSITION DES SYSTEMES EMETTEUR 1 x 50 kW O.M.		
1	1	**EMETTEUR HARRIS DX 50 SEMI-CONDUCTEURS** ONDES MOYENNES DE 50 kW Le système DX-50 comprend un émetteur DX 50 comportant : - rendement global typique de 85% - impédance de sortie de 50 Ohms - modèle 100 % semi-conducteurs - conception de panne progressive avec CAPACITE DE CONNEXIONS interchangeables - tableau de commande avant en couleurs avec schéma des circuits - 1 lot matériel d'installation et de montage - 1 système de refroidissement des émetteurs - 1 système d'extraction d'air		348.700,00
2	1	**REGULATEUR DE TENSION AUTOMATIQUE** Régulateur de tension automatique de 100 kVA avec suppression de surtension et conjoncteur-disjoncteur by-pass type : TECHNIREL		39.480,00
3	1	ANTENNE FICTIVE pour le système DXD-50 y compris panneau de commutation HF et des commutateurs de verrouillage TYPE : ELECTRO IMPULSE DPTU-75K avec ligne HF rigide 3 1/8" EIA 50 Ohms		29.480,00

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Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
4	1	**GROUPE ELECTROGENE 125 kVA** y compris : - 1 groupe électrogène à 125 kVA refroidis à l'air type KHD - 1 baie B.T. avec système de commutation manuelle entre deux groupes électrogèn. - 1 lot de câble B.T. entre deux groupes électrogènes et le tableau B.T. - 1 réservoir journalière de gasoil pour 8 heures - 1 système d'échappement - 1 système d'évacuation d'air d'air chaud - 1 résevoir principal de 4000 litres		53.240,00
5	1	**BAIE DE CONTROLE ET D'ENTREE DE PROGRAMME** Baie de contrôle et d'entrée de programme équipée comme suit : 2 récepteurs VHF/FM type EBU 3156 - avec une antenne YAGI 1 HARRIS AMAO monitour.dn 1 amplificateur de distribution 1 limiteur de modulation d'amplitude (AM) type CRL PMC-450 1 amplificateur de contrôle 1 unité de haut-parleur 1 oscillateur d'audiofréquences de précision type POTOMAC AT51 1 analyseur d'audiofréquences 1 oscilloscope double trace 50 MHz type HAMEG 1 panneau de raccordement acoustique et connecteurs 1 lot de matériaux divers trousse d'équipement d'assemblage, de câblage et d'essai		74.430,00

Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
6	1	**SYSTEME DE CABLE COAXIAL** type : HF CU2Y 3" 50 Ohms y compris : - 150 m de câble coaxial diélec à air, d'un diamètre de 3" - brides de raccordement et éléments de couplage - système dessicateur / de pressurisation La RTG devra effectuer les trav. de génie civil pour le système câbles coaxiaux à sa charge sel. plan du fournisseur INCOMTEL.		28.405,00
7	1	Système d'antenne OM de 50 kW omnidirectionnelle type : INCOMTEL y compris : - 1 pylône haubané de 94 m - 1 cabine d'adaptation d'antenn de transformateur de balisag de nuit - 1 système de réseau de mise à la terre - 1 lot matériel d'installation La Radio Rurale devra effectuer les travaux de génie civil pour les fondations du pylône à sa charge selon plan Incomtel.		102.300,00
8	1	Liaison VHF/FM y compris : - 1 émetteur VHF/FM 100 W, type - 1 antenne dipole avec fixation - 2 x 15 m câble coaxial avec connecteur et fixation		16.240,00

Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
9	1 lot	**APPAREILLAGE D'ESSAIS + OUTILS** y compris : 1 voltmètre numérique 1 fréquencemètre 1 lot de connexions d'essai et de bornes 1 wattmètre 2 trousses à outils		9.800,00
10	1 lot	**PIECES DE RECHANGE** pour le système émetteur et accessoires decrit ci-dessus (voir liste annexée)		43.060,00
11	1 lot	**DOCUMENTATION TECHNIQUE** en langue anglaise ou française		5.100,00
		PRIX TOTAL DES SYSTEMES D'EMETTEUR DES POSITIONS 1 - 11 FOB PORT MARITIME ALLEMAND ET ANGLAIS		851.175,00
12		**SERVICES D'INSTALLATION, DE MISE EN FONCTIONNEMENT ET DE FORMATION** Les services d'un ingénieur spécialisé en émetteurs et antennes pour effectuer le relevé du terrain Formation et récette en usine pour deux ingénieurs pendant 10 jours ouvrables Les services d'équipes spécialisées en émetteurs, antennes et énergie pour installer l'équipement décrit dans cette proposition Formation de 10 jours ouvrables aux centres mêmes pour trois ingénieurs, assurée par un ingénieur spécialisé en émetteurs		242.480,00

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Facture proforma n° 7314A/94

Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
13		FRAIS DE TRANSPORT MARITIME ET D'ASSURANCE depuis la RFA, les Etats Unis et la Grand Bretagne jusqu'au port maritime de CONAKRY hors tout droits de douane, impôts et taxes présents et à venir dans la REPUBLIQUE DE GUINEE		51.070,00
		PRIX TOTAL CAF PORT MARITIME DE CONAKRY		1'144.725,00

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RADIO RURALE
REPUBLIQUE DE GUINEE

LISTE DES FOURNITURES ET DETAILS DES PRIX

ALTERNATIVE 2

Pos.	Qté.	Désignation	P.U.	PRIX TOTAL US DOLLARS
		RECAPITULATIF		
		FOURNITURE ET INSTALLATION DES EQUIPEMENTS DE RADIODIFFUSION DANS LA PREFECTURE DE KAN KAN		
		SYSTEMES EMETTEUR O.M. AVEC ACCESSOIRES COMME DECRIT DANS CETTE PROPOSITION (POSITIONS 1-11) FOB PORT MARITIME ALLEMAND ET ANGLAIS		750.235,00
		FRAIS DE TRANSPORT MARITIME ET D'ASSURANCE (POSITION 13)		45.020,00
		PRIX TOTAL DE L'EQUIPEMENT CAF PORT MARITIME DE CONAKRY		795.255,00
		SERVICES D'INSTALLATION, DE MISE EN FONCTIONNEMENT ET DE FORMATION (POSITION 12)		222.480,00
		GRAND TOTAL CAF PORT MARITIME DE CONAKRY		1'017.735,00

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OFFRE N° 7314A/94

CONDITIONS COMMERCIALES

Les conditions commerciales constituent partie intégrale de notre offre n° 7314A/94

1. PRIX

Les prix indiqués s'entendent en US $ (US Dollars) pour une livraison CPT Conakry port maritime correspondant aux Incoterms 1990, y compris l'emballage pour l'exportation.

Les taxes, redevances, frais d'importation et tous les autres frais pouvant se présenter au pays de destination ne sont pas inclus dans les prix et demeurent à la charge du client.

