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BROADCASTING FOR DEVELOPMENT

The Expansion of Radio and Television in Zambia

**A report on the findings of a mission to Zambia
on the possibilities of local manufacture of
radio and television receivers**

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EXECUTIVE SUMMARY

In 1982, the Government of Zambia embarked upon the first phase of a programme to revitalize the mass media. This phase included especially the construction of the Mass Media Complex in Lusaka, providing production facilities for radio and television. What has been achieved so far has primarily benefitted urban audiences and has been constrained by problems of manpower, the replacement of equipment and spare parts, inadequate funding and other problems arising from the country's general economic difficulties.

In the course of 1987, an Italian firm, VIGINTER (Milan), in association with Zambian Broadcasting Services, undertook the initial planning of a second phase of broadcasting development in Zambia, whose primary objective would be the expansion of radio and television services to rural audiences. This initial plan foresees also the provision of solar-powered radio receivers and television sets for the public and rural institutions.

In 1988, it was agreed that UNESCO, as the lead agency and co-ordinator, other UN agencies, including ITU (for telecommunications), UNIDO (receiver production and distribution), FAO (agricultural communication), WHO and UNFPA (health and population communication), the Government of Zambia and Italian authorities should co-operate to elaborate a "definitional study" on a detailed operational plan for the extension of radio and television services throughout Zambia.

As a part of the definitional study, an expert mission by UNIDO was made to look into the possibilities of local manufacture of radio and television receiver sets in Zambia. Based on the survey, a diagnosis of the existing manufacturing facilities on the:

- electrical and electronics industry,
- plastic manufacturing industry, and
- batteries manufacturing industry,

was made, which leads to the conclusion that none of the existing manufacturers would be able to cope with a massive increase of production of radios and television sets presently. Taking into consideration the reliable number of existing radio and TV sets (about 400,000 radios and 100,000 TV sets) and the annual production output of the two manufacturing companies of about 36,000 radio units, it is obvious that the demand, estimated out of a minimum of 500,000 units by the public and various institutions like schools, co-operatives, health organizations, etc., cannot be met.

Recognizing this problem, UNESCO proposes, therefore, the local manufacturing of a solar-powered AM/FM radio receiver, which should meet the following criteria:

- very cheap,
- easy to handle and operate,
- robust, adapted to tropical conditions and with independent power supply,
- simple to manufacture
- simple to repair.

Various alternatives for the realization of local production on national and regional levels were taken into consideration. The results of the analysis lead to the following two favourable conclusions that:

- a. the proposed UNESCO solar-powered AM/FM radio receiver could be manufactured in Zambia at production costs between US\$ 19.8 and 24.0 per unit, under the assumption that already existing manufacturing facilities should be used as much as possible and additional equipment for the manufacturing will be provided through the project; and
- b. the manufacturing of the proposed radio set on a regional level through joint ventures between P.T.A. member countries to increase trade exchange between the countries and to promote technical co-operation.

Part A: 1. Introduction

In order to meet the specific objective of the study, to provide a solution to the following problem and meet the following requirement:

the development of an adequate industrial base in the field of broadcasting, especially of receiver production, so that the use and impact of broadcast programmes can keep pace with its production and technical expansion.

UNESCO has invited UNIDO to join the survey team and to look into the possibilities of local manufacturing of radio and television receiver sets in Zambia.

An expert mission was made between 28 November and 9 December 1988 to Zambia to make a short diagnosis of the existing electronics and plastic industry and to look into various alternatives of extension of local production of radios and television sets.

During the survey, a number of meetings were held with the following companies, organizations and corporations:

- a. Electrical and electronics industry
 - (1) Supersonic International Zambia Ltd.
 - (2) Philips Electrical Zambia Ltd.
- b. Plastic manufacturing industry
 - (1) Norgroup Plastics Ltd.
 - (2) Polypackers Ltd.
- c. Batteries manufacturing industry:
 - (1) Exide Zambia Ltd.
 - (2) Chloride Zambia Ltd.
 - (3) Mansa Batteries Ltd.
- d. Solar cell supplying industry
 - (1) BP Solar
- e. The Preferential Trade Area (PTA) for Eastern and Southern African States
- f. The Zambian National Broadcasting Corporation (ZNBC) and the Zambia Industrial and Mining Corporation (ZIMCO)

The following report on the findings of the mission contains two parts: Part A deals with the diagnosis of the existing manufacturing facilities on the above-mentioned industrial sectors as well as with the present situation of the supply and demand of radio and TV receiver sets and the overall economic situation of Zambia. Part B includes

proposals for the future development of local manufacturing of receivers introducing a special developed and designed solar powered radio receiver and the possibilities and alternatives to manufacture and assemble this type of radio in Zambia as far as possible, indicating (i) the required implications for the Government, (ii) the reason for the local production and (iii) the constraints to realize this target.

2. Present situation

Taking into consideration the major target of the initial project planning, made by the Italian firm, Viginter Milan, to set up a radio and television network across the country comprising seven regional production centres, an FM-radio network to cover 95 per cent of the territory and a television network on VHF band III to cover about 90 per cent of the country it is of importance to provide a respective number of radio and television receiver sets to the public to justify the investments and extensions on the broadcasting and transmission part and to enable the people, especially in the rural areas, to listen to the programmes.

A survey conducted for the BBC in 1986 indicated that 50 per cent of the people in the sample claimed to have one or more radio receivers in their homes, 12 per cent of television receivers and 2 per cent of video cassette players. In the rural areas, about 38 per cent of the people in the sample have a radio receiver. The same survey recorded that 57 per cent of the sample had listened to ZNBC (formerly ZBS) over the last twelve months, with 44 per cent of these listening regularly (at least once a week). However, severe problems of reception were reported, especially in the rural areas. In addition, three-fifths of rural respondents with radios said they were unable to use their receivers due to the poor quality of the batteries and the non-availability to buy new batteries. Since that time the chances to buy a cheap radio and to operate the radio under normal conditions became worse. Several reasons can be indicated for this situation:

- a. the two companies presently assembling radio and TV receivers have reduced drastically their production due to foreign exchange problems;
- b. the imported radio and TV receivers are so expensive that most of the Zambian people cannot afford them;
- c. the battery quality is so poor, as the lifespan of a set of batteries is only one week; and
- d. the overall economic situation in Zambia is characterized by high inflation rate, which results in the fact that a Zambian with an average income must spend a one-week salary to purchase six batteries for a radio receiver.

As it is very difficult to make reliable estimates of the number of sets available, the figures greatly vary, depending on the source, such as:

(1) BBC survey

Radio sets	750,000
TV sets	250,000

The BBC estimates are based on various sources, including UNESCO and the 1985 survey carried out by USIA.

(2) Young and Rubican (Zambia) Ltd.

