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PACIFIC BASIN COMMUNICATIONS STUDY

VOLUME I (of II)

prepared by the
Public Service Satellite Consortium

for the
National Aeronautics & Space Administration
and the
National Telecommunications & Information Administration,
U.S. Department of Commerce

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October, 1981

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This final report fulfills the requirement specified in Article VIII of Contract NASW-3488, dated 6 February 1981, between the Public Service Satellite Consortium and the National Aeronautics and Space Administration, for the Pacific Basin Study portion of the subject contract. This report was prepared by the Public Service Satellite Consortium, and does not necessarily reflect the views of the sponsoring agencies, the National Aeronautics and Space Administration and the National Telecommunications and Information Administration of the U.S. Department of Commerce.

"A communication system can be an instrument of great influence... no one should question the need for a reliable telecommunication service. Links between our islands are virtual lifelines."

Ratu Sir Kamisese Mara

"The problem is not production, it is distribution. It is absolutely vital that we have better telecommunications. It is costing us dearly in terms of economic development."

Federated States of Micronesia

"Anything a week late is still news to us."

Vanuatu

"You can't measure the value of telecommunications by looking at the revenue generated. There are so many aspects of human interaction that telecommunication doesn't improve but provides a catalyst for, and opens doors to: health, law and order, talking to mother, emergency, disaster relief, education."

Cook Islands

"We cannot wait for phones indefinitely. We have to move."

Papua New Guinea

"We use broadcast radio ... you only hope the message gets through to the people you are aiming at."

Fiji

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"Fisheries are the economic base and communication is a necessity. A prerequisite for development is an adequate infrastructure."

American Samoa

"Does it matter if people have better communications? Yes, for health, education, law and order."

Solomon Islands

"If you think in terms of lives lost, then it is not too expensive to provide service."

Republic of Belau

"What do I do if I want to talk to them? I write a letter.

Outer island Polynesia

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EXECUTIVE SUMMARY

Origins of the Study and Methods of Research

The Pacific islands lie in an ocean that covers one-third of the earth's surface. The great distances between island entities, their sparse populations and their limited development all contribute to an urgent need for better national and regional communications systems. Nearly every country and territory in the Pacific region is linked internationally by satellite, but domestic communications facilities range from adequate to nonexistent.

The present study came about because the heads of state of the Pacific island nations (the Pacific Forum) have stressed the need for improved telecommunications over the past decade and in 1980 directed the South Pacific Bureau for Economic Cooperation (SPEC), the action arm of the Forum, to advise potential satellite space segment providers that the Pacific island countries would be interested in sharing satellite use with them. Also, the National Aeronautics and Space Administration (NASA) wanted to investigate follow-on options to ATS-1, the requirements in the region that could be served by satellites in the 30/20 GHz band, and the possibility that a cooperative project with Canada involving mobile satellite communications could benefit Pacific Basin users. Thus, in 1980, NASA and the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce contracted for a study by the Public Service Satellite Consortium that would: (1) describe and assess extant telecommunications systems in the Pacific; (2) assess communications needs in the region with an emphasis on user requirements in relation to the development of social services and commercial activities; (3) propose and describe alternative technological

solutions to communications problems, including recommendations for an optimal telecommunications system or systems; and (4) discuss questions of system financing, implementation, management costs and benefits.

To conduct this investigation, existing literature about the political, economic and social structure of the Pacific Basin and current studies about communications systems in the region were reviewed. Visits to 13 selected countries were conducted by a research team that included sociological and engineering consultants, and a Pacific users' meeting was convened in Suva, Fiji, in June, 1981, to review and validate preliminary findings. Officials in metropolitan countries having an interest in the Pacific region -- most notably the United States, Australia and New Zealand -- were visited and asked for their ideas, as were existing and potential communications service providers such as INTELSAT.

Definition of the Pacific Region

For the purposes of the study, the Pacific islands* include the coral atolls and high, volcanic islands between the Asian mainland and North and South America, excluding Australia and New Zealand. Included are the island groups whose indigenous populations are Polynesian, Micronesian and Melanesian. The Philippines, Indonesia, Hawaii and Galapagos (Ecuador), and Easter Island (Chile) are excluded. Lord Howe and Norfolk Island telecommunications needs are viewed as met by Australia. Although needs of these respective entities were not studied, cognizance was taken of existing or planned communications systems serving them and especially insofar as these systems could be seen to interface eventually with the communications systems in the entire Pacific Basin.

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*with a total population of over 4.5 million on approximately 800 island with as many as 6,000 communities ranging from fewer than 10 inhabitants to a city of 100,000.

The definition of the Pacific islands used here includes: American Samoa, the Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Nauru, New Caledonia, Niue, Papua New Guinea, the Solomon Islands, the Tokelaus, Tonga, Trust Territory of the Pacific Islands (TTPI), Tuvalu, Vanuatu, Wallis and Futuna Islands and Western Samoa. The TTPI, once the compact terminating the Trusteeship has been signed, approved by Congress, and reconfirmed by plebescite, will result in four separate entities: the Republic of Belau, the Commonwealth of the Northern Marianas, the Marshall Islands and the Federated States of Micronesia, which includes the States of Yap, Truk, Ponape and Kosrae. These new entities are treated separately although decisions and control in telecommunications still lie with the presidentially-appointed High Commissioner of the Trust Territory of the Pacific Islands.

The considerable task of sorting out the Pacific can be made less complicated if one can envisage the island entities as "states" and the Pacific region as the "nation." Numbers of people (in any given country or entity) are small, services are few, GNP's and GDP's are miniscule, local languages differ within a single country, and currencies are not identical.

Despite the varying political structures found among the islands and their historical ties to a number of different metropolitan countries, a strong sense of the need for Pacific regionalism is developing, particularly with regard to fishing, shipping, air routes and communications. Regionalism and internationlism are keys to the island entities' full participation in the modern world. Leaders in the Paicifc recognize the critical role that communications will play in forging the links that will make national survival and development possible.

Status of Present Communications Systems in the Region

While a number of domestic telecommunications systems are in place and functioning (the dominant system is HF radio), some rural areas are either totally unserved or lack adequate facilities. Communications between locations within a given country, e.g., from island to island or from the coast to the interior, are generally less reliable and, therefore, less frequent than communications between island nations and developed countries.

At present, 12 INTELSAT earth stations serve the island entities covered in this report (additional earth stations have been proposed for six sites in the Trust Territory of the Pacific Islands). The dozen existing submarine cables connecting "rim" (e.g., Japan, Australia, Taiwan) countries with North America provide little capacity for the island nations near whose shores they are laid. Neither will the island nations benefit significantly from the 7,100 cable circuits planned for construction during the 1980's for increased capacity for the metropolitan countries of the Pacific. A detailed description of extant communications facilities in the Pacific region can be found in Appendix F of the present study, and a discussion of comparative costs of various technologies as well as a description of their capabilities can be found in Appendix E.

Economic, Social and Political Requirements for Improved Communications

Information obtained from other studies, the country visits, correspondence, discussions with representatives of U.S. government agencies with interests in the Pacific (as well as with representatives of other metropolitan countries), and the Pacific users' meeting in Suva has confirmed the following points.

The most critical need is for a basic two-way emergency warning

signal between remote sites and urban centers. Then, the most pervasive priority is for improved and extended telephone services. Beyond basic telephony and telegraphy, other requirements include: (1) simple conferencing facilities linked by telephone; (2) integrated services for mobile and fixed land, marine and air interconnection; (3) improved communications for marine resources management (including surveillance); and (4) data, facsimile and broadcast services. While television service is available in several of the entities, video per se was not deemed as critical a service as voice and message transfer.

With regard to commercial activities in the region, it is often the case that normal sequencing of production or cultivation, transfer of goods, and retailing or exporting are seriously hindered by lack of adequate communications links. Numerous examples were found in which food products rotted on docks since the food producers and those responsible for marketing or shipping had not been able to set up necessary schedules. Further, trade among the island entities tends to be less than it might be due to poor communications, yet many items that could be sold among islands are imported from rim countries at much greater cost.

Considering that not all Pacific island entities have similar economies or natural resources, it is, nevertheless, possible to estimate that improved communications would confer benefits on the following sectors listed in descending order based on the likely magnitude of effect: maritime industries (including the catching of fish and the movement of goods); tourism (especially with regard to opening new areas for travel); agriculture; lumbering; mining and refining of mineral resources; and small business development. Exporting is a factor in all of the above.

Social requirements wherein communications play a significant role include: disaster warnings and emergency services; delivery of health care; education; provision of government and social services; and general enhancement in the quality of life.

The politics of national and regional development also require improved communications systems. In the Cooks and Solomons, for example, broadcasts of Parliament provide a sense of unity, but many island groups lack such services. In some instances, provincial, rural areas find themselves pitted against central governments in an adversary role, the primary reason for which is the lack of flow of information. National planning, devolution of power to rural areas through gradual decentralization, and closer regional cooperation all require communications.

Examples of successful communications systems in the Pacific region -- such as the Roman Catholic Church's Micronesia-wide network, educational television in American Samoa in the 1960's, and the uses of ATS-1 by the University of the South Pacific, PEACESAT and DISPNET -- point to the fact that basic communications systems can successfully meet needs, but they also are a reminder of the unevenness of communications generally in the region. In some places where broadcast radio is available, for example, it cannot be received by all communities. And ATS-1, a 15-year old satellite, may become inoperative within the next twelve to eighteen months.

Regional cooperation in the development of an improved telecommunications system is certainly possible, but national governments must be assured that they will benefit economically, socially and politically from such cooperative effort.

Technological Options

A broad range of telecommunications technologies were examined in order to determine which of these, singly or in combination, would provide the best answer to communications requirements in the Pacific Basin. As the study progressed, it became clear that any proposed new system would have to build on the communications systems already in place since it would be far too expensive and unwise to try to start "from scratch" or replace what people were familiar with.

The two technologies deemed most likely to bring about broad scale improvements in communications in the region are submarine cable (primarily with fiber optic links between islands) and communications satellites. Since the technology of oceanic fiber optic cables was viewed as being insufficiently advanced to be counted on as an adequate near term solution, recommendations have been focused on the satellite options, and these include (and are not mutually exclusive):

1) Extension of the present INTELSAT system, including provision of small, low-cost earth stations in remote locations that would serve to relay local communications, operating in tandem with the standard A or B stations.
2) Use of existing or proposed domestic (or INMARSAT) satellites that could provide some degree of Pacific coverage. Satellite systems reviewed under this option included: ANSCS, INMARSAT, PALAPA, TDRS and ALASCOM's future satellite.
3) Creation of an Integrated Communications System that would include one 2500 MHz (2.5 GHz) satellite.

A system incorporating a 2500 MHz satellite (S-band) is deemed optimal because it would not only build on existing domestic systems in each of the countries or entities and on the INTELSAT installations, but the 2500 MHz assignment in this region of the world permits fixed, mobile and direct broadcast satellite operations.

Whichever satellite system is selected, at least 3000 earth stations will eventually be required to provide voice and message service to major population centers and rural areas of the island entities reviewed in this study. These earth stations, whether at C-band or Ku-band or S-band should be low cost, easy to maintain, easy to relocate, sturdy in terms of climatic conditions, and requiring a minimum of power.

The S-band satellite system would include approximately $100 million in non-recurring capital costs (not counting earth stations) for a single satellite. Construction of a spare would require another $36 million. There would be associated facilities with this or any other satellite option, e.g., power sources (solar charged batteries may be preferrable), public call boxes, and the like. These facilities would, of course, add to the overall system cost for each country.

There are encouraging signs with regard to satellite options for the Pacific. INTELSAT is conducting its own investigation of rural telecommunications requirements and may create a special regional tariff or tariffs. At the same time, INTELSAT and others are expending funds to see whether a break-through can be made in the manufacture of low-cost transmit and receive earth stations.

Questions of Management, Training, Costs, Benefits and Implementation

If any type of regional satellite system is to be implemented, it would be preferrable for a single entity to act as manager. There are at least four options: (1) having a single country act as manager; (2) creating a private corporation with the participating countries as the board of directors; (3) working through an existing regional consortium, e.g., SPEC; or (4) creating a new regional consortium. Domestic communications systems within each country would continue to be administered by the various authorities and entities already in place, but they would interface with the regional manager.

Regardless of what improvements are made in Pacific Basin telecommunications systems, there is a critical need for training of indigenous personnel. If the 2500 MHz satellite system is selected, it has a number of advantages for system maintenance and training. The earth station equipment is similar to the present microwave point-to-point facilities except that antennas are larger. The experience already gained in use of microwave paths can form a basis for operating and maintaining the 2500 MHz satellite system, and the existing local technicians and operators will form the cadre of the Integrated Communications System's operators.

It will be important to outline the types of positions needed, to estimate the actual manpower requirements, and to find financial support for training. The number of training institutions in the Pacific has grown in recent years. Technical courses at the trade level are offered in Kiribati, the Solomon Islands, Fiji and Guam. Basic technical training is offered in the Cooks, Tonga and Western Samoa. More advanced telecommunications training is available at the Papua New Guinea Telecommunications Training Center in Lae and at the Telecommunication Training

Center in Suva, Fiji. The University of Lae in Papua New Guinea as well as universities in Hawaii, Australia and New Zealand give tertiary degrees in engineering. Funding may be obtained from (among other sources) the United Nations Development Program administered through the ITU. Appropriately trained personnel can be phased in gradually.

Without knowing the precise characteristics of each communications satellite system that might be put in place for the region, it is not possible to give precise estimates of cost. As previously noted, non-recurring costs of a new S-band satellite would be approximately $100 million. If a significant number of earth stations were required (whether for a C-band or S-band satellite), cost might be driven down from a prototype price of $25,000 to $15,000 or less, resulting in a total cost of between $45 and $75 million over ten years. Power sources, additional communications facilities, training, and annual operating costs would have to be added to system costs. It is unknown at present what such options as an INTELSAT regional tariff or costs of using the C-band transponder on TDRS (assuming it could be negotiated) would be.

Given experience with establishing communications systems in other developing countries of the world and based on an estimate of where funds are presently available (both from the Pacific island entities and elsewhere), it is suggested that a break-out of capital funding might be along the following lines: (1) 10 percent of capital costs from the Pacific entities who would use the system; (2) 50 to 60 percent from developed countries having interests in the Pacific; (3) 10 percent from supplier credits and commercial banks, investors, foundations; (4) 20 percent from the World Bank and its affiliates.

The direct benefits of improved communications are difficult, perhaps impossible, to measure in numerical terms. Nevertheless, as has been demonstrated in other parts of the world, the impact of telecommunications on economic growth and development, on the delivery of social services, and on the enhancement of the quality of life can be considerable. Since so many problems in the Pacific can be directly related to the lack of adequate communications facilities and systems, it stands to reason that the provision of upgraded facilities will go a long way toward the solution of these problems.

At minimum, more efficient trade and commercial practices shou d be able to be established by the creation of more comprehensive voice and message networks. New commercial avenues such as tourism can be opened. Trade between and among the island entities can be significantly increased. These improvements will, in turn, provide a more solid economic base for the support of the communications systems put in place. The ability to save lives through better communications, to step up educational opportunities, and to give people the ability to communicate as extended families are benefits that have been realized in many other countries once improved communications systems were available.

Recommendations:

Based on the review of other current studies about communications in the Pacific Basin and on the results of the present effort, it is recommended that:

1. With regard to implementation, the following steps will need to be taken by those Pacific Basin countries desiring to create a regional system:

a. Deciding whether to use differing telecommunications systems in chronological sequence (e.g., starting with INTELSAT then moving to a regional satellite) or establishing a single system presumed to be useable over the next fifteen to twenty years.

b. Assessing and making a decision about the most desirable technology or technologies.

c. Establishing the necessary procedures to ensure creation of an appropriate management entity.

d. Determining the likely rate of return on investment in each country where new telecommunications systems will be installed.

e. Conducting preliminary discussions with communications satellite carriers and equipment manufacturers who can be expected to participate in the establishment of the telecommunications systems.

f. Conducting preliminary discussions with funding sources, including the private sector, foreign governments, and multilateral development banks.

g. Establishing the management entity.

h. Establishing the specifications for the desired telecommunications system and securing it (via bids, lease arrangements, etc.)

i. Borrowing of capital or other acquisition of funds.

j. Executing all necessary procedures to enable all interested Pacific Basin countries to have access to the regional system.

Steps g through j should be carried out simultaneously.

2. The governments of the metropolitan countries with relationships and responsibilities in the Pacific need to ascertain their appropriate role with regard to assisting the island entities in the implementation of an improved communications system.
3. Other studies that are currently being conducted that also touch on telecommunications in the Pacific need to be reviewed and the findings compared and coordinated so that as much evidence as is available can be brought to bear to assist the policy makers, planners, and funders who work in the region.
4. Developmental work on small, low-cost earth stations -- at S-band, C-band, and Ku-band -- needs to be fostered. A break through in earth station technology for voice and data could mean a more rapid development of satellite use in the Pacific Basin.
5. Even before all questions relating to services and structure are answered, work needs to continue with respect to system definitions for the satellite options deemed feasible. If a more precise estimate of costs can be given, and a better understanding arrived at with regard to legal and management questions, the ground work will be laid for other necessary planning.

The communications technologies available today and likely to become available over the next ten years are increasingly appropriate for efficient use in the Pacific region. What is needed now is a concerted effort to plan for and implement the most cost effective, versatile and beneficial system that can be designed. It must also be a system that can accommodate growth, can be increasingly affordable, and finally profitable over the long run.

1. INTRODUCTION

The Pacific islands lie in an ocean that covers one-third of the earth's surface. It is said that the Pacific is so large that the moon could fit inside it. The islands that dot this vast region have, besides little land, limited land-based resources for supporting their small, far-flung populations.

A major prerequisite for the successful development of these islands is the implementation of communication systems that will adequately meet their unique national and regional needs. Communications must provide them with links beyond their waters. The creation of such international service is well underway; nearly every country in the Pacific region is linked internationally by satellite. Further, however, a communication system must provide every citizen of each island entity with adequate access to meet the most basic personal and community needs, in both urban and rural environs.

The Public Service Satellite Consortium has undertaken a study of rural communication needs in the Pacific islands for the National Aeronautics and Space Administration's Office of Space and Terrestrial Applications and for the National Telecommunications and Information Administration, an agency of the United States Department of Commerce. The study is entitled "The Pacific Basin Communications Study."

The purpose of the Pacific Basin Study is:

1. To describe extant telecommunications systems in the Pacific and to indicate current plans for expanding or improving those systems.

2. To assess regional telecommunications needs, particularly in the area of rural telecommunications, from the point of view of the user who needs adequate telecommunications to accomplish the tasks of development, rather than from the point of view of the telecommunications provider which supplies each nation with telecommunications equipment and services.

3. To propose a number of alternative technological solutions to current regional telecommunications problems, recognizing that the ultimate choice of options for resolving existing difficulties lies with each government.

4. To discuss regional strategies that might facilitate the creation of an improved regional telecommunications system.

1.1 Steps Toward a Pacifc Basin Communications Study

Improved telecommunications between the island nations of the Pacific has been a long-standing high priority objective for them. The development of international links between capitals and the steady, though not rapid, economic gains in those capitals have led to dramatic improvements in the urban centers of the islands.

Conversely, urban development has caused a reduction of attention to rural development, and as the gap widens between the two, governments have been required to refocus their attention on rural issues. Health services, education, agricultural and other economic development, disaster warning and relief are all aspects of rural development requiring attention that cannot be provided adequately until rural telecommunications links are substantially improved.

1.1.1 Political Background

At their meeting as the Pacific Forum in Wellington in 1971, the prime ministers of the region discussed the inadequacy of telecommunications within the region. Indeed, its limitations had curtailed their ability to plan the very meeting at which they were discussing the issue. From the outset, then, the political importance of telecommunications was established.

In 1972, the governments requested and received UNDP/ITU* financial and technical assistance; and with the establishment of the South Pacific Bureau for Economic Cooperation (SPEC), the action arm

*UNDP/ITU--United Nations Development Program/International Telecommunications Union

of the Pacific Forum, in 1973, the prime ministers agreed that because both economic and social development were hampered by lack of efficient telecommunications, it was essential to provide an adequate telecommunications network in the region. The Forum charged SPEC with assisting in the coordination of the development of regional telecommunications. Since 1973 annual regional meetings have been convened by SPEC for the governments to review progress and plan further development of telecommunications in the region.

By June of 1981, twelve island entities had been linked internationally by satellite through INTELSAT. An earth station is planned for each of the four states of the Federated States of Micronesia and also for the Republic of Belau.

In the face of these dramatic achievements, deficiencies in national or domestic networks, particularly in rural communication, are all the more glaring.

Analysis by the International Telecommunication Union South Pacific Regional Project has revealed that these deficiencies--deficiencies in management structures of telecommunications authorities, in technical and commercial planning expertise, in operation and maintenance and in skilled and experienced staff--are a direct result of the need by the governments to provide modern and adequate telecommunications within a very short time scale.[1/]

[1/] UNDP Project Document: "Development of Telecommunications in the South Pacific. Starting date January 1, 1982." UNDP/ITU, Suva, Fiji: 1981.

The ITU also found that the region has only fifteen local graduate telecommunications engineers and that fourteen of them live either in Papua New Guinea or Fiji. Constraints on human resources, they maintain, are unequalled elsewhere in the world.

1.1.2 Call for Assistance

Thus, the Pacific Forum meeting of prime ministers in Kiribati in 1980, recognizing as an essential criterion to the common national goal for all the countries the development of their rural areas, again stressed the need for improved rural telecommunications. Realizing that collectively the countries could benefit from developments in both satellite and earth station technology, the prime ministers directed SPEC to advise potential satellite space segment providers (including those in Australia, the United States, Japan and the European Economic Community) that the Pacific island countries would be interested in sharing satellite use with them.

1.1.3 United States Study

The appropriate United States agencies, including NASA and the National Telecommunications and Information Administration (NTIA) of the Department of Commerce took cognizance of the prime ministers' interest. Also, NASA was concerned about what type of system would provide follow-on to ATS-1, how communications satellites in the 30/20 GHz band might be used for service in the Pacific, and how a possible cooperative project with Canada involving experimental mobile satellite communications could benefit at least some entities in the Pacific Basin. Given these concerns and interests, NASA and NTIA decided to investigate rural telecommunications in the region. They requested a description of those communications systems already in place and a projection of what would be desirable. They stressed the need to assess

user requirements. Only from such a needs definition could suitable communications system designs be developed.

1.1.4 Public Service Satellite Consortium (PSSC)

A contract was awarded to the Public Service Satellite Consortium of Washington, D.C., a private, non-profit, membership based organization that provides a variety of services, including contract research. PSSC's more than 100 members include representative organizations in the fields of health care, education, library services, religion, public broadcasting and state government. These members, which are not affiliated with the United States Government, share a common interest in the uses of satellite technology for public benefits. They created the PSSC in 1975 to act as an aggregator of services and their representative. Since that time, the PSSC has participated in a NASA/Department of the Interior study concerning "Determination of Societal Needs of Micronesia," has consulted on the AID Rural Satellite Program, and has engaged in technical assistance to AID and the University of the South Pacific in Suva, Fiji. The Consortium has provided coordination of services on both ATS-1 and ATS-6 in serving the Pacific Basin.

1.1.5 Definition of the Pacific Basin

For the purposes of this study, the Pacific islands include the coral atolls and high, volcanic islands between the Asian mainland and North and South America, excluding Australia and New Zealand except wherein their policies might affect Pacific island populations.

Included are the island groups whose indigenous populations are Polynesian, Micronesian and Melanesian. The Philippines, Indonesia, Hawaii, the Galapagos (Ecuador), and Easter Island (Chile) are excluded. Lord Howe and Norfolk Island telecommunications needs are viewed as met by Australia. Although needs of those respective entities were not studied, cognizance was taken of existing or planned communications systems serving them and especially insofar as these systems could be seen to interface eventually with the communications systems in the Paficic Basin.

The definition of the Pacific islands used here includes: American Samoa, the Cooks, Fiji, French Polynesia, Guam, Kiribati, Nauru, New Caledonia, Niue, Papua New Guinea, the Solomon Islands, the Tokelaus, Tonga, Tuvalu, Vanuatu, Wallis and Futuna Islands, and Western Samoa. The Trust Territory of the Pacific Islands, once the compact terminating the Trusteeship has been signed, approved by Congress, and reconfirmed by plebescite, will result in four separate entities: the Republic of Belau, the Commonwealth of the Northern Marianas, the Marshall Islands and the Federated States of Micronesia, which includes the States of Yap, Truk, Ponape, and Kosrae. These new entities are treated separately although decisions and control in telecommunications still lie with the presidentially-appointed High Commissioner of the Trust Territory of the Pacific Islands.

1.2 The Emergence of Pacific Island States

The fact that there is so vastly much more ocean than there are islands in the Pacific has been the major and most obvious

deterrent to development in the island region. Because each island group has emerged from a unique historical context and has been greatly influenced by one of the metropolitan powers, links have been from island to colonial power, while intra-regional, traditional island to island links have been neglected. Regional development has been slow--impeded by inadequate regional transportation and communication systems. Until recently, direct travel between the U.S.-administered islands of the central Pacific and the major South Pacific capitals was impossible. The deep grooves of communication and transportation networks between islands and metropolitan centers obliterate, in contrast, the thin, tentative lines that represent inter-island routes.

1.2.1 The Chronology of Independence

In the 1960's, Western Samoa and Nauru joined the Kingdom of Tonga as independent Pacific states, meanwhile, the U.S. rapidly increased its fiscal commitments in manpower development and upgrading of the infrastructure of the Trust Territory of the Pacific Islands. Fiji followed Nauru in 1970, and in the past decade Papua New Guinea, Kiribati, the Solomon Islands, Tuvalu and Vanuatu have also gained independence. The termination of the Trusteeship Agreement is imminent; a draft compact was initiated in November, 1980, and the four entities have chosen the forms of their governments. Niue and the Cooks have stable, permanent relationships with New Zealand while they are internally self-governing.

1.2.2 Regionalism and Telecommunications

The emergence of these individual island states has brought the increased interest of international agencies in their development and in the quality of life for their people. Likewise, a strong sense of a need for Pacific regionalism in several areas has developed. As individual entities gain a more exact sense of themselves, they become less quick to view regional cooperation in fishing, shipping, air routes and communications as detrimental to their own national development. Communication is crucial among these. Indeed, regionalism and internationalism are keys to these islands' full participation in today's world.

For the purposes of an outsider's understanding, the considerable task of sorting out the Pacific can be made less complicated. An outsider's sense of scale must be diminished in one sense while expanded to the limits of the imagination in another. The numbers of people are tiny, services are few, GNPs and GDPs are minuscule. It might be helpful to envisage these entities as "states" and the Pacific region as the "nation" with well-articulated "national" goals.

But this region has no contiguous states. The island jurisdictions are separated by hundreds--more usually, thousands--of miles of ocean. Looking at the Pacific, the observer must dismantle a notion of inter-state highways, mentally replacing them with inefficient, costly shipping and air routes. Add to this the unpredictability of destructive ocean storms, the fact that the local languages of each entity are different, the currencies vary and that

generations of separation--caused by nervous colonial powers--have resulted in a measure of uneasiness between the states. Reliance on imported foods and fuel leaves economies drained of funds necessary for the development of self-sufficiency. Too few skilled people are forced to perform too many different, often unrelated tasks. Human and economic resources are taxed to depletion before development can even be planned, not to mention, implemented. Such a scenario leads to the appreciation of the difficulties with which Pacific island nations and their planners are faced.

2. THE PACIFIC BASIN COMMUNICATIONS STUDY

2.1 Approach and Methodology

One of the difficulties in resolving the telecommunications needs of the small Pacific island countries is the lack of an adequate description of those needs. It is common practice for needs to be recognized in the most general terms, and then for solutions to be sought from an engineering/economics perspective.

The approach adopted in this study has been first to identify extant and planned telecommunications facilities and services, and after finding out what services exist, to determine what it is that users and potential users want and need from telecommunications. These needs will, of course, vary from country to country, from state to state, and from village to village. Furthermore, needs will change as development progresses. Clearly, the needs for agriculture, for health, for education, for marketing, for administration and for social progress are all matters of concern.

The project team needed to determine how the state of communications in each country affected the work they were undertaking. With the aid of their findings, engineering efforts were undertaken to come up with a wide range of possible solutions to meet the requirements that have been described within the countries.

These three kinds of information: 1) documentation of existing and planned facilities and services, 2) a description of user needs and

3) a set of engineering options necessary to provide the required adequate, reliable, economic services are expected to enable both potential providers and governments with a clear statement of the nature and extent of the telecommunications requirements for development, as well as to provide several options for fulfilling these requirements.

After completing the initial task of compiling data on extant and planned telecommunications systems throughout the Pacific, the project staff began a series of site visits to selected Pacific island entities. A chronology of these visits appears as Appendix A of this report.

The purpose of the visits was twofold. First, in discussions with telecommunications authorities, the project staff verified and updated the data collected earlier from a library search. Secondly, the team interviewed government and traditional leaders and individuals in rural communities in order to ascertain how the current condition of telecommunications services affects the work of each of the sectors in their efforts toward the achievement of national development.

The study emphasizes the needs of all those who use, or would use, telecommunications services in their professional, personal and traditional roles. Lengthy and numerous discussions with agriculturists and others in primary industries, marketing and rural development, with educators and health professionals, with staff members in national and provincial state planning offices, with public works suppliers, with traditional chiefs, elected heads of state and scores of others revealed

that their overall development objectives cannot be met without consistant, reliable access to the outlying, rural areas of their nations.

A particular effort was made to spend part of each visit in rural areas and on outer islands, talking with workers and officials at the provincial or district level where the implementation of national policies is required but where there is often no access to fast, reliable transportation and communication.

This information on user needs and problems was compiled by the project coordinator and two consultants. The technological data was gathered with the assistance of consultants, including the project manager of the UNDP/International Telecommunication Union South Pacific Regional Development Project. Meanwhile, engineers on staff contract to PSSC have coordinated with the UN/ITU to prepare possible technological options appropriate to the needs detailed by members of the user populations.

2.2 Users' Meeting

On June 24 and 25, 1981, SPEC and PSSC co-convened a meeting of senior government representatives from nine Pacific island countries at SPEC Headquarters in Suva. A Summary of this meeting is included in this report as Appendix B. The Users' Meeting, chaired by Dr. Macu Salato of Fiji, reviewed the telecommunications needs of a broad spectrum of government departments and other sectors of the Pacific community involved in rural development. Members of the PSSC staff, consultants and the ITU project manager presented the representatives with the findings of the study to date.

In summary, the meeting confirmed that the planning and implementation of all aspects of rural development in the region, including health, education, agriculture, primary industries, transportation, etc., would benefit significantly from improved telecommunications.

In particular, the meeting covered the various types of services which could be made available for a wide range of user applications. Particular emphasis at the meeting was given by the Pacific island representatives to the problems of human resources and training for the application of any new technology. This issue is discussed in sections 4.2.5 and 5.4 of this report.

The most critical need is for a basic two-way emergency warning signal between remote sites and urban centers. Then, the most pervasive priority is for improved and extended telephone services. Beyond basic telephony and telegraphy, other services which were noted as particularly desirable included: 1) simple conferencing by telephone, 2) integrated services for mobile and fixed land, marine and possibly air interconnection, 3) improved communications for marine resources management (including surveillance) and 4) data, facsimile and other services.

The meeting concluded that PSSC should continue to investigate thoroughly the alternative United States-provided satellite options which appear to give an opportunity to rapidly resolve rural telecommunications problems and to provide the required flexibility of utilization across the region. The representatives stressed that national requirements of each individual island state must be met on any jointly used satellite.

2.3 Phase I Report Description

The Phase I Report which was largely compiled from material available in the library of the Public Service Satellite Consortium, the Pacific Collection of the University of Hawaii Library and the UN/ITU office in Suva was completed in December, 1980, and submitted to NASA's Office of Space and Terrestrial Applications and the National Telecommunications and Information Administration of the U.S. Department of Commerce. The report contains the following sections:

1. Definition of the Pacific Region
2. The Emergence of the Pacific Island States
3. Regionalism
4. Pacific Island Telecommunications Needs
5. International Telecommunication Union Summary of Radio, Cable and Satellite Use
6. Tables I through VIII
7. Cables Servicing the Pacific Area
8. Existing Satellite Capability
9. Pacific Island Departments of Communications
10. Telephony
11. 1980 Tariffs and Traffic: Telephone, Telex, Telegraph
12. Broadcasting
13. Appendices with Information on Rim Countries

3. COUNTRIES AND OTHER JURISDICTIONS VISITED

Several island nations and other jurisdictions were chosen for visits after 1) a survey of twenty-five Pacific island specialists world-wide, 2) consultation with ITU and SPEC officials in Suva, 3) a realistic assessment of airline schedules and fares and 4) receiving permission from each government to visit that particular country.

3.1 Islands Visited

In January and February of 1981, Project Coordinator Jane Hurd and former PSSC President John Witherspoon visited American Samoa, Western Samoa, Niue and the Cook Islands. Hurd traveled to New Zealand and Fiji for consultation with government, ITU and SPEC officials before returning to Washington. In March, Hurd visited Aitutaki and Mangaia, outer islands in the Cooks, and was joined by consultant Joan Abramson and ITU South Pacific Regional Telecommunication Development Project Manager Graham Davey for visits to Fiji (Viti Levu and Vanua Levu), Vanuatu, the Solomon Islands (Guadalcanal and Malaita) and Papua New Guinea (Port Moresby, Goroka, Kainantu and Kundiawa.)

In May, June and July, Hurd, Abramson and Davey visited the Federated States of Micronesia (Ponape), the Republic of Belau (Koror and rural Babelthuap), made a courtesy visit to the Governor of Guam, visited the Republic of Nauru and the Kingdom of Tonga. A schedule of visits and interviews is contained in Appendix A.

3.2 Descriptions

The brief descriptions that follow include information on Kiribati and Tuvalu as well as on the island entities visited by the research team. Additional details on economics in the Forum countries (except Australia and New Zealand), taken from "Coping with Crisis: Disaster Preparedness and Rehabilitation the Pacific Way," a project of the Pacific Islands Development Program, East-West Center, Honolulu, Hawaii, with assistance from USAID's Office of Foreign Disaster Assistance, are contained in Appendix C. More detailed information on interviews in the countries is presented throughout section four.

3.2.1 American Samoa

American Samoa consists of the islands of the Samoan group that lie east of the 171st meridian of west longitude and at 14 degrees south latitude. The administrative center, Pago Pago, lies on the high volcanic island of Tutuila. Aunuu lies nearby. Ofu, Olosega and Tau are in the Manu'a Group, and tiny uninhabited Rose Atoll lies to the east.

Area:	75.68 square miles
Population:	32,395 (1980 census) 30,000+ (appx.) Tutuila 1,500 (appx.) Manu'a
Political status:	Unincorporated territory of the United States of America.
Telecommunications authorities:	
Administration	Office of Communications
National carrier	Office of Communications
International carrier	Office of Communications (COMSAT)
Air Service:	International airport at Tafuna, Tutuila Ta'u (small privately built airport) Ofu (small government strip)

3.2.2 Republic of Belau (Palau)

The Republic of Belau stretches northeast to southwest between 7 degrees and 2 degrees north latitude and between 130 and 135 degrees east longitude. The capital, Koror, is a small island connected by a bridge with Babelthuap, the largest island in the Trust Territory of the Pacific Islands. Palau is currently a district of the Trust Territory. After the termination of the trusteeship agreement, and the Compact of Free Association is approved by all parties, the Republic of Belau will be self-governing in free association with the United States of America.

