PEACESAT AND DEVELOPMENT
IN THE PACIFIC ISLANDS

by

Christopher M. Plant

B.A. Hons. University of Exeter 1972

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS (COMMUNICATION)
in the Department
of
Communication

Christopher M. Plant 1979
SIMON FRASER UNIVERSITY
December 1979

All rights reserved. This thesis may not be reproduced in whole or in part, by photocopy or other means, without permission of the author.
APPROVAL

Name: Christopher M. Plant
Degree: M.A. (Communication)
Title of Thesis: Peace and Development in the Pacific Islands

Examinining Committee:

William H. Melody
Professor
Senior Supervisor

Dallas W. Smythe
Professor

Robert S. Anderson
Associate Professor

Noel Dyck
External Examiner
Assistant Professor
Department of Sociology & Anthropology

Date Approved: December 5, 1979.
PARTIAL COPYRIGHT LICENSE

I hereby grant to Simon Fraser University the right to lend my thesis or dissertation (the title of which is shown below) to users of the Simon Fraser University Library, and to make partial or single copies only for such users or in response to a request from the library of any other university, or other educational institution, on its own behalf or for one of its users. I further agree that permission for multiple copying of this thesis for scholarly purposes may be granted by me or the Dean of Graduate Studies. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Title of Thesis/Dissertation:

PEACESAT AND DEVELOPMENT IN THE PACIFIC ISLANDS.

Author: ______________________________

(signature)

Christopher Plant.

(name)

Dec. 5, '79

(date)
ABSTRACT

This thesis presents an historical and empirical analysis of the PEACESAT (Pan Pacific Education and Communication Experiments by Satellite) Project in relation to its appropriateness for the development process of the Pacific Islands. In this context, "appropriateness" is defined as the extent to which PEACESAT benefits Pacific Island people. More particularly, appropriateness refers to (1) the extent to which PEACESAT is controlled and used by Pacific Islanders; and (2) how much the system avoids the traditional core-periphery relationship of Pacific Island nation dependency upon Metropolitan nations, to work predominantly in the interests of the Pacific Islands.

PEACESAT is the longest-running experiment in interactive satellite communications technology. Utilising an old NASA satellite originally used largely for weather-related experiments, it links some 17 different locations in the Pacific Islands and Pacific Rim countries by means of a primarily audio-conference link. Its major differences from other communications satellite systems are that ground station equipment is low-cost and easy to operate, and that information flow on the system is two-way. For these reasons, the PEACESAT concept has been heralded as an appropriate telecommunications technology for developing areas such as the Pacific,
characterised by isolated, impoverished communities scattered over vast geographical areas.

The thesis tests PEACESAT's claim that it is 'appropriate' for Pacific Island development by employing two broad methodological approaches. By means of a detailed historical analysis, the objectives and organisational structure of PEACESAT as an institution are examined, as are certain operational aspects of the system. An empirical analysis is then employed to investigate the predominant users and information flow patterns of PEACESAT.

Institutionally, PEACESAT is shown to be centralised in structure, with control vested in Metropolitan locations. PEACESAT's objectives, and their day-to-day implementation, are demonstrated to be more in accord with broader US interests than with the authentic development interests of the Pacific Islands. In the empirical analysis, data on a number of different variables were collected, including the sex and ethnicity of participants; the time that participants spent on air; the initiating and chairing of exchanges; the questioning and response activity of participants; and the predominant patterns of information flow among ground stations.

The data demonstrate the overwhelming influence of the Metropolitan nations in the use of PEACESAT, illustrated by the following: that in the amount of time on air used, Caucasian participants dominated Pacific Island participants in a 4:1
ratio; that less than 2% of exchanges were initiated by Pacific Islanders, and only 8% of chairpersons were Pacific Islanders; that overall information flow favoured Metropolitan over Pacific Island nations in a ratio of 1.8:1; and that, of the informal networks on the system, the Pacific Island - Pacific Island network was marginal, accounting for only 3.4% of all connections.

On the basis of these analyses, the study concludes that PEACESAT as an institution replicates the familiar pattern of the domination of the core over the periphery, represented in this case by the domination of the Hawaii and New Zealand ground stations over the Pacific Island ground stations. As such, PEACESAT is interpreted as reinforcing the conventional pattern of unequal, core-oriented development to the long-term detriment of Pacific Island nations, and is thus inappropriate for Pacific Island development.
DEDICATION

For the people of the Pacific Islands.
ACKNOWLEDGEMENTS

In writing this thesis I have benefitted from the help of a large number of people to whom I am very grateful.

At Simon Fraser University, my Supervisor, Dr. William Melody, and the members of my Committee, Dr. Bob Anderson and Dr. Dallas Smythe, have repeatedly prevented my focus from wandering; Professors Pat Hindley and Gail Martin initially gave me the opportunity of working as a Research Assistant, and later as Acting Terminal Manager, with PEACESAT SFU; and Dr. William Richards and Professor Liora Salter provided valuable assistance in formulating the research design for the empirical part of the study.

Dr. Nicholas Engler, the bibliographer of NASA's ATS experiments, from the Research Institute at the University of Dayton, Ohio, very kindly gave me access to invaluable documents relating to PEACESAT's history.

Dr. John Bystrom, of the University of Hawaii and PEACESAT, Carol Misko O'Keefe of PEACESAT headquarters, Harold Wigran, of the National Education Association in the US, Stuart Kingan, from Rarotonga in the Cook Islands, and Dr. John Chick, of the University of the South Pacific, were all good enough to grant me interviews, and Dr. Bryan Farrell, Di-Anne Reid Ross and Mark Viera, of the University of California Santa Cruz, were helpful and hospitable during my visit to Santa Cruz in 1978.
The Terminal Managers of the different PEACESAT ground stations all provided me with valuable information; furthermore, during my active involvement with PEACESAT, I much appreciated the spirit of camaraderie which prevailed in the face of many difficulties. Additionally, the co-operation of Graham Davey, of the International Telecommunication Union’s Regional Project in Suva, Fiji, and of various members of Post and Telegraph authorities and/or Ministries of Communication in Pacific countries, is appreciated.

Finally, the study could not have been completed without the continued understanding and encouragement of my family to whom I am greatly indebted.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPROVAL</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xv</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xvi</td>
</tr>
<tr>
<td>GLOSSARY OFABBREVIATIONS</td>
<td>xvii</td>
</tr>
</tbody>
</table>

## I. INTRODUCTION

1.0. Brief introduction to PEACESAT...........................................1
2.0. Hypothesis.................................................................................2
3.0. Objectives of the study.....................................................4
4.0. Orientation and scope of the study........................................5
5.0. Methodology..............................................................................6

## II. PEACESAT IN CONTEXT

1.0. Development theories: the theoretical context.........................10
2.0. Communications satellite development: an historical overview.......16
3.0. Characteristics of the Pacific Island region..........................30
4.0. Telecommunications in the Pacific Islands................................39
5.0. The specific context and objectives of the PEACESAT Project.........43

## III. THE TECHNOLOGY

1.0. The satellite.............................................................................48
VIII. INFORMATION, EVALUATION & CRITICISM
1.0. Publications on PEACESAT
2.0. Evaluations
3.0. Internal criticism
4.0. Summary

IX. ANALYSIS OF PEACESAT OPERATIONS DATA
1.0. Objective
2.0. Exchange Data Analysis
3.0. Network Flow Analysis
4.0. Discussion and summary

X. OVERALL ANALYSIS & CONCLUSIONS
1.0. PEACESAT as a technical experiment
2.0. PEACESAT as an institution
3.0. PEACESAT and US foreign policy
4.0. PEACESAT and Pacific Island development
5.0. Conclusion

APPENDIX 1: ATS-1 VHF Communication Transponder Characteristics

APPENDIX 2: PEACESAT Call Signs

APPENDIX 3: Examples of forms used in collection of raw data

APPENDIX 4: TABLES: Exchange Data & Network Flow Analyses

APPENDIX 5: Summary analysis of 1974 exchanges

SELECTED BIBLIOGRAPHY
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PEACESAT Exchanges, 1976</td>
<td>124</td>
</tr>
<tr>
<td>2</td>
<td>Titles of Exchanges Analysed, by Exchange Category</td>
<td>311</td>
</tr>
<tr>
<td>3</td>
<td>Number of Exchanges Analysed, by Exchange Category</td>
<td>313</td>
</tr>
<tr>
<td>4</td>
<td>Number of Exchanges Occurring during Period of Study</td>
<td>314</td>
</tr>
<tr>
<td>5</td>
<td>Proportional Duration of Exchanges per Exchange Category &amp; Overall</td>
<td>315</td>
</tr>
<tr>
<td>6</td>
<td>Total Time on Air, &amp; Average Duration of Exchange, per Exchange Category</td>
<td>316</td>
</tr>
<tr>
<td>7</td>
<td>Breakdown of Content Type</td>
<td>317</td>
</tr>
<tr>
<td>8</td>
<td>Average Number of Participants &amp; Locations per Exchange</td>
<td>318</td>
</tr>
<tr>
<td>9</td>
<td>Message Time &amp; Time Loss by Exchange Category</td>
<td>319</td>
</tr>
<tr>
<td>10</td>
<td>Time on Air by Location, Exchange Categories 1-4</td>
<td>320</td>
</tr>
<tr>
<td>11</td>
<td>Time on Air by Location, Exchange Categories 5-8</td>
<td>321</td>
</tr>
<tr>
<td>12</td>
<td>Time on Air by Location, Overall</td>
<td>322</td>
</tr>
<tr>
<td>13</td>
<td>Time on Air for Metropolitan Territories, Pacific Islands &amp; US Territories</td>
<td>323</td>
</tr>
<tr>
<td>14</td>
<td>Participation by Sex &amp; Ethnicity, Exchange Categories 1-8 &amp; Overall</td>
<td>324</td>
</tr>
<tr>
<td>15</td>
<td>Participation of US Nationals by Sex, Exchange Categories 1-8 &amp; Overall</td>
<td>325</td>
</tr>
</tbody>
</table>
16. Number of Different Participants, by Location, Ethnic Group & Sex..............................................326
17. Participant Time on Air, by Sex & Ethnicity,
   Exchange Categories 1-8 & Overall........................................328
18. Time on Air of US Nationals by Sex, Exchange Categories 1-8 & Overall.................................332
19. Initiation of Exchanges by Location, Exchange Categories 1-8 & Overall................................333
20. Chairing of Exchanges by Location, Exchange Categories 1-8 & Overall.................................334
21. Chairing of Exchanges by Sex & Ethnicity,
   Exchange Categories 1-8 & Overall........................................335
22. PEACESAT Staff on Air by Sex & Ethnicity,
   Exchange Categories 1-8 & Overall........................................336
23. Assessment & Comparison of Terminal Resources...........................................337
   According to Metropolitan & Pacific Island Terminals..340
LIST OF FIGURES

1. Positions of ATS-series satellites..........................27
2. Map Showing ATS-1 Coverage and PEACESAT Terminals........29
3. Cable Networks in the Pacific Region............................38
4. Applications Technology Satellite ATS-1......................47
5. Types of PEACESAT Ground Terminals...........................58
6. Facsimile Copy of Skull X-ray Transmitted via PEACESAT......60
7. Example of Electrocardiograph Transmitted via PEACESAT.....62
8. PEACESAT Organisation Chart................................94
LIST OF APPENDICES

Page
1. ATS-1 VHF Communication Transponder Characteristics .......... 304
2. PEACESAT Ground Station Call-signs .................................. 305
3. Examples of forms used in collection of raw data ................. 306
4. Tables: Exchange data and Network Flow analyses ............... 311
5. Summary analysis of 1974 exchanges .................................. 343

xvi
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEC</td>
<td>Atomic Energy Commission (US)</td>
</tr>
<tr>
<td>ALC</td>
<td>American Lutheran Church</td>
</tr>
<tr>
<td>ATS</td>
<td>Applications Technology Satellite</td>
</tr>
<tr>
<td>COMSAT</td>
<td>Communications Satellite Corporation</td>
</tr>
<tr>
<td>DBS</td>
<td>Direct Broadcast Satellite</td>
</tr>
<tr>
<td>DISP</td>
<td>Department of the Interior Special Project (the US ATS-1 net in the TTPI)</td>
</tr>
<tr>
<td>DOD</td>
<td>Department of Defense (US)</td>
</tr>
<tr>
<td>FCC</td>
<td>Federal Communications Commission (US)</td>
</tr>
<tr>
<td>FM</td>
<td>Frequency Modulation</td>
</tr>
<tr>
<td>GHz</td>
<td>Gigahertz</td>
</tr>
<tr>
<td>HEW</td>
<td>Department of Health, Education &amp; Welfare (US)</td>
</tr>
<tr>
<td>HF</td>
<td>High Frequency</td>
</tr>
<tr>
<td>HSMA</td>
<td>Health Services &amp; Mental Administration, in the Department of HEW (US)</td>
</tr>
<tr>
<td>INTELSAT</td>
<td>International Satellite Corporation</td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunications Union</td>
</tr>
<tr>
<td>KHz</td>
<td>Kilohertz</td>
</tr>
<tr>
<td>LHC</td>
<td>Lister Hill Center (US)</td>
</tr>
<tr>
<td>LHNCBC</td>
<td>Lister Hill National Center for Biomedical Communications</td>
</tr>
<tr>
<td>mc</td>
<td>millicycles</td>
</tr>
<tr>
<td>MHz</td>
<td>Megahertz</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics &amp; Space Administration (US)</td>
</tr>
<tr>
<td>NATO</td>
<td>North Atlantic Treaty Organisation</td>
</tr>
<tr>
<td>NEA</td>
<td>National Education Association (US)</td>
</tr>
<tr>
<td>NIH</td>
<td>National Institute of Health (US)</td>
</tr>
<tr>
<td>NLM</td>
<td>National Library of Medicine (US)</td>
</tr>
<tr>
<td>P &amp; T</td>
<td>Post &amp; Telegraph authority</td>
</tr>
<tr>
<td>PNG</td>
<td>Papua New Guinea</td>
</tr>
<tr>
<td>SFU</td>
<td>Simon Fraser University (Canada)</td>
</tr>
<tr>
<td>SPC</td>
<td>South Pacific Commission (headquartered in Noumea, New Caledonia)</td>
</tr>
<tr>
<td>SPEC</td>
<td>South Pacific Bureau for Economic Co-operation (headquartered in Suva, Fiji)</td>
</tr>
<tr>
<td>TTPI</td>
<td>Trust Territory of the Pacific Islands (administered by the US)</td>
</tr>
<tr>
<td>TVA</td>
<td>Tennessee Valley Authority (US)</td>
</tr>
<tr>
<td>UCSC</td>
<td>University of California, Santa Cruz</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
</tbody>
</table>

(continued over)
GLOSSARY (continued)

UNDP - United Nations Development Programme
UNESCO - United Nations Educational, Scientific & Cultural Organisation
UNSW - University of New South Wales (Australia)
UPNG - University of Papua New Guinea
USP - University of the South Pacific (Fiji)
VHF - Very High Frequency
WARC - World Administrative Radio Conference
WEFAX - Weather Facsimile
I. INTRODUCTION

1.0. Brief introduction to PEACESAT

PEACESAT is an acronym for Pan Pacific Education and Communication Experiments by Satellite. Begun in 1971 and still operating at the time of writing in 1979, PEACESAT links some 17 different locations in the Pacific Islands and Pacific Rim by means of a primarily audio-conference link. The PEACESAT project utilises Applications Technology Satellite 1 (ATS-1) - an old NASA satellite originally used for weather experiments - for this purpose.

The three most significant features of the PEACESAT system are: first, that as a communications satellite system, PEACESAT has been among the first experiments to demonstrate the use of small, low-cost earth stations which are relatively simple to construct, operate and maintain; secondly, that information flow is two-way, involving discussion of pre-arranged topics rather than the one-way broadcast of set programmes; and, thirdly, that the satellite covers almost the entire Pacific and Pacific-Rim area, or roughly one third of the world's surface. PEACESAT claims to open up new possibilities in the sphere of telecommunications as well as to offer a new solution to
communications problems in relatively poor, undeveloped areas of the world where vast distances and difficult terrain have in the past presented major obstacles to effective communication among peoples.

2.0. Hypothesis

Personal experience in the South Pacific, and with PEACESAT at Simon Fraser University (SFU) in Canada, led to the formulation of the hypothesis of this study.

1. During my five years experience in the Pacific Islands, PEACESAT never figured as an important mode of communication among the people and organisations with which I was in contact.¹ (The exception to this statement is the University of the South Pacific (USP), which developed its own dedicated network using the ATS-1 satellite. It should be noted that this study focusses only on PEACESAT and not upon any of the other networks using ATS-1.) In light of the potential of such technology, and the claims that PEACESAT made, especially regarding its role in Pacific Island development, it appeared that there must be good reasons for this lack of interest. An initial study of PEACESAT early in 1978 indicated that the history of the project and the way in which it was organised probably mitigated against its

¹ See section 5.0 of this chapter for further biographical information.
effective use by many Pacific Island people. Furthermore, it appeared from this initial study that PEACESAT, rather than assisting in the development process, might in fact be working against the development interests of the Pacific region.

2. Experience in monitoring and operating the PEACESAT terminal at SFU led me to believe that organisational and operational aspects of the system seriously prevented its use by Pacific people. Furthermore, it became increasingly apparent over time that the objectives (stated and unstated) of the major participants in the network were in conflict, and that investigation of this situation might contribute to an explanation of the system's ineffectiveness.

The major question that this study attempts to address, therefore, is: to what extent is PEACESAT appropriate for the development process of the Pacific Islands? In this context, the notion of "appropriateness" is broadly defined as the degree to which PEACESAT benefits Pacific Island people. More particularly, appropriateness refers to the extent to which PEACESAT as an institution is controlled and used by Pacific Islanders, and how much the system avoids the traditional core-periphery relationship between Metropolitan and Pacific Island nations, to work predominantly in the interests of the Pacific Islands. Given the observations made above regarding PEACESAT's apparent lack of effectiveness, the study
investigates the major contributing reasons for this state of affairs.

The hypothesis of the study is that, contrary to the claims of PEACESAT that it is appropriate for the development of the Pacific Islands, PEACESAT, as an institution, is in fact inappropriate by reason of its furthering traditional relations of core-periphery dominance over the Islands.

3.0. Objectives of the study

The purposes of this study are twofold:

1. since PEACESAT is relatively poorly known in the telecommunications literature and since the material that exists on PEACESAT has never been gathered together and organised into any coherent form, the first part of this study attempts to provide an historical description of the project. The assumption behind this part of the study is that attempts to evaluate PEACESAT can only be made on the basis of a reasonably comprehensive historical documentation of the project - which this study attempts to begin.

2. since it is claimed that, by enabling reliable, low-cost communications among Pacific Island people, PEACESAT represents a significant advance in the fulfilment of the Pacific region's development needs, the second part of the study (Chapter IX) is an attempt at testing this claim by beginning an evaluation of the project. It is important to
note that, given the absence of a documented history of the project up to now and the absence of any comprehensive outside evaluation of PEACESAT, the type of evaluation presented here is regarded as only the beginning of a process of evaluation. The writer has intended this study to provide the groundwork for his own further, more detailed attempts at evaluating PEACESAT; equally, it is hoped that the study will enable others to do likewise.

4.0. Orientation and scope of the study

Because of the innovative nature of PEACESAT, the experiment raises numerous issues: technical, economic and regulatory, political and socio-cultural. As it is impossible to hope to deal with all of these issues within the limitations of a study such as this one, I have chosen to approach PEACESAT in two broad ways:

1. from the perspective of PEACESAT as an institution experimenting in satellite-mediated telecommunications, with emphasis on its use for education, health and community service. The first part of the study (Chapters II-VIII) will therefore focus particular attention upon the objectives of the PEACESAT project, both explicit and implicit, at different stages of its development, in an attempt to shed light on the more profound reasons why PEACESAT has come to be what it is today.
from the perspective of PEACESAT as an institution serving Pacific Island development. This perspective is developed in the first part of the study, and in the second part (Chapter IX), a first attempt is made to determine the actual usage of the system by Pacific Islanders and others and the implications of such usage for Pacific Island development.

5.0. Methodology

The methodology of this study involved drawing on a number of different kinds of information:

1. Personal experience in the Pacific Islands. Immediately prior to arriving at Simon Fraser University, the author had spent five years in the South Pacific working in a variety of fields, including teaching and publishing.

   One year was spent with a political party in the New Hebrides where I worked almost exclusively with Melanesians who were trying (a) to formulate the most suitable development directions for the nation and to communicate such aspirations to both a national and international audience, and (b) to resist the overwhelming compulsion of the colonial authorities to enforce conformity to their ways of viewing the development of the country, ways which inevitably served metropolitan above indigenous interests. My role was in an information/liason capacity, trying to improve the quality and flow of news and other information
from the New Hebrides to other countries, and among islands of the group.

In Fiji, I worked extensively with community groups and organisations throughout the Pacific in their attempts to gain greater control over their lives by resisting harmful foreign intrusions such as the nuclear testing and the military use of the islands, and by striving for the independence of their countries. Additionally, I spent considerable time at the University of the South Pacific (USP), latterly working on the publication of several books on aspects of the Pacific.

Finally, during my stay in the Pacific, aside from living in the New Hebrides and Fiji, I visited the following countries and territories: New Caledonia, the Gilbert Islands, Tuvalu, Western Samoa, American Samoa, and Hawaii, as well as both New Zealand and Australia.

This experience is invaluable in informing certain debates - such as the development debate - which, when discussed by 'outsiders', tend to be ethnocentrically biased, abstract and ideal rather than being rooted in the concrete and pragmatic reality of everyday decision-making. In this particular case, much of my attention in the Pacific was focussed on the need for improved communications among specific sectors of society and to the world at large. Indirectly, moreover, my time at the USP made me very aware
of the problems which that institution faced in keeping in sufficient touch with its extension centres in different islands. Since the USP has been a major user of the ATS-1 satellite, my knowledge of that institution is of particular relevance.

In summary, therefore, although my interest in PEACESAT developed after my having left the region, my experience of communications in the Pacific informs this study profoundly.

2. Participant observation. From January 1978 to April 1979 I was employed by Simon Fraser University (SFU) as a Research Assistant in helping to launch Vancouver's participation in the PEACESAT system. From September 1978, this meant that I was Acting Terminal Manager for PEACESAT SFU. In this role, I have been able - as a participant in PEACESAT - to observe the daily working events of the system. This has played an invaluable part in my understanding of PEACESAT; in fact, it was this experience of PEACESAT's operation that finally prompted me to undertake this study.

3. Interviews. In January 1979, in Honolulu, Hawaii, I was fortunate enough to be able to interview many people connected with PEACESAT. These included John Bystrom, Carol Misko O'Keefe, Stuart Kingan (all of PEACESAT), Harold Wigran (of the US National Education Association) and John Chick (of USP). Additionally, I was able to attend a NASA-sponsored conference of ATS-1 experimenters, also in
Honolulu, where the ATS-1 experiments were discussed in some depth.

4. Questionnaires. Additional information has been gleaned by means of two questionnaires, one sent to PEACESAT terminal managers, and the other - in the form of a letter - sent to Pacific Island governments.

5. Library, and official documents. Aside from the use of usual library resources, I was also given access to many of the official NASA and PEACESAT documents and correspondance. These were compiled by Nicholas Engler of the Research Institute, University of Dayton, Ohio, who was contracted by NASA as the official ATS bibliographer.

6. Content analysis. Chapter IX of the study relies primarily on quantitative content analysis techniques, as developed by the author, to evaluate usage of the PEACESAT system.
II. PEACESAT IN CONTEXT

Because PEACESAT claims to be an innovation in telecommunications technologies, and because it operates in a relatively little-known region of the world, it is necessary to provide some context for the subsequent discussion. This will be in the form, first of all, of a brief discussion of the major theoretical approaches to communications and development, then a brief historical overview of communications satellite development and experimentation, and lastly, a brief description of the Pacific Island region.

1.0. Development theories: the theoretical context

Attempts to evaluate communications technologies and their effect on the development process of the countries or regions on which they are designed to impact have been conducted in earnest since 1945. In the earlier half of this post-war period, the approach to evaluation of communication technologies led to the formulation of a 'dominant paradigm' for use in such research, and is represented by the work of Lerner, Rogers and Schramm. In opposition to this dominant research tradition, a theoretical

approach that I shall term 'core-periphery analysis' has been refined over a number of decades and is now widely used in a number of disciplines to assess the relationships between 'developed' and 'less-developed' countries or regions of the world.

1.1. The 'dominant paradigm'

The dominant paradigm focussed attention on the impact of communications technology upon social structure, cultural patterns, individual attitudes and behaviour, and information flow and direction. Its major objective as a methodology was to determine whether or not a technology had contributed to economic and social development. Social change - or development - in this context, was regarded as positive when people moved from 'traditional' means of subsistence towards more reliance upon an industrial mode of organisation. Improved communication and the 'free flow of information' were regarded not only as positive ends in and of themselves but were crucial ingredients in inducing a population to adopt forms of behaviour more suited to industrialisation:

"Free and adequate information is not only a goal, it is also a means of bringing about social change. Without adequate and effective communication, economic and social development will inevitably be retarded and may be counter-productive."\(^2\)

The assumptions of the paradigm were not only that development

\(^2\) Schramm, p.18.
necessarily involved the adoption of the capitalist mode of production with a simultaneous shift to Western forms of social organisation, but also that the addition of a new technology could itself effect significant social, and therefore economic, change. The technology in question was one-way, mass communications technology; the belief was that, by transmitting 'modern' information via these systems, societies would be able to effect the transition from 'traditional' to 'modern'.

In his development of 'diffusion theory', Rogers epitomised this trend: the mass media were to convey information from government agencies downwards to the people. According to this model, if the changes were not as expected, then the problem tended to be attributed to the failure of technological innovation rather than to incompatibilities between the foreign technology and the predominant forms of social and cultural organisation in the societies in question. Additionally, no attention was paid to systemic constraints at national and international levels which might operate to limit the possibilities of economic and social change. Uncritically, less-developed nations were to be brought into the modern industrial system – a system in large part dominated by the US, where this theory originated. In short, the model was crassly simplistic in its linear, ahistorical, apolitical and

---

ethnocentric view of change, a view which fails to see human society as a complex web of dynamic relations.

Significantly, when expectations according to this theory failed to materialise - communications technology did not bring about instant economic growth and prosperity - the paradigm was altered to focus on 'two-way' telecommunications systems which were seen as able to prevent the economic and cultural imperialism that 'one-way' systems had promoted. The new paradigm emphasised the "development of man" as opposed to the "development of things" but was, nevertheless, based upon the assumption that a new technological configuration would solve the development problem. Institutional questions of ownership, control and social structure were still ignored and, consequently, this model, too, has met with little success.  

1.2. Core-periphery analysis

In contrast to the dominant paradigm, core-periphery analysis focusses attention on the relationships among the parts of a system, its aim being to identify the dominant and dominated elements and thereby to perceive the constraints and pressures which operate to influence the overall development process, particularly that at the 'periphery'. This model has 

---

4 In writing this section, acknowledgements are due to Robin Mansell, *Telecommunications Subsidy Policy in North West Canada and Alaska: A Comparison*, (M.A. (CMNS) thesis, Department of Communication, Simon Fraser University, November 1979), Chapter 2.
its origin in economics but has been found to be highly applicable to the analysis of communication systems.

Harold Innis, who wrote extensively about the process of economic development in Canada as well as about the role of communication in development, called this approach the "staples thesis". This view recognises the paramount importance of the 'core' of the capitalist industrial system which, through its unequal economic and political power, tends to skew development in the 'peripheries' so that it is oriented primarily to serving the core. Peripheral areas which are economically weak consequently tend to specialise in the production of staple products which are exported to industrial centres:

"Canada has participated in the industrial growth of the US, becoming the gateway of that country to the markets of the British Empire. She has continued, however, chiefly as a producer of staples for the industrial centres of the US even more than of Britain making her own contribution to the Industrial Revolution of North America and Europe and being in turn tremendously influenced thereby." 

More explicitly, "Canada has remained fundamentally a product of Europe". 

In this mode of analysis, the periphery can refer to a region of a country in the case of an analysis on a national scale, or to nations themselves (Canada in the above example) when considering questions of international development. This

---

6 Ibid, p.401.
method recognises the constraints imposed upon the periphery and its development by the unequal power of the core. Production in the peripheries is undertaken predominantly in the interests of the core, where control resides, and this causes the peripheries to be dependent on the core for their continued survival - the characteristics of imperialism. In terms of communication, core areas tend to own and control the means of communication as well as to originate most - if not all - messages and to orient them to core interests and values; information flow patterns revolve around the core as centre of the system. More communication can be seen as a way of 'softening up' the peripheries as a precursor to more effective exploitation of their resources, at the same time as attempting to tie them irrevocably to that system of exploitation.

Since PEACESAT is a 'two-way' technology which claims to avoid imperialism, and since the Pacific region has all the characteristics of a peripheral area, and since the core-periphery form of analysis is evidently more inclusive and reliable, this study employs the core-periphery approach in the analysis of PEACESAT.
2.0. Communications satellite development: an historical overview

2.1. Satellites versus other technologies

Prior to the development of satellites, most communications technologies required large investments in fixed systems which were either physically linked to one another or which were restricted in the services they could offer. The telephone line and the undersea cable were the primary technologies allowing for interactive use. Radio and television broadcast and HF fixed public service were restricted to those geographical regions which could adequately receive the signals. This placed a limit on the distance a receiver could be from a transmission point. In addition, it meant that there could be few physical obstacles – such as mountains – in the path of the signals. In general, the high costs of the equipment made it most economical to serve areas of high population density, and preferably those which presented few geographical obstacles. Costs to the consumer, as well as being based on the duration in time that the service was used, were also based on a distance formula whereby the further one was away from the point one wished to contact, the higher was the charge. The outcome was that urban centres were provided with relatively good services, while rural areas were not.

There were attempts made to devise technologies which could
overcome some of these constraints. The tropo-scatter system bounced radio signals off the troposphere, enabling points separated by considerable distances and points beyond the horizon, to be linked. However, performance using this system lacks reliability due to the variation in the characteristics of the ionosphere.

Microwave transmission provided a breakthrough for communications between line-of-sight points. Signals could be relayed between microwave towers over considerable distances as long as there were no obstacles in their path. Overall, this system reduced the need for high investment in cables and was particularly well-suited to flat areas. In mountainous terrain, the careful placement of towers meant that areas which had previously been inaccessible to cable technologies could now be penetrated. This was a major advantage in the provision of rural communications services. However, microwave technology still required users to be located near to a microwave tower and a landline system to carry the signal from the tower to the user. In many of the more isolated cases, this still meant too heavy an investment to justify the service, even when cross-subsidies from more highly profitable services to those which were not profitable were taken into account. Distance was still a major factor in the rate calculation and, therefore, in the feasibility of the service.
Satellite technology, by overcoming many of the traditional constraints of terrestrial systems, offered great promise. For the first time, there was a technology with the potential not only to link very isolated areas, but also – ideally – to make the distance from the transmitter a negligible factor in the calculation of costs to the consumer. While this was attractive to industrialised nations which already possessed a telecommunications infrastructure, it was clearly of even more potential benefit to non-industrialised countries with no such infrastructure, especially where the nations in question spanned large areas. In satellite-mediated systems, points one thousand miles away can ideally be linked as easily and inexpensively as points one hundred miles away.

In fact, satellite systems are not as simple as this might suggest. The crucial aspect is the design of the two major parts of the system: the space segment (or satellite), and the ground segment (the transmitter and the receiver). Put in crude terms, the more elaborate and powerful the space segment, the less elaborate and powerful the ground segment is required to be, and vice versa.

The simplest system is one where a signal is merely bounced from earth to the satellite and back to earth again. In such a case, the satellite would be technically a simple one, requiring a large ground segment, in the form of an elaborate and expensive receiving station. While such a system would
incorporate many of the advantages of using a satellite, it would clearly not be within the budget of a household, a village, or even a small town, perhaps, to own such receiving equipment. Considerable investment in landline technologies would still be required to link users to the main receiving station. At the other extreme, the concept of a direct broadcast satellite (DBS) is that the space segment is so elaborate and powerful that television signals, for example, could be beamed directly into the home without the use of any landline technology.

It was partly with these design possibilities in mind that satellite development and experimentation began in the 1950s. It must be stressed, however, that the major motivation for the development of satellites was not to facilitate the provision of more reliable and inexpensive communications to the general public. It was envisaged, for example, that satellites could be used for a variety of other purposes such as weather prediction and scientific research in space. But above all else, the satellite was regarded as a major tool of the military, both as a military weapon per se, and - more importantly in the early days - to facilitate and extend reliable military communications. In tandem with this overt military orientation, communications satellites were also seen to be powerful weapons in the dissemination of propaganda: the war to capture men's minds. The early development of satellite communications was
inextricably tied in to the Cold War. For this reason, the major protagonists in the development of satellites have been the US and the USSR.

2.2. Brief history of satellite development: NASA, COMSAT & INTELSAT

The development of satellites began in earnest after the successful launching by the USSR of Sputnik I in October 1957. In this period, at the height of the Cold War, Sputnik represented a startling achievement, demonstrating what was immediately interpreted in the US to be a threatening lead in a new field of technology. The consequence was an enormous effort on the part of the US to develop and out-do the Soviet Union in the 'space race'. Up until that time, in the US, satellite development had failed to go much beyond the planning stage, first because of an inability of the different branches of government to co-operate successfully, and second, "the satellite program lacked a clear-cut military objective". Sputnik provided the latter.

In the US, the enormous investment in the satellite industry and the simultaneous institutional re-organisation and innovation was shortly to result in American leadership in 'the race'. Institutional, political and policy questions were relegated to secondary status in favour of the economic and military interests "to use the satellite as a tool to shape the

---

US image abroad. The resultant creation, the National Aeronautics and Space Administration (NASA) was an enigma, on the one hand working hand in hand with private industry, on the other developing satellite capability in the 'public interest'. At almost all stages in this institutional re-shuffle, the Department of Defense (DOD) played an active role, commercial and military interests combining uniquely in the process.

The business of establishing an agency for the development and operation of communications satellites led to widespread controversy reaching a climax in 1961. The main issue was that of private versus public ownership, followed by that of institutional versus national ownership and control. Those in favour of private ownership and control argued that it would be faster and cheaper than public ownership and control, the same argument being used against international control. The counter to this was that all of the research and development already undertaken on satellites had been financed by the taxpayer, entitling him to some returns, and that the system proposed would automatically lead to vertical integration of the communications carriers and manufacturers of equipment, and thus

---

9 Ibid. Smith, by no means in opposition to the Establishment, constantly makes reference to this fact of "interplay between technical and policy decisions ... displayed in the relations established between NASA, DOD and industry".
to an inhibition of competition:

"the choice which is before us is between government ownership of a taxpayer-financed resource, with operation for the benefit of all American people, or ownership by a Government-created private monopoly."

The latter won out. The Communications Satellite Act of 1962 led to the formation of the Communications Satellite Corporation (COMSAT) in February 1963 as a private US corporation with "a monopoly in the business of intercontinental satellite communications for the expressed purpose of facilitating the public goal of developing a global communications satellite system". Original share ownership was divided equally between the public and private industry, of which segment A.T.& T. (Bell Telephone) possessed 29.0%. The four largest US carriers - AT&T, IT&T, General Telephone & Electronics Corporation, and RCA Communications Inc. - together owned 90.9% of the industry shares, or 45.4% of the total. Industry and public were to appoint six directors each, and the President, three.

The next stage was the creation of INTELSAT in August 1964, following negotiation with Canada and Western European nations. The mandate of INTELSAT is to provide the satellites for a global system while member countries provide their own ground

---

stations. Its initial membership is reflective of exactly how "international" the US was prepared to make the organisation, in terms of control. Comprising the US, Canada, Australia, Japan and 15 West European nations, original share ownership was 61% for the US (represented by COMSAT) and 39% for all the other countries. Only 17% of the shares were viewed potentially for other countries. The Soviet Union, Eastern European countries and China refused to join. It was clear that COMSAT and INTELSAT were therefore "interlocking agencies, if not a single agency".14

Since its formation, many new members have joined INTELSAT and its structure has undergone many changes. Under the initial agreement, control was proportional to investment, and COMSAT managed "the design, development, construction, establishment operation and maintenance of the space segment".15 Further agreements have led to a four-tier organisational structure. Membership has increased widely to 91 members in 1975, forcing COMSAT's share progressively down to 33.61% in the same year.16 NASA continues to launch INTELSAT satellites, the cost of

---

14 SIPRI, p.20.

Net investment in the system rose to over $308 million at the end of 1974. Correspondingly, the utilisation charge has dropped from $32,000 per unit per year (a unit being approximately equivalent to a half-circuit) to $8,460 at the start of 1975. COMSAT Annual Report to the President and Congress, 1975, pp. 14 - 16.
INTELSAT IV-A launches averaging "about $23 million each". Satellite costs have risen from $16.5 million for INTELSAT I - II to $62 million for INTELSAT V, the capacity in units (half circuits) correspondingly rising from 480 to 25,000.

Because of the extremely high costs of satellite research and development, it was apparent early on that the US government would be required to play an active role in financing such research and development. Given the lead of the USSR and its supposed potential for enormous state financing of such technology, the US was obliged to adopt new strategies if it wanted to obtain the political and economic advantages that satellite development represented. Experimentation too expensive to be done by private industry would have to be undertaken by government. In a special address to Congress in May 1961, President Kennedy - requesting an addition of $50 million to

---

NASA's budget - made it clear that, in this way, both government and commercial interests would be served. 19

Despite criticism from some quarters that public money would in this way be used to benefit private industry, this is the direction that US policy took. As a result, NASA's experimental communications satellite program incorporated a wide range of experiments, focussing on technology that might not otherwise have been developed by private industry as well as conducting military-oriented work.

The early satellites - Echo, Relay and Syncom - were designed:

"to demonstrate the technical and economic feasibility of using satellites for routine telephone, television relay, and data transmission and also to facilitate the required implementation of the technology for intercontinental communications". 20

The last of these satellites, Syncom III, served as the prototype of the first operational communications satellite, Early Bird, owned by COMSAT/INTELSAT.

At this point, in 1964, debate over government 'subsidization' of COMSAT through the NASA experiments erupted again in Congress. It was argued that the responsibilities and objectives of NASA and COMSAT were blurred, and the question was raised as to whether government funding of research and

19 Smith, p.78.
development would be reimbursed.21 The eventual result was that through Congressional pressure, vis a vis NASA’s budget, the communications satellite program was altered. Instead of developing more-or-less single-purpose satellites, NASA would design multi-purpose, advanced technology satellites whose "technological emphases were oriented toward improvements necessary not only for communications but also for other satellite applications".22

The ATS series - the second generation of communication satellites - "focused on entirely new satellite capabilities and services, such as information networking and L-band aeronautical communications".23 In the late 1960s and early 70s, NASA adopted an 'experimentation' approach designed to suit user requirements. "Invitations to participate in the ATS program were issued to NASA research centers, the Department of Defense, and private industry."24

Five satellites in the ATS program were launched between late 1966 and August 1969, all built by Hughes Aircraft. Designated by a letter before launching (e.g. ATS-A), and a numeral after launch, they were known as ATS-1 through -5, and ATS-F/6 was launched in May 1974. For the first five satellites, "a total of forty-six applications and technology experiments

21 Ibid, p.115.
22 NASA, as quoted in Smith, p.231.
24 Ibid.
FIGURE 1: POSITIONS OF ATS SERIES SATELLITES
(Source: NASA ATS Experimenters Conference, Honolulu, January 1979.)
were selected and twenty-three purely scientific experiments".\textsuperscript{25} ATS-2 and ATS-4 failed, largely through launch problems, and although the primary purpose of ATS-5 could not be achieved, some experiments were conducted successfully. ATS-1 and ATS-3 were both geosynchronous, spin-stabilised spacecraft and were completely successful. They facilitated refinements in antenna technology, frequency levels, signal transmission power, and development of small, mobile earth terminals.\textsuperscript{26} (See Figures 1 and 2.)

In particular, ATS-1 and -3 were used for experiments in the very high frequency range for four applications:

"(1) two-way voice communications with aircraft; (2) distribution of weather facsimile; (3) data collection for multiple small remote platforms; and (4) position locations".\textsuperscript{27}

Airlines, the Federal Aviation Commission and the Department of Defense participated in these experiments. Using the two satellites concurrently, concentrating on a single aircraft or seacraft target, location could be obtained "with reasonable accuracy". Enhanced antenna directivity and increased power was, according to Smith (quoting an official NASA study):

"of particular importance in connection with the extension of the commercial satellite system to the less developed countries where numerous small stations would be necessary to meet communications requirements".\textsuperscript{28}

\begin{itemize}
\item\textsuperscript{25} Ibid, p.234.
\item\textsuperscript{26} Ibid, p.235.
\item\textsuperscript{27} Ibid, p.236.
\item\textsuperscript{28} Ibid, p.237.
\end{itemize}
FIGURE 2: MAP SHOWING ATS-1 COVERAGE & PEACESAT TERMINALS
(Source: PEACESAT SFU, compiled from documents from PEACESAT Headquarters, Honolulu.)
As Smith continues, "NASA's technical innovation led directly to an expansion of COMSAT's and other satellite entities' service possibilities". A further use of ATS-1, using its C-band transponder, was the successful transmission of fingerprints "suitable for use in identifications" from a small, mobile terminal.\(^{29}\) In Alaska, the same satellite was used for biomedical, educational and networking purposes between remote villages by means of two-way audio-only capability.

It is against this background - of technical, economic, institutional, and political issues in the US - that the PEACESAT experiment on ATS-1 must be viewed.

3.0. Characteristics of the Pacific Island region

3.1. General

The Pacific region covers roughly one third of the world's surface. Within this vast area, the predominant feature is diversity.\(^{30}\)

Geographically, the Pacific Islands range in size from the largest island in the world, Papua New Guinea, with its rugged mountainous interior, to tiny atolls which rise to a maximum of a few feet above sea-level. In the region, there are four and a

\(^{29}\) Ibid, p.238.

\(^{30}\) See, for example, E. Macu Salato, "South Pacific Regionalism 'Unity in Diversity'", in South Pacific Bulletin, Fourth Quarter, 1976, (South Pacific Commission, Noumea), pp.30-35.
half million people who speak more than a thousand languages. Populations range from Niue with fewer than 5,000 people, through Fiji's half million to PNG's two and three quarter million people. Culturally, there are great differences among the three crude divisions of islands into Polynesia, Micronesia and Melanesia, as well as substantial differences between nations within the same broad ethnic division. In fact, in Melanesia, it is not uncommon to find that people in adjacent villages, separated only by a valley, speak different languages, adhere to different customs and possess different forms of social organisation, land tenure and so on.

In addition to this type of diversity is that resulting from colonial history which has tied most Pacific nations to one or more metropolitan powers. Guam has been linked with several such powers over a period of little more than a century. Yet, at the same time, the Kingdom of Tonga has never been formally colonised. The different European powers in the region have followed different colonial policies. Britain has almost entirely withdrawn from being a colonial power in the Pacific, while France still maintains an aggressive hold over her territories. The US has betrayed her UN Trusteeship responsibilities to the peoples of Micronesia by using the
islands as military bases and missile-testing sites. The three major western powers - the US, Britain and France - have all tested nuclear weapons in the Pacific with little concern for human suffering and ecological damage. Islands possessing valuable resources tend to have been more dramatically affected than those with no such resources. Even small islands possessing identical resources - such as the phosphate islands of Nauru, and Ocean Island in the Gilberts - have been affected differently. The people of Ocean Island have benefitted little from the phosphate and are now re-located in the Fiji group, while the Nauruans boast one of the highest per capita incomes in the world. Other differences among Pacific islanders include those resulting from adherence to a wide variety of religious denominations.

Overall, therefore, there is a remarkable absence of uniformity, a feature which outsiders, especially Caucasian 'experts' on short-term visits, have repeatedly failed to grasp. This diversity in the Pacific is one of the major features to be borne in mind when considering the region.

3.2. The development context

A second major characteristic of the Pacific is the way in which it is invariably regarded by outsiders as being a romantic paradise. There is little doubt that prior to European contact, --------------

31 See, for example, Donald McHenry, Micronesia: Trust Betrayed (Washington: Carnegie Endowment for International Peace, 1975)
Pacific societies were more communally-oriented than may be the case today, and they were possibly more in harmony with their environments. Nevertheless, many such societies were frequently at war, suffered from certain diseases, and in addition possessed a variety of not so attractive customs: cannibalism and widow strangling, for example. That the 'noble savage' of the Pacific has been so idealised is less due to the reality of Pacific life - either in the past or in the present - than it is due to the inaccuracy of the commentators or the collective desire of the industrialised west to believe in a lost paradise.

In fact, of course, life in the Pacific eludes simplistic characterisation. It is complicated and varied, harsh and relaxed, and full of contradictions. In general terms, however, and without going into detailed discussion of the matter, there are several trends relevant to this analysis that can be noted:

1. demographically, Pacific populations are increasing at an alarming rate, to such an extent that several nations cannot now produce sufficient food;

2. economically, there is a continuing shift away from dependence upon subsistence-based farming to a style of life which requires an increasing cash component. Concurrently, there is a trend towards cooperative and individual entrepreneurship as well as an increasing demand for urban-based employment;

3. socially, as rural life deteriorates and as populations
shift into the urban areas, there is a further dissolution of communal life at the same time as there exist increasing problems of urban poverty, unemployment, over-crowding and crime.

Overall, the Pacific Islands are very much in the process of transition, a process that has had major impact in the 1960s and 70s. There is constant and progressively more evident tension between the older ways of life and the new. The aspirations of many island people are for increased formal education in the western style, for well-paid jobs, for additions to the nation's infrastructure, and for many of the luxuries of the western life-style. At the same time, there is an awareness that the west does not have all the answers and that there is much about the Pacific style of life which should be maintained. This awareness is heightened by the observation that other recently independent nations of Africa, or Asia, have made serious mistakes in endeavouring to follow blindly the development models promoted by the west.

In summary, as Pacific nations are more and more absorbed into the market economy, there seems to be a simultaneous realisation that this is not, after all, what they really want. Or, put another way, that the price demanded for entering the market economy is too high. Yet there is little that can be done to reverse the trend. Increasingly for Pacific people, control over their lives is being removed from their own hands,
supplanted by a government bureaucracy, or the impersonal
dictates of the international marketplace. As this trend
continues, populations are becoming increasingly polarised along
class lines into party political factions, unions versus
government, etc..

In this context, discussion of development is highly
controversial. Illustrative of the degree of polarisation
referred to above is the disagreement among different groups as
to which model of development should be followed. For example,
just as there exist proponents of the 'trickle-down' theory, who
would argue that the benefits of large-scale (and often mostly
urban and industrial) capital expenditure will eventually reach
people at the 'grassroots' level by way of increased job
opportunities and government spending, there are those who
support the Tanzanian model with the accent on encouraging
grassroots development as a priority. Clearly, agreement on the
particular features of the most advantageous development policy
to pursue would be difficult to obtain. Development in the
Pacific - as elsewhere - opens up a Pandora's Box of
assumptions, definitions and opinions leading to a wide spectrum
of articulated needs and development policy options.

Pacific leaders, however, are acutely aware of the region's
problems, and there has been considerable discussion of suitable
development strategies in recent years. Dr. Tom Davis, Premier
of the Cook Islands, describes the predicament of the Island
states in the following way:

"We have become a region of consumers of imported goods. In the Cook Islands, the value of goods coming into the country is more than twice the value of goods going out. We are therefore living in a depletion economy which has to be bolstered by aid. This is to one degree or another true for most, if not all, of us in the region. We export little else than the products of our natural resources and these are insufficient to balance the extent of our imports. Because of this our average citizens cannot hope to have the quality of life they desire. Because of the unequal distribution of wealth, their share of the consumer goods that we import is next to nothing and they are on the edge of frank malnutrition."  

John Momis, one of Papua New Guinea's most prominent politicians, affirms that Pacific countries want economic development, but:

"We are becoming increasingly aware that an obsession with economic development can lead to various harmful consequences: the pollution of the environment, the disruption of traditional systems and values (desirable), the alienation of man, and the exploitation of the poor by the rich. Economic development should not bring about disparities in incomes as between individuals or regions. Development, above all, must be development of the people – hence the emphasis on egalitarianism, rural development, and the increasing participation of women in the affairs of our countries."  