2. PAIEMENT

Notre offre est basée sur les conditions de paiement suivantes:

30 % d'avance payable auprès de la Deutsche Bank Munich au plus tard 30 jours après la notification du marché

70 % par un accréditif irrévocable, divisible et confirmé, ouvert auprès de la Deutsche Bank à Munich 30 jours après la notification du contrat.

3. DELAI DE LIVRAISON

Les livraisons ex usine s'effectuent dans un delai maximum de 6 à 8 mois après la notification du marché, de la réception de l'avance et l'ouverture de l'accréditif.

4. GARANTIE

La période de garantie est de 12 mois à compter de la réception des fournitures, celle-ci expire au plus tard 18 mois après la livraison du matériel.

5. VALIDITE : Cette offre est valable jusqu'au 31 décembre 1994.

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RAPPORT

Objet : EXTENSION DU RESEAU RADIO RURALE
REALISATION D'UNE STATION D'EMISSION RADIO O.M. A KAN KAN

DESCRIPTIONS TECHNIQUES

Par la présente nous avons l'honneur de présenter le dossier technique pour la réalisation d'une station radio en ondes moyennes à KAN KAN.

Le but de ce projet est d'assurer la couverture d'une région d'environ 150 km autour de KAN KAN avec une certitude d'environ 95 % par jour (24 heures). L'exécution de ce projet devra considérer également les frais de fonctionnement économiques.

Avec la situation actuelle au centre d'émission à KAN KAN ce but n'est pas réalisable pour des raisons suivantes :

1. Les émetteurs existants de 2 x 25 kW type TESLA fonctionnent actuellement seulement avec une puissance de 25 kW à cause de vieillesse et manque de pièces de rechange.

2. L'antenne à une hauteur de ¼ onde ne couvre qu'une région d'environ 80 km avec une écoute acceptable.

3. La consommation en énergie est très élevée, causée par un rendement des équipements très faible et un groupe électrogène surdimensionné pour les besoins de la station. La consommation en gazoil pour ce groupe est d'environ 50 - 60 litres/h dépendant de la charge.

4. La liaison entre studio et centre émetteur radio se fait par un câble téléphonique perturbée régulièrement pendant la saison pluviale.

En considération des remarques citées ci-haut les spécifications techniques pour la réalisation du projet ont été établies. Les avantages de l'approvisionnement de ce nouvel équipement sont les suivants :

1. La couverture d'une région de 150 km sera garantie avec le choix de fréquence de 801 kHz et un nouveau système d'antenne de ¼ onde.

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L'utilisation du système d'antenne existant n'est pas recommandée en considération de la couverture très limitée.

2. La consommation en énergie est très réduite parce que les émetteurs transistorisés avec une puissance de 50 kW ondes porteuses ont un rendement de 83 % au lieu de 40 % avec les émetteurs existants.

   La prévision d'un groupe électrogène à une puissance de 150 kVA est largement suffisante pour alimenter les émetteurs et accessoires ainsi que l'alimentation domestique. La consommation en gazoil de ce groupe est de 25 à 35 litres/h dépendant de la charge. Donc, l'économie qui se présente par cette solution, est presque la moitié du système existant.

3. La liaison de modulation entre studio et centre émetteur est garantie par un équipement radio en VHF/FM de petite puissance.

Veuillez trouver ci-joint :

- en ANNEXE I le calcul de propagation en ondes moyennes pour les différentes fréquences et hauteurs d'antenne

- en ANNEXE II la description technique des équipements à acquérir.

ANNEXE I

CALCUL DE PROPAGATION EN ONDES MOYENNES

1. La région de transmission en onde de jour (sol) est indiquée dans les tableau et cartes géographiques ci-joints.

2. Le calcul est basé sur les suppositions suivantes :

- La conductivité de sol est de 10 milli Siemens/m.
- Une intensité de champ d'onde sol 1ière classe est considérée avec 75 dBµ (6 mV/m).
- Une intensité de champ d'onde sol 2ème classe est considérée avec 66 dBµ (2 mV/m).
- Une intensité de champ d'onde sol 3ème classe est considérée acceptable avec 60 dBµ (1 mV/m) pour des régions rurales.
- La puissance d'émetteur en porteuse est de 50 kW.
- Fréquences :

603 kHz	fréquence prévue initialement pour la station de KAN KAN
801 kHz	fréquence prévue selon plan de l'UIT et enregistrée pour la ville de DINGUIRAYE
1305 kHz	fréquence actuellement utilisée pour la station de KAN KAN

3. Zone de Fading

La zone de fading se présente au moment du crépuscule et de l'aube et reste pour un temps de 1 - 1.5 heures. Cette zone est le produit d'interférences entre l'onde de jour (sol) et l'onde nocturne (ionosphérique). Les zones de fading sont indiquées pour les deux hauteurs d'antennes (½ onde et ¼ onde).

4.1 Le calcul basé sur la situation actuelle (f = 1305 kHz et hauteur d'antenne de ¼ onde) indique que les contours sont les suivants :

75 dBµ	53 km
66 dBµ	83 km
60 dBµ	105 km

La zone de fading entre 111 et 163 km est très large.

Une écoute acceptable avec un signal de 60 dBµ (1 mV/m) est à atteindre jusqu'à 105 km, qui est inférieur de la région souhaitée (150 km).

4.2 Le calcul pour la fréquence 603 kHz et une antenne à une hauteur de ½ onde (248 m) donnera des résultats très satisfaisants parce que les limites de zone de fading (191 km à 262 km) est à l'extérieur de la région d'écoute souhaitée de 150 km.

4.3 Les résultats de calcul pour la fréquence 810 kHz et une antenne à une hauteur de ¼ onde (env. 94 mètres) indiquent que la zone de fading est très réduite de 143 km à 159 km. Le contour de 60 dBµ (1 mV/m) à 174 km est acceptable en considération de la région d'écoute souhaitée (150 km).

5. CONCLUSION

En considération du présent calcul la fréquence de 810 kHz avec une puissance porteuse de 50 kW et une antenne à une hauteur ¼ onde (env. 94 mètres) est la meilleure solution économique.

RESUMEE

TABLEAU DE PROPAGATION

Contours (intensité de champ	603 kHz (124 m) ¼ λ	603 kHz (248 m) ½ λ	801 kHz (93.6 m) ¼ λ	801 kHz (187 m) ½ λ	1305 kHz (57 m) ¼ λ	1305 kHz (115 m) ½ λ
75 dBµ (6 mV/m)	113 km	113 km	87 km	87 km	53 km	53 km
66 dBµ (2 mV/m)	175 km	175 km	134 km	134 km	83 km	83 km
60 dBµ (1 mV/m)	220 km	220 km	174 km	174 km	105 km	105 km
zone de fading						
intérieure	124 km	191 km	143 km	166 km	111 km	192 km
extérieure	204 km	262 km	159 km	220 km	163 km	248 km

puissance : 50 kW
conductivité de sol : 10 milli Siemens/m

<u>classement d'intensité de champ</u>

75 dBµ (6 mV/m) - 1ère classe très bonne écoute
66 dBµ (2 mV/m) - 2ème classe bonne écoute
60 dBµ (1 mV/m) - 3ème classe écoute acceptable dans les régions rurales

I - DISPOSITIONS GENERALES

I.1 OBJET

La DIRECTION DE LA RADIO RURALE se propose d'acquérir, d'installer et de mettre en service les équipements mécaniques électriques et électroniques nécessaires à la réalisation d'une station de diffusion radio en ondes moyennes à KAN KAN.