Area:	177 square miles
Population:	12,177 (1980 U.S. Census)
Political status:	see above
Telecommunications:	Administered by Trust Territory Headquarters in Saipan.
Air service:	Airport on Babelthuap accommodates B-727's

3.2.3 Cook Islands

The Cook Islands consist of 15 islands that lie between 8 and 23 degrees south latitude and 167 and 156 degrees west longitude in two groups. The Southern Group consists of the capital, Rarotonga, on which over half the population resides, Aitutaki, Mangaia, Atiu, Mauke, Mitiaro; the Northern Group, all atolls, includes Manihiki, Rakahanga, Pukapuka and Penrhyn. Most of the Southern Group are high volcanic islands. (Mangaia is a true makatea.)

Area:	88 square miles
Population:	18,128 (1976 data in PIY 1981)
Aitutaki	2,500± (1981)
Mangaia	1,336 (1981; compared with 1800 in 1976)
Rarotonga	9,806 (1976 data in PIY 1981)
Political Status:	Self-governing in free association with New-Zealand.
Telecommunications authorities:	
Administration	Ministry of Post and Telecommunications.
National carrier	Post and Telecommunications Department
International carrier	Cable and Wireless, Ltd.
Air Service:	US-built WWII airfield at Aitutaki, coral strip at Mangaia. Seven islands without airstrips. Only Manuaia in the southern group lacks a strip. Only Penrhyn in the northern group has one. International jet airport at Rarotonga.

3.2.4 Federated States of Micronesia

The Federated States of Micronesia, consisting of Ponape, Truk, Yap and Kosrae Districts of the Trust Territory of the Pacific Islands, lies between the equator and 10 degrees north latitude and 137 and 163 degrees east longitude. Once the trusteeship agreement is terminated and the Compact of Free Association is approved by all parties and signed by the President of the United States, the Federated States of Micronesia will become a self-governing entity in free association with the United States. The districts become states under free association. The capital of the Federated states is in the town of Kolonia on Ponape, although plans are underway to move the capital 7 miles from its current site to Palikir.

Area:	Ponape	145[1/] square miles
	Truk	45
	Yap	46
	Kosrae	41
Population:	Ponape	22,319[2/]
	Truk	37,742
	Yap	8,172
	Kosrae	5,522
	TOTAL:	73,755

Telecommunications:

Under jurisdiction of the Department of Communications, Trust Territory of the Pacific Islands. Some authority will be transferred on October 1, 1981.

Air Service: International airport on Ponape; the domestic airports on Moen, Truk and in Yap all serve B-727s. Kosrae has air service by small plane.

1/ 33rd Annual Report, Trust Territory of the Pacific Islands, May 1981.

2/ 1980 U.S. Census.

3.2.5 Fiji

The 320 islands of Fiji lie between 15 and 20 degrees south latitude and 177 and 175 degrees east longitude. The capital, Suva, is on Viti Levu. Most islands are high, volcanic while there are many small, coral atolls.

Area: 7,055.55 square miles

Population: 612,046 (1978 estimate from PIY* 1981)

Approximately 90% of the population live on Viti Levu and Vanua Levu.[1]

Suva	63,628[2]
Lautoka	22,672
Nadi	6,938
Vatukoula	6,425
Ba	5,917
Nausori	5,262
Labasa	4,328
Rakiraki	3,755
Navua	2,568

Political status: Independent, 1970. Member of the Commonwealth.

Telecommunications authorities:

Administration	Posts and Telecommunications Department Ministry of Works and Communications.
National carrier	Posts and Telecommunications Department.
International carrier	FINTEL (Fiji International Telecommunications, Ltd.)
Air service:	International airport at Nadi capable of servicing wide-bodied aircraft. Nausori Airport near Suva services jets and smaller planes/ Vanua Levu has airports at Labasa and Savusavu. Five other islands have government airstrips and there are 6 privately owned airstrips.

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[1] USAID Office of Foreign Disaster Assistance, Fiji: A Country Profile, page 21.

[2] "Coping With Crisis: Disaster Preparedness and Rehabilitation the Pacific Way," East-West Center Pacific Islands Development Program, Honolulu, Hawaii; Angela Franco and Michael Hamnett; in preparation, 1981.

*Pacific Islands Yearbook

3.2.6 Kiribati

Kiribati consists of 17 Gilbert islands, the 8 Line islands and the 8 Phoenix islands. They spread over more than one million square ocean miles from Ocean (Banaba) Island east to the Lines. The main group, the Gilberts, straddle the equator just west of the international dateline lying northwest to southeast. They are situated between 4 degrees north and 3 degrees south latitude and 172 and 177 degrees east longitude. All except the 265 foot high Banaba, are low flat, coral atolls with a maximum altitude of 12 feet. 30 of the islands are inhabited; 3 are not.

Area:	264 square miles
Population:	56,452 (1978 in PIY 1981) Over 17,000 on Betio and Tarawa in Tarawa atoll.
Political Status:	Independant in 1978; member of the Commonwealth.
Telecommunications:	
Adminstration	Ministry of Communications & Works
National carrier	Telecommunications Division
International carrier	Telecommunications Division
Air Service:	Boniki International Airport at Tarawa and eight other airfields.

3.2.7 Nauru

The Republic of Nauru is a single raised atoll located 30 miles south of the equator at 166 degrees east longitude.

Area:	274.5 square miles
Population:	7,200± (1981 local estimate) 4,000 Nauruans approximately
Political Status:	Independent in 1968; associate member of the Commonwealth.
Telecommunications:	
Administration	Department of Telecommunications
National carrier	Department of Telecommunications
International carrier	Department of Telecommunications
Air Service:	Nauru International Airport services Air Nauru

3.2.8 Niue

Niue is a single uplifted coral atoll located at 19 degrees south latitude and 169 degrees west longitude with its administrative center at Alofi.

Area:	99.62 square miles
Population:	Fewer than 4,000. Census underway 1981.
Political status:	Free association with New Zealand; internal self-government.
Telecommunications:	
Administration	Department of Telecommunications
National carrier	Department of Telecommunications
International carrier	Department of Telecommunications
Air service:	Hanan International Airport

3.2.9 Papua New Guinea

Papua New Guinea consists of the eastern half of New Guinea, second largest island in the world, the islands of New Britain, Bougainville, New Ireland and several groups of off-shore islands to the north, east and south of New Guinea.

Area: 178,490.5 square miles

Population[1]: 3,016,000 (1980 census)
3,079,000 (mid-1979) SPC estimates
11% urban population

Population Distribution according to Provinces: 1975

Port Moresby *	221,360
Western	82,930
Gulf	65,240
Milne Bay	124,300
Northern	77,430
Southern Highland	210,430
Western Highlands and Enga	558,680
Eastern Highlands	219,110
Morobe	310,000 (1980)
Madang	191,570
East Sepik	198,370
West Sepik	131,820
New Ireland	67,200
East New Britain	109,190
West New Britain	80,180
Bougainville	111,580

Political Status: Independent in 1975. Member of the Commonwealth.

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[1] "Coping With Crisis: Disaster Preparedness and Rehabilitation the Pacific Way," East-West Center Pacific Islands Development Program, Honolulu, Hawaii; Angela Franco and Michael Hamnett; in preparation, 1981.

* Central Province and National Capital District.

3.2.9 Papua New Guinea (Continued)

Telecommunications:

Administration	Department of Public Utilities
National carrier	Postal and Telecommunication Services
International carrier	Postal and Telecommunication Department
Air service:	Jackson's Airport, Kieta and Lae all provide international services with hundreds of small airstrips servicing the rest of the country. Regular service is available at Daru, Buka, Goroka, Kieta, Madang, Morobe, Mt. Hagen, Rabaul, Wewak, Kavieng and Vanimo.

3.2.10 Solomon Islands

The Solomon Islands, a double chain of six large islands and many smaller ones including Lord Howe and Santa Cruz, are located between 5 degrees and 12 degrees south latitude and 155 and 170 degrees east longitude. Honiara, the capital, is on the island of Guadalcanal. Other major populations are on Malaita, Santa Isabel, San Cristobal, New Georgia Choiseul and Rennell.

Area:	11,016,5 square miles	
Population:	217,000 (1979 estimate in PIY 1981)	
	Guadalcanal 46,619	(1976 data in PIY 1981)
	Honiara 46,619	(1976 data in PIY 1981)
	Malaita 60,000	(1976 data in PIY 1981)
Political Status:	Independent in 1978. Member of the Commonwealth	
Telecommunications:		
Administration	Posts and Telecommunications Department	
National carrier	Posts and Telecommunications Department	
International carrier	SOLTEL (Solomon Islands International Telecommunications Ltd.)	
Air service:	Henderson Field on Guadalcanal provides international air service. Munda, Santa Cruz, Gizo and Auki all have regular service. There are a total of 11 government, 9 licensed and 2 private airstrips.	

3.2.11 Kingdom of Tonga

The Kingdom of Tonga is an independent monarchy consisting of three main groups: Tongatapu, Vava'u and Ha'apai, located between 15 and 25 degrees south latitude and 173 and 177 degrees west longitude. There are 162 islands in all. The capital, Nuku'alofa, is on Tongatapu. Most of the islands are low coral atolls while some, although few, are high volcanic islands.

Area:	289.6 square miles	
Population:	Approximately 100,000	
	Tongatapu[1/]	67.576
	Ha'apai	11,144
	Vava'u	14,735
	Niuatoputapu	6,650
	'Eua	4,420
	TOTAL:	100,105
Political Status:	An independent Kingdom. Member of the Commonwealth	
Telecommunications		
Administration	Telegraph and Telephone Department	
National carrier	Telecommunications Division	
International carrier	Cable and Wireless, Ltd.	
Air service:	The International Airport at Fua'amotu is on Tongatapu. There are five other airports in the Kingdom.	

1/ USAID Office of Disaster Assistance, Tonga a Country Profile.

3.2.12 Tuvalu

Tuvalu is made up of 9 coral islands which lie in a northwest to southeast chain between 5 and 11 degrees south latitude and 170 and 180 degrees east longitude. The capital and main island is Funafuti.

Area:	10,001 square miles
Population:	7,357 living in Tuvalu 800 in Kiribati 700 in Nauru 300 employed as seamen
Funafuti	2,191
Vaitupu	1,269
Niutau	866
Nanumea	842
Political status:	Independent in 1978. Member of the Commonwealth
Telecommunications:	
Administration	Post and Telecommunications
National carrier	Post and Telecommunications Department
International carrier	Post and Telecommunications Department
Air Service:	An air strip at Funafuti accommodates regional service while amphibious planes fly to other islands.

3.2.13 Vanuatu

Vanuatu is a double chain of over eighty islands which lie between 12 and 21 degrees south latitude and 166 and 171 degrees east longitude. Its capital, Vila or Port Vila, is on Efate island.

Area:	4,587 square miles
Population:	112,596 (January, 1979 estimate from PIY 1981)
Urban Vila	16,604 (1975 estimate from PIY 1981)
Urban Santo	4,954
Rural	75,974
TOTAL:	96,532
Political Status:	Independent in 1980. Member of the Commonwealth
Telecommunications:	
Administration	Department of Posts and Telecommunications
National carrier	Posts and Telecommunications
International carrier	VANITEL (Vanuatu International Telecommunications, Ltd.)
Air service:	Bauer Field in Vila is the international airport. Pekoa field in Santo can accommodate jets. There are 15 other airfields on 11 other islands.

3.2.14 Western Samoa

Western Samoa consists of two large high volcanic islands and two smaller inhabited islands 13 and 15 degrees south latitude and 168 and 173 degrees west longitude. Apia, the capital, is on the island of Upolu. The other large island is Savai'i.

Area:	1133 square miles
Population:	160,966[1/] (mid-1979 estimate)
	Upolu 109,000+ Apia 30,000± Savai'i 42,000±
	There are approximately 30,000 Samoans in New Zealand.
Political status:	Independent in 1962. Member of the Commonwealth.
Telecommunications:	
Administration	General Post Office
National carrier	General Post Office
International carrier	General Post Office
Air service:	Faleolo International Airport is on Upolu. There is a domestic grass air strip nearer to Apia and two domestic strips on Savai'i.

[1/] Western Samoa's Fourth Five-Year Development Plan 1980-1984., Vol.I. Department of Economic Development, Apia, January 1980.

4. DEVELOPMENT ISSUES IN THE PACIFIC ISLANDS: THE ROLE OF TELECOMMUNICATIONS

The emerging Pacific island nations are engaged in a three-tiered development effort. First, government leaders are endeavoring to create a sense of national identity in order to mobilize their people to work toward development goals within the context of a unified nation. Secondly, policy makers and departmental officials are required to ensure that planning for the appropriate training and utilization of human resources be undertaken within the framework of national goals. And, finally, leaders must encourage the appropriate development of economic resources in a manner that will lead toward self-sufficiency and national self-reliance.

Improved telecommunications are vital for pointing the direction of these new nations in all aspects of their development. The following sections on national development, human resources and economic resources as they are affected by telecommunications are based on discussions with government and traditional leaders, business people and others in both rural and urban communities throughout the Pacific region.

4.1 THE PHILOSOPHY OF NATIONAL DEVELOPMENT

4.1.1 NATIONAL DEVELOPMENT

> "It is the policy of this government to equalize services, to develop entire provinces, to lift all services as close as possible to the national level."
>
> --A Pacific islands planner

The new nations of the Pacific are not easily unified. Typically, these nations are made up of scores of far-flung islands between which sea travel is measured in days and air travel is measured in hours. In the larger island nations, mountains join the sea as obstacles to unification. It follows, then, that people's identity is measured ir local links rather than in national or regional ones. In Papua New Guinea, over 700 languages are spoken by people representing as many cultures. In Ponape, Ponape Island and five tiny atolls make up a state; each supports a population that speaks a different language, and Ponape is only one state in a new nation. A concerted effort is underway to encourage people to see themselves as citizens of the Federated States of Micronesia, rather than of their own state, island or village. In an isolated province of the Solomon Islands, there has been only one popular demonstration on the issue of independence, and that demonstration was in noisy opposition to -- not in support of -- it.

Isolation's Erosion of Unity

Section 4.2.1 describes the problems that isolation creates. Outer island populations express little surprise at having to endure six to fifteen week intervals between ships. These people welcome foreign fishing boats. They pay little, if any, heed to the fact that the presence of many of these boats is illegal. The boats carry supplies of kerosene, matches, cigarettes

and canned food to trade for fresh produce and water. It is a difficult, if not senseless endeavor to explain to such isolated communities that tolerance of illegal foreign vessels is not in the best interest of the new nation. Since the development of the new nation passes outer island residents by, they feel they must not let ships with essential trade goods also do the same. Capitals and atolls, then, find themselves in adversary roles; meeting basic needs is a stronger motivation for atoll dwellers than is the desire to pursue the development of a national identity.

In some island states, populations that number in the few thousands are divided into strictly opposite political groups reluctant to cooperate on issues that require national unity. One Cook Islands official reported that politics is played too hard and that since self-government, people have ceased to cooperate in community work if they do not agree with current government policy. In the Republic of Belau, the newest of all Pacific entities, people reported that those on the east coast do not know what is happening on the west and vice versa. Those interviewed described the impossibility of knowing common issues or of discussing national issues and problems--an impossibility caused by nearly non-existant rural telecommunications.

Communication's Role in Unification

Broadcasting, which will be discussed later in this section (4.1.3.), is the major tool in the development of nationhood, in the establishment of commonality. Broadcasting is used to educate and to inform. In the Solomon Islands transmitters have been strategically placed so that every island can receive national radio. In the Cook Islands, the impossibility

of reaching the remote northern islands and of maintaining consistent contact with a Southern Group, closer to Rarotonga, led to the development of a far reaching HF system in the Premier's Department, permitting twice-daily schedule contact with every island in the Cooks. In the Cooks and in the Solomons, where the broadcasting of Parliament is considered an inalianable right, people are informed of national issues. In the Kingdom of Tonga, where the broadcasting authority is financially self-sufficient, and where national identity is long-lived and stable, Parliament is not broadcast, and the question arises of who would finance such broadcasting.

Longstanding colonial ties create difficulties in some areas toward the development of a national identity. In Papua New Guinea, a country of 11,000 villages, Papua and New Guinea were historically separate territories with slightly varying relationships with Australia. The two territories--separated by mountains--have developed at different rates, and rivalry has been exacerbated by the use of Motu as the common language in the south (Papua) and Pidgin in the north (New Guinea). These historical causes are combined with the fact that some provinces are resource-rich while the wealth of others is measured in human resources and a population of educated elite. Teachers, furthermore, are not posted to schools in their own provinces, a situation which has been divisive in the development of the nation, Papua New Guinea, rather than binding, which had earlier been anticipated. In Papua New Guinea the term "wantok" has developed as an effort to have people see one another in terms of commonality taking into consideration their likenesses rather than their differences.

Conclusion

Throughout Melanesia, the independence movement developed a momentum which, as it began to speed up, led people to realize that they

could not go back, even though--in terms of economics and infrastructure--they were not really prepared to forge ahead. The equalization of services in Melanesia, Micronesia and Polynesia is part of the thrust of nationhood. Along with national public broadcasting, an improved two-way voice or data link would go far to accomplish the unifying goal of establishing national identity and cutting down the feeling of isolation. Several officials repeatedly pointed out that without the improvement of national communications, the entire impetus of national development is apt to disintegrate. Without an adequate, cost-effective and maintenance-simple communications system, nation-building and national economic development will be stymied.

4.1.2 PLANNING AND THE IMPLICATIONS OF DECENTRALIZATION

"The national government here is the stepchild of the states. Here, power devolves up."

Federated States of Micronesia

Decentralization

Throughout the Pacific, particularly in the newly independent nations of Melanesia, the issue of decentralization has yet to find adequate, widely-accepted resolution. Provincial, rural areas find themselves pitted against central governments in an adversary role, the primary reason for which is the lack of flow of information. Adequate agreement on the meaning of decentralization is rarely reached because communication is difficult, and dialogue on the issue is impossible.

Delegation and Devolution Contrasted

From the perspective of the central government, national planning requires the kind of coordination only available in the national capital where a larger, comprehensive overview of needs is possible. Such a plan allows for the delegation of power to the provinces but presupposes tight central control. Provincial governments, on the other hand, view decentralization differently. At independence, the rural areas--some very rich in resources--anticipated that decentralization would mean the devolution of power to them. That is, provincial officials expected that responsibilities would fall to them that would give them the control to choose, prioritize and fund the development projects they adjudge to be most necessary.

Typically, one ministry takes charge of devolution efforts. But the threat lingers that that single ministry will get bigger and gain control in more areas as the power devolves. Bureaucratically, the management of devolution becomes complex. It is cumbersome because, even though power is devolved, the central government does not easily relinquish its consulting role and, at the same time that the province's power grows, the central governmental department also becomes bigger. Politically, the ramifications are also considerable. Members of the cabinet and politicians in general worry that the provinces will become powerful, so they delay and undercut attempts at development.

Clearly, it is imperative to make every effort for services to reach every province, whether the power to do so is devolved or delegated. Ideally, as described in the Federated States of Micronesia, states do the goal-setting and the central government provides technical assistance. In fact, there is little possibility of actualizing this theory because the central and state governments have so much trouble communicating.

Rural Communications

Without adequate communications, it is impossible to hold a province together, and it is impossible to speak to that province about the devolution of authority. Devolution is proceeding well in the Solomon Islands. However, communications impedes further development. Communications is controlled from Honiara, the capital; for any inter-provincial connection a patch through Honiara is required where the operator changes and adjusts the frequencies. It is also important to recall that in the Solomons, for instance, there are seven provinces besides the municipal authority of Honiara, but there are 140

individual local languages.

Communications hampers efforts to get clear policy on important educational issues. The national government in the Solomons created a traditionally-oriented post primary school system for which the control of curriculum was central. The central government reported that the program no longer exists and that schooling had moved toward a classic British-based academic high school. Visits to one provincial center revealed that the culturally traditional post-primary schools were flourishing. Administrators explained that while the province cannot influence the curriculum, it can determine the allocation of the budget resulting in the emphasizing or deemphasizing of whatever the province chooses. In Papua New Guinea 80% of the curriculum is the responsibility of the national government while 20% remains with the provincial education office which frequently stresses cultural information. Ironically, the teachers are from other provinces and cannot adequately or enthusiastically teach such cultural studies for which the provincial office is responsible.

The Role of Central Planning

Whatever method a nation finally employs to attempt to equalize services, attention must be given to parallel planning on the part of the national and local authorities. The normal political difficulties this kind of planning entails are exacerbated by inadequate communications. Roads in most cases are the beginning of a market economy; cash crops must be growing well before the road is completed. Shipping and health services for workers must be organized. Planning between national departments and field personnel parallels the work of central planning offices for integrated

rural development.

In Papua New Guinea all projects must be approved by the Central Planning Office. The projects must be of sufficient national priority for funding, even if aid funds are available. The Central Planning Office's influence predominates only every five years. At the every day maintenance level, choices and power plays are between Treasury and other departments. In one Pacific state, planning is done by departments, but efforts to execute government policy are hindered by the lack of articulation of any such policy by the government. Budgeting is willy-nilly, as objectives and priorities are unclear. Such problems are magnified because of the lack of communication facilities for improved dialogue. Similarly in Vanuatu, all development aid is administered by the Central Planning Office and distributed through Finance. Work on a five-year plan has been limited because of the implications of political unrest and unclear relations (and, therefore, aid commitments) from one of the former administering authorities. In the Solomons, government ministers are more integral to the planning effort, and work with the Planning Office. In the U.S. territories, care is taken to ensure that development is planned with state involvement. A sense of insecurity or mistrust remains, however, among state officials because of colonial associations from earlier Trust Territory-days. Likewise, the congressional adversary position is unsettling to the new locally elected administration that had thought it would receive cooperation from elected fellow countrymen.

Communications is vital to planning. National Development Plans are largely theoretical because inadequate communications limits the ability

of the rural officials to provide input into the very plan that is intended to create clear objectives for services to rural areas.

Other Difficulties with Decentralization

In the countries where the devolution of power is not smooth, provinces pass legislation but it does not become law and is not empowered with financial backing until national government acts. Functions but not power are transferred to the provinces, and confusion and frustration over access to power remains. In one Melanesian country when planning for the development of the infrastructure for local councils was begun, communications was added only as an afterthought.

In one nation's case, ministries will not officially support development efforts in the provinces until there are three to four hundred people in an area. While provincial officials might begin to create an infrastructure, their efforts are not acknowledged or assisted by the central government. This situation forces local people not to get what they believe has been promised, or they are forced to pay for initial infrastructure-building efforts themselves. In the Cooks, it was pointed out, an agricultural worker cannot borrow from an employee of another department the tools or equipment necessary for a project on an outer island. He must notify the central departmental office in Rarotonga of his need which requires lining up to get on the radio to ask for help for which he must wait until the arrival of the next ship from the capital.

The problem of inequity or disequilibrium results in nearly all resources being in the towns while government policy might say that uniform services must be delivered to people in towns and villages alike. People in villages, as is pointed out in Section 4.2.2. on health, begin not to believe that they

have a right to services that are available to their fellow citizens in urban settings.

In one Melanesian country, the central government attempted to give responsibility for fisheries, livestock and agriculture to the provinces. This scheme has not worked because the provinces have been unable to disseminate information to the farmers and fishermen. The central government is considering retaining the authority it had intended to hand over the provinces until communication networks are more far-reaching and reliable.

Conclusion

Rural authorities often do not share the philosophical perception of the central government. Improved communications is an absolute requirement for easing the psychological strain of their disparate goals and for building infrastructures and providing services to the rural population. But no matter what pattern a government chooses for actualizing its national development philosophy, the goal is certainly to provide services for all people of the nation on a reasonably equitable level. Unless an adequate communications infrastructure is created connecting the centers with provincial capitals and provincial capitals with villages, no national philosophy has a fair chance of finding its way to meet the needs of all the people of Pacific island nations.

4.1.3

THE ROLE OF BROADCASTING

"We're aiming at making people feel less isolated and making them feel they are part of what's going on."

--a Pacific radio station manager

In the Pacific islands, broadcast radio serves as a means of transmitting information to people who have little access to reliable communications facilities. Throughout the islands people whose communications needs cover a broad spectrum have found ingenious methods to ensure that broadcast radio compensates for the lack of adequate two-way voice and data systems to rural and outer island communities throughout the region.

Broadcasting as a Tool for National Development

Wherever possible, Pacific island governments utilize broadcasting as a tool for national development. In the Solomon Islands threats of political disunity resulted in the rapid placement of a repeater at the provincial center at Gizo to ensure that Solomon Islands Broadcasting Commission's coverage would be nationwide. In several countries parliamentary sessions are broadcast. In the Cooks Parliament has been known to adjourn when technical difficulties have interrupted broadcasting of a session. In the Solomons, by law, Parliament is broadcast and is viewed as "an inalienable right of the people of the nation." In Papua New Guinea such a notion is unknown, while in the Kingdom of Tonga where broadcasting is independent, (See section 4.1.1.) only the opening and closing are heard on the radio. As national stability is not at issue in Tonga, there the

question of who would pay for the broadcasting of Parliament was raised.

National and international news are broadcast, typically, several times a day in the appropriate languages. Overseas news (usually from Australia and New Zealand) is taped and replayed. National news is sometimes played up to five times a day in one language.

In Papua New Guinea radio programs originate in the 19 provincial headquarters. Each produces programs in Pidgin and in two indigenous languages. English news is produced only in Port Morseby, the capital, where it is of primary importance. In the Cook Islands one-half the broadcasting is in Maori and half in English.

In Papua New Guinea plans are underway to augment the present network with its education and training focus by setting up another commercial network featuring sports, and popular music.

Service Messages

Personal or service messages are short, usually paid (Papua New Guinea is one exception), personal announcements of particular interest to an individual, a family or a community which otherwise might not be accessible through existing communications links. Birth, death and marriage notices, birthday announcements, festival bulletins, requests for individuals to make contact with government departments (particularly the post office for letters, packages and telegrams), and announcements of unique individual concern are the most common. Typically, service messages are broadcast for fifteen to thirty minutes in the evening. In Fiji, people are said to tailor their time to be free to listen to these messages which are usually broadcast in the language most easily understood by the person who is to be reached.

In the Solomon Islands, 30% of the messages are from the government. The provincial headquarters of Auki, Malaita, alone spends $400.00 per month on such messages which are sent by letter or by telegram to Honiara, the capital to be broadcast. Officials reported that the popularity of service messages at a given time is an apt indicator of the state of the economy, and, more precisely, of the copra market, which is often the primary source of cash income for members of rural communities. In Tonga, personal messages, along with advertising and profit from broadcasting's small retail radio shop "keep radio afloat."

Other Uses

In Tonga, every church is allotted one-half hour per week for a religious program. During the team's January visit to Niue, the Government was about to undertake a census using Radio Sunshine in conjunction with an Apple II computer. In the Cook Islands the station manager reported that the station is not shut down during a hurricane warning, and he recalled a time when the station operated continuously for four weeks. In some countries 30 second radio spots on important issues in health, agriculture and education have been developed on the model of a Western commercial.

Status

In some countries, such as Western Samoa and Vanuatu, the broadcast radio facilities make up a government department; in others, such as Fiji and the Solomon Islands, they are statutory bodies wholly owned by

the government. Some are funded solely by the government; others are funded by the government and by advertising, and still others (as in the case of Tonga) receive government funds only through paid government use of time on the air.

Agriculture

The difficulties of coordinating the transporting of produce and other commodities to the appropriate market are discussed in section 4.3. In Tonga, the Agriculture Department uses broadcast radio for transmitting messages and notices to farmers. As a result, the farmers know the optimal date and time to bring certain crops to the marketing site which has the greatest demand for those crops. The Agriculture Department also produces 15 minute programs in its own studios for airing four times a week. Some provincial governments in Papua New Guinea rely on broadcasting for pricing and market analysis.

Health

In most countries health departments use broadcast radio to inform rural communities of particular, acute health hazards, to tell them of the schedule of visiting health teams, and to provide basic information on nutrition, maternal child health, family planning (the degree of emphasis depends on the country), and general preventative medicine.

Education

Many national education departments produce fifteen minute programs to be aired for teachers during their morning tea recess. Some education officials reported that the primary benefit of these broadcasts to the schools is to decrease the sense of isolation among teachers in rural communities, especially in cases (which are common) where the teachers are posted far from their own home communities. In some countries there are also educational broadcasts to the schools for students. English enrichment lessons by native English speakers are a particularly common program. In Papua New Guinea, school broadcasts are aimed at teachers. The fact that they are produced by broadcasting personnel, rather than education specialists, results in some difficulties with accuracy. The Federated States of Micronesia stressed their interest in developing broadcast radio programs to the schools, but they recognized that such a program would require additional, trained staff at both the broadcasting station and the Education Department.

Broadcast's Role in Transportation

Broadcasting assists with the announcement of both ships and air traffic. A ship with cargo to deliver at a remote provincial center in the Solomons, for instance, will contact the marine radio operator, who will in turn call SIBC, and SIBC will announce on the air that there is a shipment ready for off-loading. Likewise, points of origin, destinations, and arrival and departure times of all international and most domestic flights are announced on broadcast radio in most countries.

Problems

American Samoa's experience with broadcasting creates a unique dilemma. For cultural applicability and local adaptation it is important, education officials reported, to produce programs in Samoa and in Samoan. Yet, American Samoa must also try to expose and ready young people for what they will encounter on the U.S. mainland where a great majority of them go to further their education and some, to settle.

Another difficulty was expressed by officials in Fiji where the Fiji Broadcasting Commission provides programming in Fijian, Hindustani (over 50% of Fiji's population is Indian) and English. The FBC can draw from India for programs for the Indian segment of the population, and it can utilize programs from Australia and other Commonwealth countries for English-speaking broadcasts, but no model exists for developing indigenous, Fijian and Rotuman (a Polynesian-speaking outer island) programming. Without committing resources to the responsible development of interesting, authentic Fijian programs and to the training of Fijian personnel in production skills, Fijian programming will fall far short of that which is available to the other language groups. This example depicts the situation in a number of countries.

Citing another kind of problem, officials in the Republic of Belau indicated that broadcasting, which is the sole available means of making public announcements, is limited to a ten-mile range from the capital of Koror. In some countries there are interior communities that do not receive the signal of broadcast radio. Where rural reception is not a problem, communities are faced with the problem that programming is geared toward

the urban community and its interests. In many countries plans are underway for the broadcasting of local "breakaways", local events and local commercials.

Television

Television has reached Guam, parts of Micronesia and American Samoa. (60% of Western Samoa can receive American Samoan television signals.) A foundation-supported feasibility study has been produced by a team that visited Fiji in 1980; the results are under consideration. It is not unlikely that such developments may follow elsewhere; but governments are leary; officials realize that the impact of television is unrelenting and irreversible. Both commercial and public stations operate on Guam; private commercial stations operate in parts of the Trust Territory; and in American Samoa there is a government station supervised by the Department of Education which boasted the "world's largest educational television broadcasting system in the mid-60's."[1/] Today, television plays a minor supplementary role in instruction, especially in English, in American Samoa.

On Ponape, tapes of network broadcasts from Los Angeles, including advertising, are aired. Residents reported that "at least it keeps kids home." Education personnel reported a marked increase in English comprehension. Local news has not been successfully produced because, TV station personnel said, "it is hard to find someone willing to be 'on' all the time."

1/ Broadcasting in Asia and the Pacific, edited by Jonn A. Lent, Temple University Press, Philadelphia, Pacific Islands by Ralph Barney, 1978, page 299.

Conclusion

Broadcast radio is an extremely effective, though in some cases expensive, tool for development. Electricity costs in the Solomon Islands, for instance, will have tripled in four years by 1981 due to fuel prices and the use of larger transmitters. Virtually every sector of government has made use of broadcast radio through messages and programs that will provide information to citizens of the nation.

Broadcast radio is very popular; it decreases a sense of isolation and help to fend off boredom. People will listen to it because radio is entertaining. Radio personnel know well that in order to create a sense of national unity, national awareness, to educate and to inform, messages must be clear, relevant and enjoyable. While real efforts at upgrading will be required in Micronesia, there is evidence throughout the island nations of the South Pacific, that broadcast radio is successfully reaching the people in both the urban and rural communities it sets out to serve.

4.1.4 APPROPRIATE DEVELOPMENT: TECHNOLOGY, HISTORY AND THE APPROPRIATENESS OF SCALE

"We will use any technology that works that can help to make things better."

Western Samoa

Is "new" necessarily "complicated"?

In the Pacific islands, as in other areas in the developing world, a perspective on technology prevails in some sectors that says that if a technology is advanced, then it must be risky; the concomitant fears are that if it is advanced, it must be complicated; and a small place with limited personnel and funds will not have the resources to maintain it. Developments in solid state equipment have minimized these sorts of risks. Indeed, advances in technology can lead to more simplified equipment.

Linear Development

Another difficulty is the prevailing notion that generations of technology must not be jumped. If a new cost-effective, reliable and easily-maintained technology is made available, resistance to skipping generations of the technology is usually considerable.

Is it necessary to walk through every generation of technology? This is the issue of "linear development." Is it necessary to take intermediate steps when an appropriate technological solution to a need may be found in an advanced step that is also proven to be cost-effective? The needs of a particular community at a particular time are unique; and it should not be necessary for the colonial history or the linear development of another area to be repeated if it is not appropriate to the particular situation at hand.

In Papua New Guinea airstrips predated roads in many mountainous areas. For many people, airplanes are far more familiar than automobiles. Air transportation has been more appropriate for development than road transportation. Vanuatu provides an example of breaking from the strictures of linear development. There, the recognition of traditional medical practices has become government policy. Although western medical practices are well-entrenched, a hop back to practical traditional medicine has been deemed appropriate and potentially beneficial by national policy-makers.

It is entirely possible--and appropriate--to go back and forth without reference to time or to the history of technological development. One of the few luxuries available to island leaders is an array of choices made available from the experience of those before them. It is often expatriates who obscure the possibility of such choices, particularly since their continued presence in a country depends on that nation's continued reliance on antiquated, difficult-to-maintain systems. For an expatriate to advise replacing such a system would be to risk early termination because of the resulting adequacy of the new system.

Thus, the development of satellite technology does not depend on the completion of complex, expensive land-line systems. When engineers indicate that they have all they can do to handle the development and maintenance of HF systems which are increasingly expensive because of diminished demand, they reflect a commitment to linear development without realistic appraisal of what is economical or practical. Is it necessary to have a fully developed terrestrial system before turning to satellite systems? Such thinking may not be in the best interest of a particular island nation.

The Role of Scale

Along with consideration of what is appropriate in terms of choosing from all that history has to offer, technology and development must also be appropriate in magnitude, in scale. Despite the visual incongruity such a scene may present, there is nothing basically incompatible about a small, easily-maintained satellite earth terminal in an isolated rural island setting, regardless of what level other aspects of development in the area have achieved. Indeed, the access to urban and other rural communities brought about by advancements in telecommunications,will allow for the more rapid developments in the rest of the infrastructure and (as described in Sections 4.3.1., 4.3.3., and 4.3.4. on the Management of Economic Resources) increased opportunities for economic and social development.