A report to the South Pacific Forum – a grouping of independent Pacific nations – chaired by Tonga’s Bishop Patelisio Finau, investigated the role of aid in the Pacific development process. Entitled "More Effective Aid", the report...
repeatedly pointed out the dangers of foreign aid. For example:

"Some of the most difficult and deep-rooted problems of recipients - land tenure, distribution of population, struggles between traditional and modern power elites, rural demoralisation, micro-nationalism - are rarely solved by foreign aid, but in some cases are being worsened by the impact of government policies partly financed by aid." 34

The report continues by stating that aid has often encouraged development projects "in the wrong place; with unsuitable materials; with inappropriate technology; too lavishly; with inadequate preparation; sloppily; and with inadequate follow-up". 35

Overall, Pacific governments agree on the objectives of increased self-reliance, more equal distribution of welfare and economic opportunity, and the maintenance or improvement of the overall standard of living. 36 Their efforts now are concentrated on more realistic strategies by which to realise such objectives and this, in short, entails increased and more vigilant planning and analysis of current and proposed development projects. It is in this spirit that this study of PEACESAT is conducted.

34----------------
36 Ibid, p.10.
FIGURE 3: CABLE NETWORKS IN THE PACIFIC REGION
(Source: Schoen, Pacific Telecommunications Conference, Honolulu, January 1979.)
4.0. Telecommunications in the Pacific Islands

Characteristically, the situation with regard to telecommunications systems in the Pacific is that there is a high degree of diversity among the different islands, and among different regions of the Pacific.

International telecommunication links include both cable and satellite systems. The majority of submarine cables link points on the west coast of North America with Japan and South East Asia, and with New Zealand and Australia. Hawaii is linked by three cables to the US mainland. Two of these cables (TRANSPAC) continue to Guam and South East Asia. TRANSPAC 1 goes from Hawaii via Midway and Wake Islands to Guam, thence to Japan. TRANSPAC 2 linkes Hawaii and Guam, and then continues to Okinawa and to the Philippines. Another cable (COMPAC) links Vancouver - Hawaii - Suva (Fiji) - New Zealand - Australia. A further cable across the Tasman Sea makes another connection between New Zealand and Australia. Finally, Papua New Guinea (PNG) is linked to Guam (and thus to South East Asia and Japan) by SEACOM; and Australia connects with PNG via two cables (APNG and JASC). 37 (See Figure 3.)

Significantly, because of the low volume of traffic, only Fiji and PNG among the Pacific Islands are linked directly into

cable systems. All existing long-haul cables are due to reach the end of their design life in the 1980s. Planning is currently underway to lay new cables, but there is the possibility that no new cables will be routed via Fiji, again because of the insufficient volume of traffic. Of interest is the observation that "various communication entities in the Pacific do not consider submarine cable obsolete since the advent of satellite communications". This statement, however, presumably relates very little to the small Pacific island nations.

Pacific nations with INTELSAT ground stations linking into the global system include Australia and Hong Kong (with CTIs), and New Zealand and Fiji (with CT2s). Also recently constructed is a Standard B earth station in Tonga, and the Solomons, the New Hebrides, Western Samoa and the Cook Islands all plan to have Standard B earth stations in operation between 1980 - 1982.

Connections into the international networks are also possible via HF radio links between the New Hebrides and Fiji, and between Western Samoa, the Cook Islands and Niue which can all link via HF radio to New Zealand.

National telecommunication systems vary considerably. PNG has "an extremely good telecommunications infrastructure by any

38 Ibid. p. 1C-31
39 Ibid. p. 1C-33
40 Ibid. p. 1C-34
standards in the world", including "an overlay of a manually operated two frequency simplex HF radio outstations network to remote villages with eight base stations interconnecting to the automatic network". Fijl possesses a good national telephone network to its major centres, but a HF system serves rural areas. Other HF links with rural areas are "fair" in the New Hebrides and the Gilberts, and "poor" in the Solomons and Tuvalu.

Most of the Pacific island nations have the following basic telecommunication policy objective:

"Recognizing the importance of telecommunications, the Government wishes to upgrade the present inadequate services to a level adequate to meet our social and economic needs, both between the countries of the Pacific region and beyond into the world network. To provide for a quality of life that is considered equitable for the non-urban dwellers a high priority is given to rural telecommunications development."

In the last few years, strong initiatives have been taken to upgrade telecommunications infrastructures and by the early 1980s it is expected that all countries will have "vastly improved systems".

Significant in regard to international communications is the predominant absence of television from the independent nations of the Pacific. In some cases this is due to poverty; in others, it is an enlightened policy to deliberately avoid the
cultural impact of poor quality, foreign programming on populations.46

Regional telecommunications planning is being coordinated by the South Pacific Bureau for Economic Cooperation (SPEC). Their task is to coordinate the development of telecommunications in two specific areas:

1. The Telecommunications Network Project is "concerned with upgrading the telecommunications network of the Pacific island countries to international standard";

2. The Telecommunications Training Project "deals with training local technicians to operate the improved systems". As part of their coordinating responsibilities, SPEC convenes the annual South Pacific Regional Telecommunications meeting to review developments.47

SPEC is currently assisted by an International Telecommunications Union Regional Planning Project team, based in Suva.

5.0. The specific context and objectives of the PEACESAT Project

5.1. The specific context of PEACESAT

From the preceding sections of this chapter, it is evident that PEACESAT as an institution is linked to a wide variety of individuals and institutions in both metropolitan and Pacific Island countries.

In Hawaii, where the headquarters of the Project is located, PEACESAT is linked most obviously to the University of Hawaii and sister-institutions such as the East West Center, as well as to the Hawaii State legislature which has provided the bulk of the Project's funding. Other sources of financial support have come from international institutions such as the International Planned Parenthood Federation and The Asia Foundation, and national institutions in the US, New Zealand and Pacific countries. In the US, PEACESAT's relationship to NASA is, of course, fundamental to the Project, but other US government agencies have also been linked with the Project at different times. These include the Departments of the Interior, of State, and Defense, as well as more specialised agencies like the Joint Council on Educational Television and the National Education Association. In the Pacific, the USP has played a key
role as sponsor of many of the terminals. In all countries, telecommunications licencing authorities have necessarily been involved with PEACESAT, as have a variety of local institutions and individuals with an interest in using the system.

PEACESAT as an institution is therefore linked to this wide network of national and international relations. It is precisely this inter-related network of interests and institutions that informs PEACESAT's operations at all levels, and which will be a major focus of this study.

5.2. Objectives of the PEACESAT Project

Curiously enough, a coherent and well-articulated statement of the objectives of the PEACESAT Project is not easy to find. In the three published reports of the Project originating from Honolulu, for example, statements regarding PEACESAT's purpose are scattered through the Introduction of Report One and a subsequent section entitled 'Concept'. They read as follows:

- "The purpose of the experimental satellite communication system is work rather than entertainment. It is designed to support specialists and community leaders who have responsibilities for resolving social problems by linking them with sources of useful information."
- "This is an international communication system that is designed to avoid domination from forces outside a country. Its purpose is to link the institutions and individuals engaged in the organised work of the society for their greatest effectiveness."
- "Unlike many experiments in educational technology, this one attempts to recognise the limited money supply in less-developed areas and the absence of a market economy to support the operations of education, health and community service institutions."
In short, PEACESAT operations are designed to fit the existing physical, economic, political and social conditions of life today."

"The PEACESAT Project is attempting to determine whether other communications systems should be developed and financed for social services and how to adapt technology to requirements for service. The plan is to provide an experimental system encompassing flexibility, mobility, low-cost, wide-area coverage, and two-way transmission."48

In official statements to NASA at the start of the Project, Dr. John Bystrom, founder of PEACESAT, outlines PEACESAT's purpose in the following way:

"The principal purpose of PEACESAT (Pan Pacific Education & Communication Experiments by Satellite) is to demonstrate the benefits of currently available telecommunications technology when applied specifically to the needs of sparsely populated, less industrialised areas of the nation and the world. It is impossible for many of the peoples of the Pacific Basin to sustain adequate levels of education, health care, and technically based services. Often populations are small in size and divided by great distances. Inadequate communications constitutes a principal barrier to community development. The PEACESAT Project proposes to link the institutions of higher education and other health and educational services in the Pacific Basin, domestic and foreign, by means of communication satellite, allowing for two-way exchange of materials and services."49

The most satisfactory statement of objectives is to be found in a paper written by Bystrom for an international conference in Stockholm in 1974, where it is stated that "the


published objectives" are:

- "to determine what communications can be developed to improve health, education and community services in the Pacific with the availability of low-cost satellite, and other communication links."

- "to construct a series of pilot communication activities both international and US Pacific in which satellite communications is applied to health care, education and community programs; to develop and support feasible new approaches to the delivery of health, education and community services involving the application of communication techniques; to identify communication barriers; to measure user acceptance of the new methods; and to contribute to an assessment of future telecommunications system requirements in the Pacific Basin."

- "to test alternative telecommunications system models in relation to the delivery of health, education and community-service programs and to measure potential user demand and attitudes toward the introduction of innovative new services."

From these diverse statements, as well as from the implicit assumptions of much of the material written by Bystrom and others associated with PEACESAT, it is legitimate to characterise the objectives of PEACESAT in two broad ways, as already outlined above (see Chapter I, Section 4.0.):

1. to undertake experimentation in satellite-mediated telecommunications with emphasis on its use for education, health and community-service; and

2. as an institution, to serve the development of "sparsely populated, less industrialised areas", and in particular, the Pacific Islands.

FIGURE 4: APPLICATIONS TECHNOLOGY SATELLITE ATS-1
(Source: PEACESAT Headquarters, Honolulu.)
III. THE TECHNOLOGY

Before proceeding with the historical description of PEACESAT, a more detailed outline of the technology that is employed by the system is warranted. This chapter therefore aims to provide sufficient information on the space- and ground-segment technology to enable the reader to better understand the technical components of the experiment. However, since the main emphasis of this study is not a technical one, those readers requiring more detailed technical information are encouraged to consult other sources.1

1.0. The satellite

ATS-1 was built by the Hughes Aircraft Company for NASA's Goddard Space Flight Centre. It is a spin-stabilized spacecraft, shaped like a drum, measuring 60 inches in length by 58 inches diameter (see Figure 5). The spacecraft weighed 1,547 pounds at launch, and in orbit presently weighs 775 pounds. ATS-1 was launched aboard an Atlas-Agena booster on December 6, 1966 from Cape Kennedy.

Soon after launch, and according to plan, the satellite was shifted to 149 degrees West longitude, or roughly over Christmas

1 The technical information that follows, unless otherwise indicated, is taken from a document entitled ATS-1, no author, undated; it is believed to be a PEACESAT document from Hawaii.
Island in the Pacific Ocean. Its altitude varies from approximately 22,300 miles to 22,900 miles from the Earth. From this position, the spacecraft "sees" (and can thus be used for communication with) 42 percent of the earth's surface, an area extending roughly from 50 degrees North to 50 degrees South, and from 75 degrees West longitude westward to 135 degrees East longitude.

In this position, ATS-1 is in what is called geostationary orbit. This means that the spacecraft is rotating at the same speed as the earth and is located above the equator, thereby maintaining a constant position relative to the earth. Such positions are very advantageous, enabling continuous wide-area coverage of a specific area.

The ATS-1 satellite is spin-stabilized, meaning that it uses a gyroscopic effect to maintain rigidity in space. It spins at 97 rpm along its cylindrical axis.

Because of irregularities in the gravitational pull of the earth, as well as the gravitational influence of the sun and moon, geostationary satellites require regular attention to prevent them from drifting and/or wobbling. This process is termed "station-keeping". On the ATS-1 station-keeping is undertaken by means of two hydrogen-peroxide thrust systems. One of the thruster jets fires parallel to the satellite spin axis while the other fires perpendicularly.
For the ATS satellites, station-keeping is undertaken once a month by Westinghouse Electric, under contract to NASA. The operation takes approximately four or five hours, and is done from the ground station at Rosman, North Carolina. Apparently, the day after launch, the peroxide system lost pressurisation, effectively crippling it for anything other than station-keeping functions. Without station-keeping, the satellite would drift to 105 degrees West.

Electrical power on the satellite is obtained by solar cells which completely cover the cylindrical surface of the spacecraft, except for openings for the experiments (e.g. the camera). Two 22-cell nickel-cadmium batteries store the electricity. When the satellite is out of direct sunlight, therefore, power is supplied by the batteries; this occurs for about one hour per day. The batteries can also supply additional power during peak periods.

It is the state of the power system which will mostly determine how much longer the satellite can continue to function. Past NASA predictions of its estimated life have been quite erroneous. For example, in 1970 it was thought to have only a year's useful life remaining. Recent estimations,

---

3 Ibid.
however, are that, by the fall of 1979, the solar rays - which are decreasing logarithmically with time - will no longer be able to provide the necessary amount of power for experimentation to continue full-time.\textsuperscript{5}

There are two antenna systems on board the ATS-1. One operates in the SHF range at 4 GHz and the other - the one used by PEACESAT - in the VHF range. The ATS-1 was the first satellite to use an electronically despun antenna system. The sixteen elements of the antenna are interconnected to produce a directed beam of radiation towards Earth. This conically shaped beam is rotated at a speed equal to, but in opposite sense to, the spacecraft spin; thus the name, "despun" antenna. On the ATS-1, it is believed that one of the eight VHF whip antennas is broken or missing, thereby explaining the characteristic spin modulation tone frequently heard during transmissions.

The ATS-1 possesses three transponders, two for microwave communications, and one for VHF communications. The transponder is the basis of the communications satellite. Powered by the solar cells, the transponder receives a weak ground signal and re-transmits to Earth a boosted signal which is shifted in frequency to avoid interfering with the incoming signal.

The two microwave transponders can run separate experiments simultaneously and are capable of operating in three different modes: (1) multiple access with single side band transmissions,

\textsuperscript{5} Jim Meanen, op.
\textsuperscript{cit.}
the objective being to evaluate a single sideband/phase modulation technique to permit as many as 1,200 one-way or 600 two-way voice circuits simultaneously; (2) a wideband frequency modulation (FM) system designed primarily for colour television use, or other wideband applications such as high-speed data transmission where one ground station takes over the complete channel; (3) the transmission of wideband spacecraft sensor data to ground stations; this mode was mostly used to transmit cloud cover pictures taken by the camera.

The microwave transponders operate in the six GHz band for the up-link and four GHz for spacecraft-to-ground transmission. The VHF transponder is an active frequency translation repeater which receives in the 149 mc range and transmits in the 135 mc range without a change in modulation. (See Appendix 1 for VHF communication transponder characteristics.) The 100 KHz bandwidth is divided into five voice grade channels, only the centre one of which is currently used. If more than one channel is used simultaneously, then the power available is shared. 6

2.0. The original experiments

The design of the ATS-1 spacecraft itself was intended to test certain technical features for the first time. For example, the ATS-1 was the first to make use of an electronically despun antenna. Additionally, the ATS-1 served as a demonstration test-bed for north-south station-keeping. East-west station-keeping had been demonstrated by SYNCOMs II and III, and INTELSAT I; north-south station-keeping, requiring twenty times more energy than east-west station-keeping, had not been adequately demonstrated.

The communications experiments on the satellite utilized the microwave and VHF transponders.

2.1. Microwave communications experiments

(a) The multiple access experiment was the first real demonstration of a "telephone switchboard" technique that is vital for any communications satellite operating with two or more ground stations simultaneously. More than one thousand telephone quality channels can be handled by the ATS system. These experiments were conducted by three ground stations, at Rosman, North Carolina; at Mojave in California; and at Toowomba, Australia.

(b) Color television relay experiments were successfully conducted to the Rosman station (the only station equipped for the experiment). Good quality television signals were received
at all NASA's ATS ground stations, and in Japan.

(c) Spin-scan camera photographs were successfully transmitted in the wide-band mode, the ATS-1 being the first synchronous orbit satellite to use this new camera technique. In this system, the spin of the satellite provides the horizontal line-scan (at about 100 lines per minute), while a mechanical step motor provides the vertical (north-south) scan. The camera scanned a line 2.2 miles wide on earth, and took twenty minutes to scan its 2,000 line picture. The total area covered by the scan was about 300 million square miles, enabling details as small as two miles to be shown.

2.2. VHF communications experiments

(a) One objective of the VHF experiments was to test the feasibility of communications between moving aircraft and a satellite. Two-way voice communications between aircraft in flight and the ATS ground station, and between two aircraft, were conducted successfully.

(b) Electro-magnetic propagation through the ionosphere was evaluated by performing VHF and microwave polarization, range and range rate measurements simultaneously.

(c) The VHF transponder was used to relay, in facsimile format, processed weather data from the ATS Mojave ground station to other specially-equipped ground stations within range of ATS-1. Such weather data included maps, NEPHANALYSES, and
spin-scan camera pictures. Forty-eight ground stations apparently participated in the test transmissions, and most received good quality weather facsimile pictures.

2.3. Other experiments

The ATS-1 also carries six scientific experiments designed to provide data on a continuing, long-term basis on the orbital environment, the effect of this environment on the satellite, and magnetic storm disturbances at one longitude. These experiments are apparently proceeding as planned.

3.0. Current experiments

As of December 1978, NASA estimated that ATS-1 was being used for 109 hours a week, or about 65% of the available time. The remaining 35% of the time was not required, largely because - at all locations - it falls in the middle of the night. Of this 65% utilisation, the approximate breakdown of usage was as follows:

7 These experiments are as follows: 1. superthermal ion detector; 2. omni-directional electron-proton detector; 3. electron-magnetic deflection spectrometer; 4. multiple-element particle telescope; 5. magnetometer; 6. ionospheric beacon.

Department of the Interior Special Project

(DIS) in the TTPI .......................... 25-27%

DISP status negotiations (a link between
Washington and the TTPI) ..................... 4%

PEACESAT, Hawaii .......................... 25%

Alaska medical network ........................ 15%

University of the South Pacific Net .......... 11%

University of Miami .......................... 7%

WEFAX (Weather Facsimile) .................... 9%

ERDA and American Lutheran Church ........ 1%

TOTAL: 97-99%

It is not clear how the remaining two to three percent is
comprised. However, it is also known that the US Atomic Energy
Commission (AEC) also makes use of ATS-1, as do the US military
for certain (unknown) testing purposes. 9

According to NASA, the only remaining experimenters on
ATS-1 are those using the VHF transponder. WEFAX apparently
terminated in December 1978. Additional uses of the satellite
for 1979 included the possibility of the University of Sydney
reviving a data transmission experiment; previously, the ALOHA
system, under the direction of Professor Norman Abrahamson of
9

Remarks made by Carol Misko, of PEACESAT Hawaii, January 1979;
also Vancouver's Technical Director has monitored the US
military on different occasions.
the Department of Electrical Engineering, University of Hawaii, had involved the transmission of data between Hawaii, Australia and Japan.

Past uses of ATS-1, aside from the above, have included the National Institute of Health, at Bethesda, Maryland, USA; and the use of ATS-1 as a back-up for ATS-6.10

4.0. Ground station equipment

The ATS-1 produces about 40 watts effective radiated power. As this is a relatively weak signal, a good receiver and antenna combination is required on the ground. However, "as little equipment as a pocket FM radio, a small preamplifier and 50 cms. of aerial rod will receive good signals from ATS-1".11 In fact, there have been three substantially different types of terminal developed for use with ATS-1: (1) a receive-only terminal; (2) a light-weight portable terminal, capable of transmission and reception; and (3) a permanently housed, more powerful ground station (see Figure 5). The cost of these different terminals can range from as little as $100 for the receive-only terminal to $5,000 and much more for a permanently housed station. Reverend Doug Millar of the American Lutheran Church claims that he can construct an operational transmit-and-receive station for

11 Stuart Kingan, Report on PEACESAT and other Networks, p. 5.
FIGURE 5: TYPES OF PEACESAT GROUND TERMINALS
(Source: PEACESAT Headquarters, Honolulu.)

A. PORTABLE TERMINAL (light weight, sends & receives)
   FOR: Research Teams, Regional Inspectors, Patrol Officers, Medical Personnel

B. STANDARD TERMINAL, Permanently Housed
   (sends & receives voice, teletype, facsimile)

C. FULL UTILITY TERMINAL (terminal interconnected with user centers)
   FOR: Small Institutions, Medical Centers, Schools, Community Service

D. RECEIVE ONLY TERMINAL (small size, low cost—$100. U.S.)
   FOR: Students, News, Remote Personnel
US $850-$900. This is extraordinarily cheap for a satellite ground station.

All PEACESAT stations, according to Stuart Kingan of Rarotonga in the Cook Islands, use off-the-shelf two metre amateur band equipment. Their transceivers possess the correct crystals and alignment for the ATS-1 frequencies. Power amplifiers are in the 100 to 1,000 watt range, mostly depending on available funds (transceiver prices can range from $200 to $8,000). Problems in this regard have arisen from the use of receivers and exciters of insufficient frequency stability. Crystals which are cheap are invariably not temperature-controlled. A further problem arises when another user is operating on all of the other channels in the 100 KHz bandwidth: the power is then shared, and stations with weaker signals can disappear altogether.

The antennas in use vary: some are crossed yagis and others are helical. In the transmission and reception of signals to and from the satellite, the phenomenon of Faraday rotation is encountered. This is the changing in plane of the polarization of a signal as it passes through the ionosphere. To combat this, it is necessary to have a receive antenna capable of receiving signals that have a slowly rotating plane of polarisation. At

---
12 Doug Millar, American Lutheran Church, Remarks made at the NASA Experimenters Conference, Honolulu, Hawaii, January 10, 1979.
13 Kingan, Report on PEACESAT and other Networks, pp. 6,7,8.
Facsimile copy of skull X-ray transmitted via the PEACESAT satellite communications system from the University of Hawaii, Honolulu Hawaii to Wellington Polytechnic, Wellington New Zealand 13 October 1972.
first, most stations used a conventional ten-element yagi receive antenna, with an electric rotator to turn the boom in order to match the received polarisation. Similarly, transmit-antennas must be circularly polarised: "either crossed yagis with a total of 20 elements or ten twin helixes are used, or several of these in bays". The advantage of the VHF antennas is that they do not have to be directed precisely at the satellite: "all you have to do is get them close". Most stations also use a preamplifier mounted close to the antenna.

Problems with the antenna equipment have mostly been due to the peculiarities of operation in tropical conditions. Coaxial cable connections have been subject to corrosion, and moisture has frequently got into them. Other problems have been caused by disturbances in the propagation path. Heavy thunderclouds directly in the path of the signal can cause considerable signal absorption, and heavy rain can produce enough static to interrupt reception. However, by comparison with HF radio which had previously been used for much Pacific-wide communications, there are many advantages of the satellite link. With HF radio, to obtain optimum efficiency, different frequencies had to be used on different Pacific paths and at different times of day. Reception varied widely from place to place.

---

15 Comments by unknown NASA participant at NASA Conference of ATS-1 Experimenters, Honolulu, Hawaii.
16 Kingan, Report on PEACESAT and Other Networks, p. 7.
17 Ibid.
First test of electrocardiograph signal transmissions via the PEACESAT satellite communications system Wellington Polytechnic, Wellington New Zealand; University of Hawaii, Honolulu Hawaii; University of the South Pacific, Suva, Fiji. Medical Electronics Department, Wellington Hospital. 13 October 1972

(Signal quality can be substantially improved by technical adjustments.)
place. With the satellite, only one frequency was required, and the results were consistent over the entire region. ¹⁸

Appendix 2 lists the call-signs of PEACESAT ground stations.

5.0. Applications

The narrow-band system employed by PEACESAT enables a variety of applications. Naturally, two-way voice communication is the primary mode of operation. Simple phone-patch equipment enables speakers on telephone lines to interconnect with the system. Also possible is the transmission and reception of facsimile and teletype; PEACESAT has successfully demonstrated the transmission of medical x-rays and electro-cardiographs via the satellite (see Figures 6 and 7). Additionally, the system can be used for data and slow-scan TV transmission and reception. The simultaneous transmission of voice and data on the same channel has been reported. ¹⁹ (See Figure 5 for a graphic representation of the various modes.)

¹⁸ Ringan, PEACESAT Achievements, p. 1.
¹⁹ Ibid, p. 3.
IV. THE EARLY HISTORY OF PEACESAT

1.0. John Bystrom: biographical background

The initiator of the PEACESAT project was Dr. John Bystrom, a Professor of Speech-Communication at the University of Hawaii. Throughout the life of PEACESAT, he has been the Director of the project, or the "Principal Investigator" of the experiment, in NASA parlance. Since Bystrom's role is one of such crucial significance, especially in the early days of PEACESAT, it is necessary to have some biographical knowledge of the man in order to understand the experiment more completely.

Bystrom's career has spanned a wide range of activities in communications, academia, government and politics. His degrees, all in Speech and all from the University of Minnesota, were obtained in 1943, 1948 and 1960. During the Second World War, Bystrom was in the US Navy, and from 1944-46 commanded a PT boat in the Pacific. This provided him with his initial exposure to the Pacific Islands.

During the late 1940s and 1950s, Bystrom occupied several

---

1 All biographical information except where otherwise stated is taken from two curricula vitae, one contained in John Bystrom, Report on PEACESAT April 1971 - December 1972, Attachment F - HSMHA Proposal, (Honolulu: University of Hawaii, April 1973), and the other whose date and source is unknown.
different academic posts as well as being associated with public service television and certain political campaigns (for Hubert Humphrey, John F. Kennedy and Orville Freeman). From 1961-1968, Bystrom worked for the federal government, mostly in the Education division of the Department of Health, Education and Welfare (HEW). During this latter period Bystrom served on two White House Task Forces: on Educational Technology Policy (1966), and on the Use of Satellites in Developing Countries (1967). In addition he assisted in drafting the Public Broadcasting Act of 1967, the Networks for Knowledge provisions of the Higher Education Act, 1968, and the Programs for Peaceful Communication amendment to the Foreign Assistance Act of 1969.

His concerns, especially in the later years, seem to have been particularly in the combined fields of education and telecommunications. His publications reflected this: in 1967 he wrote the Proceedings for the Rocky Mountain States Governors' Conference on "Telecommunications Development for the Mountain States", and later, in 1971, he was to advocate the widespread use of communications satellites for library networks and information systems.  

Bystrom's period with HEW thus appears to have consolidated his three major interest areas: education, telecommunications, 

\[\text{---} \]

and government. Part of his responsibilities at HEW were presumably to keep abreast of any developments in the field of telecommunications which could have impact on education. For example, he was familiar with educational and medical satellite experiments conducted in Alaska via ATS-1 by the National Education Association (NEA). These experiments used a network of 26 earth stations. Presumably, too, he was required to be as well informed and acquainted with the major institutions in the field as possible. This, according to Bystrom's own account, included NASA; he was involved, "just on the periphery" in providing department support within government for their communications applications program in about 1965.3

There is little doubt, therefore, that through his official responsibilities with HEW, as well as through his informal contacts and friendships made in the course of his work, Bystrom was, by 1969, one of the most well-informed people on communications satellites and their possible applications.

2.0. The dream: a global communications network

It was in the years prior to 1969 that Bystrom conceived the idea of a small earth station satellite communications network to link widely separated points in the world. From his well-informed background, the dream of a communications network

3 Interview with John Bystrom, Honolulu, Hawaii, January 12, 1979.
via satellite required only sufficient imagination and a suitable opportunity to become a reality. Of course, a motive was also required.

The imaginative element is at least partially explained by Harold Wigran of the NEA who states that, in the course of his friendship with Bystrom, "we always were greatly interested in global communications and how to bring about a much better level of communication community in the world". With this as an intention, further exploration of the dream entailed only working with the privileged knowledge that Bystrom and Wigran shared concerning both the potential and actual possibilities of communication satellites.

The opportunity of being able to use ATS-1 was created by Bystrom. He was aware that, because of difficulties during launch, the ATS-1 satellite was non-manoeuvrable, fixed in geostatinary orbit at 149 degrees west over the Pacific Ocean. Moreover, he also knew that the ATS-1 was the only non-military satellite at that time which was suitable for his purposes. Because the satellite had a camera on board which had been used for cloudcover photography and possessed additional power for the other various functions it was designed to perform, it was the only satellite which possessed sufficient power to allow the

\[---------------------\]

use of small ground terminals.\textsuperscript{5} Following the official experiments on the satellite which ended in 1969, the ATS-1 theoretically became available, within limits, to anyone wanting to use it.

Having conceived the idea in Washington, Bystrom looked at three possible sites, including one in Texas, before settling on Hawaii at the most suitable location for the project. A partial influence on the choice of Hawaii was his past wartime experience in the Pacific.\textsuperscript{6} Subsequently, in 1969 he joined the faculty of the University of Hawaii (UH) as a Visiting Professor of Speech-Communication. In 1970, he became a Professor in the same Department, a title he has held ever since. It was from this base at the University of Hawaii that Bystrom was able to make his initial request to NASA for experimental use of ATS-1.

Bystrom’s motives for embarking on this venture are by no means clear-cut. However, a note on his professional reasons for initiating PEACESAT is relevant to the history of the Project.

2.1. Rationale for starting PEACESAT

One of Bystrom’s major interests has been the equitable allocation of resources between urban and rural populations, and the political process by which this is brought about. His Ph.D. dissertation focussed on the "rhetoric of legislative conflict"\textsuperscript{5} Interview with John Bystrom, Honolulu, Hawaii, January 12, 1979.\textsuperscript{6} Interview with John Bystrom, Honolulu, Hawaii, January 6, 1979.

\textsuperscript{5} Interview with John Bystrom, Honolulu, Hawaii, January 12, 1979.
\textsuperscript{6} Interview with John Bystrom, Honolulu, Hawaii, January 6, 1979.
in the struggle to establish the Tennessee Valley Authority (TVA). The TVA is one of the few publicly owned power utilities in the US. As Bystrom himself explains, public policy in the US with regard to electric power was to link the major urban centres by means of a huge grid system. This was all very well, but it neglected the rural farmers. According to Bystrom, the US, having inherited a large, highwater damn in the Tennessee valley - which was surplus war property - was forced somehow to make use of this resource. What emerged as a consequence of breaking through traditional patterns of thought in regard to this was a new power authority, the use of different technology and different standards.\(^7\)

Bystrom saw an analogous situation in (a) the creation of COMSAT, and later INTELSAT, to link the major urban centres of the world with high capacity, low-power satellites and high capacity, high-powered ground terminals; and (b) the ATS-1 satellite which, in the sense of its having completed its designated experiments but still being functional, was 'surplus'. With the employment of ATS-1 it was possible to design "a small moveable ground terminal that would be generally available".\(^8\) Bystrom's move to Hawaii, therefore, was specifically

"with the hope of starting, or engaging in a project of

\(^7\) Interviews with John Bystrom, Honolulu, Hawaii, January 12 and 14, 1979.

\(^8\) Interview with John Bystrom, January 12, 1979.
this type that would be used as a pilot demonstration to highlight the various issues that are involved in developing a truly international system".

The Pacific was particularly appropriate for this purpose for the following reasons:

1. ATS-1 was located in the Pacific and covered the huge expanse of not only the Pacific Ocean area, but also much of the mainland US and Canada, as well as Korea, Japan, much of South East Asia and Australia (see Figures 1 & 2);

2. The Pacific Islands were especially well-suited for satellite technology because of the difficulties of employing terrestrial technologies there;

3. The regulatory authorities, and the political and legal frameworks for regulating telecommunications were not well developed in this region at the time. In 1969, most Pacific Island countries were still colonised, and although they were progressing towards political independence, regulation was undertaken by officers of a colonial civil service whose interests were only short-term. Pacific Islands lacked a tradition of regulation, a fact which Bystrom regarded as a distinct advantage. (PEACESAT, he says, "could never have been done in Europe" for this reason.)

4. The Pacific was regarded by the US as a sensitive defence area. As Bystrom explains, the US not only has a commitment to the Trust Territory of the Pacific Islands, but the

---

Ibid.

70
Pacific has been the arena where three modern wars have been fought: the Second World War, the Korean War and the Vietnam War. It was Bystrom's opinion that the Pacific region was not regarded as the high priority it should be by the US and that, with the emergence of Hawaii as a State, "there ought to be interest by the US in dealing with the communication problems of the Pacific".  

More particularly, it seems, Bystrom saw the demonstration of a small ground station network as furthering the kind of work he had been engaged in at HEW, with the advantage that he could be freed from the constraints of being a government employee to direct the project himself.

As Bystrom explains, his original concept was to turn around the elements of the traditional broadcast service. In the American system, a series of 'gatekeepers' determines what news is, and what the viewer or listener will hear. By providing numerous channels from which to choose, the illusion of choice is provided; in fact, the options are very limited. In his original concept, Bystrom planned to overcome this problem by designing all terminals to be equal, capable of both transmitting and receiving information. In such an interactive system, the decision to schedule a program is ideally made by the listener: "no-one gets on the system unless somebody else

10 Interviews with John Bystrom.
wants to participate". With regard to an operational design, by using a narrow-band system, Bystrom saw the possibility of a multiplicity of networks using many different channels. Instead of designing a system and expecting society to adapt to it, Bystrom’s aim was to start with the social requirements and then design the optimum, lowest-cost and most flexible communications-system to fulfil those requirements. With regard to payment for services, he saw a lot of hope in the separation of health, education and welfare, and community services from commercial services. This, according to Bystrom, was the position in the US – which he had been instrumental in bringing about – but not in the rest of the world. In the Public Broadcasting Act of 1967, and the Higher Education Act of 1968, which he had helped to draft, the Federal Communications Commission was authorised to approve free or low cost rates for the interconnection of noncommercial educational TV stations and for higher education. Bystrom objected to the policy that all users – both commercial and non-commercial – should be treated alike. Calling it a "very serious blindspot of most telecommunication regulators", he points out that the standard practice is to "presume to regulate on the basis of the

11 Interview with John Bystrom, January 14, 1979.
12 Ibid.
13 Bystrom, Telecommunication Networks for Libraries.
technological service". In fact, Bystrom continues, this is not the case. Certain services or functions (e.g. air safety and amateurs) are allocated certain frequencies. One of the key purposes of the demonstration, therefore, was to:

"inject into the international scene a recognition that health, education and community services could be treated as a service of some kind. In other words, they would not have to compete with wealthy broadcast people for the purpose". 15

Thus, as one of the foci of the project, he was very interested in the response of the regulatory agencies whose inertia, he maintained, provided "one of the main deterrents to the development of communication". 16 There is little doubt that in this connection, Bystrom regarded himself as an innovator in the field.

3.0. Laying the groundwork for the project

After arriving in Honolulu in 1969, Bystrom soon began laying the groundwork on which to base the formal proposal for use of ATS-1. He worked to gain support for his ideas in four areas:

1. Technical expertise, both in terms of the design of suitable equipment and its construction, was of course, essential;

2. A local and formal support structure was necessary to give credence to the proposal;

------------------

Interviews with John Bystrom.
15 Ibid.
16 Ibid.
3. Informal support, both locally and nationally, was highly desirable;

4. Support, or at least evidence of interest, from the Pacific region was required.

3.1. Technical expertise

Relatively quickly, Bystrom was able to interest Dr. Paul Yuen in the project. Yuen was Professor of Electrical Engineering and Acting Head of the School of Engineering at the University of Hawaii at the time. Bystrom appointed him Technical Director of the project.

As far as the ground station equipment was concerned there was nothing suitable generally available; a custom design was therefore required. In designing this system, Yuen worked from the following specifications, as outlined by Bystrom:

1. it should use off-the-shelf equipment;
2. that every terminal should be two-way;
3. that the terminals be sufficiently simple to allow operation by indigenous personnel "who might have respect for machinery but not necessarily be highly trained";
4. that there should be redundancy built into the system (i.e. a back-up transmitter to be used in case of failure of the main transmitter). 17

17 Interview with John Bystrom, January 12, 1979.
Yuen in turn interested Professor Katashi Nose of the physics Department in the technical aspects of the project. A Harvard graduate and long-time amateur radio enthusiast, Nose was well qualified to construct the necessary ground station equipment once the necessary funds had been obtained. Nose worked under Yuen's supervision.

3.2. Formal support structure

A local support base for the project was perhaps the single most important ingredient required. To this end, Bystrom worked both within the Hawaii State government and within the University.

In the State government, Bystrom acted as communication advisor to Governor John Burns. In this role, he initiated appeals to the FCC resulting in the "reduction of Pacific telecommunication rates and the inclusion of Hawaii in domestic [US] satellite systems".¹⁸ This experience in the State government was presumably of value later on when applications for State Legislature financing of the project were made.

Initial support at the upper levels of the University of Hawaii appears not to have been immediately forthcoming. As Bystrom explains it, he had talked with Acting University Presidents over a period of a year and a half before receiving the degree of personal interest - "not simply an institutional

¹⁸ Biography of John Bystrom, undated.
response" - that he felt was necessary. The change came with
the appointment of Harlan Cleveland as President of the
University. Contrary to previous Presidents, Cleveland, an
ex-NATO ambassador, expressed particular interest in Bystrom's
plans on a number of occasions.

In September 1970, Governor John Burns requested University
of Hawaii President Harlan Cleveland to appoint a "Governor's
Committee on Pan Pacific Educational Communication System". On
this Committee sat Dr. Shiro Amioka, State Superintendent of
Education; Dr. Everett Kleinjans, Chancellor of the East West
Centre; Dr. Shelley Mark, State Director of Economic Planning
and Development; and Dr. Fujio Matsuda, State Director of
Transportation.

Bystrom summarises these twin areas of support as follows:

"President Harlan Cleveland, his assistants, Douglas
Price, Guy Kirkendad, and others in the President's
office created an environment in which growth was
encouraged and support provided whenever feasible. Under
the leadership of Governor John Burns and his State
administration, a basis was laid for broad acceptance
and support in the State and the way opened for needed
financial support."

In addition, support from the Department of Speech
Communication was, as Bystrom points out, essential. "Richard
Rider maintained faith in the idea through the early
---------
19 Interview with John Bystrom, January 12, 1979.
20 Ibid.
21 Ibid.
22 John Bystrom, The PEACESAT Project, A Report for
International Communication Association, University of Hawaii,
1972.

discouragement and as Department Chairman continued to give strong support to the proposal". 23 Various other faculty members fulfilled other roles. L.S. Harms and K.S. Sitaram provided early support, the former later chairing a faculty committee which advised on policy determination. Huber Ellingsworth is described by Bystrom as having "contributed considerable knowledge of evaluation in setting up feasible early approaches". 24 Other basic support was provided by Velma Fransisco and Susan Shinogi.

3.3. Informal support structure

Bystrom found a good deal of ready informal support among the students he taught. From a seminar on communications policy and planning which dealt with rural telecommunications problems emerged four young women whose influence was considerable. Although they "could not be thought of as particularly tuned in to telecommunications", according to Bystrom, 25 their interests and skills were encouraged in particular areas which required attention.

Corinne Anemiya intended to be a legislative intern. Bystrom encouraged her to draft a bill for presentation to the State legislature requesting support for the project, in order that she might see from an active point of view how

23 Ibid.
24 Ibid.
telecommunications were managed within the State. This she did successfully, together with Judy Naniole and others, thereby providing some of the initial—and crucial—financial support for the project. Corinne later obtained a law degree, and two of the former students ended up working in the Attorney General’s office as lawyers, one being the Attorney General’s representative to the University of Hawaii, thus processing all University Educational Communication matters.26

Other students later performed a variety of tasks, one collecting and filing materials, another acting as typist and general office manager, and another becoming Terminal Manager when the project was underway. In this respect, Abelina Costa is credited with having provided invaluable insights and essential continuity for the idea.27 For her MA thesis, Costa made a "Study of telecommunication service requirements between Hilo and Manoa campuses, University of Hawaii" in December 1971. Another student, Sherry Nadai, also undertook research for the project28, and—later—Carol Misko was to become Honolulu’s Terminal Manager for many years.

Informal government support in Hawaii and in Washington had also been established through Bystrom’s professional experience, as already described.

28 Ibid, pp.5-7 and p.8.
3.4. Pacific region support

At an early stage, in June 1969, Bystrom attempted to arouse interest in the project by writing to as many universities as possible in the Pacific region. He regarded universities to be the appropriate places to begin the establishment of international support for two reasons. First, because many universities possessed technical departments which could thus exhibit legitimate interest in the project and, second, - and most importantly - because the universities could deal directly with their national Post and Telegraph agencies (the licencing and regulatory authorities). The latter point was very important in that applications for the necessary local licences would then be made by local groups. 29

Of the seventy or eighty letters that Bystrom sent out, it is not completely clear what degree of support he initially received. The evidence is contradictory. In Bystrom's original proposal to NASA to use ATS-1, a proposal dated October 28, 1969, he claims that "informal enquiries have been made with favourable resources (sic)"[read: "responses"?] from thirteen Universities and the South Pacific Commission at Noumea, New Caledonia. 30 However, in an interview in early 1979, Bystrom

29 Interview with John Bystrom, January 12, 1979.
said that only three responses were of the kind where "there was a solid interest by someone who looked like he could mean business".31 These were from the University of Papua New Guinea, the University of New South Wales, in Sydney, Australia, and the University of the South Pacific, in Fiji. It seems likely that the latter version of the story is more likely to be the most accurate one since in the former — the application to NASA — the natural tendency would be to try to give the impression of wider support than was, in fact, the case.

4.0. Towards operation

4.1. The initial proposal to NASA

After beginning the process of establishing the above support structures, Bystrom compiled the original proposal to NASA. Dated October 28, 1969, it was entitled "Pan Pacific Educational Satellite Network, Proposal for Experimental Use of Applications Technology Satellites". The opening paragraph of the proposal stated Bystrom's intentions for a global communications network:

"This proposal envisions the development of an international experimental park or intercontinental laboratory for the application of telecommunications systems. It would extend over a great part of the world's surface, include developed and less developed areas, and involve highly industrial as well as

31 Interview with John Bystrom, January 12, 1979.
The purposes of the "intercontinental laboratory" were "to undertake experimental and developmental activities in the use of telecommunication interconnects by satellite":

1. "to assist in adapting the potential of satellite technology to peaceful public services;
2. to demonstrate that the international exchange of higher education resources is feasible and desirable;
3. to increase the quality and capacity of educational institutions in the Pacific by sharing scarce, costly resources and extending the availability of education to remote areas;
4. to provide a telecommunication support system for professional and technical operating services; and
5. to lay the basis for permanent improvement of communication between the peoples of the Pacific."\(^{32}\)

In addition, the proposal envisaged the creation of an international consortium of fifteen university members. Mentioning the possibility — but not the necessity — of utilising the television medium, the proposal spoke of the continuing system as possibly using NASA's ATS-F Prime, or of leasing satellites from INTELSAT, and/or of owning and operating a satellite for the future network.\(^{33}\) Plans were to begin tests between May - September 1970, hold a planning conference for consortium members and P & T authorities in August of 1970, and then to continue operations in "stepped-up phases" from October 1970 - December 1977.\(^{34}\) Costs of $175,000 were envisaged.

\(^{32}\) Pan Pacific Educational Satellite Network, op. cit. p. 2.
\(^{33}\) Ibid, pp. 3, 4.
\(^{34}\) Ibid, p. 9.
$75,000 of which was to pay for ground station facilities.\(^{35}\) NASA was asked to assist in providing time on ATS-1, technical assistance in installing the stations, and grant assistance under the NASA University support program for $40,000 - $60,000.\(^{36}\)

Bystrom listed the possible uses of the system and the benefits that would accrue from the experiment. From the perspective of international relations, this higher education demonstration, he said, would have "domestic implications as well as implications for such international settings as India, South America and Africa."\(^{37}\) As part of the rationale for the experiment, President Richard Nixon was quoted as having called for "increased efforts by independent groups to build educational and cultural relationships with institutions in other lands".\(^{38}\)

Of particular interest is the correspondence accompanying this proposal. In a letter to R.B. Marsten, Director of the Communications Program in the Office of Applications at NASA, and also dated October 28, 1969, Bystrom mentioned that the proposal had already been informally discussed not only with NASA personnel, but also with people from the Department of Interior (in the office of Territories, the office responsible

\(^{35}\) Ibid, p. 9.
\(^{36}\) Ibid, p. 10.
\(^{37}\) Ibid, p. 7.
\(^{38}\) Ibid, p. 8.
for the TTPI) and the FCC as well as with Hiram Fong, a Hawaii Senator. More importantly, the following points were made:

1. that the Department of Electrical Engineering at the University of Hawaii had already previously used ATS-1 for "technical projects", and that the Information Services Program was involved under a DOD program in a project "to provide remote access and on-line capabilities for computers in areas where efficient telephone systems are lacking" (a reference, presumably, to the ALOHA computer communication net). This, continues the letter, would lead to "eventual participation in a satellite-linked computer net in the Pacific area";

2. that the East West Centre, "the unique institution supported by the US Department of State ... is prepared to cooperate in the implementation";

3. that, as regards national policy, the project could be "particularly constructive". The letter continues:

"In the immediate future we will see (1) continuing adjustments in Vietnam, (2) return of Pacific Territories formally held by Japan, and (3) decisions as to the permanent disposition of the Trust Territory. As for the latter, the US past role in the economic and social development of the Trust Territory has not received a notable amount of praise. As a result, every effort is being made to improve health, education and community service. In light of the special importance of the Pacific, application of the satellite to one of the principal problems, communication, would be very timely."
Clearly, Bystrom's accompanying letter - three pages of single-spaced type - was intended to be as persuasive as the proposal itself, or perhaps even more so. What is significant about the letter is the overt appeal to be allowed to proceed with the experiment on the grounds that it would serve US defence interests. This contrasts completely with the stated purposes of the project as outlined above.

The response to the proposal from NASA was that it needed more specification of the satellite use requirements and a more complete description of the ground station design. Bystrom was urged to re-write the proposal using formal NASA guidelines. Bystrom's response, on December 26, 1969, indicated that he would collect the required information, and would arrange to meet Marsten in Washington in early January, 1970.

A final note of interest is an internal NASA memorandum from the Office of International Affairs to the Acting Deputy Director, Communications Programs. It states that, having read Bystrom's October 28 letter to Marsten and finding it "full of vague references to Hawaii's interest in internationalising their proposal", "we would appreciate being kept informed about the project so that we can review any international

developments". 40

4.2. The second proposal to NASA

Little dramatic progress appears to have been made for the most part of 1970 except, that is, that the project had at last received some funding. Bystrom had applied for special funding to the University of Hawaii President's fund for Educational Innovation and, late in 1970, was granted the largest amount: $30,000. 41 This was to construct five terminals for the purpose of inter-connecting the University of Hawaii. 42 During this same period - late 1970 - Corinne Anemiya and others (Bystrom's students) were also preparing their submission to the Hawaii State Legislature. Additionally, it was during this year that many of the organizational matters appear to have come nearer to resolution. For example, it was in August of 1970 that Hawaii's Governor John Burns requested Harlan Cleveland, President of University of Hawaii, to form the special committee for the project. Also during this period, Bystrom continued negotiations with representatives of NASA, the FCC, the Office of Trust Territories and other departments. 43

40 Memorandum: James R. Morrison, Office of International Affairs, NASA, to Acting Deputy Director, Communications Programs, December 17, 1969.
41 Bystrom, PEACESAT Report and Request to NASA, 1971, p. 4.
42 Interview with John Bystrom, January 12, 1979.
43 Pan Pacific Education and Communication Experiments by Satellite, Request and Proposal to NASA from the University of Hawaii as agent for the State of Hawaii (Honolulu: University of Hawaii, undated but known to be December 1970).
What had become apparent in the intervening months was that the most suitable way to begin the project was domestically, within Hawaii. The plan now was to link the two campuses of the University - one at the Manoa campus on the island of Oahu, and one at the Hilo campus on the island of Hawaii. To this end, applications were made to the FCC on December 7, 1970 for licences for two radio stations for experimental use. A third, portable station was planned for the future.

On December 16, 1970, Harlan Cleveland submitted a request and proposal for Pan Pacific Education and Communication Experiments by Satellite (PEACESAT). The document was officially from the University of Hawaii "as agent for the State of Hawaii".

A major difference in this proposal was the break-down of the experiment into two phases. Phase I would link the two University of Hawaii campuses, and Phase II - depending on the success of Phase I - would then involve ground stations "at foreign and domestic Universities, thus creating an educational network". Phase I operations were planned for February - June, 1971, and Phase II for July, 1971. Accordingly, the stated objectives of Phase I were: first, to demonstrate satellite communication system applications for less developed areas; and secondly, "to demonstrate utilization of the system to potential participants in the Pacific by undertaking curriculum

---

experimentation and increased exchange of educational communications between the University of Hawaii campuses". Objectives for Phase II were almost unchanged from those stated for the project as a whole in the initial proposal.

Again the rationale for the project does not appear up-front in the document, but on page eleven under the sub-heading of "Benefits". Aside from the demonstration as a whole "contributing to the long range evolution of telecommunications in the Pacific and the World", the following benefits were included:

1. "Educational Benefits: The demonstration would make possible a better understanding of the operational demands and the possible benefits of sharing education, health, and community services across national boundaries."

