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THE FRONTIERS OF
SOUTH AMERICA



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THE FRONTIERS OF SOUTH AMERICA

A SUMMARY REPORT

MAY 1966

The Frontiers of South America

A Summary Report

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The Frontiers of South America

This report is a preliminary summary effort to assess the appropriate role of hitherto unused (or under-utilized) land and natural resources in the future economic development of South America.

Part One attempts to put the problem in a general economic perspective.

Part Two examines the characteristics and potentialities of the principal undeveloped regions and the location of major unexploited natural resources.

Part Three summarizes the projects under way or under examination, on the basis of the more detailed materials in Appendix I.

Part Four presents interim policy recommendations.

Part One: The Economic Backdrop

A population density map (Map #1) reveals South America as a continent whose people still live mainly along the sea-coasts or close to them. A vast unpopulated -- or barely populated -- interior beckons and challenges, as it has done for several centuries.

The result is a product of geography and economic history.

The location of mountain ranges and escarpments as well as forbidding tropical lowlands and rain forests (Map #2 and Map #3) decreed that men would first exploit the arable land near the coast or accessible to it. The Indian population, it is true, remained withdrawn in the relatively poor plateaus of the Andes, maintaining a distinct cultural and social life; although the impact of modern public health measures has created severe population pressure in the past generation. Moreover, minerals, timber (and, at one time, Amazonian rubber), drew some enterprise to the interior. But the South American interior was -- and by and large remains -- a difficult and expensive frontier to exploit.

The


Population Map



→
Map doesn't read,

Where are the
Andes & where the
adjacent lowlands?

The darkest spots are
basins. Very poor choice
of colors

Other than the 3 ~~middle~~ colors on
the ^{cover} left in the color legend { , can any
distinction be made of the other 5? }



What are the types
from Cordoba, Argentina
west to the Coast?

Symbols all look alike in
that juxtaposition.



The first two major phases of South American economic development reinforced the bias of nature.

South America developed, in the first instance, as a supplier of agricultural products and raw materials to Europe, and then, to the United States. The modern elements in South American life were thus focused around the ports; and a premium attached to agricultural development in regions close to the seacoast or accessible by rail or road.

Over the last 30 years South America experienced its first major phase of industrialization. The initial leading sector in industrial growth has been the production of consumers goods in substitution for imports. The markets for such goods were, naturally, existing centers of population and wealth. Thus, the coastal cities built up to manage South America's international commerce became the focus for industrial activity. The coastal bias in South American development was thus reinforced.

This initial industrial phase of South American development was accompanied by a rise to effective political and social power of urban groups. Investment in infrastructure, housing, education, and health was disproportionately concentrated in the coastal cities. With certain notable exceptions -- for example, the building of Brasilia -- the development of the South American interior and, indeed, of agriculture in general, was relatively neglected over the past generation.

South America now stands at a stage where it is appropriate to look afresh at the potentialities of the frontiers for the following reasons:

-- The demand for food (flowing from the expansion of population, incomes, and urbanization) is increasing in the region as a whole faster than food production.

-- The import substitution boom in consumers goods for urban markets has clearly lost its power to carry forward

industrialization

industrialization in most of the South American countries. They must turn now to widening their domestic markets, diversifying their foreign markets, and building an efficient capital goods base for their industrial structures.

-- The impulse to economic integration is gathering strength under a mixture of economic, political, and psychological pressures; and the development of some of the potential new lands requires cooperation among South American countries as well as between them and the international financing community.

-- The growing industrial and technological competence of South America, combined with new technology and capital available from abroad, makes possible now the economic exploitation of some regions hitherto denied by natural barriers, soil limitations, and uncontrolled disease.

In the next phase, South American industrialization must move towards efficiency and maturity; markets must be widened and linked; the race between food production and demand must be won and, indeed, South America should become, again, a net food exporter; its unexploited natural resources must be put to work to provide chemical fertilizers, minerals, and fuel for its own development and to enlarge foreign exchange earnings.

There is, thus, an instinctive and proper feeling that the opening up of hitherto unused land and resources could and should play an important part in this process.

But what part -- and how big a part -- depends on answers to difficult and important economic questions.

The South American interior is not, by any means, a rich, open fertile region like the great plains of the United States. Its development has been thus far impeded by real factors:

-- the

-- the high cost of access and of transporting its products to market;

-- the high cost of establishing settlements with community facilities and social infrastructure of the kind available in coastal regions;

-- considerable lack of knowledge and technical assistance necessary to bring the soils into efficient use;

-- in some cases, the continued prevalence of uncontrolled disease;

-- in some cases, laws, public policies, and international frictions which inhibit the opening up of new lands and resources.

In short, what must be established is whether investment in the opening up of new land will yield greater benefits with respect to agricultural production and productivity, new resources, and widened markets than investment to these ends in the more developed regions of South America. Subsequently, we must determine whether the requirements for external financing in opening up new lands will be changed in magnitude and form. Moreover, the changes in law, policy and international understandings required for the economic exploitation of unused land and natural resources must be identified.