Inappropriateness of Scale

Throughout the Pacific examples of inappropriate scale in development abound. In Vanuatu, long administered in tandem as a condominium by Britain and France, the entire bureaucracy ran in cumbersome duplicate. On Mangaia in the Cooks enthusiasm for the immediate development of a pineapple scheme resulted in the cultivating of too many hilltop fields without concomitant planning and development of an adequate road structure, harbor facility or shipping system for the transporting of the crop to Rarotonga for processing and export. In several countries ships were described as too big and too expensive to service and maintain, running half full to ports with tiny shipments which are insufficient in quantity for the use of such ships to be cost-effective.

Appropriateness of Scale

In the Solomons, sewing machines have been made available to villages

for handicraft industry development. Cattle have been introduced there; and because these beasts were unfamiliar, they were introduced singly with carts so that the people could become familiar with the animal while simultaneously benefiting from them as a beast of burden. The hope was that later cash income benefits of large scale cattle raising would be seen. Likewise, in communications,not every village needs an exchange, not every home needs a phone. A scheme with a centrally located phone at a school, or, as in Western Samoa, a health center, or a telex at the Post Office, may be entirely adequate and serves the purpose of introducing new technology at an appropriate level. Once a community is familiar with the use and benefits of such technology, increased use will create greater demand and additions to the system will be made when they become economically self-sufficient.

Conclusion

There is nothing inconsistent about technologically advanced equipment that is easily maintained and cost-effective in a setting that is otherwise not yet highly advanced in its development. Nor is there any immutable requirement that a community utilize technological developments in the order in which they were invented. A developing nation has the choice to use that which is available and economically feasible as long as it will be of benefit and fits congruently into the nation's developmental goals. And finally, it is the responsibility of government policy-makers and their planners to ensure that the scale of that which they plan is appropriate to the anticipated needs of a nation, its urban and rural communities.

4.1.5

THE IMPORTANCE OF REGIONAL LINKS

"I am sure that satellite communication
would bring the Pacific Islands closer together."
Kingdom of Tonga

Regional links must be of benefit to the national development of each individual Pacific island country; otherwise there would be little reason for countries to cooperate.

Several regional organizations such as the Pacific Forum (the Prime Ministers of the independent South Pacific nations), its executing arm, the South Pacific Bureau of Economic Cooperation, the South Pacific Commission, and various United Nations secretariats and agencies are described elsewhere in this report. In order for there to be real improvements, new cooperative efforts in regional development must be implemented within the rubric of the existing international system. One interviewee described the Pacific as having too many agencies which adulterate resources that are scarce to begin with. For nearly a decade the South Pacific Bureau for Economic Cooperation (SPEC) has acted as the coordinating agency, seeking to ensure that the plans of South Pacific governments in telecommunications have been executed in a manner compatible with regional interest. Although the main thrust of such efforts has been directed to the improvement of regional (international) links, parallel improvements in national telecommunications, particularly in the rural section have lately been emphasized. SPEC also fosters improvements in other sectors of regional development such as energy, shipping trade and some agriculture.

One major difficulty with regional efforts in development has been that the smallest nations of the Pacific, some with populations as small as

3,000 feel that they are not consulted on the directions of much of the region's multilateral aid. These countries are reluctant to express enthusiasm for cooperating on projects from which they will not benefit. They point out that while their votes are of the same size as those of the larger Pacific nations, the benefits they reap are all too often negligible.

The Pacific Forum Line, for instance, reaches the tiniest of island nations very infrequently, and while they do not receive the service they sorely need, these smaller countries still have to pay costs toward maintaining the line. The costs and benefits are not shared equitably.

Another difficulty with regional cooperation is the similarity of crops and other commodities for export. Each nation wants its exports accepted by the other nations of the region, and by nations on the outside without tariff, but they do not want to have to accept the crops of their neighbors on the same basis.

Existing shipping routes operate to the disadvantage of the very islands they are meant to serve. The Solomon Islands could send 200 tons of rice per month to Vanuatu, its nearest neighbor to the east, but the rice would have to be sent via an extended triangulated route through New Zealand, nearly two thousand miles to the south, because the quantities of cargo are not large enough to justify the dispatching of the large ships between the Solomons and Vanuatu. Vanuatu, in turn, is self-sufficient in a very fine quality of beef and has ample quantities to export to other nations of the region. Nearly every country of the region has fruits or vegetables that some of the others lack. Tonga wants throw-away quality wood from Vanuatu for banana packing crates. The predominant problem

is that a lack of adequate communications prevents the countries from knowing one another's demands, and the lack of shipping routes with appropriate sized ships prevent the development of regional cooperation in such areas as trade.

Potential Regional Marketing Links

Other examples of marketing exchanges whose development would be assisted by the development of improved communications are plentiful. (See also Sections 4.3.1. and 4.3.3.). American Samoa sees itself as the conduit of United States goods to the Pacific. In the Cooks officials expressed an interest in U.S. diesel fuel which could be purchased in bulk from Pago Pago rather than the more costly purchase of New Zealand diesel in which they currently engage. Tonga exports albacore to the Pago Pago cannery; and American Samoa has made it clear that it will purchase whatever fish Tonga lands. The Cook Islands are looking into small freezing units for the transshipping of fish from the Northern Group (nearer to Pago Pago than to their own capital of Rarotonga) to American Samoa. And a tourism ship this year boarded passengers at Rarotonga, carried them through the islands northward for disembarkation at Pago Pago, boarded a new party there, plied south and off loaded that group back in Rarotonga, stopping at islands in both nations along the way.

A French lesson on the blackboard at a government office in Rarotonga suggested a marketing interest in their nearest neighbors (and closest cousins) in Tahiti. Despite traditional relationships, modern trading routes have not yet been developed.

Regional Cooperation in Telecommunications

Historically, there is a precedent for international cooperation in the development of telecommunications systems. Areas of the world that have had far less in common are looking to regional cooperation for the development of improved national systems. In the Pacific low cost, reliable national systems are possible using combined regional resources. None of these nations has sufficient resources to create such far-reaching systems on its own. With such a system of improved communications each nation would know better what the others in the region had to offer it and the rest of the world would have a better idea of what resources are available from the Pacific. The outside world would also have a more realistic idea of the needs of the area.

Such cooperation would provide a system from which each nation could benefit individually. As a 1980 ITU document on telecommunication needs in the Pacific points out: "Certainly good telecommunication assists good government; assists economic development; assists social stability and in a compounding way makes it possible for the people, as a whole, to both have and look forward to a better way of life. [A] breakthrough in today's inflationary world [is possible]if the countries of the region pool their requirements and cooperate with larger countries in the application of satellite technologies for the solution of their national telecommunication requirements."1/

To date, 12 island nations of the Pacific participate in the INTELSAT system. While the use of INTELSAT has improved regional and international links dramatically, the smaller nations, where the construction of a Standard B earth

1/"Satellites and the Telecommunication needs of South Pacific Countries." ITU. Suva, March, 1980.

station has not transpired because of the inability to rationalize such costly hardware given so little traffic demand, (or potential) are left at a terrible disadvantage. Kiribati, Tuvalu, Niue (and as of now the Federated States, Belau and the Marshalls) are not connected with INTELSAT. While upgrading of their HF systems has increased traffic considerably, the construction of Standard B earth stations for these islands states may be prohibitively expensive at present, considering the limited potential revenue that could be expected from such tiny countries.

While on the surface it is reasonable to assume that an upgraded HF system is for the time being adequate for places with such limited demands, it is important to consider the linkage required for such a system to operate successfully. Although the larger island nations to which such HF-dependent countries are linked do profit from revenue from such traffic, these larger countries have less incentive to properly maintain an HF system than to pursue their primary focus: the maintenance of their own satellite link, their international carrier, that carrier's relationship with the national telecommunication authority and the nations' participation in INTELSAT.

Despite the low volume of traffic, it is imperative that the smaller countries have improved access to international links. It is likely, given the increased availability of high quality international communication in the last five years in the Pacific, that such access will, after this current period of transition, be developed and become available. The small countries should be able to participate in satellite linkage among themselves using small antennas. Such linkage would be accompanied by their

being connected with international communications through cable and INTELSAT facilities. Whatever the solution, greater effort toward the equalization of service is desirable to enable the smallest nations of the Pacific--and, indeed, of the world--to participate more fully in regional activities from which they might benefit.

Conclusion

Along with regional cooperation in the creation of improved telecommunication for national benefit, the Regional Telecommunication Training Center in Fiji will help regionalize the vision of tomorrow's leaders in telecommunications. The University of the South Pacific will do the same (section 4.2.8.). Likewise, if the Pacific Forum Line can create an appropriately scaled (see section 4.1.4.) and regular, shipping schedule for the region, nations will benefit from regional cooperation. Air routes to promote the development of regional links for the benefit of the countries themselves, not for the economic or social convenience of the companies of their former colonial guardians, must also be fostered.

The continued development of improved regional links through shipping, air routes and telecommunications will provide the Pacific region with a regional infrastructure from which individualized development for national benefit can flourish.

4.2 TELECOMMUNICATIONS AND THE MANAGEMENT OF HUMAN RESOURCES

4.2.1 TIME AND ISOLATION

"The best thing about the HF system is the agricultural extension officers feel they are a part of a team. Even in the Northern group, they don't feel like forgotten people."

Cook Islands

Time

In the context of developed nations, isolation is most often thought of as a physical separation that is readily overcome once there is a reason to bring isolation to an end. But in the context of developing island countries, isolation is inextricably bound with time and magnified by the barriers of distance. People living on isolated atolls, separated from sources of supply, medical assistance and news of events, and having no reliable or rapid means of crossing vast ocean distances, suffer the dual burden of time and isolation. Without adequate means of communication, the best they can do is to measure their isolation in terms of time -- in terms of hours, or more often the days it would take them to reach people who can supply them with needed assistance.

The Effects of Isolation

Perhaps the most debilitating effect of a lack of reliable communications systems for remote island dwellers is the sense of complete isolation that pervades every aspect of life. Children may be sent away to school and parents have no way of knowing or finding out if they are well or if they remain in school. Food supplies sometimes dwindle. When they are dangerously low, islands cannot easily order supplies or ascertain when the next supply ship will arrive. A typhoon may hit without warning

and there is no means available to inform the outside world of damage, nor any means of calling for emergency aid.

It is this sense of total isolation that is perhaps the most difficult for persons in developed countries to grasp: we simply cannot conceive of the powerlessness--of what it would feel like to be so completely helpless, so cut off from assistance when it is needed. And it is this sense of isolation, according to one interviewee, which so debilitates people in remote locations that they come to believe that they are not entitled to the kinds of services town dwellers take for granted. This point is discussed in the section on health, but it is well worth underscoring here as well: people dwelling in remote areas with no means of communication come to accept death as the inevitable consequence of major illness or injury, even when they recognize that the same consequence does not exist for urban dwellers.

In recognition of the paralyzing effects of such isolation, the Jesuit mission in the United States Trust Territory began a system of radio links between mission locations during the early 1960s. According to mission priests, the system was developed, in part, as a means of increasing the efficiency of the missions, enabling each outpost to convey its needs immediately so that there would be improved utilization of the limited ship visits between the islands. But the major reason for the system, mission priests insist, was that it helped dissolve a sense of isolation that had paralyzed many mission activities. Even when the system was not in use, it provided a sense of security that did not exist before. People simply felt better knowing that, if the need arose, they could utilize the radio system to call for assistance, seek medical advice, or merely to chat about mutual problems or to exchange bits of news. The sense of isolation, according to mission

fathers, was more than just lack of person to person contact. It was not necessary to provide frequent travel for people in isolated locations to keep their sense of involvement in an ongoing group activity alive. While travel was of course useful, it was not nearly so important as the provision of instant communication and the sense of security and involvement that communication made possible.

The mission system is still functioning nearly 20 years later in the Trust Territory. It now consists of a total of 16 radios: three in Belau; three in Yap, six in Truk, including one located on a mission boat; two in Ponape, and two in the Marshalls. The system occasionally is able to work directly from Belau to the Marshalls. However, it is much more common for it to function by means of island to island hops. Thus, if it is necessary for a Belau station to contact the Marshalls, the message would have to be relayed through Yap, Truk and Ponape with the spin-off positive result of those intermediate islands remaining in contact with one another. The system works currently as a backup for government-run systems in the Trust Territory. Since the mission stations are mission-serviced and are powered by mission run and serviced generators, they are not subject to the frequent fluctuations in power that damage government systems. Experience thus far has shown the system to be far more reliable than that operated by the government.

Communication's Role in Diminishing Isolation

There is a general recognition on the part of most interviewees of the importance of communications in overcoming the debilitating effects of isolation in remote locations. Indeed, for those interviewees who have

experience in remote areas, the point was driven home most graphically: without communications,both personal and professional life becomes at least partially paralyzed in remote areas. In the Solomon Islands, the drop-out rate for people in remote areas enrolled in university extension courses is enormous: people simply give up because they do not have any contact or encouragement in their work. Program officials in women's programs in the Solomons stated that the worst problem they had to cope with while doing field work was the sense of isolation from their families and from co-workers. Their work would be easier, they said, if they could contact headquarters or home. In Papua New Guinea, education workers stated that people working outside the capital and the provincial centers generally feel no one cares about their efforts or their problems. They are unable to communicate with town centers, and no one is able to communicate with them. The result, said one education worker, is that "when you go out, they pour their hearts out to you." They have found it all too easy to believe that their work and their personal needs were going completely unnoticed.

On Ponape, the importance of human communication was well illustrated when the road between Kolonia and the Ponape Agriculture and Trade School, some twenty miles away, was recently completed. Radio telephone links along the route are almost nonexistent and until the road went through, communication was limited to infrequent trips into town by boat. With the road a new phenomenon developed. As one interviewee put it, "The road grows bananas and stores." The stores are mostly tiny and uneconomical to run. Yet an effort by the Federation of Cooperatives on Ponape to provide wholesale merchandise to the store at low cost was largely a failure: the running of a store, it seems is in part an excuse for taking frequent trips into town--trips that are as much for the purpose of making human contact, hearing

gossip and exchanging small talk as they are for picking up merchandise. Indeed, on Ponape, one interviewee provided an example of the rejection of a radio telephone link in favor of time-consuming and expensive trips to town. He explained that while he had used a radio telephone for some time he had recently turned it in: all his needs could be met during his weekly trips into town, he said. The example was certainly unusual: however, it could have been merely an example of the failure of inadequate and unreliable telecommunication systems. On the whole, more interviewees insisted that reliable communications systems would reduce the need for time-consuming trips to town, the gas for which averages 65 dollars round trip.

The Outside World

While the most paralyzing aspect of the lack of telecommunications is the sense of insecurity and isolation experienced by people in remote areas, another important aspect of the problem is isolation from the outside world that can affect development. One aspect of this problem is the effect on marketing of the lack of adequate information concerning world trade and commodities. This problem is discussed in detail in Section 4.3.1. below. Isolation from adequate outside world communications also affects education. In American Samoa, for example, the lack of adequate up to date news feeds severely affects social studies programs in the school system. In American affiliated entities, the problem of the lack of sufficient input from the outside world had another important result. In the Federated States of Micronesia, for example, interviewees noted that the government often lost out on available federal funds because communications systems were inadequate and federal program deadlines had been passed.

In general, isolation from the world's growing bank of information is considered to be a serious problem by many of the government officials interviewed. The information gap between the Pacific and the rest of the world is growing and lack of access to information is rapidly increasing that gap. The uses made of information are certainly matters of national choice, but access to that information is considered by many officials to be vital if the Pacific nations are ever to be able to lessen the gap between the information available to them and that which is available to the rest of the world.

4.2.2 HEALTH CARE DELIVERY

"Once a week I go to a community 15 miles away from here where there is a nurse with no communication. She's lucky she has a road."

--A rural physician

Providing adequate health service is among the basic national goals of the nations of the Pacific. Health care delivery is hampered in virtually all of these countries by inadequate communication facilities leaving rural population with insufficient preventive and curative medical services. Island peoples' attitudes toward the availability of medicine have changed. Whereas, in previous generations people had uniform expectations of a certain level of health care from traditional healers, Western medicine has introduced practices that compete (if not conflict) with these traditional methods. Worse, the development of hospital facilities has been limited to urban centers largely because of the inadequacy of infrastructure--especially of power supply--in rural areas to support Western-style clinics and because of the inadequate number of trained personnel for rural service.

As a result, a two-tiered system of expectations from health services has evolved: people in urban areas anticipate and receive relatively consistent, effective health care, whereas in rural communities people have come to accept death as an inevitable result of major injury or illness. Doctors and nurses are unavailable to intercede with emergency procedures, drugs and supplies are not readily obtained and

referral from isolated remote communities to centers or on metropolitan hospitals are complicated by the limitations of communications and transportation.

Lack of Communications

Descriptions of rural health care from the 1950's from one of the larger nations illustrate the isolation and professional difficulties caused by the lack of transportation and communications. There were no roads, no airstrips, and few radio telephones. Messages were run on foot or sent bobbing downstream in bamboo sections to be snatched out of the river by any random person who might be able to read and who might be able to track down the medical officer who spent 75 per cent of his time making rounds on horseback.

While medical services have grown in size and sophistication in urban centers, rural health assistants are still largely unsupported by adequate communications and transportation. If an assistant needs medicines, letters must be sent by boat and he or she must await a bureaucratic decision and delivery. In an emergency, it is in most countries impossible to contact the hospital for advice because of poor or unreliable communications, so the health assistant usually puts the victim in a canoe or open boat and ferries to town for treatment.

People walk three or four hours to reach an assistant with a tenth grade education who has inadequate supplies and severe restrictions on means of communications with better trained health personnel. In one state of the Federated States of Micronesia there is only one medic per two dispensaries on the main island and one on each of the atolls

accessible by field trip ship. When the health aides are away from these posts, entire populations are left without even the most rudimentary health care. In the case of the atolls, a health assistant fetching supplies in town is dependent on the random schedule of the field strip ship and may be forced to leave an island community unattended for well over a month.

In Micronesia, inadequate radio communications on an outer island led to the death of one man and permanent blindness of several others who had consumed wood alcohol. Immediate medical advice by voice or data may have spared this death and possible reduced the severity of injury. Likewise, a lack of communications hampers health education programs. One-half the children in a large Melanesian province suffer from eye infection because of a parasite in the water. Information on prevention would spare some of these injuries and adequate communications facilities would facilitate implementation of such a program.

In another Melanesian nation a medical officer who tours remote villages every three weeks reports that the quality of treatment by health aides and the health of the people are definitely affected by bad morale. Such feelings are caused by a lack of proper means to communicate with urban or even rural health centers.

Efforts to Overcome the Inadequacies

In the rural interior of one Melanesian country a doctor travels once a week to a community fifteen miles away from his tiny health center. The nurse at this station is without any form of communication, and agreed with the doctor that she was lucky that she had a road. The doctor in

turn reported that it was easier for him to travel to the base hospital that is his back up than to phone.

"What kinds of communications improvements would assist me?" he mused. "Perhaps if they would straighten the road."

Broadcast radio is used widely for health education and for announcements about traveling health teams with prophylactic injections, mobile X-ray units, dental facilities or maternal and child health care teams. In one of the entities of the Trust Territory of the Pacific islands, physical screening of small children is available by visiting pediatricians through the Headstart program. But radio announcements are not always heard by the parents of the target population and letters sent ahead to village leaders do not always arrive. All too often very few children are gathered for examination by specialists this program provides.

Besides the limited relief broadcast radio provides, in Fiji there is a twice a day schedule of special frequency radio contact from sub-district health personnel to small widely scattered islands. Another effort in which some countries are engaged is the promotion of medical training as a preferred career for young people. In Tonga four of the twenty-seven medical officers are about to retire. There are twenty-four young Tongans in medical schools overseas and an ample number of student nurses who plan to join the force of nearly two hundred and fifty nursing sisters.

Recognition of the Importance of Communications

In all of these countries radio breaks for medical emergencies

are the top priority and the objective is to ensure that health care reaches all people. Only in one visit with an expatriate non-medical administrator in a health department was there reluctance expressed to support a health network or dedicated circuit for health needs. In all other nations such facilities were seen as essential for adequate health care delivery.

A young M.D. on an isolated island in the Cooks said he has to treat fractures "by guesswork" because of the lack of equipment and power. Because of these limitations he would value consultation with other physicians in town. Although his needs are top priority on the Premier's radio system, there is tremendous pressure to wait his turn and there is always the problem of the availability of those to consult at the urban center.

Many doctors indicated that they would benefit greatly from data links. In Vanuatu a doctor explained that such links would provide a means of simple record keeping and could replace the tedious narrative reporting on maternal and child health care, immunization, health education, family planning, nutrition and epidemiology that outer island health assistants are now forced to record, and send by boat. Doctors in Fiji anticipate that such a system would be of exceptional organizational support and would save time for nurses in the remote interior and on outer islands. It would, of course, be of untold benefit for health planning and analysis of current health care difficulties. Health workers in Micronesia note that the ordering and inventorying of drugs and supplies would be simplified and speeded by a data system. They also point out that consultation with remote specialists would be made possible by a facsimile slowscan system.

American Territories

Efforts in the U.S. territories to interface with the U.S. system disintegrate because of inadequate communications. One administrator said he conducted a hundred thousand dollars worth of business per month with Tripler Hospital in Honolulu, but that because of limited access to direct communications, "Tripler never knows we are coming." He is unable to obtain important Veteran's Administration data and requires a link with San Francisco to do so. This doctor described health as a consumer of economic resources. The system, he says, wastes a good amount of money and the supply should not be a bigger problem than the real needs. Because of faulty storage, aging supplies and inadequate date preserving techniques, Medicare threatens to cut their funds. Meanwhile, however, an inadequate communications prevents this hospital from learning of, let alone collecting a Medicaide check which awaits them on the mainland.

Conclusions

There is general recognition throughout the Pacific region, of a need for better communications systems if there is ever to be a reasonable possibility of providing basic medical services in remote and rural locations. Indeed, health leaders in many Pacific countries are beginning to realize that the lack of such communications facilities is undermining existing efforts to upgrade service. Many countries are currently engaged in efforts to promote medical training as a preferred career for young people. There are, however, twenty-four young Tongans in medical schools overseas and an ample number of student

nurses who plan to join the force of nearly two hundred fifty nursing sisters. Additionally, a number of people pointed out that the usual island medical education, which takes place at the Fiji School of Medicine or at the University of Papua New Guinea, is now often supplemented by sending medical students for advanced training in western metropolitan centers. Trainees are exposed to the best and most modern equipment and have at their disposal the most sophisticated of back up communications systems. When they return to their Pacific countries they become dissatisfied and frustrated with the level of medical service they are able to provide without such back system: often they either leave the practice of medicine or leave their countries to practice in developed countries that can provide them with the level of support services they believe they need.

4.2.3 PUBLIC SAFETY: DISASTER PREPAREDNESS AND RELIEF, SURVEILLANCE AND LAW ENFORCEMENT

"If you think in terms of lives lost, then it is not too expensive to provide services."

Republic of Belau

Providing public safety services--disaster warning systems, emergency relief, law enforcement--is considered by officials in most Pacific countries a vital, basic service required of governments. Yet, even these most basic of services are beyond the reach of many Pacific governments because the telecommunications systems required to ensure the functioning of such services are not currently in place.

Natural Disasters

In an area of the world where seismic activity is common and frequent and typhoons are regular occurrences, it may seem strange that there is no comprehensive, reliable communications system for disaster alerts. Yet, for the most part, this is the case in the Pacific. Given the limitations and costs of existing ground technology, Pacific island nations simply have not been able to install adequate systems. Fiji, for example, frequently suffers the effects of seismic activity: disturbances in the Lau island group cause local emergency problems and produce wave action that can endanger other islands in the Fiji group. Yet there is no early warning system that informs officials on Viti Levu when a quake has occurred and there are no tsunami* measuring stations along the route of

*tidal wave

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possible seismic waves. Public safety officials in the Kingdom of Tonga report that the country currently has no hurricane warning system: indeed, there is virtually no reliable communication even between the government centers of the Ha'apai and Vava'u island groups and the nation's capital on the island of Tongatapu. The Solomon Islands are frequently hit by cyclones. Yet provincial centers often have no advanced warning and have no means of conveying warnings to outlying areas. Nor do they have any means of ascertaining damage once it has occurred. These problems are typical throughout much of the Pacific.

The consequences of a lack of adequate communications for natural disaster warning are enormous: not only are officials unable to provide sufficient advanced warning to minimize loss of life, food stores and valuables, but also relief efforts are hampered and reduced in their effectiveness once the disaster has struck. In the Solomon Islands, for example, a 1980 cyclone touched the Sikiana area on the southern tip of Malaita island. Officials at Auki, the provincial capital, were out of touch with the area for ten days. There are no roads to the area, wave action was too high to send boats, and there had been no radio contact whatever from the villages. Officials chartered a plane, but could only discover that people remained alive: the extent of the damage to the area was impossible to measure from the air. Nor could they tell if the people had food, water, were injured, or had other acute needs. When weather permitted, police from a nearby sub-district center walked to the area--a three-day trek. They found that it had been devastated by three waves. Five villages had been affected: their food supply had rotted, as had crops in the fields innundated by the salt water. Moreover, villagers had lost most of their cooking pots, bush knives

and clothing.

Organization of relief for the area was also hampered by the lack of adequate communications. Supplies and boats to carry them had to be ordered and coordinated on the provinces' inadequate and frequently inoperative radio telephone system and, once organized, had to be transfered to the devastated area where there was no operative communications system to allow officials to monitor fair and equitable distribution of relief goods or to supervise the replanting of subsistence crops.

Similar problems with the provision of immediate disaster warning and relief were reported in a number of other Pacific countries. In Papua New Guinea, for example, officials reported that the provision of emergency food supplies following natural disasters was extremely difficult: information about such disasters was slow in reaching officials and the organization of relief was hampered by a lack of adequate communications system. Only two months before the Papua New Guinea site visit, officials stated, 1800 people were starving in the mountainous Oksapmin region following crop damage caused by severe frosts. Relief activities had been extremely slow and ineffective.

Medical Emergencies

The same communication-limited ability to respond affects medical emergencies through most of the Pacific.* In Palau, officials told of untrained visitors to Anguar who were forced to perform emergency surgery without benefit of any medical advice and because of the lack of either communications or transportation to a proper medical facility. In the

* See also section 4.2.2.

Federated States of Micronesia interviewees pointed out that even basic diagnosis was often more than two days away because of the lack of adequate communication systems: patients must be brought in for such diagnosis since there is no means of describing symptoms to distant medical personnel. But in many cases, officials point out, even the medical evacuating of patients depends on the chancy availability of both communication and transportation: "If the radio works and if a plane or ship is available, then maybe we can med-evac a patient, "said one official. Moreover, even when all systems are functioning, which is rarely the case, there are remote atolls that require a day or more to reach. Their remoteness makes the provision of emergency medical consultation via telecommunications all the more critical for saving lives.

Even within the confines of some Pacific urban centers, communication systems are often inadequate for emergency purposes. In one such center, hospital officials noted that it was not possible for them to have telephones or warning signals installed in their homes. Though there were hardly any doctors available in the area, even those who were on call could not be reached except by sending someone by car or truck to bring them in to the hospital. In another center, hospital authorities pointed out that there was no communication between the hospital and the airport, which provides the island country with its only international air connections. "We'd have to wait for the big boom," to know if there were an airport emergency, they stated.

Law Enforcement

In many of the entities visited, law enforcement authorities are officially responsible for emergency support during natural disasters.

Yet enforcement authorities complain of inadequate police radio networks, lack of funds for the purchase of communications equipment,and poor cooperation from telephone authorities in the assignment of secure police frequencies.

In one large Pacific nation, the official in charge of police communications noted that his budget "does not even cover maintenance" of existing equipment, even though that equipment is barely adequate to reach only a small percent of the nation's district centers. Mobile telecommunications equipment is simply unavailable, he complained.

In a small Pacific country, authorities noted that the national disaster relief plan called for police to handle emergency support on a 24-hour a day basis. But national police have no equipment and must depend upon the equipment at provincial level communications centers and that equipment is often broken and inoperative. In another country, civil defense personnel depend upon communication equipment available at local airports since they have no equipment of their own and believe that the airfield communications system, while not adequate, is the best they can do during emergencies.

In one country that does have its own police radio system, officials complain that the system is inadequate, insecure and unwieldy. Police radio operates on single side band on frequencies assigned by the government telecommunication authorities. One set of frequencies is used to communicate between provincial centers and the capital. A second set is used to patch through calls from one provincial center to another. Communication, officials complain, is at best frustratingly poor in quality.

The lack of adequate police communication systems, moreover, hampers efforts at apprehending criminals, as well as efforts to coordinate disaster releif and public safety during national emergencies. One common complaint, where

single sideband radio serves as the major means of police communications, is that the lack of security on police frequencies frustrates efforts at capturing suspected criminals. Another is that inadequate village communication networks produce enormous time delays between a crime and the reporting of that crime to the police. In one country, police noted that the only means of reporting crimes in one vast area was a system of three widely spaced radio telephones that did not always function properly. And in another country, where recent efforts to install more radio telephones for police use were just completed, officials complained that lack of sufficient budget had made it impossible to purchase proper air conditioning units for one particularly hot and humid location. As a result, the equipment was soon ruined: when the room in which it was housed was closed, parts of the equipment melted. Operators then opened the room and found that the equipment soon began to rust. In most of the entities visited police complain of the lack of any mobile radio. One of the few countries to have any mobile units at all used vintage World War II mobile landpack sets.

The result of these inadequate systems is that criminals all too often remain unapprehended. In one country, for example, officials told of a recent murder that was not reported for three days--the time it took for a villager to walk to the nearest phone. By the time police arrived at the scene the body had disintegrated and clues had vanished. The pattern was similar in other countries.

Drug control is another big problem confronting many Pacific entities. A number of private yachts trafficking in drugs between Asia and the West use remote Pacific island for refueling and taking on supplies. Even in cases where smugglers have neen identified, the lack of adequate communications systems between Pacific island nations makes apprehension virtually impossible.

Authorities told of one instance, for example, where a yacht listed on FBI computers as engaged in drug smuggling was in local waters for two weeks before police were informed of its location. By the time police authorities could respond, the vessel had disappeared. Other officials noted that cannibus is often planted on remote islands by visiting yachts which return months later to harvest it. Yet police have no means of tracking the yachts.

Surveillance

Clearly some surveillance capability would be most useful to law enforcement officials, both in the control of drug trafficking and in the control of illegal fishing operations. Virtually every Pacific nation has declared a 200-mile fishing limit and is currently licensing fishing vessels that wish to operate within that limit. (Tonga is perhaps one of the few exceptions: it has declared its intent to announce a 200-mile limit but has not yet set up a licensing system). The licensing system represents considerable revenues for nations that otherwise have limited sources of cash income: generally, licensed fishing vessels are required to pay royalties or the equivalent of a percentage of the catch to the country claiming the waters in which the fish were caught. But without proper surveillance the system has become almost meaningless.

Lack of surveillance poses problems in relation to both unlicensed and licensed fishing craft. Unlicensed craft can poach with little difficulty--the only threat they face is that licensed craft may inform authorities. But this is hardly a significant threat since when this occurs they are able to leave the area before police can organize to catch them. In the few instances

where such craft have been caught, there has been significant benefit to the island nation that caught them, both through fines and through the confiscation of the offending fishing vessel itself. Moreover, if such vessels could be discouraged, the fish catch for licensed vessels would be likely to improve and the island nation would thus benefit from increased royalties.

Without surveillance, even licensed vessels become a problem for their host nations. It has become common practice for fishing vessels to report their locations outside the waters of their host nations and thereby reduce the amount of royalty owed. A fishing boat, for example, may report to Belau that it is fishing far south of that country's waters. The same boat may report to Papua New Guinea that it is fishing far the north. Without surveillance, neither country can benefit from royalties and neither can inform its neighbors of suspected irregularities.

Lack of surveillance capability also has implications for the safety of ships at sea, including those vessels that are engaged in illegal fishing or drug operations and would prefer that their location remain unknown. Tales of wrecked vessels and marooned crews are surprisingly common in many of the entities visited. In addition to the needless loss of lives, lack surveillance complicated by lack of adequate communications systems on remote atolls has in recent years produced a number of incidents. Officials in one country told of a fishing crew of 19 marooned recently on a remote atoll. Atoll dwellers shared food supplies with the crew until supplies became dangerously low. They had no means of informing central authorities of their dilemma since their radio telephone had long been out of service. They could only wait for the arrival of a supply ship that

serviced the atoll at irregular intervals. By the time that ship arrived, however, the island residents and the marooned crew were facing near starvation. Additionally, hostility had broken out between the two groups and there were a number of incidents of violence. Similar incidents were reported by authorities of several countries. All of these incidents were recent, and all could have been prevented or ameliorated had there been adequate surveillance systems for ships at sea and adequate communication systems for remote atolls.

4.2.4 EDUCATION

"We have pushed education to the limit and that limit is communication."

Polynesian outer island

Introduction

This section and the three which immediately follow address the issue of how a new nation prepares itself for participation in the economic and social mainstream of a world on the verge of a new millenium while preserving the unique characteristics that set that nation's island population apart from the rest of the world.

The history of education for Pacific islanders has varied depending on which colonial power has controlled an island group during the past 100 years. In nearly every case education for children, especially through the secondary level, has come relatively recently. While missionaries were quick to devise orthographies for rapid translation of the Bible into the vernacular and equally quick to train considerable numbers of the adult population to read those translations, such ideas as universal or free education are recent and, in many newly independent island states, have not been actualized. The following sections on human resources and particularly on training reflect some of the reasons that such notions are still considered luxuries, and, indeed, in some cases, are viewed as incompatible with the national development goals of some countries for the foreseeable future.

Communication's Role in the Development of Education

Education is essential in order for development to proceed at the pace and to the level policy makers and the communities they represent

realize they require. Education is a basic requirement in order for students to be basically and appropriately prepared for training in the special skills that support their nations' development. Education is severely crippled by a lack of adequate communication between communities, schools, curriculum planners and government administrations.

Basic communication is essential to the efficient running of a school. National broadcasting has long been an invaluable tool. Communication with parents who send their children to town to board with relatives or in dormitories, is only possible through broadcast radio messages and letters which sit sometimes for 5 to 12 weeks awaiting a field trip ship. Central education departments broadcast messages to principals, telling them to come in to town for supplies or for information too complicated, lengthy or confidential to be broadcast by the local station. Otherwise, central education officials are forced to send messages by boat or by road; such use of transportation as communication is expensive and time-consuming. Often, the response to such messages requires that principals leave their posts for an equally costly trip to town. In most countries, distances and access to most schools are too great for such double roundtrips to be a reasonable means of communication.

Principals with relatively easy access to town reported that they had to make the trip three to five times a week for the normal course of business, and more frequently for emergencies or specific problems. One principal indicated that such frequent trips were required simply to gain permission from the Education Department for community use of the school facilities for meetings, etc. The school is usually

the center of a community. Typically, the school building's roof is the central water catchment for a remote village, and people congregate at the water tank for discourse and information. Atoll principals are required to wait for sufficient radio contact with the center to get permission for credit at the sole local retail cooperative store. If conferencing capability were available on a two-way radio, countless hours and financial resources could be saved.