2. Communication Benefits: These were listed as stimulating interest in the use of communication satellites for sparsely populated areas, for educational institutions, and to provide experience on which to base the design of a permanent system. Additionally, "In the Pacific Basin specifically the demonstration would awaken those in need of improved real-time communications, for commercial as well as non-commercial purposes, to the benefits potential in new
3. **National Policy:** "The project could contribute favourably to the reputation of the United States as an administrator in the Pacific under United Nations' Trust. Any increase in Pacific communication systems which might result would serve the security of the free world by its contribution to redundancy. And the proposed network would draw the United States closer to its Pacific neighbours at a time when our policies in Asia dictate a strengthened position in the Pacific."

Once more, the possible US defence interests that might be served by the project are rated highly. This would seem to point to two possible interpretations. One is to doubt the sincerity of the PEACESAT promoters' claim to be concerned for social service applications. The alternative is to deduce that Bystrom knew how best to sell the Project to the powers that be. Neither is very appealing, especially since the latter - the most likely alternative - is based upon the assumption that US defence interests and the development/social service needs of the Islands are not incompatible.

Also included in this proposal were details concerning evaluation of the proposed experiment. Phase I would be "evaluated by a team of specialists at the University of Hawaii", and Phase II evaluation would include representatives

---

from other stations. Grants of approximately $3,000 from UH had been approved for the evaluation work. Details of what kinds of uses the system would be put to were included also, as well as a breakdown of the proportion of time that each such use would occupy.

NASA's reply this time was positive. In a letter dated February 1971, it was stated that the proposal appeared to be "well thought out", promising a fruitful application of satellite technology to "advanced educational systems". NASA required two changes: one, a reduction in the number of hours; and two, a change in the time of day for the operational hours. Some uncertainty was expressed by NASA that after June 18, 1971 operational hours might be further reduced "because of reduction in control station operating hours by NASA". At this time it was widely believed that the life expectancy of ATS-1 was only about fourteen months.

4.3. The Hilo-Manoa link

The University of Hawaii President's funding was received in approximately October of 1970. From this time onwards - with assurance that the project was viable - events occurred swiftly.

48 Ibid, pp.5,6.
49 Letter to Dr. Harlan Cleveland from R.B. Marsten, February 5, 1971.
50 Ibid.
Within three months of receiving the funds, the equipment was ordered, the terminals assembled (with student help) and the antennae tested.\textsuperscript{52} Katashi Nose, with the help of an undergraduate and a research assistant from the Physics Department, managed to put together a ground station unit for only $6,000. The antenna had been constructed from a piece of pipe and fencing guard rails, and the main unit was a taxi-cab transceiver.\textsuperscript{53}

In December, the first terminal was tested against itself, receiving its own signal which had been transmitted to the satellite. Katashi Nose and Paul Yuen were elated with the results, which vindicated all of the technical design decisions they had made.\textsuperscript{54}

By February of 1971, following NASA approval of the second proposal, the FCC granted licences for the Hilo and Manoa ground stations. The period until April was devoted to the construction of the two ground stations, and successful testing of the link between them. The Manoa ground station was housed temporarily in a shack on the top of the fourth floor of the Physical Science Building. Negotiations were apparently under way to expand facilities into the Hamilton Library, the East West Center and

\begin{footnotes}
\item[52] Interview with John Bystrom, January 12, 1979.
\item[53] "UH Physicist constructs satellite ground station", Honolulu Advertiser, March 14, 1971 and April 24, 1971, per PEACESAT News File.
\item[54] Ibid.
\end{footnotes}
the Kennedy Theater.55

In April of 1971 - marked as the official starting date of the PEACESAT project - regular, daily scheduled operations began, linking the Hilo and Manoa campuses via ATS-1. Two months later, Bystrom was able to announce to University of Hawaii faculty that the system was successfully operating two-way voice, facsimile and teletype, and that it had been used to broadcast over KTUH - the university radio station - the investiture of the Chancellor of Hilo to the people of Manoa. The system was being used daily by the libraries of both campuses to process inter-library loans within forty-eight hours.56 By July, 1971, Speech 150 and Speech-Communication 145 were being conducted via satellite.57 PEACESAT was effectively launched.

There were two other important events during this period. First of all, in April of 1971, the Hawaii Legislature passed bill SB 1075 appropriating $75,000 for development of the project. This was a major breakthrough, despite the fact that the funds were later frozen because of the depressed Hawaiian economy; $62,700 was finally released in November, 1971.58

Secondly, Governor John Burns, in May 1971, appealed to the

55 John Bystrom, Memo to University of Hawaii Faculty, June 9, 1971.
56 Ibid.
58 PEACESAT Chronology, undated.
International Telecommunication Union for radio spectrum assignments to enable the continuation of a PEACESAT-like system in an operational mode; for "international educational exchange by satellite". In a letter from Burns to NASA, requesting NASA's support in the allocation appeal, Burns stated that PEACESAT should evolve "into a major force sustaining peace and progress in the Pacific and Asia".

59 Ibid.
60 Letter from John A. Burns to Dr. Marsten, NASA, May 27, 1977.
V. INSTITUTIONAL AND OPERATIONAL ASPECTS

Interrupting the historical description of the growth of PEACESAT, this chapter outlines the major organisational features of the PEACESAT institution as they have developed over the years in order to place PEACESAT's further history more fully in context.

1.0. PEACESAT organisation

The way in which PEACESAT is organised is illustrated in Figure 4, which also shows the decision-making meetings held regularly via the system, and the participants who attend them. As can be seen, PEACESAT's organisational structure is hierarchical, comprising four basic levels: (1) NASA; (2) the Principal Investigator, at PEACESAT headquarters, Honolulu; (3) the local sponsoring institution, licencing authority and Terminal Manager; and (4) the user.

Authority to conduct an experiment on the ATS satellites is given by NASA. If the proposed experiment is approved, the proposer is thereafter referred to by NASA as the "Principal Investigator". The latter is responsible for the conduct of the experiment according to the conditions agreed upon with NASA. In September 1973, such conditions were articulated to those
FIGURE 8: PEACESAT ORGANISATION CHART

- NASA Office of Applications Communications Programs
- Principal Investigator
  John Bystrom
  University of Hawaii
- (Non-participating institutions)
- PEACESAT Consortium Council
  (members only)
- C.C. Executive Board
- Local sponsoring institution
  Director, local PEACESAT terminal
- Local Terminal Manager
  (& Technical Director)
- Users
- Local licensing authority

Management Meetings
Scheduling Meetings
interested in, or using, the PEACESAT system as follows:

1. That proposals should present experiments in which the satellite capacity is a necessary component;

2. That utilization of the satellite could demonstrate a totally new application, could show feasibility of an application, or could establish a reference for comparison with other techniques of implementation;

3. That proposals should set forth a well-developed evaluation program which would consider experimental results and draw conclusions therefrom;

4. That a proposal carries with it an implied obligation to publish the results of the experiment, including evaluation, for wide dissemination.¹

In the case of PEACESAT, which includes a number of sub-experiments, negotiations with NASA regarding the sub-experiments are required to be undertaken by the Principal Investigator. NASA does not deal directly with sub-experimenters. PEACESAT’s Principal Investigator has from the outset been John Bystrom of the University of Hawaii, who, in turn, has been mostly responsible for the organisation within PEACESAT.

Terminals outside of Honolulu are required to be sponsored by a local institution in order to become a part of the PEACESAT

¹ Letter from R.B. Marsten, Director, Communications Program, Office of Applications, NASA, to Anthony Hanley, (September 17, 1973).
Historically, the usual case with PEACESAT has been that an individual at a local institution has developed an interest in establishing a ground station, and has subsequently obtained official support from his institution. Bystrom has preferred such support to be as full and as active as possible, the ideal being that the local institution provide sufficient financial and other assistance to enable the construction of a high quality terminal with at least one full-time staff member to act as Terminal Manager. This, of course, has not always been possible, and local terminals have frequently had to operate with part-time, or totally voluntary, staff.

The initiator of a local terminal usually becomes its Local Director and is responsible both to his/her local institution and to the Principal Investigator at PEACESAT headquarters in Honolulu. The Local Director might then either become the local Terminal Manager himself, or might appoint a manager; additionally, there has often been a local Technical Director, responsible for the construction and maintenance of the equipment. In some cases, an advisory committee, comprising other members of the local institution and/or people from the broader community, has been established to oversee the operations of the local PEACESAT terminal: to formulate policies, establish objectives and undertake evaluations of its participation in the project.
The addition of a new terminal to the PEACESAT system has therefore been conditional on a substantial amount of local initiative and support. In addition, of course, a new terminal is required to be approved both by the local licencing authorities and by NASA. The position of the local regulatory agencies has differed widely from location to location and is dealt with in more detail in a later section of this chapter. As regards NASA, approval of a local terminal has usually been granted following an official request from the sponsoring institution.

There are three major decision-making fora in the PEACESAT system: (1) the Scheduling meetings; (2) the Management meetings; and (3) the Consortium Council. All meetings of these bodies are conducted via satellite.

1.1. Scheduling meetings

Scheduling meetings are held once a week over the system and include all of the PEACESAT Terminal Managers. At these meetings, the schedule for the coming week is read out and each Terminal Manager indicates whether or not his/her terminal will have participants for the particular exchanges. Also at this time, requests for future scheduling are made. One terminal undertakes the task of coordinating the different scheduling requests and planning them so that (a) they are scheduled for the time most appropriate to most participants, and (b) all such
requests are accommodated into the limited number of hours provided by NASA. For many years, Honolulu fulfilled this role; recently it has been undertaken by Wellington.

1.2. Management Meetings

Management Meetings have occurred with varying degrees of regularity over the years, sometimes once every two weeks, sometimes once a month, and at times even less frequently. The meetings are for all PEACESAT Terminal Managers, occasionally including the local Director if this person differs from the Terminal Manager. Most meetings are chaired by John Bystrom.

The purpose of the Management Meetings has been to discuss operational aspects of the system, and to resolve any problems that might arise. Operational procedures have developed over time with the increasing use of the system. Management Meetings have functioned, partly at least, to formalise these procedures. The meetings were also intended to provide a regular evaluation of exchanges by the Terminal Managers so that the use of the system could be refined and improved on a continuing basis. In practice this appears to have occurred very little.

1.3. The Consortium Council

The PEACESAT Consortium Council was established in April, 1973. Initially a joint venture between John Bystrom, Hawaii, and Tony Hanley, Terminal Manager of the Wellington terminal, and member of the School of Physics, Electronics,
Telecommunications and Electrical Engineering at Wellington Polytechnic, they were later joined by other institutions of a predominantly educational nature. Its principal objective is "the improvement of communications for health, education, and community services"; it also "advises the PEACESAT Project and promotes joint experimental applications from among the participating institutions". The Consortium's aims have also been described as "to promote joint approaches to Pacific-wide problem-solving" and "to facilitate cooperation in planning and experiments".

In addition, the PEACESAT Consortium was regarded, by Bystrom at least, as the nerve-centre for an expanded PEACESAT system which was to cover the world; this he has termed the Extended Experiment (see Chapter VII, Section 4.0.). The Consortium was seen to be both the major planning body for the Extended Experiment (and, in this connection, focussed on obtaining suitable international frequency allocations at the World Administrative Radio Conference in 1979, for example), and as the embryonic centre for the future, expanded system which

2 Research Corporation of the University of Hawaii, Proposal to Telecommunications Demonstration Program, Attachment D: International PEACESAT Consortium Information (Honolulu: Research Corporation of UH, September 1, 1977).
4 PEACESAT Project, Report Two p. 70. There reportedly exists a Consortium Council constitution; repeated attempts by the author to obtain a copy of this document from Honolulu were unsuccessful.
would define satellite system policy. Originally including only Hawaii and NZ in its membership, the Council was joined by other institutions so that by 1977, nine Pacific Basin educational institutions were members, all of them regular users of PEACESAT:

1. University of Hawaii, Honolulu, Hawaii;
2. Wellington Polytechnic Institute, Wellington, New Zealand;
3. University of Technology, Lae, Papua New Guinea;
4. South Pacific Commission, Noumea, New Caledonia;
5. Office of the High Commissioner, Saipan, Trust Territory of the Pacific Islands;
6. University of the South Pacific, Suva, Fiji;
7. American Samoa Community College, Pago Pago, American Samoa;
8. University of California, Santa Cruz, California;

Each member is represented by three delegates to the Consortium Council which meets approximately twice per year. An Executive Board consists of seven members elected from the Council; it meets approximately four times per year (1979 figures). The Research Corporation of the UH - a non-profit corporation set up, it seems by Bystrom - "serves as the

---

administrative agent for the PEACESAT Consortium". Presidents of the Consortium Council have been Martin Kimble, also Chairman of the Wellington Tertiary Education Consultative Committee; Frank Mahoney, of the South Pacific Commission; and — currently — Stuart Kingan, of the Scientific Division, Premier's Department, Cook Islands. Executive Board Chairmen have included Martin Kimble, and Executive Secretary has been John Bystrom throughout.

A significant observation with regard to the Pacific is that, of the twenty-seven Consortium Council members in 1979, only four were Pacific Islanders, and none of the Executive Board members were Pacific Islanders.  

2.0. Financing

2.1. Satellite and operational costs

The small earth station satellite concept employed by PEACESAT is, by any standards, the lowest cost satellite-mediated communications system available. However, with regard to PEACESAT per se, a major reason for its low cost

6 Proposal to Telecommunications Demonstration Program, Attachment D.
7 Pacific Islander Consortium Council members were: Dr. Tom Davis (Premier) and Tui Short (Secretary of Education) from the Cook Islands; and Dwight Heine (Special Consultant to the High Commissioner) and Resio Moses (Administrator in the Department of Community Service) from Saipan.
has been the provision, by NASA, of the ATS-1 satellite at no cost to the project.

Estimates of the value of the space segment and control costs vary. For example, one report estimates the cost of the ATS-1 as "part of a five-satellite program costing $21.3 million". Another newspaper article puts the cost at $150 million to build and launch the satellite. An estimate of the cost of replacing the ATS-1 with the modified ATS-F Prime placed the total cost of the satellite and launch at $70 million. Costs for NASA control for a seven year period were estimated at $0.5 million. These latter figures therefore give a more accurate picture of what the space segment costs for an operational system might amount to, although it must be taken into consideration that these figures are from January 1976, and inflation will have increased them considerably since then.

To illustrate the low costs of the system, comparisons with regular common carrier charges have at times been made. In 1972, for example, it was estimated that a thirty minute conversation between Honolulu and Suva - costing nothing via PEACESAT - would have cost $87.45 over a regular telephone line. A 1973 report estimated that the use of Hawaiian Telephone Company telephone

9 "PEACESAT's Cost", Honolulu Advertiser, August 23, 1973 per PEACESAT News File.
10 PEACESAT Extended Experiment, p. 3.
connection between Honolulu and Wellington for twelve hours would cost $3,139.20. RCA teletype rates for twelve hours between the same points would be $2,442.69:

"Six months of commercial communications at these rates and for these air hours would cost some $75,000 between Honolulu and Wellington, or an amount close to PEACESAT's total two year budget for communications among dozens of stations."12

Several points emerge from such cost comparisons:

1. That trans-Pacific communications costs via the established common carriers are, indeed, prohibitively high, especially for the smaller, and poorer, Pacific nations;

2. That, if there were some doubt that PEACESAT was an operational, rather than an experimental activity, it is highly likely and understandable that common carriers would regard PEACESAT as a competitor and would object to its non-experimental activities;

3. That such comparative figures are, to a considerable degree, mis-leading: the PEACESAT costs of zero omit the capital costs of the satellite and the ground stations, and the maintenance, control and operations costs of the space and ground segments. Consequently, the comparison is not a fair one in that the cost of an operational system based on PEACESAT are not presented.

12 "PEACESAT's Cost", Honolulu Advertiser.
In connection with the above, it is interesting to note that detailed press coverage of PEACESAT's low costs has most often occurred during times of crisis. In October 1970, the report was designed to stimulate action to enable the project to begin; in August 1973, the reports effectively provided fuel for the protagonists of PEACESAT in a dispute with NASA (see Chapter VI). The comparison was therefore of more dramatic and polemic value than it was an indication of the partial costs of an operational system. To my knowledge, detailed studies of the economics of an operational PEACESAT-type system have not been undertaken.

2.2. Ground segment costs

Costs of the ground stations have all been low, averaging about $5,000. Lowest estimates, for the simplest possible system, have been for $800.\textsuperscript{13} However, the problem of equipment standards and compatibility has meant that, in later years, there has been an attempt to ensure that new terminals in the system possess equipment of certain minimum technical specifications. For example, sufficient transmission power has been isolated as an essential.\textsuperscript{14} This, in turn, has meant an

\textsuperscript{13} "UH establishes satellite contact with Suva, Fiji", Honolulu Advertiser, February 3, 1972, p. E-4, per PEACESAT News File; the Reverend Doug Millar, in 1979, also spoke of a design costing the same amount (comments made at the NASA ATS-1 Experimenters' Conference, Honolulu.).

\textsuperscript{14} John Bystrom, Hanley Motion Background Report, (Honolulu: PEACESAT Consortium Council, July 30, 1977).
increase in the minimum cost of a ground station of sufficient performance capability. In addition, there is a preference within PEACESAT that terminals be equipped for multi-media capacity where possible — especially for the addition of teletype and facsimile capability to the voice mode. In the proposal for an Extended Experiment, ground terminal costs are put at between $5,000 - $25,000 depending on the capacity required.

The financing of local ground terminals has been mostly the responsibility of the local sponsoring institutions. In many cases, terminals constructed in Honolulu were shipped to Pacific Island locations; these, for example, include terminals at Suva, Tahiti, Lae, American Samoa and Saipan. In some instances, the terminals were installed by Katashi Nose — for example at Saipan and Noumea. In most cases, PEACESAT Headquarters was reimbursed for the cost of the materials. One exception was Saipan where a report in the TTPI government's official newspaper stated that the terminal there was a "complete ground station" costing $7,000, and that "aside from a small air freight charged for the shipment of equipment, the Trust Territory entered the field of satellite communications without charge".\textsuperscript{15} It is significant that the one location not to have reimbursed ground station costs should have been in the TTPI. Honolulu's financing of the

\textsuperscript{15} "Micronesia Becomes Affiliated with Peacesat", in \textit{Highlights} (Saipan, Mariana Islands: Office of the High Commissioner), p. 1, per PEACESAT News File.
Saipan terminal as an exceptional case is understandable: (a) it adds another ground station to the network; and (b) it serves the unpublicised foreign policy objectives of PEACESAT.

Examples of initial ground station costs at three locations demonstrate the impressively low cost of PEACESAT terminals. At Suva, a "high power terminal" was originally installed at a cost of US $6,237 for basic transmitting/receiving equipment; auxiliary equipment and maintenance was an additional $1,950, amounting to a total cost of just over $8,000. The "low power terminal" at Tonga cost $1,437 with additional costs of $50 - a total of less than $1,500.\textsuperscript{16} In Lae, costs were estimated at "about $900".\textsuperscript{17} Up until about 1973, Bystrom estimated that the nine stations in the network had been put together "for less than $50,000".\textsuperscript{18}

Rough figures for the overall development and operation costs of the system have been available at different times. In one report, according to Bystrom these costs for the first two years had been "about $135,000 drawing extensively on student help at the University".\textsuperscript{19} In a report in 1975, costs were said

\textsuperscript{17} "An Education via Satellite", in The Papua New Guinea Post–Courier, March 30, 1973, p. 17, per PEACESAT News File.
\textsuperscript{18} "Saipan joins University's Pan Pacific radio network", Honolulu Advertiser, April 18, 1973, p. F-12, per PEACESAT News File.
\textsuperscript{19} Ibid.
to have been "$350,000 for the past five years". Sources of funds for PEACESAT have been international and local, but the bulk of the finance for operating costs in Honolulu has been derived from the Hawaii State Legislature. In the same 1975 report, half of the $350,000 was said to have come from the State of Hawaii and "half from foreign sources". A September 1977 estimate of Hawaii State funding for the project was that, since 1971, over $300,000 had been invested in PEACESAT; an appropriation of $41,000 had been made for Fiscal Year 1977-78. In addition:

"a reliable estimate is that a total of $600,000 in non-Federal support has gone into the project and annual operations of all terminals in the full project are estimated at in excess of $165,000". The contribution of Hawaii to this total, although low in terms of the communication capability it represents, clearly indicates the crucial role that Hawaii funding has played in the development and continuation of PEACESAT.

The political value of this non-Federal US funding is recognized by Bystrom in a statement made in testimony before the House of Representatives Committee on Higher Education, in 1973:

"The support of the legislature under special legislation represents more than dollars. We are able to go to institutions in other countries concerned about

21 Telecommunications Demonstration Program, p. 15.
22 Ibid.
what is termed 'cultural imperialism' and point to the fact that we are state funded -- that the project is an outgrowth of local interest".23

Considering Bystrom's non-Hawaiian origins and that the project germinated in Bystrom's mind while he was in Washington, there is a certain amount of irony in this comment.

Naturally, one of PEACESAT's major pre-occupations throughout the development of the Project has been to secure grant-money. Aside from the Hawaii funding, Bystrom also claims to have assisted in securing Carnegie Corporation funds for the USP's participation in the project (see Chapter VI). Another approach adopted by PEACESAT headquarters has been to secure contract grants for specific projects undertaken via PEACESAT. A major contract of this type was with the Lister Hill Center National Library of Medicine (NLM) of the Department of Health, Education and Welfare. This contract, worth $50,000 was for "planning, study and demonstration activities" in medical information transfer in the US Pacific during 1972-73. A continuation of the contract, included as a part of PEACESAT's April 1973 report to NASA, was not granted.24

Local financing has been from the following sources:

1. in New Zealand: from the Department of Education; Wellington Polytechnic Institute; and the MacKenzie Foundation;
2. in New Caledonia (for the region): from the South Pacific Commission;
3. in Fiji (for the region): from the University of the South Pacific;
4. in Papua New Guinea: from the University of Technology (at Lae) and from the National Broadcasting Commission (Port Moresby);
5. in American Samoa: from the Education Department;
6. in the TTPI: from the Office of the High Commissioner;
7. in the Cook Islands: from the Scientific Research Division, Premier’s Department;
8. in Niue: from the Department of Education. 25

3.0. Licencing

3.1. Local licencing

Naturally the authorisation of terminals by the local telecommunications regulatory bodies has been of fundamental importance to the success of the PEACESAT project. Because of the experimental nature of PEACESAT, the regulatory question has

25 PEACESAT News File.
also been the locus of much concern and controversy. Without wishing to oversimplify what has been a complex history in this regard, the regulatory situation can be roughly schematised as the tension between the PEACESAT 'organisation' on the one hand, trying to gain and then establish access to the air-waves with a novel system, and the local regulatory bodies on the other hand, each a slightly idiosyncratic national entity, anxious both to jealously guard its own established interests and at the same time to facilitate and take advantage of such new systems for national development.

A further complicating factor derives from the basic differences in approach between the US and the British models of regulation. The US system involves the private ownership and control of telecommunications systems regulated by a federal body (the Federal Communications Commission) and the courts whose stated purpose is to prevent a monopoly in the supply of services and protect the consumer. On the contrary, the system in most of the Pacific Islands is inherited from the British and consists of one body (usually referred to as the Posts and Telegraphs authority - the P & T) for both the supply and regulation of telecommunications services.

The accommodation of these differences was one of the major hurdles which the development of PEACESAT faced. As Bystrom himself saw it, the regulators - and their set ways of thinking - were a major target of the experiment. Rather than having
social services compete with "wealthy broadcast people" for telecommunications services, he was trying to inject into the international scene a recognition that health, education and social services could be treated as a non-commercial service. Since there was in the Pacific at that time no long-established regulatory tradition as part of the civil service, but rather a loose liaison between temporary expatriates and local politicians, Bystrom considered the Pacific to be a desirable "test-site" for the experiment, one which might be more flexible and susceptible to innovation than others.

Predictably, following NASA approval of the PEACESAT project in February 1971, the University of Hawaii received operating licences shortly thereafter from the FCC. This enabled operations within Hawaii state to commence. The difficult and entirely unpredictable question was then how other national authorities would react to requests for authorisation of PEACESAT. Clearly, there was a question of precedent involved here, and the earliest efforts in Honolulu were focussed firmly upon getting just one other national regulatory body to approve PEACESAT operations, after which it was felt that resistance by other regulatory agencies would be greatly diminished.

Connected to the problem of precedent was that of credibility: unless the regulatory authorities recognised the viability of a small terminal satellite system, they certainly

26 Interview with John Bystrom, January 14, 1979.
would not authorise its operations. This accounts for Bystrom's early plans to organise a demonstration of the Hilo-Manoa link (the intra-Hawaii link that started the experiment) for the benefit of representatives from educational institutions and from Pacific P & T authorities.

However, the shortage of funds prevented such a demonstration, and - as Bystrom reported to NASA in 1972 - telecommunications authorities in other nations had been "slow" in providing the necessary licences: they had "shown reluctance to authorise operations and have provided time limits of as little as six months on authorisations provided". Papua New Guinea was a case in point, where Frank Johnson - an acquaintance of Bystrom's who was enthusiastic to establish a terminal at the University of Papua New Guinea - was unable to get a licence from the Australian Overseas Telecommunications Commission (PNG was at that time a UN Trust Territory administered by Australia).

It was the unexpected entry of New Zealand into the picture that started the ball rolling. Since the Wellington Terminal Manager, Tony Hanley, was a lecturer at Wellington Polytechnic, and since this institution was not only located next to the Post Office but also carried out most of New Zealand's radio training, it was Hanley's personal contacts which influenced the

---

New Zealand Post Office to grant a licence for PEACESAT operations. As Hanley himself describes the process:

"in the case of New Zealand it was necessary for me to arrange for some discussions with the Post Master General and the Minister of Education to obtain project approval over the misgivings of the Post Office administrators."

The New Zealand licence was unique in being a special licence to cover educational exchanges. Yet even as late as November 1974, the relationship between the Wellington PEACESAT operation and the New Zealand Post Office was tenuous, largely because of the more global ambitions of the project, it seems. Hanley adds:

"we continue to have to deal warily with the regulatory authorities who are rather suspicious of our project and are not really aware of the reasons for its importance and its implications for the future".28

Largely because of New Zealand's outwardly positive response, it seems, Fiji then granted the University of the South Pacific a licence to operate an experimental radio station. Since Fiji was bound by a contract with Cable & Wireless Ltd., giving the company exclusive rights to all telecommunications services from Fiji to Hawaii, the US and to "most other major countries", the Fiji approval was a definite breakthrough. Unwilling to incur the wrath of Cable & Wireless, the authorities granted a licence which took advantage of two exceptions to the company's monopoly over international

telecommunications traffic: the Fiji government's right to establish any experimental apparatus, and apparatus "for the provision of telecommunications services with the Pacific Island territories". 29

With Wellington and Fiji having set the necessary precedents, regulatory authorities in other countries followed suit with few problems. Tonga issued a private radio station licence to the USP Centre at Nuku'alofa, and the Gilbert & Ellice Islands Colony and the Cook Islands rapidly issued local licences, also in 1972. Additionally, in the same year, the Papua New Guinea authorities succumbed, following a visit to Hawaii by the Director of Communications (an Australian) and the location of the terminal at the country's technical university at Lae. In the latter case, the licence was again issued for radio experiments. 30

There were, however, exceptions to the trend. Nauru, for example, has consistently refused to licence a terminal in that country, and Fiji refused to licence a second terminal at Labasa, on the island of Vanua Levu. Also, attitudes of regulatory authorities to PEACESAT have changed over time, partially, it seems, from experience of having monitored the system over several years and partially from the added complication of the USP developing its own dedicated satellite

30 Interview with Bystrom, January 14, 1979.
network. The Fiji authorities, for example, quickly became alarmed by the loose objectives of PEACESAT and, while going out of their way to assist the USP with its own more highly directed experiments on ATS-1, maintained a vigilant control over PEACESAT exchanges. The Fiji P & T now demands prior approval of USP's participation in exchanges on the PEACESAT network. In order to be approved, exchanges must meet the following criteria:

1. "They must be non-commercial in nature;"
2. They must have an experimental content;
3. They must be of benefit to Fiji;
4. Information exchanged may not be distributed direct to the news media."\(^{31}\)

Graham Davey, Project Manager for the International Telecommunications Union's Regional Project based in Suva, defends the action of the Fiji Post Office - and similar authorities in other Pacific countries - on largely economic grounds, in the following way:

"Unfortunately, privileged users - often academics - or other small pressure groups, do not contribute to the national cost burden of telecommunications for these countries. The man in the street/village finishes up paying (either thru taxes, increased telecom charges, or increases in the cost of goods and services due to high telecom charges) as a result of loss of revenues from a privileged few misusing PEACESAT ... Not surprisingly, with the heavy cost of communications development in rural Fiji and the low financial returns from

\(^{31}\) Letter from G.B. Whiting, for Permanent Secretary for Posts and Telecommunications, Fiji, to the author, March 7, 1979.
telecommunications, they become annoyed if a privileged few (usually in the name of some higher social or moral goal) misuse the ATS-1 system and do not contribute their correct charges to the public system."32

3.2. International frequency allocation

Having established a foothold, as it were, with operations in the Pacific, Bystrom's next concern was to put pressure on the international community for the allocation of suitable frequencies for small earth station satellite use, citing PEACESAT as a working example of the uses of such an allocation.

As early as 1971, Governor John Burns and the Hawaii congressional delegation petitioned the US delegation to the World Administrative Radio Conference (WARC) for Space Telecommunications to assure the availability of international allocations for educational communications, using a low-cost, two-way satellite system. 33

This campaign has continued through to the present. During 1979, PEACESAT devoted a considerable amount of time and energy to making its case widely known for this year's WARC which was to allocate frequencies for the remainder of the century. A PEACESAT seminar on the subject was held over the air with officials from US, New Zealand and Canadian telecommunications authorities outlining their delegations' national positions regarding small earth station satellite frequency allocations to

other PEACESAT members. The PEACESAT proposal was "for frequency allocations for global communications between health, education, scientific and community development institutions and agencies for public service and global emergency purposes". Two actions were proposed:

1. "international allocations that allow HF tropospheric radio links for regional communications among social service institutions;"
2. international allocations that allow earth to space and space to earth transmission for regional and global links among small low cost ground terminals."

This dual approach envisaged the interaction of the tropospheric and satellite systems. Allocations at the ends of the 620–790MHz bands were suggested. 34

In order to assess the degree of support forthcoming from Pacific and Pacific Rim countries for the PEACESAT proposals, the author wrote to Ministers of Communication (or their equivalents) in 16 countries asking them (a) what their government's policy was regarding PEACESAT; and (b) how they viewed an operational telecommunications system for the future based on the PEACESAT concept, and whether their government would support PEACESAT requests for relevant frequency allocations at the forthcoming WARC. Only eight replies to this survey were received. Of these, two indicated that they would support the proposals (Hawaii and Tonga); two were non-committal (Australia and New Zealand); two acknowledged receipt of the 34--

---

34 A. Hanley, WARC 1979: Summary of PEACESAT Project Proposals (Wellington, undated).
enquiry but never replied in full (New Caledonia and Canada); and two indicated a distinct pre-disposition against supporting the PEACESAT proposals (Fiji and the Solomon Islands).

Looking at the replies in more detail, Hawaii's new Governor, George Ariyoshi, continued his predecessor's support for the PEACESAT proposals, saying that PEACESAT met "significant human and social needs" and "demonstrated that frequencies should be made available on a permanent basis for such activity".35 Hawaii had therefore supported the PEACESAT proposals in submissions to the FCC. The Governor added that "U.S. authorities have acted favourably on this request".36 The reply from the Prime Minister's Office in Tonga stated that "the viewing of an operational telecommunication system for the future based on the PEACESAT concept should be from an educational standpoint only", and that "the Government of Tonga should support PEACESAT requests for relevant frequency allocations".37

Both Australian and New Zealand authorities were non-committal, Australia stating that their preparations for WARC had not been finalised, and New Zealand saying simply that PEACESAT views were being taken into account. The New Zealand

37 Letter from Kalaniuvalu Fotofili, for the Secretary to Government, Tonga, to the author, March 6, 1979.
Postmaster-General, however, did add the following comments regarding PEACESAT:

"It is believed that the experiment has shown the value of this type of conference operation for discussion between special interest groups particularly where small Pacific Islands communities are involved. The operation of the PEACESAT terminal in New Zealand has perhaps continued beyond what might reasonably be regarded as the experimental stage because some of the smaller countries do not have public telecommunication facilities capable of providing the type of conference calls required." 38

Canadian and New Caledonian authorities referred the matter to higher authorities in Ottawa and Paris respectively from where no further replies have yet been forthcoming.

The response from Fiji was detailed and demonstrated a definite position on the issue. After outlining Fiji’s originally sympathetic attitude towards PEACESAT and details concerning the local licence, it is said that:

"We are of the opinion that the PEACESAT Project has ceased to be an experiment even in the loosest sense of the word. It has on occasions carried, free of charge, traffic which should properly be carried by public communications facilities to the detriment of the revenue earning capacity of those systems. ...

... As the financial resources of the Pacific Island nations are rather small, telecommunication facilities, once established, have to be self-financing. The PEACESAT Project has been beneficial to the region in that it has made the peoples of the region aware of the possibilities that exist for communication by satellite. However, it has also become a source of free communication which can only be to the detriment of the development of public communication facilities in the region.

38 Letter from M.B. Couch, Postmaster-General, New Zealand, to the author, March 27, 1979.
We would therefore regard the provision of an operational telecommunications system based on the PEACESAT concept as a serious threat to the orderly growth of a regional telecommunications system. In view of the above, we cannot see any justification for giving support to PEACESAT requests for relevant frequency allocations..."\(^39\)

The reply from the Solomon Islands was brief and to the point:

"I regret to advise you that this government is unaware of the existence of PEACESAT and consequently I am unable to provide you with the information you sought."\(^40\)

At the time of writing, the outcome of the WARC meeting was unknown.

4.0. Operational aspects

4.1. The "exchange" concept

There is no programming, in the conventional sense of the term, on the PEACESAT system. That is, there are no pre-recorded sessions originating at one location and transmitted to other locations which act merely as receivers. Instead, PEACESAT customarily uses what is now widely known as a tele-conferencing technique in which a number of participants at a number of locations can confer together via an audio-link. On the PEACESAT system, this arrangement has been termed "an exchange". While

\(^39\) Letter from G.B. Whiting to the author.
\(^40\) Letter from J.T. Michie, Ag. Permanent Secretary Ministry of Transport and Communications, Solomon Islands, to the author, February 19, 1979.
only one person can talk at a given moment (the link is technically referred to as a simplex system), all participants at all other locations are able to hear him/her. Participants can take turns at speaking over the system, or can remain silent, as they wish.

Theoretically, therefore, the exchange concept enables any potential participant at any PEACESAT location to originate a topic to be discussed (an exchange). All that is required, according to PEACESAT procedure, is that at least one other terminal be willing to participate, and that there be a mutually convenient time available on the schedule. Once these two criteria are fulfilled, the exchange can be scheduled.

Exchanges fall into two broad types:

1. point-to-point exchanges which involve only two locations (or 'points'); and
2. multi-point exchanges, involving a number of locations.

In the latter type of exchange, once an exchange has been proposed, any PEACESAT terminal can choose to join in on the discussion. Participation at local terminals is entirely voluntary: as is stressed by PEACESAT, each terminal is autonomous, possessing the power to control the on-off switch.

Naturally, in a system of this kind, detailed procedures are required for it to operate at maximum efficiency. Such procedures have been developed over time by the most frequent users of the system, partly utilising PEACESAT itself and partly
meeting face-to-face as at a meeting held in Noumea for the purpose in early 1978.41

Procedures that have come under scrutiny in this way have included: different tele-conferencing formats; the importance of having a concise agenda, preferably drawn up in advance of the exchange and distributed to participants; the role of the chairperson; evaluation of exchanges, etc.

Despite attempts to institute effective procedures, however, the implementation of them does not seem to have been consistently effective over time. Common problems still recur, such as an excessive amount of time spent on the passing of messages, and on scheduling; the intrusion of local politics into the operation of the system (by Terminal Managers exercising control over who might and might not be asked to participate in a given exchange, for example); inefficient chairing of exchanges; the initiation of exchanges of interest to only a small number of terminals; and the insensitivity of Metropolitan participants to the needs and aspirations of Pacific Island participants. The continued existence of these problems led to a formal protest by the Director of the University of California's terminal, Dr. Bryan Farrell, in

---

January 1979. 42

See Chapter VIII, Section 3.2.
TABLE 1: PEACESAT EXCHANGES, 1976.

(As detailed by Wellington Terminal, New Zealand.)

High Schools Pacific Forum
Technical Education in the Pacific
South Pacific Commission News Experiment
Nursing Education
Small Communities Exchange
LANDSAT; DSIR and Pacific scientists confer, at irregular intervals, with USA scientists at the Goddard Spaceflight Center on the use of Landsatellite
Copra-drying (2 exchanges)
Archives of Pacific Music
South Pacific Festival of the Arts Planning (some sessions in 1975; two in 1976)
Pan-Pacific Satellite Seminar (Some sessions in 1975, some in 1976; 6 sessions in all. ATS-1 and ATS-3 linkage. Pacific, Alaska and Appalachian terminals. Discussion on aims and problems in education.)

Music Education
Ocean Management
Dental Nursing
Oral Traditions (High School students discuss myths and legends of their countries.)
Guide Leader Training
Elementary Schools Exchange
American Field Service Exchange
Communications in the Future (two sessions, to evaluate a previous series and plan for another.)
Gerontology (Two one-hour, two two-hour sessions. People concerned with the care of the aged in the Pacific joined a Summer Course of the University of Hawaii.)
Social Welfare and Community Development in the South Pacific
The Use of Indigenous Materials in Architecture
Libraries Exchange
Dengue Fever (One exchange; link by telephone to Otago Medical School.)
Solar and Wind Energy; Biogas (Exchanges at irregular intervals.)
Marine Turtles; Ecology and Conservation
Education by Correspondence (linking with Alaska, and with Massey University.)
Baurua Taraetai (occasional exchanges on the significance of early canoe voyages.)

(continued over)
TABLE 1 (continued)

The Electric Pacific (One 3 hour session, demonstrating the value of all forms of electronic communication in the region.)
Management Education and Industrial Engineering
Journalism Training
Church Youth Group Leadership
Off-shore Prospecting Conference Planning (3 exchanges.)
The Growing and Processing of Pawpaws (linked with Massey University; 5 sessions.)
Boys Brigade Leadership
Habitat Conference. (Ten consecutive early morning sessions, and some slightly later, were held. The Goddard-mobile was used in Vancouver, and groups there discussed Conference topics with groups at Pacific terminals.)
Rheumatic Fever and Rheumatic Heart Disease Registers (One exchange.)
Family Planning
Land and Economic Development in the Pacific: The role of the Associate State (two two-hour seminars, hosted by the Institute of International Law and Economic Development, Washington.)
International Labour Organisation (One two-hour seminar, attended by representatives of employers and employees.)
Museum Conservation

In addition, there have been three experimental tutorial sessions. One of these, in Accountancy, linked Massey University with the University of the South Pacific tutorial system for the smaller islands. Massey was also linked via PEACESAT for a History seminar for extramural students in the Pacific. The third experiment of this type was an exchange between a member of the Waikato University Department of Education and educationists in the Pacific on the topic of Special Education.
4.2. Uses and users

Because of the openness of the exchange concept, there is clearly an infinite number of possible uses to which the PEACESAT system can be put. Examples are the wide range of exchanges included during 1976 as shown in Table 1. Exchanges have been categorised by PEACESAT into the following eight categories: (1) Classroom Instruction; (2) Decision-making Conferences; (3) Professional and In-Service Training; (4) Community Development Service; (5) Research Support; (6) Professional Consultation; (7) Technical Development; and (8) Administrative. Additionally, PEACESAT headquarters has at different times referred to exchanges of certain types as "networks" which have included: medical, news, education, science, community, national and library networks.43

One set of experiments of particular interest was conducted in Papua New Guinea by the University of Technology at Lae. Their main aims were to experiment with simple electronics, lightweight construction and portability. A portable ground terminal was developed which could operate on as little as 10 watts power output and could be transported to isolated villages by canoe or pack.44

43 PEACESAT, Report Three.
44 PEACESAT, Report One.; and other papers by Steve Seumahu.
As regards users of PEACESAT, the list is as varied as the myriad uses indicated above. One item of interest, however, is that on two occasions conferences of users have been called. The first was sponsored by the University of Hawaii’s East West Center in April 1975 "to review four years of the PEACESAT experiment". Pacific Basin leaders in education, media and social services were invited, along with local PEACESAT Terminal Managers and specialists in satellite communication.45 A second conference, in January 1978, was held in Noumea, New Caledonia and sponsored by The Asia Foundation, the International Planned Parenthood Federation (East Asia and Oceania region), and New Zealand Catholic Overseas Aid. The latter was attended primarily by Terminal Managers and intended mainly as an in-service training conference for PEACESAT staff.

4.3. Content Guidelines

Rules delimiting the conduct and content of exchanges have been developed as the system progressed, largely on a pragmatic basis. An incident of major importance in this respect occurred on June 28, 1972 when PEACESAT was used "for an educational discussion to focus on the effect of scheduled French nuclear-testing in South Pacific waters on the environment".46 Local press attended the exchange as well as participants from Honolulu, Wellington and Suva. An official PEACESAT report

45 PEACESAT, Report Three, p. 74.
46 PEACESAT, Report Two, pp. 66-69.
documents the incident in the following way:

"As the discussion progressed, it became apparent that some participants were trying to organise support for a Pacific-wide protest of the nuclear-test activities. Under a first-page banner, a headline news item, drawn from the exchange, appeared in the following morning's edition of The Honolulu Advertiser. PEACESAT Terminal Managers in Honolulu and Wellington agreed that the topic was not suited for an educational system such as PEACESAT and that no further exchanges involving these participants were to occur. President Harlan Cleveland of the University of Hawaii expressed concern about the event. Policy or precedent regarding content of exchanges did not exist, however, revealing the need for guidelines on programming content."\(^{47}\)

Subsequently a Committee was organised to formulate guidelines which were then approved in March 1973. The preamble to the document refers to the difficulty of defining "educational services" so as to be commonly interpreted by all users and acceptable in terms of national sovereignty and national cultural sensitivity. "In such a situation, the most feasible course of action is to repair to those general values that are universal and lend order and propriety to actions in all societies."\(^{48}\) The following are the guidelines which were established:

1. "The net will not be used to transmit or receive messages for hire, nor for communication for material compensation, direct or indirect, paid or promised.

2. The transmission of messages in codes and ciphers, to or

---

\(^{47}\) Ibid.

\(^{48}\) Ibid.
between stations, is not authorised. All communications, regardless of type of emission employed, shall be in plain language except that generally recognised abbreviations established by regulation or custom and usage are permissible as are any other abbreviations or signals where the intent is not to obscure the meaning but only to facilitate communications.

3. Communications containing obscene, indecent, or profane words, language, or meaning will not be transmitted.

4. No station will transmit tendentious information or unidentified radio communication or signals.

5. The net will not be used to publicise or solicit support for potential causes, either domestic or international.

6. Material that propagandises ideas of war or racial hatred or is aimed at interference in another nation's internal affairs or foreign policy will be avoided.

7. Weekly programming discussions will be used to filter and identify those topics that fall within the categories enumerated above.

8. In the final analysis, each terminal can elect to cut off any broadcast that does not conform to local norms; i.e. nothing in these suggestions shall be interpreted as restricting the right of terminal managers to switch off broadcasts they consider in violation of local terminal rules on broadcast content."
At the Noumea PEACESAT Conference, it was agreed that each new or prospective terminal should agree in writing to abide by these guidelines before being allowed to be a part of the PEACESAT system.

That these guidelines are adhered to is evidenced by the fact that during the period when the exchange data analysis was conducted (see Chapter IX) a proposed exchange was dis-allowed. At a Planning meeting on February 5, 1979, to discuss a Student Christian Movement exchange series oriented towards international development and the Pacific in particular, it was suggested that the first exchange in the series focus on the nuclear arms/nuclear power debate. During the planning meeting, Terminal Managers at Honolulu and Wellington interrupted to point out that this was a sensitive and overly-political topic. Following this exchange, the same Terminal Managers decided together that such an exchange should not be permitted.
VI. GROWTH AND CONFLICT, 1970-1973

As we have seen, by July of 1971, the PEACESAT link was successfully operating between the Hilo and Manoa campuses of the University of Hawaii, providing what Bystrom termed the "first course for credit by satellite in the world", and the "first satellite library network". Having thus established the technical feasibility of the project and having also built up a considerable and diverse support system, Bystrom was now able to proceed with his plans to expand the system internationally. In this, chance was to play a part as well as his earlier letter-writing campaign to Pacific Basin universities.

As the system expanded, of course, so did the complexity of the issues surrounding PEACESAT. In the further history of the project that is presented in this chapter, the major focal points of attention are confined to: (1) the objectives held by participants in Hawaii and in the non-US terminals; (2) the relationship of PEACESAT to the development of telecommunications and telecommunications-related institutions (especially NASA) in the US; and (3) the reactions of the local regulatory authorities and governments to PEACESAT.

1 Project Chronology, PEACESAT NEWS FILE.
1.0. The Hawaii position

As required by NASA, Bystrom submitted an interim report on the PEACESAT project to NASA in August, 1971. While this report was congruent with the intentions as expressed in the formal request to NASA of December 1970, in that it reported on usage during "Phase I" up to July 1971, it did include some minor differences in planning.

Planning of PEACESAT, so this particular report maintained, had been undertaken within "Schedule Periods". Consequently, what had originally been described as Phase II, extending from July 1971 - July 1972, now appeared as Schedule Periods three and four. Schedule period three (SP3) moved "a step closer to regular operation", extending from July 1971 - January 1972. Schedule Period four was described as being "much less definite", with the anticipation of new requests, the inclusion of terminals at the USP and at the University of Papua New Guinea (UPNG) as well as locations in American Samoa and the TTPI. Tables showing the number of satellite hours that potential PEACESAT users had requested were attached. Such users ranged from University of Hawaii departments (Communications, Religion, Education, the Library) to the EWC and departments of the State of Hawaii; educational uses at the USP and UPNG were
also listed. These exhibits were used to support the request to NASA for increased operating hours from 12.5 to 25 hours per week. In addition, stated Bystrom, because of the wide range of institutions involved in the planning and financing of the project, "no assurance can be given that all planned activities will be completed by June 30, 1972". Having established PEACESAT operationally and got his foot in the door, so to speak, it appears that Bystrom, perhaps anticipating conflict in the non-too-distant future, was concerned to consolidate his position vis-à-vis NASA well in advance.

Other items of interest in this August 1971 report again concern Bystrom's ideas as to the uses to which PEACESAT could and should, be put. US interests in the Pacific and Asia are stressed, and it is said that:

"President Richard Nixon in a letter to Governor John Burns delegated to Dr. Clay Whitehead, Director, Office of Telecommunications Policy, consideration of proposed application of the PEACESAT system in support of normalizing relations in the Pacific."

"Policy level negotiations" between the Governor of Hawaii and the High Commissioner of the TTPI are said to have opened, with a view to expanding the project. Plans for terminals in American Samoa and Guam - more US-controlled territories - are mentioned, as well as a request from the Cross Cultural Training Center (Hilo, Hawaii) to establish a ground station at the Peace Corps

---

3 Ibid, p.20.
4 Ibid, pp. 4,5; (emphasis added).
Training Center at Saipan. Furthermore, "representatives of the US Army Engineers" were said to be planning a ground station at Kwajalein - the US military's missile-testing base in the Marshall Islands.

It is perhaps no coincidence, given the strong emphasis on PEACESAT as being a tool in the 'Americanization armada' that one of the first uses of a portable, remote, receive-only terminal was aboard the US liner President Wilson, in August of 1971. The liner carried grantees from Asian countries bound for the East West Center, and PEACESAT was used to transmit "messages basic to orientation education activities". As the report continues, the EWC foresaw "extensive use" of PEACESAT in the future.

Problems within the State of Hawaii at this time contributed to delays in the implementation of development plans for PEACESAT. The $75,000 appropriated by the State legislature in April 1971 were later frozen in a state-wide attempt to adjust to a tax revenue decline. $62,700 were released in November, but with severe restrictions on their use; for example, no expenditures were to be allowed for personnel. This situation, according to Bystrom, helped to account for the fact that international operations, instead of beginning in September

---

5 Ibid, p. 5.
7 Ibid, p. 10.
8 Ibid, p. 16.
of 1971, did not officially start until January of the following year.

2.0. International expansion: 1970-73

2.1. Early interest: Papua New Guinea, Fiji, Tonga

From the 70 or 80 letters that Bystrom had sent out to Pacific and Asian universities in 1969, he received only three replies indicating "solid interest". These were from the University of Papua New Guinea (UPNG), the University of the South Pacific (USP), and the University of New South Wales, in Australia (UNSW). It is not clear what became of the UNSW interest in PEACESAT, but the UPNG and USP proved to have considerable impact on the project.