The answer to these questions must be established region by region and project by project against the background of expanding research and exploration; for, despite the powerful attraction over adventurous minds of the South American interior, there is a great deal we do not know. Investment decisions must be based on the answers to these questions.

Nevertheless, it is possible to map roughly the potentialities and to suggest where and how to move forward on a rational basis.

Part Two:

Part Two: The Major Undeveloped Regions and
Resources of South America

7

A. Land

It is useful to set out the major potential unused regions of South America under the following seven headings, moving, more or less, counterclockwise south from the Panama Canal.

1. The Darien Gap
2. The wet tropical lowlands (other than flood plains)
3. The wet tropical flood plains
4. The East Andean Piedmont (upper tropical lowlands)
5. The Campo Cerrado
6. The Gran Chaco and Gran Pantanal
7. The River Plate Drainage System
8. The Sao Paulo-Buenos Aires axis
9. The Guayana complex

The Darien Gap. The missing link in the Panamanian highway system is the 250 mile Darien Gap. It is a tropical jungle region containing a good deal of arable land but cut by rivers and mountain ranges, notably near the Panama-Colombia border. As indicated in Appendix I (Tab G-1) the Darien Highway Survey is nearing completion. No firm cost estimates for constructing the highway through the gap are yet available, but informed guesses range from \$125-250 million, depending mainly upon the routes chosen within Colombia for linkage to the new road.

The case for making the link is the following:

-- It would open up considerable areas in Panama for cattle raising and other agricultural uses, as well as extensive forest resources. It might make accessible some mineral resources; for example, gold in Colombia.

-- It would help open up the Panamanian hinterland and draw some population away from the Canal Zone. There is a strong case for using the interval between the present

and the

and the building of a new trans-isthmian canal to begin to open up this region, so that the canal construction boom can be supplied in higher proportion from Panamanian resources rather than from imports.

-- It would provide a land link between Central America and the northern part of South America -- an objective with strong psychological and political overtones throughout the region -- and permit truck traffic between Central America and the industrial centers of Colombia.

These positive aspects of the completion of the Panamanian highway must be weighed against the cost and be related to the timing, character, and location of the new canal.

This project (on which a feasibility study is now being done) should also be related to ultimate decisions about the Atrato-San Juan waterway (Appendix I, Tab E-8) whose northern dike, should it be constructed, might serve also as a part of the passage for the Panamanian highway. Moreover, that waterway, if judged economic and constructed, would make available additional Colombia resources and electric power and increase the rationality of closing the Darien Gap.

The wet, tropical lowlands (other than flood plains). The largest undeveloped region of South America consists of the wet tropical lowlands of the Amazon and Orinoco river basins in Brazil and adjacent regions, Venezuela, Colombia, Peru, and Bolivia. This region is characterized by dense forest and grassy savannahs, with heavy rainfall, high temperatures, and soils of extremely low fertility.

Because of their low fertility, these areas remain virtually unused; although cropping is possible on forested lands under shifting cultivation; while cattle grazing is practiced on the savannahs at low carrying capacity.

In the very long run, it is possible that sophisticated fertilizer application and suitable soil conservation

practices

practices might render these regions productive. Moreover, permanent tree crops, like rubber, are possible where drainage problems permit. But, for the foreseeable future, this vast region does not appear a rational area for systematic economic development, unless new minerals or other natural resources are discovered. Population maps of South America are likely to continue to exhibit a vast empty area for many decades, unless the scheme recently suggested by Herman Kahn is adopted, in which the damming of rivers would convert the Amazon Basin into a vast lake.

Wet, tropical lowlands (flood plains). The Amazon River flood plains have an area of 25,000 square miles; and the flood plains of tributary streams may add another area of similar size. The Brazilian Ministry of Agriculture is conducting exploration and research to establish whether these regions are capable of economic exploitation. The replenishment of soil nutrients through flooding suggests that rice might be economically produced in these areas and water buffalo might be grazed on pastures resistant to periodic flooding. Although a few areas of higher level ground in the zone are being successfully cultivated, much further research is required to establish whether the agricultural output from this region would justify the expensive measures of water control required.

The East Andean Piedmont. This relatively promising region consists of an interrupted strip of valleys and rolling hills in a narrow belt running along the eastern foothills of the Andes from Venezuela, through Colombia, Ecuador, Peru, and Bolivia. It is more than 3,000 miles in length; 10-50 miles in width; and contains perhaps 3 million acres of arable land.

The following table roughly indicates the relative expansion in arable land involved for each of the four countries.

Arable

Arable Land and Potential Expansion in Andean Piedmont
(1,000 acres)

	<u>Current</u>	<u>Andean Piedmont</u>	<u>Total</u>
Colombia	12,100	750	12,850
Ecuador	2,800	150	2,950
Peru	3,300	1,200	4,500
Bolivia	7,700	900	8,600

Most of this land is forest or woodland, but there are some savannahs. On the whole, this area has adequate but moderate rainfall; better drainage and better soil fertility than the wet, tropical lowlands which adjoin it to the south and to the east.