In several U.S.-administered territories, HEADSTART enrichment programs for pre-schoolers, provide just that--an excellent headstart for children before entering school. Nutrition and medical screening are among the particularly beneficial aspects of this popular federally-funded program as is the cultural component which brings children into contact with traditional leaders in their communities who teach them chants and other cultural information unique to their village. Head-start programs visited in Belau have two-way CB radios which cut in half the running back and forth to town. It is of utmost importance for people in rural areas to know when the supply boat is due so that appropriate crews of people can be available to unload it before the tide changes.

One high school principal detailed the ordering of books. While replies from vendors take from four to six weeks, elapsed time between that reply and the actual delivery of the books is from six months to two years. This same Micronesian principal indicated that while the moving of the capital (and red tape) from Saipan to Ponape, a thousand miles closer, has shortened the distance, and, he had thought, the hassle of administrative tasks, it has not yet seemed to shorten the wait for supplies.

When officials in the Federated States of Micronesia were asked what kind of communications they had, they explained that they can reach schools by boat or by road. No mention was made--and this happened in discussions with many other departments too--of telecommunications facilities because they simply are not sufficiently reliable (when they do exist at all) to be considered a functional aspect of the infrastructure.

In the Federated States, 60% of high school graduates go on to college. This has been possible largely because of the federal Basic Education Opportunity Grant program which, some say, offers a great deal more benefit to the institution than to the student. Improved communications would allow more constant and efficient monitoring of such programs. Only 5 per cent of these students graduate from college. And few are trained for the tasks integral to national development.

In one Polynesian country officials described the collection of salaries. It is far too expensive for the education department to hire a boat, so teachers catch rides to the capital or other centers and then charge the education department for expenses. Electronic data links would alleviate this problem, as would simple voice links which might make other arrangements easy to accomplish and then to explain.

On one Polynesian outer island which takes pride in an education system that includes a fine secondary school, communication is so difficult and transportation so further complicating, that two years ago someone was actually sent to New Zealand to fetch and hand-carry back the exams so important to the future of those students about to complete their high school education.

Another example of the complications arising from poor or non-existent telecommunications links was described at the Ponape Agriculture and Trade School which sends out over 10,000 letters per year soliciting donations to sustain the school. Much of this paper work, officials, felt, could be eliminated if adequate telecommunications were available.

Conclusion

The effects of telecommunications on education and of education on telecommunications are cyclical. Myriad descriptions of the limitation to education that are caused by inadequate communications are presented here.

Some of the students these educational systems endeavor to prepare for careers will enter technical fields. There is (as described in Section 4.2.3) very little in their experience or in their primary and secondary education, that leads them to pursue any innate penchant they may have for careers in technical fields, including telecommunications. Students entering such fields must be able to rely on a sturdy basic education in order to participate in improving the system which will provide a means for further developments in upgrading the education system. But, because of the limits of communications, the growth of both systems has been severely hampered.

4.2.5 TRAINING FOR DEVELOPMENT

"Development plans need to suit the place, the temperament and the resources - then relate to the budget."

Cook Islands

Introduction

The development of an adequate communications infrastructure within and between the Pacific nations is dependent upon the retention of a sufficient number of trained technicians to maintain and operate such a system. The issue of training--especially technical training--was raised repeatedly during country visits. Most of the new nations in the area require the services of expatriates with certain professional and technical skills. The manner in which such foreign nationals conduct their work and relate to host country nationals was also widely discussed.

Lack of Technically Trained Pacific Islanders

Pacific Island entities face a crucial problem of insufficient numbers of trained, competent technicians to handle the growing volume of technological equipment in use. According to figures gathered by the International Telecommunication Union, in the entire Pacific, outside Guam, Hawaii and the French territories, there are only fourteen local persons trained as engineers. They are all located in Papua New Guinea and Fiji.

Communications technology is rapidly becoming easier to maintain and service. The maintenance required is less complex than in previous generations of technology: solid state devices are more reliable and maintenance-free than the older, mechanical types of communications equipment. But in order to maintain a communications system within a country or a region, personnel must be trained to understand that system and its component parts.

Acquiring Technical Personnel

The solution must be either to import a parade of trained expatriates or to train and employ people in the required technologies. The first alternative--the importation of expatriates--is at best a temporary solution (although it is the solution in practice at present in most Pacific countries.) The second, apparently sensible in the long run, is not now evident in most entities: local people are not being trained in technological areas in large enough numbers to meet the current demand. Moreover, because of the scarcity of technologically trained nationals, there is a pattern of moving trained nationals into management positions. While it may be politically essential to do so, the pattern has the disadvantage of removing the few technologically trained individuals from professional work into administrative tasks. A vacuum is then created in mid-level management and engineering posts. That vacuum, in some countries, is filled by expatriates.

Expatriate Employment

Cable and Wireless, the United Kingdom company that, in partnership with some island governments, handles much of the communications service for the Pacific areas that were once affiliated with Great Britain as colonies or remain affiliated as members of the Commonwealth, prides itself on its ratio of local employees to expatriates: there are only three expatriates employed at the new Cook Islands Cable and Wireless office. They are, however in top management positions.

In Papua New Guinea, expatriates complain of a different problem. Papua New Guinea citizens with only a few years of technical training and experience are rapidly moved to top positions. A local citizen

with perhaps four years of engineering experience beyond his tertiary training will be found in a high level management post in telecommunication while Australians with ten or more years experience are required to work for that individual.

The situation in telecommunications is, in one form or another, duplicated in much of the Pacific. There are insufficient numbers of trained persons to meet the demands of expanding systems and the gap is filled by the employment of expatriates. In some countries, particularly those where foreign companies (ofter working cooperation with Pacific national governments) provide telecommunications services, the expatriates sometimes form the top and the middle levels of management and hold the top technical posts. Thus at many of the organizations that provide international satellite telecommunications connections, all but the lower level technical posts and menial posts are often filled by expatriates.

Reasons for Lack of Trained Personnel

The reasons offered for the lack of a sufficient flow of technically trained individuals into the workforce vary with the individuals interviewed. The most officious and illogical reason--usually propounded by expatriates with tremendous vested interest in remaining in the host country--is that Pacific islanders are simply incapable of grasping technology and cannot by trained to become competent technicians and engineers. In general, the older the colonial power associated with an island entity, the more often this sentiment was expressed by resident expatriates from that colonial power.

Thoughtful persons--frequently in these same island entities--point out that, while there is a great deal of talent and ability, there is, in fact, a tendency for Pacific islanders to go into such fields of study as teaching, management and the humanities rather than mathematics, science and technology.

Why is this so? One Vanuatu interviewee pointed to the lack of teachers trained in math and science: it is unlikely that many students enthusiastic about advanced training in technology will be produced by a school system with inadequate and reluctant teaching of these subjects. In other countries people pointed out an additional problem: expatriates themselves often fail to accept training as an appropriate part of their role. Where expatriates do take training seriously there is ample evidence of technology transfer. For example, the Director of Radio Vanuatu is a ni-Vanuatu (indigenous personnel) trained on the job within broadcasting. Likewise, in the Solomon Islands the expatriate manager of the Solomon Islands Broadcasting Corporation trained his counterpart during his three-year contract and has effected a transfer of his duties to a Solomon Islander who now serves as a system manager.

In Papua New Guinea the Posts and Telecommunications authority which depends heavily upon expatriate technicians recently upgraded its system for selecting and training telephone technicians, and is increasing its output of locally trained workers.

The key problem almost everywhere in the Pacific, however, seems to be an inadequate flow of young people interested in pursuing advanced training in technological fields. The number of training institutions available within the region has grown: technical courses are offered at trade level in Kiribati, the Solomon Islands, Fiji and Guam. Basic technical training is offered in the Cooks, Tonga and Western Samoa.

More advanced telecommunications training is available at the Papua New Guinea Telecommunication Training Center in Lae and at the Telecommunication Training Center in Suva, Fiji. The University of Lae, as well as the University of Hawaii, offers tertiary degrees in engineering.

The problem, then, is not the availability of training institutions. It is, rather, the availability of students to enter those schools. (To some extent there is also a problem in finding sufficient numbers of technically trained Pacific islanders to serve as instructors in these institutions. Since Pacific countries have so few trained technicians, departments are understandably reluctant to release them for service as instructors, despite the long term benefit.)

Recognition of Training Needs

The important role of expatriates in telecommunications is particularly noticeable, and the need to train local replacements, is well understood. Indeed, there is a general agreement among national authorities that the situation is the same for every level that requires specialized expertise. Real needs exist for more training in a number of areas from telecommunications to tourism.

In Fiji, which is attempting to develop a stable, efficient and profitable visitor industry, tourism officials point to the need for worker training. Such training, they say, would assure the travel industry of a supply of workers who could perform "hard and consistently" to service visitors. Moreover, officials insist it is considered vital that all Fijian citizens be, in a sense, sensitized to the value of tourism as a source of national income so that they will treat visitors considerately.

The training of managers and finance officers is recognized as crucial by authorities in the countries that make up the United States Trust Territory of the Pacific Islands. Such training is of special importance in regard to the use of grant and contract funds for U.S. federal programs. A staggering number of these programs are, according to officials, currently inauditable because of inadequate accounting procedures. Leaders in both health education and women's concerns in the Solomon Islands point out that their most immediate need is advanced and specialized training of their own staff members--to "train them to be trainers".

In many of the nations visited, the training of managers and finance officers is recognized as essential for the development of marketing cooperatives. In Fiji, the Ministry of Cooperatives recently placed two mobile units in service to bring training films to villages beginning new cooperatives.

The Shortage of Local People

In the Solomon Islands one local educator speculated on the reasons for the lack of sufficient numbers of trained Solomon Islanders. The British, he explained were slow to identify needs and even slower to train Solomon Islanders to fill those needs. The first secondary school in the country was opened only in the mid 1950s. Before that time, the few Solomon Islanders who received secondary school training were sent out of the country. It was in the early 1960s that girls were first allowed to attend secondary schools. It was not until 1957 that the first Solomon Islander received a university degree.

The attitude of the British, according to the educator, was, "you are not ready yet." Only in the 1950's did the British colonial government take

enough interest to begin a public school system at any level. Until that time the authorities had left education to the churches, which were "more interested in converting than in educating."

He pointed, as well, to another problem--one that has carried over into independence: the country depends upon a number of expatriates who retain a traditional colonial attitude and are more interested in staying on in Solomon Islands than in training local workers as their replacements.

In Vanuatu, colc ial authorities, both French and British, did not commence building an educational system until the late 1960s. Thus there is, understandably, a critical shortage of ni-Vanuatu with advanced training in any field.

In the entities that make up the Trust Territory of the Pacific Islands, more attention was paid to the education of island residents, probably because the United States has a well established tradition of compulsory schooling for all children. While there is ample room to debate the suitability of the particular schooling offered within the island entities, the fact remains that the basic skills were more readily available to children in the Trust Territory than in other colonial areas of the Pacific. Nonetheless, there remains a significant problem of lack of specialized training, particularly in technical areas.

It would seem clear that throughout the Pacific the idea of training in the skills required to achieve independence from an expatriate work force came relatively late in the history of colonial management. It is not surprising then, that training is a primary need in many Pacific nations. The role of expatriates in providing that training, however, has been uneven.

Lack of Technological Environment

The best insight into this problem presented so far by interviewees seems to be that children growing up in the Pacific island village environments do not have daily experience of technology. Most spend their formative years without access to telephones, radios, alarm clocks, electric toasters, typewriters, automobile engines, television sets, etc. They have no exposure to "hands on" technological experience.

Children growing up in technologically developed countries are surrounded from birth with an array of gadgetry: they learn to handle machinery. They have frequent opportunities to watch others dismantle mechanical devices and repair them. They can take things apart and know the occasional satisfaction of getting them back together again. They are familiar, as well, with the language of technology. They watch rocket launches and moon landings on television as they are actually hapenning. They read maps and use telephones routinely. Island children, exposed to an entirely different array of experiences, assimilate knowledge that is not available to children in technologically developed countries. But they may lack the easy familiarity with technology that would enable them to feel comfortable in selecting careers in technical fields. Number concept too, differ considerably for Pacific Islanders. Some Pacific cultures have numerous counting systems unknown to the Western world. Clearly, if teachers are drawn from a population of individuals who are not comfortable with Western math technology, then the problem is compounded rather than alleviated through the process of formal schooling.

Parallel Problem for Women in Developed Countries

An interesting parallel problem within technologically developed

countries may add some valuable insights. In countries such as the United States, the invention, design, installation and maintenance of technical equipment has, until very recently, been considered the exclusive province of males. Just as insensitive expatriates in the Pacific today insist that islanders are not capable of acquiring the technical skills to manage a modern infrastructure for themselves, so for decades women in developed countries were told they did not have the natural ability to excel in math or science or to acquire mechanical or technical skills. Indeed, it should be pointed out that in a large part of the technologically developed world this notion is still quite dominant.

The idea operates as a kind of self-fulfilling prophecy. Young Western boys, for example, are expected to help their fathers in carpentry chores that require the acquisition of basic mathematical concepts. They are allowed to assist in the dismantling of automobile engines and radio sets. They are given toy airplanes, chemistry sets and mechanical design sets. Until quite recently, on the other hand, girls were steered away from "masculine" technologically oriented pursuits. (In 18th and 19th century England it was considered physically damaging to the female brain to pursue such subjects as mathematics.) Indeed, the majority of girls did turn away from technological careers. It was inevitable since their entire upbringing and schooling was designed, with good intention, to convince them that they were naturally lacking in aptitude in these areas.

The Pacific island experience has been similar. Young people are often told technical training would be inappropriate for them: they are neither encouraged nor anxious to seek it.

Special Programs

In recent years there has been a recognition that a nation, whether large or small, can ill afford to waste one-half of its human resources by subtly steering young girls and women away from technology even though they might have the natural potential for technological work. There has been a marked, conscious effort to change both the attitude of school teachers and the curricular materials available so that girls now entering school will be encouraged to develop their potential in math and science. Special programs have been developed to cope with math anxiety that has been engendered in girls who are already of high school age and in young women entering college. These programs are remedial in nature and are intended to supply the base of technologically oriented skills that in most nations has long been built into the upbringing of boys.

One American engineering university has proven this by taking young women who intended to study there and giving them the opportunity to spend a summer in "hands on" technical work: they took such courses as automobile mechanics and basic electricity, and they were given actual experience in taking engines apart, dismantling and assembling radios, television sets, etc. The normally high attrition rate for women dropped significantly after the program was introduced: young women began to perform as well in their engineering classes as the young men enrolled in the university.

Such programs prove that when "hands on" training is made available immediately before the beginning of tertiary training, it can enable young people--men and women alike-- who are brought up outside technological societies to develop sufficient skills to excell in technological careers.

In the Pacific context, the lessons may be twofold: first, that attention to training is the key to the achievement of an adequate communications infrastructure, and second, that training must take into account the fact that not all islanders grow up in a technological environment. For those island citizens who have not had this total emersion during their formative years, successful training must begin with the provision of adequate experience in technology.

Examples of Successful Training

There are ample illustrations of expatriates who have successfully transferred special skills to Pacific island counterparts. It is possible, then, to state: 1) training of local people can be accomplished successfully where there is a desire to do so, and 2) there are foreign nationals who view it as an appropriate part of their role to engage in such training, even in instances where it will, if successful, cause them to work their way out of their own jobs.

On Ponape, in the Federated States of Micronesia, the Ponape Agriculture and Trade School (PATS) provides one of the oldest examples of the successful transfer of technical skills to islanders. The school, which operates on the secondary level and serves students throughout the Trust Territory, was begun in the 1940s by a Jesuit priest for the purpose of training Micronesians in mechanical, agricultural and technical skills. PATS has won international recognition and support for its work.

The school has reached the point in its development where it employs a large number of its own Micronesian graduates as instructors. Indeed, its principal is a graduate of a dozen years ago. Its reputation for

producing skilled graduates is excellent. PATS recently launched a new program for young women and is currently training them in the same technical areas as its male students.

On a more modest level, also on Ponape, there is a hotel run by American expatriates who have trained a local staff to offer consistently high quality visitor services--something that has not been available on that island. Similar private training by former New Zealand expatriates has produced excellent tourist services at a small hotel on Vanua Levu in Fiji.

Two examples from radio broadcasting are presented in section 4.1.3 of this report. One involves the long neglected Solomon Island Broadcasting Corporation which recently received considerable support in the form of Australian aid and personnel seconded from the Australian Broadcasting Commission. The upgrading of equipment for SIBC has wisely been accompanied by expatriate staff whose vested interest is in improving the delivery of broadcast services and therefore in training their Solomon Island replacements. The second program, in Vanuatu, is even further along, and the new and excellent broadcast facility in Port Vila is now managed by a ni-Vanuatu who received his training on the job in that country.

Examples of Lack of Attention to Training

Unfortunately, there are in the Pacific a number of examples, at a number of levels, of expatriate workers who neither train local replacements nor seem willing to leave their host countries or their jobs. This pattern seems to be particularly prevalent in Melanesia. In one Melanesian country, several expatriates who were interviewed contradicted each other concerning which of them had been in the country for the longest time:

each seemed to want that honor. All had been in the country a minimum of 18 years and all served in top level civil service positions (but on salary scales comparable to their fellow nationals at home rather than to the nationals of their host country.)

One of these expatriates frankly pointed out that in his own country he did not have the qualifications or training for anything but a relatively low level position while as an expatriate he was able, without competition, to hold down a high level position with considerable authority. His fellow long-term expatriates each ran major departments in their host country. They would be unlikely to have similar opportunities at home.

Deleterious Expatriate Attitudes

Is the problem that local people are untrainable? Have expatriates tried to train and failed?

There is, of course, evidence that training is not easy and there are valid, understandable reasons for the difficulties. But, there is absolutely no acceptable evidence that local people are untrainable. There is indeed evidence, however, that the failures, where they do exist, are related to either self-interest on the part of expatriates who wish to retain their positions, or, to chauvinistic attitudes that would seem embarrassing in the twentieth century, particularly among those who depend for their livelihood upon host countries whose nationals they disparage.

At least a few of the expatriates who harbored these attitudes were surprisingly candid about them. In the Federated States of Micronesia, for example, one highly placed expatriate, discussing the servicing of

communication equipment, argued "Who's going to service it? If you say a native, I'll throw you out that door".

In Vanuatu, another expatriate involved in the provision of telecommunications insisted that whenever an expatriate left the country and a ni-Vanuatu took over "the situation deteriorates". Expatriates must be called back in, he said, and the systems are then built up again. Ni-Vanuatu may have the technical competence to maintain the system, he said, but "they don't have the desire to do it". They do not have the common sense, he argued to approach problems logically. Perhaps with more experience than his two months in Vanuatu he will realize his need for additional training in order to do appropriate training.

Conclusion

In order to meet the demands of national development, especially in the area of communication, a greater number of island citizens--men and women alike--must be trained in technical fields in the coming years. Ideally, such training will begin with earlier exposure to basic technology while students are still in school, well before they choose a particular field.

The continued presence of expatriates who denigrate the professional potential of their local colleagues must be rethought by host country officials whose responsibility it is to ensure that only those expatriates are employed who are able not only to provide the skill for which they were hired but also to impart skills and to foster a sense of professional competence among their local counterparts.

Otherwise, the long term price will be unceasing dependency on outside assistance even after the dollars to pay for that assistance are no longer forthcoming.

4.2.6

WOMEN AS A RESOURCE FOR DEVELOPMENT

"The problem is not in having girls here. The problem is what happens when they graduate. How acceptable will they be--a girl mechanic, for instance."

Federated States of Micronesia

The Role of Women

As described in the preceding two sections, officials recognize that the lack of trained human resources hinders development and the planning of suitable national infrastructures in the Pacific. In telecommunications the expertise even to maintain existing systems at a minimal level is lacking and the possibility of designing and creating future, more appropriate systems is severely hampered.

Given this reality, the utilization of all available human resources is all the more critical to developing Pacific nations. The failure to recognize the potential contribution of women--one-half of the Pacific population--to development can be particularly counterproductive.

The role of Pacific women, though varied from culture to culture, was of considerable importance while island societies were based on subsistence rather than money economies. As these societies have moved away from subsistence, the roles of both men and women have become less clearly defined and adjustments have not been easy. On balance, however, it can be said that the transition has been more difficult for women than for men and that the traditional roles women have played have been gradually eroding while no new roles have taken their place.

At the same time, there is general recognition on the part of men in positions of authority of the need to bring women into the economic mainstream in order to maximize national development. For example, in the Federated States of Micronesia and in Belau, women are beginning to enter the police force. In the Kingdom of Tonga women have become a part of several branches of the police and defense forces. FSM now has three policewomen (and 62 men). In Vanuatu, the agriculture department is beginning to train women as agricultural extension officers. And Papua New Guinea is currently training its first women as telecommunications technicians. Interestingly, the five women currently undergoing training are among the top ten students in a class of 47. They entered the telecommunications training program of their own accord as members of the first class selected on an examination and merit basis. Earlier classes had been selected at random from among persons already employed by the telecommunications authorities.

The Lack of Women in Government

One of the most striking and noticeable features of the country visits was the virtual absence of women in government leadership roles. As the project team traveled from country to country and from government office to government office, interviews took place with dozens of men but the opportunity to discuss with women leaders their own view of the role of women in development within their nations was limited. The fact is that there are hardly any women among the national leaders of the Pacific countries. In one entity, for example, where there is a greater proportion of women than men graduating from public schools, and where officials stated that there is a strong leadership role on the part of women in family affairs,

government leaders have expressed as policy the belief that women should not to be included in politics and therefore should not interfere with any non-family business.

In another country, even the opportunity for leadership was foreclosed until relatively recently. The first secondary school for girls was not opened until the mid 1960's, a decade after similar schools were opened for boys. Any parent who wished to educate a daughter had to send her outside the country. The result of this lack of women leaders is that most of the countries, while recognizing the need for a stronger role for women in development, are doing little if anything to bring about that stronger role. In most nations, the numbers of girls and young women attending schools were considerably lower than boys and young men. Where special programs to improve the lives of village women did exist, they were generally underfunded and understaffed. In one Melanesian country, for example, there is an active government-funded women's interest program, with seven staff members, housed in an out of the way bungalow where little daily contact with on-going government happenings could be maintained. The workers are responsible for traveling through rural areas to do nutrition, child care and hygiene training and to establish small programs that will help village women achieve some measure of economic self-sufficiency. The number of workers was clearly minuscule compared to the size of the task and the workers themselves complained of feeling isolated, unsupported and in need of more training of their own in order to begin accomplishing their government set goals. The need for their effort was underscored on a site visit to the island of Malaita, where it was stated that one of the gravest economic problems

in the rural areas is that men leave the villages to seek employment and do not return any cash income to their families. The women, who remain in the villages, have no economic resources and no means of achieving membership in the developing cash economies of their countries.

Similar economic problems occur for women in other Pacific countries. In Belau, for example, family structure has broken down to the point where large numbers of women remain without the economic support of men. Five years ago, five of thirty children born in Belau were born to unwed mothers. Today, while the birth rate remains stable, twenty of every thirty children are born to unwed mothers.

Among the recent efforts to bring women in the economic mainstream is an experimental program begun recently at the Ponape Agriculture and Trade School (See Section 4.2.5.). Several years ago the institution accepted its first female students, offering them an identical course of study to male students. The first four female students graduated in 1981. The school trustees are examining the experiment in order to determine the directions they should take in the future. The problem is not whether to continue accepting girls. It is, rather whether special courses of study along more traditional female lines, should be introduced.

While such a step may seem backward to western trained minds, it is being considered (but not yet taken) into recognition that traditional community values may not yet be ripe for the challenge of women trained for employment in technical fields. Officials are frankly worried as to whether or not female graduates will be able to obtain jobs in the community, even where their skills are sorely needed.

The same concerns were expressed in Papua New Guinea in relation to sending trained female telephone technicians into the field. And, in Vanuatu, even though women are beginning to receive training in agricultural work, officials expressed some doubt that they would be able to use women in the field as agriculture extension workers. While these graduates may be useful in training women in the villages in such areas as first aid, nutrition and home economics, it was generally felt they could not be used in training male villagers.

Steps Toward Change

While such concerns may be legitimate, women in many of the Pacific entities visited are beginning to express the belief that acquiescing to such concerns may deny women entry into training programs. This result will not resolve either the problem of vocational training needed by women or the problem of national needs for trained technicians.

In recent years women's concerns group have sprung up in a number of Pacific countries, many of them with the encouragement of the United Nations, which set the model for such activities with its 1975 through 1985 Decade for Women.

In the Solomon Islands, for example, a women's meeting held in 1977 as a follow up to the UN sponsored International Women's Meeting in Mexico City, came up with a platform on women's needs that recognized the importance of the traditional family role of women in Melanesian society but that also urged: "It is incumbent on them as women to look beyond the immediate environment of the home; not to abandon the home, but to become more knowledgeable and concerned about those factors which

also influence it from the outside." The platform included such items as encouraging women to stand for public office, establishment of programs for unmarried mothers and unemployed women, and establishments of improved information networks specifically on women's issues. The Fiji women's United Nations mid-decade plan of action expressed similar concerns, pointing out the need for more active involvement in the professional and political life of the country, the need for more programs that address specific problems of unmarried or unemployed women, and the need for a women's resource center and a more adequate communications network on women's issues.

Both the Solomon Island plan and the Fiji plan underscored, as did many individual interviewees, the belief that it is absolutely essential for women's groups to work through existing government mechanisms in order to bring women into the economic mainstream. Indeed, most items in the women's programs that have been articulated are specific programs requests directed at specific government ministries which the women's groups believe need attention.

At the 1980 subregional meeting for Pacific Women, sponsored by the UN Economic and Social Commission for Asia and the Pacific and attended by women from 11 Pacific Island nations, key issues included: "women's unequal access to employment opportunities and to educational and training facilities, the lack of management training opportunities for women and the relatively insignificant role of women in decision making and leadership positions. The position of rural women remained a major concern, as did the existence of unsanitary living conditions and the lack of adequate water supply. The difficulties of solving

these problems were exacerbated by the absence of adequate statistical data on the condition of women."

The recommendations adopted by the meeting mirrored the recommendations adopted by individual nations' women's meetings. They underscored the need to work through existing governmental bodies and the need for women to be brought into the business of government throughout the Pacific both as participants and as recipients of government programs. In training, they specifically noted the importance of making available "training in new technologies and skills" on an equal basis to both men and women.

Conclusion

In response to the meeting recommendations, the United Nations Development Program in the Pacific has proposed a specific project aimed at helping Pacific governments establish programs that will be "supportive of the interests of women in national development within the Pacific Region" and will increase the ability of Pacific governments to bring women into the economic mainstream. It goes without saying that increased access to telecommunications facilities would provide more far-reaching opportunities for rural women's needs and interests to be heard and for rural women and urban women to band together to ensure that their potential as a stabilizing economic and social resource be recognized both nationally and regionally.

4.2.7

PERSONNEL: THE SINGLE LAYER PROBLEM

"Trained people have no replacements."

--a Conference participant

The Resource Pool

In the Pacific islands the number of people appropriately trained to organize and maintain the infrastructures of these new nation is sorely inadequate. The population base in each of these entities is tiny, and only with careful planning will the pool of citizens be sufficient to provide the various sectors of government and private business with appropriately trained personnel for nation-building. (See section 4.2.5. on Training for Development). It is important for the planners in these nations to project the number and kinds of trained personnel necessary for various fields; such decisions depend on the national development goals of each of the countries and on whether the basic population pool is 3,000, 14,000 or two million people.

Defining the Single Layer Problem

Trained local personnel rarely have replacements when their work is interrupted because of illness, training courses, regional meetings or even for well deserved holidays. Such a situation is characterized as the "single layer" problem. In one Polynesian example, the radio operator and a garage manager do not work on Saturdays for religious reasons; and they have no replacements; so, wireless is not available on Saturdays and no one is available to repair machines. It was reported that the latter charged double the following day because he was forced to work on Sunday! When the single radio operator is not working for whatever reason, there is no one else available to handle communication between police, firemen, harbor authorities and the government administration. In some

cases, national safety is at stake. American Samoa's recent commitment to haul water to Canton Island could not be met because the tug and the personnel had to be kept in the harbor for cannery ships. At the same time there was a hurricane watch; the possibility of ensuing emergencies required that the Canton-bound ship and its personnel remain in port.

Moving Into Management

Another difficulty is that trained local personnel are drawn up into the ranks of management without expertise in management skills or anyone willing (expatriates) or with the time (other local managers) to train them. When people are forced into managerial positions, they are themselves unable to train others because they have not had sufficient time on the job in their original positions to have developed in-depth professional skills prior to their upward posting. Thus, managers are unskilled at both managing and at training and their expertise--or potential expertise--is lost at the working level. The result is that new young recruits have no one to serve as professional models. Interviews in one Melanesian nation revealed that often those who have had to move up are less skilled than those they supervise (often expatriates) and will never have the opportunity to gain the experience necessary to make them the models that the young workers beneath them deserve and sorely need in their psychological and professional development. A sense of professional insecurity prevails.

People are not trained in appropriate skills. In many cases officials lamented their inability to take advantage of the offers of many international agencies to provide project funds and materials simply because the host governments did not have the funds or appropriately trained personnel to implement and manage the projects.

Even the June Users' Meeting (see Appendix B.) was an example of the single layer problem. There was no backup for some of the individuals invited to represent their governments. Several were unable to attend or to send someone else in their own field to represent them, simply because there was either no backup person in the home office or there was no appropriate replacement with similar skills and experience to send to the meeting.

Good managers are switched from ministry to ministry because the government sees them as mediators between the ministry and the minister; they are not viewed as the primary, senior professional in that particular field. As a result, a medical doctor may direct the telecommunications and transportation efforts of a government (which is an actual example), or an engineer appointed to run a department may lack the skills for doing an adequate job while his sorely needed skills and experience are lost to those who are struggling in his own field.

Thus, there is heavy dependence on expatriate assistance in some vital fields in order for trained persons to be spared for advanced training abroad or for them to train younger newer workers in their field.

Similar problems exist in education, though this situation is hardly unique to the Pacific or the developing world in general. In one Melanesian country, good teachers were drawn up into the ranks of administration, the level of expertise in the classroom, it would follow, remained very low.

Telecommunications

In the case of telecommunications, the development of a cadre of

professionally competent technicians, engineers and managing administrators is crucial for the implementation and management of a reliable system. The single layer problem is particularly acute in the field of telecommunications because the small pool from which local personnel can be selected is further narrowed by the requirement that telecommunications personnel have technical aptitude to begin with. (4.2.5. contains descriptions and documentation of specific training problems in fields that require such technical expertise.)

People in jobs can only act in one capacity at a time, no matter how broad their skills or how far-reaching the demand of their department or company. In one Polynesian country a technical training program was set up, but the only trainer was also the chief technician and the only person who could keep the telecommunication system operating. It was, therefore, impossible for him to sustain any effort in the area of training, despite the fact that he desperately needed someone to back him up in his efforts to function in a variety of professional and highly technical roles.

Conclusion

Small populations have difficulty producing sufficient numbers of adequately and appropriately trained personnel for the many varied jobs that are vital to the building of a nation. Those who are trained locally or sent abroad take on jobs from which they are plucked before they have had the time and experience to gain expertise and confidence in their professional roles. These professionals are catapulted into managerial positions for which they are ill-prepared; they know well neither the skills of their former jobs nor the skills of management, and worst of all,

they are ill-equipped to train those who come up through the workforce seeking role models and specific training.

This single layer problem brings with it professional isolation. Employees have no one else to talk to who knows how to do the same thing. There is no collegial camaraderie; there is no source of a second opinion and there is no security-engendering support from others like oneself. Reliance on expatriates perpetuates this cycle from which local professionals cannot break out. Careful planning is required on the part of the central administration, planning departments and the management of each government department as well as the private sector in order for sufficient numbers of appropriately trained people to take on the roles required in the pursuit and achievement of national development.

4.2.8

ATS-1: THE UNIVERSITY OF THE SOUTH PACIFIC, PEACESAT AND DISPNET

"We can't encourage outer island students to take degree courses because they don't have the benefit of the satellite."

-- a USP Center Director

Since 1969 the National Aeronautics and Space Administration has made available for a series of experimental communications projects its Applications Technology Satellite No.1 (ATS-1), an experimental geostationary satellite launched in 1966. These experiments are among the first in the world aimed at determining what educational, social and medical benefits can be derived from satellite technology. Three networks, USPNET, the University of the South Pacific Network; PEACESAT, the Pan Pacific Education and Communication Experiments by Satellite; and DISP, the Department of the Interior Satellite Project Network, currently utilize ATS-1.

The University of the South Pacific is the single major source of tertiary education in the region. While students in the U.S.-administered territories have access to the University of Guam, the College of Micronesia, and the Community Colleges of American Samoa and the Northern Marianas, as well as to colleges and universities in Hawaii and on the U.S. mainland, USP provides a unique scheme of extension services to students in the South Pacific who are unable to make their way to metropolitan universities abroad, or even to the Laucala campus of USP in Suva, Fiji. (There are also two universities in Papua New Guinea).

Besides the traditional resident tertiary education available at the main campus in Suva, in 1974, USP established at NASA's invitation, its own experiment satellite network to test the effectiveness of satellite educational activities for the regional university using ATS-1. "The 23 hours per week of University broadcast time currently allocated by NASA are divided between credit courses, tutoring sessions, adult education courses, conferences and administrative sessions." A campus specializing in agriculture has been set up in Alafua, Western Samoa. It operates an agricultural advisory service which is still in its formative stages and conducts programs in biological control, marketing and other aspects of tropical agriculture. Other campuses, or Centers, are linked to Suva, and with one anotherm by ATS-1. A small computer link is also in the early stages of use among them. The Centers are located in the following capitals:

COOK ISLANDS	Avarua, Rarotonga
KIRIBATI	Tarawa
NIUE	Alofi
SOLOMON ISLANDS	Honiara
TONGA	Nuku'alofa
TUVALU	Funafuti
VANUATU	Port Vila
WESTERN SOMOA	Apia

USP officials indicate that they are satisfied with eight years of service, (which began in conjunction with PEACESAT in 1972) especially since a grant from USAID has enabled the University to upgrade the terminals. While a desire for an additional voice channel has been expressed, there was reluctance to complicate the situation with television, whose "marginal use" is not central to the educational goals of the University.

Visual presentations (T.V. cassette tapes) in multi-media for extension courses and facsimile telecopying capability have proven very successful.

USP Centers

USP Extension services have grown, developing a pattern in which satellite communication plays a crucial role. The focus of USP extension would have to be considerably altered if satellite use were unavailable. One possibility is to package extension sufficiently differently to use national broadcast radio in each country, or to arrange with national Post and Telecommunication authorities to use special-rate telephone links to outer islands for tutorials. Indeed, outer island education personnel have indicated that initially they had been made to understand that they would be offered courses and services similar to those available to extension students in the island capitals. Such services have not materialized.

Instead, outer island residents (usually teachers) who pay for courses, remained without materials three weeks after the beginning of the term. In most countries outer island students are not encouraged to follow degree courses because of their inability to gain access to the satellite tutorials. Center directors endeavor to bridge the gap by spending a few minutes weekly on broadcast radio, supplementing materials (should they arrive) and anticipating issues outer island students might need to have clarified. Center directors face a special problem: the greatest need is among their outer island communities without benefit of the satellite, and they are constantly pressured to find ways to augment the non-degree course materials most such students receive. Meanwhile, the center directors indicate that the interruption of the satellite link would make the running

of the Centers extremely difficult. Therefore, they find it necessary to program as if there were no satellite, though the satellite is central to the success of their educational delivery system. In some cases they utilize pre-recorded audio tapes, sent on to outer islands for weekly supplemental use. Such use enables agriculture extension students throughout the region to ask questions twice a week on the satellite, though this access is only for those in capitals.