The most active interest was expressed by Dr. Frank Johnson, a professor in the teaching of English as a second language at UPNG. Bystrom had made his acquaintance during a visiting Professorship that Johnson had held within the Department of Speech-Communications at the University of Hawaii. From 1970 onwards, it appears that Johnson attempted in vain to secure a licence to participate in the PEACESAT project from the authorities in Papua New Guinea. At that time, PNG was still a UN Trusteeship administered by Australia, and telecommunications

10 Interview with Bystrom, January 12, 1979.
regulation was undertaken by the Overseas Telecommunications Commission of Australia.\textsuperscript{11}

One of the problems faced by interested people such as Johnson was the disbelief expressed by the authorities that a small earth station satellite system was in fact possible. Statements made by Bystrom in the letters to the universities had quoted a figure of US $10,000 as the cost of a ground terminal. This was a cautious estimate, taking into account that the Hawaii terminal costs of $4,200 each included student labour.\textsuperscript{12} The need for a working demonstration of the system was, therefore, a priority, and it was for this reason that Bystrom's proposal to NASA included budgeting for a conference to be attended by representatives of Pacific P & T authorities. However, funding for such a conference was not forthcoming.

The response from Colin Aikman, Vice Chancellor of the USP was apparently enthusiastic but similarly sceptical. A long correspondence developed between Aikman and Bystrom on the matter, in which Aikman spoke of the USP's desire to begin developing extension centres outside of the main campus at Suva, Fiji. The plan, apparently, was to start in Tonga.

It happened that Bystrom was at that time attending the first Methodist church in Honolulu, the church which was selected to be the home church of the Tongan community there. It

\textsuperscript{11} Ibid.
\textsuperscript{12} Ibid.
had a US pastor, and a Tongan pastor who also happened to be a student in one of Bystrom's seminars. In a short time, Bystrom had stimulated "a dozen really enthusiastic people" - Tongans - in the PEACESAT project. Their personal enthusiasm, according to Bystrom's account, was very great. Some of them were acquainted with the royal family in Tonga, and letters were written back and forth. However, it appeared to be impossible to raise any money for the installation of a terminal in Tonga. It seemed that yet another suitable location fell just short of being able to participate, this time for financial reasons.

In this same period (1970 and early 1971) Bystrom had been attempting to raise funds for PEACESAT to enable both domestic and international operations to proceed. He had tried to interest the Ford and Rockefeller Foundations but unsuccessfully; the former did not fund projects in the Pacific region and the latter's program at that time gave priority to food and agriculture. Following the correspondence with the USP, and the attempt to establish a Tongan terminal, Bystrom wrote to the Carnegie Corporation in New York, proposing that they support the establishment of two terminals, one in PNG and one at the USP.

It was almost one year later in October 1977, that Bystrom received a telephone call from the Director of the Commonwealth

---

13 Ibid.
14 Ibid.
Program of the Carnegie Corporation. The Board was already supporting the development of regional centres at USP and it was consequently a relatively simple matter to provide additional funding there. The Carnegie administrators could themselves approve a project for $15,000 or less without additional Board involvement. Bystrom was encouraged to submit a proposal requesting funds for a USP terminal which, if suitable to the USP, would automatically be granted. A terminal in PNG could not be funded, as it was not a part of the Commonwealth. Bystrom consequently submitted a proposal to the Carnegie Corporation.

In the meantime, planning at the USP had been underway, and proposals made for the utilisation of a satellite system for three purposes:

1. a practical scientific experiment;
2. exchange of educational material; and
3. links with the University region.15

Bystrom's proposal was re-written and re-submitted to the Carnegie Corporation by Aikman. At last an international system was imminent.

2.2 Wellington, New Zealand

At this point, in December 1971, Wellington, New Zealand, entered the system. According to Bystrom, this was a complete surprise. While the Hilo-Manoa link was in operation, Tony

Hanley from Wellington broke into the system with no prior warning. Lacking NASA approval, he was ordered off the air, but was subsequently invited to join PEACESAT, which he gladly did.

Hanley, who was a Senior Tutor in the Department of Physics, Electrical Engineering, Telecommunications and Electronics department at Wellington Polytechnic, had independently constructed an ATS-1 ground station, apparently planning to tie in with some of NASA’s programs to use the satellite for health work in the Pacific Islands. In cooperation with a doctor from the medical department, about $600,000 had been obtained for the project, and an experimental licence granted by the New Zealand Post Office.\(^{16}\)

Wellington’s initial aims were primarily technically-oriented:

1. to create an awareness in the New Zealand technical community of the potential use by New Zealand organisations of satellite technology and to demonstrate their low cost and simplicity;
2. to create a portable unit for occasional use on Pacific Islands when there is an urgent need for good, continuous communications.\(^{17}\)

\(^{16}\) Interview with Bystrom, January 12, 1979.
\(^{17}\) "A satellite link with Hawaii", The Gisborne Herald, December 14, 1971, p. 20 as appears in PEACESAT NEWS File.
As Bystrom points out, the addition that Hanley brought to PEACESAT was not merely that of the first non-US terminal in the project. He provided also a great deal of skill, enthusiasm and commitment to PEACESAT. In June of 1972, Hanley was awarded a grant by the McKenzie Education Foundation of New Zealand to work full-time for six months on the project. Later, after Bystrom had travelled to New Zealand and met personally with Hanley in August 1972, Hanley was appointed Assistant Director of PEACESAT by Bystrom.

2.3. The University of the South Pacific

By January 1972, the Carnegie Corporation had approved the $15,000 for the establishment of the USP terminal. Alan Cutting, a New Zealander and lecturer in Physics, was appointed Project Manager and relieved of most teaching responsibilities; Brian Berry, an Englishman, and chief electronics technician for the university, became Technical Assistant; and Dr. David Berkowitz, a Peace Corps Volunteer who had been a senior scientist with the Mitre Corporation (operated by the Massachusetts Institute of Technology) was the consultant for the project.18

Later in the same month, Cutting and Berry visited Honolulu, Cutting to discuss overall programming material and Berry to become better acquainted with the technical aspects of

The arrangement was that the USP would purchase one of Nose's terminals, paying just for the cost of the parts. Departing Hawaii with "equipment that you could stuff into one golf bag" the USP officials were enthusiastic. Ten days later, on February 1, 1972 "only hours after NASA gave the go-ahead", Suva connected with Honolulu via ATS-1. In the same month, Bystrom could add a third "first" to the PEACESAT list of achievements: the "first international educational exchange network by satellite", linking the two University of Hawaii campuses, Wellington and Suva.

Towards the end of February, the USP realised that a certain amount of funds remained unspent and decided to establish a second terminal under its auspices. Because it was fully staffed and was close to Suva, the University Centre at Nuku'alofa, Tonga, was selected. The lecturer-in-charge there, Miss Margaret Blundell, was supportive, and the Tongan Broadcasting Commission agreed to provide technical assistance and training. By mid-April a low-power terminal was installed and tested. Total expenditure on the high-power terminal at Suva, the Tongan terminal, the lease costs of a Xerox telecopier for Suva and Tonga, and travel expenses left an amount of

19 USP, 1972, p. 3.
20 Interview with Bystrom, January 12, 1979.
21 "UH establishes satellite contact with Suva, Fiji", Honolulu Advertiser, February 3, 1972, as appears in PEACESAT News File.
22 PEACESAT Network Chronology, undated.
F$1,600 still remaining from the Carnegie grant! The USP was clearly impressed by the system. In its 1972 report on PEACESAT, it was stated that the governments of the Gilbert and Ellice Islands colony and the Cook Islands had both issued local licences for ground terminals, and that the University looked forward in the future to operations continuing through to 1974.

2.4. Tahiti, American Samoa and Saipan

At the same time that the USP was contributing in a major way to the development of the system, other terminals were being established or negotiated. February 1972 saw successful receive-only tests between the UH Manoa campus (transmitting) and Papeete, Tahiti, capital of French Polynesia. In May, a third terminal was set up in Hawaii, at the Community College on the island of Maui. In the same month, the Department of Education in Pago Pago, American Samoa, entered the system. By August of 1972, a terminal was finally established in Papua New Guinea at the Institute of Technology in Lae, with hopes to place a second terminal at the UPNG in Port Moresby. The following year, in April 1973, the Trust Territory of the Pacific Islands joined PEACESAT, with a ground station at the Broadcast Division in the Department of Public Affairs on

24 Ibid, pp. 6 and 20.
The Saipan terminal was initiated by George Callison, Chief of the Broadcast Division in the Office of the High Commissioner, in the TTPI. Callison had met with Bystrom at a Conference of Pacific Broadcasters held at the East West Center, and his initial attraction to the system had been the possibility of networking and sharing programs in the Trust Territory via PEACESAT. In the course of the following years, he came to be a major supporter of PEACESAT, being Vice President of the PEACESAT Consortium Council in 1978-79.

3.0. The 1973 crisis

3.1. Background

During this period of quite rapid expansion of PEACESAT, from 1971-1973, Bystrom managed to obtain approval from NASA to continue the project through to May 1973. At this point in time, however, the seemingly smooth, continued expansion of the PEACESAT system was shattered by a crisis: the NASA authorities appeared to be determined to close the network down.

The history of 1973, consequently, is a complicated one. As it was presented to the public, it appeared to be a

26 Documentation - in the form of a report and/or request to NASA - was unfortunately not available for the period immediately prior to 1973.
straightforward conflict between NASA on the one hand and PEACESAT on the other.

In order to expand further, PEACESAT required a commitment from NASA that satellite time would be available well into the future. Locations which were potentially interested in joining the network – such as Guam – were deterred from doing so by the prospect of having experimentation on ATS-1 curtailed before they had participated for any length of time. Under these conditions, funding was understandably not readily forthcoming since there was no guarantee of an adequate return on investment in ground station equipment. For similar reasons local licencing authorities were in some instances only granting limited authorizations for potential PEACESAT stations, for as short a time as six months only, or were reluctant to grant licences at all.\(^27\)

NASA, on the other hand, was constrained by its mandate from Congress not to be involved in activities which could be interpreted as being of the character of a service; it could only undertake experimental activities. Additionally, NASA’s ATS program was advancing, and the ATS-1 satellite was slated to be used to provide an audio link for television experiments using ATS-6 in the Rocky Mountain states. This would mean less time available for the Pacific experiments.

\(^{27}\) Second Interim Report to NASA , p. 2.
In the conflict that developed, the media reports, emanating almost exclusively from Honolulu, painted the picture of PEACESAT as being the highly desirable and innocent victim of an impersonal government agency, in the form of NASA, working hand in hand with corporate interests to stifle this beneficial, low-cost system. While there is truth to both the NASA and PEACESAT points of view, as well as to the above interpretation, this version of the story omits one important aspect. That is, that whatever the larger issues behind the conflict, it appears that Bystrom, as "Principal Investigator" (NASA parlance for one in charge of an experiment), was simply not fulfilling the requirements as stipulated by NASA.

3.2. PEACESAT Report and Request to NASA, April 1973

Bystrom submitted to NASA a Continuation Proposal in October 1973 and a Report and Request - for additional satellite time - on March 29, 1973. Included with the request for additional satellite time for PEACESAT per se were two other proposals. One was to the Lister Hill Center, National Library of Medicine (NLM), to continue experimental activities in medical information transfer begun in 1972. This proposed "that NLM support extension to the PEACESAT satellite communication system by providing for the cost of ground terminal equipment to be located and operated in the Trust Territory of the Pacific
Islands and the US Pacific". The other proposal was to the Health Services and Mental Administration, in the US Department of Health, Education and Welfare, Maryland. It was designed to improve health care services in the US Pacific by linking "medical and health personnel in remote areas of the US Pacific with limited health services to centers where greater expertise and services are available". These two proposals, together with the proposal to continue PEACESAT, were described as "three interrelated proposals"; the overall system, it was stated, would be "used for user applications including health care and information activities and international education projects". Both medical projects were anticipated to extend over three years; the first was budgeted for a total of $197,300 and the second for $264,900 for calendar year 1973. The number of satellite hours to be used was projected to rise from 25 per week in April 1973 to 91 per week by April 1974.

Incorporating over 160 pages on the two medical proposals alone, Bystrom had evidently expended a large amount of time and effort on the entire package. One of his objectives, however, appear quite clearly to have been to expand the PEACESAT system,

29 Ibid.
using funding from the medical experiments.

While in Washington, Bystrom met with Marsten to discuss his plans, and NASA reservations, on May 1, 1973. On May 15, Dr. Richard Marsten, the Director of Communications Programs in NASA's Office of Applications, wrote to Bystrom summarizing the results of NASA's evaluation of Bystrom's reports and proposals. These were:

1. That Bystrom's combining of an evaluation report with a proposal for further use of ATS-1 was not acceptable, since the two documents were intended for different distribution;

2. That the report should concentrate on a description of experiments as originally proposed and contain statistical evidence of trends discernible by the experiments, and/or "document the attainment of objectives through experimental results";

3. That the report contained accounts of isolated experiments without follow-up experiments or analyses of them, thereby creating an impression of superficiality;

4. That the proposal for extension of ATS-1 requested more time than was available; that increases in satellite time would need to be justified, and would, in any case, be restricted.

----------------------
31 All references in this section, unless otherwise stated, are from correspondence contained in two files included in the University of Dayton, Ohio, bibliography: File #211, Bystrom, J.W., Correspondence between Bystrom and Marsten (University of Hawaii, 1970-73), and file #221, Unknown, Correspondance concerning PEACESAT (Hawaii, Washington, 1973).
to 18 hours per week.

In addition, the letter reiterated two matters that NASA had previously communicated to Bystrom:

5. That, on January 5, 1973, "NASA announced that it is phasing down its in-house and contracted communications satellite work insofar as it relates to early commercial applications. Further advances in satellite communications research and development, therefore, will be mainly accomplished by industry." Bystrom was accordingly recommended to recognize this policy "by incorporating a developmental plan which would indicate the evolutionary provision of communications services by commercial sources";

6. That NASA intended extending the period of ATS-1 usage by three months, from May 17, 1973 to August 17, 1973, in order to allow sufficient time for Bystrom to complete commitments to PEACESAT participants or to furnish a revised report. It was stressed that further extension was not contemplated "unless strong and supported reasons to the contrary are presented".

A handwritten internal note from a NASA official emphasized the NASA predicament as expressed in point five above: "We must be exceptionally careful to determine whether the extension is a legitimate new experiment series, or merely expands a service".

148
3.3. Further extension to September 1973

In the next two months, Bystrom's energies appear to have been mostly devoted to stimulating users of PEACESAT to write to NASA expressing their support for its continued use. One complicating factor in the situation was the successful application by the USP, in July, for a separate network linking USP extension centres via ATS-1.

By August 3, having received no revised proposal from Hawaii, NASA sent a cable to all PEACESAT Terminal Managers. The cable pointed out information already known by Bystrom, presumably in an attempt to ensure that PEACESAT participants were fully aware of NASA's reasons for its actions. It stated that the normal NASA requirements regarding experimental results documentation and evaluation had not been provided by the PEACESAT Project, and that further PEACESAT operations were contingent on a proposal including "clear statements of objectives, implementation, evaluation and reporting procedures for the experiment". Responses of participants' intentions to continue with PEACESAT were solicited, with the possibility of a further one month extension mentioned "to allow for preparation of a PEACESAT proposal".

Having received sufficient replies, a further telegram from NASA to all terminals, dated August 7, 1973, extended PEACESAT time to September 17. It was stressed that a new proposal was required, one which took into account NASA's inability to
authorize operational, or non-experimental, satellite use because of international radio regulations governing the frequency used by ATS-1. The NASA cable stated, furthermore, that consideration could be given to increasing the total time for Pacific experiments to 18 hours per week, and that ATS-1 use was possible after April 1974 despite the priority commitment of the satellite for other uses. Beyond April 1974, PEACESAT time would have to be renegotiated. Finally, the cable pointed out that a condition of experimentation was the forwarding to NASA of "documented evaluation of the experiments completed".

A letter of September 14, addressed to all terminals, basically repeated the text of this cable, but outlined in more detail NASA's criteria for accepting satellite experiment proposals. These criteria were:

1. That "utilization of the satellite could demonstrate a totally new application, could show feasibility of an application, or could establish a reference for comparison with other techniques of implementation";

2. That "proposals should set forth a well-developed evaluation program which would consider experimental results and draw conclusions therefrom";

3. That "a proposal carries with it an implied obligation to publish the results of your experiment, including evaluation, for wide dissemination".
In the next two weeks or so, NASA officials made telephone calls to Hawaii and to New Zealand (amongst other locations) to ascertain PEACESAT participants' intentions after September 17. Bystrom said that, by close of business on September 17, he would send to NASA supplementary reports, a revised evaluation and proposed new experiments. Having run out of funds, he also outlined the fact that the State legislature would fund PEACESAT provided they were assured of satellite time by NASA. Hanley, in Wellington, expressed strong support of Bystrom as a person and of Bystrom's work in organizing and coordinating PEACESAT.

It seems from these events that NASA's requirements of the PEACESAT project were clearly articulated well in advance, and that NASA's concern to ensure that local terminals were directly informed of their position was an expression of their desire for fairness and clarity. By comparison, it is relatively unclear why Bystrom was unable to fulfil the NASA demands in the time allowed. Presumably contributing factors were his lack of funds and time to prepare such materials, although it seems fair to assume that he should have been aware of the NASA requirements from the start.

In the Honolulu press, several articles and editorials appeared in the late August to early September, 1973 period. The earlier pieces presented a distinct bias in favour of PEACESAT, and one later article included Marsten's replies to criticisms, on behalf of NASA. The major arguments presented to the public were: first, that "political opposition in Washington, D.C.", in the form of commercial communications carriers, were pressuring NASA not to provide what was being interpreted as a low-cost service; and that, in addition, domestic satellite projects should be in the hands of private industry; and, secondly, that financial cutbacks in the State Capitol had led to the refusal of a further $60,000 grant to PEACESAT. An editorial's opinion was that "neither reason seems good enough to discontinue this important experiment".

In reply, Marsten, for NASA, maintained that "communication over long periods of time, is a service, not an experiment anymore". He denied that any common carriers had contacted NASA regarding PEACESAT. In response to a PEACESAT statement that its user groups were too small and poor to utilise commercial carriers, Marsten pointed out that:

---

35 Honolulu Advertiser, August 23, 1973 as appears in PEACESAT News File.
"the research and development business doesn't predicate a definition of research and development on who can afford to pay for a service and who cannot. It defines its research and development in terms of investigating and experimenting with new things. That is completely independent of who can afford services of an existing nature." 36

Also referred to was a report by the US House Committee on Government Operations which had noted that NASA's ATS program was bound by restrictions imposed in 1965 to keep the program experimental. These restrictions were the result of COMSAT pressure at the time. The House Committee, as quoted by the press, said the restrictions were

"an unfortunate and unnecessary outcome. The common sense approach, it would seem, is to derive whatever residual benefits in practical application can be obtained from this $150 million Federal investment". 37

At the same time that the press storm was blowing, NASA was inundated with letters of support for PEACESAT, or letters which criticised NASA's stand on the issue. These came from a variety of organisations and locations, including the US Department of the Interior and the Department of State; Hawaii Congresswoman Patsy Mink, and Senators Nelson and Inouye; and from Guam and New Zealand.

Congresswoman Mink's criticism of NASA was also covered in the press. She disputed the fact that PEACESAT was taking traffic which might otherwise be carried by commercial carriers, saying that "commercial domestic satellite development does not

36 Ibid.
37 Ibid.
reach into the Pacific". 38 Additionally, she criticised NASA's "inconsistency" in spending millions of dollars on the ATS-F experiments in the Rocky Mountain states and Alaska, while not supporting the modestly-financed PEACESAT venture. NASA's requirement to use ATS-1 as a back up to the ATS-F could be met without terminating PEACESAT, she said. Mink's letters to NASA also contained questions regarding NASA's approval of the USP's July request for ATS-1 time for its network and the fact that the USP network would be using satellite time which appeared to be so scarce. Implied in this enquiry was a strong criticism that NASA should seemingly approve a foreign institution's request while refusing that of Hawaii. This complaint was also aired in the Honolulu press. 39

Other relevant items that emerged from this period concern the relationship between PEACESAT and the interests of both the US and Hawaii State in the Pacific Islands. A Department of State telegram from Peter Coleman, Deputy High Commissioner in Saipan, TTPI, to NASA, dated July 30, 1973, said that the limited experience of the Saipan terminal has "clearly demonstrated [PEACESAT's] value in medical, educational and agricultural information exchange", and that extended use would be desirable to further explore its potential. This "would ---------

permit experimentation in vital areas of political education". Harlan Cleveland is quoted in one press report as saying that PEACESAT should be supported since "it is the most visible thing we're doing in the Pacific Islands". In the same report, he termed it a "difficulty" that the ATS-1 had not been able to reach Manila and Japan. 40 Editorials in the Honolulu Advertiser on two occasions expressed disappointment that the closure of PEACESAT would deal a harsh blow to "Hawaii's attempts to develop as the communications hub of the Pacific" and "the desire to make Hawaii a Pacific communications center". 41

3.5. The revised Report: October 1973

For reasons that are not known, Bystrom failed to prepare the revised report and proposal, as requested by NASA, by September 17, 1973. However, it seems that PEACESAT was allowed to continue on the basis of a promise from Bystrom that a proposal was on the way. A cable from NASA, dated September 17, apparently stated that PEACESAT could continue pending evaluation of the promised proposal. 42

At last, on October 19, NASA received from Bystrom a PEACESAT Continuation Proposal, Supplemental Evaluation Report

41 Honolulu Advertiser, August 16, 1973 and "Keep PEACESAT going", Honolulu Advertiser, April 2, 1974, as appears in PEACESAT News File.
42 The September 17 cable from NASA was not available; it is, however, referred to in a letter from Marsten to Bystrom, dated November 7, 1973.
and Press Kit. The Proposal included a request for 18-24 hours of satellite time per week, not including the USP network or a TTPI medical network which had been proposed. Bystrom's ten-page covering letter of October 11 answered point-by-point NASA's criticisms as expressed in Marsten's May 15 letter:

1. Bystrom pointed out that the combination of the report and request in 1973 followed the same pattern as his 1971 and 1972 reports and requests, and that his report had followed guidelines as published by NASA in February 1971. He said that the 1973 Report had been designed for a professional audience, documenting evidence that the originally articulated objectives had been achieved. "Following our original statement of objectives we included in each case the actions taken, as behavioural indicators, to confirm our assessment of achievement."

Regarding NASA's request for a report suitable for wide distribution, Bystrom enclosed a "kit of press materials". He pointed out that funding had been insufficient to produce materials for wide distribution and that press coverage had, in certain instances, not been regarded as advisable because of possible adverse effects on experiments.

2. Regarding NASA's requirement for descriptions of experiments and data collected from them, Bystrom again maintained that the reports of actions taken indicated the attainment of objectives (as above). Furthermore, he pointed out:
a. that the small number of terminals existing at that time made sampling difficult;

b. that the intention of adding terminals to PEACESAT had been to "broaden the experimental base": "trends figures produced to date have very limited validity; the utilization of the system for international exchanges has been for too short a period";

c. that the very nature of the PEACESAT experiment was "to avoid experiments which can be accomplished by conventional or existing telecommunications" but to determine whether workable systems were possible using the satellite; and

d. that, in summary, it was NASA's policy against the "proliferation" of ground terminals which was restricting the PEACESAT experiment to urban centres where conventional systems could be used, thereby reducing "experimentation at planned remote locations and lessen[ing] reliability of statistical trend data".

3. Regarding NASA's complaints of the absence of evidence of experiments, analyses of them and follow-through experiments, Bystrom maintained that Phases I and II of PEACESAT had been limited to establishing a "test bed" for future experiments. Attached to the letter were reports on 24 experiments, of which only 25% represented complete studies. A larger time span was required to complete
experiments and undertake evaluation.

4. Regarding time allotments on the satellite, Bystrom stated that Terminal Managers had collectively agreed to a request of 18 hours weekly, and that the USP and TTPI requests would be separate. Bystrom stressed the need for a commitment from NASA to allow operations beyond April 1974. Short-term commitments alone made it difficult to obtain funding, often forcing experiments to be brief and superficial: "the present uncertainty results in a gradual withdrawal of participation and contributes to adverse and invalid results".

5. Regarding NASA's phase-down of communications satellite work, and their demand that future proposals incorporate plans for the gradual provision of services by commercial sources, Bystrom replied that the PEACESAT experiments were indeed a type of market development, assessing present and future communications needs in less developed areas, and their commercial viability. This was not being done by private industry. Additionally, the PEACESAT experiment was an attempt to test out currently available technology in the provision of social services (education, health and community welfare). PEACESAT's present development plan was "testing the political, human and geographical environment to determine appropriate designs of effective new systems and the possibility that non-subsidised communications can
be sustained in the future by users".

Because the wide involvement of many organisations were necessary in this development, Bystrom continued by asking what support NASA was able to offer in the future in the following areas:

a. the allocation of suitable frequencies for international education;

b. the provision of resources and assistance in obtaining funding from private sources for communications planning in the Pacific. This was because "the PEACESAT Project has strongly favoured and sought to promote planning of communications for the US Pacific as proposed by the Office of Telecommunications Policy at meetings we have both attended";

c. the provision of funding from within NASA for "specific purposes such as evaluation, dissemination, technical development and planning".

Finally Bystrom asked NASA to clarify its relationship with PEACESAT, for "the attitude of administrative decision-makers here, stimulated by NASA statements and actions, is that the PEACESAT international education project is, in fact, pursuing goals which are contrary to NASA objectives and this accounts for the damping of future project development".
NASA acknowledged receipt of Bystrom's letter and enclosures on November 7, adding that Alan Cutting's proposal for the USP had been evaluated and approved. As a result, the time available for PEACESAT would be the Pacific allotment of 18 hours minus the USP's number of hours. As it happens, PEACESAT's schedule up until that time had been for 12 hours per week, and the USP allocation was for six hours, to begin in January 1974. Bystrom's revised proposal was then sent off by NASA for evaluation, on the basis of which a further allocation of satellite time would be made. In the meantime, PEACESAT was to continue as before.

3.6. NASA's evaluation

NASA's evaluation of the PEACESAT proposal was to be made by "a number of telecommunications specialists in the disciplines of education, medicine, and teleconferencing/networking". Evaluations available to the author were from Dr. Harold Wooster, Chief, Research and Development at the Lister Hill National Centre for Biomedical Communications (LHNCBC); Dr. Albert Feiner, Director of the LHNCBC; Frank Norwood, Executive Secretary of the Joint Council on Educational Telecommunications; and Dr. Delbert D. Smith. A detailed account of these evaluations (particularly those of

------------------

43 Letter from Gerald D. Griffin, Assistant Administrator for Legislative Affairs, NASA, to Dr. Eiler Ravnholdt, Administrative Assistant to Senator Inouye, March 11, 1974.
Norwood and Smith) are presented in Chapter Eight. What follows is a brief overview of their major conclusions.

Both Wooster and Norwood commented on the extraordinary volume of the material: the substitution of "massive accumulation of detail of fact, past, present and future, such that cohesion and discipline are totally overwhelmed ... My criticism of the original evaluation report and proposal was not that it was too short but that it was too diverse, and the problem is hardly solved by additional pounds of paper".  

Feiner's comments were restricted to the contents of a covering letter to Wooster's evaluation. They were confined to pointing out that the proposal for a TTPI medical network, for which Bystrom was requesting satellite time, would not be funded by Lister Hill. In any case, Feiner recommended that the time required for such medical consultations was unrealistic: where Bystrom was requesting "four to six hours per day for six to seven days a week ... [which] ... may or may not have been cut back to seven to ten hours a week" 45, Feiner maintained that three hours per week would be adequate.

Most significantly, Wooster, Norwood and Smith all basically agreed that both Bystrom's report of past PEACESAT activities and the proposal for future use failed on almost all

counts to satisfy NASA criteria. Summarizing, Smith wrote:

"the critical factors in this continuation proposal would be evidence of (1) sound experiment design, (2) intentions to refine reporting techniques - including evaluation, and (3) a developmental plan for incorporating commercial sources into the provisions of communications. On all three points convincing evidence is not present."

Despite this unanimous conclusion, however, Smith qualifies his remarks by saying that, on the whole, "the PEACESAT system is undoubtedly of social worth". Norwood makes similar remarks, concluding that the project "deserves further encouragement ... [and] assistance more than it needs condemnation and literary criticism". An internal NASA memorandum from Marsten probably summed up NASA's final position quite well: "I would opt for no more continuation unless he can be helped and accepts it".

Unfortunately, documentation beyond this date was largely unavailable. One document that was on hand was identified only as "Attachment 2" of the September 1973 proposal. It listed a total of 74 proposed studies in five broad categories: user applications, user networks, equipment development and performance, system design and operating effectiveness, and requirements for satellite communication. It seems from handwritten notes attached to this document that a total of 33 of these were accepted by NASA. This despite the proposal evaluators' criticisms that PEACESAT evaluations were inadequate and that Bystrom's proposed studies were far too numerous to
enable improved evaluations to be made in the future. In some cases, such as the proposed medical network for the Trust Territory, the receipt of adequate financing was defined as a pre-condition of acceptance.

During the Rocky Mountain experiments, PEACESAT time was cut to 4.5 hours a week and on occasion was less. Scheduling was apparently difficult to predict. Since PEACESAT has continued up to the present and has, moreover, expanded over the years both in terms of the number of satellite hours used and the number of ground stations in operation, it would appear that arrangements satisfactory to the different institutions and individuals involved were finally agreed upon. PEACESAT continued through April 1974, by which time it must be assumed that the demands to use ATS-1 in conjunction with ATS-6, for PEACESAT, and for other purposes, were in some way all accommodated.

46 For example, Norwood, page 2: "This proposal, if approved, would not only greatly exceed the number of satellite hours available but would require funding and staff of enormous proportions... [it] evidences an undesirable emphasis on how many things might be done rather than on how well a few well-chosen areas could be explored."

47 Author unknown, PEACESAT Extended Experiment, Attachment B: The Communication Satellite Component, (Source unknown, January 15, 1976)
VII. FURTHER EXPANSION, 1973-1978

1.0. Planned expansion, 1973

The last ground station to have been added to the PEACESAT system before the 1973 crisis had been the one at Saipan in the Trust Territory. That had made a total of nine terminals in the system, including the Hilo and Maui terminals also in Hawaii.

Bystrom's April 1973 Report to NASA made a strong case for the addition of several additional international terminals as well as another Hawaii terminal. The additional Hawaii terminal was to be located at Kauai, thereby completing coverage of the four major Hawaiian islands. Terminals at the Cook Islands and Tarawa in the Gilbert Islands were requested in order to make possible "a genuine test of a regional network currently involving the University of the South Pacific and Kingdom of Tonga." The upgrading of the Lae terminal was proposed, in order to "make feasible the already agreed upon link with Port Moresby via Post and Telegraph lines". Particular reference was made to the proposed addition of the University of New South


2 Ibid, p. 77.
Wales (UNSW) in Australia. The UNSW would represent another large university, second to the UH, providing a much desired exchange facility between scholars, especially since other Australian universities could then be linked into the system via the common carriers. Furthermore, added Bystrom, this would make the UH "less susceptible to the 'big brother' label or the charge of 'cultural imperialism'". 3

Regarding the TTPI, immediate approvals were requested from NASA for the addition of terminals at Saipan and Truk (the request was presumably written before Saipan actually joined PEACESAT in April, 1973.). The immediate need for this was that the renewal of Bystrom's contract with the National Library of Medicine was claimed to be "dependent on prior test of medical diagnostic consultation between the TT and Hawaii". 4 Approval of other terminals at other TTPI locations was requested for Majuro, Palau, Ponape (Kolonia), Ponape (Kusaie) and Yap, and a request was also made for a terminal on the island of Guam, also in the Marianas chain, but politically a part of the US. As justification for these additions, Bystrom stated that:

"at the risk of oversimplication, the US goal in Micronesia has been to encourage the development of a permanent association with the United States. Critical reports have been issued by the UN and the Micronesians themselves have also been critical of the US Administration. Micronesian and US delegations have been meeting in an attempt to reach an agreement on permanent arrangements for the area. Whatever comes of these

3 Ibid, p. 84.
4 Ibid, p. 75.
talks, the US will remain largely responsible for the social and economic well-being of the islanders for the foreseeable future".

In addition, Bystrom quoted Interior Secretary Rogers Morton who, in mid-1971, had defined US policy for the TTPI in the following way:

"The main point is to develop the economic and social structure through the development of education and health so there can be a viable act of self-determination. We cannot expect people to make a viable act unless they have the alternatives available".

Good telecommunications, added Bystrom, was essential to the development of health and education - and thus the rationale for extending PEACESAT in that area.

The dispute with NASA suspended Bystrom’s plans for the extension of PEACESAT for the remainder of 1973.

2.0. International expansion

2.1. Pacific Island terminals

In view of the 1973 crisis, which appeared not to be formally resolved by the end of the year (NASA received Norwood’s evaluation of the PEACESAT proposal on January 10, 1974, for example), it is a little surprising that additional terminals were added to PEACESAT early in 1974.

---

5 Ibid, p. 86.
6 Ibid, p. 87.
The South Pacific Commission (SPC) headquarters at Noumea in New Caledonia inaugurated its terminal on January 10, 1974. Frank Mahoney, Acting Secretary-General of the SPC, had written to NASA requesting approval to join PEACESAT in November, 1973:

"Because the South Pacific Commission is deeply and extensively involved in educational activities in the Pacific region, and inasmuch as the South Pacific Health Service and its Epidemiology Unit is now located here in Noumea at SPC headquarters, we believe we can make a very positive contribution to the educational and epidemiological application of the PEACESAT network." 7

Katashi Nose was again involved in the establishment of the terminal.

One month later, in February, 1974, a terminal at Rarotonga in the Cook Islands was formally opened under the direction of Stuart Kingan. A New Zealander by birth, Kingan had worked in the Pacific during World War II, carrying out ionospheric sounding for the New Zealand Scientific and Industrial Research Department. 8 Having settled in Rarotonga he had been heavily involved in amateur radio, and had also participated in medical and scientific work. For example, in 1967 he had collaborated with the Stanford Research Institute in California on an experiment studying VHF transequatorial radio propagation between Rarotonga and the Hawaiian islands. An extension of this

8 Stuart G. Kingan, Communications as an Aid to Research in the Pacific (Rorotonga, Cook Islands: Premier's department, undated), p. 2.
experiment lasted for over nine years. He had also used amateur radio to collect and summarize auroral sightings from high altitude bomb tests in 1962.\textsuperscript{9}

It was towards the end of 1972 that Katashi Nose, in a conversation via amateur radio, had invited Kingan to participate in the PEACESAT experiment. The next year, the Cook Islands' Director of Education visited Hawaii and was shown the PEACESAT system in operation. Kingan then set up a receiver in Rarotonga and demonstrated the system to the Minister of Education and other officials of the Cook Islands government. A licence was obtained from the local authorities, but by October 1972, no transmitter was available.

Kíngan improved his reception capability in Rarotonga in order to participate in Operation "Picaposte", conducted by the Los Alamos laboratory of the University of California. This experiment involved the release of barium ions from high altitude rockets in order to "paint" the Earth's magnetic field. Countdown and communications for the experiment were to be conducted via ATS-1, and Kingan's role was to advise radio photographers when to photograph the sky.\textsuperscript{10} Two weeks before the firings, Rarotonga was asked to transmit, and within ten days a transmitter had been fabricated from spare parts.

Having thus been already operational on the ATS-1

\textsuperscript{9}\textsuperscript{Ibid, pp. 3 and 4.}
\textsuperscript{10}\textsuperscript{Kingan, Report on PEACESAT and other networks, p. 2.}
satellite, Rarotonga was an obvious candidate for entry into PEACESAT. However, it was not until the end of 1973 that clearance was obtained for the terminal. As part of the USP region, the Rarotonga terminal, although established independently, was later used as one of the USP extension centre terminals in addition to its operations with PEACESAT.

The USP proposal to NASA of July 1973 proposed ten ground stations. Additional funding from the Carnegie Corporation was obtained to this end, as well as funds granted by UNDP/UNESCO for the construction of four terminals. In April, 1974, first transmissions by local education officials were made from the small island of Niue even before a USP terminal had been established in the Department of Education. August and October of 1974 saw further terminals established at USP centres in Honiara, Solomon Islands, and in Tarawa, in the Gilbert Islands. Also in 1974, another terminal was apparently successfully established in Port Moresby, capital of Papua New Guinea. This was at the PNG National Broadcasting Commission. In July, 1975 the New Hebrides joined the network, with a terminal at Kawenu College in Port Vila. Apia, in Western Samoa, established their USP centre terminal in mid-1976, and the terminal at Funafuti in Tuvalu, was the last USP Centre location to be set up, in

---

11 Ibid, p. 2.
mid-1978. Two other terminals planned for USP centres in Labasa, Fiji, and in the Republic of Nauru, were not approved by the local licencing authorities. By this time, due to the UH's inability to continue funding the project, PEACESAT terminals on Hilo and Maui had been closed down, limiting Hawaii's participation to the Manoa campus terminal.

2.2. The University of California Santa Cruz, and Vancouver

Up until this stage, the only 'metropolitan' terminal in the PEACESAT system - aside from at Honolulu - was at Wellington. Difficulties with the Australian regulatory authorities had prevented that country's participation in the project.

The ground station at the University of California, Santa Cruz (UCSC) was therefore an addition of a different kind to the PEACESAT system. Negotiated and planned during the latter half of 1976, the terminal began formal operation on January 25, 1977. The man responsible for its establishment was the Director of the Center for South Pacific Studies, Dr. Bryan Farrell. Farrell, a New Zealander by birth, was a geographer and had previously worked at the University of Victoria, in British Columbia, Canada. The terminal was set up within the Center, at Merrill College, UCSC. Through phone-patch arrangements utilising toll-free lines available to the many University of California campuses, as well as to other US mainland locations,
the UCSC terminal held great potential. Its objectives included assisting the overall PEACESAT goal of "providing valuable experience in the use of long distance transmission" including "studying the applications of communications satellites in meeting the social requirements of remote areas with limited industrialization". Additionally, PEACESAT was to "enrich teaching and research at UCSC and UC systemwide with regard to the Pacific region" and "to achieve an outreach program of high quality by involving representatives of Santa Cruz and other local communities, from a wide range of interest and ethnic groups, in the cross-cultural use of the PEACESAT international network".13

Preparations for participation at Santa Cruz included the visit to Hawaii of the Terminal Manager, DiAnne Reid-Ross, in November 1976. Amongst other things, she discussed possible joint projects. The outcome of this was a proposal entitled "The Demonstration of a Wide-area, Multi-media, Narrow Band Telecommunications System for Health, Education and Social Services" to the Telecommunications Demonstration Program in the US Department of Health, Education and Welfare. The proposal listed Bystrom, Callison, Farrell and Russell Journigan, State Director of Vocational Education at the American Samoa Community

13 DiAnne Reid-Ross, Program Evaluation of the Santa Cruz PEACESAT Terminal for the period September 1, 1976 through June 30, 1977 (Santa Cruz: Center for South Pacific Studies, UCSC, October 1977), pp. 5 and 6.
College, as Principal Investigators. It proposed the demonstration of multimedia packages, including teletype, facsimile and slow-scan TV equipment at US Pacific locations, and requested a total of $76,500 Federal assistance. It appears that funding for the proposal was not forthcoming.

The addition of Santa Cruz to PEACESAT consolidated the system in two important ways. First, it added another location to the list, one which was, moreover, fully staffed. (Many of the Pacific Island terminals, although nominally participating in both the PEACESAT and USP networks, were staffed only on the basis of USP Centre funding; the effect of this was to limit participation in PEACESAT to a negligible number of hours per week in some cases.) Secondly, it provided a broader and more credible base upon which to attempt to build the system further. The above multi-media proposal is an example of the latter.

The idea of incorporating Canada into PEACESAT was basically for similar reasons. Tony Hanley had been strongly supportive of including Canada as another Commonwealth country, and had made "impassioned pleas" to this end. Again, the main motive behind this was to broaden the international base, with the more particular intention of attracting funding from alternative sources. Although it seemed that the University of

15 Interview with John Bystrom, January 6, 1979.
British Columbia was the preferred location for a PEACESAT terminal, it happened that, largely by chance, Vancouver's second university - Simon Fraser University (SFU) - emerged as the most likely candidate.

Theoretically, Canada was an obvious choice for participation in PEACESAT. Possessing a small, widely dispersed population scattered over a large and often inhospitable area, Canada's concern to overcome communications problems had led to its early involvement in communications technology development, and especially in the use of satellites. Two professors in the Department of Communication Studies at SFU - Pat Hindley and Gail Martin - had been particularly involved with rural communications. They had assisted in the establishment of the RAVEN network, which linked isolated West coast Indian villages together by means of a single side-band system. A similar project that they were developing in the Cook Islands led to their interest in PEACESAT, and after meetings with Bystrom in spring of 1975 and 1976, an invitation was made to construct a PEACESAT station at SFU. By the summer of 1978, initial testing of the Vancouver terminal was undertaken. In September of the same year, operations began on a provisional basis, there being difficulties with the location of the terminal and the allocation of sufficient funding for its continued operation. At the time of writing, its future was not certain.
By April 1979, the entry of UNSW at Sydney again seemed imminent with work actively under way to construct a terminal. It was also possible that the Australian government would finance the construction of a terminal at the Australian National University at Canberra. This was apparently designed mainly to be of use in the event of medical emergencies in the Pacific, such as the cholera epidemic in the Gilbert Islands during 1978, but would also be open to other users.

3.0. The controversy between PEACESAT and the USP

The expansion of the system had not been as smooth as the above characterisation perhaps conveys. Ironically enough it was PEACESAT's relationships with the University of the South Pacific and with Fiji's licencing authorities -- both key institutions as regards PEACESAT -- that disturbed progress.

In 1974, after what the USP officially describes as "a most successful period with the early programme", the USP established its own network by arrangement with NASA.\(^\text{16}\) Presumably this development was of great relief to the Fiji licencing authorities who apparently held "strong reservations" concerning PEACESAT's operations, particularly concerning its "loose objectives". By contrast, the University's formulation of a

\(^{16}\) USP Extension Services, A Submission for a Satellite Communications Project, 1979-1980, Presented to the Agency for International Development (AID) and the National Aeronautics and Space Administration (NASA), Vol.1, (Suva: USP Extension Services, June 1978), p.3.
four-part experiment related directly to its own educational objectives and regional responsibilities to the Island governments, "was viewed by the Fiji authorities very favourably". The Vice Chancellor of the USP describes the University's relationship and obligations to the Fiji authorities in the following way:

"On our part we undertook to hold our experiments firmly within the institutional framework of the regional university; but we also pointed out that continued PEACESAT membership had value for both the region and institution. If the Fiji authorities could be informed precisely of our month-by-month involvement with this Pacific-wide system, and if we undertook to make sure that the PEACESAT programs were firmly part of our Regional and University activities, and that we did not transgress normal telecommunications policy, we were permitted to continue our involvement with PEACESAT. In other words, the fully approved University uses of the system (tutoring, course work, curriculum development, university administration) could be extended to PEACESAT (and other multi-system links) where this was useful, but only with specific permission ... from 1974 our submissions to NASA have therefore specifically listed six experimental uses - four USP Net experiments; PEACESAT; other multi-system links."18

Specifically excluded from the terms of the Fiji licence, therefore, were point-to-point exchanges between Fiji and the US or New Zealand.

The establishment of the USP Net therefore had two effects. Firstly, the more specifically outlined objectives of the USP Net seem to have appealed to the local Pacific Island licencing

17 Letter from James A. Maraj, Vice Chancellor, USP, to Richard J. H. Barnes, Director, International Planning & Programs, Office of International Affairs, NASA, September 26, 1977, p. 2
18 Ibid.
authorities. Secondly, the USP - as a regional institution - became responsible for the Pacific Island terminals within its own network. This, in turn, meant not only that funds were directed to these smaller terminals (which otherwise would not have possessed the necessary financial resources to establish or maintain operations), but also that the USP became responsible for the licencing of its terminals.

In terms of the relationship of Pacific Island terminals to PEACESAT, the establishment of the USP Net meant, on the positive side, that under-financed terminals were now more secure than previously, and on the negative side, that priority went to the USP Net over PEACESAT operations. Maraj describes the relationship of the countries of the USP region to PEACESAT as "interfac[ing] with the PEACESAT Project through our network of University Centres and Agencies". The one exception was the Cook Islands terminal at Rarotonga where, by memorandum of agreement with the Cooks' government, Rarotonga possesses separate membership of PEACESAT.

Despite the new arrangement brought about by the addition of the USP Net, it appears that Bystrom persisted in viewing the Pacific Island terminals as separate, independent entities. Furthermore, he held that they were accountable to PEACESAT headquarters in Honolulu. In fact, what seems to have been in conflict here were the broad objectives of PEACESAT and the USP, and the question of Pacific terminals' allegiance to the one or
the other.

In practice what emerged was a dispute purportedly over the licencing of a number of island terminals. In March 1977, Bystrom requested "evidence of licensed operations, or that operations are recognised as a responsibility of the institution ...", and in April the matter was discussed at a Consortium Council meeting, where the University made a detailed statement of its broad objectives and the particular issue in question. A week later, and with no prior consultation with the USP, Bystrom unilaterally terminated the operations of the Honiara, Apia and Tarawa terminals.\footnote{Ibid.} At a further Consortium Council meeting in June 1977, representatives of the USP again clarified the University's position that it recognised no obligation to provide licencing information to the PEACESAT Director but was willing, nevertheless, to provide "a formal statement clarifying the licence particulars if this will serve any purpose".\footnote{Statement by Ian Honeyman, USP, to Consortium Meeting, June 17, 1977 (attached to Maraj's letter to Barnes).} A Consortium Council motion was passed later in the same meeting reinstating the three terminals in question. Surprisingly, however, participation in PEACESAT exchanges by these three terminals was still blocked by Honolulu following the Consortium Council meeting.

Presumably the conflict was resolved in the weeks that followed, although no documentation to this effect was available.\footnote{Ibid.}
to the author. Bystrom’s actions can at least be partly explained by a document entitled "Hanley motion: Background Report" written by Bystrom as Consortium Council Executive Secretary and dated July 30, 1977. The focus of this paper is upon the strategy required in order for the PEACESAT system to become a global system. Its main target is upon the perceived need for "standard behaviour". Bystrom expresses concern that participating institutions should cooperate fully and in a responsible fashion with local licencing authorities, or run the risk of "international concern" and the "rejection of the small low-cost terminal concept by international authorities". Similarly, the paper stresses the need for reliable performance and operation of equipment, especially the capacity for transmission. Bystrom refers to the legal form of the Consortium Council and the need to enforce more standardised behaviour, adding that "our problems thus far in obtaining standard behaviour are arguments for a more responsible system" - presumably meaning "a firm legal alliance of participating user institutions".

In more direct language, what appears to have been at issue in this incident is the fact that Honolulu did not trust the USP to make the necessary arrangements with local licencing authorities; in turn, fearing that such possible ‘irresponsible behaviour’ might damage the longer-term attempts to establish a global system, Bystrom wanted to impose a centralised authority
upon the system as a whole (including the USP Net) by means of a revised Consortium Council in the form of a "legal alliance".

4.0. The Extended Experiment

4.1. The proposal

From the time of the initial proposal to NASA up until the present, Bystrom has always cherished the idea of a global satellite communications network of small, low-cost ground stations. In the initial 1969 proposal, this was described as "an international experimental park or intercontinental laboratory for the application of telecommunications systems". Later proposals tended to play down this notion, presumably as a reaction to NASA coolness concerning the "proliferation" of terminals. The global network has, however, always been present in Bystrom's thinking as the primary objective, whether stated or unstated. In fact, in the early years of the development of PEACESAT, Bystrom admits that he felt obliged not to divulge his overall plans:

"for much of the early period, I didn't feel it was appropriate to articulate the total idea since that could arouse opposition on the one hand, and could be thought of as rather ambitious by people who couldn't see it perhaps as a contribution in light of their own experience".

---

22 Interview with Bystrom, January 12, 1979.
Once the project had gained a sure footing, however, and additional supporters of a global network, the "Extended Experiment" concept could be publicised. The addition of Tony Hanley to the project was crucial in this regard, as was the creation in March, 1973, of the PEACESAT Consortium Council. The Consortium Council's objectives, although based on the experience of experimentation in the Pacific region, were sufficiently general to encompass such a global concept. Its principal objective was "the improvement of communications for health, education and community services". The PEACESAT Consortium was envisaged to be the major policy-making body for the extended system.