Radio sets in working order	387,000 (in urban/semi-urban areas)
TV sets	98,000 (including 15,000 non-Zambian/expatriate households)

These estimates are based on a survey carried out in 1985 on behalf of Young and Rubican in Lusaka, Ndola, Kasama, Chipata, Livingstone and Mongu.

(3) ZNBC

Some sources at ZNBC claim that there are about 400,000 TV sets in Zambia.

It can be assumed that the Young and Rubican estimates for radio and TV sets are quite realistic. The BBC estimate on radio sets might be right, except the fact that the sets may not all be in operating condition because of the lack of batteries and spare parts.

Taking into consideration the reliable number of existing radio and TV sets (about 400,000 radios and 100,000 TV sets) and the production output of the two manufacturing companies of about 36,000 radio units per year, it is obvious that the demand by the public cannot be met presently. Characteristic for this situation is the fact that the two companies are not producing on stock, the radios are sold immediately to the public.

When looking to the population distribution in Zambia for 1988 about 53.9 per cent of the people are living in rural areas and about 46.1 per cent are living in the urban areas (see Table 1). The number of households projected for 1988 is about 1,499,700 with an average size of five people per household. Under the assumption to provide a low-cost radio receiver set at least to every second household a demand of about 500,000 radio receiver sets would occur, which cannot be met under the present condition, especially as the existing manufacturers are only in the position to assemble about 36,000 units per year due to the scarce foreign exchange situation and the limited import of components and new material for assembling.

TABLE ONE

Projected population by area for 1988

	<u>abs.</u>	<u>per cent</u>
Rural area	4,065,298	53.9
Urban area	3,465,821	46.1
Total Zambia	7,531,119	100.0

and projected number of households for 1988

	<u>abs.</u>	<u>per cent</u>	<u>average size</u>
Rural area	887,700	59.2	4.6
Urban area	612,000	40.8	5.7
Total households	1,499,700	100.0	5.0

Source: CSO (1985)

3. Existing manufacturing facilities

A short survey was made on the following industrial sectors:

- a. radio and TV assembling companies
- b. plastic manufacturing companies
- c. battery manufacturing companies

In various meetings with the management of the companies and through factory visits, it was possible to gain information on:

- a. the background of the company;
- b. the organizational set and human resources available
- c. the product range
- d. the production equipment
- e. the condition of the factory; and
- f. the existing problems.

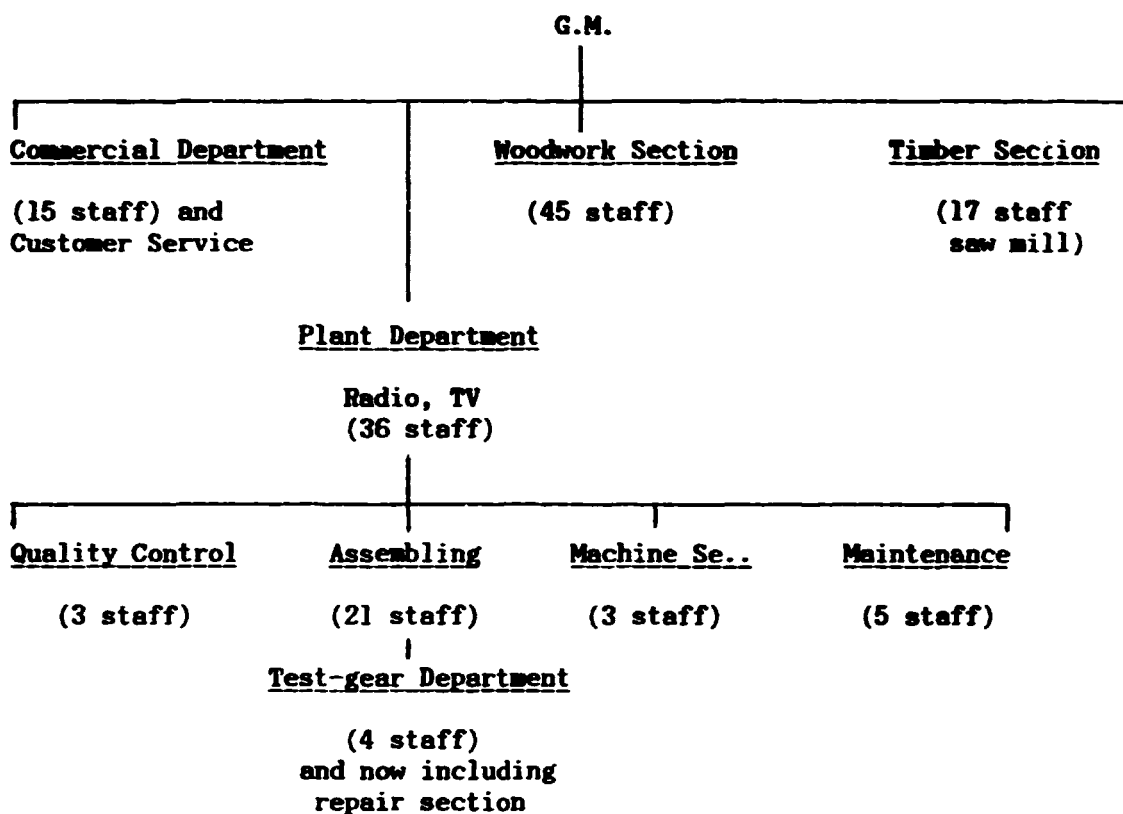
3.1 Radio and television receiver assembling

Radio and television receiver sets are only assembled by two companies, namely: Supersonic International Zambia Ltd. in Livingstone and Philips Electrical Zambia Ltd. in Lusaka.

3.1.1 Supersonic International Zambia Ltd.

Background, organization set-up and human resources

The company was founded in 1965 as Supersonic Radio TV Ltd.; then ITT bought the shares and it became ITT Supersonic Ltd. In 1985, ITT sold its shares and it became Supersonic International (Z) Ltd. The organizational set up of Supersonic is described below:



The customer service includes 3 workshops for repair of radio and TV sets in:

- a. Ndola with 3 technicians;
- b. Lusaka with 4 technicians; and
- c. Livingstone with 4 technicians.

The test gear department is responsible for testing, calibration and now, also, for the repair and setting-up of the production line. Furthermore, this department takes care of all repair activities and the maintenance of the radio and television receiver sets due to the fact that the present output of assembled radio units is very low. The total number of present staff is 113 people. Most of the technicians received their training on the job within the company or were trained at the former sister company of ITT in BULAWAYO (Zimbabwe).

In the audio-visual department 21 operators are now assembling multi-band radios (MW/SW) under licence from National of consolidated kits. Up to 50 technicians have worked there, but most of them have been transferred to the timber and woodwork sections due to the limited availability of components and kits for assembling.