Extension consumes an increasing portion of USP's recurrent annual budget, but support of an extension student costs only one-tenth of that of a Suva campus student. Center directors remark on the compatibility of the satellite medium with the non-confrontive style of Pacific islanders' interaction. Likewise, USP faculty members, initially unimpressed with teaching to an absent class and correcting papers to which they could not attach faces, are showing increased interest in the satellite tutorials.

Through funds from the Commonwealth Fund for Technical Cooperation and other sources, tutors travel through the region, run workshops and meet with students, increasing their understanding of the tutorial and the role the tutor plays in minimizing educational isolation with which the Center director and students must cope.

A European Economic Community pilot project will be underway soon to demonstrate the use of INTELSAT for University extension courses. The pilot will show costs and provide valuable information on the possible usefulness of INTELSAT for regional benefit to the public service sector, once ATS-1 is no longer available to the University of the South Pacific.

PEACESAT

The Pan Pacific Education and Communication Experiments by Satellite (PEACESAT) links institutions in twelve Pacific Basin nations for information sharing. The project began in 1969, and the experimental system has operated regularly since April 1971. 1/

Local institutions arrange for capital and operating costs of the terminals which are licensed by local authorities. "In most nations facilities are shared with USPNET. PEACESAT's organized users include groups from such areas of interest as: medicine news, education, science and community libraries. Projects such as dengue fever control, a "Pacific Roundup" of regional news, conferences on economic development, remote sensing, coverage of the Micronesian Constitutional Convention, and earlier this year a meeting of Pacific heads of government have all proven extremely useful.

DISP

Since January, 1977, the Public Satellite Consortium has operated a radio telephony network interconnecting district centers throughout the Trust Territory of the Pacific Islands (Micronesia) and offering telephone patch services for the Federated States of Micronesia and the Department of the Interior in Washington, D.C., utilizing ATS-1.

Administrative communications among various district centers in the Federated States of Micronesia and with other island groups take place at varying times in any given day according to weekly

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1/PEACESAT Project Networks Report #3, Univ. of Hawaii, Honolulu, Hawaii, November 1975, page 2.

schedules published by NASA.

Because of the unreliability of the current HF system, DISP has been highly utilized by Political Status Commission personnel in Micronesia requiring contact with their attorneys and other advisors in the United States. Personnel in the Marshall Islands have used the system infrequently, and those in Palau have experienced difficulty because of Palau's location at the edge of ATS-1's footprint. The Federated States, however, uses the system frequently and with a reasonable degree of success (considering the age of the satellite). The Department of the Interior reports that it uses the system only for emergencies.

The need for reliable communications coupled with the deterioration in the quality of ATS-1 transmissions, points to the need for replacing the existing systems as soon as possible.

The recently signed COMSAT agreement to provide reliable communication to and from Micronesia will lead to the placement of INTELSAT Standard B earth stations in each district center, by 1984.

After ATS-1?

Despite its heroic durability, the 15-year old ATS-1 is well beyond its design life and may not be able to continue providing the essentially no-fee service upon which the public service community in the Pacific has become dependent. NASA is considering moving ATS-1 at the beginning of 1982 to 162 degrees East longitude. This will mean that coverage will cease to include the U.S. mainland but should leave the satellite operational for the Pacific islands through at least September, 1983. Although informal

negotiations with the international carriers in the countries with earth stations have begun, USP and the international carriers are not yet engaged in official negotiations which would lead to the use of INTELSAT for educational purposes at a reduced, public service rate. One difficulty with such a plan is that access to USP transmissions through INTELSAT would require an established Standard A or Standard B earth station which Tuvalu, Niue and Kiribati do not have.

The governments of the region have instructed their international carriers to negotiate with the USP toward providing the University with a viable system over the public network to take up services that ATS-1 has offered until now. Likewise, the International Telecommunication Union advises that "commercial public service rates" be initiated. Such a scheme would mean using surplus capacity on existing systems at substantially lowered rates than at the existing available commercial conferencing rates, too expensive for USP use. If engineered properly, the cost should be little more than two simultaneous phone calls.

ATS-1 has provided the region with services that were previously and would otherwise be unheard of. Its availability has sensitized entire national populations to the potential of education by satellite. A major difficulty is that the anomalous ATS-1, despite its original 18-month design life, has come to be seen as permanent; users, however, have not remained entirely aware of the costs of the space segment of such useful capability. USP has expressed a willingness to pay for satellite

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1/ PSSC Newsletter, Vol. 5, No. 9, September 1981, page 1.

access, although public service rates are still to be negotiated. This would be an arrangement from which both USP and the providers would benefit.

Arrangements for replacing services now provided by the PEACESAT users will fall to the individual countries and common carriers, as will the provision of the services of the Department of the Interior Satellite Project Network (DISPNET). One government, though unenthusiastic about the potential use of satellite for the development of its own rural communications, was assertively supportive of the use of satellite for USP and PEACESAT.

Conclusion

When ATS-1 became available for use in the Pacific, both the reality of communications and the Pacific islanders' notion of communications were radically altered. That was in 1969. Since then, PEACESAT, the UPSNET and finally DISP has provided thousands of people in different island groups with a forum for discussing issues of utmost concern to their basic welfare, to their national development and to the education of their young people.

The continued use of ATS-1 (essentially a no-fee service) has become an issue of concern to the international carriers who believe that present ATS-1 transmissions should be absorbed by commercial communications systems. There is an immediate need to establish affordable rates for present ATS-1 users in order to facilitate their transition from the experimental satellite to the commercial international carriers.

4.3 TELECOMMUNICATIONS AND THE MANAGEMENT OF ECONOMIC RESOURCES

4.3.1

TOWARD SELF-SUFFICIENCY: IMPORT SUBSTITUTION, PRODUCTION FOR EXPORT AND MARKETING

"The problem is not production, it is distribution. We must be able to talk to people."

Federated States of Micronesia

Introduction

In interviews leaders of Pacific island government departments have repeatedly said that economic self-sufficiency is a key ingredient of national stability. Import substitution, particularly in food, is often cited as a key national goal. Additionally, some countries have achieved a sufficient level of production of selected items to add the goal of developing an export market.

Clearly, an adequate marketing system is a key to the success of both an import substitution program and an export program. Marketing, in turn is dependent upon an adequate communication and transportation infrastructure. This is particularly true in the Pacific environment, where distance and its accompanying problems complicate the development of a responsive marketing system. The following sections discuss, in turn, the problems of import substitution, export, and the interrelated problems of communication and transportation as they affect the development of an adequate marketing system.

Import Substitution

While import enriches the variety of goods available for the people of any country, no nation, particularly one dependent upon long distance transport for such importation, can feel comfortable without a degree of self-sufficiency in food goods.

Most Pacific island entities once had self-sufficiency, although it did not come without problems of distribution or periodic scarcity. But with the advent of colonial rule and the importation of processed food goods, the degree of dependency on the the outside world gradually increased while the production of locally grown or obtained foods decreased. Indeed, today canned fish is a prestige food throughout the Pacific despite the fact that on most islands fresh fish is within easy reach. Last year the Kingdom of Tonga imported $A1.m million[1/] worth of canned fish. In Micronesia, canned mackerel is a featured item in school lunch programs.

With independence and with the coincidental rising cost of fuel, the achievement of self-sufficiency in food goods through programs of import substitution has become a national goal for almost every Pacific entity. One planner from the FSM pointed out that it is essential that farmers be encouraged to increase their production of staples, but in order to sell products the country needs better communications both on islands with urban centers and on atolls so that the entire population can receive a steady supply of necessities.

The cooperation of distributors is crucial to the success of efforts in import substitution. Distributors on Ponape are beginning to support a locally produced soap by agreeing to reduce the importation of bar soap. In contrast, in one South Pacific country some of the major importers are employed as government policy makers. The practical result of this possible conflict of interest is that the national goal of import substitution is undermined.

[1/] Australian dollars. Dollar amounts in this report will be given in U.S. dollars unless otherwise noted.

The benefits of import substitution are readily enumerated. First, the substitution of locally grown fruits and vegetable, locally caught fish, locally raised chicken, beef and pork, can provide a cash income for farmers and fishermen. Second, it serves to reduce sharply the cash flow from a nation. Third, it can, if properly managed, provide local residents with foods that are more reasonably priced: residents do not end up subsidizing long distance shipping enterprises. Fourth, it provides a more nutritionally sound, varied diet.

There is ample illustration throughout the Pacific of the negative effects of the lack of adequate self-sufficiency in basic food items. On Nauru, for example, the price of bananas, all imported is $A5 per kilo. On Guam, coconuts cost $US1 each and papayas sell for $US2.35 each.

To date, the successful examples of import substitution in the Pacific are relatively few in number. American Samoa for example, is self-sufficient in breadfruit, taro and bananas but must import all other categories of foods; Western Samoa has become independent of bacon and ham imports. Vanuatu produces sufficient beef for local consumption, and the Solomon Islands, a rice crop that is adequate for local needs. Import substitution in non-food agricultural areas has also received attention in some areas. Belau, for example is now producing feed for pigs and chickens. The feed sells for one-half the price of feeds imported from the United States mainland, and agricultural experts say that animals are doing well on them. If the program is successful, it is possible that farmers will be able to pass along lower pig and poultry prices to Belau consumers. Ponape is looking to its fishing industry for fertilizer for its gourmet pepper supply.

Production for Export

A second, more ambitious step, follows the goal of self-sufficiency through import substitution in a number of Pacific countries. That step is the export of locally grown food products for market in other Pacific countries or in the countries of the Pacific rim. This step, where it is possible, serves to increase cash income for a country and provides additional employment opportunities in food processing industries as well as in agriculture.

Intra-regional trade is difficult because of the similarity of commodities available in the countries of the region. There is, however, far more room for regional trade than currently exists. Only with improved communication links--both voice and data--can the countries gain a better grasp of each other's specific requirements and their own ability to meet their own ability to meet their neighbor's needs.

Vanuatu has timber appropriate for construction of Tonga's banana crates. The Solomons produce sufficient rice to export 200 tons per month to Vanuatu, meeting that nation's entire requirement.

FSM sells Guam considerable quantities of fresh water eels for the Japanese tourist market. Communication's role in the success of an export market was illustrated recently when Guam cancelled an order because of a slack tourist season. Distributors exported 2000 lbs of fresh water eels because they hadn't received the stop shipment order.

In addition to trade within the region, Pacific countries are beginning to enter the world market with a number of their products. But such potential cannot be fully realized without an adequate infrastructure--especially a viable communication system within each country to facilitate the reliable delivery of products to the world markets.

Vanuatu beef currently has disease-free status and can be exported anywhere in the world. At present, 90% of the country's beef is exported. Ironically, although beef is readily available, protein deficiency exists in the diet of local people. But an effort is currently under way to introduce beef, which was not a part of the traditional diet, into the diet of ni-Vanuatu, or local people.

Western Samoa is currently expending a large proportion of its development dollars in improving agriculture for export. The country now exports $US2 million in taro to Hawaii and San Francisco. In the Cooks there is an effort to import varieties of mango and lichee that would produce fruits suitable for export. Papayas are already exported in quantity from the Cooks. Solomon Island planners are attempting to develop agricultural exports in cocoa, rice and cattle. And Papua New Guinea's lucrative coffee industry provides the world with a highly valued coffee that commands a high price on the world market. Vanuatu's mixed tropical hard woods are finding markets in Japan and Singapore.

Marketing: Communication and Transportation

The goal of developing an agricultural export base for island economies and the goal of achieving self-sufficiency in food goods through programs of import substitution are only achievable through the creation of adequate, responsive marketing systems. Attempting to establish a viable marketing system without functioning communication and transportation is virtually impossible.

The Pacific is full of examples of frustration in this area. In Vanuatu, for example, planners point to Arewa--one tiny island that is covered with orange trees. The current orange crop is sufficient to supply the needs of the entire country. But the island lacks communication facilities. Farmers cannot arrange for shipping at appropriate times. Their choice is to expend effort to pick the orange crop and risk its rotting before transportation is available or to let the oranges fall to the ground and rot without the effort of picking them.

Tanna island in Vanuatu has an ideal environment for vegetable growing. Port Vila and Espirito Santo are areas with a volume of tourist business and with a need for garden produce. But the people of Tanna have become discouraged with vegetable farming since they have no proper communication system and shipping services are irregular and inadequate. Given the perishable nature of vegetable crops, a well-developed system of market logistics is essential to the farmer as well as the buyer. Villagers are quite willing to invest in a boat that could be used to transport perishable goods to market in Port Vila. However, without an adequate communication system, which they cannot provide for themselves, the investment will not serve to overcome all marketing problems.

In Belau the lack of adequate communication systems is the major stumbling block to developing a functioning marketing system. Eight thousand of Belau's 12,000 citizens live on the island of Koror while the large island of Babelthuap contains most of the nation's land area. Vegetable producers have no means of communicating with Koror and cannot ascertain the price of produce or the existing market needs. Nor can they communicate ahead so that buyers will be present on their arrival. They must simply take their chances when they decide to harvest and market their crops. On arrival they may find that five villages have harvested and marketed cucumbers on the same day while no villages have brought in cabbage. The problem is compounded in Belau by shallow lagoons and major tidal fluctuations. Because of tides, villagers may find they must arrive after normal market hours and since they cannot communicate ahead the time of arrival, they may find no buyer awaiting them. Thus perishable crops sometimes end up at

least wilting, usually rotting, even though they are sorely needed by restaurants, hotels and individual buyers in Koror. Meanwhile the village has spent, on average, $US60 on gasoline and oil for one round trip by boat from the village to Koror.

Planners in American Samoa have estimated that a program of import substitution could save islanders $US50,000 a week. Moreover, the production of sufficient agricultural products is possible: there is good land on Manua Island and a population that would remain stable if the island had some economic base. But poor communication and transportation have so far prevented the growth of a viable agricultural economy on the island: the population therefore, has been in continual decline.

On Mangaia in the Cooks, pineapples can be found rotting on the ground. Again the problem is inadequate communication to arrange schedules for picking and shipping, combined with the unavailability of adequate shipping. Incentive for picking, furthermore, is deterred by the Government decision to subsidize farmers for the fruit they cannot market.

Given these problems, everyone loses. Urban dwellers face uneven supply and must pay exorbitant prices for food items imported from great distances. Hotel owners and restaurateurs cannot provide dependably for their customers. Money that would otherwise circulate within a nation is drained out, and local diet lacks the variety and nutrition that freshly grown local products can provide.

Country visits have revealed that there is sufficient land, enterprise and desire within most Pacific nations to develop strong agricultural economies and to cut significantly into the current dependence on imported

food products. The visits have also revealed a large residue of discouragement: too many agricultural enterprises have begun with enthusiasm and failed because of an inadequate marketing infrastructure. Government Agriculture Departments, cash cropping land holders, exporters, and importers all need telecommunications for ordering, scheduling and market advice. Adequate communication systems and shipping must be in place before workable marketing systems can be developed.

4.3.2 TRANSPORTATION AS COMMUNICATION

"Communication here is a boat with an outboard motor."
Micronesia

A library search for information on communications in the Pacific preceded country visits. This effort consistently revealed information that reinforced the inextricable link between communication and transportation in the Pacific. During country visits, responses to the question, "What kind of communication do you have outside the major towns?" frequently included such details as: roads, some trucks, canoes, motor boats, some air flights. In Pacific islands development plans, descriptions of road networks characteristically are found under the heading "Communications." This collapsing of categories is more prevalent in areas of the region where there is little access to telecommunications than where communications are better developed. While highly technological societies have come to separate these two concepts, both transportation and communications connect; both provide access, networks and the vehicle for interaction. In developing countries where telecommunications beyond urban areas are minimal, transportation has traditionally been used to bridge the gap. In the Pacific, where vast expanses of ocean and, in some cases, far-reaching mountain ranges, have made it more difficult for transportation to serve as communications, boats and airplanes are all the more often described as a vital part of the communication system. Other sectors such as health and education which depend on both transportation and communication do not view them separately because neither is sufficiently well developed or well integrated to meet society's needs. It is as if to combine the two might serve to compensate

for the deficiencies of each, in providing some kind of access to those who need to communicate.

Roads

Improved roads are certainly a link to access. In the case of Ponape, the new road has stimulated a greater number of trips to town. These trips are more accurately seen as efforts at communicating in areas where no reliable far-reaching telecommunications system yet exists. Roads also stimulate rapid economic growth. One individual on Ponape said, "The road grows bananas and stores." The primary difficulty with the substituting of roads for telecommunications systems, even on an interim basis, is that because of the spiraling cost of fuel in the Pacific, such a scheme is prohibitively costly. Also, the use of transportation as communication requires round trip and often double roundtrip journeys for obtaining goods and services.

Planners see the road as the focal point of an island's economic base. It is impossible to establish a market economy on an island where villages are separated from the town unless there is a road. Only recently have such planners begun to view telecommunications improvements as the next critical aspect of development. Communications systems have not been considered integral in the planning of new settlement schemes; rather, the road has traditionally been seen as the mechanism for providing access to new projects, new communities and between towns.

In Western Samoa, improvements in the roads have brought increasing numbers of people to Apia, the capital; but because the improvements have also provided an easier flow,the town is not congested. Improvements in the telecommunication system will help to stem the transportation problems that inevitable will crop up.

In the Federated States of Micronesia it was pointed out that funds spent on travel would be better used if sufficient telecommunications systems were in place. Travel for government officials is increased because of inadequate and sometimes non-existant communications. A Tongan official estimated that, considering the distances between islands in Tonga's three groups, 40% to 50% of some workers' time is spent simply getting places. Telecommunications improvements will minimize the need for such trips.

One particularly apt illustration of transportation's role in communication comes from Mangaia, an outer island of the Cooks, where a delivery boy rides around the island twice weekly delivering telegraph messages on his bicycle. And finally, in Fiji, one government official cited the road as "a means for education."

Boats and Planes

Although air and sea transportation costs have reached what one Pacific public servant described as "fundamental crisis proportions," planes and boats provide communications among communities even more remote than those reached by road transportation systems. In the Republic of Belau the police send boats out, three or four times a week to serve papers in person to those whom the police want apprehended. One agency in Belau described that the annual fuel budget for administration was depleted within the first two months of the year. Numbers of trips are increased regularly because there are no improvements in communications facilities. A trip "practically anywhere" costs an average of sixty dollars.

The double trip problem has been mentioned repeatedly. Whatever the

basic communication that must be accomplished, a trip is required; that is coupled with the trip back to the initiating point. Usually, though, such trips are doubled because the first, for information, must be accompanied by the second, which is usually for action. Such double round trips--besides being costly--are time consuming and,in emergencies, dangerous. Problems with double roundtrip for supplies are exacerbated by tide problems. Often, a boat can only reach a village on one tide a day. In Belau, the government sent a landing craft with cement for a new men's house. There was no communication to that village. The boat arrived at the wrong tide, at the wrong time, and when there were no villagers assembled to carry the cement. The landing craft had to dump the cement and leave the people to spend two weeks rafting it in to shore.

There have been cases when pilots servicing outer islands take examinations from the hands of examiners and hand carry them to education officials in the capital. In the case of one outer island, although there are flights every day, the Post Office, rather than pay for frequent air cargo, leaves parcels and letters with airmail postage waiting on the other island until the bag is full. One Papua New Guinea official explained that it takes five minutes to fly to a town for which he has responsibility; the town can be reached two and one-half hours by road, but it requires a half hour to reach it by radio. The airfare is approximately 65 dollars, while discussion on an HF link would cost only 15 cents per minute.

There are cases of transportation's role in servicing communication. Access to repeater stations in remote places where other aspects of the infrastructure remain underdeveloped is extremely difficult. In the Solomon

Islands one official estimated that it would take a week to charter a ship to get to the site of faulty equipment in order to repair it.

Shipping

Attention has been given to the fact that inadequate communication means either double trips or months or waiting. Field trip ships provide a lifeline for atolls totally dependent on them for medical, educational supplies, and personnel, spare parts, food, kereo_ene for lamps, fuel for generators and vehicles, cloth, soap and matches. These atolls are too remote to enjoy even the luxury of double trips. The field trip ships may carry, the wrong supplies, the wrong people, because problems have to be identified before solutions can be carried out by ship. Improved communications would provide an opportunity to transport all the necessary equipment and personnel on one trip. In Belau, every field trip ship is required to have a radio operator, repair person aboard. Sometimes the schedule of calls are the only means available to outer islands to stay in touch with the centers.

There are many economically unviable routes that are not serviced by the commercial sector. The government has to provide for these uneconomical routes. In the Solomons, for instance, the government owns 30 ships for a variety of purposes. A baker in Honiara said that an improved telecommunication structure will encourage expansion of his, and other companies to provincial capitals. In neighboring Vanuatu, a scheme been developed to make a joint schedule of all boats to service places on rotation. Some would win profitable routes some time and the less profitable ones at others. Boat owners would be jointly responsible to pay a route controller.

In the Cooks, ships are necessary for the exportation of fruit crops. The New Zealand market is secure, but trips infrequent; the Cook Islands Government would prefer a schedule of ships every two weeks in order to open new markets in Niue and Pago Pago.

Conclusion

Throughout the Pacific, enormous distances between small island communities have coupled with the vagaries of colonial history to prevent the development of an adequate communications infrastructure. As a result, transportation has had to function as communication, and shipping has played a major role in this use of transportation. The utilization of transportation as communication is expensive and time consuming, but until an adequate communications system is available to remote areas, the two will not be able to be separated, Indeed, neither system--transportation nor communication--is sufficiently developed for the growing needs of the region--and each must augment the other in order to provide even the most basic services to the portion of the population beyond the urban centers.

4.3.3

SUPPLY AND PRODUCTION
AGRICULTURE AND FISHERIES, COOPERATIVES AND COMMODITIES BOARD; TOURISM AND ENERGY

"Communication is holding the country back. It is absolutely vital that we have better telecommunications. It is costing us dearly in terms of economic development."

Federated States of Micronesia

Agricultural Extension

Agriculture, especially in rural areas of remote provinces, is a likely source of growing revenue throughout the Pacific. In Vanuatu the number of agricultural field officers will double shortly to a hundred in anticipation of agriculture growth. Such developments in supply and production to support the local economy will require improvements in the existing communications network.

The biggest problem according to agriculturalists in the Solomons is "getting from place to place and having regular access to telecommunication facilities." A major difficulty is that extension workers who want to communicate with the central office--whether agriculture, forestries, minerals, management, land cadastre--must leave their field tasks and travel miles--often hours--to a fixed radio, usually daily to speak on a fixed schedule to the capital. Fixed scheduling has several inconvenient features besides the fact that it interrupts one's field efforts. The allotted time is usually too short to accommodate orders, requests, clarifications and answers to specific questions. Thus, it is not hard to understand that people do not finish transmitting in the allotted time and often run over into another department's slot. A typical 15-minute departmental time

allotment may have to accommodate the exchange of information among several dozen people. At best the system is unwieldy, at worst it is unworkable and is often viewed by users as worse than no communication at all.

In countries where there are field radio phones available but no such scheduling procedures, extension workers are required to book calls well in advance. They are typically disturbed by the interruption of their work, by long waits and often find that faulty equipment prohibits a reasonable discussion or solutions to their problems. Worst of all, they have no assurance that the official they are calling will be available when they get through.

Broadcast radio is a means of providing farmers with advisory service. In Tonga notice of what crops to bring to town are announced on the radio as are other messages and notices to specific land holders.

In cases where there is no communications, agriculture work is further complicated. For example, in one Micronesian country officials discussed that agriculture experts who are sent to outer islands atolls on field trip ships have no way of anticipating the specific needs of atoll dwellers. In one instance an expert arrived to find a flea infestation but had no supplies with which to alleviate the problem. Atoll residents had to wait until the next field trip (5 to 8 weeks) for relief.

Research is another communications-related problem in agriculture. Typically one-third of a Pacific nation's agriculture budget is devoted to research. Virtually every country is engaged in testing fertilizers,

herbicides, and insectisides, the introduction of new plants and breeding for better livestock for local farmers. Similar research is repeated from country to country but agriculture experts have limited means of communicating with one another and are not accustomed to comparing or utilizing each other's results. With limited total resources the result is that more agriculture experts are engaged in possible redundant research while fewer are available for essential extension work with farmers.

Fisheries

The development of fisheries is considered essential to the economic survival by authorities in a number of Pacific countries. Yet authorities note that improved telecommunications are essential for the management of fishing, both in terms of licensing and monitoring of foreign fishing vessels and in terms of tracking migratory species, inventorying of the catch, processing and marketing. The Federated States of Micronesia, for example, considers fishing a vital primary industry. One official noted that the current estimated catch from Japanese fishing vessels in FSM waters is 30 to 60 thousand tons each year. With the price of oil going up, he believes it will not be long before it will become desirable to process the catch within the Federated States of Micronesia, thus reducing travel time and

expense on the part of the Japanese fishing fleet. The Federated States of Micronesia is therefore planning for the establishment of facilities to process fish.

One federal authority noted: "Communication is so critical because fish is so competitive. To be world class we must have communications."

In Ponape state, the Economic Development Authority is working toward implementation of a scheme to have a fish-carrier/ice-maker equipped ship to serve the five atolls. Fisherman on each atoll would fish with the large vessel for six weeks, the catch frozen and stored in the mother ship for eventual shipment to market. The scheme, according to EDA authorities, is dependent upon a reliable communication system that will allow notification of atoll dwellers of ship arrival time and will enable the ship to remain in contact with headquarters on Ponape for safety, weather and surveillance information, record keeping and exchange of market information.

The Tongan government, also aware of the importance of fish to the economy, has a scheme whereby $10,000 fishing boats are built for villages or for individual fishermen with a 50% government subsidy. There is no problem marketing fish in Tonga. According to authorities, 15,000 pounds of fish can be sold in one day in the Nuku'alofa market alone. Tonga does, however, have serious communication problems with its fishing fleet. Currently, even when there is a shipboard radio, contact from shore or from another ship must be made through the Telephone and Telegraph authority in Nuku'alofa.

Information on catch, fishing boat location and marketing could be conveyed more conveniently and rapidly, according to fisheries personnel, if they were able to make direct contact with fishing boats. Tonga fisheries officials have devised a scheme where refrigerated ships call twice weekly at the Vavau and Hapai island groups to collect fish. Fish can then be transhiped to Pago Pago in American Samoa, where the nearest cannery is located. The scheme, however, is unwieldy in the face of inadequate ground communication systems on the two island groups and between the groups and Nuku'alofa. This problem is complicated by the inadequate ship to shore communication system that requires telephone system interconnection.

In American Samoa, fishing is currently considered the primary economic base and authorities view reliable communication structures as a necessity for keeping that base strong. Telephone officials in American Samoa note that fishing fleets are among their best customers and require direct telephone and data links to Taiwan, Korea, the United States and Western Samoa.

Tourism

The introduction of tourism in most Pacific island countries is recent enough for government leaders not to know whether the benefits outweigh the liabilities; but they are certain that the introduction of tourism is a highly-profitable income generating industry.

Tourism's development--whether large scale or small and selective--requires a certain minimum level of communication infrastructure to facilitate

air and hotel booking. People will not travel without the assurance of confirmed air transportation and lodging. Communications are also required to assure tourists a reasonable supply of minimal goods and services. Supply is uneven. Without adequate communications, it is often a chore just to keep available items promised on a printed menu.

Two contrasting approaches to tourism illustrate the need for communication. The Waikiki model of large hotels, isolated from the local population, provided entertainment and recreation designed specifically for the tourist--includes as a component the goal of providing tourists with bedside international telephone connection. Large resorts in some Pacific island countries are being designed to follow this model.

Culture contact in such resorts is minimal. Benefits are from employment opportunities and the spreading of the communications and transportation infrastructure to new areas.

On the other end of the spectrum is the building of small remote tourism destinations that appeal to the adventuresome tourist. One such example is Namale Plantation on an outer island of Fiji connected to the nearby town and to Suva by a single telephone. Telex is available at the local post office. Tourists at this resort have such specialized interests as ornithology and archeology. They are motivated by an interest in local life. Such tourists revealed that they did not want the intrusion of international or national telephones except for emergency purposes.

In Papua New Guinea tourism has no established place as yet in the national development strategy although the government seems to prefer to develop tourism on the second small-scale model. Officials spoke of the desirability of a number of small tourism developments in several provinces

rather than one or two primary tourist destinations. A major benefit of this approach is preservation of unique aspects of local cultures without commercial exploitation of the values of the society while tourists benefit from performances, sale of handicrafts and accompanied field trips. One such lodge won an international award for the preservation of culture and heritage. Hundreds of miles from the capital and far from any manor town, this facility is connected to the outside by VHF radio and a grass airstrip.

39,000 tourists visited Papua New Guinea for an average of 14 days each in 1980. In Fiji where both models of tourism are found, 188,000 visitors on 9-day visits generated $108 million revenue.

No matter what kind of tourism these countries choose to develop a minimum reliable communication system is a requisite for the needs of the industry.

Cooperative Societies and Commodities Boards

A number of countries visited are using the establishment of marketing cooperatives as a means of encouraging rural dwellers in cash crop production and as a means of bringing down the price of goods available to rural people. Some cooperative authorities who were interviewed expressed frustration in establishing well run cooperatives without the assistance of a communication infrastructure.

On Ponape, for example, one cooperative official stated that his organization would be able to save $100,000 by reducing inventory if it had a means of communicating rapidly with all its member cooperatives. He also noted that the lack of communications complicates ordering for member

organizations. (Atolls are not ordering because they worry they owe too much already.) In order to buy copra, the cooperatives need to be plugged into world market prices.

The Fiji cooperative marketing authority has installed telex at several large town collection centers to help with the marketing of produce collected from members farmers and to tie together the cooperative marketing managers with international buyers and prices. Authorities reported that the new system had markedly improved the cooperatives' ability to maintain a balance between prices offered small holders and income from the sale of their produce.

The weakest links are between cooperatives and farmers and between mobile buyers and officers. There is an expressed need for trucks to have two-way radio to be kept informed of market prices and to keep officers informed of incoming goods to enable the encouragement of the timely sale of perishable items.

In some countries commodity boards take on some of the functions of cooperatives acting as middlemen between the farmer and wholesaler or between farmer and retailer.

In Papua New Guinea the government has established commodities boards for copra, coffee, cocoa and palm oil. The boards serve as regulating authorities, setting standards for products, and also serve as collecting agencies and marketers. Here, too, authorities pointed to the difficulties of managing the collection and sale of products without adequate communication. The difficulties include the notification of small landholders or villages concerning collection. Broadcast radio for

example is often the only means of informing farmers about the arrival dates of copra collecting vessels. If no one in a village has listened at the proper time, or if atmospheric conditions have interfered with reception, copra boats may arrive to find that copra has not been readied for shipment. That failure in turn, leaves farmers without the immediate cash income provided by the copra buyer--who may not return for many months.

Power

Officials in several countries state unequivocally that power is the greatest problem that they face. Without a source of reliable power supply, development is stymied. Rising fuel costs compound the problem for governments with small budgets and numerous far flung atoll communities to serve.

On Ponape, for example, officials state that the current expenditure for fuel is $1.5 million annually and estimate that by 1984 the government will spend $5 million, or one-third the entire state budget for imported fossil fuel unless alternate energy sources are developed.

Current power supplies on many islands are unreliable because of the lack of fuel and generator breakdown.

On a remote Cook island, the hospital generator broke down and was carried to Rarotonga for the entire following year; the doctor substituded his own personal generator for power in the hospital. When the repaired generator finally was returned from Rarotonga, the doctor immediately

sent his in for servicing, only to discover that the hospital generator did not work.

In Micronesia power fluctuations damage electrically-run equipment and throughout the Pacific power outages are frequent. In one Polynesian entity some residents record the number of outages per day and the number of minutes (sometimes hours) of each instance. On the day of one visit the interviewee had recorded seven outages; the previous week he had recorded over 9 hours without electricity. Yet, in a neighboring country power outages are not common and are described as accidental.

Alternatives

Many of these countries have sought alternative sources of power. On Ponape, for example, there is interest in reestablishing a hydro-electric system successfully operated during the pre-World War II Japanese mandate. They are exploring the use of bio-mass in place of fossil fuels to run generating plant.

Vanuatu is completing a micro-wave spine to provide the islands with a basic communications system. Each tower will be powered by a large array of solar panels. Western Samoa is making efforts to utilize solar power and wind.

Other countries are also moving toward solar power. Western Samoa's "country sets", providing a radio link from clinics on the island of Savaii to Apia, the capital, on the island of Upolu, are powered by solar panels which officials report are extremely successful. Palau is moving toward solar energy for water heating and individuals in many

countries are doing the same. Tonga is using windmills for pumping water, in some remote areas.

Not all efforts to employ alternative sources of energy have been successful. Despite findings of a visiting team of energy experts, officials in one island country elected to install a diesel generator on an outer island that the visiting team had determined ideal for harnessing wind power. Forecasts of the cost of power to local consumers are estimated at $140.00 per household per month.

4.3.4

RESOURCE MANAGEMENT FOR LOCAL BENEFIT

"Development plans need to suit the place, the temperament and the resources - then relate to the budget."

Cook Islands

Some of the islands in the Pacific--and certainly the sea surrounding them--are resource rich and are the focus of interest by foreign companies.

Pacific nations are currently engaged in the formulation of policy on such outside interest; governments are attempting to protect themselves from the invasion of foreign interest for quick profit, from the depletion of their natural resources, description of their social systems and outflow of government funds for an infrastructure that will accommodate outsiders' needs rather than the nation's own.

At the same time governments recognize that the utilization of local resources by outsiders can be of benefit to the local community if managed correctly. A major benefit can be the providing of infrastructure in rural areas rich in natural resources.

Development for local benefit requires early consideration of a communications system appropriate to meet the needs of a proposed project; it must keep the project in touch with the local community, national center and it should anticipate, the project's requirement for international connections. The development of such a communications system would enable local business local labor and local service industries to benefit from contract with the newly-planned venture.

The development of communications and other aspects of the infrastructure to meet the needs of such an enterprise--given proper planning--

leaves the community with an infrastructure that can be used to continue economic benefits to the area should the initial project's life span be limited.

In response to such anticipated developments as the growth of tourism, and an elaborate proposed pineapple scheme, the Cook Islands are concentrating on the construction of an outer island airport. The Government offers and designs heavy equipment and planning expertise, while the local island council supplies free, local labor. Both tourism and agriculture are labor intensive and their scales are sufficiently adaptable to meet specific interests of the various islands of the nation. The scale of outer island tourism is, of course, relatively skeleton for services from which local people can benefit is being constructed.

Progress is often slow and local benefits are sometimes obscured by overriding concerns of those engaged in business; airlines, breweries, shipping outfitters and importers require vast resources, and infrastructures that support them are expensive. Local benefit seems to be primarily in the form of jobs and the growth of secondary services industries.