I.2 BUT

Ce projet porte sur l'extension du réseau radio rurale de diffusion radio définie comme suit :

- réalisation d'une station de diffusion radio en ondes moyennes pour assurer la couverture en programmes radio un rayon d'environ 150 km autours de la ville de KAN KAN.

I.3 SITUATIONS ACTUELLES :

KAN KAN

coordonnées géographiques	: latidude 10° Nord 20' longitude 9° Ouest 17'
- altitude N.N.	: 380 mètres
- accès	: route nationale KAN KAN - KISSIDOUGOU

Cette station est équipée comme suit :

- deux émetteurs radio O.M. d'une puissance 25 kW chacun, type SRV 20, fabriqués par TESLA et accordés sur 1305 kHz dont un émetteur en panne

- un système d'antenne rayonnant composé d'un pylône haubané d'une hauteur de 60 mètres, cabine d'antenne et feeder aérien d'une impédance de 250 Ω

- un groupe électrogène de 250 kVA, type VM

- liaison de la modulation Studio - CER longueur du câble P.T.T. environ 500 mètres

ANNEXE II

REPUBLIQUE DE GUINEE

MINISTERE DE LA COMMUNICATION

DIRECTION GENERALE DE LA RADIO RURALE

DESCRIPTIONS TECHNIQUES

POUR

L'EXTENSION DU RESEAU DE LA RADIO RURALE
PAR UNE STATION D'EMISSION EN ONDES MOYENNES
A KAN KAN

II - DEFINITIONS ET PRINCIPES D'EXPLOITATION

II.1 DESCRIPTIF DES EQUIPEMENTS ET INSTALLATIONS ACTUELLES

L'ensemble de diffusion radio en O.M. existant est composé de deux émetteurs d'une puissance de 20 kW chacun.

- L'alimentation électrique des émetteurs est assurée à partir d'un tableau général basse tension et à travers un régulateur de tension par émetteur.

- En cas d'une panne secteur un groupe électrogène de 250 kVA est mis en marche pour assurer l'alimentation des équipements.

- Le système d'antenne est composé d'un pylône de 60 mètres avec cabine d'antenne. Le réseau de terre à la base du pylône et partiellement manquant.

- Le feeder principal et un feeder aérien d'une impédance de 250 Ω

- Les émetteurs et groupe électrogènme sont refroidis à air. L'air nécessaire au refroidissement est pris directement dans la salle d'émission. L'air chaud est rejeté vers l'extérieur moyennant des gaines d'extraction.

- Un bâtiment à deux (2) niveaux sert d'abri aux équipements, de logement au chef de centre, de toilette pour le personnel de magasin, de bureau et d'atelier.

  Il nécessite des travaux de remise en état.

  Dimensions du bâtiment :

	salle émission	cabine d'antenne
longueur :	8m20	4m70
largeur :	5m28	2m82
hauteur :	3m10	3m62

	salle groupe électrogène
longueur :	11m70
largeur :	5m60
hauteur :	3m36

distance entre abri groupe électrogène - émetteur : 65 mètres

III - DESCRIPTIF DES EQUIPEMENTS ET INSTALLATIONS DEMANDES

Les équipements et installations demandés dans ce projet portent sur ce qui suit :

III.1 FOURNITURES DEMANDEES

- deux (2) émetteurs radio O.M. 25 kW chacun, transistorisés, munis d'un système de couplage en parallèle ou un émetteur 50 kW transistorisé en option

- deux (2) régulateurs de tension appropriés

- une (1) antenne fictive avec système de commutation HF

- un (1) groupe électrogène d'une puissance appropriée pour l'alimentation des équipements

- une (1) baie d'entrée et de contrôle 19" câblée et équipée de :
  - 2 récepteurs VHF/FM (de la liaison VHF/FM)
  - 1 démodulateur de contrôle AM
  - 1 amplificateur de distribution
  - 1 limiteur de modulation AM
  - 1 unité de haut-parleur avec amplificateur
  - 1 analyseur d'audiofréquences
  - 1 oscillateur d'audiofréquences
  - 1 oscilloscope double trace, 50 MHz
  - 1 panneau de raccordement audio et HF
  - 1 lot de matériels divers, trousse d'outillage et câble de connexion

- un (1) système d'antenne omnidirectionnelle avec cabine d'antenne et feeder coaxial

- un compresseur dissicateur

- une liaison VHF/FM pour l'acheminement du programme de studio vers le centre émetteur composée de :
  - 1 émetteur VHF/FM 100 W
  - 2 récepteurs VHF/FM
  - 1 antenne de réception YAGI 4 éléments
  - 1 antenne d'émission dipôle
  - 2 câbles coaxiaux de 15 mètres de longueur chacun avec connecteur HF

- un (1) système de refroidissement des émetteurs
- un (1) système d'extraction d'air chaud
- un (1) lot de matériel de montage et d'installation
- un (1) lot de pièces et modules de rechange

III.2 PRESTATIONS DEMANDEES

- récette en usine, livraison coût, frêt et assurance jusqu'au port de CONAKRY, installation, réglage, récette en station et mise en service des équipements définis au § III.1
- formation en Guinée de quatre techniciens
- l'ensemble des contraintes et servitudes nécessaires à l'installation des équipements, telles que :
  * plans guidés de différentes réservations et génie civil
  * définition de besoins énergétiques

IV. FOURNITURES ET PRESTATIONS A LA CHARGE DE LA DIRECTION DE LA RADIO RURALE

- l'alimentation électrique 220 V/380 V - 50 Hz
- les locaux pour les équipements
- la livraison sur sites de tous les équipements définis au § III.1
- le génie civil

IV - SPECIFICATIONS TECHNIQUES DES EQUIPEMENTS

Les caractéristiques techniques indiquées ci-après constituent des spécifications minimales.
D'une manière générale, le matériel à acquérir devra être conforme aux normes et spécifications internationales, avis et recommandations du CCIR, de la CEI, de l'UER ou à défaut celles en vigueur dans le pays du fournisseur.