Previous multi-band radio assembly was about 60,000 units per year (5 years ago). The present production is now less than 20 per cent of the capacity, about 12,000 units per annum of two-band radios of very low technology. In addition, about 10,000 units of mono- and stereo-cassette recorders are assembled each year. Presently all parts, including PCBs and cabinets are imported.

The major local product is the Champion III. This is a two-band MS/SW receiver. It is the popular rural set moulded in bright green plastic. The prices for the Champion III are (i) ex factory KW345 and (ii) retail KW475. The other sets which are assembled are much more expensive so that these are well outside the scope of the project. A prototype one-band MW receiver called the LIMA was developed for the Ministry of Agriculture for rural distribution; however, this project was never followed up.

The cost of sets is significantly increased by sales tax and customs duty.

- a. 30 per cent import duties on the components, and
- b. 15 per cent sales tax on the product.

Television sets were assembled from kits before the production stopped about five years ago as no foreign exchange allocation for the import of components has been granted. Supersonic dealt with the following firms:

- a. Thorne
- b. Zanussi B/W (Italy)
- c. ITT Standard, Milan (Italy)
- d. Galaxy

About 3,000 units of mono and colour TV sets have been assembled per year (from 16 inches up to 26 inches in tube size).

Supersonic now provides a maintenance service but only for the sets that they supplied. Maintenance service is also faced with the problem of availability of spares. The company has enforced some major dealers to employ at least one technician for minor repair and maintenance of sets. Larger repair works are still made at the service centers or the company's premises. Supersonic provides the following guarantee period on their products:

- a. 3 months for radios;
- b. 6 months for television sets; and
- c. 12 months for the television tube.

The company assembles also larger loud speakers for music centers.

The distribution of audio-visual equipment is made through wholesalers and retailers with defined sales areas. Other distribution channels like supermarket chains are not used.

During the years 1980 and 1981, also cassette bands from BASF were assembled at Livingstone. Due to the small market, Supersonic stopped the production and sold the equipment. Audio cassettes are presently in very short supply; when they are available, they are grossly overpriced. The prices for cassettes are now:

<u>Type of cassette</u>	<u>Wholesale price</u>	<u>Retail price</u>
prerecorded	KW 60	KW 75
maxi	KW 40	KW 50
blank C60	KW 60	KW 70
blank C90	KW 70	KW 80

As the Government of Zambia has declared Supersonic as a foreign exchange consuming undertaking, they had to diversify their product range to become a foreign exchange earning company. They now have in the same complex a woodwork section presently manufacturing doors, furniture shelves, cabinets for loud speakers, as well as rulers for schools.

The timber yard is manufacturing mainly sleepers for the mines and railways.

The products of the woodwork section are mainly dedicated for export. However, the export of these products has been stopped since some months by the Government due to irregularities in the export of timber and woodwork by other companies.

Production equipment

Two moulding machines from Negri-Bossi and Co. (Italy - V15-23 FA, V50-80- FA) for the moulding of the cabinets and other plastic components were bought in the early 1960s. Since several months, the equipment was not in operation. Assembling equipment such as tools, tongs, soldering equipment and silk-screen printing facilities of simple, new professional types, as well as testing and aligning equipment are available. However, most of the equipment is presently not in use and is stored under difficult conditions.

The company also has experience in the etching of boards, but the tools for punching holes in boards are not available.

Factory

The dimensions of the factory buildings, excluding the open area of the timber yards, are:

a. Radio and TV plant

- | | |
|--|------------------------|
| 1. radio and TV production floor | 803.3 m ² |
| 2. offices, machine shops,
maintenance shops, stores and dispatch | 1,227.5 m ² |
| 3. test gear section and TV soak line | 197.8 m ² |

b. Woodwork section

1. woodwork production floor

1,181.9 m²

The building, which houses the radio and television assembly unit, neither is dust proof nor has it been insulated against heat. It is of major concern that the assembling unit for electronics requiring a dust-free environment is located in close proximity to the timber-yard and woodwork section with its lime-wood dust. At the woodwork building, anti-dust covers and air exhausters are installed, but their capacity is quite below the requirements.

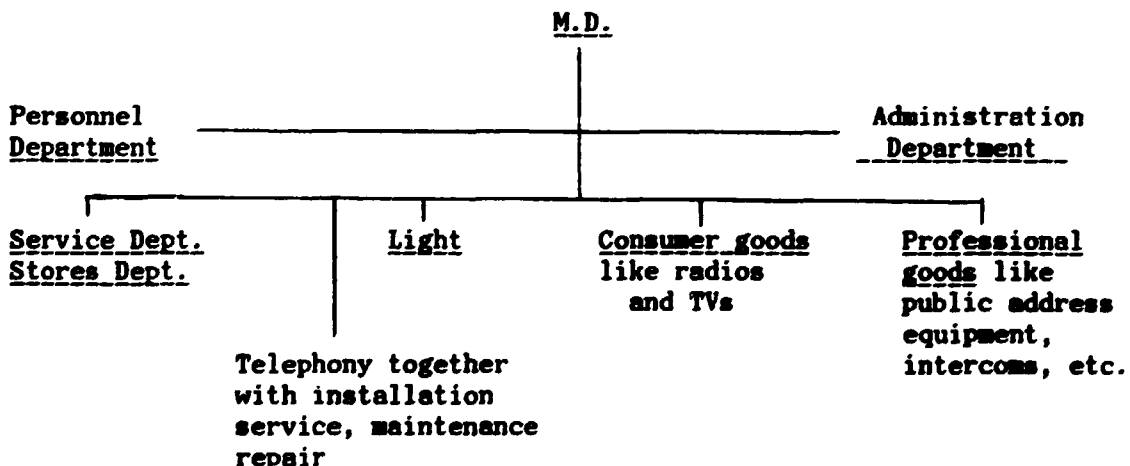
Conclusion

At present it is unlikely that Supersonic would be able to cope with a massive increase in production of radios and TV sets. Considerable assistance in training and provision of equipment for moulding and assembling would be required to upgrade their facilities. Considerable work needs to be done to improve the factory environment for electronics production and assembly.

3.1.2 Philips Electrical (Z) Ltd.

Background, organization set-up, human resources

The company was established in 1962 and is owned by Philips. The organization set-up of the company is shown below:



Philips has employed about 180 people and 40 to 50 casuals for wiring and digging purposes. The permanent staff consists of:

- a. 20 people as administrative staff, including import, export and store activities;
- b. 20 people for cleaning and messengers;

- c. 15 people as security guards; and
- d. 125 people as technical staff for telephony, service for consumer goods and assembly (19 people).

Service of receiver sets is made by Philips at two workshops in Lusaka and Kitwe. Dealers are not performing service; only limited repair is made by themselves.