Extensive employment possibilities do exist if schemes are monitored for local benefit. Ok Tedi, a huge mining operation in the remote mountainous area of Papua New Guinea near the West Irian (Indonesia) border will require services, transport and will provide jobs for hundreds

of people. Prices will rise and the problem remains that local people without benefit from Ok Tedi employment will have to compete for goods with people in the cash economy.

Projections estimate Ok Tedi will be mined out in 30 years. Hopefully local people will be sufficiently trained to work elsewhere and the highly developed infrastructure the mine requires will encourage other auxiliary interests and commerce into the area. The Government has determined that secondary services and trades such as bus services, restaurants, laundry, trade stores, trucking, secondary construction and other services--are reserved local ownership. P & T points out that because of the scale of Ok Tedi and the need for international links, they have been required to put in a microwave spine in the area. Experience in Papua New Guinea has shown that such development of a communications spine will immediately produce a demand for telephone services both along the way at the mining site and in the communications development to support the operation.

If the government does implement its plans for training people to take over service industries in the area and if it plans for new sources of economic enterprise when the mine is depleted, then the benefits to the local community will be permanent and self-sustaining.

Lumber schemes have attracted the interest of provincial politicians in some heavily forested Melanesian islands. Developers have promised local employment, the creation of roads and a communications

system and the emplacement of a permanent saw milling operation, whereas in reality, local employment is minimal and temporary, road construction is limited to a track or wide path, communications is a removable CB system and the milling operation is a portable forest mill. Their temporary employment and the contribution of a flimsy physical support system could not make up for the eroded soil and deforestation from which the island is unlikely to recover ever.

Typically, this type of operation does little local milling. The logs are exported to the international spot market on ships owned and operated by the timber company. Thus jobs and lumber are not for local benefit. What remains is a royalty sufficiently large enough to intrigue customary land holders into cooperating. Claims to such royalties are disputed, the money is quickly spent, the roads, communication and milling operation disappear, and worst of all, villages have no timber; the land is so eroded it will support neither agriculture nor reforestation.

5. THE TECHNOLOGY: ENGINEERING OPTIONS, STRATEGIES FOR IMPLEMENTATION, AND COST/BENEFIT RELATIONSHIPS

The history of telecommunications in many countries has involved a step by step progress through what has been historically available, e.g., moving from telephone systems to adoption of radio, then television, and so on. Some countries have had the money and the luxury of time to plan for and implement many complementary communications systems that can co-exist and provide a rich array of services.

In developing countries, and especially in the Pacific Basin, both time and money are at a premium. Time is a factor because as the rest of the world increases its telecommunications sophistication, the island nations may fall further and further behind. The constraint of money has to do with the relatively small populations in most of the entities and the relative lack of highly developed business enterprises, although there are a few exceptions to this generalization.

In what follows, both constraints are kept in mind, and telecommunications options are proposed that are felt to be uniquely appropriate for the Pacific Basin region.

One caveat should be kept in mind. As research on new technologies progresses, there will likely be options not mentioned here or not seen as feasible at present. Fortunately, the trend will be toward more options at increasingly affordable prices even for the Pacific.

5.1 REQUIREMENTS FOR THE ISLAND NATIONS

As indicated in section 1.2, there is a great variation among the island nations of the Pacific. This variation is not only economic but extends to needs and capabilities. To some extent, these three elements are interrelated. During the course of this study, an extensive amount of telecommunications traffic information was obtained and analyzed. Classical, North American and European traffic estimating techniques were attempted using the Pacific data.

Several models of traffic flow were constructed, but for every data point that supported a model, another denied the model's validity. It may also be the case that prior attempts by others to establish such models may have been based on inadequate or incomplete data, thus explaining the lack of one uniform Pacific model after all these years.

As shown in Figure 5.1.1, the variation, even within an island nation, is so great as to thwart these classical approaches. Discussions with the islanders have shown that there is indeed such variation. Because the state of development of individual telephone exchanges is so diverse and so ripe for further development, it is hazardous to extrapolate traffic requirements based on what is presently occurring. The Pacific Basin is both a grossly underserved area and encompasses wide variations. Each island and village is unique unto itself.

Other studies were reviewed that use the normal technique of extrapolating from the present traffic on either a linear or exponential growth basis. This type of extrapolation does not seem realistic for the area

because of its substantial underdevelopment from a telecommunications standpoint. In many respects, it is like trying to estimate the number of television sets that would be in use in the United States in 1981, based on information available in 1941.

An alternative approach (and the one taken here) is to define and describe what each relevant communications technology might provide at the minimal or most modest level of design. For example, we can project the capacity and service capabilities of the smallest economical satellite. The capacity in each case may be in excess of the present and linearly extrapolated demand. But just as is the case with roadways, telecommunications traffic has a way of filling all of the available capacity in a remarkably short time, often in defiance of earlier predictions.

The first Atlantic submarine telephone cable was laid in 1956. At that time, the builders, having full access to all the data available, estimated TAT-1 would be filled in 1966. In fact, several generations of cables (plus satellites) were needed to meet the demand by that year.

Communication has a broader meaning in the Pacific than in most other parts of the world. Any form of information exchange or service is considered to be a form of communication. This can mean that island shipping, agricultural transactions, and air transport are all spoken of as "communicating." Certainly, communication plays an integral role to all of these functions, and the current lack of adequate communications (as illustrated in section 4 of this study) presents unique challenges.

The interplay between telecommunications and marine resources is very important. The island nations are very dependent upon the waters that surround them. Aeronautical mobile services play an important role in communications.

Any system must consider the intimate relationship between land, sea and air users.

Appendix D shows some of the techniques used in this study. These resulted in a number of candidate forms of telecommunications being studied (see Appendix E).

The existing resources in the area are indicated in Appendix F.

Based upon the detailed studies made by the field team, it appears rather unlikely that major improvements in telecommunications, either domestically or internationally, can be brought about on an individual nation-by-nation basis. Each nation is either physically two small or economically too poor to invest in a major terrestrial system change. Satellites, as explained further on in this section, offer an opportunity to break the present cycle, but because of the investment cost and operational characteristics, are best provided on a regional basis.

Fortunately, the spirit of regional cooperation is already present in the Pacific, and the mechanisms for bringing about a regional telecommunications system are substantially in place.

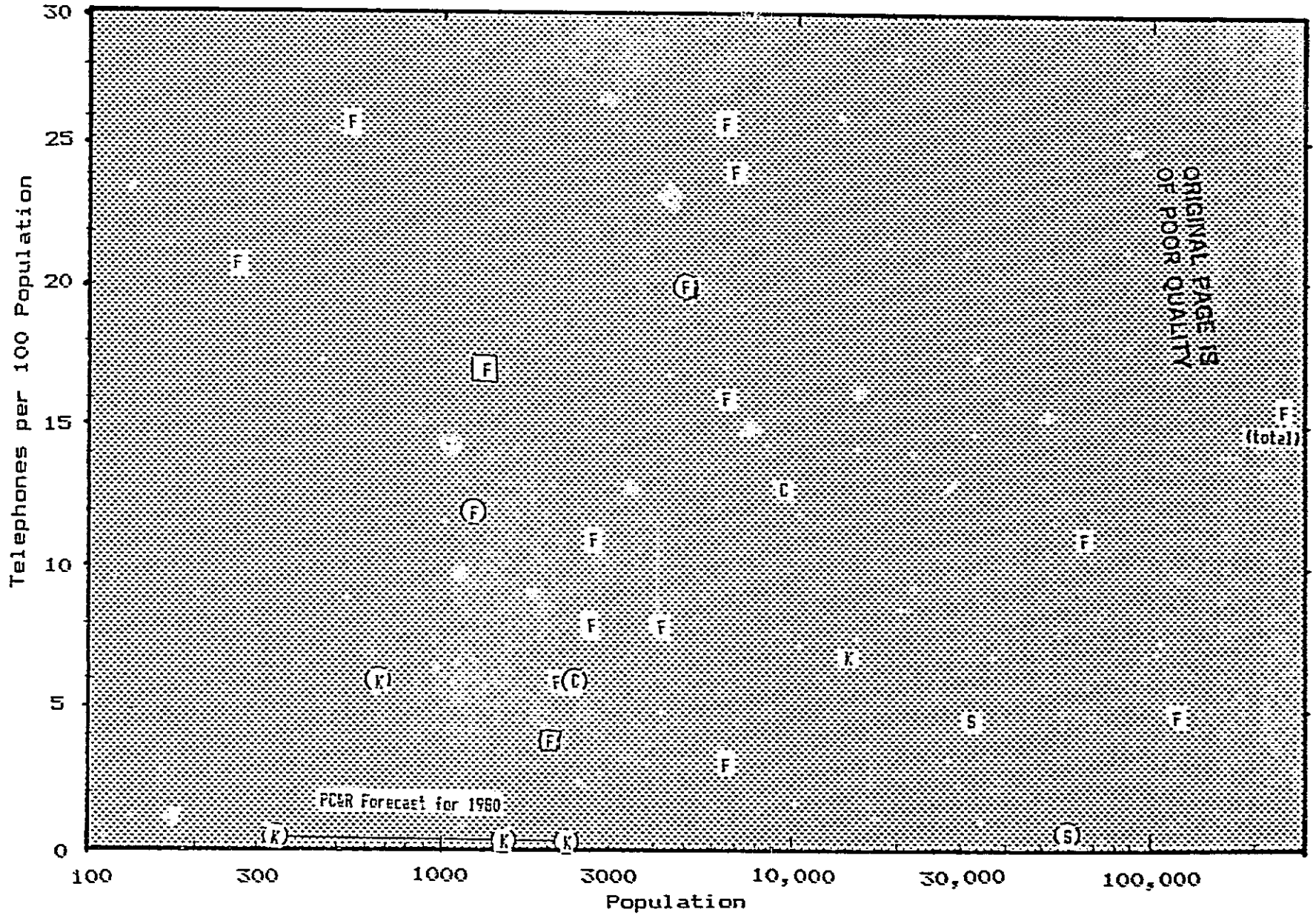

Figure 5.1.1 - Distribution of Telephones in four Island Nations

5.2 OPERATIONAL ALTERNATIVES

As indicated in Appendix E, a number of different techniques for meeting the needs of the Pacific were examined. (See Table 5.2.1). As noted in section 4, a primary and the most pervasive need is for improved telephony, followed closely by the need for better message transmission.

The geoeconomics of the Pacific island nations present a particularly severe challenge to the telecommunications designer. In many instances, line-of-sight communications are impractical because of the distances between various islands. Early in the present study, a hypothetical chain of microwave stations for several island groups was considered. These were later compared with the actual in-place routes. The presence of low, uninhabited islands made many of these routes economically impractical. This is an example of what can happen when systems are designed based solely on data from maps and using traditional techniques without benefit of site visits to confirm practicability. This exercise also failed to take into account the widely varying development of telecommunications within each nation.

Detailed examination of some of the in-place routes revealed that, using existing Northern Hemisphere standards, there were links that some engineers would pronounce theoretically unworkable, yet they were in service. It is apparent that in some engineering areas, the world can learn much from operations in the Pacific. Due to the unique rainfall and equatorial propagation conditions, there are some important differences from traditional higher latitude engineering configurations.

As far as Pacific island telecommunications for the future are concerned, there are several choices available:

- Do nothing
- Continue with present systems (including modest upgrading)
- Slowly accelerate growth of present systems (including addition of new facilities)
- Establish an Integrated Communications System

It was apparent at the users' meeting in Suva, Fiji (June, 1981) that the first two alternatives are unacceptable to the island nations represented. There seemed to be considerable impatience with the rate at which regional telecommunications are being improved. There was an impatience to jump ahead to a more advanced system that would allow catching up with other parts of the world. And there was widespread interest in integrating communications satellites into existing and planned systems.

The remainder of this section describes the two primary alternatives: (1) slowly accelerating the growth of present systems, including the addition of interim satellite capability beyond what is presently available; and (2) introducing a regional satellite capacity.

A number of different forms of telecommunications were studied as possible solutions for the Pacific. There was particular concentration on approaches other than communications satellites to determine if some single or combined system short of satellites would be beneficial. Appendix E lists some of these alternatives. A few represent the addition of more HF or wire systems. Others, such as extensive submarine cables, were discarded because of cost. Still others, such as high altitude balloon

repeaters, floating reflectors, fiber optic submarine strands, etc., while intriguing, had to be dismissed because the technologies are not far enough advanced to give the assurance that they would operate reliably or economically in the coming ten to fifteen years.

One common system kept reappearing as feasible, and it involved some form of satellite relay. This approach is consistent with the thrust of the Kiribati Forum of Prime Ministers, which resolved that:

> "The Forum concluded that it was the wish of its island member countries to join in a suitable consortium for national satellite telecommunications and that this should be made known to the major telecommunications institutions with responsibilities in the satellite area, and also noted the possibility that the Australian government would take into account this view when finalizing its own national satellite system." (July, 1980)

A further persuasive point with regard to the satellite option comes to light in reviewing the experience in Indonesia with the PALAPA system which is being used to serve other countries, e.g., the Phillipines, Thailand, Malaysia, and Papua New Guinea. As with the Pacific region generally, in Indonesia there was the problem of many islands spread over great distances. These islands had differing communications system prior to the establishment of PALAPA, and although many were linked by high frequency radio, this service was generally not available on a 24-hour basis. As was noted in a U.N. study:

> The difficulty of communicating with remote areas was a great obstacle to national development, particularly since the development of more remote areas has been a national priority. . . . Extension of conventional links to new areas would have been a slow and expensive process. 1/

1/ "Relevance of Space Activities to Economic and Social Development," a background paper for the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, April, 1981, p. 16.

The experience in Indonesia since the introduction of the first PALAPA satellite in 1976 has been favorable. The system has permitted relatively rapid introduction of new links, although it was deliberately designed not to replace the good quality terrestrail circuits in areas of high demand. Rather, it was planned to be integrated into the existing communications systems in the country.

Thus, it appears that the satellite choice is unique in that it offers a high quality, distance insensitive solution but also preserves national options.

Table 5.2.2 lists various service options that might be provided and describes each one briefly. Just as in the case of a restaurant, this can be thought of as a menu. Each nation may make its own selections, independent of other nations in the region. There are in the Pacific Basin a few countries that will have need of most of these services in the immediate future. Other entities can move more slowly toward adoption.

5.2.1 Interim System Incorporating Existing Satellites

The first alternative for meeting Pacific Basin communications needs, and the most realistic for the next five years, involves the provision of temporary (gap filling) telecommunications capacity from existing satellites that cover all or part of the Pacific. The choice is rather limited if all island nations are to be served, although an interim system, by definition, may not be able to serve all who would like to have satellite services. Given current options, several

frequency bands are possible.

Military satellites operate in the UHF (Fleetsatcom and Leasat) and 7230 to 8400 MHz bands (DSCS). Because of their missions (national defense) they are not suited for commercial and government to government communications (except under certain limited circumstances).

Figure 5.2.1 shows the coverage provided by existing satellites in the frequency band at 4 and 6 GHz (1 GHz=1000 MHz). The bulk of this traffic is provided by INTELSAT satellites that are positioned nearly overhead.

The highest frequency to be considered is the frequency pair of 12 and 14 GHz. This band will be available principally from the Australian National Satellite Communications System (ANSCS). Figure 5.2.2 shows the coverage existing and planned for at these frequencies. Not all Pacific nations would be covered by the planned first generation ANSCS. The configuration of the second generation system is under study. The ANSCS incorporates some direct broadcasting capabilities and therefore will be particularly advantageous in the provision of this form of telecommunications.

Figure 5.2.3 shows the coverage of the Maritime satellites (Marisat and other satellites in the INMARSAT system), including INTELSAT V's with the Maritime Communications Subsystem. These satellites operate in the 1.5 to 1.6 GHz band. At present, the INMARSAT system does not allow any fixed satellite stations. (A fixed satellite station means that the earth does not move about). It may be possible to approach INMARSAT for the provision of a temporary fixed-station service for a predetermined period of time until some other option (perhaps the Integrated Communications

System) is initiated. INMARSAT, headquartered in London, will need as much revenue as possible in the early years; it therefore might be willing to accommodate on a temporary basis the needs of the Pacific islands.

The most reasonable option for an interim service would appear to be the use of the INTELSAT system coupled with low-cost earth stations. Clearly, not all the locales requiring services in each of the island nations can afford to purchase (or operate) an INTELSAT "A" or "B" station. While such facilities can be and often are located at national capitals, the extension of satellite services into very rural areas is now lacking. However, two factors have come into play in recent months that may change the picture insofar as the projected accessibility and affordability of an integrated INTELSAT system.

First, in June 1981, the INTELSAT Board of Governors authorized a new study that will examine and assess the expected demand for domestic satellite services, with particular attention to thin-route rural and island communications.[1/] In discussions with INTELSAT staff,[2/] it has become apparent that there is considerable interest in finding ways to break through the problems presented by an area such as the Pacific Basin, namely, low demand (at least at present) over a broad area coupled with limited ability to pay. One implication of the study seems to be that INTELSAT might consider establishing some type of regional tariff rather than attempting to deal with each island nation separately. In this scenario, there would have to be a regional entity that could act as the official contracting body on behalf of the participating nations.

1/ Press Release, "News-Nouvelles-Noticias," INTELSAT, Washington, D.C., 30 June, 1981.

2/ PSSC Pacific Basin Study Team discussions with Business Planning staff, INTELSAT, Washington, D.C., August 12, 1981.

INTELSAT has begun a study of low-cost C-band earth stations that could transmit and receive voice and data. It hopes to be able to demonstrate that a 4 to 6-meter, low side lobe antenna can be constructed to work with the current INTELSAT spacecraft global beam. While it is premature to predict price, INTELSAT hopes that for small orders (less than 100), the earth station could sell for around $25,000. For orders approaching 1,000, the price might drop to approximately $15,000. Assuming that demand would build over the next ten years to a maximum requirement by 1992 of 3,000 low-cost C-band earth stations, the capital investment required (in 1981 dollars) would be between $36 million and $45 million. The cost to any one government, however, would be relatively modest, and operational costs are also likely to be low.

Given the fact that INTELSAT is just beginning to look at rural and thin-route special needs, it may be unwise to predict what type of new tariff (if any) will be designed. However, in terms of the operational structure of the system as it might work in the Pacific, the following assumptions could be made:

1) That the capital in each country (or other entity) would be likely to have one standard A or B station.
2) That outlying districts, towns, or other population centers would each have one of the low-cost earth stations.
3) That each A or B station could access a pool of circuits that could, in turn, be shared with the "slave" (low-cost) earth stations.

More will be said in Section 5.4 about management of such a system.

Should an Integrated Communications System (ICS) satellite (described below) become operational, there is the problem of transitioning equipment from either the INMARSAT or INTELSAT frequency band into the (proposed) ICS 2,500 MHz. With proper planning, some of the elements (antennas and baseband equipment) can be utilized at either frequency, and, therefore, can be incorporated into the ICS.

There are certain problems associated with an INTELSAT system solution in the Pacific, and these are detailed in Appendix E. One limitation is that if the existing satellites in their present locations are used, this means that the global antenna coverage pattern must be employed because of the particular antenna beam configuration of the satellites. Through deliberate design, the hemi and zone beams cover the rim nations in the Pacific and completely ignore the island nations in the middle. There is a substantial EIRP reduction when the global beams are used instead of the hemi or zone beams.

For some time, the various INTELSAT satellite location plans have shown INTELSAT V's going into the Pacific sometime around 1982 or 1983. Each of these plans seems to vary in timing and as to what satellite goes where, but there does seem to be a consistency in the plan to locate some of these satellites in the Pacific. At C-band, the satellites have the same difficulties as the older satellites. Their coverage is either global (low EIRP) or hemi-zone beams aimed at the extreme edges of coverage. The two spot beams (both at 14/12 GHz) can be moved, but it

does not appear that they can be moved far enough south to get anywhere near the island nations of interest. These beams also tend to be relatively small and present conductivity difficulties. In addition, there is the question of the use of Ku-band in areas where the rain exceeds 100 inches per year.

Another type of satellite option that presents itself (short of configuration of a new system) is the overlapping use of existing or proposed domestic satellites that cover at least some of the countries in question. The plans for the Australian system have already been noted. The PALAPA satellites provide service to countries neighboring Indonesia. (See Figure 5.2.1). In the U.S., at least two carriers may have excess capacity on new satellites that could be used for some Pacific service, assuming that problems of INTELSAT agreements and other legalities could be resolved.

Western Union, with its TDRSS (tracking and data relay satellite system), expects to have spare capacity at C-band that can be leased on the satellite positioned furthest west (171 degrees). This satellite, which will have a footprint that covers a substantial portion of the Pacific, may not have enough power to operate at its NASA-assigned frequencies simultaneously with C-band, or, if the C-band antenna is used, there may be insufficient power for it to continue beyond four or five years. However, there may be enough time for an interim system to provide service. There would also be a need to reorient the antenna for coverage of island nations south of the equator, and that decision would have to be made in the near future[1/] before manufacturing is completed.

1/ Conversations between PSSC project staff and Ralph Morris, Western Union Government Systems, June, 1980, and August, 1981.

Also, NASA may not station-keep TDRSS as precisely as commercial domestic satellites are kept, so if a Pacific service were offered, it might be necessary to arrange for additional tracking capability, adding to system cost. NASA itself would have to approve any special use of the satellite.

Another option has recently surfaced in connection with the sale by RCA of a complete C-band satellite to Alascom Inc. for service to the state of Alaska. The satellite will be parked at 143 degrees west, and while the footprint has not been released (as of this writing), it is possible that at least a portion of the eastern Pacific Basin may be covered, although it is likely that the coverage will be far north of the equator. Thus, to obtain better overall coverage, a second antenna would need to be added. Alascom has indicated that some excess capacity may be available for leasing on a preemptible basis, but these conversations have been very preliminary.1/

The chief advantages of using existing or planned domestic or regional satellites are: (1) cost, since the space segment presumably exists and earth station technology has been developed; (2) availability, since the systems are or soon will be in operation; (3) reliable frequencies, since most of these systems operate at C-band or Ku-band, although the latter presents problems with rain attenuation. Chief drawbacks include: (1) lack of a single, coordinated system for the Pacific; (2) the need to establish new legal mechanisms (except if the INTELSAT system were to be used); (3) the possibility that in the future, coordination between and among these disparate systems and the user nations would

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1/ Conversations between PSSC Project Staff and Alascom, August, 1981.

become increasingly difficult and costly.

Plainly for an interim system, increased uses of existing satellites and improved earth station technology will provide some of the answers. It may even be that the INTELSAT system, with lower cost ground stations and increased satellite capacity in the Pacific can be seen as adequate. What follows in this section suggests an alternative approach beyond the interim solutions.

5.2.2 The Integrated Communications System

The 2,500 MHz (2.5 GHz) frequency band was allocated at the World Administrative Radio Conference of 1979 (WARC-79) for Region 3 with the express thought of permitting integrated telecommunications in the Pacific. Within the frequency range of 2,500 to 2,690 MHz, the operations of both Fixed Satellite Services (namely those in which the earth station does not move) and Maritime Mobile Satellite Services are permitted. Direct Broadcasting is also allowed in this band. Appendix G shows the WARC-79 Region 3 regulations that pertain to this particular part of the radio spectrum in the Pacific. It is further observed that, under the proper regional allocation, the Aeronautical Mobile Satellite Service might be permitted on an exception basis due to the geographical remoteness of the Pacific islands. Obviously, a formal proposal for such an exception would have to be made by the appropriate group of nations or consortium. If land, sea, and air stations can be incorporated within the same frequency band and through a common satellite, then a truly Integrated Communications System can be achieved.

There is a successful history of S-band satellites, including ATS-6, INSAT-1, and Arabsat. Currently, antennas for the latter two are planned at 4 and 6 meters, respectively, but since television will be transmitted on these systems, it can be assumed that smaller antennas could be used for voice/data only as may be most appropriate in the Pacific.

The 2,500 MHz frequency band is less demanding as far as equipment is concerned. This is particularly true in the case of antennas. In some configurations, simple antennas made of chicken wire or mesh screening may be considered. The local fabrication of these antennas is within the realm of possibility. In both India and Indonesia this is already taking place. Unlike many satellite designs that emphasize extreme communications channel capacity, the Integrated Communications System satellite would be concerned with making the earth stations inexpensive and easy to use.

The selection of a 2,500 MHz satellite as the centerpiece of the Integrated Communications System has operational advantages that will make maintenance and training easier than other satellite frequency choices. In many respects it is more forgiving of imperfect installations and maintenance than higher frequencies. This frequency tends to be relatively independent of rainfall. Higher frequencies, especially at 14/12 GHz, are sensitive to the heavy downpours that are regularly experienced in the Pacific region (See Figure 5.2.4). There should be little interference with other systems.

Because of difficulties in generating DC power, the use of low power uplink transmitters is desirable. This would permit the use of solar power systems, thus circumventing many of the usual power supply

problems. This would be of particular advantage on the out-islands where power is unreliable, if available at all. It also eliminates the need to haul in petroleum and to maintain rotating machinery.

Insofar as necessary, existing terrestrial equipment would be used to access the Integrated Communications System earth stations. Depending on cost of these earth stations and the ability of user nations to pay, it may be that in some cases a "final mile" terrestrial link will not be necessary since communications can terminate at the earth station location.

Because there would be some changes in the routing of telephone and telex calls, some of the existing equipment would be relocated into other feeder trunks. It is not the intent of this system to eliminate existing communications equipment (except where such elimination was both practical and desirable from the point of view of the user). Rather, the ICS includes use of each nation's communications infrastructure and, where desirable, it would relocate some of the present equipment into other (new)routes, thereby extending service further to the outer population centers.

Table 5.2.5 indicates the probable costs of an S-band satellite system in 1980 dollars. Not included are projections of operational dollars on an annual basis. While it is safe to assume that inflation may decrease the value of the 1980 dollar, it is also safe to assume that some costs may be reduced in coming years, so the overall estimate may be reasonably correct even five years out.

Figure 5.2.5 shows the present day mix of various forms of technologies. It is not to scale. Figure 5.2.6 shows the reconfiguration

at some future time after the Integrated Communications System has been introduced and deployed, The equipment from 1981 is retained in Figure 5.2.6.

The regional satellite approach may permit the system design to be flexible enough to grow into other forms of communications as each island nation's requirements change. In this manner, it can simultaneously accommodate the requirements of the most and least advanced island nations in the region. This flexibility can be used to enhance the growth of each nation individually and at a pace chosen by that nation. The region need not force any nation into areas for which it is not prepared.

The Integrated Communications System is so called because it handles both island-to-island traffic (and, in the case of large island, intra-island traffic), maritime and aeronautical communications simultaneously. It is envisioned that each station (whether on a ship or on land) would have its own telephone and it would be equally easy to call from a ship, home or office.

The Integrated Communications System offers unique features in several respects. Unlike the Forum Line (where the ships must be used sequentially), the ICS permits all users to access it simultaneously, no matter how large or small their needs (within reason). There is no waiting for service. In addition to being a collection of national systems, the ICS may also be used on a regional basis for certain functions where resource sharing may be desired. Examples of these are weather reports, disaster warnings, air traffic control, and marine

resource management. It may also be used for international commerce and government-to-government communications.

The time required to design and prepare for launching a new 2500 MHz satellite was investigated. Reputable U.S. spacecraft manufacturers estimate that this phase would require from 30 to 36 months. It has been assumed in the costing of the system that only one satellite would be constructed, but if a ground spare were required, the costs as outlined in Table 5.2.5 would increase by $36 million.

Table 5.2.1 - TECHNIQUES CONSIDERED

TERRESTRIAL

- High Frequency Radio
- Very High Frequency Radio
- Ultra High Frequency Radio
- Microwave Links
- Tropo Scatter
- Meteor Burst Communications
- Underseas Cables
- Inter-Island Fiber Optic Cables
- Constant Altitude Balloons
- Hovering Film Reflectors

SATELLITE

- The Global INTELSAT System
- A Regional System Using Old Leased INTELSAT Satellites
- A Regional System Using Overlapping Domestic Satellites of Other Countries
- INMARSAT
- Amateur Radio Satellites
- Military Satellites
- A New Regional Satellite System

C-3

Table 5.2.2 - ALTERNATIVE SERVICE REQUIREMENTS AND THE LIKELY APPLICATIONS OF A COMMUNICATIONS SYSTEM FOR THE PACIFIC ISLANDS

1. Basic Telephony
2. Telegraphy/Telex
3. Emergency/Disaster Warnings - with Inbound & Outbound Options
4. Integrated Services - Mobile & Stationary Land, Maritime and Possibly Air Connections
5. Maritime Resource Management
6. Multipoint Voice Conferencing
7. Low Speed Data
8. Radio Relay Feeds - for MF Broadcasting
9. Facsimile
10. Electronic Blackboard
11. Slow-Scan & Freeze-Frame Video
12. Direct Broadcast Radio
13. Television - Relay and Community Reception
14. Electronic Mail
15. Direct Broadcast Television

5.2.2 (cont.) ALTERNATIVE SERVICE REQUIREMENTS AND THE LIKELY APPLICATIONS OF A COMMUNICATIONS SYSTEM FOR THE PACIFIC ISLANDS

1. BASIC TELEPHONY

Telephony is necessary for adequate, reliable and readily available communications. Telephony is highly desirable to and from schools, health centers and transportation facilities. Telephony provides village leaders with access to government and also provides for normal social discourse on family and community matters of concern to people who are unable to live together because the cash economy takes the wage earner to town.

In Papua New Guinea officials estimated that a village telephone for medical emergencies would save three or four lives per province (19 provinces) per year. A traditional chief said he would call the national elected leadership to advise the national government. Government departments could communicate more efficiently and regularly with provincial offices.

2. TELEGRAPHY/TELEX

As with telephony, telex and telegraphy provide reliable communications on demand. Such service would be beneficial in connecting offices (at different locations) of a government department. Currently, provincial field workers must interrupt activities to participate in scheduled radio transmissions. Transportation and lost work time are expensive and wasteful of both human and economic resources. Telex would provide printed copy which could be collected at any time of day allowing field workers to maintain their schedules and transmit data at irregular hours, irrespective of slow or non-existent mail service.

3. EMERGENCY SIGNALS WITH DISASTER WARNINGS (INBOUND AND OUTBOUND OPTIONS)

Emergency communications are needed to alert outlying villages at the first sign of a tsunami (tidal wave), earthquake, hurricane or other disaster. Villages would also then be able to transmit information on damage assessment back to government centers. Each disaster might have a different signal identifying the type which might also be used in conjunction with broadcast radio for disaster assessment and relief efforts. Such communications would cut the time necessary for mobilizing disaster relief forces and would also shorten the time before accurate, up-to-date information can be broadcast by radio.

4. INTEGRATED SERVICES (MOBILE & STATIONARY LAND, MARITIME AND POSSIBLY AIR CONNECTIONS)

Integrated communications services are a highly desirable solution for linking mobile & stationary systems for disaster relief coordination. Rather than have an interconnection between different services via manual exchange or message systems, it would be preferable--particularly in emergencies--to have integrated channels for both fixed and mobile systems available for telephone and telex.

5. MARITIME RESOURCE MANAGEMENT

Continuous ship to ship and ship to shore communications would facilitate the management of maritime resources. In particular, the need for surveillance capability has repeatedly been raised. Licensed ships might have a continuous signal for constant mapping of ships by satellite. All licensed ships would light up, and if an unfamiliar ship were reported, officials could immediately determine if it were licensed. Such a signal would also aid in disaster relief: i.e., the cessation of a signal would indicate a disaster. As surveillance is not easily provided by communications satellites, it was suggested that DOD provide a telex print out of ships in each country's waters at a given time.

6. MULTIPOINT VOICE CONFERENCING

Point to multipoint voice conferencing is well known to Pacific islanders through the USP PEACESAT and DISP networks utilizing ATS-1. Such a service would be very useful for police, education, health, and for service departments endeavoring to assist in emergency situations. Close coordination is necessary both between departments and between the disaster relief center and the disaster area. In education, multipoint conferencing would enable principals, specialists, teachers and students, in a variety of combinations, to conduct conference calls.

7. LOW SPEED DATA

The use of low speed data would assist in such areas as airlines bookings, timber operations, land surveys and would provide fisheries departments with a means of keeping accurate inventory information on catches and royalties that are due governments from foreign vessels' catches. Universities could have links between their distant campuses or with other universities; banks could have links with their branches; governments, which currently must keep funds in provincial offices, could use low speed data links for the dispersal of pay checks and other funds.

8. RADIO RELAY FEEDS (FOR MF BROADCASTING)

Many Pacific countries are so spread out geographically that they need more than one MF radio station to give satisfactory coverage to the entire population. Relays from their main studios would be highly desirable.

In the Solomon Islands, for example, the provincial centers at Gizo to the west and Santa Cruz to the far east are connected by a series of relay towers. Radio relay would facilitate more direct communication between those disparate points.

9. FACSIMILE

Facsimile would provide the ability to send copies of printed pictorial materials between government offices. This method of sending letters, legal documents and government notices is highly desirable for rapid transmission between urban and rural centers.

For example, in education, standard examinations could be sent by facsimile rather than having an official travel around to various schools. Principals in each high school could than make additional copies at the local level of the master form transmitted by facsimile. In addition to the government departments that could justify having such service available, each post office might have a facsimile machine for general use. In the future, there may be a need to send news releases between certain population centers and government offices.

10. ELECTRONIC BLACKBOARD

The electronic blackboard is an inexpensive technique for transmitting image information. Electronic blackboards could have important applications for educational use.

Particularly useful in tutorials, the electronic blackboard eliminates the difficulty of answering questions without the aid of sketches transmitted by some other means (e.g., television). In health training, a procedure might be sketched. In agriculture, a formula and techniques might be transmitted. In most areas, it is conceivable to think of the electronic blackboard as aiding in the process of training, education and information exchange.

11. SLOW SCAN AND FREEZE FRAME VIDEO

The use of slow scan freeze frame technology offers the possibility of transmitting visual information. Diagrams could be drawn and

replicated. In health, X-rays could be transmitted for consultation on fractures, splits, etc. Pictures could be transmitted for illustration of points otherwise difficult to make without visual aids.

12. DIRECT BROADCAST RADIO

Direct broadcast radio could feed to village receivers for transmission of educational programs. Direct broadcast radio increases range because it eliminates the necessity of going through a radio station before transmission to distant sites.

13. TELEVISION (RELAY AND COMMUNITY RECEPTION)

In time video distribution service will provide community reception of educational television programming from capitals to outlying villages in countries which might choose to utilize such services.

14. ELECTRONIC MAIL

Electronic mail could be provided between all post offices, however, it is felt that a mixture of normal paper mail and facsimile mail (where speed is important) will suffice in the foreseeable future. Eventually, electronic mail may be considered desirable. Presently, it may be useful between selected centers with high volumes of communications traffic.

15. DIRECT BROADCAST TELEVISION

Direct broadcast television is designed to transit to individual receivers. Such capability is expensive but may be considered desirable at some stage of telecommunications development in the Pacific.