The plan for the Extended Experiment was to launch another one or two geostationary satellites to extend the range of the project into Asia, and possibly Africa and South America. The launching of one satellite - the most likely possibility - would mean that, if located at 130 degrees East, it would cover an area between 55 degrees East and 150 degrees West, or between

23 Misko, Attachment D: International PEACESAT Consortium Information.
24 Author unknown, PEACESAT Extended Experiment, (no publisher indicated, undated). Further references to the Extended Experiment, unless otherwise stated, are from this single-sheet document, or from two others which are similarly poorly identified: PEACESAT Extended Experiment Data Sheet (no author, publisher or date specified), and Attachment B: The Communication Satellite Component (no author or publisher specified, dated January 15, 1976). The former is believed to have originated from the PEACESAT headquarters in Honolulu, the latter is believed to have been authored by Tony Hanley or John Bystrom.
Teheran and Hawaii. This was the major proposal. A second satellite located at five degrees West would enable coverage of the area between 75 degrees East and 85 degrees West. Coverage of North America would be possible using existing common carriers. The system would provide similar narrow-band communication capability to the PEACESAT system using multi-point teleconferencing and other media, with the difference that the satellite(s) would be designed to carry fifty or 100 channels.

One of the reasons why this proposal was not so wildly ambitious as it might appear to have been is that it envisaged the redesign and use of a partly completed satellite. The ATS-F Prime satellite, designed to be the next in NASA's ATS series after the ATS-6, had been about ninety percent completed when President Nixon had announced the phasing down of communication satellites in January 1973, to avoid competition with domestic private carriers.25 It had cost $20 million at that stage, and required the expenditure of approximately another $5 million to complete it according to its original design. An embarassment to NASA, they were required to dispose of the satellite by May 30, 1976. Bystrom planned to have the satellite designed for two-way narrow-band communication to low-cost terminals. Negotiations with the Fairchild Space and Electronics Corporation - the

original manufacturers - had led to an estimate of $11 - 15 million for the modifications. An Air Force Titan III C rocket, costing $30 million (and already available) would launch the satellite, and NASA would be contracted to control it for seven years at a cost of $0.5 million.

Despite the high costs involved, Bystrom argued persuasively that the PEACESAT proposal was the most attractive to the various agencies of the US government. Compared to other proposals, Bystrom estimated that the Extended Experiment costs would be lower than others. In this connection, PEACESAT was the only project to have "operated thus far without Federal funds and visualizes support of future system operation primarily from non-Federal sources". Furthermore, added the proposal of January 15, 1976, there were good reasons why NASA and the Air Force should support the PEACESAT proposal. NASA it was said, "would not lose control of the satellite and could continue to retain hope for their Communication Applications Program now being phased out". This was surely an interesting twist to relations between NASA and PEACESAT, considering the events of 1973. On this occasion, Bystrom appears to have been making PEACESAT out to be a means of salvation for NASA!

A final interesting factor is the appeal, once again, to foreign policy and defence interests of the US as a rationale for supporting PEACESAT:

"The geographical area covered in the extended
experiment is the most important in the world from the standpoint of Defense. The Departments of State, Defense and Interior could be attracted by the development of closer bounds [sic] among the peoples of the area, potential contributors to social stability and environmental understanding and experiments in the use of mobile communication in sparsely populated areas."

Given this overtly defence-oriented statement, it is a harsh irony, twelve lines later, to read in the conclusion to the proposal that:

"it can make a fundamental contribution to the solution of world social problems by improving health, education, and community development programs while opening new markets for communication".
VIII. INFORMATION, EVALUATION & CRITICISM

The purpose of this chapter is to review briefly existing information on PEACESAT in an attempt to determine the type and scope of this information, its major sources, and what effect it might have had on public opinion (both lay and academic) concerning the project. Three types of information will be considered:

1. published material in the press, and other published articles (both academic and non-academic);
2. evaluations of the project; and
3. criticism - largely internal and/or unpublished - of the project.

1.0. Publications on PEACESAT

1.1. The press

Considering information published in the daily press first of all, it is evident that there has been coverage of PEACESAT in an impressively wide variety of newspapers. These, for example, range from the Tonga Chronicle and La Depeche de Tahiti to the New York Times. A PEACESAT publication entitled The PEACESAT News File, 1970-1975, for example, contains 36 press articles from Hawaiian newspapers, 10 from US newspapers, and 26
from other newspapers (a total of 72 articles). All of these press items are concerned either with:

1. a description of the PEACESAT system, often focussing on its novelty and largely concerned with technical data (the number and location of the terminals, the history and details of the satellite, the quality of the voice signal, the low cost of the equipment, etc.); or

2. in later press coverage, reviews of the system focussing on a new application of the system (e.g. the transmission of x-rays and electro-cardiograms), or a novel exchange (e.g. a trans-Pacific, first-time library exchange), or — in the case of Hawaii — coverage of political manoeuvres concerning PEACESAT (e.g. the NASA-PEACESAT dispute in 1973).

As one would expect, none of these press articles concern themselves with any in-depth analysis of PEACESAT; they simply describe the system and/or particular items or events. The sources upon which such articles are based are almost exclusively PEACESAT personnel. John Bystrom is frequently quoted, as are local Terminal Managers who have played a major part in promoting the project (e.g. Tony Hanley in New Zealand, Steve Seumahu in Papua New Guinea). For instance, Bystrom alone is quoted in three of the US newspaper articles, 16 of the Hawaii newspapers, and six of the others: i.e. in more than one third of the articles in the News File. Without exception, newspaper coverage has been weighted in favour of PEACESAT; in
the case of the Honolulu press, editorial comment has even been used to campaign on behalf of the project (e.g. The Honolulu Advertiser, August 16, 1973; Honolulu Advertiser, July 17, 1974).

1.2. Published papers

Considering next papers published in magazines, academic journals and those presented at conferences, two broad categories can be discerned:

1. those authored by people intimately associated with the project; and

2. those authored by people not directly related to the project.

Within the first category fall the official PEACESAT reports (a total of three), and — primarily — articles by John Bystrom, Anthony Hanley and Stuart Kingan (from PEACESAT terminals at Honolulu, Wellington and Rarotonga respectively).

Three reports, published by the PEACESAT Project headquarters in Honolulu, in October and November 1975, provide a large amount of information on the early experiments. The reports, it is stated in the introduction to Report One, are "intended to stimulate the interest of specialists, administrators and government officials. We hope to provide an insight into the potential social benefits provided by a low-cost ground terminal system of the type used in the PEACESAT
The material in the reports consists primarily of descriptive information on the system (its history and potential) and on a wide range of different exchanges, and of reports by a variety of Terminal Managers and users. Included in the latter were evaluative statements, most being subjective in character. Users invariably reported that initial experiments were enthusiastically undertaken and successful; often they added that technical problems (e.g. noise and interference) were obstacles to complete success, or that attendance tended to decline after a number of sessions, but that useful experience had been gained for the future. The system seemed to be particularly useful for administrative tasks (by the USP, for example) and for rapid communications in times of emergency (e.g. the controlling of epidemics), and was reported to be of substantial use for instructional purposes (e.g. the USP Land Tenure course). Overall, the reports present a large amount of predominantly descriptive and/or anecdotal information, and while much of this is redundant, it has the effect of portraying PEACESAT as a dynamic, exciting and essential operation, albeit with some problems that still need to be ironed out.

Of the publications authored by people directly associated with the project, the most numerous are by John Bystrom (a total of eight). These range from specialist studies (e.g. PEACESAT Report One.  

1
Telecommunications Networks for Libraries and Information Systems: Approaches to Development, 1972; and Pacific Satellite Health Information Study, 1974), through conference papers (e.g. PEACESAT: A Report to the International Communication Association, 1972) to articles in more popular periodicals (e.g. Satellite Communications for Social Development, in Educational Broadcasting, March 1976). The specialist studies are directly related to PEACESAT and, in fact, were written under contract to certain agencies (e.g. the US National Institute of Health), the purpose having been to promote the use of a PEACESAT-like system for library or health information networking. The articles and papers are almost wholly descriptive, and often include proposed developments of the system (e.g. the 'Extended Experiment' concept, including cost calculations, etc.). Frequent assertions are made as to the value of the PEACESAT experience and its desirability as a model for future systems. One passage from an article in "World Health", the magazine of the World Health Organisation (January, 1978) will suffice as an example;

"The PEACESAT Project demonstrates a system that, side by side with existing telecommunications, can meet many of the basic requirements for world development, and can do it within five years".

Papers by Kingan, Hanley and Seumahu (five by Kingan, two by Hanley and three by Seumahu) tend to reflect the authors' primary interests in the technical. When not doing so, their contributions are also largely descriptive, although Kingan has
at times attempted to provide some evidence in support of his praise of the system and his advocacy that such a system ("a service in which educational, medical, research and social development institutions can freely use parts of the electro-magnetic spectrum for both terrestrial and space communications") should be provided in the Pacific in the future. For example, Kingan states that "300 people, nearly 4% of the population of Rarotonga, participate in PEACESAT sessions annually, most in three or four sessions", and that University teaching via the satellite has achieved impressive results:

"Last year one 15 week class which started with 12 students and in which attendance at satellite sessions was required, ended with no dropouts and all 12 succeeded in passing the examination. This contrasted with normal correspondence classes in which the dropout rate was always high—less than one third normally completing the course".3

While such an example implicitly acknowledges the need for 'hard' data in the analysis of PEACESAT, this represents the only attempt to provide statistical evidence in support of PEACESAT.

Other papers by people directly associated with the project are as follows:

Callison, George T., "PEACESAT—Satellite Communication Experiment—nears 4th Anniversary in TT", in Highlights, (Office of the High Commissioner, Saipan, TTPI:

3 Kingan, Report on PEACESAT and other Networks, p.4.
February 15, 1977) and "PEACESAT: Communications by Satellite for Micronesia" in Micronesian Reporter, Fourth Quarter, 1974, Vol.XXII, No.4 (Public Information Division, Department of Public Affairs, Saipan, TTPI); Kimble, Martin,Missionary Efforts in Sharing Knowledge - the ordinary person's satellite: A Review of PEACESAT, The Ralph Slade Memorial Lecture, NELCON Conference, Wellington, New Zealand, August 1977; McMahon, James P., Pacific Library Conferences; Misko, Carol, First Year User Demonstrations; Oka, Beverley Jean, Biomedical Transmission Tests. (The papers by McMahon, Misko and Oka are all part of a study undertaken for the Lister Hill National Center for Biomedical Communication as part of a contract, with Bystrom as Principal Investigator. They are primarily descriptive, McMahon's paper, for example, mainly comprising transcripts of satellite exchanges.) These papers, too, are mostly descriptive and at times exhort support for the project despite an absence of evidence as to why this should be so.

The one exception to this general trend is a paper by Tonga's one-time Terminal Manager, Margaret Blundell, "Satellite Conferences in the Pacific Islands", published in Pacific Perspective (Vol. 5, No. 1, 1976). Unlike any other published material on PEACESAT, this paper deliberately weighs the positive and negative aspects of the system, and does it from
the perspective of the "small place user of satellite communication". In the first paragraph, Blundell complains of people in Tonga sometimes "losing a whole afternoon to PEACESAT to little effect" and urges users to question what the system should be used for. She continues:

"Are we making communication between remote places easier? The answer is yes. Another question takes on a gloomier shape. Is PEACESAT to help big places to pontificate and dominate over smaller places? Sometimes, alas, the answer is yes. Are we sharing ideas between places with shared problems? Sometimes yes, sometimes no ... Is there cultural sharing with fellow Polynesians and Melanesians? Sometimes, but not often enough."

Blundell points out that the machine-mediation of the system and the impersonality of slowed-up conversation tends to make some people shy, especially those brought up to accept, not to discuss, and those for whom English is a second language: "I do not think enough of the people from the industrialised countries on the network take these things into account". Additionally, she complains of thoughtless chairmanship which has been over-dominating or over time-conscious, and exchanges that have been "too much oriented to American problems". At the same time, Blundell cites examples where exchanges have been very successful, by being used sensitively. The most useful application of the system, she maintains, would be in conferencing (by saving time and money in expensive air-fares), including inter-governmental use. In conclusion, Blundell summarises Tonga's conception of the project:
"We value the connection with larger places, but the network will be infinitely more valuable when it is doing something for Niuafo'ou, Tokelau and islands of the Lau group, Pitcairn and even Easter whose isolation is far greater than ours in Nuku'alofa, and any more proliferation for experiment [sic] should perhaps be in those directions rather than larger cities of the industrialised Pacific borderlands."

Blundell's paper also lacks empirical evidence, but it is at least written from the point of view of the small Pacific Islands.

Considering those publications authored by people not directly associated with the project, the single most striking thing to note is that the information on which the articles are based is drawn exclusively from Bystrom and/or PEACESAT headquarters. Examples here are papers by D.G. Hawkridge of the Institute of Educational Technology, Open University, England, and Frank W. Norwood of the U.S. Joint Council on Educational Telecommunications which both review educational communications satellite experiments, devoting only a small space in each case to a description of PEACESAT. A paper by Sarah Anderson King and Richard A. Sanderson - of the UH - describes a course on "communication and the futures" conducted via PEACESAT.

A paper by Jim Richstad of the East West Center's Communications Institute (Honolulu), entitled "PEACESAT: Sharing by Satellite" (Conference on Communication in the Pacific, Honolulu, May 1975) draws heavily from Bystrom, again is primarily concerned to simply describe the project, and again
tends to make assertions such as "The five year PEACESAT demonstration has clearly shown the need for such a social communication system in the Pacific Islands". A further quotation shows how Richstad, like Bystrom, has a propensity to make statements that appear to be substantiated conclusions but which actually beg the questions they raise. Richstad describes existing communication in the Pacific as being slow and primarily concerned with economic information, and also:

"Communication tends to flow in and out and across the Pacific, but not much among the Pacific Islands. The PEACESAT system ... provides a means for social communication among the Pacific Islands at a cost and technological level compatible with island cultures".

The critical question regarding PEACESAT is, precisely, what kind of communication goes on over the system and between whom; the fact of its being a "means" is not in dispute. In addition, Richstad unquestioningly exemplifies the 'free flow of information' and/or 'right to communicate' perspective by implying, for instance, that more communication, of whatever kind, is to be encouraged, a position also frequently adopted by Bystrom. 4

A final article in this section appears in the influential British monthly, "The New Internationalist". In an introductory explication of the TCDC (Technical Co-operation Among Developing

---

Countries) movement, the author refers to the concept as "potentially a two-way process of teaching and learning among equal partners based on mutual problems rather than a one-way flow based on the concept that all progress must come from the Northern industrialised world". He continues: "But TCDC is not only an abstract concept. It is already happening ...", and he cites PEACESAT as a working example of co-operation in the Pacific.  

2.0. Evaluations

No evaluations exist which deal specifically with the question of the performance of PEACESAT in relation to Pacific Island users. What evaluations there are focus either on technical matters, on user attitudes to the system, or on particular exchanges or on an exchange series. The evaluations concerning technical matters and particular exchanges include nothing about overall users of the system. Those concerning user attitudes and such like in fact deal almost exclusively with technical matters of a different order. For example, Carol Misko (for a long time Honolulu's Terminal Manager) and William Pape,  

in a study entitled "User attitudes towards PEACESAT" (Honolulu, undated) were concerned with the differences in dialects and accents and their effect on understanding, the organisation of discussions and procedural matters, etc.. Likewise, Carol Misko and Beverley Jean Oka in a study of (PEACESAT) First Year Medical User Demonstrations (National Institute of Health, 1973) purposefully use subjective questionnaires as their method of evaluating the system.

Two evaluations of a different kind are those by Frank Norwood and Delbert Smith, contracted by NASA in 1973 to evaluate the PEACESAT Report and Proposal as submitted by Bystrom (see Chapter VI, Section 3.6). While these studies are not, strictly speaking, evaluations of the PEACESAT system but address NASA criteria for approving satellite experiments, they do in fact deal with the question of adequate evaluation procedures and are also revealing in other respects.

Both writers' main criticism of Bystrom's reports to NASA is that there is insufficient drawing of overall experimental conclusions from the data that exists. They say that evaluative procedures do not appear to have been built into the design of the experiment and, consequently, while there is a massive accumulation of raw data, this post-hoc approach necessarily

---

falls down in not being adequately directed. Norwood criticises the evidence obtained from experiments as being "anecdotal rather than statistical", yet regards PEACESAT as having gained "experiential evidence of a spectrum of ways in which low-cost, narrow-band satellite communications might be employed in the Pacific environment, the technical and managerial problems which should be anticipated, and the acceptability of satellite communications by potential groups of users."9

Smith regards the raw data in the report submitted to NASA as being fragmented, and which "only obliquely constitutes evaluation".10 Smith cites Bystrom's rationale for the rejection of conventional evaluational methodology ("the constraints of geography, income, expertise, and small culturally mixed populations make it difficult or impossible to use evaluational methodology developed for classrooms and urban environments") and points out that, having said this, the experimenters are bound to "explicate an alternative methodology and justify their decisions".11 This, he continues, they have not done, despite the two year duration of the experiment. Information regarding project objectives and assessments is general and non-empirical; overall, PEACESAT "as an experiment is not definitive in several aspects important to conclusion-producing procedures".12

10 Delbert D. Smith, PEACESAT Evaluation, (Wisconsin: no publisher, undated.) p.3.
11 Ibid, p.2.
12 Ibid, p.23.
Furthermore, says Smith, speculating on the reason for this inadequate evaluation, the emphasis upon incrementing the number of PEACESAT terminals without sufficient reasons may lead one to question the system planners' intentions:

"... is PEACESAT an experiment, testing new communications satellite applications or frameworks, or is PEACESAT an operational service system disinterested in experimental guidelines and intent upon expansion? The Report and Evaluation material would seem to indicate the latter."

Smith in some cases suggests specific evaluative questions which might be of more use in assessing whether or not a given objective had been achieved. For example, regarding the objective "to determine a satellite communication system designed to have scale application for sparsely populated areas and areas of low industrial development" (one of Bystrom's stated objectives), Smith suggests that an assessment might consider:

"(1) where the terminals exist and why they are there, (2) a statistical performance report, (3) the exigencies of sparse population areas and low industrial development as they bear on a satellite system, (4) use level indicators in statistical format, (5) evaluation of the "scale application" in cost-benefit terms as well as technical support reactions."

By omitting this kind of detail, he continues, "the report simply is not an in-depth analysis".

---

13 Ibid, pp.9,10.
3.0. Internal criticism

Among member terminals of PEACESAT, there is, by and large, a distinct reticence to criticise the system. While it has been claimed that regular Management Meetings over the system have been used to critique and evaluate past exchanges and to mutually decide upon future exchanges, this has not been the case during the author's monitoring of the system in 1978 and 1979. Sometimes meetings were missed altogether; often they were poorly attended and managed; and in only one instance — following harsh UCSC criticism — did it seem that Terminal Managers felt free to openly criticise the system. Two exceptions to this general reticence to criticise have been from the USP and the University of California at Santa Cruz (UCSC). Although criticisms from these sources are not based upon precise, empirical data, they are enlightening for the same reason as Margaret Blundell's reservations were: they represent the views of users of the system who have had considerable experience with it and who feel that constructive changes could be implemented to improve its operation.

3.1. Criticism from the USP

Criticism from the USP comes primarily from Peter McMehan, for many years the Director of Extension Services at USP, and from James Maraj, the Vice Chancellor of the University. In outlining the reasons for the USP's dispute with PEACESAT, (see
Chapter VII, Section 3), Ma'raj complains of Bystrom's unilateral actions. While giving praise to the original concept of PEACESAT, he continues:

"But if an experiment of linking diverse educational institutions (and their surrounding environments) degenerates into a loosely conceived attempt to further a network of vague community groupings, an institution such as this University must hold back. General community interest may be a valid concern on the Pacific margins; it is much less a priority in the third world centre of the Pacific Basin. The USP has a definite commitment to developmental objectives ... Programming without clear focus and orientations to recreation and interest rather than to development purposes are very low priorities in the S.W. Pacific.

The difficult inter-institution experimental problems of the PEACESAT Project are made more difficult when the focus shifts to the idea of networking local communities rather than responsible institutions. A satellite version of citizen band radio may be a very important experiment of the future; it is of low priority when an institution such as this one has more basic problems to overcome in a group of countries which includes some of the world's poorest."

It is interesting, incidentally, that Maraj's perspective is that PEACESAT in practice regards inter-institutional relationships as being secondary to relationships between communities - an inversion of Bystrom's originally stated rationale for the project.

Maraj's broad criticisms stem from very much more specific concerns with day-to-day operations as outlined by Peter McMeihan. These involve:

1. the practical difficulties of achieving the ideal of "international co-operation" as enunciated by the PEACESAT

Letter from Maraj to Barnes.
Project; and

2. the precise programming and evaluative procedures of the system.

Regarding the former, McMehan states unequivocally that while the ideal of international co-operation is all very well, the realities in the S.W. Pacific (often over-looked by people wanting to use the system) have "usually meant outsiders doing their thing for over 150 years. This attitude is no longer viable".\(^\text{16}\) The problem, he continues, is that:

"there is a danger of the PEACESAT system becoming merely a resource for metropolitan organisations - the rather flashy means whereby the exotic islands are asked for data, information, or opinions, in the pursuit of some project, research, or even entertainment."

In the small Pacific societies, as McMehan points out, many burdens often fall upon the shoulders of very few busy people. Contrary to the popular Western misconception of the Pacific islands as being paradises, "no Islander wants to sit and listen to an erudite discussion between Honolulu and Wellington when he has urgent problems of his own to cope with". Consequently, argues McMehan, programmes should be very carefully planned, with agendas and documentation sent in advance enabling Terminal Managers to conduct advance evaluation of proposed exchanges. The decision to participate in an exchange should then be made according to the needs of the local country. McMehan calls for

much greater structuring of programmes, including a pre-planning stage and evaluation by participants and Terminal Managers:

"Evaluation of each series, or programme, as appropriate, is of the utmost importance. It is not enough to claim success because people talked; it is much more important to assess how and why and to what purpose."

Additionally, he complains of the "embarrassing habit that's crept into the system whereby outside organisations are contacted before the terminal", and calls for a policy decision against this.

A final criticism from the USP is provided by Professor Ron Crocombe, Director of the Institute for Pacific Studies, who has been praised for using the system to good effect in teaching his land tenure course to extension students. Crocombe comments concerning PEACESAT:

"In the beginning I thought it was very important and did participate in some sessions, but found it to be almost totally controlled and dominated by Americans, and those who were not Americans were other Europeans. The stations throughout the American territories were all manned by Americans and those in Papua New Guinea by Australians, and Hawaii tended to dominate. I decided that it was just a de facto piece of American imperialism - even though many of the individuals participating in that imperialism would not have intended that. From the little I still hear that still tends to be the case."

---

17 See Blundell.
3.2. Criticism from UCSC

Criticism from the UCSC was first made by Dr. Bryan Farrell, local PEACESAT director and Director of the Center for South Pacific Studies, and DiAnne Reid-Ross, the first UCSC Terminal Manager, following UCSC's initial nine month period as a PEACESAT member, from September 1976 to July 1977. In October 1977, Santa Cruz made a statement concerning its own position within the PEACESAT network, and its concerns for the entire system.19 Because of its concise and balanced appraisal of PEACESAT, the first part of this document ("I. The Santa Cruz view of PEACESAT") is quoted at length:

"We see PEACESAT as a serious and exciting experiment with exceptional potential which is not yet close to realisation. As a means of international communication among a number of different groups, PEACESAT has few equals. One of its virtues is the free exchange of ideas it allows. Its programming can have considerable versatility. Participants can range from pre-school children to the elderly, from the erudite to the unschooled, from village people to big-city people. Above all, it can be a learning experience for all - windows to a host of worlds.

A disadvantage of free exchange, however, is that the best-organised and most practiced voices are usually loudest. For PEACESAT, this means that the voices of the developed countries too often overwhelm those of the smaller, less-developed locations. Institutions or other intermediaries too often come between people who could use PEACESAT to communicate directly. And the needs and wishes of small island and indigenous communities who might benefit greatly from PEACESAT are too often drowned out by the flood of information from the more developed centers.

We feel this is due largely to three weaknesses in PEACESAT as it now functions: (1) the lack of clear

19 No author, PEACESAT: Observations, policy, concerns, (Santa Cruz, October 1977).
priorities and program objectives set by the whole network for itself, (2) the lack of appropriate programming procedures, and (3) the absence of regular, thorough-going evaluation in the light of the priorities and objectives the network has set. Programming over PEACESAT is often haphazard and last-minute, with times allotted whenever requested without reference to a set of priorities. Series begin without much advance planning, and since the topic and participation may change considerably as the series progresses, it is difficult to say whether or not the series has succeeded. Although many interesting and useful exchanges have evolved in this way, the process is clumsy and approximate. It seems unlikely to meet the needs of most network people and was probably better suited to PEACESAT's early years."

The statement continues by outlining the reason for the establishment of the UCSC terminal:

"Santa Cruz joined the PEACESAT network assuming the benefits would flow two ways ... The terminal was not instituted for research purposes, although some potential practical research can be served admirably by its use. It was instituted to keep in touch with the Pacific in a constructive reciprocal manner."

It also stated UCSC's own policy guidelines for the future. The third and final section of the statement dealt with UCSC's concerns regarding PEACESAT, and strongly urged the network to consider a list of changes ranging from an assessment of the needs of Pacific people and the establishment of priorities for exchanges to a more precisely elaborated and efficient structuring of the PEACESAT organisation.

Other points among this list were: the limiting of discussions among metropolitan terminals; the evaluation of each exchange series as well as overall PEACESAT programming; the establishment of a policy regarding the composition of the
PEACESAT network ("The network should agree on the balance it wishes to maintain between different sizes of terminals, types of communities and geographical locations. No new terminals should be admitted to PEACESAT until the network as a whole formulates a policy about its future composition.")); the creation of a more representative advisory body ("Most members of the present Consortium Council are male Caucasians from urban areas with academic or professional training...")); and the encouragement of community-based terminals, "if existing stations, through other commitments, are not able to participate fully in PEACESAT" (a reference to those terminals of the USP Net).

The convening of the PEACESAT "In-Service Training" Conference at Noumea in January 1978 was seen to be the first step towards sorting out some of these problems and instituting some constructive changes in the system. Meeting face-to-face over a period of three days, Terminal Managers discussed a wide range of concerns including these from Santa Cruz, represented by DiAnne Reid-Ross. Whatever the outcome of the discussions were, any changes that were actually implemented as a result appear to have been minor and/or short-lived. For one year later, Farrell reiterated his concerns in a letter to Stuart Kingan, President of the PEACESAT Consortium Council, copied to all Terminal Managers. The letter responded to a memo from Kingan and Bystrom concerning membership in the Consortium, and
the payment of annual dues, to be discussed at a future
Consortium Council meeting. Farrell repeated his belief in the
"marvellous potential" of PEACESAT which, he said, was "barely
scratching the surface now", but:

"despite the feeling of camaraderie developed at the
Noumea Conference and the views aired, the network is in
no way improved in its quality and may be further from
its potential than it was a year ago. I think people on
the network know I have a real concern for its continued
first-rate operation. More time appears to be spent in
scheduling, forward scheduling, passing messages and
conducting exclusive point-to-point conferences than
ever previously. First-rate exchanges at any level have
become fewer and fewer. From this point of view I feel
that the system is still experimental to the extent that
it is by no means well grounded. It has proven to be
feasible but has the apathy and lethargy which can
easily color terminals previously characterised by
enthusiasm if it has not already done so. In all honesty
and realism, I could not recommend to anyone a "Pacific
and Worldwide service" if the lead portion, the Pacific,
doesn't work.
Carrying on from this, regardless of the fact that money
is short at this institution, I could not recommend that
it invest $500.00 for paid-up membership in the
Consortium Council when the only reason it is eligible
for membership is this terminal's participation in a
network which appears to leave so much room for growth
that I frequently despair that it will ever succeed. To
suggest that the network now represents a "successful
PEACESAT experiment" seems no more than the wishful
thinking we all do at times."20

Farrell finished by requesting a PEACESAT Management Meeting be
set aside for discussion of these concerns.

Significantly, at a meeting of the Consortium Council
immediately following receipt of Farrell's letter, discussion of

20 Letter from Bryan H. Farrell, Director, Center for South
Pacific Studies, UCSC, to Stuart Kingan, President, PEACESAT
other business left only two or three minutes for Farell to speak to this letter, indicating a remarkable lack of concern for the system's overall welfare by those in authority. However, in the weeks that followed, some discussion amongst Terminal Managers took place regarding these matters and an over-air committee of three Terminal Managers was struck to investigate such concerns and propose changes. But the composition of the Committee was also significant: it included no Pacific Islanders! The Committee comprised Mark Viera, UCSC; John Somerhauser, Funafuti (John is a Peace Corps Volunteer); and John Flannigan, Pago Pago. The eventual outcome of these meetings was not known at the time of writing, but did not appear to have had any greater chance of effecting significant changes in PEACESAT than did the Noumea Conference.

4.0. Summary

In summary, there are two broad conclusions that can be made:

1. Information about PEACESAT which is available to the general public comes from very few sources: usually either from Bystrom, or from another closely associated member of PEACESAT, or from an 'outside' source who has derived his/her information largely from Bystrom. Furthermore, such information is most often very superficial in character, explicitly or implicitly biased in favour of PEACESAT, and
2. Criticism of PEACESAT is, first of all, in all but one case (the Blundell article) not freely available to the public and, secondly, is remarkably consistent. All critics — from both within and without PEACESAT — appear to agree that, as an experiment, PEACESAT possesses unclear objectives and incorporates insufficient evaluation of its own performance. User-critics go further, complaining of inefficient procedures and of insensitivity towards the Pacific Islands on the part of Metropolitan users, and a consequent domination — albeit unintended — of Metropolitan terminals over Pacific Island terminals.
IX. ANALYSIS OF PEACESAT OPERATIONS DATA

1.0. Objective

It is evident from the previous discussion that most of what is widely known about PEACESAT is derived either from PEACESAT headquarters or from people closely connected with the conduct of the experiment. Furthermore, and quite surprisingly, it is also evident that opinions concerning the value of PEACESAT are based on almost no empirical data. The empirical evidence that does exist is mainly technical concerning voice levels, reliability of the system under differing weather conditions, and so forth.

For an experiment which has been justified largely according to its asserted social value, for its public service applications, there is a remarkable absence of research concerning PEACESAT's actual operations and effectiveness. In the literature on PEACESAT there exists only anecdotal evidence concerning uses and users of the system; examples are the use of PEACESAT by medical authorities trying to control epidemics of dengue fever and cholera in the Islands, and the real-time interviewing of a Pacific Prime Minister on the process of his islands' attainment of self-government. Accounts of such
isolated experiments are impressive; they are, at the same time, not representative. No answers exist to questions such as who uses PEACESAT, for what purposes, how effectively and for what proportion of time, etc. This absence of scientific data is particularly noticeable with regard to Pacific Islands' use of the system. It seems that interested parties are asked to infer from the existence of a technically operating system in the Pacific Islands that it is automatically of benefit to the development of those Islands.

The objective of this chapter, therefore, is to provide some empirical basis for the beginnings of an evaluation of PEACESAT's actual operations. Two broad types of analysis are presented:

1. an analysis of PEACESAT exchange data; and
2. a network flow analysis of the PEACESAT system.

The overall aim of this part of the study is to determine the predominant uses and users of the PEACESAT system, and the relationships between them.

2.0. Exchange Data Analysis

2.1. Methodology in the collection of raw data

Raw data for these studies were collected in the following way. All exchanges over a given period of time were monitored
(at the Vancouver terminal) and, for each exchange so monitored, the following information was recorded:

1. the exchange title, and the date and time at which it occurred;

2. the category in which the exchange would be classified (Tables 2, 3, 4, 5 and 6);

3. for each terminal participating in the exchange, the number of participants, their names, their affiliations (i.e. their role professionally or in the community, etc.), their sex and ethnicity. Additionally a record was made of whether or not a participant was American (Tables 8, 14, 15, and 16);

4. for each participant, the amount of time he/she spent on air (in minutes), calculated in half minute units (Tables 10, 11, 12, 13, 14, 17, 18 and 22);

5. for each portion of time on air recorded for participants, an indication of which of four categories of content the portion could be classified as: whether procedural, administrative, substantive or miscellaneous (Table 10.E.);

6. for each portion of time on air recorded for participants, an indication of whether the participant was either: (i) asking a question, requesting information, or soliciting advice (recorded as a "Q" score); or (ii) providing a response, supplying information, or giving advice (recorded as a "R" score)(Tables 24, 25, 26, 27, 28 and 29);

7. the amount of time lost, through noise and interference on
the system (Table 9);

8. the amount of time used for the passing of messages (unrelated to official exchange topics) between and among terminals (Table 9);

9. the chairperson of the exchange, and the location which initiated the exchange (Tables 19, 20 and 21).

An example of the "Exchange Data" sheet used in the collection of the above data is provided (with others) in Appendix 3. Tables for this study are provided in Appendix 4. In most instances exchange data was recorded live as the exchange was conducted on air. Additionally, each exchange was tape-recorded so that it could be played back at a later time if necessary.

Because an audio-conferencing system allows people to participate in an exchange passively, i.e. without necessarily speaking on the system but listening to the discussion, it was necessary to adopt a consistent procedure which took this into account. Consequently, if non-speaking participants were identified, they were counted as participants.

Similarly, a procedure which took into account the unique role of the Terminal Manager was also required. In many cases, the Terminal Manager played an introductory role at the beginning of an exchange, often facilitated the planning of future exchanges, and occasionally played an active role as a full participant in exchanges. In other instances, the Terminal
Manager would be present throughout an exchange, but would not speak at all, and could not be said to be participating, even passively. Consequently, a procedure was adopted whereby if a Terminal Manager spoke at all during an exchange, he/she was counted as a participant; if he/she did not speak, he/she was not counted.

Initially an attempt was made to further specify Pacific Island participants into those possessing some ranking in their communities and those possessing little such ranking. The objective here was to try to determine, albeit in a crude manner, whether or not there was a class basis operating in the accessibility of the PEACESAT system to Pacific Island people or its use by Pacific Island people. In practice there was insufficient information available to be able to make such a distinction, and the attempt was abandoned early in the study.¹

The analysis of exchanges was conducted during two time periods. Period One covered one calendar month, from GMT February 1, 1979 to GMT February 28, 1979 inclusive. During this period, all major exchanges were analysed, subject only to the signal reception quality at the Vancouver terminal. (During this

¹ What appears to have been the case, however, is that Pacific Islander participation seems to have been very much dependent on class. For the majority of Pacific Islanders who were at all vocal during exchanges were first required to speak fluent English and, second, were mostly professionals, i.e. coming from the middle and upper classes. It would seem that this line of enquiry might be fruitfully pursued in further studies of PEACESAT exchanges.
time, the quality of Vancouver's transmission signal was often unreliable. Vancouver's reception of incoming signals, however, was less variable."

Owing to the small number of exchanges recorded during Period One in five categories (Classroom Instruction, Professional and In-Service Training, Research Support, Professional Consultation and Technical Development) it was decided to extend the period of analysis. Period Two, therefore, extends from GMT March 1, 1979 to GMT April 12, 1979 inclusive. The procedure used to analyse exchanges was exactly the same for Period Two as for Period One. However, during Period Two, some degree of selectivity was introduced in order to obtain larger samples of exchanges in the poorly represented categories and, in some cases, to match the analysis of a Planning exchange (say, in Period One) with the analysis of a regular exchange (say, in Period Two). In this way, most - but not all - major exchanges were analysed; some exchanges in categories which were already well represented were excluded. For example, this particularly applied to exchanges such as the South Pacific Commission News which is scheduled on a regular weekly basis. In this case, four News exchanges were analysed in Period One, but only one in Period Two. An additional reason for having been more selective in Period Two was that of necessity: reception quality in Vancouver deteriorated during March and April 1979, making a complete analysis of all exchanges impossible.
2.2. Categorisation of Exchanges

Table 2 shows the titles of PEACESAT exchanges analysed, by exchange category. Altogether, a total of 74 exchanges were analysed over a ten week period; this amounted to 4,024 minutes - or over 67 hours - of air time.²

The procedure employed for the categorisation of exchanges was the same as that used by PEACESAT.³ The following definitions of eight exchange categories were utilised:

1. Classroom Instruction - including enrichment activities and both credit- and non-credit courses to elementary, secondary or tertiary students;
2. Decision-making Conferences - meetings involving specialists and/or administrators in the discussion of topics related to the solution of problems and the implementation of programs;
3. Professional and In-Service Training - exchanges enabling trained personnel to receive continuing education and to keep up with changing developments in their specialised fields;
4. Community Development Service - exchanges which bring together widely separated local groups interested in

²The total amount of time analysed is calculated by adding the total amount of "Content" time (3,309 minutes) to the total amounts of time for messages and time lost (478.5 and 236.5 minutes respectively): see Tables 7 and 9.
³See section 2.10 for a comment on the categorisation of exchanges.
improving their social environment;

5. Research Support - exchanges facilitating the dissemination of discoveries and new techniques among colleagues in a rapid manner;

6. Professional Consultation - exchanges assisting medical specialists in urban centers and health personnel in remote areas to exchange data on epidemics, patient referrals, and diagnostic consulting, etc.;

7. Technical Development - experiments developing different technical aspects of the system, such as facsimile, teletype and slow-scan television;

8. Administrative - exchanges conducted largely by PEACESAT personnel for the administration of the PEACESAT system, such as scheduling, management and other meetings.  

Finding definitions of exchange categories that were consistent over time was not an easy task. There is, to my knowledge, no official PEACESAT document outlining such definitions. In three different papers published by Bystrom, a number of different exchange categories are described. For example: (1) Decision-Maker Conferences; Professional and In-Service Training; Classroom Instruction; Community Development Seminars; Information Transfer (as applied to library and data stores, and data transfer); Professional Consultation; and Public Information ("for international interconnection of national news and broadcast services") are the seven categories described in: Bystrom, John, *The Application of Satellites to International Interactive Service Support Communication*, Proceedings of the Royal Society of London, 1974; (2) in the same year, at another conference, categories are described as: Decision-making Conferences; Professional and In-Service Training; Classroom Instruction; Community Development Seminars; Consultation and Report Arrangements (including research support and epidemic control); and User Networks ("designed to serve high priority social services... indicates a degree of central control and planning, a group of designated users, and a
The objective of the selectivity introduced in Period Two was to attempt to ensure that, within the limited scope of the study, samples in each category were large enough to be significant in their own right and to be able to make significant comparisons between exchange categories.

Significantly, despite this objective, those categories of exchange which were low in number in Period One did not increase dramatically in Period Two. (See Table 3: Number of Exchanges analysed, by Exchange Category.) It would seem reasonable, therefore, to assume that the total figures for the distribution of exchanges into categories are a fair approximation of the normal distribution. This being the case, we can conclude that exchanges in three categories occur noticeably more frequently than exchanges in other categories: 2. Decision-making Conferences, with 26.9% of the total; 4. Community Development

(cont'd) special purpose which is determined by a limited area of communications coverage, a political relationship, or specialised functions") in Bystrom, John, Satellite Communication Applied to the Needs of Developing Areas: The PEACESAT Experiment, Paper presented at the International Conference on Computer Communication, Stockholm, August 1974; and (3) in 1978, "uses" were described as: administrative planning; diagnostic consulting; library information ("and searches for printed materials"); public information ("e.g. a talk on nutrition was taped for radio broadcast"); research support; and in-service training, in Bystrom, John, "PEACESAT" in World Health, Magazine of the World Health Organisation, USA: January 1978. Consequently, these definitions of exchange categories were taken from: DiAnne Reid Ross, Program Evaluation of the Santa Cruz PEACESAT Terminal for the period September 1, 1976 through June 30, 1977 (Santa Cruz: Center for South Pacific Studies, University of California, October 1977), pp.3 - 5.
Service, with 24.4% of the total; and 8. Administrative, with 20.5% of the total - all of these categories comprise more than 20% of the total. Category 5, Research Support, is clearly fourth in importance, the only remaining category to comprise over 10% of the exchanges.

As a comparison with these figures, and in order to compensate for the selectivity of the sampling in Period Two, the actual number of exchanges conducted in the two periods (not all of which were analysed) was determined. This is shown in Table 4: Number of Exchanges occurring during period of study. The results are remarkably consistent with those obtained above. The same three categories (2, 4 and 8) dominate, with the important difference that Category 8, Administrative, exchanges are the most numerous, also being the only category to top 30% of the total. Category 5, Research Support, although comprising less than 10%, is still significantly higher than the remaining categories.

The duration of PEACESAT exchanges is variable. In practice they can range from a minimum of two to five minutes up to a maximum of two hours. Because of this, the total time on air of exchanges must be taken into account when calculating the relative proportions of the categories. This data is presented in Table 5: Proportional Duration of Exchanges, per Exchange Category and Overall, and Table 6: Total Time on Air, and
Average Duration of Exchange per Exchange Category.  

Table 5 shows that the majority of exchanges last for 30-60 minutes (51.4%) and 15-30 minutes (24.3%): a combined total of 75.7%. This is reflected in the average duration of exchange of 44.7 minutes shown in Table 6. There are only two noticeable exceptions to this norm: (1) 33.3% of exchanges in Category 5 are short, between 0-15 minutes; and (2) 50.0% of exchanges in Category 3 are long, between 60-90 minutes. In both cases, the high percentages of short and long exchanges respectively would appear to result in part at least from the small number of samples.

The third column of Table 6 records the total time on air per category for the entire two periods of the study. Allowing for the differences in duration of exchanges in this way, it is significant that Categories 2, 4 and 8 remain substantially higher than the others, each accounting for over 20% of the

In Table 5, and for the remainder of the study, it should be noted that Category 7, Technical Development, has been omitted. The reason for this is that, as distinct from all other categories, technical experimentation cannot be measured in the same way that voice-interaction over the system can be measured. Throughout the period under study, only two experiments occurred which could be classified as being "technical developments". One was a continuing teletype exchange between Honolulu (usually transmitting) and Pago Pago (usually receiving), and the other was a short slow-scan television experiment initiated at Vancouver which principally involved Santa Cruz and Rarotonga, with occasional participation by New Zealand. Since this level of activity in Category 7 would appear to be typical, or even higher than the norm, and since the orientation of this study is not a technical one, no further reference will be made to technical exchanges. This would in no way appear to do PEACESAT any injustice.
total time on air. Fourth ranking is again Category 5, Research Support, but in this case only very slightly ahead of Category 3, Professional and In-Service Training. This can be explained by the average duration of exchanges in Categories 3 and 5. Exchanges in Category 3 were all quite long, two lasting for well over an hour. Those in Category 5, except for one Vulcanology exchange of over one and a half hours, were all relatively short, often lasting for less than 30 minutes. Thus the average duration of exchange for Category 3, Professional and In-Service Training, is 58.1 minutes - the highest of all exchanges - while the average duration of exchange for Category 5, Research Support, is 27.2 minutes - the lowest recorded.

Considering Tables 3, 4, 5 and 6 together, it is reasonable to deduce that a pattern is discernible in the relative importance of the different categories of exchange, both in terms of the frequency with which exchanges in different categories occur, and the amount of time on air they occupy. Categories 2, 4 and 8 (Decision-making Conferences, Community Development Service and Administrative) are overwhelmingly more important than the others, accounting for approximately 75% of all exchanges, in roughly equal proportions of 25% each. Of the remaining categories, Category 5, Research Support, is next in importance, followed by Category 3, Professional and In-Service Training. Category 1, Classroom Instruction, and Category 6, Professional Consultation, are the least important.
Regarding the average duration of exchanges, the overall figure of 44.7 minutes per exchange would appear to be an accurate average. Similarly, in the categories where sample populations were higher than 10 - 15 exchanges, we would expect the average figures to be reliable also. Thus the figures for Categories 2, 4 and 8 can be accepted. In the remaining categories, it would seem that samples were too small not to have been overly influenced by exceptional cases.

The following conclusions can be drawn from this data:

1. That Categories 2, 4 and 8 appear to be overwhelmingly more important than other categories of exchange in terms both of the frequency with which exchanges in different categories occur and the amount of time on air they occupy. Of these three categories, the high proportion of Administrative exchanges (Category 8) - approximately 25% of the total - would seem to be noteworthy.

2. That the proportion of educational and medical exchanges (Categories 1, 3, 5 and 6: Classroom Instruction, Professional and In-Service Training, Research Support and Professional Consultation) is relatively low: a combined 20% of the total.

3. That, since all categories except 1 and 4 (Classroom Instruction and Community Development Service) involve specialists and administrators, the proportion of exchanges not catering to specialists and administrators is relatively
4. That the average duration of exchange is 44.7 minutes; furthermore, that more than 50% of exchanges last 30-60 minutes, and approximately 25% of exchanges last 15-30 minutes, making for over 75% of exchanges in the 15-60 minute range.

2.3. Content Type

Table 7 shows the breakdown of time on air into content type per category of exchange and overall. The four types of content discriminated are as follows: procedural included all introductions, farewells, the setting of the agenda, and the chairing function; administrative included the scheduling of future exchanges, and messages and other matters of an administrative nature; substantive included all content pertaining to the exchange in question; and miscellaneous included all items which fell into none of the above categories.

The overall figures show that 74.8% of all exchange time is concerned with substantive matters, and 18.8% is concerned with procedure. Time used for administrative and miscellaneous matters is small at 3.8% and 2.6% respectively.

The relatively high overall figure for procedural content in part reflects the nature of the audio-conferencing system. Participants at all locations need to introduce themselves or be introduced, and a chairing function is a necessity to ensure
that all participants get a chance to speak and that business follows an agreed-upon agenda. Naturally, the more participants there are, the more important and complex becomes the role of the chair, especially when participants are not familiar with one another nor with the system. The breakdown of procedural content into the different categories of exchange partially reflects this. Categories 5, 6 and 8 (Research Support, Professional Consultation and Administrative) have the lowest figures for procedural content. This can be explained in part by the fact that exchanges in all three of these categories tend to have much more specific or formal objectives than in the other categories. For example, a professional consultation between doctors will tend to get straight to the issue in question, not wasting time with formalities and/or niceties. This should theoretically be true also for the Classroom Instruction category; in this case, it is possibly the small size of the sample which has meant a higher average procedural figure. Nevertheless, the Classroom Instruction category does represent the fourth smallest procedural figure, which is less than the overall figure of 18.8 minutes.

Table 8, showing the average number of participants and locations involved per exchange, would tend to support the hypothesis that the time used for procedural matters increases in direct proportion to the number of people and locations participating in an exchange. Thus, Categories 5, 6 and 1
(Research Support, Professional Consultation and Classroom Instruction) possess the smallest average number of participants and locations per exchange. The low procedural content figure for Category 8 (Administrative), given the relatively high average number of participants figure (6.6), could be explained by the fact that participants in administrative exchanges are frequently Terminal Managers or other PEACESAT personnel who are usually very familiar with one another and the system, and therefore take up little time with such procedural matters as introductions, etc. A similar explanation can be given for why Category 8, with the highest average number of locations per exchange (7.4) still uses relatively little procedural time.

Table 8 also shows that the overall average number of locations per exchange is 4.8, and that the average number of participants per exchange is 5.4.

Table 9, Message Time and Time Loss by Exchange Category, shows the amount of time spent in passing messages via the system on the one hand, and the amount of time lost through noise, interference, etc., on the other. Neither of these sets of figures are particularly significant in relation to the categories of exchange, however. Messages (among Terminal Managers) are usually only passed at the beginning of a two or three hour period of exchanges; in this way, only the first exchange of that period will be affected by the transmission of messages, and the messages in question do not usually concern
the exchange immediately following. Time loss is similarly arbitrary.

The overall figures, however, are interesting. Messages occupy 11.9% of all time analysed, representing 8 hours from a total of 67 hours. This may reflect either the utility of the system for the passing of informal messages, or some casualness and/or inefficiency in PEACESAT’s operations. The figure for time loss of 5.9% probably reflects the variable quality of the equipment, and satellite, in use.

The following conclusions can be drawn from this data:

1. That the amount of time available for substantive content varies directly in inverse proportion to the amount of time devoted to procedural content; in turn, procedural content is dependent upon the number of locations and participants involved in an exchange; it should theoretically be possible, therefore, to establish an optimum number of locations and participants per exchange category;

2. Familiarity among participants would seem to increase the amount of substantive time possible, as would the relative specificity and formality of the task to be undertaken during an exchange;

3. Figures for message time and time loss over the system - a total of 17.8% of all time analysed - could indicate a relatively inefficient system, both in terms of operating procedures (and/or personnel) and equipment reliability.
Alternatively, the high figures for message time could indicate the utility of the system for this informal purpose.

2.4. Involvement by location in exchanges

Table 8 shows the number of locations participating in exchanges by Exchange Category and also the average number of locations per Exchange Category and Overall. Predictably, the lowest figures (2.2 and 2.5) can be seen in those categories characterised primarily by point-to-point participation (Category 5, Research Support, and Category 6, Professional Consultation), and the highest figure (7.4) is evidenced in Category 8 (Administrative) where one would expect system-wide participation. Overall, the average number of locations per exchange is 4.8. Tables 10 and 11 show the time on air by location for Exchange Categories 1 - 8; Table 12 shows the overall time on air by location. This data is then summarised in Table 13 which shows the time on air for metropolitan territories, Pacific Islands and US territories.