Philips is not only using the chain of wholesalers and dealers, but also using supermarkets chains like ZCBC, MWAISENI Stores and NIBC as distribution channels. They are buying the radios directly from Philips and selling them through their branch offices to the customers.

The margins for the distribution of the radios and TVs are about 12 percent for wholesalers, 10 per cent for dealers and 15 per cent for sales tax.

The assembly operators and technicians receive on-the-job training at the factory but Philips is looking also for graduates from the Zambia Institute of Technology (ZIT), College of Technology (Livingstone) and Technical University (especially for high-skill activities).

The operators at the assembling unit receive as a basic payment an average between 600 to 700 KW per months, plus a transport allowance of 60 KW and a housing allowance of 15 per cent of the salary. Therefore, the total salary for an assembling operator ranges between 750 to 865 KW monthly.

Products

Philips is importing most of the products, which they sell in Zambia. All professional goods like telephone systems, public address systems, office equipment, etc., are imported, as well as some consumer goods such as bulbs and lamps. The only consumer goods, which are usually assembled in Zambia, are desk fans, irons, radios, radio recorders and TV sets. Presently only irons and TV sets are assembled. The assembly of radios, desk fans and recorders has stopped due to the lack of components. Normally Philips assembles the following two types of radios:

	<u>units/p.y.</u>	<u>ex-factory price</u>	<u>retail price</u>
AM-radio, 1-band	12,000	KW 180	KW 260
AM and 2SW radio, 3-band	12,000	KW 470	KW 600

and the following radio recorder (mono):

AM-FM 2SW radio recorder, 4-band, 10,000 units/year, KW 906 retail price;

and the following colour TV sets:

1,000 units/year with 14 inches, KW 8,500 new retail price; and with 20 inches, KW 12,000 new retail price.

In addition, the guarantee period for the radios is 6 months, for the TV sets also 6 months, and for picture tube 12 months.

Assembling equipment

The equipment for the assembling of radios and TV sets such as tools and hand-soldering equipment, testing and aligning equipment are available. Injection-moulding equipment and moulds for cabinet production are not available, as all components are imported.

Factory

The assembly room is in good condition and is, however, without any additional facilities against heat or dust. Additional rooms for extended assembly are available and need only minor improvements.

Conclusion

At present Philips would be able to cope with a massive increase in assembling radios and TV sets. A considerable increase in staffing and training would be required. Minor adaptations are necessary to improve the assembly unit. Complete provision of injection moulding equipment, including training, would be required to start the production of the plastic cabinets.

3.2 Plastic manufacturing

There is a considerable number of plastic manufacturing companies (about 30 factories) in Zambia especially producing domestic articles, bags and small items. Out of this number, the two companies below were selected:

- a. Norgroup Plastics Ltd., Ndola;
- b. Polypackers Ltd., Lusaka.

3.2.1 Norgroup Plastics Ltd.

Background and human resources

Norgroup Plastics Ltd. was founded in 1968 and is located in the copper-belt area of Ndola. Norgroup is a parastatal company; it is one of 35 subsidiary companies of the Industrial Development Corporation (INDECO), which again is entirely owned by the Zambia Industrial and Mining Corporation (ZIMCO). Ninety-nine people are presently working at the factory.

Products

The company produces various kinds of plastic products, especially beer-bottle crates, cooking-oil containers, washing bowls, baskets, domestic items, etc. The production is now running at about 25 per cent of the capacity with a production output, for example, of 450 crates and 1,200 small items per day. The production is executed in three shifts, but the local production still cannot satisfy the demand. All raw materials must be imported.

Production equipment

The company disposes of a number of HDPE injection-moulding machines for the production of containers and household wares and HDPE blow-moulding machines for the production of cooking-oil containers and bottles.

Factory

The factory itself was opened in 1979 and space for extensive production would be available.

Conclusion

Under the assumption that injection-moulding equipment together with the moulds and the respective training for the production of the plastic shells for the radio are provided, the company would be capable to produce these items according to specifications.

3.2.2 Polypackers Ltd.

Background, organization set-up and human resources

This privately owned company was inaugurated in 1971 and the operation started one year later. Presently about 90 people are working there: 25 in administration and 65 as technicians and factory workers. Under the managing director, the financial, operation and technical departments are installed.

Products

Presently, the company is producing cooking-oil containers (8,000 daily), plastic bags for mealie meal and household articles; other products are battery tops and bottles.

The production is running at 20 per cent of the installed capacity in three shifts.

Production equipment

The company disposes of a number of machines:

- a. extruders for the production of agricultural sheeting and all types of polythene bags;
- b. injection-moulding machines for the production of containers and bottle tops, battery tops and household wares;
- c. blow-moulding machines for the production of cooking-oil containers and bottles; and
- d. thermoforming machines for the production of plates, cups, tubs and meat trays.

Factory

The factory area is about two acres.

Conclusion

Under the assumption that injection-moulding equipment together with the moulds and respective training for the production of the plastic shells for the radio are provided, the company would be capable of producing these items according to specifications.

3.3 Battery manufacturing

Only two companies produce batteries; they are (i) Chloride Zambia Ltd. in Kitwe and (ii) Mansa Batteries Ltd. in Mansa.

3.3.1 Chloride Zambia Ltd.

Background, organization and human resources

Chloride Zambia Ltd. was founded in 1963 in Kitwe, one of the industrial centers of the copper-belt area. It is a subsidiary company of the Chloride Group PLC from U.K. manufacturing lead-acid batteries for cars and trucks. The distribution and marketing of the car batteries is made through Exide Zambia Ltd., which was founded in 1976. Chloride employs about 230 people and Exide employs about 40 people.

Products

The annual production of 6V- and 12V-batteries is about 50,000 units; the maximum capacity would be around 100,000 units. Chloride is

providing a one-year guarantee on their batteries. The life span of a battery averages 2 1/2 years. The company processes the lead, which is locally available. Locally produced batteries are also exported to neighbouring countries, such as Zaire.

Conclusion

Although Chloride does not presently produce radio batteries, the company would be capable to start production of radio batteries if there were a high demand.

3.3.2 Mansa Batteries Ltd.

Background, organization and human resources

Mansa Batteries Ltd. began production in 1978 as a joint-venture company between INDECO and the Finnish firm, OY AIRAM AB. In 1983, AIRAM sold all its shares to INDECO. The factory is located in the rural area where no other industry is developed, but not far away from a manganese mine, which is the single largest raw material component that goes into the dry-cell manufacturing (about 30 per cent, the large majority of raw materials has to be imported). The company presently employs about 250 people.

Products

The company has concentrated its production on the ammonium chloride-type dry cell battery of R20 size with nominal 1.5 volt, with the product name "Spark". Out of the annually rated capacity of 22 million batteries, the factory is producing only between 6 to 7 million batteries per year (30 per cent capacity utilization). The prices for a single battery are:

- a. wholesale price (3.68 KW); and
- b. retail price (4.75 KW).