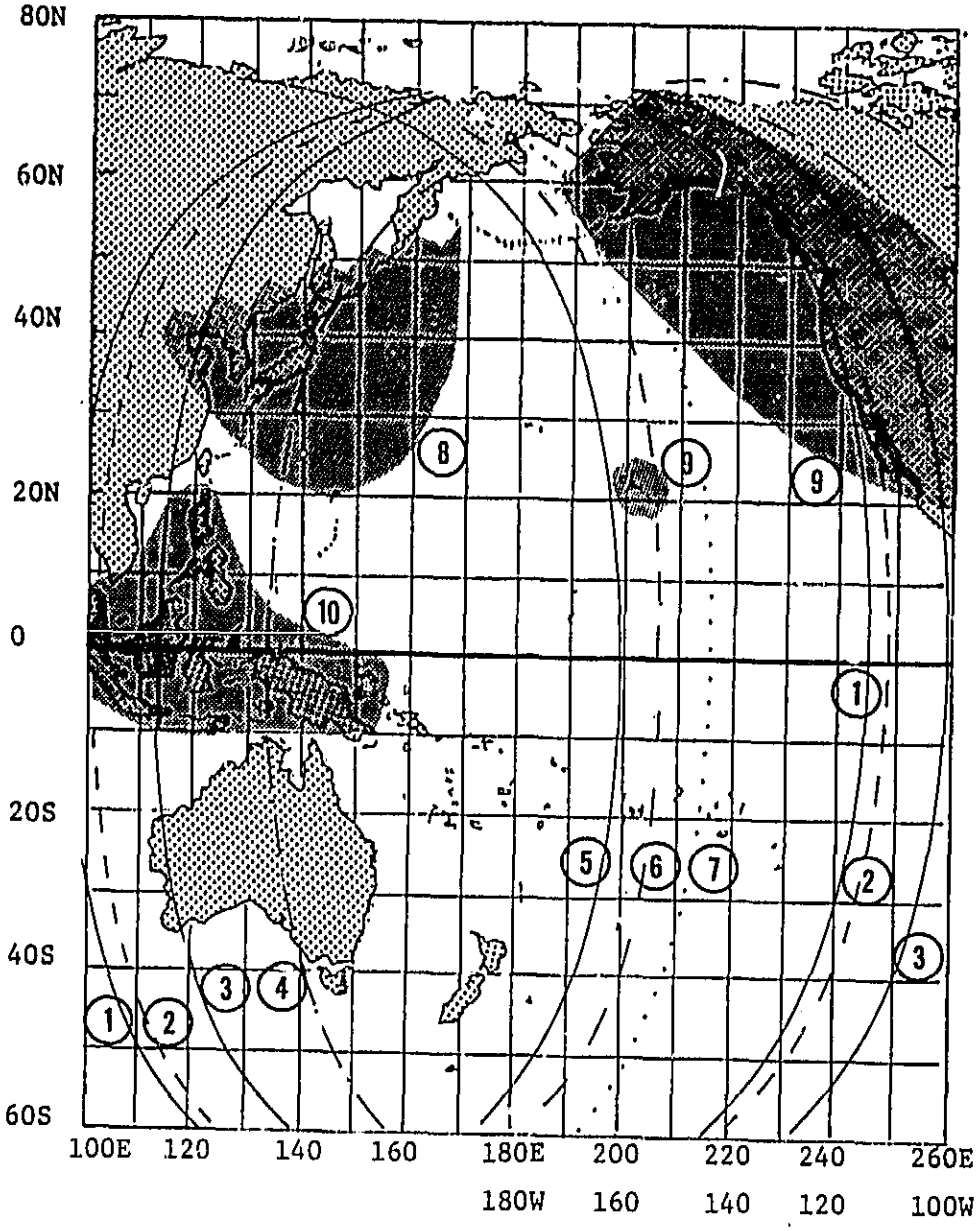

Figure 5.2.1 - Downlinks in the 3 & 4 GHz Bands

See Table 5.2.3 for Symbols

Table 5.2.3 - Downlinks in the 3 & 4 GHz Bands

KEY	SATELLITE	SERVICE	NATION	BAND	STATUS
1	INTELSAT IV (LATER IVA)	INT'L FSS	INTELSAT	4	A
2	INTELSAT IV (LATER IVA)	INT'L FSS	INTELSAT	4	A
3	STATSIONAR-10		USSR	3	F
4	ATS-1	EXPERIMENTAL	USA	*	*
5	STW-1	EXPERIMENTAL	PRC	4	F
6	STATSIONAR-15		USSR	3	F
7	STATSIONAR-7		USSR	3	F
8	SAKURA (COMMUNICATIONS SATELLITE OR CS)	NAT'L FSS	JAPAN	4	A
9	TYPICAL US DOMSAT	NAT'L FSS	USA	4	A
10	PALAPA A & B SERIES	NAT'L FSS	INDO-	4	A
		REG'L FSS	NESIA	4	C

* MAY NOT BE AVAILABLE FOR USE AT THIS FREQUENCY.

STATUS: A=AVAILABLE NOW, C=UNDER CONSTRUCTION, F=FILED WITH THE IFRB

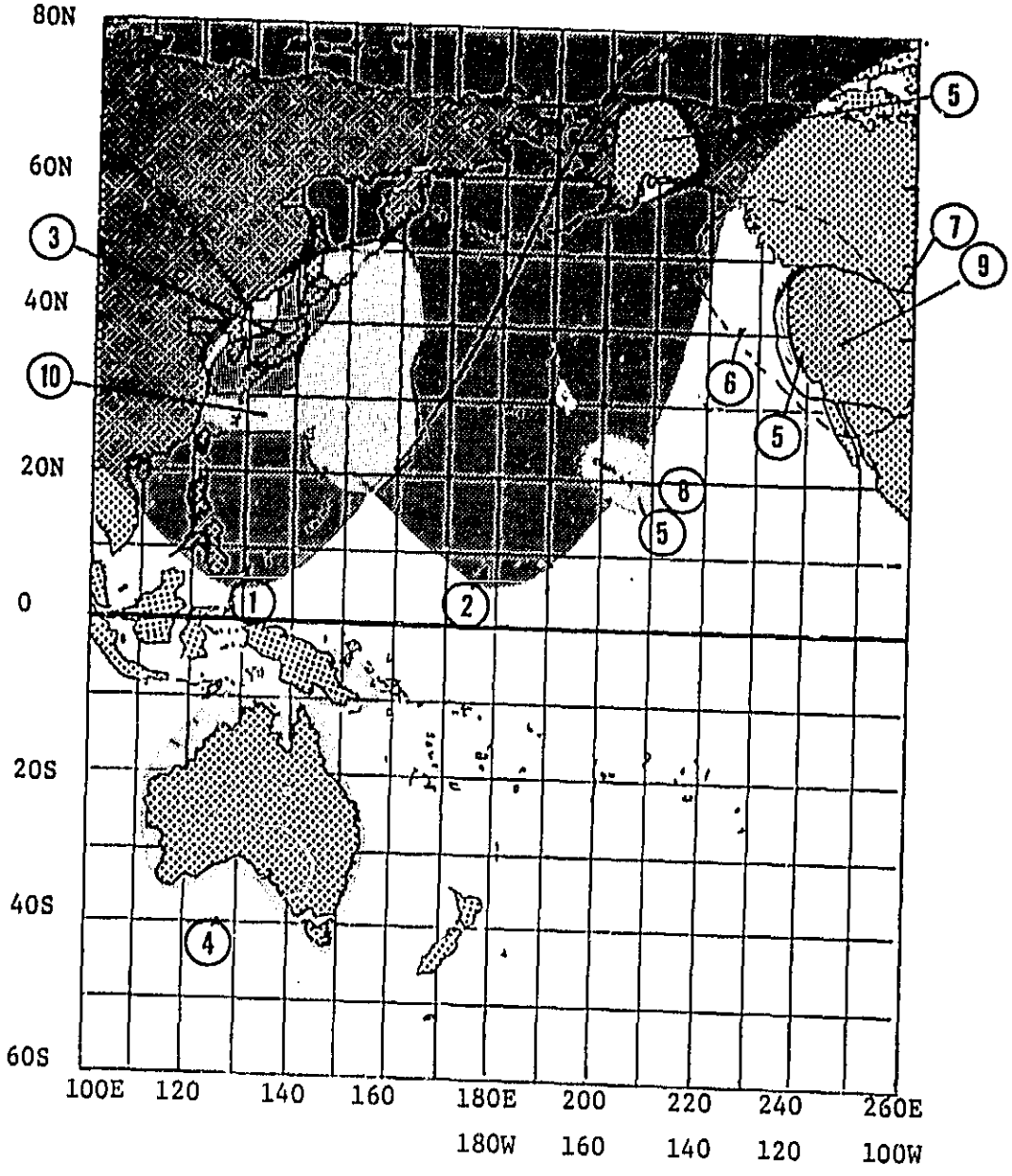

Figure 5.2.2 -- Pacific Ocean Coverage at Frequencies over 10 GHz

See Table 5.2.4 for Symbols

Table 5.2.4 - Downlinks at Frequencies over 10 GHz

KEY	SATELLITE	SERVICE	NATION	BAND	STATUS
1	LOUTCH-4	FSS	USSR	11	F
2	LOUTCH-P4	FSS	USSR	11	F
3	YURI (BROADCASTING SATELLITE OR BS)	DBS	JAPAN	12	*
4	AUSTRALIAN NATIONAL SATELLATE COMMUNICATIONS SYSTEM (ANSCS)	FSS/DBS	AUSTRALIA	12	R
5	SATELLITE TV CORPORATION (COMSAT)	DBS	USA	12	P
6	ADVANCED WESTAR	FSS	USA	12	C
7	SBS	FSS(DATA)	USA	12	A
8	GSTAR(GT&E)	FSS	USA	12	R
9	SPCC(SOUTHERN PACIFIC COMM.)	FSS	USA	12	P
10	SAKURA (COMMUNICATIONS SAT. OR CS)	FSS	JAPAN	20	A

* BS-1 HAS CEASED OPERATION. BS-2A & -2B ARE PLANNED.

STATUS: A=AVAILABLE NOW, C=UNDER CONSTRUCTION, F=FILED WITH THE IFRB, P=PROPOSED, R=IN RFP STAGE, LAUNCH IN 3 YEARS.

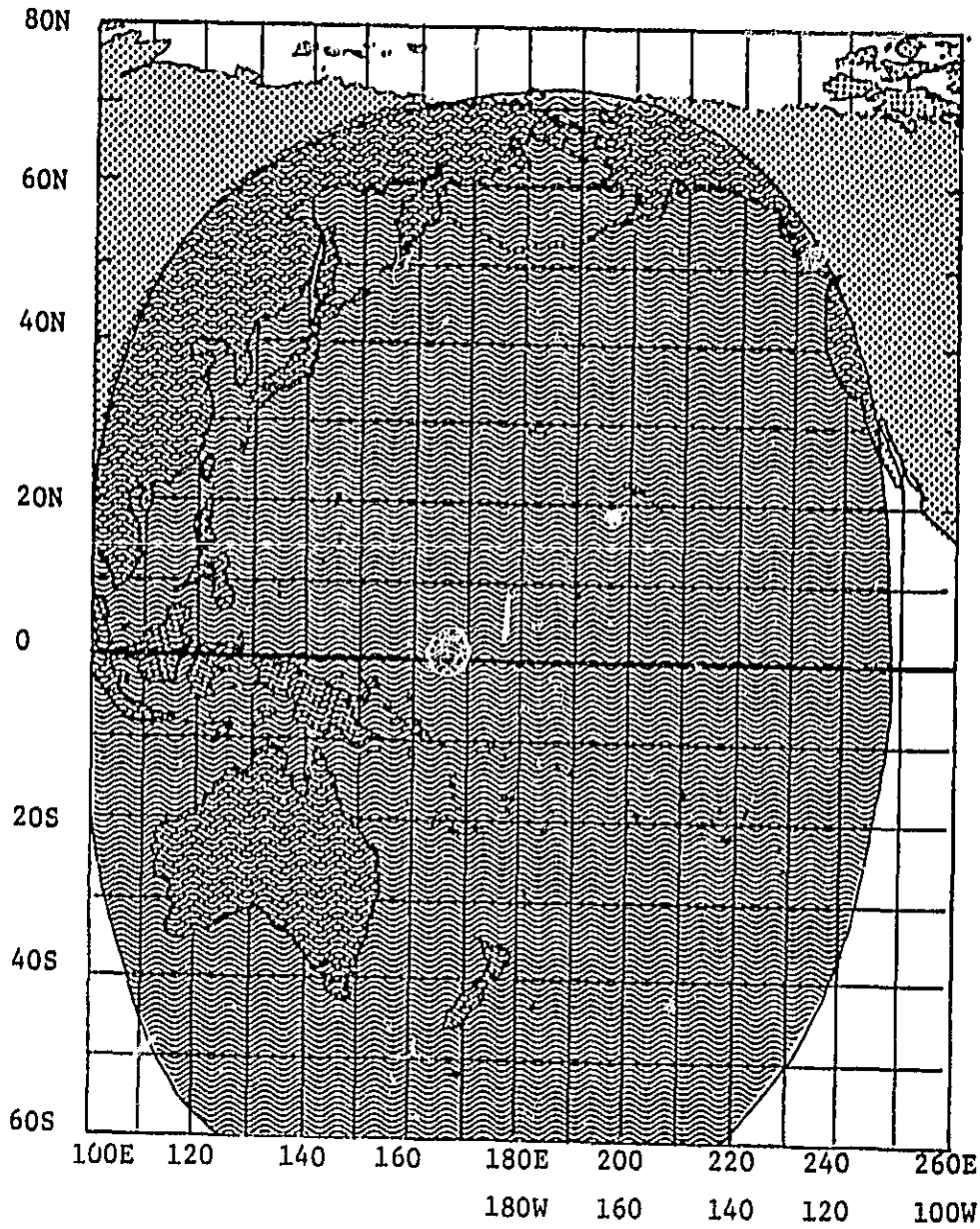

Figure 5.2.3 - Pacific Coverage from Inmarsat Satellites

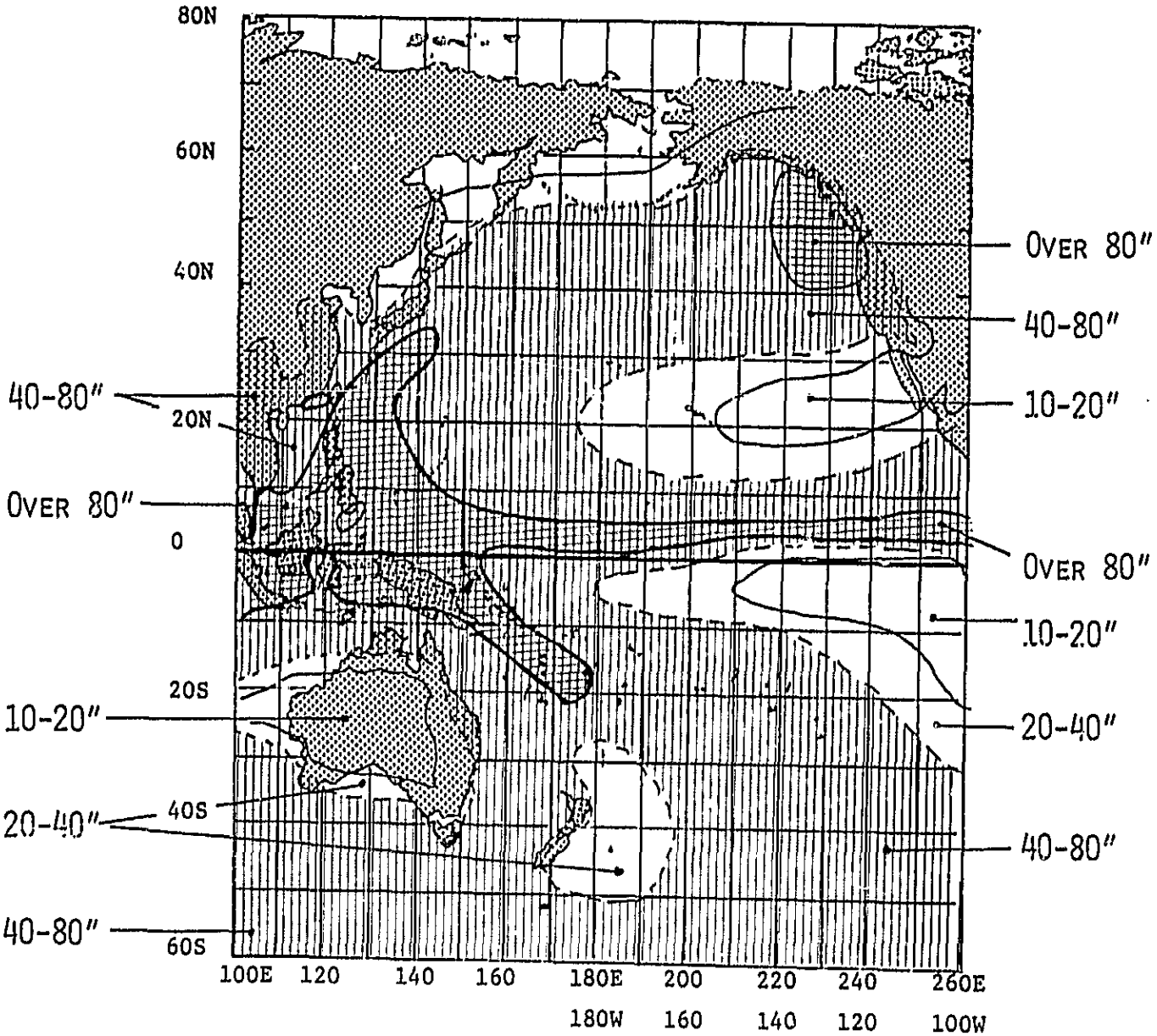

Figure 5.2.4 - Annual Rainfall in the Pacific Basin

Table 5.2.5 - 2.5 GHz SATELLITE SYSTEM CAPITAL COST SUMMARY

The following figures represent an average best estimate of capital costs (excluding recurring costs) for the major equipment and services required in implementing a new 2.5 GHz satellite system, assuming that the single satellite required has the equivalent capacity of a 12-transponder C-band satellite (e.g., a WESTAR I class). It is assumed for the sake of these estimates that the satellite does not operate in a TDMA mode, although further analysis may suggest that this mode is preferable.

*1	System Design (nonrecurring cost: includes spacecraft, ground segment and user terminal designs)		$ 6 M
2.a.	Satellite Manufacture (1 Spacecraft) (Note: Assumes use of an existing design)	$36 M	
**2.b.	Satellite Manufacturer Incentives	12 M	
2.c.	STS (Shuttle) Launch (1) (Assumes Delta class, including PAM D)	18 M	
2.d.	Flight Insurance Policy (1)	8 M	
2.e.	Launch Services Contract (1)	5 M	
	Subtotal: Satellite and Launch		79 M
3.	Tracking, Telemetry, and Control		15 M
	Total Satellite System Capital Cost:		$100 M

Note: This estimate does not include earth station costs. Assuming the prices of the types of low-cost, low side lobe C-band earth stations INTELSAT is studying, an estimate of $25,000 or less per earth station seems reasonable. If TDMA were used, the earth stations would be considerably more expensive.

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* Cost estimates based on prices (in 1980 dollars) quoted by two manufacturers who were given general specifications of the proposed system.

** Although a sum like the one shown here is paid over the life of the satellite (assuming all transponders continue to work), and as such could be considered a "recurring cost," it is nevertheless included here.

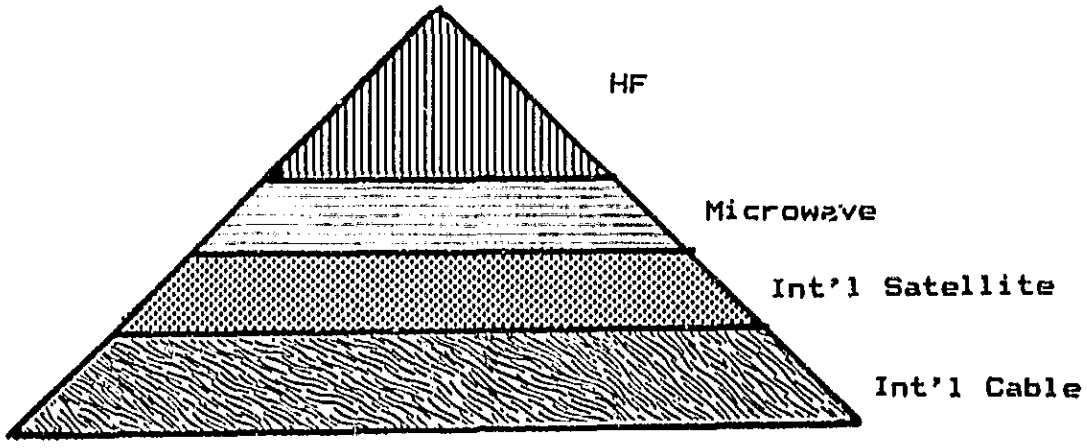

Figure 5.2.5 - Pre-Integrated Communications System

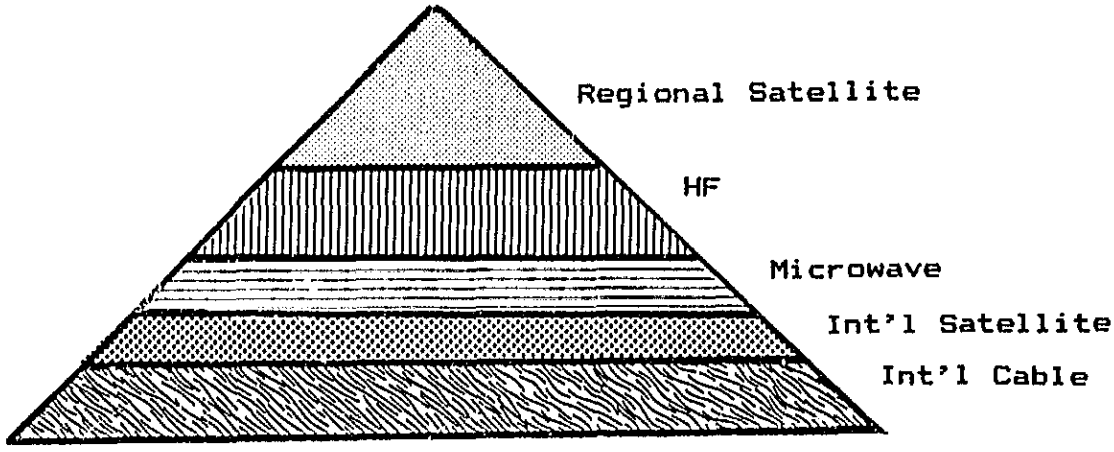

Figure 5.2.6 - Integrated Communications System

5.3 MAINTENANCE AND TRAINING

In addition to being selected on a multi-use frequency basis, the 2.5 GHz frequency band has a number of advantages for system maintenance and training.

The earth station equipment is similar to the present microwave point-to-point facilities except that the antennas are larger. (Technologies at 4/6 and 12/14 MHz are progressively less like point-to-point microwave.) The experience already gained in use of microwave paths can form a basis for operating and maintaining the 2.5 GHz satellite system. The existing local technicians and operators will form the cadre of the Integrated Communications System's operators.

As noted in the previous section on operational alternatives, a 2.5 GHz system is relatively independent of rainfall and is less exacting with regard to the precision of installation of terrestrial equipment. Since the system being discussed here is for voice and data only in its initial stage, it is envisioned that relatively simple, rugged, low-cost terminals could be manufactured.

Annual costs of maintenance are difficult to estimate without better knowledge of the precise specifications of the earth stations. Costs will also vary dependent on the type of power source used. As has been suggested, solar power might be used. (During the SITE experiment in India with ATS-6, solar panels were used satisfactorily to recharge batteries for television sets in two locations -- one that was dry and one that regularly experienced heavy rainfall. Both installations worked well.) It will be necessary to plan for an inventory of parts -- probably on the order of 15 to 20 percent -- for the audio recorders, "call boxes," and other associated equipment. The

amount and type of equipment at each site will affect maintenance costs, but it is assumed here that the earth stations themselves can be highly reliable and sturdy.

System operations will require certain trained manpower. General requirements will include personnel for: (1) management and supervision; (2) operation and maintenance of the earth stations, transmitters and addition links (if any); (3) operation and maintenance of associated equipment at each earth station site; (4) operation and maintenance of support facilities such as the power system. As explained in one of the background papers prepared for the second United Nations' conference on the exploration and peaceful uses of outer space:

> The type of background required of personnel depends on the nature of work. Usually, supervisory staff should have a degree in engineering while the technicians should have an engineering diploma. . . . It is necessary in all cases to have these people trained on the equipment they are to operate and maintain. One way of doing this is to include training as a part of the procurement contract. . . . Some manufacturers also hold courses for operations and maintenance. 1/

As has been noted in Section 4.2.5 of this report, finding trained personnel in the Pacific Island nations presents a problem. Thus, special attention must be turned to the issue of technical training at an early stage in the planning of any upgraded communications system.

The planning for a training program will involve at least the following steps. 2/(1) a review and preparation of a chart of the positions likely to be needed, in effect, an organization chart; (2) a review of all the systems and subsystems in the Integrated Communications System that will require skilled personnel for operations and maintenance; (3) preparation of specific job descriptions including detail about the level of performance desired

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1/ "Feasibility and Planning of Instructional Satellite Systems," a background paper for UNISPACE '82 (Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space), 13 February 1981, p. 19.

2/ This listing is partially based on a recommendation from "Training and Education of Users of Space Technology," a background paper for UNISPACE '82, 8 March 1981, p. 36.

and training required; (4) determination of numbers of personnel required at each type of facility; (5) delineation of a recruitment program that will result in the most promising candidates being identified; and (6) determination of the costs and sources of funding to carry out the required education and training.

Once the necessary training plan has been laid out, decisions can be made about appropriate training facilities and locations. As has been mentioned (section 4.2.5), the number of training institutions in the Pacific Basin region has grown in recent years. Technical courses at the trade level are offered in Kiribati, the Solomon Islands, Fiji and Guam. Basic technical training is offered in the Cooks, Tonga and Western Samoa. More advanced telecommunications training is available at the Papua New Guinea Telecommunication Training Center in Lae and at the Telecommunication Training Center in Suva, Fiji. The University of Lae, as well as universities in Hawaii, Australia and New Zealand, offer tertiary degrees in engineering.

Since it will likely be the case that even in the several years required to get the Integrated Communications System underway not enough Pacific island nationals can be trained for all jobs at all levels, expatriates will continue to play a vital role. As in the examples of the broadcasting systems in the Solomon Islands and Vanuatu described earlier, successful transition from expatriate management and operations to local control can take place. Another example comes from Upper Volta where in the 1960's, the telecommunications system was wholly dependent on expatriates for the managerial and senior technical jobs. But, because a commitment was made to training nationals, by 1976, the system was manned exclusively by Upper Voltans.[1/] Students were sent away to foreign universities and to

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1/ Robert J. Saunders, "Financing of Telecommunication Expansion," P.U.. Report No. PUN 48, The World Bank, September, 1979, p. 2.

telecommunications administrations in Europe (and later at African regional centers). Such models as these need to be studied, especially in light of the long lead-time that may be needed to give nationals control of the proposed telecommunications system.

As with the implementation of the technological side of a regional telecommunications system, cooperation among participating countries can make training both less difficult and more efficient. If planning for training is done in a cooperative manner, much valuable time can be saved and personnel from different countries will eventually come to the system with common skills and knowledge.

As participating countries search for the necessary funds for training, it should be borne in mind that the United Nations, primarily through its Development Program (UNDP) has funded training programs that have been under the direction of the ITU. The assistance generally takes the form of fellowship grants, recruitment of experts from countries willing to share their expertise, and the procurement of equipment. UNDP assistance is provided only at the request of developing country governments. Each country is responsible for preparing its own request for UNDP assistance. When a telecommunications project is approved, the UNDP contacts the ITU to seek out technical experts or training programs from the private and public sectors of countries willing to assist. The total expenditure for ITU directed technical cooperation activities in 1980 was $US 30 million, most of which was UNDP financed. Almost two-thirds of the total field expenditure was disbursed for the training of staff to meet the manpower demand in various sectors of telecommunications in developing countries. 1/

1/ "Training and Education of Users of Space Technology," op. cit., p. 38.

While it may be misleading to begin predicting numbers of personnel who would be required for a regional telecommunications system, some estimates can be offered. Assuming that 3000 earth stations will eventually be in operation (whether in conjunction with INTELSAT or as part of a 2.5 GHz satellite system), it can be assumed that on the average three additional persons would be needed for each local operation to provide service and maintenance. There may, of course, be some sharing and reassignment of present personnel working in telecommunications.

Supervisory personnel would presumably be located at regional centers, although additional supervisors would be needed with an expanded system. It is assumed that there would be a commitment to training nations for these higher level positions.

Thus, something like 10,000 trained personnel (approximately .02 percent of the island nations' population) might be needed toward the end of the regional system's first ten years of operational life. However, the number of trained personnel could grow gradually since not all facilities would be built simultaneously.

Until the eventual system is more precisely defined, it is not prudent to try to estimate the costs of training. Whatever the estimated cost of training, the investment should more than pay off if the telecommunications system itself works to solve the many problems and bring about the social and economic goals delineated in this and other studies. The very creation of a technological environment -- and one in which nationals work -- may serve to make technical fields more attractive to young people and to give them more opportunities for first-hand experience.

Whatever the problems to be encountered in structuring a training program, it should be possible with careful planning and recruitment to take

advantage of the training facilities in the region and the existing sources of financial assistance. Certainly in the overall planning for implementation of an upgraded telecommunications system, whether at the level of an individual nation or at the level of the entire Pacific Basin region, funding for training must be considered an essential element of the plan.

5.4 MANAGEMENT AND IMPLEMENTATION

Telecommunications systems throughout the world have traditionally been established and managed on a national basis. This is particularly true in large, well developed, wealthy nations. Each nation establishes its own rules and regulations and telecommunications systems. Only at the borders do the individual national systems meet. The ITU has established a series of engineering and economic standards that permit the orderly flow of transborder communications.

In the Pacific Basin, a number of factors -- including geographic isolation, underdeveloped economies and long distances between islands (even within a single nation) -- require somewhat different approaches.

In reality, most Pacific telecommunications (including domestic) are international in scope. HF and MF radio are two examples. These signals transcend national boundaries and are limited by mutual interference.

In the Pacific, there are reasons to believe that a regional approach may be more productive in the provision of additional telecommunications capacity and in the enhancement of individual national capabilities in such areas as tourism, education, and general commerce. The shared use of facilities would result in a lower cost per user because of economies of scale.

If the assumption is made that improved communications in the Pacific will be accomplished strictly on a country-by-country basis, the question of management becomes irrelevant since each country does already have the structure to manage internal communications. (See section 3 for a listing of telecommunications authorities within each nation.) However, if any type of regional system is to be considered, an additional question must be raised about the type of management structure that would be appropriate.

A difficulty that immediately presents itself concerns the fact that Pacific Island nations have varying political status and affiliations. To try to create a unified approach with countries that range from being "territories" of another country to "independent states" calls for creative legal thinking. Nevertheless, if the potential user countries can agree that some new form of cooperative venture is warranted, there should be no absolute barrier to creation of the necessary new forum or consortium or other entity.

Assuming here that some variation of the proposed Integrated Communications System is to be tried, there are four possible management structures that could be designed to handle the regional administration of the system. (See Table 5.4.1) It is taken for granted that those portions of the system that fall within national boundaries would continue to be administered as at present.

The first option would require that a single country would arrange for the regional system and other countries would purchase telecommunications capability from this "manager country." For example, if a regional satellite were to be launched, Country A would be the entity that would make all financial arrangements with the manufacturer (or carrier) and Country A would, in turn, lease time on the satellite to other Pacific Basin users. This model could serve to provide an entity "of record" to lease circuits from INTELSAT with the express understanding that the circuits are being leased for regional use. (This also presumes INTELSAT would create an appropriate special tariff for this circumstance.)

One advantage of this option is that carriers and others have a single legal entity with which to deal. If the country selected already had experience in establishing improved communications within its own borders, then it could also create and to some extent provide some of the training

necessary for other Pacific Island nationals who would ultimately be responsible for working with the regional system. Another advantage would be that financial organizations, such as private banks and lenders and the World Bank would have a single, established entity with which to transact business. This, of course, places a certain amount of risk on the "manager country," but this risk could presumably be reduced by the nature of the contracts and other agreements that would be put in place with "customer" countries.

A second model would entail the creation of a new, private company (which could be established as a for-profit or a non-profit) in which the participating user countries would be partners. In this instance, considerable effort would need to be given to establishing the appropriate form of corporation, but once in place, it could administer the regional aspects of the communications system.

As with the first model proposed, this option would give carriers, investors, and others a single entity with which to deal. Especially in the case of loans, e.g. from the World Bank, the creation of a single, regional corporation would alleviate the necessity of individual transactions between lenders and some twenty or more different governmental bodies. Assuming the participating countries were limited partners or stock holders, once the corporation began to show a return on its investment, each participating country would benefit.

The location of the corporation could be chosen on purely political grounds, but consideration should be given (as with the single "manager country" approach) to a location where training would be available to those from many of the participating countries.

A third option entails the creation of a new consortium that would act

on behalf of member countries. This body would presumably be set up through compact agreements ratified at the national level in each country, and its sole purpose would be the acquisition and administration of a regional telecommunications capability.

While this model would again have the advantage of presenting carriers, manufacturers, lenders and others with a single entity of record, it might well present special problems. First, the ratification procedure itself might be lengthy and cumbersome. Secondly, the consortium would likely have to be administered in such a way that individual governments would have a participating voice in virtually every decision, even at the most mundane operating level. Thirdly, by its nature, such an entity is less likely to have borrowing power than would a corporation. On the other hand, if no other managerial structure were possible, this one could be made to work.

Finally, a fourth option would be to have an existing regional body, for example SPEC (The South Pacific Bureau for Economic Cooperation which is the action arm of the Pacific Forum) become the manager of a regional system. Assuming that nations in addition to those that are members of the Forum would want access to the system, SPEC could arrange a type of affiliate status for them. This model might be preferable to the creation of a new regional entity in that it builds on an existing structure and presents a familiar name in the marketplace. It would have some of the disadvantages already noted for the new governmental consortium, but it would offer a track record.

If either the "manager country" or a regional corporation were selected as the management entity, there would have to be support and endorsement by existing regional consortia. Thus, a cohesive effort would be the first step. The ultimate selection of the appropriate management structure can be made only after two prior questions are answered: (1) which countries would want to participate in using the eventual system; and (2) the nature of the system itself. Obviously, it must also be possible legally for the prospective user

countries to be able to enter into the necessary agreements to form the management structure. It is conceivable that work on system definition and exploration of the form of the management entity could be carried on more or less simultaneously and, indeed, this timetable might be desirable.

The question about management can be taken one step further. If it is assumed that a decision is made either to use existing INTELSAT capacity in a regional configuration or to seek a new satellite (or both, perhaps in sequence), the regional manager would handle the lease arrangements for the space segment as far as termination of the circuits at the INTELSAT station in each country (or at some other designated point if another satellite were used). Each country would continue to manage its own internal communications. Assuming an S-band satellite were constructed so as to be accessible to small terminals throughout all participating countries, the regional manager would still deal with a single managing authority in each participating country in terms of lease payments and other arrangements even though the communications paths might be directly from individual earth stations to the satellite without any intermediary "master stations."

Since this study and others currently underway attempt to provide the data that will be helpful in the selection of technologies to improve communications in the Pacific Basin, it is to be hoped that after the relevant data has been assessed, movement can be taken by the potential user countries to implement the desired system. In addition to making decisions about who will cooperate and in what form, other steps toward implementation will need to be taken. They include:

1. Deciding whether to use differing telecommunications systems in chronological sequence (e.g., starting with INTELSAT then moving to a regional satellite) or establishing a single system presumed to be

useable over the next fifteen to twenty years.