Looking first at the overall figures (Table 13), the metropolitan locations can be seen to dominate Pacific Island locations by a factor of almost 2 to 1: 64.3% of all time on air for metropolitan territories as compared to 35.7% for Pacific Islands. In this context, the metropolitan locations are defined as Honolulu, Wellington, the University of California Santa
Cruz, Vancouver and other occasional users (NASA Ames, the Research Vessel "Gyre" - owned and operated by the University of Hawaii - and the American Lutheran Church, Los Angeles\(^6\)).

Considering that the ratio of the number of metropolitan terminals to Pacific Island terminals is 1 to 2 - the exact reverse of the time on air ratio - these figures are extremely significant.

Looking in more detail at these results, it is apparent from Table 12 that Honolulu and Wellington take up almost equal proportions of the total time on air (26.6% and 27.7% respectively), and together comprise a total of 54.3% of all time on the system. This is extremely high. From the same table it is also apparent that seven locations each use less than 2% of the total time on air. Six of these (Niue, Lae, Apia, Honiara, Tarawa and Vila) are Pacific Islands, Vancouver being the seventh. Since Vancouver was at this time only in a provisional operational mode, and yet used 1.5% of the total air time, this indicates the very low extent of these six islands' effective participation in exchanges. In fact, these results show that, with the exception of Vancouver and Lae, these five Pacific Island terminals cannot in practice be legitimately

\(^6\) Reverend Doug Millar, of the ALC, Los Angeles, has access to ATS-1 for a very limited number of hours/week: see Chapter IV, section 3.0. During the period of the study, he broke into an exchange and a short discussion ensued. For this reason, the ALC has been summarily included as 'an occasional user', although it is not a regular PEACESAT user.
considered part of the PEACESAT system. Niue, Apia, Honiara, Tarawa and Vila take part mostly in the USP Net. NASA Ames—which took part in only two exchanges—managed to be on air for more time than all seven of these PEACESAT terminals combined.

Of the Pacific Island terminals, Rarotonga and Suva (with 9.3% and 6.3% of the total time) dominate by a clear margin over the other islands. Combined, the metropolitan terminals plus Suva and Rarotonga comprise 69.9% of all time, indicating that the majority of activity on PEACESAT would tend to take place among these terminals.

The breakdown of time on air by location into exchange categories reveals other important items. Terminal participation in Exchange Categories 1, 3, 5 and 6 (Classroom Instruction, Professional and In-Service Training, Research Support and Professional Consultation) is obviously low, as indicated by the number of zero scores in these categories. In fact, in Categories 1, 5 and 6 fewer than half of the terminals participated. With the exception of Category 6 only, metropolitan terminals dominate over Pacific Island terminals in close to the 2:1 ratio previously noted. Metropolitan terminals use 79.2% of time in Category 1, 61.1% in Category 2, 58.6% in Category 3, 62.5% in Category 4, 68.1% in Category 5, 38.8% in Category 6 and 71.1% in Category 8. Category 6, however, is misleading because Noumea comprises 42.7% of the time. Since no Pacific Island people participate from Noumea, this—as we
shall see later in the discussion of participation — is perhaps not as important an exception as it might at first appear. The same applies to Category 5, where Noumea uses 23.7% of time.

Categories 2 and 4 (Decision-making Conferences and Community Development Service) show the greatest spread of time among all terminals, although in these categories five terminals in Category 2 and six terminals in Category 4 use less than 1% of all time.

Category 8, Administrative, provides an indication of the degree of involvement that the Pacific Islands play in the administration and decision-making processes of the PEACESAT system. Clearly, Honolulu and Wellington (with 34.5% and 26.8% of the total time respectively) dominate dramatically. With the addition of Rarotonga, these three terminals comprise 76.6% of all Administrative time.

Further interesting results are obtained for the combined participation of US Territories in the PEACESAT system (see Table 13). The US terminals are those in Honolulu, the University of California Santa Cruz, Saipan and Pago Pago (plus, of course, NASA Ames, the Research Vessel "Gyre", the American Lutheran Church, and Ponape — which is one of the TTPI terminals in the DISP Net). Overall, US Territories account for 41.2% of all PEACESAT time on air. Furthermore, US terminals account for 64.2% of the time in Category 1, Classroom Instruction; 52.1% of Category 2, Decision-making Conferences; 44.2% of Category 5,
Research Support; and 44.8% of Category 8, Administrative. The high amount of time taken by US terminals in the administration of PEACESAT is especially worthy of note.

The following conclusions can therefore be drawn from this data:

1. Overall, the average number of locations per exchange is 4.8;

2. Despite Pacific Islands terminals outnumbering metropolitan terminals 2:1, Metropolitan terminals dominate use of the system in a ratio of approximately 2:1;

3. Honolulu and Wellington clearly dominate in the overall use of PEACESAT time, their combined time use being 54.3% of the total;

4. Of the Pacific Islands terminals, Suva and Rarotonga clearly dominate over other Pacific Islands. Six island terminals (Niue, Lae, Apia, Honiara, Tarawa and Vila) - each using less than 2% of the total time - use the system to an insignificant extent.

5. Figures for Category 8, Administrative, reveal that in the decision-making processes concerning PEACESAT, Metropolitan terminals dominate dramatically, comprising 71.1% of all time on air; Honolulu, Wellington and Rarotonga together use 76.6% of all time. The domination of these three terminals can be seen in the overall figures where, combined, they use a total of 63.6% of all time;
6. US terminals - mainly Honolulu, the University of California Santa Cruz, Saipan and Pago Pago - consistently use over one third of the time and overall account for 41.2% of all time. In the administration of the PEACESAT system, figures for Category 8 indicate that US terminals account for 44.8% of the total time.

2.5. Participation in exchanges

The problem with measuring the involvement of terminals in the use of the system is that this provides no indication of the identity of the user - the actual participant - at the terminals in question. For example, a situation could theoretically arise where all participants at Pacific Island locations were non-Pacific Islanders. In order to overcome this problem, therefore, measurements were made both of the number and identity of participants in exchanges and of the time that each participant used on air. These results are presented in Tables 8, 14, 15, 16, 17 and 18.

Table 8 shows the total number of participants and the average number of participants per exchange category. The only remarkable thing about these results is the overall average number of participants per exchange of 5.4, which is surprisingly low.

Table 16 shows the number of different participants who took part in all exchanges, according to location, ethnic group
and sex. Because a number of participants were counted more than once in Table 8 (for example, most often the Terminal Managers), this table gives a more accurate idea of the number of different participants involved in exchanges during the period of study. Overall, 374 people participated; this gives an average figure per exchange of 5.1, and an average per location of 18.7.

These average figures, however, give no indication of the distribution of different participants at different ground stations. Again, Honolulu and Wellington clearly dominate, with 28.3% and 18.2% of the total of different participants. Metropolitan terminals combined comprise 54.8% of all different participants. Of the Pacific Island terminals, Rarotonga, Tonga, and Suva (with 9.1%, 7.2% and 7.0% of the total respectively, or 23.3% combined) produce many more different participants that the other Pacific Island locations which each average only 2.0% of the different participants.

Dealing next with the number and identity of participants in exchanges, Table 14 shows the Participation by Sex and Ethnicity in Exchange Categories 1 - 8 and Overall, and Table 15 shows the Participation of US Nationals by Sex, in Exchange Categories 1 - 8 and Overall.

Table 14 reveals that, overall, Pacific Islanders comprise only 28.4% of all participants, as compared to Caucasians who comprise 66.3% of the total. This is more than the 2:1 ratio of metropolitan to Pacific Island locations' use of the system as
noted above. Significantly, this imbalance in the relative number of participants is maintained in all exchange categories. Categories 5 and 6 (Research Support and Professional Consultation) are extreme in this regard, with Pacific Islanders comprising only 4.8% of all participants in Category 5 and being totally unrepresented in Category 6. In Category 8, Administrative exchanges, Pacific Islanders account for only 22.9% of all participants. The category in which Pacific Islanders figure most highly is Category 4 (Community Development Service) where 38.4% of participants are Pacific Islanders.

The sex breakdown of participants in the same table shows that, overall, the number of male participants exceeds the number of female participants by 56.9% as compared to 43.1%. However, while this slight imbalance is further accentuated in the Caucasian population (59.1% males as compared to 40.9% females: a 1.3:1 ratio), in the Pacific Island population, the figures are reversed (45.3% males as against 54.7% females). The number of females of both ethnic groups exceeds males in Categories 3 and 4 (Professional and In-Service Training and Community Development Service), and in the Pacific Island population, females dominate entirely in Category 5 (Research Support).

A further breakdown to determine US participants is presented in Table 15: Participation of US Nationals by sex,
Exchange Categories 1 - 8 and Overall. This shows that, of all participants, US Nationals comprise 38.3% which is, in turn, 57.8% of all Caucasians. Significant figures occur in Categories 5 and 6 (Research Support and Professional Consultation) where US participants comprise 76.2% and 55.6% respectively of all participants in those categories. In Category 1 (Classroom Instruction), 72.7% of all Caucasian participants are US Nationals.

The sex breakdown of US Nationals (also in Table 15) shows, overall, an overwhelming dominance of males over females in a ratio of 72.0% to 28.0%. This dominance is maintained in all categories, but comes nearest to being balanced in Categories 3 and 4 (Professional and In-Service Training and Community Development Service). US males similarly dominate the number of Caucasian participants, comprising 41.6% of the total.

Table 16, showing the number of different participants by location, ethnic group and sex, provides another dimension to the analysis of participation. Figures from this table provide greater specification of the ethnic and sex breakdowns. For example, the Caucasian to Pacific Islander ratio is seen in fact to be 65.8% to 30.7%, or a ratio of 2.1:1; and the sex breakdown 55.1% male to 44.9% female.

More importantly, however, Table 16 also shows the sex and ethnicity of participants at the different locations. Amongst the Pacific Island terminals, it is instructive to note that
many of the participants were Caucasian, not Pacific Islander. For example, at the Noumea, Lae, Honiara and Vila terminals, no Pacific Islanders at all are included among their total participants, and at Suva and Pago Pago, the numbers of Caucasians and Pacific Islanders are equal. The only Pacific Island terminals where Pacific Island participants outnumber Caucasian participants are therefore Rarotonga, Saipan, Niue, Funafuti, Tonga, Apia and Tarawa. As regards the sex breakdown of participants, it is interesting to note that at all the metropolitan terminals males outnumber females, and that in most cases (9 out of 13) amongst Caucasian participants at Pacific Island terminals, the same phenomenon occurs. However, amongst Pacific Island participants at Pacific Island terminals the reverse is more usually the case: females outnumbering males (5 out of 9 times). Saipan, Pago Pago and Funafuti are the most obvious exceptions to this.

Naturally, the above figures for participation give only a crude idea of the actual use of the system. In interpreting these tables, it is important to consider that a participant can be present at an exchange without necessarily contributing to, or gaining anything from, it. In an attempt to overcome this problem, the time that each participant used on air was also measured, thereby providing an indication of a participant's active contribution to an exchange. The results are presented in Table 17: Participant Time on Air by Sex and Ethnicity,
Exchange Categories 1 - 8 and Overall.

From the overall figures of Table 17, it is evident that the actual use of the system by Pacific Islanders is even less than that suggested above. Caucasians dominate the time on air by 77.8% as compared to only 18.6% for Pacific Island participants - or a ratio of 4:1. Examining the different exchange categories, it is significant that from all categories the highest figure for Pacific Island time on air is only 33.4%, in Category 4 (Community Development Service). Next in importance for Pacific Island use of the system come Category 2 (Decision-making Conference) with 20.4% of the total time and Category 3 (Professional and In-Service Training) with 17.2%. Pacific Islanders are dramatically absent in Categories 5 and 6 (Research Support and Professional Consultation) with 2.0% and 0% of the time used. A further significant observation is the 7.0% of total time scored in Category 8 (Administrative) which would suggest a disappointingly marginal role of Pacific Islanders in the administration of the PEACESAT system.

The more detailed breakdown of use of the system by sex as also presented in Table 17 confirms the male to female imbalance overall (64.6% male as against 35.4% female). In this respect, it is instructive to note that the 1.3:1 ratio of males to females increases to 1.8:1, suggesting that despite a more equal attendance of males and females at exchanges, males tend to dominate more in the actual use of the system. With regard to
Caucasians, this imbalance is overall at a ratio of almost exactly 2:1 and appears in all categories except Category 4 (Community Development Service) where males score 31.0% as against 34.1% for females. It would seem that the extreme Caucasian male dominance in Category 8 (Administrative) - Caucasian males comprise 69.6% of all time - is also significant. However, amongst Pacific Islanders, despite considerable male domination in Categories 1, 2 and 3 (Classroom Instruction, Decision-making Conferences and Professional and In-Service Training), overall, Pacific Island males and females use the system equally (9.0% of total time for males and 9.6% for females). This is also true for Category 8 (Administrative).

The figures shown in Table 18 further illustrate the dominant role of US Nationals in the use of PEACESAT. Overall, US Nationals take up the high figure of 40.2% of all time on air and represent more than half of all Caucasian time on air (51.5%). Exceptionally high figures of 78.8% and 86.0% for US Nationals' time on air occur in Categories 5 and 6 (Research Support and Professional Consultation), and in Category 1 (Classroom Instruction) the figure is 63.7%. Since the figures for US participation in these categories are lower than these percentages, it would suggest that, on a person-for-person basis, Americans are more dominant in the use of the system. In Administrative exchanges (Category 8), US time on air is high at 43.7%, demonstrating US dominance of the decision-making
apparatus. The lowest figures for US Nationals are in Categories 3 and 4 (Professional and In-Service Training - 14.2%; and Community Development Service - 25.9%). In the breakdown of these figures into the two sexes, of the total time on air for US Nationals, males comprise 76.7% (a ratio of males to females of 3.3:1) and US males account for the high figure of 30.8% of all time on air.

The following conclusions can be drawn from this data:

1. That the overall average number of participants per exchange is 5.4, and the overall average number of participants per location is 18.7. However, Honolulu and Wellington clearly dominate in the number of different participants attending exchanges. Metropolitan terminals combined account for more than half of all different participants (54.8%) and, of the Pacific Island terminals, Rarotonga, Tonga and Suva account for 23.3% of the remainder.

2. That, in the overall use of the PEACESAT system, Caucasians dominate over Pacific Islanders by a ratio of more than 2:1 in terms of the number of participants involved, and, that in terms of the time on air used by the two ethnic groups, Caucasian domination over Pacific Islanders is in the ratio of 4:1.

3. That, in terms of the use of the system according to Exchange Categories, Pacific Islanders use the system most in Category 4 (Community Development Service) with 33.4% of
the total time, Category 2 (Decision-Making Conferences) with 20.4% of the time, and Category 3 (Professional and In-Service Training) with 17.2% of the time. Pacific Islanders are almost wholly absent from Categories 5 and 6 (Research Support and Professional Consultation) with 2.0% and 0% of the time used. In Category 8 (Administrative), Pacific Islanders account for only 7.0% of the time used, indicating their marginal role in the running of PEACESAT.

4. That, in the breakdown of participation according to sex, in the overall use of the system males outnumber over females in a ratio of 1.8:1 despite male and female attendance at exchanges being more balanced in a ratio of 1.3:1. This overall male dominance appears in all categories except Category 4 (Community Development Service) where females outnumber males, although only marginally. In terms of the ethnic breakdown, amongst Caucasians, males dominate females overall in a ratio of 2:1, whereas amongst Pacific Islanders, use of the system is equally balanced between males and females. Of particular significance is the domination of Caucasian males in Category 8 (Administrative) where they comprise 69.6% of all time.

5. That US Nationals occupy the high figure of 40.2% of all time on air overall, representing more than half of all Caucasian time on air. Particular US dominance is evidenced in Categories 5, 6 and 1 (Research Support, Professional...
Consultation and Classroom Instruction), and in Category 8 (Administrative) US Nationals occupy 43.7% of the total. Amongst US Nationals as a group, males dominate females in a ratio of 3.3:1. Furthermore, US males comprise the high figure of 30.8% of all time on air.

2.6. Initiation of Exchanges

Of great importance in the analysis of PEACESAT's use by Pacific Islanders is not only their participation in exchanges, but the extent to which Pacific Islanders provide the stimulus for, and direction of, exchanges. In this section, initiation of exchanges is therefore analysed, and in the next section (2.6.), an analysis of the chairing function is provided.

Table 19: Initiation of Exchanges by Location, Exchange Categories 1 - 8 and Overall, shows the number of exchanges initiated by different locations. (It should be noted that if more than one exchange occurs with the same title, it is scored only once according to the terminal which originally initiated it.)

The total figures show that Honolulu and Wellington initiate the most exchanges by a significant margin: 38.2% and 29.1% of all exchanges respectively (a total of 67.3%). Metropolitan terminals combined initiate a total of 42 exchanges (or 76.4%), while Pacific Island terminals initiate a total of 13 (or 23.6%) - a ratio of 3.2:1. US terminals initiate a total
of 27 exchanges, or 49.1% of the total.

Results from the different exchange categories reveal that, even in Exchange Categories 2 and 4 (Decision-making Conference and Community Development Service) where Pacific Island users are most prominent, only 5 exchanges (or 26.3%) in Category 2, and 1 exchange (or 9.1%) in Category 4 were initiated by Pacific Island locations. Significantly, administrative exchanges were initiated exclusively by Honolulu and Wellington.

With the above results, the same problem recurs that the initiating location tells us little about the ethnicity and sex of the person initiating the exchange. Further analysis of the exchanges in this table reveals, for example, that Noumea accounts for 5 of the 13 Pacific Island-initiated exchanges, all of which were actually initiated by Caucasians from the South Pacific Commission. Furthermore, that only one exchange (initiated by Rarotonga in Category 2) was initiated by a Pacific Islander. This fact would tend to strongly suggest that initiatives in the use of PEACESAT come overwhelmingly from Caucasians.

The following conclusions can be drawn from this data:

1. That metropolitan terminals dominate Pacific Island terminals in the initiation of exchanges by 76.4% to 23.6%, or a ratio of 3.2:1. Honolulu and Wellington together account for 67.3% of all initiations.
2. That US terminals initiate a total of 49.1% of all
3. That, even in Exchange Categories 2 and 4 (Decision-making Conference and Community Development Service) where Pacific Island usage is highest, initiation of exchanges by Pacific Island locations is low; and that no exchanges in Category 8 (Administrative) are initiated by Pacific Island locations.

4. That, in the whole period under study, only one exchange was initiated by a Pacific Islander per se, indicating that initiatives in the use of PEACESAT come overwhelmingly from Caucasians.

2.7. Chairing of exchanges

Table 20: Chairing of Exchanges by Location, Exchange Categories 1 – 8 and Overall, and Table 21: Chairing of Exchanges by Sex and Ethnicity, Exchange Categories 1 – 8 and Overall, provide information on the identity of the chairpersons for exchanges in the period under study. (It should be noted that not all exchanges require a chairperson as such; this, for example, accounts for Category 6 where there are no chairpersons recorded, since all exchanges in this category involved only two locations.)

The results from Table 20 clearly show the dominance of Wellington and Honolulu which accounted for the very high totals of 45.2% and 30.6% respectively of all chairpersons – a combined total of 75.8%. In fact, the combined total of chairpersons from
metropolitan terminals (Honolulu, Wellington, UCSC and NASA Ames) is 51, or 82.3%, as compared to a total for the Pacific Islands of 11, or 17.7%. However, the inferior role played by the Pacific Islands in the chairing function is seen to be much worse than this in Table 21 which shows that Caucasian chairpersons totalled 57 (91.9%) as against 4 Pacific Islanders (6.5%). Given the figures for participation in exchanges (from Table 14) where the ratio of metropolitan to Pacific Island participants was approximately 2:1, these figures (a ratio of 14.1:1) demonstrate an extreme inequality for Pacific Islanders.

With regard to exchange categories, it is interesting that Pacific Islanders mostly chair exchanges in Category 4 (Community Development Service) and also chair one exchange in Category 2 (Decision-making Conference). Significantly, they chair no other exchanges.

The breakdown of chairpersons into sexes follows the same pattern as noted above in the discussion of participation: males dominate females 61.3% as against 38.7% (a ratio of 1.6:1). These figures are also very similar for the Caucasian population, where males outnumber females by 36 to 21, or a ratio of 1.7:1. Again, however, the Pacific Island figures are reversed and noteworthy: Pacific Island females outnumbering males in the chairing function in a ratio of 3:1.

Figures from Table 21 (b) show the role played by US Nationals in chairing exchanges. In total, US Nationals account
for the high figure of 37.1% of all chairpersons, of which most are male.

The following conclusions can therefore be drawn from this data:

1. That, in terms of location, the chairing function is overwhelmingly dominated by metropolitan terminals, and in particular by Wellington and Honolulu which together account for more than 75.0% of all chairpersons.

2. That, in the ethnic breakdown, Caucasian chairpersons overwhelmingly dominate the chairing function, accounting for 91.9% of all chairpersons.

3. That, in terms of exchange categories, Pacific Islanders only chair 3 exchanges in Category 4 (Community Development Service) and 1 in Category 2 (Decision-making Conference).

4. That, in terms of a breakdown into sexes, males dominate the chairing function in a ratio of 1.6:1. While this ratio also approximately holds for the Caucasian population, amongst Pacific Islanders, females dominate males in a ratio of 3:1.

5. That US Nationals account for 37.1% of all chairpersons, most of which are male.

2.8. Involvement of PEACESAT staff

Table 22: PEACESAT staff on air by sex and ethnicity, Exchange Categories 1 - 8 and Overall, shows the amount of time on air used by PEACESAT staff.
The overall results show that a total of 793.0 minutes were used by PEACESAT staff. This translates into the high figure of 24.0% of all participant air time (3309.0 minutes). Significantly, Caucasian staff dominate Pacific Island staff by 67.3% to 26.7% - a ratio of 2.5:1.

The sex breakdown shows that, overall, female staff outnumber male staff by a small margin (420.0 minutes as against 373.0 minutes, or 53% to 47%). This situation is true for both the Caucasian and Pacific Island populations. The figures for the different exchange categories would suggest that, for the Caucasian population, Categories 4 and 8 (Community Development Service and Administrative) mainly serve to swing the balance in favour of females, and that for the Pacific Island population it is also Category 4 which swings the balance. The predominance of Caucasian females in Category 8 is largely explained by the fact that the Wellington Terminal Manager (Elsa Flavell) conducts the regular weekly scheduling function for the system.

Considering the role of US National PEACESAT staff, it is worthy of note that their overall time on air represents 31.3% of all staff time. Furthermore, US Nationals can be seen to account for 46.5% of all Caucasian staff time - a high figure. US male staff dominate female staff in a ratio of more than 2:1 (169.5 minutes as against 78.5 minutes.)

When these results are compared with Table 10.P: Participant Time on air by sex and ethnicity, the proportion of
time for each ethnic group that is made up of PEACESAT staff time can be determined. Amongst Caucasians, 20.7% of time is PEACESAT staff time (533.5 minutes out of a total of 2576.5 minutes); amongst Pacific Islanders, 34.3% is staff time (211.5 minutes out of a total of 617.0 minutes). These results indicate that a considerably greater proportion of non-staff Caucasians use the system than do non-staff Pacific Islanders or, conversely, the results would tend to suggest that the Caucasian 'general public' use PEACESAT proportionately more than the Pacific Island 'general public'.

Table 22 can be slightly modified in two ways to further illustrate the relative importance of Caucasian and Pacific Island staff.

First, in Category 4 (Community Development Service), it is common practice during the SPC News exchange for some terminal managers to read the weekly news bulletin. This is especially true of the smaller terminals where resources do not extend to using special news-readers. If all time devoted to reading news by PEACESAT staff is subtracted from the figures, then the total time for Caucasian staff becomes 515.5 minutes (72.3%), and for Pacific Island staff, 150.5 minutes (21.1%). This increases the Caucasian to Pacific Island staff dominance to a ratio of 3.4:1.

Secondly, the figures in Table 22 do not include the PEACESAT staff time spent on air for special exchanges such as the PEACESAT Consortium Council meetings and the meetings which
were held to plan strategy for the World Administrative Conference (WARC). When adjustments are made in Category 8 (Administrative) to include this time, the Pacific Island figure remains the same (i.e. no Pacific Islander staff were involved in these meetings), whereas the figure for Caucasian staff doubles, from 276.5 to 570.0 minutes. This has the effect of further increasing the Caucasian to Pacific Island staff dominance to 76.2% to 19.5%, or 3.9:1.

Finally, if the above revised figures are both included, then the overall figures become: Caucasian, 809.0 minutes (80.7%); Pacific Islander, 150.5 minutes (15.0%); and Other, 43.0 minutes (4.3%). These figures demonstrate very clearly the extreme dominance of Caucasian staff over Pacific Island staff on the system: a ratio of 5.4:1 (or more than double the ratio that first appears from Table 22). Furthermore, since all major contributors to Consortium Council and WARC meetings were male (only 2 females participated at all in these meetings, for a combined total of 8.0 minutes), the inclusion of these results changes the above male-female ratio. In this case, final figures work out to: male staff, 661.0 minutes (or 60.7%) and female staff, 428.0 minutes (or 39.3%) — or a ratio of male to female dominance of 3:2.

The following conclusions can therefore be drawn from this data:

1. That 24.0% of all PEACESAT time on air is used by PEACESAT
2. That Caucasian staff use a large amount of time—from 67.3% to 80.7%—and that Pacific Island staff use a relatively small amount of time—from 26.7% to 15.0%; or, that Caucasian staff dominate Pacific Island staff in a ratio of between 2.5 to 5.4:1.

3. That, superficially, female staff are more prominent on the system than male staff by a small margin, but that, if specialised administrative exchanges are taken into account, male staff dominate female staff in a ratio of 3:2 overall.

4. That US Nationals account for 31.3% of all staff time, or 46.5% of all Caucasian staff time. Further, that US male staff dominate female staff in a ratio of more than 2:1.

5. That the Caucasian 'general public' use PEACESAT proportionately more than the Pacific Island 'general public'.

2.9. Comparison of terminal resources

Table 23: Assessment and Comparison of Terminal Resources, represents an attempt at quantifying the differences among terminals in terms of the resources they each possess. As explained in the table, scores are allocated according to three criteria: (1) staff (full- and part-time); (2) equipment (reliability and signal strength); and (3) whether or not the terminal is used exclusively for PEACESAT operations. (The
rationale for the latter criterion is that a terminal dedicated to only one network can focus all of its resources upon participation in that network; terminals involved in both the PEACESAT and USP nets often cannot do this, for lack of resources.

The total figures show that the metropolitan terminals (with the exception of Vancouver) have significantly more resources at their disposal than do the Pacific Island terminals. In fact, the combined resources of metropolitan terminals (66.5%) outnumbers those of the Pacific Island terminals (32.7%) in a ratio of 2:1. When the average resources for Metropolitan and Pacific Island terminals is calculated, the extent of this imbalance is more noticeable: Metropolitan terminals average a score of 4.5, or 16.4% of all resources, while Pacific Island terminals average a score of 0.7, or 2.5% of all resources. This amounts to a ratio of 6.6:1 in favour of Metropolitan terminals. It is also interesting to note that the combined resources of US terminals total 19.5 - or 70.9% of all resources. Of the Metropolitan terminals, it is significant that Honolulu dominates by a clear margin over Wellington and UCSC (30.9% of total resources as compared to 16.4% and 18.2%). Of the Pacific Island terminals, Rarotonga, Saipan (each with 10.9%),Pago Pago and Suva (with 9.1%) are dominant, followed by Tonga with 7.3% of total resources. Other Pacific Island terminals possess comparatively marginal resources according to
these criteria.

Results from Table 23 would also suggest that the number of PEACESAT staff available at a terminal (column 1) has a major influence upon the overall assessment of a terminal's resources as calculated here. Since the privileged position of the Metropolitan terminals evidenced in this table correlates closely with the other parts of this study as presented above, it is reasonable to conclude that there is some correlation between the number of staff available at a given terminal and the overall participation of a terminal in the system.

The following conclusions can be drawn from this data:

1. That the combined resources of the Metropolitan terminals are twice the combined resources of the Pacific Island terminals; and that the average resources of Metropolitan terminals are more than 6 times those of the Pacific Island terminals.

2. That the combined resources of US terminals are 70.9% of the total.

3. That, of the Metropolitan terminals, Honolulu (with 30.9%) clearly dominates; and that, of Pacific Island terminals, Rarotonga, Saipan, Pago Pago and Suva are dominant.

4. That the number of staff available at a given terminal - especially the availability of a full-time staff member - would seem to have an important influence on the overall participation of that terminal in the system.
2.10. Limitations of the study

A limitation in the above analysis of exchange data is the small size of the sample. With the limited resources at my disposal, and owing to administrative difficulties, it was not possible to extend it to any grander scale than has been presented although it was originally hoped to have been able to conduct the analysis at different points in PEACESAT's history (e.g. also including analysis of exchanges from 1974 and 1976), thereby attempting to ascertain whether any changes occurred in exchange data over time.\(^7\)

Given the circumstances, it was important to ensure that the sample chosen was representative. In this respect, it is important to note that (1) PEACESAT procedures have been established for a long period and have changed little over time;\(^7\)

Prior to the period of this study, the author repeatedly tried to arrange for the copying of tape-recorded exchanges from two previous periods (mid-1974 and mid-1976) to be supplied to him for this purpose from PEACESAT headquarters. This was done by letter in December 1978, in person in Honolulu in January 1979, and repeatedly by letter and via PEACESAT from January - April, 1979. Finally, a copy of some exchanges from April 1974 were received in Vancouver in August 1979 with the promise that a further selection from 1976 would follow shortly. By October 1979, this material had not arrived. Even the material received in August was too late to be included in the study. Explanations for the delay in providing this material were said to be for (i) copyright reasons; and (ii) because resources at Honolulu did not extend to doing the tape-recording quickly. These reasons are legitimate. However, since they were explained to me in Honolulu in January 1979, and since I was at that time prepared to sign a copyright document and had already arranged for the tapes to be copied by other than PEACESAT personnel, it would appear that neither explanation is really sufficient to account for such a delay.
and (2) that the possibility of seasonal variation was compensated for (see below). As regards the possibility of a growth or decline in the system in different years (e.g., especially of Pacific Islander participation), the summary analysis of exchange material from 1974 (presented in Appendix 5) would indicate that the sample chosen in this study is, in fact, representative.

As regards the time period chosen for the study, it happened - for reasons of necessity - to fall at the start of the PEACESAT year. For this reason, it is likely that during the period under study, there were more Planning exchanges than is normal. In order to compensate for any unusual results that might in this way be produced, wherever a Planning exchange was analysed, an attempt was made when possible to also analyse a regular exchange of the same title. For example, where a Small Business Management Planning exchange was analysed, a regular Small Business Management exchange was also included. This was part of the rationale for extending the period of time under study (see above, Section 2.1).

Regarding the method of categorisation of exchanges, the following points need to be made:

1. It was found that exchange titles were frequently mis-leading. The following examples are illustrative:
   a. a Health Exchange between Vancouver and Rarotonga was in fact a discussion between a medical doctor in Canada and
a government official in the Cook Islands concerning the launching of a health research project — and problems associated with it — in the Cooks. As such it was categorised as a Decision-making Conference, not — as it might appear from the title — as a Professional Consultation;

b. Similarly, exchanges entitled "Adult Education (US Terminals)" and "Special Education (US Terminals)" in fact involved administrators and, it seemed, were largely for the purpose of facilitating the administration of US education matters and organising Conferences. They were thus categorised as Decision-making Conferences;

c. The "Teaching of Social Sciences" in fact involved Social Science teachers from different Pacific Islands who were using PEACESAT to facilitate the formation of a Social Sciences Association and as a means of holding meetings to this end. As such, the exchange was categorised as a Decision-Making Conference (Category 2) not under Professional and In-Service Training (Category 3).

d. Similarly, Planning exchanges were in many cases categorised as Decision-making Conferences since the aim of the exchange was frequently to decide whether or not to actually go ahead with a series of exchanges on a
certain topic. Examples here are "Spanish Conversation Planning" and "Small Business Management".

However, in the case of well-established exchanges such as Guide Leaders and Boys Brigade, Planning exchanges were not so much concerned with deciding whether or not to launch an exchange series, rather they were the first meeting in a series at which past and future business was discussed by regular participants. In cases of this kind, a Planning exchange was categorised as a regular exchange: Guide Leaders Planning thus was categorised as a Community Development Service exchange.

As is evident from the definition of exchange categories, some categories (such as Classroom Instruction, Professional and In-Service Training, Research Support, Professional Consultation and Administrative) are very specific, while others (such as Decision-making Conferences and Community Development Service) are very loosely defined. Therefore, within Categories 2 and 4 (Decision-making Conferences and Community Development Service) particularly, there is a high degree of variation among exchanges.

To some extent, the above calls into question the categories being employed, especially with regard to the problem of the large degrees of variation in the exchanges that were
analysed. It is apparent that the exchange categories used by the PEACESAT system may be fine from the point of view of the system itself, but ideally require more rigorous specification if further studies of this kind are to be undertaken. Such added methodological sophistication might enable a reduction in the degree of variation within categories of exchange. In turn, this would enable a far greater degree of precision to be included in the analysis of certain sub-categories of exchange. For example, (1) Community Development Service exchanges of an international nature (such as the International Year of the Child) could be analysed separately from those of a local, Pacific nature; and (2) medical exchanges in Category 5 (Research Support) could be analysed separately from others (e.g. Vulcanology). The extent to which it is possible to categorise PEACESAT exchanges in a variety of ways has been noted in footnote 4 of this chapter.

Nevertheless, having used what appears to be the most 'standard' method of categorisation in this study, two important and inter-related implications must be noted:

1. that, whatever the categorisation procedure employed, the overall results remain substantially the same: Pacific Islanders use the system very little; and

2. that the very absence of more precise categories of exchange must mitigate against a useful running analysis of PEACESAT use, and therefore make positive remedial action difficult to take.
For example, if certain time periods, or categories of exchange, were devoted either to specific Pacific Islands-oriented exchanges, or to exchanges involving only Pacific Islanders, it is likely that the degree of Metropolitan domination of the system could be substantially reduced. The absence of such formalised structures reflects the short-sightedly liberal administration of PEACESAT, and provides a good example of how such a stance mitigates against weaker parties in a supposedly 'equal' system.

3.0. Network Flow Analysis

3.1. Objective

Two separate but complementary studies were undertaken: Network Flow Analysis (1) and (2). Both studies had as their objective the measurement of the flow of information between and among terminals in an attempt to determine whether any distinct relationships existed between them, especially between Metropolitan and Pacific Island terminals.

3.2. Methodology

Network Flow Analysis (1) was concerned to distinguish between (i) those participants who asked a question, requested information, or solicited advice (recorded as a "Q" score); and (ii) those who provided a response, supplied information, or
gave advice (recorded as a "R" score). All exchanges analysed in the Exchange Data Analysis section above were also subject to this study. Both Q and R scores were counted in half minute units and originally recorded as raw data on the Exchange Data sheets (see Section 2.1. of this chapter). Secondly, this information was tabulated and the relationships between Q and R scores and Metropolitan and Pacific Island terminals ascertained. (See Tables 24, 25 and 26.) Finally, the significance of the results was calculated using the Chi Square method (see Table 27).

Network Flow Analysis (2) was concerned to ascertain the number of connections made amongst the different terminals. To this end, only the periods of time categorised as "messages" were analysed, the rationale for this being twofold: (1) that message periods had not up until this stage been analysed at all; and (2) that such message periods are informal in structure (i.e. not scheduled) and might thus be best suited as indicators of important connections among terminals. Consequently, all message periods of 12 minutes or more were analysed. This amounted to 235.5 minutes of message time out of a total of 478.5 minutes (or 49.2% of all message time) and was thus considered to be a representative sample. For each message period analysed, a score of 1 was allocated to each message that each terminal originated; this was scored according to the transmitting and receiving terminals, thereby indicating the
direction in which the message was travelling. (See Appendix 3 for an example of the form on which raw data was collected.) Secondly, this information was compiled into one table (Table 28) and the relationships between Metropolitan and Pacific Island terminals ascertained (see Table 29). Finally, the significance of the result was calculated using the Chi Square method.

3.3. Network Flow Analysis (1)

Tables 24 and 25 show the Q and R scores respectively for Exchange Categories 1 - 8 and Overall. Table 26 then shows the relationships between Q and R scores and Metropolitan and Pacific Island terminals, and Table 27 summarises the probability scores for the results obtained in Exchange Categories 1 - 8 and Overall.

From Tables 24 and 25 it is first evident that R scores are more numerous than Q scores, in fact, in a ratio of 6.3:1 (see also Table 26). This would not seem to be an unlikely result and probably reflects the normal pattern of interaction in such a system. However, the distribution of Q and R scores among the different terminals again shows a definite imbalance in favour of the Metropolitan terminals. Honolulu and Wellington possess 31.8% and 32.9% respectively of the Q scores (a combined 64.7%), and 28.1% and 24.3% of the R scores (a combined 52.4%). Similarly, Suva and Rarotonga are dominant among the Pacific
Island terminals.

It is, however, Table 26 that shows the relationship between the Q and R scores and the Metropolitan and Pacific Island terminals. First of all, it is noticeable from column 4 that Metropolitan terminals dominate all activity on the system (i.e. Q and R activity combined) by 64.9% as against 35.1% for Pacific Island terminals: a ratio of 1.8:1. This overall ratio is almost identical to the ratio of Metropolitan - Pacific Island R scores: 63.5% to 36.5%, or 1.7:1. This indicates a flow of information from Metropolitan - Pacific Island locations. However, in considering Q scores, it is noteworthy that Metropolitan terminals dominate Pacific Island terminals by 73.6% to 26.2%, or a ratio of 2.8:1. What these results would suggest, therefore, is that while one would expect Metropolitan activity overall and as regards R scores to dominate over Pacific Island activity (from the results of the Exchange Data Analysis), there are distinctly more questions asked (or Q activity) by Metropolitan terminals than expected. This indicates a more than usually active role for Metropolitan terminals and a more than usually passive role for Pacific Island terminals. In turn, this would suggest that a significant proportion of Metropolitan dominance of PEACESAT is concerned with questioning activity, and that there might be a flow of information from the Pacific Islands to the Metropolitan areas because of this.
In order to assess the significance of the above results, a probability test (the Chi Square) was conducted for results from each exchange category and for the overall results. The results of this test are shown in Table 27.

Interestingly, among the exchange categories, only the results in Category 4 (Community Development Service) would appear to be significant, with a probability of < 0.02. Despite this, however, it would appear that the overall result is also significant (with a probability of < 0.15), although by no means dramatically so.

The following conclusions can therefore be drawn from Network Flow Analysis (1):

1. That Honolulu and Wellington clearly dominate activity on the system with a combined total of 64.7% of Q scores and 52.4% of R scores;

2. That, overall, and as regards R scores, Metropolitan terminals dominate Pacific Island terminals in a ratio of approximately 1.8:1 indicating a dominant flow of information from Metropolitan to Pacific Island locations;

3. That, as regards Q scores, Metropolitan terminals dominate Pacific Island terminals in a ratio of 2.8:1, suggesting a more active role of Caucasians than for Pacific Islanders;

4. That the above would tend to suggest that there might also be a flow of information from Pacific Island terminals to Metropolitan terminals, elicited by dominant questioning
activity on the part of Metropolitan terminals.

3.4. Network Flow Analysis (2)

Table 28: Network Flow Analysis (2): Connections made amongst terminals during message periods, shows the number of messages passed from transmitting to receiving terminals for the period under study, and Table 29 summarises this data into Metropolitan and Pacific Island divisions.

From Table 28 it is apparent that Honolulu and Wellington again play a dominant role, especially in the originating (or transmitting) of messages: Honolulu accounts for 41.5% of all transmitted messages and Wellington for 39.0% - a high combined total of 80.5%. The results for the receipt of messages shows a much greater spread over all terminals, with Honolulu and Wellington still nevertheless dominant.

Table 29 summarises the results into the Metropolitan and Pacific Island divisions and as such gives a clearer picture of the connections being made. The largest numbers of connections made are from Metropolitan to Pacific Island terminals (54.1%), and from Metropolitan to Metropolitan terminals (30.7%). Of Pacific Island-transmitted messages, most are directed to Metropolitan terminals (11.7%), even though this is a low percentage of the total. Most significantly, messages transmitted by Pacific Island terminals and directed to Pacific Island terminals are extremely low: only 3.4%. These figures
would indicate that there is a hierarchy of networks: first, there is a definite pattern of connections flowing from Metropolitan to Pacific Island terminals; second, that the next most important network of connections is between and amongst Metropolitan terminals; third, that Pacific Island terminals’ major message activity is directed towards Metropolitan terminals; and fourth, that what exists of a network amongst Pacific Island terminals is distinctly marginal.

An important factor in relation to these results is that the outcome of the Chi Square test undertaken on the above figures indicates that they are significant: the probability of these results was < 0.14.

The following conclusions can therefore be drawn from this data:

1. That Metropolitan terminals dominate the transmission of messages by 84.9% to 15.1%, or a ratio of 5.6:1; and that the number of messages received by Pacific Island terminals exceeds those received by Metropolitan terminals by 57.6% to 42.4%, or a ratio of 1.4:1; furthermore, that Honolulu and Wellington dominate in the transmission and reception of messages, being especially dominant in the transmitting of messages where they account for a combined figure of 80.5% of the total;

2. That the following hierarchy of networks is discernible:
   a. from Metropolitan to Pacific Island terminals (54.1% of
the connections);
b. from Metropolitan to Metropolitan terminals (30.7% of the connections);
c. from Pacific Island to Metropolitan terminals (11.7% of the connections); and
d. from Pacific Island to Pacific Island terminals (3.4% of the connections - a marginal network).

3.5. Limitations of the study

Dealing first of all with Network Flow Analysis (I), the following limitations of the study are apparent:

1. First, it became evident in the course of the study that the division of participants' time on air into the two categories Q and R was very crude and in some cases unsatisfactory. While the objective of making the binary distinction was an attempt to facilitate the discrimination of the flow of information, this allowed no room for 'neutral' speeches (i.e. those which were not susceptible to either categorisation), nor for the finer grading of 'Q-ness' of 'R-ness' which inevitably occurs in verbal interaction. To some extent, this limitation was anticipated prior to the study. However, it was felt that the study should be carried out in this way for two reasons:
a. in order to see what validity the results of such a study would in fact have; and
b. because even if results were not wholly satisfactory, they could most probably add an important element to the overall study when considered in relation to the Exchange Data Analysis and Network Flow Analysis (2). In practice it is evident that further refinement of this method could very probably produce more satisfactory results.

2. Secondly, as with the Exchange Data Analysis, a limitation imposed by the constraint of time was the small size of some of the samples. Interestingly, in those Exchange Categories where a large number of exchanges were analysed (e.g. Categories 2 and 4), the results showed greater significance (e.g. probability scores of < 0.55 in Category 2, and < 0.02 in Category 4). The overall probability score would tend to support the view that larger samples were necessary in many of the exchange categories.

3. Connected with both of the above points is the fact that the degree of variation amongst exchanges - even amongst exchanges of the same category - is high. This would also reduce the degree of significance of the results. The conventional solution to this is that the higher the degree of variation one finds, the larger the sample must be. Since this was impossible, the alternative solution would have been to re-categorise exchanges in such a way as to reduce the degree of variation. In other words, it is probable that
if a procedure were to be adopted to categorise the exchanges with a much greater degree of specificity, thereby limiting the degree of variation within each category, then more satisfactory analyses could be undertaken. This I would recommend for future analyses of this type.

Regarding Network Flow Analysis (2), the major limitation was also the small size of the sample. One would expect the significance of the results to rise if double or treble the amount of message time were to be analysed. In this respect it should be noted that only those message periods over 12 minutes in duration were analysed. A speculation is that, if the shorter message periods had also been subjected to scrutiny, the Metropolitan domination would increase owing to the fact that in the shorter message periods it appears most often to be the case that Metropolitan terminals get the opportunity of passing messages on the system.

The only other observation with regard to Network Flow Analysis (2) is that the method employed in this analysis (possibly with some modifications) would seem to have a great deal of potential in the analysis of regular exchanges also.
4.0. Discussion and summary

Despite the limitations of the preceding analyses, it would seem that the degree of complementarity of the overall results suggests conclusions of considerable importance regarding the role of Pacific Island terminals and Pacific Island people within the PEACESAT system. While the results also provide useful technical information (regarding, for example, the duration of exchanges, the average number of locations and participants per exchange, etc.) as well as experience in the development of a methodological approach to the analysis of such systems as PEACESAT, this section will be primarily concerned to highlight those findings which shed light upon the Metropolitan - Pacific Island relationships.

The key results can be summarised as follows:

1. Metropolitan locations dominate Pacific Island locations by 64.3% to 35.7%, or a ratio of almost 2:1;
2. Caucasian participants dominate Pacific Island participants by 66.3% to 28.4%, or a ratio of more than 2:1;
3. Caucasian participants dominate Pacific Island participants in the amount of time on air used, by 77.8% to 18.6%, or a ratio of 4:1;
4. Metropolitan terminals dominate Pacific Island terminals in the initiation of exchanges by 76.4% to 23.6%, or a ratio of 3.2:1; furthermore, only 1.8% of all exchanges were initiated by Pacific Island people;
5. Metropolitan terminals dominate Pacific Island terminals in the chairing of exchanges, by 82.3% to 17.7%, or a ratio of 4.6:1; furthermore, Caucasians account for 91.9% of all chairpersons, a ratio of Metropolitan - Pacific Island dominance of 11.3:1;

6. Caucasian staff dominate Pacific Island staff in their time on air at best in a ratio of 2.5:1, at worst in a ratio of 5.4:1;

7. The primary information flow is from Metropolitan to Pacific Island locations; Metropolitan locations are also characterised by dominant questioning activity on their part;

8. Metropolitan terminals dominate informal networking on PEACESAT by 84.9% to 15.1%, or a ratio of 5.6:1; furthermore, the dominant networks on the PEACESAT system are clearly:
   a. from Metropolitan to Pacific Island terminals; and
   b. from Metropolitan to Metropolitan terminals.

   Pacific Island to Pacific Island networking is only marginal.

   Overall, then, the position of Pacific Island terminals relative to Metropolitan terminals can at best be said to be weak, despite Pacific Island terminals out-numbering Metropolitan terminals in a ratio of 2:1. The figure for the amount of time on air used would seem to be a crucial one, and
this shows a 4:1 ratio of Caucasian dominance over Pacific Islanders. But what is more disturbing is the role seen to be played by Pacific Islanders in the decision-making and administrative areas of the system: the initiation and chairing of exchanges, and the amount of time used on air by PEACESAT staff. Here, the role of Pacific Islanders is little more than marginal, and these results are supported by the low figure of 7.0% of all time that Pacific Islanders are involved in Category 8 (Administrative) exchanges. Finally, the results of the Network Flow analyses indicate a largely passive role for Pacific Island terminals, being questioned by Metropolitan terminals and consequently providing information to Metropolitan terminals more than the reverse is the case, a result, incidentally, which is supported by the author's participant observation. Furthermore, the marginality of Pacific Island terminals is corroborated by the insignificant networking between Pacific Island locations and the inferior networking from Pacific Island to Metropolitan locations.

These overall trends having been discerned, the picture is made more complete by the more fine-grained results. Honolulu and Wellington are overwhelmingly important, not only among the Metropolitan terminals but within the system as a whole. Of the

8 The author was employed as Acting Terminal Manager with PEACESAT (SFU), after having assisted in establishing the terminal, from September 1978 May 1979, and in this period monitored a majority of the exchanges.
Pacific Island terminals, Suva and Rarotonga are significantly more active than the others, and six terminals (Niue, Lae, Apia, Honiara, Tarawa and Vila) play a distinctly marginal role in PEACESAT.

Among participants, US Nationals occupy over 40% of all time on air. Furthermore, US males alone account for over 30% of all time on air.

The sex breakdown indicates an approximate 2:1 domination of males over females overall, a figure repeated in the Caucasian population (despite, for instance, the large amount of time on air of the female Terminal Manager at Wellington). Among Pacific Islanders, the sex ratio is balanced, a surprising result on the surface considering the largely dominant role of males in many Pacific societies, but one which might be reflective of Pacific Islanders' reactions to a novel (i.e. non-traditional) and not particularly important institution. In other words, one could hypothesise that the reaction from Pacific people to a new communication system which is of no great importance to their everyday lives would be that the males (who occupy the vast majority of important positions and who are today frequently occupationally over-extended) would tend not to participate to a great extent, while the females (who are principally occupied domestically) would tend to participate more so, especially since participation might be regarded as a means for the acquisition of status by people with little such
status. The predominance of Pacific Island females in Category 4 (Community Development Service) - 21.8% females as compared to 11.6% males - which is, in turn, the category where Pacific Island participation is the highest, might tend to support this hypothesis, since exchanges in this category were, after all, of little importance to the crucial functioning of Pacific societies.