A 15-per cent sales tax has to be included to the price.

There are many claims on the quality of the battery. The batteries are often not standardized in quality and vary in their reliability extremely. Poor sealing of the battery and long distribution procedures (up to 3 months) lead to losses of up to 50 per cent of the power, which explains that the average life span is presently about 70 hours instead of 200 hours

Production equipment

Three assembly lines and two cell-making lines are in operation. Out of the 19 components, which are required for battery assembly, 5 to 6 components are manufactured locally; the remaining components must be imported. The assembly lines are in good condition; the cell-making equipment shall be replaced by new equipment due to a high-failure output and a high number of machine breakdowns.

Conclusion

Due to the aged manufacturing equipment, the company would not be capable to cope with a massive increase in battery production. The replacement of cell-making equipment would be required, and an extension of product range to other battery sizes would require extensive technical assistance and financial support.

4. Overall economic situation of Zambia

Zambia, like most African countries, has been facing acute economic and financial problems mainly caused by the fall of the price of copper, the principal source of its export earnings, on the world market since 1976. This has severely undermined the country's capacity to import capital and consumer goods, and to produce domestic goods and services with the resulting socio-economic problems of unemployment and inflation.

Other factors contributing to the general economic decline are the heavy dependence of the country's industry on imported inputs, severe drought over three consecutive years and weaknesses in economic management.

As the country's terms of trade deteriorated rapidly, administrative controls on inputs, foreign exchange and credit allocation have grown more restrictive. This has inhibited the economy's adjustment to the radically changed external circumstances, including the collapse of the copper prices, oil price increases, accelerating international inflation and rising interest costs on Zambia's growing external debt. By the early 1990s, the constraints on Zambia's external resources had already overwhelmed the country's ability to service its attempts to maintain government services and employment; Zambia's fiscal position deteriorated severely. The foreign-exchange and domestic-resource constraints also led to a severe decline in production.

As a small open economy, Zambia is heavily dependent on external trade. Zambia depends on copper mining and its related activities for over 85 per cent of its foreign earnings. This dependence on a single commodity in a volatile international market is the source of much of Zambia's economic difficulties today.

In 1987, the Government embarked on the Interim National Development Plan (valid till December 1988) with the theme "Growth From Our Own Resources". The main objectives are to reinvigorate and stimulate the economy through a series of measures, including a sustained export drive with increased emphasis on nontraditional exports, compression of nonessential imports and limiting of debt service repayments. The new five-year plan, which shall start in January 1989, is expected to maintain the policy thrust of the Interim National Development Plan.

In 1987, a new system of allocation of foreign exchange was introduced. The Government constituted a committee known as the "Foreign Exchange Management Committee" (FEMAC) to allocate foreign exchange for various purposes (mostly for imports) on a fortnightly basis. Representatives from the private sector, parastatals, Government and Bank of Zambia are members of the Committee.

To get foreign exchange, the following alternatives are possible:

- a. The company has enough local currency to buy foreign exchange through application;
- b. P.T.A. funds or funds administered by other organizations like E.E.C. are available;
- c. Retention fund: a company with foreign exchange earnings can retain 50 per cent of the earnings from export to finance the import;
- d. No fund application: the company has foreign exchange already for the import of equipment, raw material and other products.

All applications have to be made through the Bank of Zambia to FEMAC, which decides on successful applications in a two-week interval. The list of successful applicants is announced in the newspapers.

The Committee allocates foreign exchange in accordance with the broad principles laid down by the Government. Priority is given to enterprises producing essential or basic goods for domestic consumption or goods for export. Once FEMAC allocates foreign exchange for the importation of goods, import licences are issued by the Ministry of Commerce and Industry automatically. The successful applicants can then open an import letter of credit through their bankers who obtain foreign exchange cover from the Bank of Zambia against the exchange allocated by FEMAC.

The system of foreign exchange allocation, being operated through the FEMAC mechanism, is, by and large, functioning satisfactorily under the existing circumstances. However, limited availability of exchange resources (about US 7 million every second week), coupled with the very large demand for foreign exchange from various sectors of the economy, has made the task of allocation of forex rather difficult. Even eligible requests for foreign exchange allocations have often to be deferred due to severe foreign exchange constraints.

Part B: Proposals for future development of local
manufacturing of receivers

1. Project proposal

As the overall project proposal foresees the extension of the broadcasting facilities to FM transmission, there is the need to make available enough low-cost FM radio receivers to the public. Unfortunately, standard transistor radios do not usually include the FM band. UNESCO recognized this problem and, along with engineers from Europe, Africa and the Far East, a series of meetings were held in the last years to develop low-cost FM radios for the African market. The radio set, especially dedicated for use in the rural areas, should meet the following criteria:

- a. low-cost radio;
- b. easy to handle and operate;
- c. simple to manufacture;
- d. possibilities of different power-supply systems; and
- e. simple to repair.

The discussions and meetings included also the possible use of solar energy as an alternative source of power supply for the radio receivers since it is expected that solar-powered radio receivers will, in the long run, prove more economical to operate than dry-cell powered receivers. After thorough examinations of various radio prototypes, the design of the UNESCO FM receiver has been upgraded to take advantage of recent advances in circuit design, with the objective of increased energy efficiency. The layout has been improved, and the printed circuit has been redesigned to use a single-sided board instead of a double-sided one, with consequent savings in cost and complexity of mounting and fault localization. The tuning components have been changed to simpler and more readily available types. With respect to the reception mode for the radio receiver, the choice was in favour of integrated circuits for both AM and FM modes.

The radio shall be fitted with nickel-cadmium batteries (four AA-sized cells), charged from the solar panel. With this arrangement, the radio requires no expenditure at all for the life of these batteries, which should be about six years. The batteries can be fully recharged with six to seven hours of tropical sunlight. The period of possible use before the batteries are discharged depends very much upon the loudness used, but should be at least 48 hours of listening.

Special consideration was put on the design of the radio concentrating on three general themes:

- a. the environmental conditions in which the radio will be used and how they affect its performance;
- b. manufacturing methods; and
- c. human factors: both physical (ergonomics) and psychological (cultural).

Each theme has been resolved as follows:

1. Environmental conditions:

Heat, dust and water protection is essential to ensure reliable operation. To achieve this, the case of the radio is made from two simple moulded plastic shells or compartments that fit together to form a cube. A central partition carries the printed circuit board and a handle.

The upper compartment is completely airtight, being sealed by a diagonal dividing plate and the loudspeaker. This airtight compartment not only improves loudspeaker performance but also protects sensitive components (potentiometers and electronics) from dust and water (rain and humidity).