IV.1 CONDITIONS GENERALES DE FONCTIONNEMENT

IV.1.1 Alimentation

- tension : 380/220 V triphasée, le neutre étant isolé de la masse de l'émetteur
- fréquence : 50 Hz
- stabilité : ±5 % tension, 48 - 53 Hz

IV.1.2 Conditions climatiques

- température : 0° C à 50°C
- humidité relative : < 95 %
- altitude : jusqu'à 1500 mètres

IV.2 EMETTEURS O.M. TRANSISTORISÉS

- bande de fréquences : 531 kHz à 1705 kHz le canal d'émission étant sélectionné et préréglé à l'usine
- stabilité de fréquence : ±10 Hz, 0 à 50°C
- type de modulation : AM modulation digitale
- impédance de sortie HF : 50 Ω asymétrique
- variation de la porteuse : < 1 %
- niveau d'entrée audio : -10 à +10 dBm
- impédance d'entrée audio : 600, 150 ou 50 Ω
- réponse amplitude/fréquence : ±0.5 dB 20 Hz à 10 kHz
- distorsion harmonique de 30 Hz à 10 kHz : <0.9 % à 95 % de modulation
- rapport S/B : > 65 dB
- capabilité de modulation en point positif avec modulation du programme : +145 % à 25 kW, +135 % à 27.5 kW
- rendement : > 83 %

IV.3 ANTENNE FICTIVE

- puissance à dissiper . 75 kW
- fréquences de travail : 531 kHz à 1705 kHz
- ROS : < à 1.05
- impédance : 50 Ω
- température ambiante : 0°C à +45°C
- mode de refroidissement : à air

L'antenne fictive devra être fournie avec le matériel suivant :

- une charge et une section de mesure avec wattmètre, pour la mesure de la puissance dissipée
- les dispositifs nécessaires à sa protection en cas d'insuffisance de ventilation, surcharge etc...

IV.4 FEEDERS 3"

- impédance caractéristique	: 50 Ω
- diamètre	: 3"
- gamme de fréquences	: 531 à 1705 kHz
- ROS (feeder chargé sur Zc)	: < 1.05
- longueur	: 120 mètres
- type de connecteur	: EIA

IV.5 COMPRESSEUR DISSICATEUR

- alimentation 220 V/50 Hz
- fonctionnement automatique en pressurisation et régénération
- seuil de pression réglable
- débit d'air pessurisé réglable

Il devra être fourni avec un lot de tuyauterie, colliers et tous les accessoires à son installation dans la station.

IV.6 REGULATEUR DE TENSION

- tension d'utilisation	: 220/380 V triphasée
- puissance	: 60 kVA
- variation de la tension d'entrée	: ± 20 %
- variation de la fréquence d'entrée	: -10 à +20 %
- distorsion harmonique	: nulle
- précision de la tension de sortie	: ±1 %

- tension de sortie en phase avec la tension d'entrée
- possibilité d'intervention sur le réglage de la tension de sortie

IV.7 GROUPE ELECTROGENE

Le groupe électrogène devra être installé dans la salle d'énergie.
Il devra avoir une puissance d'environ 150 kVA, dans tous les cas, la puissance devra être suffisante pour répondre aux besoins de l'ensemble des équipements.

IV.7.1 Moteur :

- puissance	: 134 kW environ
- vitesse	: 1500 tr/mn
- utilisation	: continue
- carburant	: Diesel
- refroidissement	: à air, option à l'eau
- altitude	: jusqu'à 1500 mètres
- surcharge	: 10 % pointe
- régulation de vitesse	: mécanique
- instabilité	: ±0,2 %
- variation de la vitesse pour 25 % et 50 % de la variation de la charge	: < 3 %
- détection pression d'huile	: précision 5 %
- détection température moteur	: précision 5 %

IV.7.2 Alternateur :

- puissance	: 150 kVA environ
- surcharge	: 10 % pointe
- fréquence	: 50 Hz ±1 Hz
- vitesse	: 1500 tr/mn
- tension de sortie	: 380 V triphasée
- classe d'isolation (rotor + stator)	: H avec traitement anti abrasif et anti moisissure
- classe de protection	: IP 21
- régulation de la tension	: ±5 % (cos phi = 0,8)

IV.7.3 Fonctions de commande, de contrôle et de protection

Les fonctions de commande, de contrôle et de protection seront integrées dans le tableau général de distribution d'alimentation électrique de la station mobile. Les principales fonctions sont les suivantes :

a) contrôles :
- paramètres moteur
- principales grandeurs électriques
- états d'alarmes
- niveau du carburant dans le réservoir
- état de la charge de la batterie de démarrage
- nombre d'heures de fonctionnement

b) commandes :
- choix du mode de fonctionnement
- le démarrage et l'arrêt du groupe électrogène en position "manuel"
- l'effacement de l'affichage des défauts
- Le réglage de la tension et de la fréquence pourront se faire directement sur le groupe électrogène.

c) protections :
La protection de l'alternateur sera assurée par un disjoncteur à commande électrique, muni de contacts auxiliaires. La commande du disjoncteur de protection pourra être faite à partir des unités de commande placées dans le tableau général d'alimentation électrique.

IV.7.4 Batterie de démarrage

Le démarrage du groupe devra être assuré par un ensemble chargeur/batterie 24 V installé soit sur le chassis du groupe électrogène, soit à côté.

Le maintien de la charge de cette batterie sera assuré à partir du groupe électrogène et du réseau 380 V/50 Hz.

IV.7.5 Alimentation en combustible

L'alimentation du groupe électrogène en combustible se fera à partir d'un réservoir, appelé réservoir journalier, fixé sur groupe, lui-même alimenté automatiquement à partir du second réservoir de 4000 litres.

IV.7.6 Tableau général d'alimentation électrique

Les fonctions d'alimentation électrique, de commutation secteur/groupe, de distribution électrique, de commande et de signalisations seront placées dans une baie appelée tableau général d'alimentation électrique. Ce tableau assurera les fonctions de commande, de contrôle et de protection du groupe électrogène.

Le tableau général d'alimentation électrique sera alimenté à partir de deux sources, une source normale en 380 V/50 Hz triphasé et une source de secours à partir du groupe électrogène. Les deux sources seront protégées et commutées vers un régulateur de tension, par un inverseur Normal/Secours.

La sortie du régulateur sera connectée à la barre de distribution, qui alimentera l'ensemble des équipements à travers des disjoncteurs de protection.

IV.8 SYSTEME D'ANTENNE OMNIDIRECTIONNELLE

IV.8.1 Pylône haubané

Le pylône de hauteur de 94 mètres sera de type haubané de section triangulaire minimum 1 mètre et à ossature tubulaire galvanisée.

IMPORTANT : Le pylône à ossature en L ne sera pas accepté.