This raises the final point concerning the different exchange categories, and participation within them. Categories 2, 4 and 8 (Decision-making Conference, Community Development Service and Administrative) appear to be overwhelmingly more important than others, Category 8 alone comprising 25% of all time. In Category 8, Caucasian males comprise 70% of the total time. Those categories of an overtly educational or medical value (Categories 1, 3, 5 and 6: Classroom Instruction, Professional and In-Service Training, Research Support and Professional Consultation) comprise a total of 20% of all time, a low figure, especially when some exchanges in these categories in fact possessed only marginal educational or medical importance. Furthermore, the role of Pacific Islanders in these categories is low (30% of the total time on air, with only 2% in Category 5 and nil in Category 6) while the figures for US Nationals in the same categories are exceptionally high (US Nationals occupying 86.0% of time in Category 6, 78.8% in Category 5, 63.7% in Category 1 and 14.2% in Category 3).
A further hypothesis arises from the results of the Categorisation of Exchanges and Content Type analyses. Category 8 (Administrative) exchanges have been shown to occupy 25% of the total time, and procedural content to occupy 18.8% of the total. In addition to the conclusions drawn earlier, these figures also suggest the possibility that such administrative and procedural matters are, to some extent, in fact substantive; i.e. that PEACESAT uses a considerable amount of time in a self-serving manner to promote the system by stimulating needs. In turn this raises the question of how much such self-promotion might be considered a legitimate experimental activity, and how much it might be considered indicative of "a system in search of a function" as opposed to "a whole series of functions in search of a system" - a distinction that has been made between PEACESAT and the USP Net. 9

As a general conclusion to these results, therefore, it seems justified from the data to say that Metropolitan terminals and Caucasian participants play an overwhelmingly dominant role in the operation of the PEACESAT system as compared to Pacific Island terminals and Pacific Island people. Furthermore, while there are obvious dangers in extrapolating qualitative judgements from quantitative data, it would also seem justified to conclude that, with the occasional exception, the probability

9 John Chick, Regional Communications and the University of the South Pacific, (Suva: Extension Services, USP, December 1979), p.2.
that PEACESAT plays more than a marginal role in the development process of the Pacific Islands is extremely low. On the contrary, there would appear to be evidence to support an argument that PEACESAT, in acting as a major vehicle for the dissemination of Western - and predominantly US - ideas, might in fact be contributing negatively to the development process.
X. OVERALL ANALYSIS & CONCLUSIONS

In the overall analysis of PEACESAT, it is important to make the distinction between the core nations and the periphery nations that PEACESAT serves: the Metropolitan and Pacific Island nations that comprise the system as a whole. Having made this fundamental distinction, the next step is to distinguish the particular interests served by PEACESAT within both the core and the periphery divisions. It is on the basis of an analysis of these divisions that PEACESAT's appropriateness for Pacific Island development can be determined.

What follows, therefore, is an analysis of the particular features of PEACESAT as examined in the bulk of this study, followed by an analysis of the more general context into which PEACESAT fits. Throughout, the focus of attention will be upon the core-periphery and secondary divisions defined above. First, however, although this study has not dealt with the analysis of PEACESAT as a technical experiment, it is appropriate also to make a brief mention of this aspect of the project.

I propose to consider these three aspects of the study in the following order, starting with PEACESAT as a technical experiment, then considering it as an institution and its particular performance in the Pacific, and, finally, examining PEACESAT as a whole in relation to development in the Pacific.
1.0. **PEACESAT as a technical experiment**

There can be little doubt that, as a technical experiment, PEACESAT has demonstrated the practical possibility of a novel kind of telecommunications service. The addition of such an innovation to the collective experience of the telecommunications 'community' and the people of the Pacific extends the repertoire of telecommunications possibilities to draw from in the design of national and/or regional communications systems. The tele-conferencing aspect of the demonstration has been instructive, and would be a facility that— as a result of PEACESAT, perhaps—many people would probably opt for if they had the choice, given certain modifications. Similarly, the additional technical services that can be carried via a narrow-band system have been sufficiently demonstrated: the use of facsimile, teletype and slow-scan television on the system, as well as its capacity to carry computer-originated data.

On top of these bare technical achievements, PEACESAT has also demonstrated by experience the wide variety of uses to which such a system can be put. While it would be quite legitimate to argue, for instance, that PEACESAT per se has in fact demonstrated little that experimentation in Alaska using
ATS-1 did not already indicate was technically possible\(^1\), there is, in fact, a difference between the potential of technological hardware and its application, especially in terms of conveying the idea of its possible applications to a public with little specialist knowledge. In short, a demonstration is much more effective in conveying such potential than a speech or a printed document. The people of the Pacific can, in this sense, be said to have been privileged in having been part of such a demonstration for such an extended period of time. The wide variety and range of PEACESAT users testifies to the fact that, over the eight years of the project's history, it has touched many peoples' lives. In this respect, then, as even PEACESAT's harshest critics have agreed, PEACESAT has served an important function, and John Bystrom in particular deserves praise for the large part he has played in its operation, as do the other people who played key roles in its development.

There is a danger, however, in considering a technical system to be a neutral, and somehow apolitical, phenomenon. All technologies are devised by particular social forms for particular purposes. Equally, a "technology" must be regarded as comprising both a hardware and an institutional component, both of which are inevitably designed for use by interests in a particular society, and for particular purposes. As a

consequence of this, technologies are by no means readily transferable across cultures, since much more than the hardware component of the technology gets transferred with the subsequent risk of undesirable consequences vastly outweighing the desirable consequences because of very different social and cultural circumstances. In the analysis that follows, therefore, these considerations will also be borne in mind.

2.0. PEACESAT as an institution

Considering PEACESAT as an institution actually operating in the Pacific, we must examine a number of aspects, including the form of the institution itself, its relation to other institutions, its performance, and what I shall refer to as PEACESAT's 'hidden agenda': the Extended Experiment.

2.1. Organisational structure

As has been documented, PEACESAT's organisational structure is hierarchical with a great deal of power vested in the "Principal Investigator" at Honolulu. Significantly, although the establishment of Management Meetings seems on the surface to have been a positive step towards democratising the structure of PEACESAT, they appear to have been only a token in this regard and thus readily disregarded by local PEACESAT staff as largely a waste of time. It is also significant that the scheduling
function has always been undertaken by a Metropolitan terminal (Honolulu or Wellington). While this might well have been largely a function of the ability of Metropolitan terminals to find the financial resources to employ full-time Terminal Managers for this (amongst other) tasks, this is not sufficient explanation for why Pacific Island terminals have never assumed this important task. Were the objectives of the PEACESAT project genuinely to be concerned with the development of the Pacific Islands, it would seem that the transfer of funding from Metropolitan terminals to a Pacific Island terminal, or the receipt of outside funds specifically for this purpose, would be a relatively simple matter.

This token representation can be seen also in the Consortium Council Executive Board, possessing no Pacific Island representatives, and the fact that all major official positions of importance are filled by Americans or Caucasian others. The fact of the decisions of the Consortium Council on occasion being unilaterally over-ruled by Honolulu (in the case of the PEACESAT-USP controversy, for instance) is evidence of where the power really lies. Many of PEACESAT's problems regarding its seemingly well-intentioned but constantly frustrated desire to develop as a Pacific region institution must revolve around this fundamental failure to genuinely share and/or delegate authority, and function as a legitimately democratic institution. To a certain extent, the responsibility for such
failure lies with the NASA-experimenter relationship which promotes such hierarchical organisation. However, since there appear to be no good reasons why a more democratic organisation was not attempted (with, for example, the development of some form of collective responsibility to NASA) other than that Honolulu specifically wanted to maintain control over the system itself, the major burden of responsibility for this must fall upon PEACESAT headquarters in Honolulu.

In this connection it is worth raising the question of the extent to which the institutional organs of PEACESAT are in fact an integral part of the technology of PEACESAT. Clearly, the scheduling function, for example, is vital to the system's operation. That it has been so dominated by the Metropolitan terminals is indicative of the small extent to which PEACESAT has been encouraged to develop in response to Pacific Island requirements. In this contradiction lies the key to understanding the frustrations and good intentions just mentioned, for they are not symmetrical, and for obvious reasons. No matter how well-intentioned are the individuals at PEACESAT headquarters, for example, the frustration of Pacific Islanders (as well as those from Metropolitan locations wishing to see the system develop in a more Pacific-oriented way) will remain so long as control over such key functions remains firmly in the hands of the 'core'.
2.2. Relations with other Pacific institutions

Perhaps the classic example of PEACESAT's failure to attain its own objectives are the extremely poor relationships that PEACESAT has managed to develop with other crucial institutions. In direct contrast to the necessity for local terminals to work within the licencing terms imposed by local regulatory authorities, as enunciated by Bystrom, PEACESAT appears over time to have progressively alienated Fiji's P & T department to the present point where PEACESAT is clearly tolerated only because of the USP's separate involvement with ATS-1.² Furthermore, PEACESAT's extremely poor relations with the only other universities of the network - the USP and the UCSC - represents an incomprehensible contradiction of its original aim to link universities of the region, unless we conclude either that this was only to be achieved within certain constraints (imposed by Honolulu), or that this was not the real objective at all, but merely a convenient and 'respectable' front for the development of this grand global communications system which envisaged Honolulu being at all times placed firmly at the core. Either way, there is sufficient evidence to conclude that both Fiji's P & T and the USP are now thoroughly disillusioned with PEACESAT per se.

² See Maraj's letter to Barnes to this effect.
2.3. Funding and programming

A note on funding is relevant at this stage. The bulk of Honolulu's funds have come from Hawaii State. It is not without justification to speculate that such continued funding is, in an obviously unstated, informal way, conditional on PEACESAT serving the predominantly conservative 'Establishment' interests represented in the State government. That such interests relate to the wider foreign policy objectives of the US will be examined in section 3.0. The fact that Bystrom's propensity would, in any event, be to serve these interests means that economic constraints have most probably had a considerable conservative effect on PEACESAT's development.

Other funding has evidently constrained PEACESAT in similar ways. The Noumea Conference, for example, was funded by The Asia Foundation, the International Planned Parenthood Federation, and New Zealand Catholic Overseas Aid. The Asia Foundation is considered to be quite 'traditional' in its concept of development, as well as being pro-US, and thus will have exerted an additional overall conservatism on PEACESAT.

The case of the IPPF represents influence of another kind, this time upon programming. During the period of the Exchange Data Analysis, Planning exchanges were scheduled in the same week for two rival family planning groups (the IPPF and a Natural Family Planning group), both originating in New Zealand and both wanting to plan an exchange series of their own. Some
criticism of Wellington's administration of this matter was expressed by other terminals. As it happened, there was eventually no series planned for the Natural Family Planning group. The IPPF, on the other hand, scheduled a series of exchanges led by a leading IPPF member in Wellington. The latter proved to be one of the most paternalistic and insulting (albeit well-intentioned) Caucasians monitored during the period of the study - so much so, in fact, as to have caused Suva's Terminal Manager to complain about the one-way dimension of the exchange, where Pacific Islanders were treated as needy respondents by Metropolitan participants, rather than as equals. Whether or not the IPPF gained precedence over the other group directly because of their having funded the Noumea Conference is not known; my suspicion is that influence of this kind is more likely to be much more indirect than direct. What is disturbing is that PEACESAT should in any way whatsoever have been influenced by donors of funds and, moreover, should not (to my knowledge) possess a policy regarding this kind of possible influence over the system. On the contrary, in fact, it appears that PEACESAT headquarters has actively encouraged such support without consideration of its effect on the system.

---

3 Exchange dated February 7, 1979, 0300 GMT.
4 A further example is that the Board of Global Ministries of the United Methodist Church donated US$5,000 to PEACESAT in 1979 for the express purpose of facilitating PEACESAT's campaign to secure suitable international frequencies at WARC '79.
A further programming-related criticism of PEACESAT concerns censorship. The overt examples of the 1972 nuclear-testing exchange, and the exchange that never happened in 1979, have been documented. The absence of any Pacific Islanders from the ensuing discussion of the event and establishment of Content Guidelines in 1972 represents a stunning insensitivity to Pacific Island concerns. Similarly, the 1979 case demonstrated exactly how little such important matters are in fact discussed among the whole membership of the network. The full extent of such censorship is not known. Neither is the extent to which self-censorship of a similar kind operates to control the subject matter of exchanges, especially that exerted by the local Terminal Managers as 'gate-keepers' to the system. If the nuclear-testing exchanges are any indication of policy in a wider sense, however, this represents a serious limitation on the extent to which PEACESAT can, legitimately, be relevant to the Pacific.

2.4. Performance

As far as the performance of PEACESAT is concerned, findings from the Exchange Data and Network Flow analyses have entirely supported the criticisms of Blundell, Crocombe, Farrell and McMehan (all user-critics of the system) concerning the Metropolitan users' domination of the system. In fact, the data from the studies suggest that PEACESAT is much more extreme in
this regard than it would appear on the surface. If a qualitative element could be added to the overall analysis, I would speculate, on the basis of the quantitative data from this study, that the utility of PEACESAT to the Pacific Islands would appear to be even less than these somewhat crude quantitative figures suggest. For the situation is similar to assessing the system in terms of the number of participants as opposed to their time on air. Pacific Islanders may indeed spend so many minutes/hour on air, but if this is largely tokenism in the first place, and does not necessarily contribute significantly to their lives in the second place—a hypothesis that would seem legitimate by observation—then we would expect from the addition of a qualitative assessment that PEACESAT's value to Pacific Islanders would drop still further.

A significant note is that the above-mentioned critics are all Caucasians. This may simply be a result of the fact that no Pacific Islanders connected with PEACESAT have been able or willing to put their assessments regarding PEACESAT on paper. Alternatively, an equally likely possibility is that Pacific Island people are accustomed to institutions such as PEACESAT being designed, introduced and operated by Caucasians in ways which effectively exclude maximal Pacific Island participation. Consequently, Pacific Islander expectations of PEACESAT may never have been high, and their reaction to the reality of its performance would not therefore be extreme. The latter
speculation is borne out by my personal experience of New Hebridean reactions to PEACESAT and, in addition, possibly accounts to some extent for the indifference shown towards PEACESAT by Pacific people in general.

A further important observation is to be made with regard to the identity of the Pacific Island people who have in fact used PEACESAT. Although it was not possible to collect data on the class to which participants belonged, it was evident that, in most cases, Pacific participants were predominantly drawn from the educated, urban elite, not from the urban poor or working classes, nor from the rural areas (see footnote 1, Chapter IX). PEACESAT must therefore be interpreted as having strengthened the status quo in both the core and periphery by having acted as a vehicle for the inter-connection of the privileged classes in both divisions. Significantly, when the network was used to link people who objected to the status quo (the 1972 nuclear tests affair), and who were trying to coordinate their protests, PEACESAT reacted by ensuring that such communication was thereafter prevented.

As clarification of the above, it should be noted that an implicit requirement of PEACESAT is that all users should, to some extent, share a common language, common assumptions and common experience in order for communication to take place. This is especially true of Terminal Managers. The absence of exchanges occurring in Pacific languages supports this view. In
practice, this requirement is a major limitation of the institutional arrangements of the technological form.

Regarding PEACESAT's performance in terms of its own objectives (refer Chapter II, section 5.2.), the value of the experiment as a pilot demonstration has already been acknowledged (see section 1.0. of this chapter). However, the extent to which PEACESAT as an "alternative telecommunication system" has been strictly "tested" is clearly minimal. Similarly, PEACESAT has not in any way "measured" "user acceptance" nor the "potential user demand and attitudes towards the introduction of innovative new services" as Bystrom claimed it would in 1974. Neither has it identified communication barriers. Ironically, PEACESAT's institutional form has in large part itself constituted a barrier to more effective communication via the system, and this has been exacerbated by PEACESAT's unwillingness to conduct critical analysis.

It must be concluded that although PEACESAT has indeed linked individuals and institutions in different countries and has promoted "new approaches to the delivery of health, education and community services", it has done so almost by default: it would have been difficult for the experiment to have done otherwise. What is more important is that PEACESAT has failed to provide the more detailed and precise data on the system that it claimed it was setting out to provide.
2.5. Operational future

It is reasonable to expect from a technical experiment that the experimenters provide ideas on the ways in which the system could be used operationally. This, too, was stated as one of PEACESAT's objectives: "to contribute to an assessment of future telecommunications system requirements in the Pacific Basin".

In this respect, one is forced to make reservations concerning PEACESAT's performance. For while it is true that those closely associated with PEACESAT have promoted the ingenious Extended Experiment concept, they have done so rather too frequently and with rather too much disregard for other telecommunications' agencies' plans and priorities. The consequence is that it has become evident that the PEACESAT experimenters possess a vested interest in promoting their own system which does not necessarily appear to be in the overall best interests of the Pacific Islands. Comments from Graham Davey of the ITU's Regional Project in Suva, and from G.B. Whiting of Fiji's P & T are apposite in this regard.

The burden of discussing operational futures, and the transitional stages that might be possible, has fallen on other shoulders. What PEACESAT has achieved, in this respect, is the development of an awareness that, in order to establish a

---

PEACESAT-like system operationally, should this be something to be desired, suitable international frequency allocations would be required. PEACESAT's success in this, however, is considerably marred by the extremely poor relationship that the project has managed to develop with a major user-country, Fiji.

2.6. The 'hidden agenda'

It should be remembered that Bystrom's objectives from the start of PEACESAT, have been concerned with a global network. Whatever the stated objectives might have been, therefore, this has been his paramount, underlying motivation and objective. This having been established, it provides a clue to comprehending certain aspects of Bystrom's behaviour and of PEACESAT's history which are otherwise difficult to explain.

For example, this global 'hidden agenda' accounts for Bystrom's constant preoccupation with expanding the PEACESAT network; it also accounts for his lack of concern to undertake high quality evaluation of a limited number of experiments, rather than superficial evaluation of many experiments - NASA's major criticism of PEACESAT. Additionally, given the global objective, the Pacific region per se becomes relatively insignificant in the overall scheme of things. The Pacific, as Bystrom has said, was the place to start, primarily because of the existence of the ATS-1 satellite. But as a region, the Pacific represents no more than a step towards the realisation
of a much grander enterprise.

Connected to this is a second manifestation of the 'hidden agenda'. It concerns Bystrom's constant justification of the project in terms of US foreign policy and defence objectives. These objectives, it should be noted, never appear as the officially-stated, public objectives of PEACESAT, and for good reasons. It is highly unlikely that Pacific Island participants would approve of them. They remain, therefore, the semi-private rationalisations employed by Bystrom to appeal to the decision-makers in Washington whom he regards to be the most influential. From the number of defence-oriented references, Bystrom evidently supports a relatively aggressive US foreign policy with regard to the less-developed world in general, and to the Pacific and Asia in particular. Relating this foreign policy attitude to his implicit attitude that the Pacific is merely a stepping-stone towards a 'WORLDSAT' system, it is not in the least surprising to find that his sensitivities - and thus those of PEACESAT headquarters - towards the aspirations and development needs of the Pacific people are low indeed.

3.0. PEACESAT and US foreign policy

The results of this study have so far shown that organisationally and operationally PEACESAT as an institution is inappropriate for Pacific Island development. We must now turn to an analysis of PEACESAT's wider context in order to more
thoroughly explain why PEACESAT has been allowed to develop in this way, and how PEACESAT fits in to the global development process.

Basically, the analysis is a straightforward one: in all significant ways, the broader interests of the US are served by PEACESAT as opposed to being jeopardised by the Project. This can be seen in two major respects:

1. in terms of US aims with regard to communications, especially with regard to communication satellites; and

2. in terms of broader US foreign policy interests in the Pacific region.

First, as noted earlier, a major reason for US emphasis upon the aero-space (and space telecommunication) industries was the US desire for control over as much of the globe as possible in its role as protector of the 'free' world. To this end, the efforts of US military and industrial interests in designing, testing and manufacturing communications hardware have been more than moderately successful. For example, according to Nicholas Garnham, three out of four satellite circuits have one end in the US, and

"Of total present TV transmission by satellite, approximately one third is domestic US, e.g. to Puerto Rico and Hawaii, another one third are European/US exchanges on a more-or-less reciprocal basis and the remaining one third is dominated by traffic from the US"
US dominance of communications is such that the US now controls much of the market for both hardware and software. PEACESAT has encouraged the notion of a satellite system serving the Pacific and, naturally, if an operational system is in fact to be designed, it is most likely that, as a result, US hardware and expertise will be purchased, thereby furthering US control of the region. What is more, this end-result has been achieved with negligible expenditure on the part of the US.

Second, and very much related, PEACESAT fits well within the broader US defense interests in the Pacific, a region — as noted in Chapter 2 — that is of considerable strategic value to the US. In this connection it is understandable that Hawaii was among the most suitable of all possible locations for the headquartering of PEACESAT. Since Hawaii has, since 1941, been developed as the single most important western defence base for the US, it follows that most of its institutions and agencies are oriented towards furthering this strategic capacity by...

---


In fact, in 1979 the US Agency for International Development signed a $2 million contract with the USP to upgrade the USP Net to allow video experimentation via ATS-6; this demonstrates how experiments 'grow' through their own impetus to become necessities.

'peaceful' means: by developing aid, trade and defence relations with the Pacific Islands. PEACESAT clearly falls within this orientation and has had the added advantage of establishing potential control over satellite communications in the Pacific - a top priority defence requirement - in a low-key manner.

For example, in the State government, the Department of Planning and Economic development recently issued an "exploratory document" concerning Hawaii's present and future relationships with other Pacific Islands. The only inclusion under the title of "Communications" was a description of PEACESAT which, it was stated, "serves as possibly the most important link between Hawaii and the other Island communities of the Pacific". It has "become almost an indispensable communications medium for the Pacific Islands". Harlan Cleveland's comment that PEACESAT represented the "most visible thing we're doing in the Pacific" should be remembered in this context. Hawaii has been, and still is, clearly regarded as the most suitable take-off point for US penetration of the Pacific because of its superficial status as a 'Pacific Island'.

In connection with PEACESAT's relationship to US foreign policy interests two further items are of relevance. One is that Bystrom's personal philosophy correlates well with US foreign

---

9 Harlan Cleveland's comment that PEACESAT represented the "most visible thing we're doing in the Pacific" should be remembered in this context. Hawaii has been, and still is, clearly regarded as the most suitable take-off point for US penetration of the Pacific because of its superficial status as a 'Pacific Island'.

In connection with PEACESAT's relationship to US foreign policy interests two further items are of relevance. One is that Bystrom's personal philosophy correlates well with US foreign

---

policy interests reminiscent of the 1950s and 60s. Secondly, and related to this, is that Bystrom presumably saw his actions as contributing to the growth of American empire. He has said for example, that a small terminal telecommunications network would enable the expansion of western ideas in the "global competition" for men's minds. Additionally, in the initial planning stages he was well aware that, because there was to be no federal agency officially involved in the project, there would be no possibility of federal funding. However, while in Washington before launching the project, Bystrom was apparently told — presumably on an unofficial basis — that federal funding would be possible if Korea and Indonesia were to be included in the link-up. Clearly, Washington was interested in the project if it could be made to serve their foreign policy ends, and thus the powers-that-be dangled the carrot of funding in front of

10 Bystrom had been a major contributor in drafting the "Programs for Peaceful Communication" amendment of December 30, 1969, to the Foreign Assistance Act. This amendment authorized the use of funds for "programs of peaceful communications which make use of television and related technologies, including satellite transmissions, for educational, health, agricultural and community development purposes in the less developed countries". (Section 220, US Public Law 91-175, December 30, 1969, 83 Stat. p. 807.) Furthermore, the "Programs for Peaceful Communication" amendment is to the Foreign Assistance Act of 1961 which aims to "strengthen the forces of freedom by aiding peoples of less developed friendly countries of the world", and states its conviction that "the peace of the world and the security of the United States are endangered" by international communism; assistance will thus be provided to help countries "maintain their freedom". (Section 102, Public Law 87-195, September 1, 1961, 75 Statute, p. 424, 425.)

11 Interview with John Bystrom, January 6, 1979.

12 Interview with John Bystrom, January 6, 1979.
Very much related to the above is PEACESAT's peculiar relationship to NASA. Why, if PEACESAT was so blatantly not adhering to NASA's experimental criteria, was PEACESAT allowed to continue beyond 1973 and up to the present? The question carries even more weight when one considers that, if anything, PEACESAT's performance seems to have degenerated further since 1973 (for example, becoming more of a service than an experiment, and being less evaluated than ever previously).

One curious aspect of the NASA-PEACESAT conflict is that NASA approved the original PEACESAT proposals despite their not having demonstrated that effective and detailed evaluation of the type desired by NASA would, in fact, be a part of the experiment. In this sense, therefore, NASA's post-hoc complaint regarding the absence of desired evaluation is a little unjust. It would appear from the history of NASA that the reason why NASA bureaucrats acted in this way when they did was not only (1) because NASA was at that time under attack in the US (note the phase-down of the ATS experiments required of NASA), and therefore had to cut back on ATS activities, particularly those of an originally-unscheduled nature; but also (2) because, not being pre-disposed to low-level technology in the first place,
preferring the glamour of 'big events', NASA personnel wanted
to prevent further criticism by tightening up their whole
operation. In the latter case, concerned about the global
ambitions of PEACESAT already, NASA might well have panicked at
the poor evaluative task that the PEACESAT Project was doing and
at the extent to which PEACESAT seemed to be inexorably
developing into a service rather than an experiment. On both
counts, NASA could have suffered further criticism which it
wanted to avoid at all costs, as a matter of survival.

The solution, if PEACESAT was to be allowed to continue,
was to ensure that it abided by NASA requirements to the letter.
This would account for Marsten's in-house memo to the effect
that PEACESAT would not be allowed to continue "unless he
[Bystrom] can be helped and accepts it". It is testimony to the
strength of the relations that PEACESAT had fostered within
Hawaii that PEACESAT was able to fend off NASA's assault and to
continue operating for seven years after the incident. Evidently
PEACESAT's operations fell so much within broader US interests
that, on this occasion, David was able to overcome Goliath.

Given the fact that PEACESAT was allowed to continue (and
to degenerate) we are forced to conclude that a major
contributing reason for this decision was that PEACESAT was

13 Comments by W.H. Melody, August 1979. Apparently, NASA had at
one stage been approached to develop a low-technology satellite
system, the design of which received a great deal of support at
NASA staff level, but which was promptly shelved when it
percolated to higher levels of the administration.
serving both military and corporate interests. PEACESAT was not only actively and self-consciously "competing for men's minds" in the Pacific, but also helping to create a demand for sophisticated telecommunications hardware which would inevitably be satisfied in the long run by US corporations. This is not to imply the existence of a conspiracy among PEACESAT and other US institutions. On the contrary, it is testimony to Bystrom's skill and experience as a bureaucratic entrepreneur that he has been able to promote and publicise PEACESAT so skillfully in spite of justified criticism from other US agencies.

4.0. PEACESAT and Pacific Island development

4.1. Beneath the surface

Perhaps the most important element of PEACESAT that has, up until now, not been directly scrutinised is its claim to being a novel - or even revolutionary - communications system. In the literature on PEACESAT it is precisely this claim, followed usually by a description of the system, which serves to divert attention away from an examination of how novel the system in fact is, in a structural sense. The semantic element is important here. The very word "PEACESAT" could not have been better chosen, nor could the notion of an "exchange": we are led, as though by the cunning of an advertising agency, to
believe that the system represents peaceful, mutual sharing...
Likewise, the casual observer or distant reader is asked to infer from a geographically devolved system that its authority structure is, in fact, decentralised. And he is asked to infer also from the "autonomy" of local terminals that there is necessarily democracy in its overall structure. The jargon is effective: witness The New Internationalist citing PEACESAT as an example of cooperation among developing countries! Similarly, we have Bystrom's repeated assertions (based on the above) that PEACESAT is designed to avoid cultural imperialism.

What appears beneath the surface is quite different. Informing every crucial aspect of PEACESAT is 'traditional' development philosophy as propagated by the US school of thought (Schramm, Lerner, et al) in the interests of US development. Prime among centres of this philosophy as regards communications is the EWC. Serving both the economic and military interests of the US, the implementation of this philosophy serves to maintain the less industrialised countries in a perpetual state of under-development.¹⁴ In this context, PEACESAT is a perfect tool for US development. It is no wonder the project has endured for eight years.

At the very least, the juxtaposing of US military interests with educational and social service benefits to the Pacific

¹⁴ See, I. Wallerstein and Andre Gundar-Frank, for example, as well as Harold Innis.
Islands raises the question of how genuine such educational and social benefits in fact can be. Bystrom's overt concern for educational exchange, for example, translates more accurately into an elitist desire to link Western academics than to assist the 'average' Pacific Islander. And although Bystrom accurately describes the US position in the TTPI, he does it very firmly from the point of view of one concerned primarily with the political standing of the US, rather than one concerned with the welfare of Micronesians.

A further point to raise here concerns the evidence of Bystrom's ideology of progress inherent in the statement that "the demonstration would awaken those in need of improved realtime communications ... to the benefits potential in new technology". There is an implicit sales-pitch detectable here, which is in turn indicative of the erroneous attitude that social problems can be overcome merely by the addition of new technologies. As part of the same ideological package, the following statement from a different paper reveals Bystrom's leaning towards industrial society:

"Isolation and distance from sources of knowledge can strangle industrial development. With telecommunications distances can be bridged. Men can keep up with change. The benefits of industrialization can become more widely available and living conditions for the people greatly improved."\(^{15}\)

There is no evidence from these statements, nor indeed from

Bystrom's writing in general, that he has been sensitive to Pacific peoples' particular aspirations regarding development. However, and very importantly, this is not to say that Bystrom, or the PEACESAT Project, is insincere. Rather it is evidence of the assumption on PEACESAT's part that US defence and corporate interests are not incompatible with social service applications in general, and with the development interests of the Pacific Islands in particular. It is this contradiction that lies at the heart of PEACESAT's inability to respond to Pacific Islands' concerns and aspirations.

4.2. The structure of constraints

What is, in fact, beneath the surface of PEACESAT can be represented structurally as a series of levels of constraint. The over-riding level of constraint on PEACESAT's potential, I would contend, is that of US foreign policy interests, as represented by NASA, the other Washington-based institutions, the Hawaii institutions, and Bystrom himself. This level, for example, filters out the possibility that the system could ever be used for discussions of too critical a nature: witness the nuclear-testing examples.

A second level would be the drive to establish an extended experiment ('WORLDSAT') as represented by Bystrom, joined by Hanley, Kingan et al. This pre-occupation with the possible future as opposed to the real present appears not only to have
diverted attention away from the day-to-day operational tasks so vital to the system's functioning, but also to have mitigated against the present system ever developing organically in ways not consonant with the idealised future. The primary emphasis from the top has been upon PEACESAT's continued expansion. It is this, I believe, that is the root cause of Farrell's frustration with the system, for example.

A third level of constraint is represented by the lack of sensitivity towards the Pacific Islands of those people with most authority, those at the Honolulu and Wellington terminals. That these people can exhibit such paternalist attitudes towards Pacific Islanders, attitudes reminiscent of the days of missionaries and colonisation, has been a constant source of wonder to me during the period I have monitored PEACESAT. Doubtless it has insulted many Pacific Island participants and alienated them from the desire to contribute precious time and energy to PEACESAT's possible development. Equally certainly, this backing away from active involvement by Pacific Islanders because of such Metropolitan insensitivity has, in turn, provided the rationale for the Metropolitan terminals taking progressively ever more control themselves. This situation seems to have arisen in large part because the implicit development theories of the implementors of PEACESAT, theories which radically influence their behaviour and attitudes, have been fundamentally incorrect. The burden of responsibility in this
case falls squarely upon PEACESAT headquarters: those involved in establishing and maintaining a development project such as PEACESAT have the responsibility to be fully acquainted with development theory and to see that it is applied consistently in the day-to-day operations of the system.

Finally, beneath these three overwhelming levels of constraint, there are the basic constraints of life in the Pacific: the lack of funds, the lack of technical expertise, the lack of time because of more pressing concerns, etc. — the constraints which PEACESAT should have been addressing primarily if the experiment were genuinely in the interests of Pacific development.

4.3. The value of PEACESAT in Pacific development

If these levels of constraint have thus acted as filters on PEACESAT's potential, what, then, remains of PEACESAT's value in the development process? The answer, I believe, on the evidence of this study, is very little. True, PEACESAT has been used for medical emergencies, for consultations on agricultural and other matters, and even for training purposes. But these are isolated, particular events. The effect of PEACESAT on more general social, political and cultural levels is to legitimise the ideology of progress, and the core-periphery relations with — primarily — the US as the all-provider at the core.

As much as John Bystrom has personally influenced PEACESAT,
however, it would be quite wrong to imply that the responsibility for PEACESAT's failure lies solely with the Honolulu headquarters. PEACESAT has emerged, developed and, later, has been propped up, as part of the imbalanced process of international development taking place throughout the world.

Moreover, it is important to discriminate in this process the more precise interests that PEACESAT has, and has not, served. The old maxim that "you can't get something for nothing" can be applied here. Since the ATS-1 satellite has been provided by the US free of charge for eight years, it can be guaranteed that it has been calculated to have paid off in terms of US foreign policy in the Pacific. PEACESAT, has, therefore, worked for these interests in the US. Similarly, PEACESAT has served a variety of interests in the Pacific, from expatriate specialists and 'do-gooders' to a section of the Pacific Island elite who regard the development process as the emulation of the ways of the industrialised world. In addition, of course, PEACESAT must also have served the more authentic development interests of the Pacific to a certain, if minor, extent.16 It has almost certainly been the potential of PEACESAT to serve the latter interests that has inspired so much initial enthusiasm for the Project in so many different people. Equally certainly, it has been PEACESAT's disappointing record in this respect that has

16 See Chapter II, section 3.2. for a characterisation of "authentic development interests".
fueled the legitimate frustration and criticism from the USP and UCSC, for example.

Given this characterisation of PEACESAT, the chances are that (with the exception mentioned in 1.0. above) it has already wrought a good deal of damage in the Pacific; in other words, that it has worked against the overall, long-term best interests of the Pacific Islands. A key way in which this might have occurred is in the creation of further dependency on the part of the elite class in the Islands upon 'core' powers external to the Pacific. As Dr. Wooster, of the Lister Hill National Center for Bio-medical Communications warned, in November 1973: "The basic problem is whether the experiments will give participants expensive communications tastes that they will be unable to maintain after the test period is over". Space-junk imperialism is no different from any other kind of imperialism: it is imperialism just the same.

At the other extreme, it could be argued that the impact of PEACESAT in the Pacific is marginal. Ironically, employing Bystrom's own stated methodological approach to evaluating PEACESAT which uses "behavioural indicators" and "user attitudes", the data from the Exchange Data Analysis can be interpreted as showing that the Pacific people do not much like being treated like "exotic guinea pigs". Clearly, there is

\[17\] Memo from Dr. Harold Wooster, Chief, R & D, LHNCBC to Dr. Albert Feiner, Director, LHNCBC, November 16, 1973.
validity in both interpretations, both of which indicate the inappropriateness of PEACESAT for the Pacific.

5.0. Conclusion

In conclusion, it can be stated that PEACESAT as an institution is disappointingly centralised in organisational structure and, on the evidence of this study, has performed poorly in relation to Pacific Island users. Secondly, it can unequivocally be asserted that the major objectives informing PEACESAT's operation are much more concerned with the personal ambitions of certain individuals and with the foreign policy interests of the US, than they are with the genuine development of the Pacific Islands.

Despite its pretensions to the contrary, PEACESAT is, therefore, a classic example of established core-periphery relations among the 'have' and 'have-not' nations of the world. It is, furthermore, an excellent case study of the process by which imperialism functions: not by means of a conspiratorial alliance of individuals and institutions possessing a common, unshakeable and secret purpose, but rather as the product of the assumptions and actions of a common social class going about their everyday business: the "de facto imperialism" as mentioned by Professor Crocombe. Consequently, the overall conclusion of this study must be that PEACESAT as an institution represents a highly inappropriate tool of development for the Pacific.
Islands.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transponder type</strong></td>
<td>Active, frequency translator</td>
</tr>
<tr>
<td><strong>Carrier frequency</strong></td>
<td>Receive 149.22 mc</td>
</tr>
<tr>
<td></td>
<td>Transmit 135.60 mc</td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td>100 KC</td>
</tr>
<tr>
<td><strong>Antenna type</strong></td>
<td>8 element phased array</td>
</tr>
<tr>
<td><strong>Antenna gain</strong></td>
<td>8.5 db</td>
</tr>
<tr>
<td><strong>Transmitter power output</strong></td>
<td>Per element 5 watts</td>
</tr>
<tr>
<td></td>
<td>Total 40 watts</td>
</tr>
<tr>
<td><strong>Receiver noise figure</strong></td>
<td>2.5 db</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>20 pounds</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>40 percent</td>
</tr>
<tr>
<td><strong>D.C. power</strong></td>
<td>90 watts</td>
</tr>
</tbody>
</table>
APPENDIX 2: PEACESAT Call Signs

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV2 XXX</td>
<td>Honolulu</td>
</tr>
<tr>
<td>ZLCG</td>
<td>Wellington</td>
</tr>
<tr>
<td>KS2 XEL</td>
<td>Santa Cruz</td>
</tr>
<tr>
<td>VE9 EDU</td>
<td>Vancouver</td>
</tr>
<tr>
<td>3D 3AV</td>
<td>Suva</td>
</tr>
<tr>
<td>ZK1 XA</td>
<td>Rarotonga</td>
</tr>
<tr>
<td>KUP 71</td>
<td>Saipan</td>
</tr>
<tr>
<td>KWM 99</td>
<td>Pago Pago</td>
</tr>
<tr>
<td>?</td>
<td>Noumea</td>
</tr>
<tr>
<td>ZKNA</td>
<td>Niue</td>
</tr>
<tr>
<td>T2U 31</td>
<td>Funafuti</td>
</tr>
<tr>
<td>A3Y 67</td>
<td>Tonga</td>
</tr>
<tr>
<td>P 250</td>
<td>Lae</td>
</tr>
<tr>
<td>5 WSP</td>
<td>Apia</td>
</tr>
<tr>
<td>V2J 397</td>
<td>Honiara</td>
</tr>
<tr>
<td>VSA 41</td>
<td>Tarawa</td>
</tr>
<tr>
<td>YJ KK</td>
<td>Vila</td>
</tr>
</tbody>
</table>

[KE2 XFG : American Lutheran Church, Los Angeles]
APPENDIX 3: Examples of forms used in collection of raw data
<table>
<thead>
<tr>
<th>Location</th>
<th>No. of participants</th>
<th>Affiliation of participants</th>
<th>Ethnicity &amp; ranking</th>
<th>Sex</th>
<th>Time on air, participant/mins., Content Indicator (CI), &amp; Question or Response.</th>
<th>Exchange Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Date: GMT:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LDT:</td>
</tr>
<tr>
<td>N.Z.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time: GMT:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LDT:</td>
</tr>
<tr>
<td>U.C.S.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Title:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tape No.:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Category of Exchange:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1. Classroom Instruction:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Decision-Conference:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Prof. &amp; In-serv. Training:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4. County Dev't. Service:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5. Research Support:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6. Prof. Consultation:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7. Technical Dev't.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Exchange initiated by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Content Indicator Key:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P = Procedural: introductions/face-wells/chairing function/agenda, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A = Administrative: PEACESAT admin/ messages/scheduling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S = Substantive: re. the Exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M = Miscellaneous: none of above</td>
</tr>
<tr>
<td>Receiving Terminal</td>
<td>Metropolitan</td>
<td>Pacific Islands</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------</td>
<td>----------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hawaii</td>
<td>N. Z.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UCSC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vanc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sydney</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suva</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Raro.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saipan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pago</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noumea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Niue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Funaf.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tonga</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Honiara</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tarawa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vila</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NETWORK FLOW ANALYSIS (1): Number of Connections made amongst Terminals**

<table>
<thead>
<tr>
<th>Exchange Title:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape No.:</td>
<td></td>
</tr>
<tr>
<td>Date: GMT:</td>
<td></td>
</tr>
<tr>
<td>Time: GMT:</td>
<td></td>
</tr>
<tr>
<td>LDT:</td>
<td></td>
</tr>
</tbody>
</table>
### NETWORK FLOW ANALYSIS (2): Direction of Information Flow

**Exchange Title:**

---

**Date:** GMT: 
LDT: 

---

**Tape No:**

---

<table>
<thead>
<tr>
<th>Total Metro/Pl</th>
<th>Total Q</th>
<th>Q</th>
<th>Terminal</th>
<th>R</th>
<th>Total Q</th>
<th>Total Metro/Pl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Metro.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawaii</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Z.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UCSC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sydney</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suva</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raro.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saipan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pago</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noumea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funaf.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tonga</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aplia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honiara</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tarawa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vila</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Pacific Island</th>
<th>Total Q</th>
<th>Q</th>
<th>Terminal</th>
<th>R</th>
<th>Total Q</th>
<th>Total Pacific Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Pacific Island</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Q** = Question asked / Information asked for / Advice solicited

**R** = Answer given / Information supplied / Advice given

- Q & R scoring: ½ minute units, score 1.
TABLE 2: TITLES OF EXCHANGES ANALYSED, BY EXCHANGE CATEGORY

(Numbers in square brackets following exchange title indicate the number of exchanges of this title which were analysed.)