The lower compartment contains the heat-sensitive and heat-producing accumulators. For this reason, the compartment is provided with ventilation slots that allow a cooling convection current to develop. This air flow also cools the dividing plate and the attached electronics in the upper compartment.

Further heat protection is achieved by placing the solar-cell unit on top of the radio. This protects the upper surface of the case from direct sunlight, as well as providing a heat-insulating air gap.

The ventilation and loudspeaker slots have been designed to protect against rain damage, not only while free standing but also while being carried. The accumulators could be further protected, if necessary, with an airtight plastic bag. The loudspeaker has the additional protection of a wire gauze (against insects).

2. Manufacturing methods:

The two-compartment concept with the diagonal part line allows uncomplicated tooling and assembly. The two shells and the dividing plate are held together with a soft rubber seal or a protective frame with an integral carrying handle. The result is a robust and very reasonably-priced case. This method of construction also allows a number of different manufacturing methods to be considered without affecting the overall design concept too extensively:

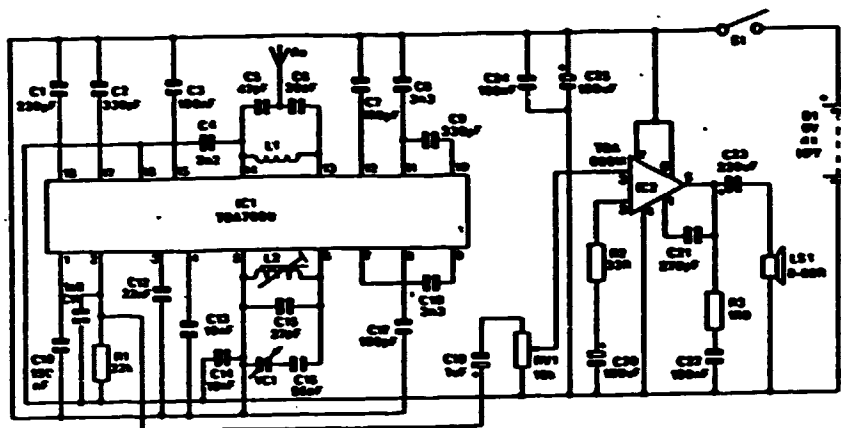
- a. injection-moulded plastic shells and moulded rubber seal;
- b. fiberglass or vacuum-formed shells and moulded rubber seal; and
- c. fiberglass or vacuum-formed shells and wooden dividing plate with integral handle.

3. Human factors:

Consideration of the physical human factors has resulted in the following characteristics:

- a. The large handle and integral soft protective frame allow easy picking up, carrying and putting down;
- b. The case has soft edges for comfortable carrying;
- c. A carrying strap or rope can be attached if needed;
- d. The large base area and squat proportions make the radio difficult to knock over, even when standing on rough ground;
- e. The radio can be used outside without removing or positioning the solar cells;
- f. When removed, the solar-cell case can be positioned horizontally or at 45°;
- g. Knobs have adjustable station locators and a bump protector; and
- h. Robust and sealed housing minimize the need for careful handling.

On the next page, the specifications and parts list for the solar-powered FM radio receiver, as well as a sketch of the radio case, are presented.



Specifications

Supply voltage	2.7 to 12 volts
Tuning range	87 to 108 Mhz (or optionally fixed)
Standing current	8mA
Sensitivity for 3dB limiting	1.5 microvolt emf
Input impedance	75 Ohms
Signal handling without overload	200 mV
Output power	0.75 Watt
Distortion (max)	2 %
Intermediate frequency	70 Khz
Bandwidth	500 Khz at -60dB