IV.8.2 Effet de vent

- vitesse moyenne du vent : 150 km/h
- vitesse de pointe : 180 km/h

IV.8.3 Equipements

Le pylône est muni des équipements suivants :

- une échelle verticale avec un système anti-chute type crinoline
- un lot de plateformes de repos
- un réseau de terre constitué par 120 fils en cuivre (diamètre 3 mm) d'une longueur de $\lambda/4$ relié à la base du pylône
- un isolateur de base
- un lot d'isolateurs d'hauban
- un balisage de nuit conforme aux normes de l'O.A.C.I. composé d'un feux clignotant

IV.8.4 Traitement de surface et peinture

Tous les éléments de charpente métallique seront galvanisés au bain à 600 Gr/m², les boulons seront galvanisés au bain à 300 Gr/m².

Le balisage de jour sera assuré par de bandes verticales peintes alternativement en blanc et rouge (2 couches) conformément de l'O.A.C.I.

IV.8.5 Fondations

Les fondations de pylône devront être prédimensionsées sur la base des données suivantes :

- angle de frottement interne : 25°
- cohésion : 0,2 kg/cm²
- poids spécifique de terre : 1.8 t/m³

IV.8.6 Cabine d'adaptation d'antenne

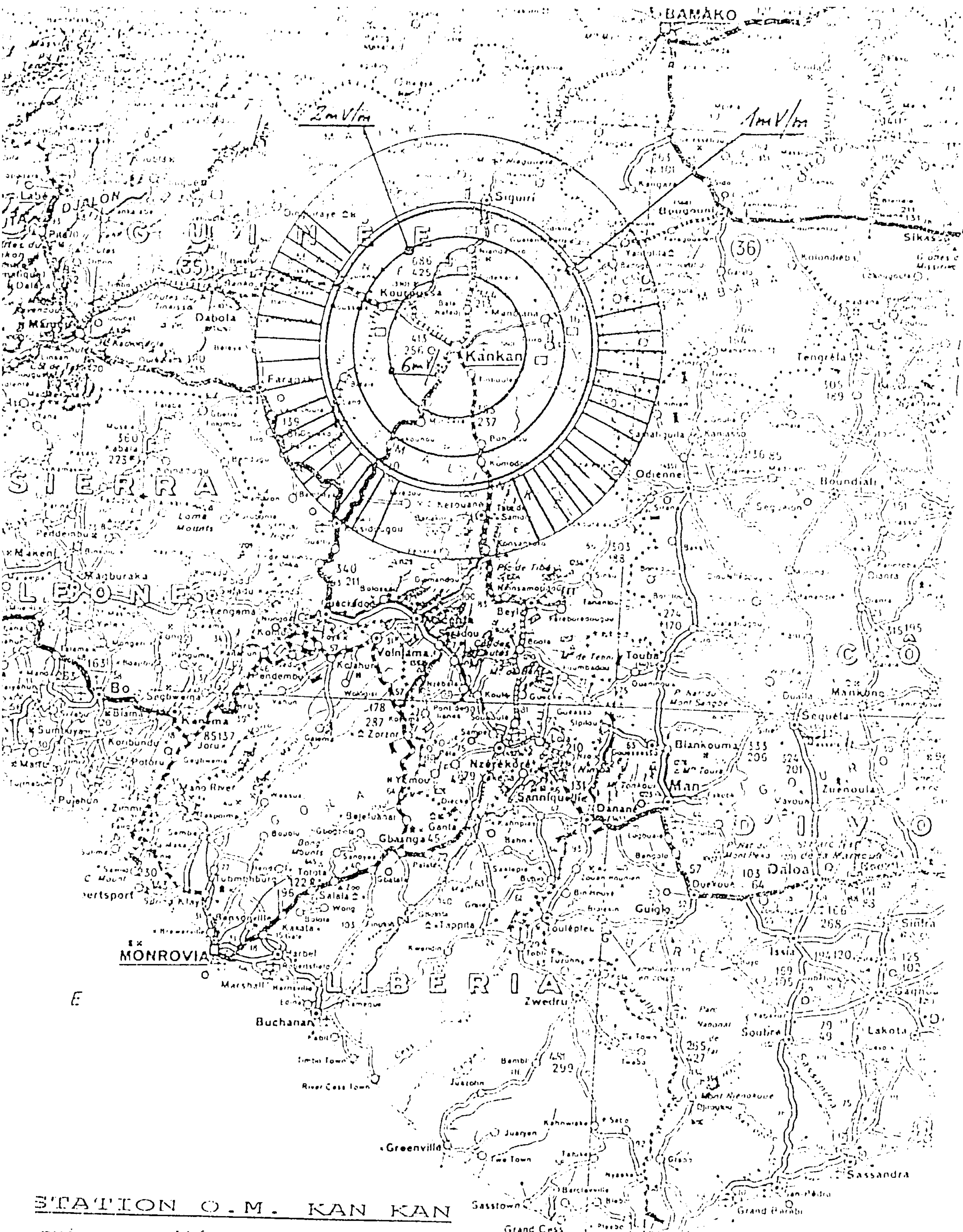
type préfabriqué

- impédance : 50 Ω asymétrique
- impédance de sortie : à adapter sur le pylône
- connecteur d'entrée : EIA 1 5/8"
- R.O.S. : < 1.1
- puissance HF : 50 kW avec 100 % de modulation