<table>
<thead>
<tr>
<th>Category of Exchange</th>
<th>Title of Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Professional and In-Service Training:</td>
<td>Training of Teachers in the Teaching of Reading [2]</td>
</tr>
</tbody>
</table>

(continued over)
Table 2 (continued)

Small Business Management
Archives in the Pacific (a joint PEACESAT-USP exchange)

4. Community Development Service:
South Pacific Commission News [5]
Jaycees
Student Christian Movement [2]
Guide Leaders [2]
Boys Brigade [2]
Church Women's Groups [2]
American Field Service
International Year of the Child
Women's Interest Groups [2]
World Humanity Conference

5. Research Support:
Vulcanology
Research Vessels - Honolulu [3]
Health Research
Medical Exchange, Noumea-Pago
Noumea-Hawaii
Noumea-Niue
Skipjack Program

6. Professional Consultation:
Cholera Discussion, Noumea-Hawaii
Medical Consultation, Tonga-NZ

8. Administrative:
Eastern Pacific Terminal Managers' Meeting [3]
Taped Message for Consortium Council
PEACESAT Scheduling [5]
Consortium Council Meeting
Discussion re. WARC '79 [4]
PEACESAT Management Meeting
Consortium Council Executive Board Meeting
TABLE 3: NUMBER OF EXCHANGES ANALYSED, BY EXCHANGE CATEGORY

<table>
<thead>
<tr>
<th>Category of Exchange</th>
<th>No. of Exchanges</th>
<th>Total no. of Exchs.</th>
<th>Total no. of Exchs. as %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Period</td>
<td>One</td>
<td>Two</td>
</tr>
<tr>
<td>1. Classroom Instr.</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2. Decision-Conf.</td>
<td>13</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>3. Prof.&amp; In-Serv.Tr.</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4. Cmnty.Devt.Serv.</td>
<td>12</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>5. Research Support</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>6. Prof.Consultation</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. Technical Devt.</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>8. Administrative</td>
<td>10</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>OVERALL</td>
<td></td>
<td>45</td>
<td>33</td>
</tr>
</tbody>
</table>
### TABLE 4: NUMBER OF EXCHANGES OCCURRING DURING PERIOD OF STUDY

<table>
<thead>
<tr>
<th>Category of Exchange</th>
<th>No. of Exchanges</th>
<th>Total no. of Exchs.</th>
<th>Total no. of Exchs. as %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Period</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One</td>
<td>Two</td>
<td></td>
</tr>
<tr>
<td>1. Classroom Instr.</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2. Decision-Conf.</td>
<td>14</td>
<td>21</td>
<td>35</td>
</tr>
<tr>
<td>3. Prof.&amp; In-Serv.Tr.</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4. Cmnty. Devt. Serv.</td>
<td>13</td>
<td>20</td>
<td>33</td>
</tr>
<tr>
<td>5. Research Support</td>
<td>6</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>6. Prof.Consultation</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. Technical Devt.</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>8. Administrative</td>
<td>17</td>
<td>25</td>
<td>42</td>
</tr>
<tr>
<td><strong>OVERALL</strong></td>
<td>55</td>
<td>78</td>
<td>133</td>
</tr>
</tbody>
</table>
TABLE 5: PROPORTIONAL DURATION OF EXCHANGES PER EXCHANGE CATEGORY & OVERALL

No. of exchanges by duration (mins. & %)

<table>
<thead>
<tr>
<th>Exch. Cat.</th>
<th>0-15 mins</th>
<th>%</th>
<th>15-30 mins</th>
<th>%</th>
<th>30-60 mins</th>
<th>%</th>
<th>60-90 mins</th>
<th>%</th>
<th>90+ mins</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>33.3</td>
<td>2</td>
<td>66.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>1</td>
<td>4.8</td>
<td>7</td>
<td>33.3</td>
<td>10</td>
<td>47.6</td>
<td>1</td>
<td>4.8</td>
<td>2</td>
<td>9.5</td>
</tr>
<tr>
<td>3.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>50.0</td>
<td>2</td>
<td>50.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>10.5</td>
<td>12</td>
<td>63.2</td>
<td>4</td>
<td>21.1</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>5.</td>
<td>3</td>
<td>33.3</td>
<td>3</td>
<td>33.3</td>
<td>2</td>
<td>22.2</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>11.1</td>
</tr>
<tr>
<td>6.</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>50.0</td>
<td>1</td>
<td>50.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>25.0</td>
<td>9</td>
<td>56.3</td>
<td>1</td>
<td>6.3</td>
<td>2</td>
<td>12.5</td>
</tr>
<tr>
<td>OVRL</td>
<td>4</td>
<td>5.4</td>
<td>18</td>
<td>24.3</td>
<td>38</td>
<td>51.4</td>
<td>8</td>
<td>10.8</td>
<td>6</td>
<td>8.1</td>
</tr>
</tbody>
</table>

315
TABLE 6: TOTAL TIME ON AIR, AND AVERAGE DURATION OF EXCHANGE, PER EXCHANGE CATEGORY

<table>
<thead>
<tr>
<th>Category of Exchange</th>
<th>Total no.</th>
<th>Total time on air/cat (mins)</th>
<th>Time on air/cat as %</th>
<th>Avg. duration of exch. (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Classroom Instr.</td>
<td>3</td>
<td>106.0</td>
<td>3.2</td>
<td>35.3</td>
</tr>
<tr>
<td>2. Decision-Conf.</td>
<td>21</td>
<td>901.5</td>
<td>27.3</td>
<td>42.9</td>
</tr>
<tr>
<td>3. Prof.&amp; In-Serv.Tr.</td>
<td>4</td>
<td>232.5</td>
<td>7.0</td>
<td>58.1</td>
</tr>
<tr>
<td>4. Cmnty.Devt.Serv.</td>
<td>19</td>
<td>963.5</td>
<td>29.1</td>
<td>50.7</td>
</tr>
<tr>
<td>5. Research Support</td>
<td>9</td>
<td>244.5</td>
<td>7.4</td>
<td>27.2</td>
</tr>
<tr>
<td>6. Prof.Consultation</td>
<td>2</td>
<td>78.5</td>
<td>2.4</td>
<td>39.3</td>
</tr>
<tr>
<td>8. Administrative</td>
<td>16</td>
<td>782.5</td>
<td>23.6</td>
<td>48.9</td>
</tr>
<tr>
<td>OVERALL</td>
<td>74</td>
<td>3309.0</td>
<td>100.0</td>
<td>44.7</td>
</tr>
</tbody>
</table>
### TABLE 7: BREAKDOWN OF CONTENT TYPE

<table>
<thead>
<tr>
<th>Cat.of Exch.</th>
<th>Procedural</th>
<th>Administr.</th>
<th>Substantive</th>
<th>Miscellan.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. mins.</td>
<td>19.0</td>
<td>13.0</td>
<td>72.5</td>
<td>1.5</td>
<td>106.0</td>
</tr>
<tr>
<td>as %</td>
<td>17.9</td>
<td>12.3</td>
<td>68.4</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>2. mins.</td>
<td>176.5</td>
<td>27.5</td>
<td>680.0</td>
<td>17.5</td>
<td>901.5</td>
</tr>
<tr>
<td>as %</td>
<td>19.6</td>
<td>3.1</td>
<td>75.4</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>3. mins.</td>
<td>61.0</td>
<td>17.5</td>
<td>154.0</td>
<td>-</td>
<td>232.5</td>
</tr>
<tr>
<td>as %</td>
<td>26.3</td>
<td>7.5</td>
<td>66.2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4. mins.</td>
<td>235.5</td>
<td>46.5</td>
<td>622.0</td>
<td>59.5</td>
<td>963.5</td>
</tr>
<tr>
<td>as %</td>
<td>24.4</td>
<td>4.8</td>
<td>64.6</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>5. mins.</td>
<td>26.5</td>
<td>10.5</td>
<td>203.5</td>
<td>4.0</td>
<td>244.5</td>
</tr>
<tr>
<td>as %</td>
<td>10.8</td>
<td>4.3</td>
<td>83.2</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>6. mins.</td>
<td>6.0</td>
<td>-</td>
<td>71.0</td>
<td>1.5</td>
<td>78.5</td>
</tr>
<tr>
<td>as %</td>
<td>7.6</td>
<td>-</td>
<td>90.4</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>8. mins.</td>
<td>99.0</td>
<td>9.5</td>
<td>671.5</td>
<td>2.5</td>
<td>782.5</td>
</tr>
<tr>
<td>as %</td>
<td>12.7</td>
<td>1.2</td>
<td>85.8</td>
<td>0.3</td>
<td></td>
</tr>
</tbody>
</table>

**OVERALL**

| mins.        | 623.5      | 124.5      | 2474.5      | 86.5       | 3309.0 |
| as %         | 18.8       | 3.8        | 74.8        | 2.6        | 100.0  |
TABLE 8: AVERAGE NUMBER OF PARTICIPANTS AND LOCATIONS PER EXCHANGE

<table>
<thead>
<tr>
<th>Exch.</th>
<th>No. Exchs.</th>
<th>Participants</th>
<th>Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat.</td>
<td>per Cat.</td>
<td>No./Cat.</td>
<td>Avg./Exch.</td>
</tr>
<tr>
<td>1.</td>
<td>3</td>
<td>14</td>
<td>4.7</td>
</tr>
<tr>
<td>2.</td>
<td>21</td>
<td>115</td>
<td>5.5</td>
</tr>
<tr>
<td>3.</td>
<td>4</td>
<td>28</td>
<td>7.0</td>
</tr>
<tr>
<td>4.</td>
<td>19</td>
<td>101</td>
<td>5.3</td>
</tr>
<tr>
<td>5.</td>
<td>9</td>
<td>30</td>
<td>3.3</td>
</tr>
<tr>
<td>6.</td>
<td>2</td>
<td>8</td>
<td>4.0</td>
</tr>
<tr>
<td>8.</td>
<td>16</td>
<td>106</td>
<td>6.6</td>
</tr>
<tr>
<td>OVERALL</td>
<td>74</td>
<td>402</td>
<td>5.4</td>
</tr>
<tr>
<td>Category of Exchange</td>
<td>Message Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>1. Classroom Instr.</td>
<td>27.5</td>
<td>9.2</td>
<td>4.5</td>
</tr>
<tr>
<td>2. Decision Conf.</td>
<td>122.5</td>
<td>5.8</td>
<td>60.5</td>
</tr>
<tr>
<td>3. Prof. &amp; In-Serv.Tr.</td>
<td>46.5</td>
<td>11.6</td>
<td>40.5</td>
</tr>
<tr>
<td>4. Cmnty. Devt. Serv.</td>
<td>172.5</td>
<td>9.1</td>
<td>93.0</td>
</tr>
<tr>
<td>5. Research Support</td>
<td>17.0</td>
<td>1.9</td>
<td>16.0</td>
</tr>
<tr>
<td>6. Prof. Consultation</td>
<td>-</td>
<td>-</td>
<td>1.5</td>
</tr>
<tr>
<td>8. Administrative</td>
<td>92.5</td>
<td>5.8</td>
<td>20.5</td>
</tr>
<tr>
<td>OVERALL</td>
<td>478.5</td>
<td>6.5</td>
<td>236.5</td>
</tr>
</tbody>
</table>

Message Time as % of Total Time analysed: 11.9%

Time Loss as % of Total Time analysed: 5.9%
<table>
<thead>
<tr>
<th>Location</th>
<th>Category 1</th>
<th>Category 2</th>
<th>Category 3</th>
<th>Category 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hon’l</td>
<td>55.5</td>
<td>238.5</td>
<td>180.0</td>
<td>18.7</td>
</tr>
<tr>
<td>W’ton</td>
<td>27.5</td>
<td>140.5</td>
<td>393.5</td>
<td>40.8</td>
</tr>
<tr>
<td>UCSC</td>
<td>1.0</td>
<td>71.5</td>
<td>26.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Vanc.</td>
<td>–</td>
<td>17.5</td>
<td>–</td>
<td>0.3</td>
</tr>
<tr>
<td>Suva</td>
<td>0.5</td>
<td>90.5</td>
<td>47.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Raro.</td>
<td>1.5</td>
<td>44.5</td>
<td>127.0</td>
<td>13.2</td>
</tr>
<tr>
<td>Saipn.</td>
<td>–</td>
<td>50.5</td>
<td>40.5</td>
<td>4.2</td>
</tr>
<tr>
<td>Pago</td>
<td>11.5</td>
<td>25.5</td>
<td>22.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Noumea</td>
<td>–</td>
<td>4.5</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Niue</td>
<td>1.0</td>
<td>8.5</td>
<td>40.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Funaf.</td>
<td>–</td>
<td>28.5</td>
<td>47.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Tonga</td>
<td>7.5</td>
<td>65.0</td>
<td>22.5</td>
<td>2.3</td>
</tr>
<tr>
<td>Lae</td>
<td>–</td>
<td>16.0</td>
<td>–</td>
<td>4.0</td>
</tr>
<tr>
<td>Apia</td>
<td>–</td>
<td>7.5</td>
<td>–</td>
<td>2.5</td>
</tr>
<tr>
<td>Honiara</td>
<td>–</td>
<td>2.0</td>
<td>–</td>
<td>4.5</td>
</tr>
<tr>
<td>Tarawa</td>
<td>–</td>
<td>7.0</td>
<td>–</td>
<td>3.0</td>
</tr>
<tr>
<td>Vila</td>
<td>–</td>
<td>–</td>
<td>8.5</td>
<td>–</td>
</tr>
<tr>
<td>NASA Ames</td>
<td>–</td>
<td>83.0</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>TOTAL</td>
<td>106.0</td>
<td>901.0</td>
<td>963.5</td>
<td>100.1</td>
</tr>
</tbody>
</table>
TABLE 11: TIME ON AIR BY LOCATION, EXCHANGE CATEGORIES

<table>
<thead>
<tr>
<th>Loctn.</th>
<th>5</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mins.</td>
<td>as %</td>
<td>mins.</td>
</tr>
<tr>
<td>Hon'1</td>
<td>83.0</td>
<td>33.9</td>
<td>22.0</td>
</tr>
<tr>
<td>W'ton</td>
<td>29.0</td>
<td>11.9</td>
<td>8.5</td>
</tr>
<tr>
<td>UCSC</td>
<td>44.5</td>
<td>18.2</td>
<td>-</td>
</tr>
<tr>
<td>Vanc.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Suva</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Raro</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saipan</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pago</td>
<td>15.0</td>
<td>6.1</td>
<td>-</td>
</tr>
<tr>
<td>Noumea</td>
<td>58.0</td>
<td>23.7</td>
<td>33.5</td>
</tr>
<tr>
<td>Niue</td>
<td>5.0</td>
<td>2.0</td>
<td>-</td>
</tr>
<tr>
<td>Funafuti</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tonga</td>
<td>-</td>
<td>-</td>
<td>11.5</td>
</tr>
<tr>
<td>Lae</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apia</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Honiara</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tarawa</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vila</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RV Gyre</td>
<td>10.0</td>
<td>4.1</td>
<td>-</td>
</tr>
<tr>
<td>Ponape</td>
<td>-</td>
<td>-</td>
<td>3.0</td>
</tr>
<tr>
<td>ALC,LA</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

TOTAL   | 244.5 | 99.9  | 78.5  | 99.9  | 782.5 | 99.9  |

321
<table>
<thead>
<tr>
<th>Location</th>
<th>Time on Air (mins)</th>
<th>As % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu</td>
<td>879.0</td>
<td>26.6</td>
</tr>
<tr>
<td>Wellington</td>
<td>915.0</td>
<td>27.7</td>
</tr>
<tr>
<td>UCSC</td>
<td>190.0</td>
<td>5.7</td>
</tr>
<tr>
<td>Vancouver</td>
<td>49.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Suva</td>
<td>208.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Rarotonga</td>
<td>307.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Saipan</td>
<td>113.0</td>
<td>3.4</td>
</tr>
<tr>
<td>Pago Pago</td>
<td>85.5</td>
<td>2.6</td>
</tr>
<tr>
<td>Noumea</td>
<td>109.5</td>
<td>3.3</td>
</tr>
<tr>
<td>Niue</td>
<td>60.5</td>
<td>1.8</td>
</tr>
<tr>
<td>Funafuti</td>
<td>96.5</td>
<td>2.9</td>
</tr>
<tr>
<td>Tonga</td>
<td>127.0</td>
<td>3.8</td>
</tr>
<tr>
<td>Lae</td>
<td>31.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Apia</td>
<td>10.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Honiara</td>
<td>6.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Tarawa</td>
<td>15.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Vila</td>
<td>8.5</td>
<td>0.3</td>
</tr>
<tr>
<td>NASA Ames</td>
<td>83.0</td>
<td>2.5</td>
</tr>
<tr>
<td>R.V.Gyre</td>
<td>10.0</td>
<td>0.3</td>
</tr>
<tr>
<td>A.L.C., L.A.</td>
<td>1.0</td>
<td>0.03</td>
</tr>
<tr>
<td>Ponape</td>
<td>3.0</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>3309.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
### TABLE 13: TIME ON AIR FOR METROPOLITAN TERRITORIES,

PACIFIC ISLANDS & US TERRITORIES

<table>
<thead>
<tr>
<th>Cat. of Exch.</th>
<th>Metropolitan Total mins.</th>
<th>% of total</th>
<th>Pacific Islands Total mins.</th>
<th>% of total</th>
<th>U.S. Territories Total mins.</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>84.0</td>
<td>79.2</td>
<td>22.0</td>
<td>20.8</td>
<td>68.0</td>
<td>64.2</td>
</tr>
<tr>
<td>2.</td>
<td>551.0</td>
<td>61.2</td>
<td>350.0</td>
<td>38.8</td>
<td>469.0</td>
<td>52.1</td>
</tr>
<tr>
<td>3.</td>
<td>136.5</td>
<td>58.6</td>
<td>96.5</td>
<td>41.4</td>
<td>30.5</td>
<td>13.1</td>
</tr>
<tr>
<td>4.</td>
<td>602.5</td>
<td>62.5</td>
<td>361.0</td>
<td>37.5</td>
<td>269.0</td>
<td>27.9</td>
</tr>
<tr>
<td>5.</td>
<td>166.5</td>
<td>68.1</td>
<td>78.0</td>
<td>31.9</td>
<td>108.0</td>
<td>44.2</td>
</tr>
<tr>
<td>6.</td>
<td>30.5</td>
<td>38.9</td>
<td>48.0</td>
<td>61.1</td>
<td>25.0</td>
<td>31.8</td>
</tr>
<tr>
<td>8.</td>
<td>555.5</td>
<td>71.0</td>
<td>227.0</td>
<td>29.0</td>
<td>350.5</td>
<td>44.8</td>
</tr>
<tr>
<td>OVERALL</td>
<td>2127.5</td>
<td>64.3</td>
<td>1181.5</td>
<td>35.7</td>
<td>1364.5</td>
<td>41.2</td>
</tr>
<tr>
<td>Exch. Cat.</td>
<td>Ethnic Group</td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>T as %</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
<td>------</td>
<td>--------</td>
<td>-------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Cauc.</td>
<td>9</td>
<td>2</td>
<td>11</td>
<td>57.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>36.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>5</td>
<td>19</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Cauc.</td>
<td>78</td>
<td>51</td>
<td>129</td>
<td>69.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>28</td>
<td>18</td>
<td>46</td>
<td>24.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>9</td>
<td>1</td>
<td>10</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>115</td>
<td>70</td>
<td>185</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Cauc.</td>
<td>21</td>
<td>24</td>
<td>45</td>
<td>72.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>7</td>
<td>10</td>
<td>17</td>
<td>27.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>28</td>
<td>34</td>
<td>62</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Cauc.</td>
<td>58</td>
<td>86</td>
<td>144</td>
<td>57.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>35</td>
<td>61</td>
<td>96</td>
<td>38.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>8</td>
<td>2</td>
<td>10</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>101</td>
<td>149</td>
<td>250</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Cauc.</td>
<td>28</td>
<td>10</td>
<td>38</td>
<td>90.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30</td>
<td>12</td>
<td>42</td>
<td>100.1</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Cauc.</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Cauc.</td>
<td>75</td>
<td>22</td>
<td>97</td>
<td>67.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>17</td>
<td>16</td>
<td>33</td>
<td>22.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>14</td>
<td>-</td>
<td>14</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>106</td>
<td>38</td>
<td>144</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>OVRL</td>
<td>Cauc.</td>
<td>277</td>
<td>192</td>
<td>469</td>
<td>66.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>91</td>
<td>110</td>
<td>201</td>
<td>28.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>34</td>
<td>3</td>
<td>37</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>402</td>
<td>305</td>
<td>707</td>
<td>99.9</td>
<td></td>
</tr>
<tr>
<td>Exch. Cat.</td>
<td>Sex</td>
<td>No. of US As % of US</td>
<td>No. of US As % of US</td>
<td>US As % of Cauc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----</td>
<td>----------------------</td>
<td>----------------------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>M</td>
<td>8 100.0 42.1 72.7</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>- - - - -</td>
<td>Total 8 100.0 42.1 72.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>M</td>
<td>56 70.0 30.3 43.4</td>
<td>F 24 30.0 13.0 18.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>80 100.0 43.3 62.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>M</td>
<td>9 52.9 14.5 20.0</td>
<td>F 2 4 13.0 18.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>17 100.0 27.4 37.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>M</td>
<td>40 54.1 16.0 27.8</td>
<td>F 34 45.9 13.6 23.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>74 100.0 29.6 51.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>M</td>
<td>26 81.3 61.9 68.4</td>
<td>F 6 18.8 14.3 15.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>32 100.1 76.2 84.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>M</td>
<td>5 100.0 55.6 55.6</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5 100.0 55.6 55.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>M</td>
<td>51 92.7 35.4 52.6</td>
<td>F 4 7.3 2.8 4.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>55 100.0 38.2 56.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL</td>
<td>M</td>
<td>195 72.0 27.6 41.6</td>
<td>F 76 28.0 10.7 16.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>271 100.0 38.3 57.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Sex</td>
<td>No. of ptcpnts. by Ethnic Grp.</td>
<td>Total</td>
<td>Total as %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----</td>
<td>--------------------------------</td>
<td>--------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cauc.</td>
<td>Pac. Is.</td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honolulu M</td>
<td>49</td>
<td>3</td>
<td>6</td>
<td>58</td>
<td>87</td>
<td>28.3</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
<td>6</td>
<td>4</td>
<td>48</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>9</td>
<td>10</td>
<td>106</td>
<td>106</td>
<td>28.3</td>
</tr>
<tr>
<td>Wellington M</td>
<td>39</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>29</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>68</td>
<td>18.2</td>
</tr>
<tr>
<td>U.C.S.C. M</td>
<td>12</td>
<td>-</td>
<td>2</td>
<td>14</td>
<td>19</td>
<td>5.6</td>
</tr>
<tr>
<td>F</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>-</td>
<td>2</td>
<td>21</td>
<td>21</td>
<td>5.6</td>
</tr>
<tr>
<td>Vancouver M</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>Suva M</td>
<td>8</td>
<td>4</td>
<td>-</td>
<td>12</td>
<td>13</td>
<td>7.0</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>9</td>
<td>-</td>
<td>14</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>13</td>
<td>-</td>
<td>26</td>
<td>26</td>
<td>7.0</td>
</tr>
<tr>
<td>Rarotonga M</td>
<td>2</td>
<td>14</td>
<td>-</td>
<td>16</td>
<td>7</td>
<td>9.1</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>13</td>
<td>-</td>
<td>18</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>27</td>
<td>-</td>
<td>34</td>
<td>18</td>
<td>9.1</td>
</tr>
<tr>
<td>Saipan M</td>
<td>4</td>
<td>9</td>
<td>-</td>
<td>13</td>
<td>5</td>
<td>4.0</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>10</td>
<td>-</td>
<td>15</td>
<td>15</td>
<td>4.0</td>
</tr>
<tr>
<td>Pago Pago M</td>
<td>6</td>
<td>6</td>
<td>-</td>
<td>12</td>
<td>9</td>
<td>4.8</td>
</tr>
<tr>
<td>F</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>9</td>
<td>-</td>
<td>18</td>
<td>18</td>
<td>4.8</td>
</tr>
<tr>
<td>Noumea M</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>Niue M</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td>F</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>12</td>
<td>-</td>
<td>13</td>
<td>13</td>
<td>3.5</td>
</tr>
</tbody>
</table>

(continued over)
<table>
<thead>
<tr>
<th>Location</th>
<th>Sex</th>
<th>Cauc.</th>
<th>Pac. Is.</th>
<th>Other</th>
<th>Total</th>
<th>T as %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funafuti</td>
<td>M</td>
<td>2</td>
<td>6</td>
<td>-</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4</td>
<td>9</td>
<td>-</td>
<td>13</td>
<td>3.5</td>
</tr>
<tr>
<td>Tonga</td>
<td>M</td>
<td>5</td>
<td>9</td>
<td>-</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3</td>
<td>10</td>
<td>-</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>8</td>
<td>19</td>
<td>-</td>
<td>27</td>
<td>7.2</td>
</tr>
<tr>
<td>Lae</td>
<td>M</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>0.8</td>
</tr>
<tr>
<td>Apia</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>Honiara</td>
<td>M</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>Tarawa</td>
<td>M</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>Vila</td>
<td>M</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>NASA Ames</td>
<td>M</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>1.3</td>
</tr>
<tr>
<td>Ponape</td>
<td>M</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>L.A. (ALC)</td>
<td>M</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>OVERALL</td>
<td>M</td>
<td>145</td>
<td>52</td>
<td>9</td>
<td>206</td>
<td>55.1</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>101</td>
<td>63</td>
<td>4</td>
<td>168</td>
<td>44.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>246</td>
<td>115</td>
<td>13</td>
<td>374</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Total as %</td>
<td>65.8</td>
<td>30.7</td>
<td>3.5</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 17: PARTICIPANT TIME ON AIR, BY SEX AND ETHNICITY, CATEGORIES 1 - 8 & OVERALL

<table>
<thead>
<tr>
<th>Exch. Cat.</th>
<th>Ethnic Group</th>
<th>Sex</th>
<th>No. of mins.</th>
<th>As % of eth. grp.</th>
<th>As % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cauc.</td>
<td>M</td>
<td>79.0</td>
<td>84.0</td>
<td>74.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>15.0</td>
<td>16.0</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>94.0</td>
<td>100.0</td>
<td>88.7</td>
<td></td>
</tr>
<tr>
<td>P.I.</td>
<td>M</td>
<td>7.0</td>
<td>63.6</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>4.0</td>
<td>36.4</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>11.0</td>
<td>100.0</td>
<td>10.4</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>M</td>
<td>1.0</td>
<td>100.0</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>1.0</td>
<td>100.0</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Ovr'l</td>
<td>M</td>
<td>87.0</td>
<td></td>
<td>82.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>19.0</td>
<td></td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>106.0</td>
<td></td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>2. Cauc.</td>
<td>M</td>
<td>444.0</td>
<td>66.9</td>
<td>49.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>220.0</td>
<td>33.1</td>
<td>24.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>664.0</td>
<td>100.0</td>
<td>73.6</td>
<td></td>
</tr>
<tr>
<td>P.I.</td>
<td>M</td>
<td>126.0</td>
<td>68.5</td>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>58.0</td>
<td>31.5</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>184.0</td>
<td>100.0</td>
<td>20.4</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>M</td>
<td>52.5</td>
<td>97.2</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.5</td>
<td>2.8</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>54.0</td>
<td>100.0</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Ovr'l</td>
<td>M</td>
<td>622.5</td>
<td></td>
<td>69.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>279.5</td>
<td></td>
<td>31.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot</td>
<td>902.0</td>
<td></td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

(continued over)
Table 17 (continued)

<table>
<thead>
<tr>
<th>Exch. Cat.</th>
<th>Ethnic Group</th>
<th>Sex</th>
<th>No. of mins.</th>
<th>As % of eth. grp.</th>
<th>As % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Cauc.</td>
<td>M</td>
<td>122.5</td>
<td>63.5</td>
<td>52.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>70.5</td>
<td>36.5</td>
<td>30.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>193.0</td>
<td>100.0</td>
<td>83.0</td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>M</td>
<td>26.5</td>
<td>66.3</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>13.5</td>
<td>33.8</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>40.0</td>
<td>100.1</td>
<td>17.2</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Ovr'1</td>
<td>M</td>
<td>149.0</td>
<td></td>
<td>64.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>83.5</td>
<td></td>
<td>35.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>232.5</td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td>4.</td>
<td>Cauc.</td>
<td>M</td>
<td>298.5</td>
<td>47.6</td>
<td>31.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>329.0</td>
<td>52.4</td>
<td>34.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>627.5</td>
<td>100.0</td>
<td>65.1</td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>M</td>
<td>112.0</td>
<td>34.7</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>210.5</td>
<td>65.3</td>
<td>21.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>322.5</td>
<td>100.0</td>
<td>33.4</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>M</td>
<td>11.5</td>
<td>85.2</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>2.0</td>
<td>14.8</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>13.5</td>
<td>100.0</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Ovr'1</td>
<td>M</td>
<td>422.0</td>
<td></td>
<td>43.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>541.5</td>
<td></td>
<td>56.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>963.5</td>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>

(continued over)
<table>
<thead>
<tr>
<th>Exch. Cat.</th>
<th>Ethnic Group</th>
<th>Sex</th>
<th>No. of mins.</th>
<th>As % of eth. grp.</th>
<th>As % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Cauc</td>
<td></td>
<td>M</td>
<td>161.5</td>
<td>75.5</td>
<td>66.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>53.5</td>
<td>25.0</td>
<td>21.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>214.0</td>
<td>100.5</td>
<td>88.0</td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>5.0</td>
<td>100.0</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>5.0</td>
<td>100.0</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>M</td>
<td>23.5</td>
<td>100.0</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>23.5</td>
<td>100.0</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td>Ovr`l</td>
<td>M</td>
<td>185.0</td>
<td>-</td>
<td>75.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>59.5</td>
<td>-</td>
<td>24.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>244.5</td>
<td>-</td>
<td>100.0</td>
</tr>
<tr>
<td>6. Cauc</td>
<td></td>
<td>M</td>
<td>78.0</td>
<td>99.4</td>
<td>99.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>0.5</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>78.5</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>P.I.</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Ovr`l</td>
<td>M</td>
<td>78.0</td>
<td>-</td>
<td>99.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>0.5</td>
<td>-</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>78.5</td>
<td>-</td>
<td>100.0</td>
</tr>
</tbody>
</table>

(continued over)
<table>
<thead>
<tr>
<th>Exch. Cat.</th>
<th>Ethnic Group</th>
<th>Sex</th>
<th>No. of mins.</th>
<th>As % of eth. grp.</th>
<th>As % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8.</strong></td>
<td><strong>Cauc</strong></td>
<td>M</td>
<td>544.5</td>
<td>77.3</td>
<td>69.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>160.0</td>
<td>22.7</td>
<td>20.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>704.5</td>
<td>100.0</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td><strong>P.I.</strong></td>
<td>M</td>
<td>26.5</td>
<td>48.6</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>28.0</td>
<td>51.4</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>54.5</td>
<td>100.0</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td><strong>Other</strong></td>
<td>M</td>
<td>23.5</td>
<td>100.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>23.5</td>
<td>100.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td><strong>Ovr’l</strong></td>
<td>M</td>
<td>594.5</td>
<td></td>
<td>76.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>188.0</td>
<td></td>
<td>24.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>782.5</td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td><strong>OVRL</strong></td>
<td><strong>Cauc</strong></td>
<td>M</td>
<td>1728.0</td>
<td>67.1</td>
<td>52.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>848.5</td>
<td>32.9</td>
<td>25.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>2576.5</td>
<td>100.0</td>
<td>77.8</td>
</tr>
<tr>
<td></td>
<td><strong>P.I.</strong></td>
<td>M</td>
<td>298.0</td>
<td>48.3</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>319.0</td>
<td>51.7</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>617.0</td>
<td>100.0</td>
<td>18.6</td>
</tr>
<tr>
<td></td>
<td><strong>Other</strong></td>
<td>M</td>
<td>112.0</td>
<td>97.0</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>3.5</td>
<td>3.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>115.5</td>
<td>100.0</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td><strong>Ovr’l</strong></td>
<td>M</td>
<td>2138.0</td>
<td></td>
<td>64.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>1171.0</td>
<td></td>
<td>35.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tot</td>
<td>3309.0</td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td>Exch.</td>
<td>Sex</td>
<td>No. of As</td>
<td>As % of U.S.</td>
<td>As % of Total</td>
<td>US as % of Cauc</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>-----------</td>
<td>--------------</td>
<td>---------------</td>
<td>----------------</td>
</tr>
<tr>
<td>1.</td>
<td>M</td>
<td>67.5</td>
<td>100.0</td>
<td>63.7</td>
<td>71.8</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>67.5</td>
<td>100.0</td>
<td>63.7</td>
<td>71.8</td>
</tr>
<tr>
<td>2.</td>
<td>M</td>
<td>283.5</td>
<td>75.3</td>
<td>31.4</td>
<td>42.7</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>93.0</td>
<td>24.7</td>
<td>10.3</td>
<td>14.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>376.5</td>
<td>100.0</td>
<td>41.7</td>
<td>56.7</td>
</tr>
<tr>
<td>3.</td>
<td>M</td>
<td>20.0</td>
<td>60.6</td>
<td>8.6</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>13.0</td>
<td>39.4</td>
<td>5.6</td>
<td>6.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>33.0</td>
<td>100.0</td>
<td>14.2</td>
<td>17.1</td>
</tr>
<tr>
<td>4.</td>
<td>M</td>
<td>137.0</td>
<td>54.9</td>
<td>14.2</td>
<td>21.8</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>112.5</td>
<td>45.1</td>
<td>11.7</td>
<td>17.9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>249.5</td>
<td>100.0</td>
<td>25.9</td>
<td>39.7</td>
</tr>
<tr>
<td>5.</td>
<td>M</td>
<td>142.0</td>
<td>73.8</td>
<td>58.1</td>
<td>66.4</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>50.5</td>
<td>26.2</td>
<td>20.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>192.5</td>
<td>100.0</td>
<td>78.8</td>
<td>90.0</td>
</tr>
<tr>
<td>6.</td>
<td>M</td>
<td>67.5</td>
<td>100.0</td>
<td>86.0</td>
<td>86.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>67.5</td>
<td>100.0</td>
<td>86.0</td>
<td>86.0</td>
</tr>
<tr>
<td>8.</td>
<td>M</td>
<td>301.0</td>
<td>88.1</td>
<td>38.5</td>
<td>42.7</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>40.5</td>
<td>11.9</td>
<td>5.2</td>
<td>5.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>341.5</td>
<td>100.0</td>
<td>43.7</td>
<td>48.4</td>
</tr>
<tr>
<td>OVRL</td>
<td>M</td>
<td>1018.5</td>
<td>76.7</td>
<td>30.8</td>
<td>39.5</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>309.5</td>
<td>23.3</td>
<td>9.4</td>
<td>12.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1328.0</td>
<td>100.0</td>
<td>40.2</td>
<td>51.5</td>
</tr>
<tr>
<td>Initiating Terminal</td>
<td>Exchange Category</td>
<td>Total</td>
<td>Total as %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------</td>
<td>-------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Honolulu</td>
<td>1</td>
<td>7</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Wellington</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>U.C.S.C.</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Vancouver</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Suva</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rarotonga</td>
<td>-</td>
<td>1*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saipan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pago Pago</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Noumea</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Niue</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Funafuti</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tonga</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lae</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Honiara</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tarawa</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vila</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>19</td>
<td>3</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>

* = Pacific Islander
### TABLE 20: CHAIRING OF EXCHANGES BY LOCATION,

**EXCHANGE CATEGORIES 1 - 8 & OVERALL**

<table>
<thead>
<tr>
<th>Chairing Terminal</th>
<th>Exchange Category</th>
<th>Total</th>
<th>Total as %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Honolulu</td>
<td>2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Wellington</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>U.C.S.C.</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Vancouver</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NASA Ames</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Suva</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rarotonga</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saipan</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pago Pago</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Noumea</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Niue</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Funafuti</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Tonga</td>
<td>-</td>
<td>1*</td>
<td>-</td>
</tr>
<tr>
<td>Lae</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apia</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Honiara</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tarawa</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vila</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3</td>
<td>14</td>
<td>5</td>
</tr>
</tbody>
</table>

* = Pacific Islander
TABLE 21: CHAIRING OF EXCHANGES BY SEX & ETHNICITY,
EXCHANGE CATEGORIES 1 - 8 & OVERALL

(a)

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Exchange Category</th>
<th>Total</th>
<th>Total as %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1  2  3  4  5  6  8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian M</td>
<td></td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>91.9</td>
</tr>
<tr>
<td>Pacific M</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Islander F</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4</td>
<td>6.5</td>
</tr>
<tr>
<td>Other M</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>OVERALL M</td>
<td></td>
<td>8</td>
<td>61.3</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>7</td>
<td>38.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>100.0</td>
</tr>
</tbody>
</table>

(b)

| U.S. | Exchange Category | Total | |
|------|-------------------|-------||
|      | 1  2  3  4  5  6  8 |       | |
| M    |                   | 3     | 20 |
| F    |                   | 2     | 3  |
| Total|                   | 5     | 23 |

335
### TABLE 22: PEACESAT STAFF ON AIR BY SEX & ETHNICITY, EXCHANGE CATEGORIES 1-8 & OVERALL

**(a)**

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Sex</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>Total (mins)</th>
<th>Total as %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cauc.</td>
<td>M</td>
<td>5.5</td>
<td>53.0</td>
<td>11.5</td>
<td>36.0</td>
<td>5.0</td>
<td>0.5</td>
<td>121.5</td>
<td>233.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>8.5</td>
<td>45.0</td>
<td>14.5</td>
<td>72.5</td>
<td>4.5</td>
<td>0.5</td>
<td>155.0</td>
<td>300.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>14.0</td>
<td>98.0</td>
<td>26.0</td>
<td>108.5</td>
<td>9.5</td>
<td>1.0</td>
<td>276.5</td>
<td>533.5</td>
</tr>
<tr>
<td>Pac.</td>
<td>M</td>
<td>1.0</td>
<td>23.0</td>
<td>15.5</td>
<td>27.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>25.5</td>
<td>92.0</td>
</tr>
<tr>
<td>Is.</td>
<td>F</td>
<td>4.0</td>
<td>6.5</td>
<td>8.0</td>
<td>70.0</td>
<td>3.5</td>
<td>-</td>
<td>-</td>
<td>27.5</td>
<td>119.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>5.0</td>
<td>29.5</td>
<td>23.5</td>
<td>97.0</td>
<td>3.5</td>
<td>-</td>
<td>-</td>
<td>53.0</td>
<td>211.5</td>
</tr>
<tr>
<td>Other</td>
<td>M</td>
<td>1.0</td>
<td>12.0</td>
<td>-</td>
<td>4.0</td>
<td>0.5</td>
<td>-</td>
<td>-</td>
<td>29.5</td>
<td>47.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1.0</td>
<td>12.0</td>
<td>-</td>
<td>4.0</td>
<td>0.5</td>
<td>-</td>
<td>-</td>
<td>29.5</td>
<td>47.0</td>
</tr>
<tr>
<td>OVERALL</td>
<td>M</td>
<td>7.5</td>
<td>88.0</td>
<td>27.0</td>
<td>67.0</td>
<td>5.5</td>
<td>0.5</td>
<td>177.5</td>
<td>373.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>12.5</td>
<td>51.5</td>
<td>22.5</td>
<td>142.5</td>
<td>8.0</td>
<td>0.5</td>
<td>182.5</td>
<td>420.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>20.0</td>
<td>139.5</td>
<td>49.5</td>
<td>209.5</td>
<td>13.5</td>
<td>1.0</td>
<td>360.0</td>
<td>793.0</td>
<td></td>
</tr>
</tbody>
</table>

**(b)**

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Sex</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>Total (mins)</th>
<th>Total as %</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>M</td>
<td>7.0</td>
<td>39.0</td>
<td>11.0</td>
<td>2.5</td>
<td>5.5</td>
<td>0.5</td>
<td>104.0</td>
<td>169.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>1.5</td>
<td>-</td>
<td>35.5</td>
<td>1.0</td>
<td>-</td>
<td>40.5</td>
<td>78.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>7.0</td>
<td>40.5</td>
<td>11.0</td>
<td>38.0</td>
<td>6.5</td>
<td>0.5</td>
<td>144.5</td>
<td>248.0</td>
<td></td>
</tr>
</tbody>
</table>

*PEACESAT staff includes the Local Directors, Terminal Managers and Assistant Terminal Managers, etc., of all terminals except that this study does not include those PEACESAT Local Directors and others who participated in Consortium Council or WARC Planning sessions – see discussion for further details.*
<table>
<thead>
<tr>
<th>Terminal</th>
<th>Resource Criteria</th>
<th>(1)</th>
<th>(2)</th>
<th>Total score</th>
<th>Total as %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu</td>
<td></td>
<td>7.0</td>
<td>-0.5</td>
<td>1</td>
<td>8.5</td>
</tr>
<tr>
<td>Wellington</td>
<td></td>
<td>2.5</td>
<td>-</td>
<td>1</td>
<td>4.5</td>
</tr>
<tr>
<td>U.C.S.C.</td>
<td></td>
<td>3.0</td>
<td>-</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>Vancouver</td>
<td></td>
<td>1.0</td>
<td>-2.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Suva</td>
<td></td>
<td>1.5</td>
<td>-</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Rarotonga</td>
<td></td>
<td>2.0</td>
<td>-1.0</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Saipan</td>
<td></td>
<td>3.0</td>
<td>-1.0</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Pago Pago</td>
<td></td>
<td>2.0</td>
<td>-</td>
<td>-</td>
<td>3.0</td>
</tr>
<tr>
<td>Noumea</td>
<td></td>
<td>1.0</td>
<td>-1.0</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Niue</td>
<td></td>
<td>1.0</td>
<td>-2.0</td>
<td>-</td>
<td>-1.0</td>
</tr>
<tr>
<td>Funafuti</td>
<td></td>
<td>1.0</td>
<td>-1.0</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Tonga</td>
<td></td>
<td>1.0</td>
<td>-</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Lae</td>
<td></td>
<td>2.0</td>
<td>-2.0</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Apia</td>
<td></td>
<td>-</td>
<td>-1.0</td>
<td>-</td>
<td>-1.0</td>
</tr>
<tr>
<td>Honiara</td>
<td></td>
<td>-</td>
<td>-2.0</td>
<td>-</td>
<td>-2.0</td>
</tr>
<tr>
<td>Tarawa</td>
<td></td>
<td>-</td>
<td>-1.0</td>
<td>-</td>
<td>-1.0</td>
</tr>
<tr>
<td>Vila</td>
<td></td>
<td>-</td>
<td>-2.0</td>
<td>-</td>
<td>-2.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>27.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The following criteria and scoring system have been used to compile the above table:

(1) Staff available at terminal:
   - For every full-time staff member, score 2
   - For every part-time staff member, score 1
   (includes Local Directors)

(2) Performance of equipment:
   (a) Equipment usually functions well, score 0
   - Equipment occasionally fails, score -1
   - Equipment frequently fails, score -2
   (b) Signal volume & reliability good, score 1

(3) Dedication to PEACESAT Net
   - Facilities used exclusively by PS, score 1.
### TABLE 24: NETWORK FLOW ANALYSIS (1): Q SCORES, EXCHANGE CATEGORIES 1 – 8 & OVERALL

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Q scores/Exchange Category</th>
<th>Total</th>
<th>Total as %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Hon'l</td>
<td>19</td>
<td>77</td>
<td>7</td>
</tr>
<tr>
<td>W'ton</td>
<td>11</td>
<td>49</td>
<td>14</td>
</tr>
<tr>
<td>UCSC</td>
<td>-</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Vanc.</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>RV Gyre</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NASA Ames</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Suva</td>
<td>-</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Raro.</td>
<td>1</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Saipan</td>
<td>-</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Pago</td>
<td>9</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Noumea</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Niue</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Funaf.</td>
<td>-</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Tonga</td>
<td>2</td>
<td>21</td>
<td>-</td>
</tr>
<tr>
<td>Lae</td>
<td>-</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Apia</td>
<td>-</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Honiara</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tarawa</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Vila</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

**OVERALL** 42 214 32 184 93 21 138 724 100.2
TABLE 25: NETWORK FLOW ANALYSIS (1): R SCORES,
EXCHANGE CATEGORIES 1 - 8 & OVERALL

<table>
<thead>
<tr>
<th>Terminal</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>Total</th>
<th>Total as %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hon'1</td>
<td>88</td>
<td>288</td>
<td>32</td>
<td>280</td>
<td>110</td>
<td>31</td>
<td>457</td>
<td>1286</td>
<td>28.1</td>
</tr>
<tr>
<td>W'ton</td>
<td>28</td>
<td>177</td>
<td>118</td>
<td>426</td>
<td>25</td>
<td>13</td>
<td>326</td>
<td>1113</td>
<td>24.3</td>
</tr>
<tr>
<td>UCSC</td>
<td>2</td>
<td>92</td>
<td>41</td>
<td>56</td>
<td>79</td>
<td></td>
<td></td>
<td>270</td>
<td>5.9</td>
</tr>
<tr>
<td>Vanc.</td>
<td>-</td>
<td>19</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>69</td>
<td>1.5</td>
</tr>
<tr>
<td>RV Gyre</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13</td>
<td>-</td>
<td>-</td>
<td></td>
<td>13</td>
<td>0.3</td>
</tr>
<tr>
<td>NASA Ames</td>
<td>-</td>
<td>157</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>157</td>
<td>3.4</td>
</tr>
<tr>
<td>Suva</td>
<td>-</td>
<td>155</td>
<td>36</td>
<td>77</td>
<td>-</td>
<td>-</td>
<td>51</td>
<td>319</td>
<td>7.0</td>
</tr>
<tr>
<td>Raro.</td>
<td>2</td>
<td>63</td>
<td>15</td>
<td>158</td>
<td>-</td>
<td>-</td>
<td>177</td>
<td>415</td>
<td>9.1</td>
</tr>
<tr>
<td>Saipan</td>
<td>-</td>
<td>70</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>27</td>
<td>147</td>
<td>3.2</td>
</tr>
<tr>
<td>Pago</td>
<td>9</td>
<td>45</td>
<td>1</td>
<td>58</td>
<td>28</td>
<td>-</td>
<td>15</td>
<td>156</td>
<td>3.4</td>
</tr>
<tr>
<td>Noumea</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td>75</td>
<td>57</td>
<td>26</td>
<td></td>
<td>164</td>
<td>3.6</td>
</tr>
<tr>
<td>Niue</td>
<td>-</td>
<td>8</td>
<td>4</td>
<td>60</td>
<td>6</td>
<td>-</td>
<td>4</td>
<td>82</td>
<td>1.8</td>
</tr>
<tr>
<td>Funaf.</td>
<td>-</td>
<td>42</td>
<td>17</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>13</td>
<td>132</td>
<td>2.9</td>
</tr>
<tr>
<td>Tonga</td>
<td>12</td>
<td>73</td>
<td>12</td>
<td>26</td>
<td>-</td>
<td>17</td>
<td>20</td>
<td>160</td>
<td>3.5</td>
</tr>
<tr>
<td>Lae</td>
<td>-</td>
<td>25</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>16</td>
<td>45</td>
<td>1.0</td>
</tr>
<tr>
<td>Apia</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>0.2</td>
</tr>
<tr>
<td>Honiara</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td>Tarawa</td>
<td>-</td>
<td>13</td>
<td>7</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>23</td>
<td>0.5</td>
</tr>
<tr>
<td>Vila</td>
<td>-</td>
<td>-</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14</td>
<td>0.3</td>
</tr>
</tbody>
</table>

OVERALL 141 1244 256 1245 313 118 1261 4578 100.1
### TABLE 26: NETWORK FLOW ANALYSIS (1): OVERALL Q & R SCORES ACCORDING TO METROPOLITAN AND PACIFIC ISLAND TERMINALS

<table>
<thead>
<tr>
<th></th>
<th>Q scores</th>
<th>R scores</th>
<th>Total M/PI scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan Terminals</td>
<td>534</td>
<td>2908</td>
<td>3442</td>
</tr>
<tr>
<td></td>
<td>(73.6%)</td>
<td>(63.5%)</td>
<td>(64.9%)</td>
</tr>
<tr>
<td>Pacific Is. Terminals</td>
<td>190</td>
<td>1670</td>
<td>1860</td>
</tr>
<tr>
<td></td>
<td>(26.2%)</td>
<td>(36.5%)</td>
<td>(35.1%)</td>
</tr>
<tr>
<td>Total Q &amp; R scores</td>
<td>724</td>
<td>4578</td>
<td>5302</td>
</tr>
<tr>
<td></td>
<td>(13.7%)</td>
<td>(86.3%)</td>
<td>(100.0%)</td>
</tr>
</tbody>
</table>

### TABLE 27: SUMMARY OF PROBABILITY SCORES FOR NETWORK FLOW ANALYSIS (1), EXCHANGE CATEGORIES 1 - 8 & OVERALL

<table>
<thead>
<tr>
<th>Exchange Category</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Classroom Instruction</td>
<td>&lt; 0.7</td>
</tr>
<tr>
<td>2. Decision-making Conference</td>
<td>&lt; 0.55</td>
</tr>
<tr>
<td>3. Professional &amp; In-Service Trng.</td>
<td>&lt; 0.8</td>
</tr>
<tr>
<td>4. Community Development Service</td>
<td>&lt; 0.02</td>
</tr>
<tr>
<td>5. Research Support</td>
<td>&lt; 0.6</td>
</tr>
<tr>
<td>6. Professional Consultation</td>
<td>&lt; 0.95</td>
</tr>
<tr>
<td>8. Administrative</td>
<td>&lt; 0.92</td>
</tr>
</tbody>
</table>

**OVERALL**< 0.15
TABLE 28: NETWORK FLOW ANALYSIS (2): CONNECTIONS
MADE AMONG TERMINALS DURING MESSAGE PERIODS

<table>
<thead>
<tr>
<th>Receiving Terminal</th>
<th>Ha</th>
<th>Wn</th>
<th>UC</th>
<th>Va</th>
<th>Su</th>
<th>Ra</th>
<th>Sa</th>
<th>Pa</th>
<th>No</th>
<th>Ni</th>
<th>Fu</th>
<th>To</th>
<th>La</th>
<th>Ap</th>
<th>Ho</th>
<th>Ta</th>
<th>Vi</th>
<th>TOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>T Hon’l</td>
<td>13</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>7</td>
<td>8</td>
<td>14</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>r W’ton</td>
<td>17</td>
<td>6</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>a UCSC</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>n Vanc.</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>s Suva</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>m Raro.</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>i Saipan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t Pago</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Noumea</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>T Niue</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e Funaf.</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>r Tonga</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>m Lae</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>i Apia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n Honiara-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a Tarawa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l Vila</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>30</td>
<td>25</td>
<td>15</td>
<td>17</td>
<td>19</td>
<td>13</td>
<td>14</td>
<td>20</td>
<td>13</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>205</td>
</tr>
</tbody>
</table>

341
<table>
<thead>
<tr>
<th>Receiving Terminals</th>
<th>Metropolitan Terminals</th>
<th>Pacific Island Terminals</th>
<th>Total Transmit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63</td>
<td>111</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>(30.7%)</td>
<td>(54.1%)</td>
<td>(84.9%)</td>
</tr>
<tr>
<td>Tx Terms</td>
<td>24</td>
<td>7</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>(11.7%)</td>
<td>(3.4%)</td>
<td>(15.1%)</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>118</td>
<td>205</td>
</tr>
<tr>
<td>Receive</td>
<td>(42.4%)</td>
<td>(57.6%)</td>
<td>(100.0%)</td>
</tr>
</tbody>
</table>

Probability score for the above from Chi Square: < 0.14
APPENDIX 5: Summary analysis of 1974 exchanges

Twelve exchanges from April 1974 were analysed using the same methods as employed for the analysis of exchange data in Chapter IX. The 12 exchanges represented a total of 449.5 minutes of exchange time, or 7 hours 29.5 minutes. The exchanges were from the following Exchange Categories:

- Category 2 (Decision-making Conf): 5 exchanges
- Category 5 (Research Support): 3 exchanges
- Category 6 (Professional Consult.): 2 exchanges
- Category 8 (Administrative): 2 exchanges

Total 12 exchanges

The duration of exchanges was as follows:

- 0-15 mins.: 3 exchanges
- 15-30 mins.: 4 exchanges
- 30-60 mins.: 2 exchanges
- 60-90 mins.: 2 exchanges
- 90+ mins.: 1 exchange

Participation in these exchanges by sex and ethnicity was as follows:

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td></td>
<td></td>
<td>58</td>
<td>78.4%</td>
</tr>
<tr>
<td>Pac. Is.</td>
<td>10</td>
<td>6</td>
<td>16</td>
<td>21.6%</td>
</tr>
<tr>
<td>Overall</td>
<td>59</td>
<td>15</td>
<td>74</td>
<td>100.0%</td>
</tr>
<tr>
<td>US</td>
<td>22</td>
<td>6</td>
<td>28</td>
<td>37.8%</td>
</tr>
</tbody>
</table>
The time on air for the different terminals was as follows:

- Honolulu: 136.0 mins.
- Wellington: 95.5 mins.
- Stanford: 14.5 mins.
- Bethesda: 8.0 mins.
- Metro.: 254.0 mins = 56.5%
- Pac. Is.: 195.5 mins = 43.5%
- Suva: 71.0 mins.
- Tonga: 53.0 mins.
- Rarotonga: 35.0 mins.
- Noumea: 19.0 mins.
- Saipan: 9.0 mins.
- Lae: 8.5 mins.
- Total: 449.5 mins.

The time on air for participants, by ethnicity, was as follows:

- Caucasian: 362.5 mins. = 80.6%
- Pac. Is.: 87.0 mins. = 19.4%
- US: 190.5 mins. = 43.9%

An interesting detail is that one Pacific Island participant - a Fiji Indian - spoke for 32.5 minutes of the 87.0 minute total for Pacific Island participants.

These results are very similar to those of the main study. The time on air of locations shows less imbalance between Metropolitan and Pacific Island locations (56.5% to 43.5%). However, in terms of participation, the ratio of Caucasians to Pacific Islanders (78.4% to 21.6%) shows a lower figure for Pacific Islander participation than in the main study. In the participant time on air, the ratio of Caucasian to Pacific Islander is the same as the main study (4:1). Essentially, therefore, despite the small sample, these figures corroborate
those of the main study, demonstrating that the results of the 1979 figures are therefore representative.

In the chairing of exchanges, seven exchanges were chaired by Caucasians as against nil for Pacific Islanders; five of the exchanges were chaired by US Nationals (or 71.4% - higher than in the main study).

The results of employing the methods of Network Flow Analysis (1) on these figures do not show significance, a result that one would expect from so small a sample.
SELECTED BIBLIOGRAPHY

Published materials

Books


Periodicals


Reports, etc.


Misko, Carol, James P. McMahon & Beverley Jean Oka. First Year Medical User Demonstrations (1); Pacific Library Conferences (2); Biomedical Transmission Tests (3). Honolulu: PEACESAT Project, July 1973.


--------------. Summary Record of the Fifth South Pacific Regional Telecommunications Meeting, July 4-10, Rarotonga, Cook Islands. Suva: SPEC, 1978. (Mimeoographed.)


Unpublished materials

Correspondence


Unknown. Correspondence concerning PEACESAT. Hawaii, Washington, 1973. [File #221, University of Dayton bibliography.]

Interviews


Conferences & other

Author unknown. *ATS-1.* Source unknown, publisher unknown, undated. (Mimeographed.)


Hanley, Anthony. *WARC 1979: Summary of PEACESAT Project*
Proposals. Wellington: no publisher, undated. (Mimeographed.)


----------. Communications as an aid to Research in the Pacific. Rarotonga: Premier’s Department, undated. (Mimeographed.)

----------. The PEACESAT Experience in the Pacific. Rarotonga: no publisher, February 1979. (Mimeographed.)