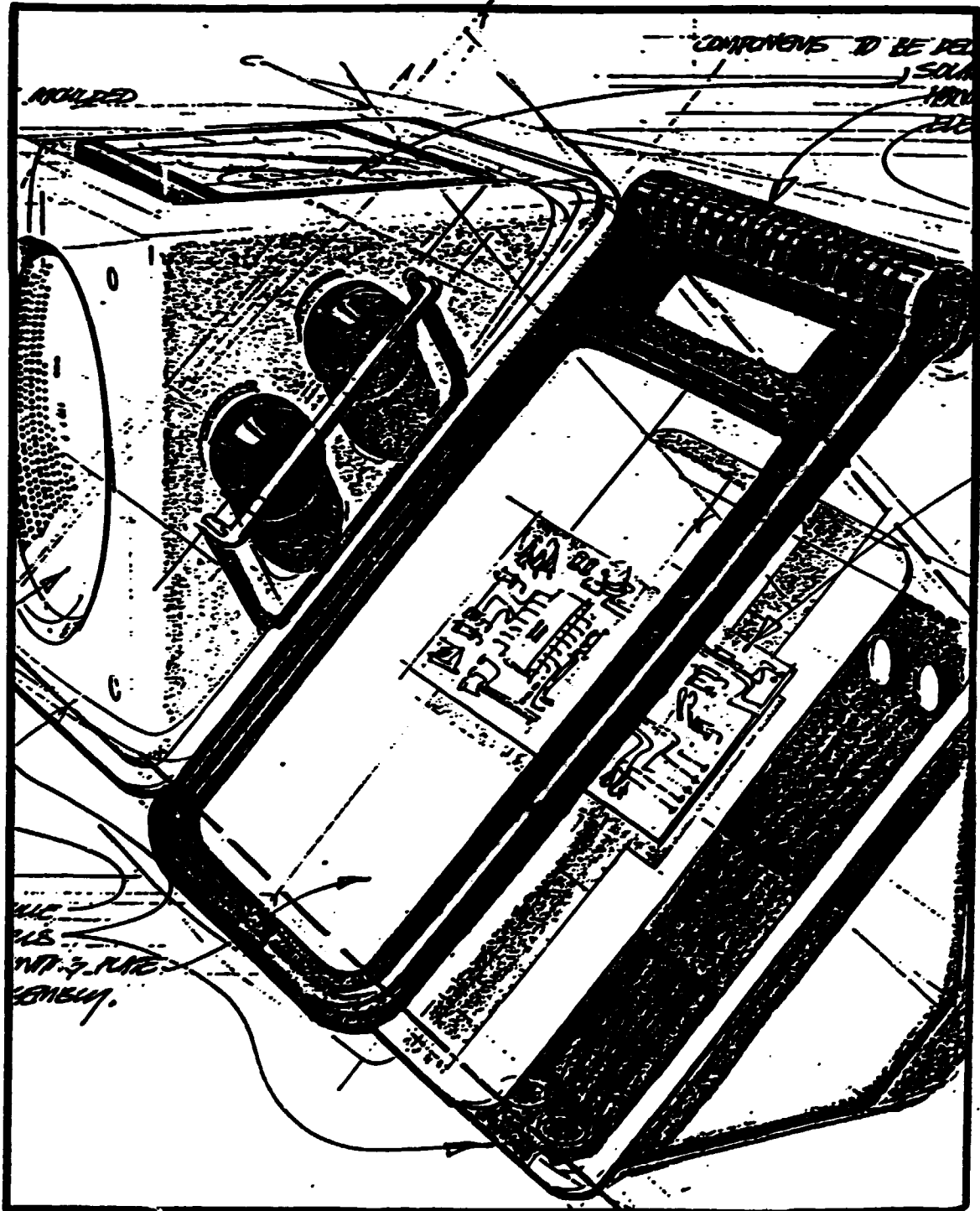
Parts List

R1	22k
R2	33R
R3	1R0
RV1	10k logarithmic
C1	220pF ceramic
C2,C9,C21	330pF ceramic
C3,C10,C22,C24	100nF minidisc
C4	2n2 ceramic
C5	47pF ceramic
C6	39pF ceramic
C7	150pF ceramic
C8,C18	3n3 ceramic
C11	1n8 ceramic
C12	22n ceramic
C13,C14	10n ceramic
C15	27pF ceramic
C16	56pF ceramic
C17	180pF ceramic
C19	1uF axial electrolytic
C20	100uF axial elec rolytic
C23	220uF axial electrolytic
C25	100uF vertical electrolytic
VC1	AM/FM tuning capacitor
IC1	TDA7000
IC2	TBA820M
L1	8 turns of 1mm wire 6mm dia
L2	7 turns of 1mm wire 6mm dia

Printed circuit card

Loudspeaker, mylar cone, 8 ohms

4 Nickel-cadmium batteries, AA size



2. Possible alternatives in the local manufacturing of receivers

Estimation of production output

Zambia has a relatively high annual population growth rate of about 3.4 per cent. This would mean, that, if fertility does not change, the population of 5.6 million in 1980 would double by the year 2000 to 11.5 million and would reach nearly 21 million by 2015. On Table 2 a projection of the population development for the years 1988 and 1993 is given. On Table 3 the number of households is projected from 1980 to 1995.

TABLE 2

Projected population of provinces for 1988 and 1993

<u>Provinces</u>	<u>Area</u>	<u>1988</u>	<u>Total</u>	<u>1993</u>	<u>Total</u>
Central	Rural	399,165		487,114	
	Urban	296,726		362,105	
			695,891		849,219
Copperbelt	Rural	216,015		272,276	
	Urban	1,570,991		1,980,159	
			1,787,006		2,252,435
Eastern	Rural	737,720		846,665	
	Urban	67,027		76,925	
			804,747		923,590
North-Western	Rural	340,356		397,130	
	Urban	44,434		51,846	
			384,790		448,976
Southern	Rural	652,077		774,433	
	Urban	225,934		268,329	
			878,011		1,042,762
Western	Rural	499,022		545,720	
	Urban	66,274		72,476	
			565,296		618,196
Luapula	Rural	435,269		497,602	
	Urban	75,311		86,096	
			510,580		583,698
Lusaka	Rural	101,346		134,624	
	Urban	989,589		1,314,527	
			1,090,925		1,449,151
Northern	Rural	684,328		770,679	
	Urban	129,535		145,880	
			813,863		916,559
Grand Total			<u>7,531,119</u>		<u>9,084,586</u>

TABLE 3

Projected development of households by
rural and urban areas 1980-1985

<u>Year</u>	<u>Rural area</u>			<u>Urban area</u>			<u>Total</u>	<u>Size</u>
	abs.	per cent	size	abs.	per cent	size		
1980	727,100	64.7	4.7	401,300	35.3	5.6	1,128,400	5.0
1988	887,700	59.2	4.6	612,000	40.8	5.7	1,499,700	5.0
1990	918,400	57.5	4.5	678,100	42.5	5.9	1,596,500	5.1
1995	1,013,200	52.6	4.4	913,900	47.4	5.8	1,927,100	5.1

Source: CSO (1985)

Taking into consideration the reliable number of radios in working condition of about 400,000 units, the total population of about 7.5 million people and the annual production output of the radio assembling companies of only 36,000 units, it is obvious that the demand by the public cannot be met presently. Under the assumption to provide every second household with a low-cost radio set—especially in the rural areas for group or family listening—a demand of a minimum 500,000 to 600,000 radio receiver sets would occur. Besides public demand, it is of special importance within the scope of the project to provide "institutional radio and TV sets" to various institutions, such as schools, training colleges, co-operatives, health organizations, etc., for educational, broadcasting. At one time over 5,000 radios were in use in primary and secondary schools throughout the country, as well as some 400 television receivers; however, these have not been replaced by the time so that only relatively few are in working condition.

Presently, about 100,000 TV receiver sets are in operation in Zambia. Under the assumption that institutional TV sets are provided for various organizations and institutions for educational purposes, as well as a percentage of the people employed can afford to buy a TV set, an additional demand of about 100,000 to 200,000 TV sets would occur. It has to be noted that the employment in Zambia is declining. From 1980 to 1987, employment in the formal sector declined from 381,490 to 356,600, representing a drop of 6.6 per cent.

To meet the estimated demand, especially of low-cost radio receivers, the following alternatives can be taken into consideration:

- a. to import already assembled radio sets;
- b. to increase the current production of existing radios, which would probably be more expensive than the import of radio sets because of the large number of components required; and
- c. to improve the radio design and to adopt the radio to tropical conditions. Capital investment is required into flow soldering, special moulding and printing (etching) production automation, etc. to reduce production costs.

On the other hand, development targets have to be taken into consideration:

- a. provision of employment through the increase of local manufacturing;
- b. provision of training to improve the skills of the workers and management;
- c. reduction of import requirements; and
- d. possible start of non-traditional export of a surplus in radio production within the Preferential Trade Area (PTA).

And finally, the radio set, which is especially dedicated for use in rural areas and by institutions, should meet the following criteria:

- a. low price;
- b. easy to handle and operate;
- c. independent power supply system;
- d. simple to manufacture; and
- e. easy to maintain and repair.

Considering all these targets and alternatives, it might be worth considering these alternatives, which are not necessarily the cheapest but which could be the most effective in the long-term development by establishing a local supply and support system. Therefore, it is most recommended to pursue the alternative under paragraph c to fulfil the above-mentioned development targets.

2.1 Rehabilitation and extension of existing facilities

With respect to the conclusions of the survey on existing TV-set and radio assembly companies, plastic- and battery-manufacturing companies, none of the companies are presently able to cope with a massive increase in production to meet the demand. Therefore, rehabilitation and/or extension measures have to be selected to start the production of a solar-powered AM/FM radio receiver as proposed in Chapter 1. Table 4 summarizes the industrial sectors, which require rehabilitation and/or extension of production and which indicates the basic requirements to start local manufacturing.