2. Assessing and making a decision about the most desirable technology or technologies.
3. Establishing the necessary procedures to ensure creation of an appropriate management entity.
4. Determining the likely rate of return on investment in each country where the new telecommunications system will be installed.
5. Conducting preliminary discussions with communications satellite carriers and equipment manufacturers who can be expected to participate in the establishment of the telecommunications system.
6. Conducting preliminary discussions with funding sources, including the private sector, foreign governments, and multilateral development banks (World Bank, Asian Development Bank, etc.).
7. Establishing the management entity.
8. Establishing the specifications for the desired telecommunications system and securing it (via bids, lease arrangements, or whatever is appropriate to the system selected).
9. Borrowing of capital or other acquisition of funds.
10. Executing all necessary procedures to enable all interested Pacific Basin countries to have access to the regional system.

Steps 7 through 10 should be carried out simultaneously.

These steps are summary in nature and may in practice include many elements, such as the hiring of consultants and the conduct of studies, that will need to be carefully plotted in terms of time requirements.

Embedded in the management options and the steps toward implementation are further questions about costs, benefits, and likely future growth of the system. While such questions must be addressed, it is a mistake to assume that all the answers must be revealed before any action can be taken. Even without any additional supporting data, it is clear to the potential user nations

that better telecommunications will result in significant improvements in many areas of life in the Pacific. The history of the implementation of improved telecommunications in other underdeveloped countries is encouraging. (This will be discussed in greater detail in section 5.5.) First steps can be taken without knowing all the outcomes, all the answers.

Table 5.4.1

MANAGEMENT OPTIONS FOR A PACIFIC REGIONAL TELECOMMUNICATIONS SYSTEM

1.	"Manager Country"	Single Pacific Basin country acts as administrator and manager of the regional portion of the telecommunications system
2.	Private Corporation	New corporation, established by countries in the Pacific Basin, acts as purchaser and central manager of services for all participating countries
3.	New Regional Consortium	New entity with membership from all user countries acts as administrator and manager
4.	Existing Regional Consortium	Existing entity (e.g., SPEC) acts as administrator and manager and obtains contractual agreements from non-member countries desiring to share the system

5.5 COMPARATIVE COSTS AND BENEFITS

This section responds to three related questions about the costs of improved communications in the Pacific Basin: (1) How do the various proposed telecommunications systems compare in cost? (2) How could the region be expected to pay for improved telecommunications? (3) What would be the benefits of improved communications and how could these be determined?

5.5.1 Costs of Alternative Telecommunications Systems

Whatever decisions are to be made in the Pacific Basin with regard to improved communications, a major consideration will be cost. This report suggests that for significant improvement of communications and extension of facilities to a greater number of people in the region, there are likely to be two generic approaches: underseas cables (including inter-island fiber optic cables) and satellites. Since the feasibility of the inter-island aspects of the first option would seem remote for the near-term future, attention has been concentrated on the second option. Within that option, as has been noted in Section 5.2, there are several possibilities: using existing satellites (primarily INTELSAT), assuming the availability of new domestic satellites to provide overlapping coverage, and the establishment of an Integrated Communications System that includes provision for a 2500 MHz satellite serving the region.

At present, there are uncertain cost variables in connection with each of the satellite options, although some assumptions can be made for purposes of comparison. In what follows, the variables are

discussed, and tentative conclusions about comparative costs are offered.

With regard to INTELSAT, exploration of lower cost earth stations needs to be completed before we can have an accurate estimate of cost, although as noted in Section 5.2, an initial cost of $25,000 per earth station might be reasonable. If 3,000 earth stations were eventually to be installed, and orders were placed for 100 or more at a time, the cost would be driven down, even taking inflation into account. Another unanswered question is the type of tariff INTELSAT might create to provide for use on a regional (as opposed to a single country) basis.

Similar questions exist with regard to the possible, temporary use of the INMARSAT capacity, assuming a dispensation would be granted for the installation of fixed terminals.

If, as has been suggested, the C-band capacity of the TDRS satellite positioned over the Pacific could be used for a domestic/regional service (and this could only happen if NASA permitted it), a special tariff would need to be created, and costs of earth stations for voice and data transmission and reception would have to be low enough to be affordable.

The estimated nonrecurring costs for a single satellite system at S-band have already been given in Table 5.2.5.

The unknown cost variables at present make it difficult to compare fully the options of present satellites versus future satellites that might serve the Pacific. Enough is known so that it is possible

to say that using an existing system would likely be the least expensive option in terms of capital expenditures. (No attempt will be made here to compare operating costs since such factors as regional tariffs are not known at present.)

However, the least expensive system in absolute dollars does not necessarily equate with the system that will, in the long run, be most profitable or beneficial. More will be said about such predictions in 5.5.3.

If it seems reasonable to proceed with a more detailed definition of the satellite alternatives for the Pacific, complete system definitions would need to be drawn up and additional cost data based on those designs would need to be made explicit. This is especially true with regard to the feasibility of establishing low-cost earth stations for voice and data transmission and reception. Since INTELSAT and others are working on the matter, it should be possible to fill in some of the gaps in existing data with better estimates late in 1982. While this is being done, the question of fiber optic cables should also be revisited since work is going on to realize the benefits that optical fiber submarine systems can bring and cost data should begin to emerge.[1/]

1/ Osamu Kameda, "Submarine Cable Network in South East Asia and Western Pacific and Technological Advancement in Next Two Decades," Conference Proceedings of the Telecommunication and Computer Exposition, Los Angeles, California, November. 1980, pp.69-73.

5.5.2 Who Will Pay?

Regardless of how improved telecommunications are brought into being in the Pacific island nations, there will be capital expenditures and ongoing operational support required. A growing body of studies tends to suggest that telecommunications systems can, even in developing countries, generate respectable rates of return on the initial investment.[1/] When one is looking at the Pacific Basin, there is a common assumption that these countries, even in the aggregate, are "too poor" to be able to afford better communications. Until more detailed analyses are performed on a country by country basis and with a well defined telecommunications system in mind, it will be impossible to show conclusively that the system can be "made to pay." Even when the analysis is performed, there will be open questions that can only be resolved through pricing procedures that will either prove to be a successful or unsuccessful. Fortunately,however, we can find data from projects in other developing countries and regions that provide at least some guidance in terms of questions about funding of new systems. As Saunders summarizes certain recent experience in developing countries:

1/ See, for example: Robert J. Saunders and Jeremy J. Warford, "Telecommunications Pricing and Investment in Developing Countries," P.U. Report No. PUN-30, The World Bank, Washington, D.C., June 1977; Robert J. Saunders, "Financing of Telecommunication Expansion," P.U. Report No. PUN-48, The World Bank, Washington, D.C., September, 1979; C.P. Vasudevan, "Financial Resources for Telecommunication Development," P.U. Report No.PUN-40, The World Bank, D.C., 1978.

> On average, about 46 percent of the construction funds required for the latest ten telecommunications programs partly financed by the World Bank will be generated internally; the operating entities are very conservatively estimated to average 15 percent annual rate of return on overall net plant in service over the five years following World Bank project appraisal. Furthermore, several telecommunications entities will make very substantial net transfers of funds to government for investment in other sectors (postal, etc.) less capable of mobilizing domestic resources.
>
> Internal financial rates of return attributable to the last ten telecommunications investment projects approved for World Bank support are expected to range between 13 percent and 35 percent, averaging 18 percent. 1/

Considerable analysis has been done concerning the optimal investment required in developing countries to provide for an adequate communications system. It has been suggested that while the range of investment in developed countries averages about 0.8 percent of Gross Domestic Product (GDP), a minimum in developing countries should be 0.5 percent.[2/] In fact, it has tended to average only 0.3 percent. But it may be that an even higher rate of investment in developing countries will be necessary to ensure service that is reasonable in cost. As Dickenson has pointed out in reviewing the experiences in several developing countries,". . . an examination of countries which have achieved high rates of growth and substantially met demand shows that about 70% offer relatively low cost service. The average annual percentages of GDP invested over five years for these countries have been about the same as those for developed countries. From this, it would seem that adequate investment is important to minimize costs."[3/]

1/ Robert J. Saunders, "Financing of Telecommunication Expansion," P.U., Report No. PUN-48, The World Bank, Washington, D.C., September, 1979, pp.2-3.

2/ C.R. Dickenson, "Telecommunications in Developing Countries: The Relation to the Economy and the society," P.U. Report No. PUN-32B, The World Bank, Washington, D.C., October, 1978, p.3.

3/ Ibid., p. 17.

While it is useful to review the broad history of how developing countries have implemented new or improved telecommunications systems, it is still not clear that one can do more than treat each country on a case-by-case basis when trying to assess how a system can be funded and what its benefits will be. In this regard, Dickenson notes:

> Our present knowledge of the national significance of telecommunications services and of their importance to other development and to effective administration appears completely inadequate for a reliable assessment on which well-founded decisions on sector priorities, development and tariff policies, etc., can be based. This is in large part due to the fact that we have not done an adequate job in establishing what telecommunications contribute in socio/economic terms. 1/

Realizing that it is necessary to take a microeconomic approach toward analyzing what telecommunications system may be needed, how it can generate revenues and how it can be beneficial, one of the first tasks in a country or region is to study current communications traffic and behavior. A central portion of the present study was, therefore, devoted to site visits and the compilation of annecdotal data to supplement and augment economic and demographic information about the countries. The compilation of descriptions of existing conditions and behavior as these relate to communications will be a necessary first step in analyzing how to price services, what return on investment to expect, and how to fund the required system or systems.

It is important to note that when developing countries do install new or improved communications facilities, long-held beliefs about how people will behave sometimes are demolished. For example, one finds in some of the literature on developing countries (although generally not in

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1/ Ibid., p.18.

studies dealing specifically with communications) the assumption that telephones and other communications facilities will, when made available, chiefly benefit the elite or at least the business community, and that, in turn, only these sectors will be willing to pay.

Concrete evidence refutes this point. For example, in a study of rural telecommunications in Costa Rica, it was found that when public call box telephones were installed in rural villages,". .. the usage of the telephone was relatively widespread with no one small group tending to dominate over the others. One particularly interesting result was that there appeared to be no significant observable income bias among the callers, i.e. both the higher and lower income villagers participated on a relatively equal basis in telephone usage."[1/] This study also found that "calls made for agriculture and business purposes were also quite clearly correlated with the appropriate economic base and demographic characteristics of villages. By far the most prominent reason for which calls were made, however, was personal." [2/]

Another study, which compared purposes of calls in three developing countries, reviewed the pattern of use at a village public call office in an (unnamed) country in Melanesia.[3/] It was found that 5 percent of the calls

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1/ Robert J. Saunders and Jeremy J. Warford, "Telecommunications Pricing and Investment in Developing Countries," P.U. Report No. PUN-30, The World Bank, Washington, D.C., June 1977, p.2.

2/ Ibid.

3/ Robert J. Saunders and Jeremy J. Warford, "Evaluation of Telephone Projects in Less Developed Countries," P.U. Report No. PUN-37, The World Bank, July 1978, pp. 11-12.

were made for emergencies, 20 percent for business purposes (including agriculture and public administration) and 75 percent to maintain contact with friends and family. Equally interesting was the fact that in that country, of those on subscriber waiting lists for telephones, some 42 percent indicated that their priority was business communications, while 22 percent listed emergencies and health matters, and 36 listed personal contact.

This study is mentioned because it suggests, again, that there is an interest in improved communications by a broad spectrum of the population and for a variety of reasons. This, in turn, would tend to point to the fact that people will use the facilities and will pay.

An instance of this ability and willingness came to light in the course of the present study. When the site visit team was in Western Samoa, officials there reported that one public call box placed in a rural community on the island of Savai'i had paid for itself in eleven days. People stood in line to use it as soon as it was installed. This rapid return had not been estimated, and it is likely that it could not have been entirely predicted even from a careful market survey or analysis of past communications on that island.

Saunders and Warford go on to suggest that with regard to pricing policies for telecommunications facilities in developing countries, marginal cost pricing, despite some problems, is desirable. They conclude: "The use of price to help allocate the limited supply of telecommunications services has the critical advantage of leaving the decision as to the importance of telecommunications service relative to other goods and

services in the hands of the beneficiaries themselves, and it helps encourage highly valued uses of telecommunications to replace those that are relatively less valuable to beneficiaries."[1/]

While it may be safe to assume that a developing country (or region) can generate internally some of the funds needed to establish a new or improved telecommunications system, the order of magnitude of investment required for, e.g., a new satellite, will clearly extend beyond the limited resources of the Pacific Basin countries in question.

If as a solution in the Pacific the option of using and extending the use of the INTELSAT system is chosen, this, of course, reduces the overall costs to the annual tariff, the acquisition and installation of additional earth stations, and the establishing of associated communications facilities, e.g., public call boxes. In this instance, it might be assumed that roughly a third of the satellite installations would generate a high enough rate of return to make money for the countries, a second third would likely break even and the final third might not be able to pay for themselves but could be subsidized by the more profitable installations. This would argue perhaps for some regional sharing of the revenues from the system if, for example, one country realized a significant rate of return on all of its facilities and a neighboring (much smaller) country realized a return on less than half of its installations. There would need to be considerable further analysis on a country by country basis to determine where the most and least profitable installations would be.

1/ Robert J. Saunders and Jeremy J. Warford, "Evaluation of Telephone Projects in Less Developed Countries," P.U. Report No. PUN-37, The World Bank, July 1978, p. 13.

If some other satellite option is chosen, e.g., using existing or new satellites that are owned and operated by others (Australia, Japan, INMARSAT), the economics might be similar to the INTELSAT case, with the variants being the cost of the annual transponder leases and the initial costs of earth stations.

If a system is chosen such as the Integrated Communications System described in this study, involving a new satellite and augmentation of existing communications facilities in each of the island nations, the chief cost barrier will be the approximately $100 million required to build and launch the satellite. While it might be assumed that capital from the countries might be generated in sufficient amounts for them to make, in effect, a downpayment on the system (perhaps some 10 percent of the cost), clearly other sources of funds will be needed. Among these, as Saunders suggests, could be: supplier credits, foreign commercial bank loans, bilateral aid donors multilateral development banks, and the United Nations Development Program.[1/]

It will likely be in the interest of certain of the developed countries that have relationships with the Pacific island nations, e.g. Australia, New Zealand, the United States, France and Japan to provide low-interest, long-term loans for the purpose of capitalizing the satellite system. These countries not only benefit from the economic relationships with the Pacific Basin countries but have other interests as well. If as a rough estimate it can be assumed that these "affiliated", developed countries would assume 50 to 60 percent of the nonrecurring costs of

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1/ Robert J. Saunders, "Financing of Telecommunication Expansion," P.U. Report No. PUN-48, The World Bank, Washington, D.C., September, 1979, p.3.

getting a satellite system in place, then a remaining 30 to 40 percent of the funding required would have to be sought from other available sources.

Certain entities such as foundations, system suppliers and private investors may find it in their interests to support Pacific telecommunications projects also. It can probably be assumed that such sources, whether through gifts and grants, loans, or supplier credits, would support up to 10 percent of the initial capital costs.

While it is true that the World Bank considers itself the "lender of last resort," the World Bank has been the principal multilateral source of financing for telecommunications development in developing countries, and has financed part of the foreign exchange requirements for urban, local, long distance, and international telecommunications facilities, with the average size of a loan for telecommunications being $22.5 million.[1/] Thus, it could be anticipated that this source would also be available for a Pacific regional project. Clearly, the Bank prefers to deal with a single, established entity and in a situation where a number of countries planned to share a satellite, the Bank would be disposed to working with one representative of the group, whether a single country, an existing agency, a new agency, or a private corporation representing the users.

In summary, then, the initial capital costs of a new satellite system for the Pacific might be expected to be borne by: (1) the countries themselves - 10 percent; (2) developed countries with close Pacific ties -

1/ Robert J. Saunders, "Financing of Telecommunication Expansion," P.U. Report No. PUN-48, The World Bank, D.C., September, 1979, p.4.

50 to 60 percent; (3) supplier credits, commercial bank loans - 10 percent; and (4) the World Bank Group - 20 percent. These estimates are shown in Table 5.5.1.

It is quite likely that at least in the initial stages of any improved telecommunications system for the Pacific, whether this involves an extension of INTELSAT or some other satellite or a new satellite, capital beyond what can be generated internally in the region will be needed, e.g., for the purchase of the first 300 earth stations, and the like. The same sources as those just described could be expected to participate, although the ratios of the contributions would likely change.

The two most important points that can be made about financing of telecommunications in the Pacific Basin are, first, that given detailed analyses of present behavior and careful forecasts of likely need and ability to pay, pricing structures can be put in place that can be expected to generate enough return to pay for at least a portion of whatever system is chosen. In time, and after the initially high nonrecurring capital costs have been financed, the rate of return on the countries' telecommunications facilities should require less and less support from foreign sources, even to the point where in a majority of the countries in question, the telecommunications systems will be self-supporting.

The second point is that it may be in the best interests of certain of the developed countries to continue to share some of the financing burden to support improved communications in the Pacific if only because defense, economic and political interests are thus served. It is very important in this regard to distinguish between high subsidies,

TABLE 5.5.1 - PERCENT OF CAPITAL COSTS OF SATELLITE SYSTEM DISTRIBUTED AMONG FOUR LIKELY SOURCES

Sources	Percent of Costs
1) Pacific Island Entities *	10
2) Developed Countries with Pacific Ties	50 to 60
3) Supplier Credits, Commercial Bank Loans, Investors, Foundations	10
4) The World Bank and Affiliates **	20

* Assuming the capital costs of the most expensive option, e.g., a new 2500 MHz satellite, the estimated total nonrecurring costs (excluding earth stations) is $100 million. Thus, the island nations would be expected to bear $10 million of the cost. In 1978, the aggregate Gross Domestic Product of the SPEC nations alone exceeded $3 billion. If the GDP for the other Pacific entities is added to this number, it can be shown than an investment of less than .2 percent of the total GDP for all Pacific entities, using ever 1978 numbers, would be required to aggregate the requisite $10 million.

** The 20 percent suggested here would equal $20 million in a satellite system costing $100 million. This amount is close to the average telecommunications grant made by the World Bank to an individual country or entity in recent years.

which are probably not desirable since they tend to allow for the perpetration of telecommunications systems which may be inefficient, and modest investments that support ongoing operations of systems that are both cost-effective and contribute to the welfare of personnel from the developed countries who are posted in the Pacific.

However the eventual design of a new telecommunications system for the Pacific turns out, financing should not be considered the paramount barrier to implementation. Other matters, such as structure of an entity to implement and manage the system and the need for trained personnel in the region may, in fact, be more critical issues in the first stages. (See sections 5.3 and 5.4 for a discussion of these matters.)

5.5.3 Economic Impact and Benefits of Improved Communications

While it is vital to know whether the investment made by a country or a region in a telecommunications system can generate a satisfactory rate of return, it is also critical to be able to estimate whether the telecommunications system can or will provide economic and social benefits that will justify the expense of establishing it in the first place. Policy planners and government officials in the country or countries in question will need to have some sense of why facilities for telecommunications, whether new or expanded, should take priority in the allocation of scarce, precious monetary resources.

If there were a single, reliable model (or even several reasonably reliable models)for conclusively measuring benefits, then collection of

data and insertion of numbers would be all that would be required to complete the equation for each instance being studied. As Saunders and Warford have noted:

> It is axiomatic that economic development requires an adequate means of conveying information rapidly and over long distances. It follows that telecommunications, which is generally defined to include telephone, telex, telegraph, and data and audio-visual transmission systems, has an important role to play in the development process. Unfortunately, establishment of the link between economic development and the nature, magnitude and timing of telecommunications investments has not proceeded far beyond such intuitively obvious statements. Development economists have, to date, paid little attention to telecommunications and many empirical and conceptual issues remain unresolved. 1/

There have been and continue to be research studies that attempt to establish links between improved communications and improvements in the economies of given developing countries. In one study, the effects of improved telecommunications in rural areas of a developing country were studied intensively, but even with this study it was concluded that:

> The Costa Rica rural telephone research exercise generated a considerable amount of information on telephone benefits and the recipients of those benefits which should be of much use to planners when allocating investment both within the telephone sector and among other sectors . . . . What is still lacking, however, is a method by which to accurately quantify the variety of benefits which were identified. 2/

It is possible in specific instances to examine what the lack of communications facilities or the provision of them has meant in so far as economic returns. For example, Dickenson describes the case of a new resort hotel that when first opened in its remote

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1/ Robert J. Saunders and Jeremy J. Warford, "Telecommunications Pricing and Investment in Developing Countries," P.U. Report No. PUN 30, The World Bank, Washington, D.C., June, 1977, p. 1.

location lacked telecommunications facilities.[1] He projects the economic losses that resulted and the probable gains in income from tourism that adequate telecommunications facilities would provide. He goes on to compare these gains (favorably) with the necessary investment needed for adequate telecommunications facilities. Even in this exercise, of course, some assumptions must be made.

When there is an attempt to extrapolate from such concrete examples to situations involving entire countries or regions, the task becomes formidable if not impossible. As Dickenson himself reports:

> The evaluation of economic benefits which cannot be easily measured but are based on largely abstract considerations, is very difficult. We have made a number of experimental approaches to this problem . . . . in one case, an attempt was made to estimate benefits to the national economy . . . in the form of larger export earnings and greater income from tourism that could be expected to occur as a result of the telecommunications development program. In each case these analyses have shown a very high economic rate of return but are not altogether convincing in that (a) the information obtained by interview is open to question . . .; (b) there are no comparable communication substitutes for telecommunications and (c) there are possibilities in the broader and more general approach of double counting. [2]

In another statement of the problem, Saunders and Warford note: "Even if we could accurately estimate such benefits, however, this would only solve part of the problem, for particularly in LDC's the willingness to pay for individual subscribers may not be indicative of the true economic benefits to society that may result. . . . Even in

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[1] C.R. Dickenson, "Telecommunications in Developing Countries: The Relation to the Economy and the Society," P.U. Report No. PUN 32B, The World Bank, Washington, D.C., October, 1978, p. 19.

[2] Ibid., p. 14

areas in which one would suppose the impact of investments would be more dramatic, such as rural electrification, we know of no case in which multiplier effects have been successfully quantified." 1/

What can be said, then, in looking at the Pacific Basin and estimating cost/benefit relationships as these apply to an Integrated Communications System involving satellites? From the evidence gathered in this and other studies, it is clear that certain sectors of economic activity would benefit substantially. Examples have been noted in section 4 of the present study regarding the critical need for better communications in support of most business, industrial and agricultural activities.

Considering that not all Pacific island entities have similar economies or natural resources, it is, nevertheless, possible to estimate that improved communications of the type outlined, e.g., provision of voice and data exchange services in a significant number of locations not now served, would confer benefits on the following sectors, listed in descending order based on the likely magnitude of effect:

-Maritime Industries (including the catching of fish and the movement of the goods)

-Tourism (especially with regard to opening new areas for travel)

-Agriculture

-Lumbering

-Mining and Refining of Mineral Resources

-Small Business Development

It is understood that exporting comes into play in all of these areas.

1/ Robert J. Saunders and Jeremy J. Warford, "Evaluation of Telephone Projects in Less Developed Countries," P.U. Report No. PUN 37, The World Bank, Washington, D.C., July, 1978, p. 10.

In trying to estimate benefits, there is the further complicating factor that might be labelled the "spiral effect." As better telecommunications impact favorably on the economy of a country, industrial, agricultural and exporting activities may increase, thus generating greater demand for facilities which demand when met further affects economic activity. However, all the evidence points to the fact that these are positive relationships in so far as the impact of telecommunications: more activity and greater productivity do result.

It would require a monumentally greater effort than has been possible within the scope of the present study to even begin to estimate the specific impact on GDP for each Pacific Basin entity if an improved communications system were put in place. Indeed, as the literature suggests, accurate estimates that quantify benefits may be impossible to obtain. Nevertheless, anecdotal information, the evidence of clearly frustrated demand on the part of users, and examples from other developing countries all lead to the conclusion that we can identify the sectors that will feel the greatest benefit and we can gain some idea of the time period in which the benefits will be felt. Fortunately, that time period can be defined as almost immediately after the installation of the telecommunications facilities.

Social benefits must also be considered, and these include the availability of emergency services, provision of health care, enhancement of education, provision of other government and social services, and the enhancement of quality of life. Given the evidence previously cited (section 5.5.2) concerning the percentages of use of telephones for

differing purposes in certain rural areas of developing countries, users would seem to place a high value on such benefits as ability to keep in touch with family and friends.

In trying to relate all the types of effects and benefits that can come about as a result of improving telecommunications, Bebee and Gilling have observed that: "The basic requirements of a productive labour force are nutrition and education."[1/] And they then discuss how basic telecommunications facilities must be provided to ensure adequate education and food supplies before other benefits in the commercial sector can be realized.

As has been stated in one of the background papers for the Second United Nations Conference on the Peaceful Uses of Outer Space:

> If economic development is difficult to measure, social development is even more difficult. While social services such as education and health care are universally considered desirable, there is no agreement on measures of their quality. . . . While the per capita GNP may be a useful rough index, it does not accurately reflect the quality of life or the degree to which the basic needs of all of the people are met.[2/]

In the Pacific, again relying on historical and anecdotal data, plus interviews during site visits, it is clear that the provision of emergency services (including the critical element of warning and prevention notifications) ranks highest in terms of the need for improved telecommunications facilities. This area is closely followed by health

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[1/] E. L. Bebee and E. J. W. Gilling, "Telecommunications and Economic Development: A Model for Planning and Policy Making," Telecommunication Journal, Vol. 43, August, 1976, p. 39.

[2/] "Relevance of Space Activities to Economic and Social Development," a background paper for UNISPACE '82, April, 1981, p. 6.

care and education.

As one example with regard to education, the success of the University of the South Pacific is particularly noteworthy. (See section 4.2.8 for a description of the program.) If a satellite system could be established that would provide for continuation and expansion of the USP project, a truly regional higher education program could result. Other similar projects could be started in other areas of the Pacific not served by the USP. Again, while it is not possible to quantify such benefits, at least not in advance of the implementation of the system, evidence, e.g., from the PALAPA service in Indonesia, strongly suggests that positive outcomes would result from an upgraded educational service. Such upgrading in an area like the Pacific Basin must rely on satellite communications in the near future.

Thus far, we have concentrated on benefits to the Pacific island nations themselves. It should be added that the developed countries having relationships with and personnel in the Pacific islands also have a direct interest in improved communications. U.S. agencies such as the Agency for International Development, the Department of the Interior, and the Department of Commerce all have specific responsibilities and interests in this part of the world. This will be true of government agencies in France, Australia, New Zealand and Japan as well.

If it becomes necessary in order to persuade policy planners and others who will be involved in decisions about improving communications in the Pacific Basin that there are specific commercial and social activities that will benefit from the investment in telecommunications facilities, then Saunders' and Warford's advice should be

heeded:

> Any precise scientific allocation of funds between competing sectors in LDC's is, of course, precluded by the difficulty of measuring the benefits which stem from alternative investments. . . . It appears that there is no real alternative to a case-by-case microeconomic approach; in order to address the peculiar problems encountered by the telecommunications sector in achieving an optimum rate and mix of expansion, the economic and social benefits of investments in the sector require more detailed country-specific analysis than is usually given to them.1/

In conducting the microeconomic analyses, it will be helpful to keep in mind that the telecommunications system most likely to bring about significant changes in communications in the region will of necessity involve a satellite or satellites.

This study has attempted to provide a preliminary analysis of those communications systems that are already in place in the Pacific and has suggested where the unmet needs lie and how they might be met by an approach called an Integrated Communications System. Further work remains to be accomplished in terms of defining the specifications and costs of each possible alternative that seems feasible at this point, e.g., the extension of the INTELSAT system, sharing of one or more other satellite systems, the implementation of an S-band satellite. However, it would be unfortunate if all decisions to move forward with planning for improved telecommunications facilities were delayed until quantifiable data regarding benefits were obtained, for such data may never be forthcoming. On the other hand, there should be sufficient cumulative evidence to indicate the efficacy of improved communications and the need to implement a truly regional system.

1/ Saunders and Warford, "Evaluation of Telephone Projects in Less Developed Countries," op. cit., p. 3.

6. FINAL CONCLUSIONS AND RECOMMENDATIONS

The challenge of providing adequate communications is not unique to the Pacific Basin region. Although problems of distance, isolation, small populations and historic underdevelopment with regard to telecommunications may seem more severe here than in other parts of the world, a closer look reveals both that the needs can be sufficiently articulated to be dealt with and that communications solutions can be brought to bear that have a reasonable expectation of success.

6.1 Summary of Findings

The present study took into consideration the state of telecommunications and the apparent needs of all the island entities in the Pacific (Hawaii, developed countries and certain small entities were excluded). While the site visits were made to selected representative countries, the findings, especially with regard to system solutions, can be generalized for the area. What follows is a summary of the principal findings:

A. A review of the status of telecommunications in the Pacific island nations has revealed that:

   1. While a number of domestic telecommunications systems are in place and functioning (the dominant system is HF radio), rural areas are either unserved or lack adequate facilities.
   2. Communications between locations within a given country, e.g., from island to island or from the coast to the interior, are

generally less reliable and, therefore, less frequent than communications between island nations and developed countries.

3. There is a need to equalize services and facilities between population centers (often country capitals) and other places in the country.

4. There is an apparent desire and willingness on the part of island nations to acquire telecommunications facilities that will improve domestic and regional communications, and communications satellites are viewed by country representatives as a most efficient and desirable means of achieving greatly improved capability. Additionally, a willingness has been expressed to cooperate on a regional basis.

B. With regard to specific activities in the region that would be significantly affected by improved communications, it was found that:

1. The provision of basic services such as emergency warnings, health care delivery, and education are seriously hampered at present by inadequate communications systems. There is both a demonstrable need and articulated desire for improvements in these areas.

2. In many of the countries, growth in commercial activity is limited by the nature of existing telecommunications facilities or the lack thereof. Most industrial, agricultural and business activities could be made more efficient and profitable by the creation of better communications systems within the countries themselves and within the region generally. In many cases, new businesses could be formed with the single important variable being the need for an adequate communications system.

3. Services most needed in the region include telephony and telex/telegraphy. While television does exist in some countries now and could have applications for the future, chiefly in delivery of education and some forms of medical care, video per se was not deemed as critical a delivery mode as others that will provide voice and data transmissions.

C. Taking into consideration the characteristics of the region, including its present communications systems and apparent economic and social requirements for the coming decade, many of which have been spelled out in countries' long-range plans, it has been the conclusion of the present study with regard to communications technologies that:

1. A number of different technologies could be employed, but the two most likely to bring about broad scale improvements in communications in the region are underseas cable (primarily with fiber optic links between islands) and communications satellites.

2. Since the technology of oceanic fiber optic cables was not deemed far enough advanced to be counted on as a pervasive solution in the near term, attention was focused on the satellite options, and these include (and are not mutually exclusive):

   a. Extension of the present INTELSAT system, including provision of small, low-cost earth stations in remote locations that would serve to relay local communications, operating in tandem with the standard A or B stations.

   b. Use of existing or proposed domestic (or INMARSAT) satellites that could provide some degree of Pacific coverage. Satellite

systems reviewed under this option included: ANSCS, INMARSAT, PALAPA, TDRS, and ALASCOM's future satellite. Other countries, e.g., Japan and the Latin American countries, may also have candidate satellites for such a service in the future.

c. Creation of an Integrated Communications System that would include provision of one 2500 MHz (2.5 GHz) satellite.

3. A system incorporating an S-band satellite was deemed optimal because it would not only build on existing domestic systems in each of the countries and on the INTELSAT installations, but the 2500 MHz assignment in this region of the world permits fixed, mobile and direct broadcast satellite operations.

4. Whichever satellite system is selected, approximately 3000 earth stations will eventually be required to provide service to major population centers and rural areas. These earth stations should be low-cost, easy to maintain and capable of transmitting and receiving voice and data.

D. In examining probable costs and benefits of an improved communications system that would include the satellite option it was noted that:

1. More work needs to be done with respect to satellite system definition, especially with regard to the feasibility of manufacturing the desired small antenna earth stations. Fortunately, developmental work on this front is going forward through the efforts of INTELSAT and others, and earth stations retailing at $25,000 or less are likely to be available within the next two years. This cost should hold for either S-band or C-band stations.

2. Associated facilities, including power sources (perhaps solar powered batteries), public call boxes, etc., would have to be priced and these costs added to the system cost for each country,

depending on its individual requirements.

3. An interim system using INTELSAT or other available satellites would be less expensive than creation of a new satellite system but might not, in the long run, be as flexible or allow for the full range of desired services in the region.
4. While the capital costs of a new regional satellite at S-band might be on the order of $100 million (in 1981 dollars), this system would be capable of meeting expansion needs in the region, and financing might be provided by the countries themselves, developed countries having responsibilities in the Pacific Basin, supplier credits, commercial bank loans, private investors, foundations, the United Nations Development Program, and the World Bank with its affiliates.
5. In addition to nonrecurring capital costs, there will be costs associated with training, establishing an appropriate regional management structure, and annual operations. Apart from the initial training costs, which might be borne in part by loans and the UNDP, a significant portion of the operating costs should be able to be paid for by the participating countries.
6. Evidence from the telecommunications experiences of other developing countries indicates that an appropriately designed communications system has at least a reasonable expectation of showing a positive rate of return on investment. In some places, the rate of return might be sufficient to provide a contribution to other sectors of the economy.
7. A management structure that allows for a single entity -- whether a country in the region, an existing regional entity, a new

regional consortium, or a new corporation composed of user countries -- would be the most efficient means of establishing and operating a satellite system for the region.

8. Direct benefits to commercial and social activities because of the provision of better communications are very difficult to quantify, but anecdotal evidence, user interviews, and the examination of the experiences in other developing countries all suggest that many benefits can be realized and that overall productivity and quality of life will be enhanced.

6.2 Recommendations

1. The developmental steps outlined in section 5.4 (Management and Implementation) need to be undertaken as soon as possible if the region wishes to establish significant new telecommunications facilities and services.
2. The governments of the developed countries with relationships and responsibilities in the Pacific Basin need to ascertain their appropriate roles with regard to assisting the island nations in the implementation of an improved communications system.
3. Other studies that are currently being conducted that also touch on telecommunications in the Pacific need to be reviewed and the findings compared and coordinated so that as much evidence as is available can be brought to bear to assist the policy makers, planners, and funders who work in the region.

4. Developmental work on small, low-cost earth stations -- at C-band, S-band, and Ku-band -- needs to be fostered. A breakthrough in earth station technology for voice and data could mean a more rapid development of satellite use in the Pacific Basin.
5. Even before all questions relating to services and structure are answered, work needs to continue with respect to system definitions for the satellite options deemed practical. If a more precise estimate of costs can be given, and a better understanding of the legal and management questions arrived at, the ground work will have been laid for the other planning that is necessary.

The fact that there may be no easy solutions to providing improved communications in the Pacific does not mean that there are no solutions. The communications technologies available today and likely to become available over the next ten years are increasingly appropriate for efficient use in this region of the world. What is needed now is a concerted effort to plan for and implement the most cost effective, versatile and maintenance simple system that can be designed. It must also be a system that can accomodate growth.

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