munie de :
- transformateur de courant
- toit anti-soleil

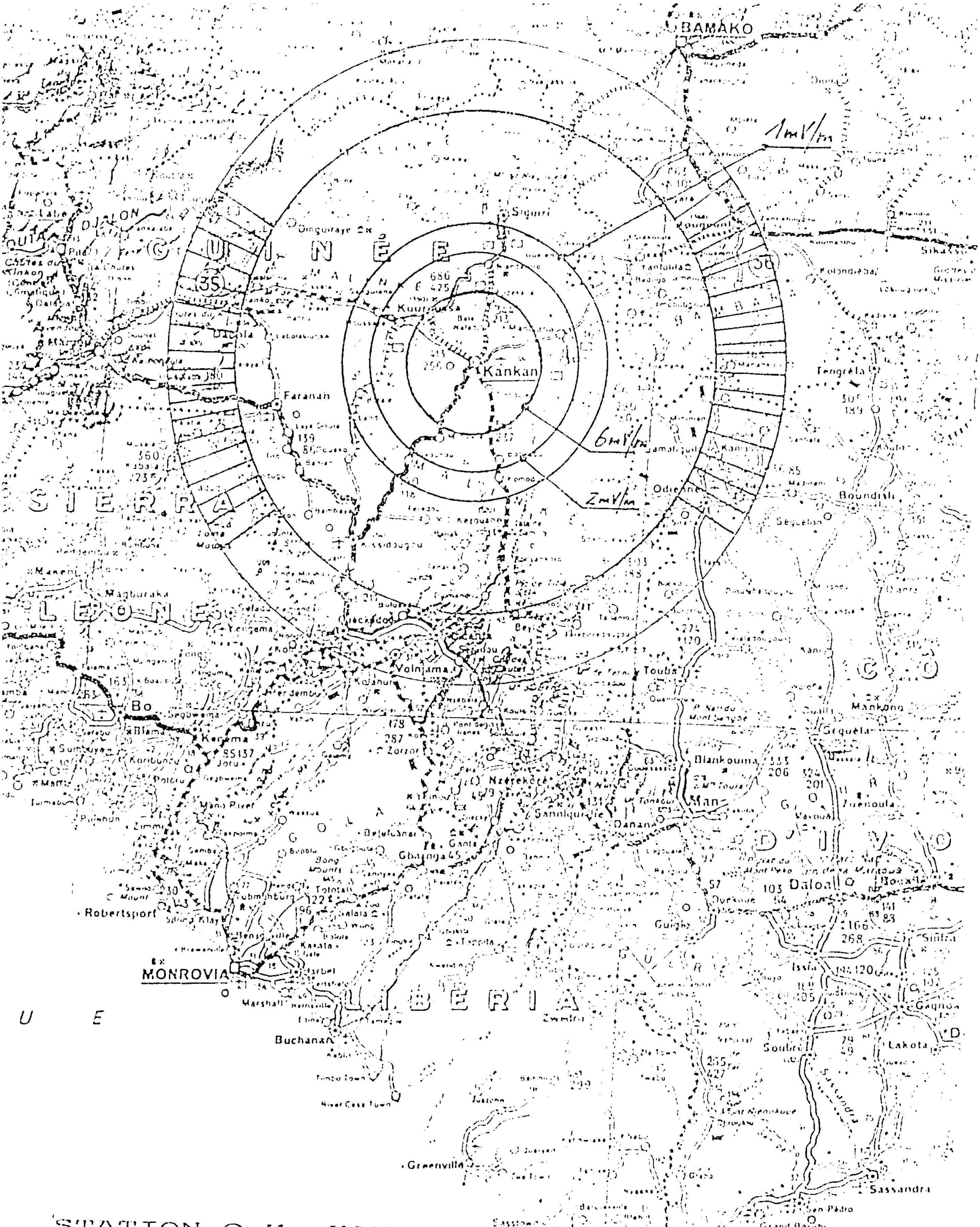
IV.9 PROTECTION DU PERSONNEL

Les armoires contenant de tensions dangereuses devront être équipées d'organes de verrouillage et de protections nécessaires.



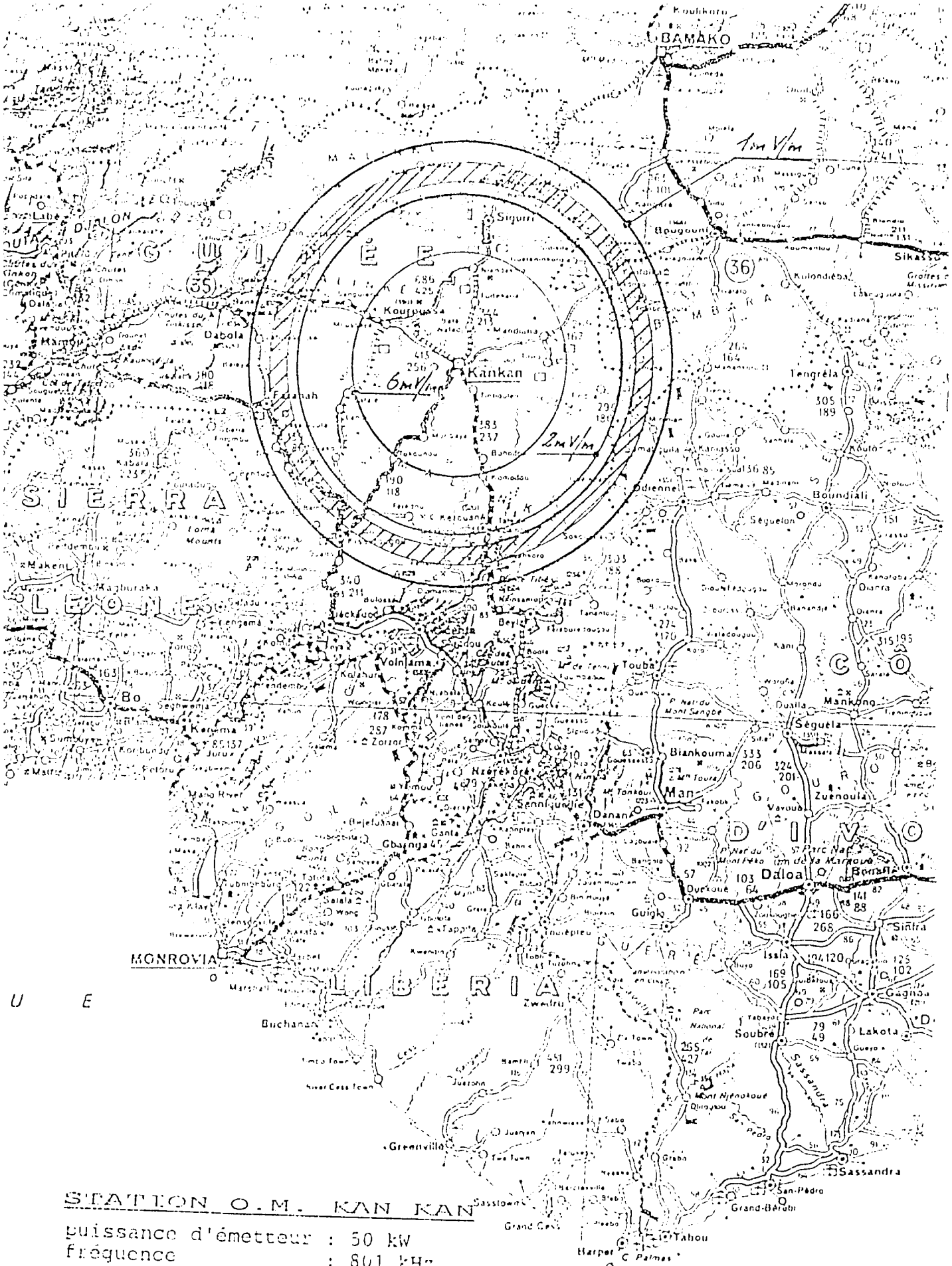
STATION O.M. KAN KAN

puissance d'émetteur : 50 kW
fréquence : 1305 kHz
système d'antenne : 1/4 onde omnidirectionnel
onde de jour (sol) : (6 mV/m, 2 mV/m et 1 mV/m) zone de fading