TABLE 4

Requirements for existing manufacturing facilities

Facilities Requirements	<u>Major radio components</u>		
	Electronics	Plastics	Power supply batteries
Manufacturing facilities			
Assembling and/or manufacturing companies	existing	existing	existing
Rehabilitation required	yes	minor	yes
Extension required	yes	yes	yes
<hr/>			
Requirements to start manufacturing solar-powered radios			
- assembling/manufacturing equipment	yes	yes	yes
- training	yes	yes	yes
- technical assistance	no	no	yes
- financial support	yes	yes	yes
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- raw material/components to be imported	components for P.C.B.	raw material colouring material	solar cells Nicad batteries
- local manufacturing	printed board assembly	radio case circuit board loudspeaker- mylar cone	(cables)*
<hr/>			
* Note: Cables can be provided by local cable manufacturers			

(continued)

Estimation on investment costs

- Acquisition of machine tools: Three medium-size vacuum injection presses including the mould and single tools for the plastic shells US\$ 2.0 million
- Rehabilitation and extension of existing production facilities including assembly tools, bath, etching and punching equipment US\$ 1.0 million

2.2 Establishment of new manufacturing facilities

An alternative to the rehabilitation and extension of existing facilities would be the establishment of new manufacturing workshops. These workshops could be located within the framework of the provincial ZNBC production centers. Their range of activities would not only be the assembly but also the maintenance and repair of the radio and TV sets.

Another alternative would be the set-up of a new company for the assembly of electronic components, which shall supply P.C.B.s not only for radios and TVs but also for other end products like household equipment, telecommunication and office equipment, etc. Table 5 summarizes various alternatives, which can be established on a national or regional basis.

Of special importance are the alternatives on a regional co-operation within the P.T.A. It can be assumed that the proposal of a solar-powered radio receiver is not only of interest for Zambia but also for other P.T.A. member countries. (Zimbabwe expressed already its interest in the solar-powered radio.) Possible joint ventures on bilateral or multilateral levels would lead to a considerable increase in trade exchange between the P.T.A. countries and would elevate the chances to realize a viable project.

Estimation on investment costs

An estimation on investment costs for the various alternatives can only be made at a later stage.

TABLE 5

Alternatives of new manufacturing facilities

Major radio components

<u>Manufacturing facilities</u>	<u>Electronics</u>	<u>Plastics</u>	<u>Power supply batteries</u>
<u>Alternative A</u>			
New workshops for assembling/manufacturing in Zambia	advisable for radio/TV-set assembly	no need	not advisable for Nicad battery and solar-cell production
<u>Alternative B</u>			
New company with extended manufacturing in Zambia	advisable for the production of PCBs for different end users	no need	not advisable for Nicad battery and solar-cell production
<u>Alternative C</u>			
Regional co-operation within PTA for radio/TV sets	advisable joint ventures with PTA member countries for radio/TV sets	advisable joint ventures with PTA member countries for plastic components	advisable joint ventures with PTA member countries for Nicad battery production
<u>Alternative D</u>			
Regional co-operation within PTA with extended manufacturing	advisable joint ventures with PTA member countries for PCB's production for different end users	advisable joint ventures with PTA member countries for plastic components for different end users	advisable joint ventures with PTA member countries for Nicad battery production

2.3 Implications for the Government

In the rural areas the radio is the main source of outside information and for educational programmes. There are only few, if any, newspapers available. For the development of mass communication and for the achievement of the major target of the local manufacturing of radio and TV-receiver sets, the respective industry would need to be recognized as a "strategic industry". This classification should enable the industry to provide reasonably low-cost receiver sets, which are essential for the successful realization of the overall project on the extension of broadcasting.

Hand in hand it would be necessary to reduce the impact of import duties and sales taxes on raw materials and components required.

Finally, it is of importance to provide a sufficient allocation of foreign exchange for the import of the raw materials and components to guarantee a continuous production process.

3. Reason for local production

For the development of a local production, important reasons can be summarized below:

a. Development and integration of rural areas

- Through the provision of adequate, low-cost radios to people in rural areas, education and the flow of information can be extended and improved. Furthermore, the gap in the development between rural and urban areas would be reduced.

b. Labour effects and social aspects

- Through the rehabilitation and extension of existing production facilities and/or the establishment of new production units, new jobs can be created and the employment opportunities can be improved. Additionally, a better utilization of existing industrial capacities could be achieved.

c. Training effects and know-how transfer

- Through the provision of extensive training in the manufacturing of radio and TV-receiver sets, it should be possible to provide sets of good quality and less drop-out percentage of production.

d. Maintenance and repair

- Through the extension of manufacturing units, additional facilities for the maintenance and repair of the sets could be provided to ensure continued improvement in the operation and service of the sets for the customers.

e. **Export possibilities**

- The improved utilization of domestic resources and a respective large-scale production of the sets would encourage the nontraditional export of products to neighbouring countries.

f. **Regional co-operation**

- Through a regional approach in realizing the manufacturing of radio sets, the country would be able to improve regional co-operation with member countries of PTA, which would lead to an increase in trade exchanges and industrial co-operation.

4. Constraints with respect to local production

The most difficult constraint towards the realization of a low-cost radio-receiver set, which can be afforded by the public in the rural areas, will be the cost of production and distribution. A rough estimation on the production cost, including the labour cost for the radio as proposed in chapter one, at a production output of 500,000 units, would vary between US\$ 19.8 and 24.0 per unit (Table 6). The production cost of the radio depends very much on the import cost of the component, the quality and thickness of the plastic shells and the raw material used.

To these costs the overhead costs, distribution costs and sales tax have to be added.

This estimation leads to the conclusion that the radios might have to be subsidized, as the total cost of the radio should not be passed onto the consumer market.

The same situation applies for the production of a solar-powered television set. The unit price for such a television set can be estimated at about US\$ 1,750. It can be assumed that such solar-powered TV sets can hardly be afforded by the rural population. This estimation leads to the conclusion that these TV sets, which shall be allocated as "institutional TV sets" to educational institutions, might have to be subsidized.

TABLE 6

Estimation of unit cost of solar-powered radio

<u>Components</u>	<u>Estimation in US\$</u>	
	<u>Low cost</u>	<u>High cost</u>
Production cost of:		
Solar panel	9.34	11.04
Components (part list)	6.82	8.53
Plastic upper compartment	1.22	1.62
Handle part	0.48	0.48
2 knobs	0.16	0.16
Plastic lower compartment	1.22	1.62
Silk screening	0.04	0.04
	19.28	23.49
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Labour costs (10 minutes per unit)	0.53	0.53
<hr/>		
Total	<u>19.81</u>	<u>24.02</u>



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