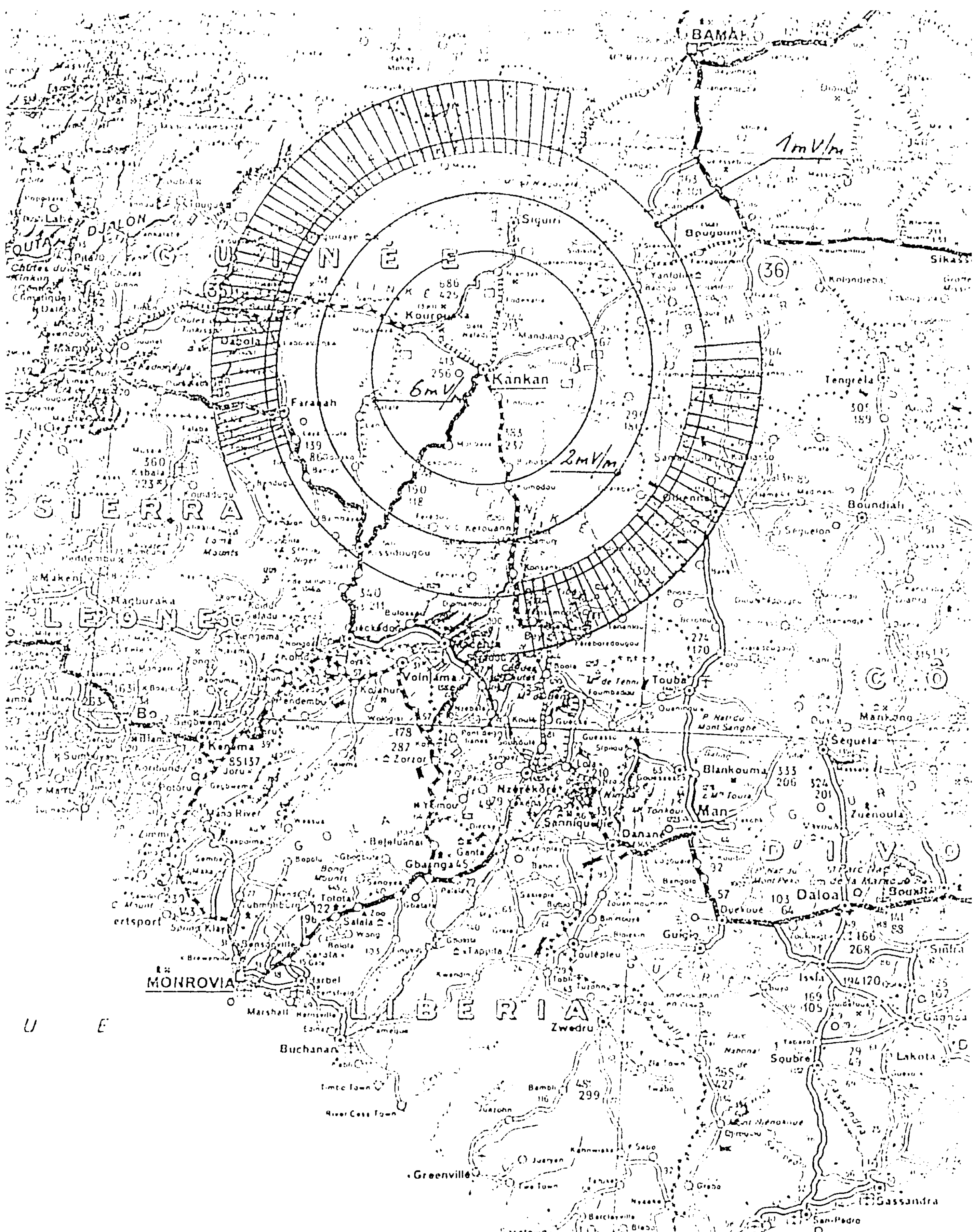
STATION O.M. KAN KAN

puissance d'émetteur : 50 kW
fréquence : 1305 kHz
système d'antenne : 1/2 onde omnidirectionnel
onde de jour (sol) : (/6 mV/m, 2 mV/m et 1 mV/m) zone de fading



STATION O.M. KAN KAN

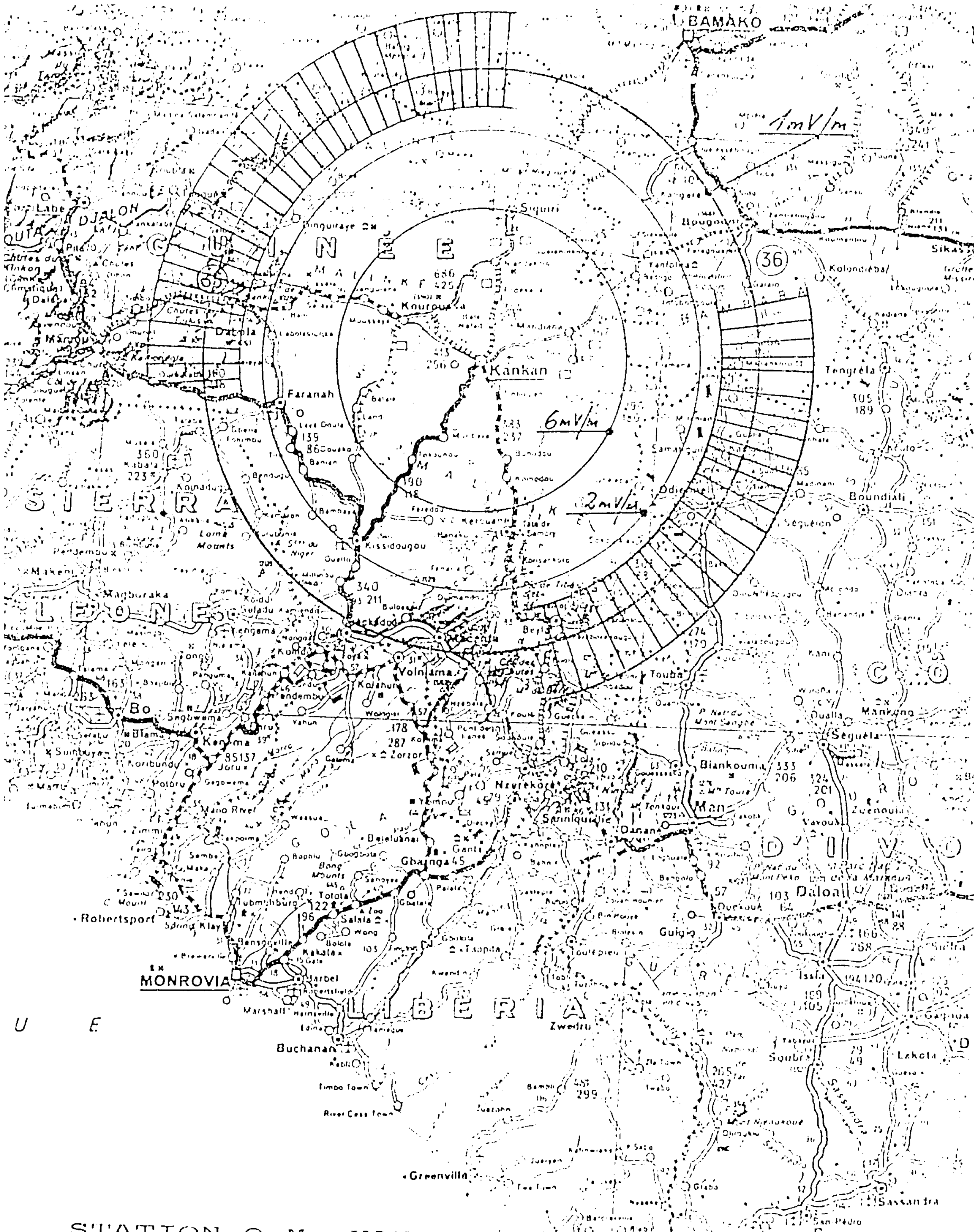
puissance d'émetteur : 50 kW
fréquence : 801 kHz
système d'antenne : 1/4 onde omnidirectionnel
onde de jour (sol) : (/6 mV/m, 2 mV/m et 1 mV/m) zone de fading



STATION O.M. KAN KAN

puissance d'émetteur : 50 kW
fréquence : 801 kHz
système d'antenne : 1/2onde omnidirectionnel
onde de jour (sol) : (/6 mV/m, 2 mV/m et 1 mV/m) zone de fading

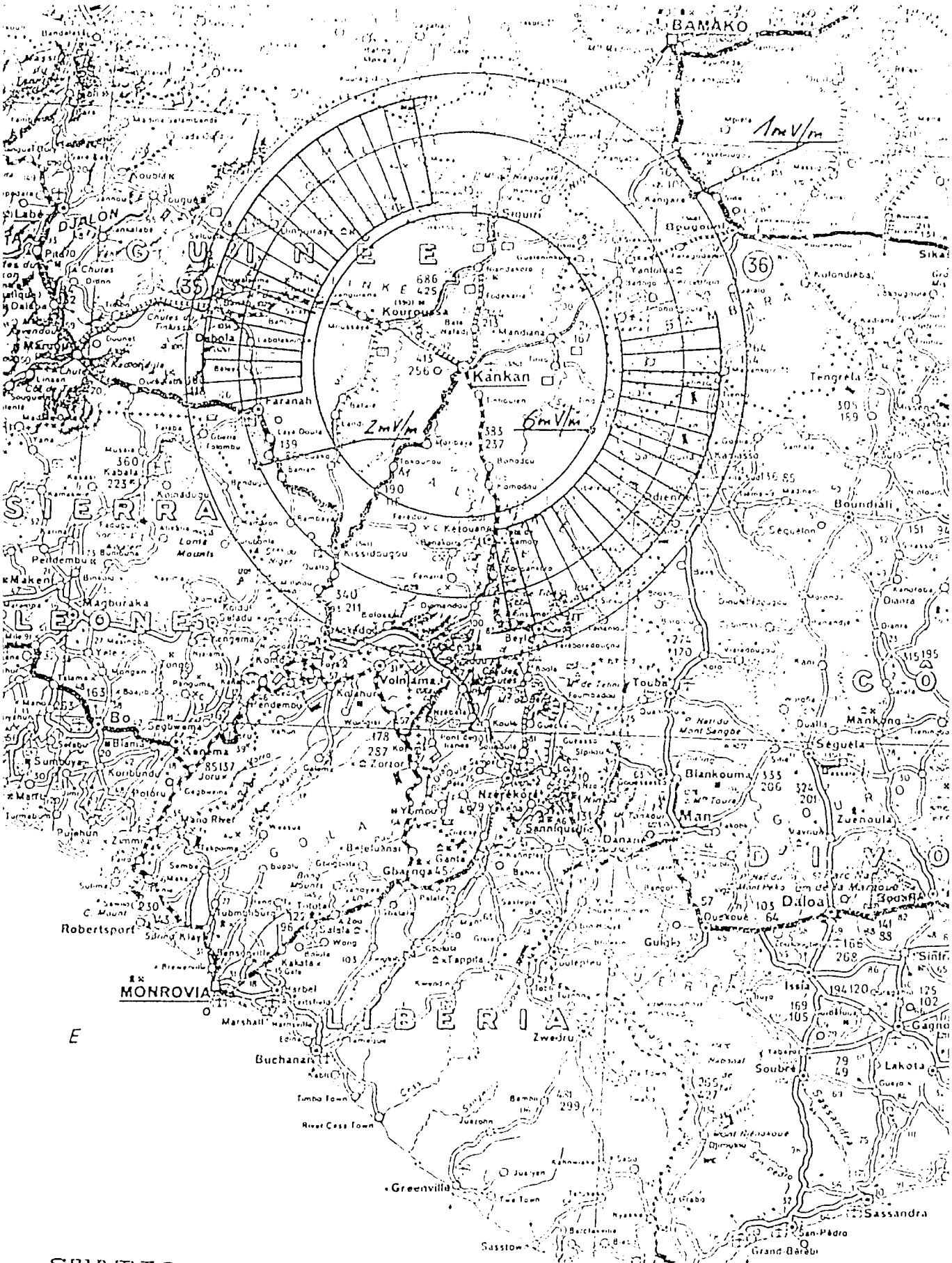
160



STATION O.M. KAN KAN

puissance d'émetteur : 50 kW
fréquence : 603 kHz
système d'antenne : 1/2 onde omnidirectionnel
onde de jour (sol) : (6 mV/m, 2 mV/m et 1 mV/m) zone de fading

1161



STATION O.M. KAN KAN

puissance d'émetteur : 50 kW
fréquence : 603 kHz
système d'antenne : 1/4 onde omnidirectionnel
onde de jour (sol) : (6 m V/m, 2 mV/m et 1 mV/m) zone de fading

ANNEX

Guinée*Accès

Communication & Information Digitales

Le Président-Directeur Général

A

Monsieur Andy Lohoff
Consultant
USAID/Conakry

24 Octobre 1994

Monsieur,

Suite à un échange de vues, le 23 courant, avec Monsieur Dominique Gaye, j'ai l'honneur de vous communiquer, pour toutes fins utiles, quelques éléments d'information sur mon entreprise, qui est spécialisée dans les réseaux de communication et d'information numériques. Guinée*Accès a négocié avec l'Etat Guinéen l'attribution d'une licence et la signature d'une convention portant sur le déploiement et l'exploitation d'un réseau VSAT privé, domestique et international. L'objectif envisagé est de fournir une large gamme de services à valeur ajoutée de télécommunications : *e-mail*, Internet, télé-enseignement, Collecte de Nouvelles par Satellite, Diffusion Directe par Satellite, edition CD-ROM, etc.
Guinée*Accès a également introduit auprès du Ministre des Postes et Télécommunications, Autorité de Tutelle, une demande de licence d'exploitation d'une chaîne privée de radiodiffusion émettant en modulation de fréquence. L'approche ici consistera à utiliser le réseau satellite VSAT à installer et transmettant sur la Bande C pour couvrir l'ensemble du territoire guinéen.

Veuillez agréer, Monsieur, l'expression de ma considération distinguée.

Tierno Siradiou BAH