This is the terrain which the Carretera Marginal de la Selva (Map #4) is designed to exploit. Access roads are being built; settlers are moving in; but the high cost of transporting its commercial products to market remain -- and will remain -- a problem to be solved in the future by a mixture of road and air transport plus more efficient linking to the Amazon ports leading to the Atlantic.

In the first instance, the region is a good potential source of meat, dairy products, tropical foods, tobacco, tea, and other cash crops, as well as a base for self-sufficiency farming. A high premium will attach to processing in the region to reduce transport costs to markets.

The Campo Cerrado. A broad belt of rolling lands runs south of the Amazon Basin, from the Mato Grosso to the Sao Francisco River. This vast area is covered by scrub or low forest interspersed with savannahs and includes at least 400 million acres, a large part of which is topographically and climatically suited for cultivation. The low fertility of the soil will require, however, correction for nutrient deficiencies. Research (including that conducted systematically by the I.R.I. Research Institute) indicates that

highly

Pôrto Alegre

highly acceptable yields are possible of corn, beans, sorghum, soybeans, forage, and fiber crops, as well as cattle. At the present time, while the population is pushing into this area, it remains very lightly settled. Massive settlement, however, must be accompanied by sophisticated fertilizer application and technical assistance. The existing (and expandable) region from Sao Paulo to Puerto Alegre is evidently capable of further fruitful development and should enjoy higher priority in Brazilian agricultural development in the years immediately ahead. Like the Andean piedmont, this is another major region for systematic future agricultural development in South America.

The Gran Chaco and Gran Pantanal. This area includes Central and Northwestern Paraguay, Northeastern Argentina, Eastern Bolivia and the drainage system of the Paraguay River in Brazil. The Chaco is divided from the Pantanal roughly by the Paraguay River. The main difference between the two areas is drainage. Much of the Pantanal is flooded from November to April, while the Chaco is well drained and has less rainfall. Both areas have a pronounced dry season between May and September. Due to its size (perhaps 400,000 square miles) the area is important for future development, but will be costly to develop. The Pantanal will require extensive drainage works, dikes and roads. The Chaco needs irrigation, in part, before it can be intensively used. Extensive use in grain farming and improved forage production is possible without irrigation.

River Plate Drainage System. This is a large area which is composed of the complex of the Paraguay, Parana and Uruguay Rivers and their tributaries. It extends south from the Mato Grosso province in Brazil through Central and Eastern Paraguay, the broader areas of Brazil and Uruguay along the Uruguay River and into Northeastern Argentina (provinces of Entre Rios, Corrientes). These waters flow into the Argentine delta area where the Uruguay and Paraguay Rivers converge to become the River Plate estuary. These rivers flow through the swamplands of the Pantanal. Not infrequently the rivers of this system reach a flood stage at which they inundate vast areas and cause grave economic damage. This occurred this past Spring in Entre Rios in Argentina.

Parts

Parts of the river system are being studied to determine navigation potential, particularly the Paraguay River which runs through Asuncion to the Delta. It could be a major transportation artery from the Brazil-Paraguay-Bolivia interior. The U.N. is financing a survey of southeastern Paraguay which will include the Paraguay and Parana Rivers.

Power surveys have been completed and hydroelectric facilities are being constructed on Brazilian rivers which feed this system. Development of these power sites in Brazil will have an important effect on the downstream waters in Paraguay and Argentina. The Salto Grande hydroelectric project at Concordia, Argentina which will supply power to Argentina and Uruguay is ready for financing.

There is a growing recognition that the power, navigation and water resources of the rivers should be studied systematically and with the view that the region forms an economic unit. Study of the river system in its totality will require cooperation and agreement among the five countries involved. The development of the river system could be the basis for a multinational agreement and the establishment of a coordinating development agency.

The Rio-Sao Paulo-Buenos Aires Axis. Looking ahead to the economic integration of Latin America, the strengthening of transport links between Buenos Aires and the industrial triangle of Brazil (Sao Paulo, Rio, Minas Gerais) makes sense. It is not too far fetched to regard that region as constituting in the future of South America a potential metropolitan strip something like that between Chicago and New York in the United States. It contains the richest agricultural area of Brazil as well as Uruguay -- a country which should find its destiny as an agricultural, commercial, and industrial component of this larger complex.

One project which would probably be justified within the decade and which would dramatize and accelerate this linkage would be a bridge over the River Plate estuary (or over the Parana delta). (Appendix I, Tab A-5.) The configuration of waterways around Buenos Aires makes awkward road communications

between

between that center and the region to the north. Improved ferry service across the estuary is now contemplated; but a bridge link might have major direct and indirect effects on the development of the whole southeastern sector of the continent.

The Guayana. One of the more important developments going forward in South America is the creation in Venezuela of the industrial complex at San Tome de Guayana, located in the mineral rich area at the conjunction of the Caroni and Orinoco Rivers. San Tome de Guayana was a village of 4,000 in 1950; it is expected to reach 200,000 by 1975. It already includes, in addition to hydroelectric facilities, a steel mill. A joint venture with Reynolds Aluminum Company is expected to construct a bauxite reducing plant. Both U.S. Steel and Bethlehem Steel conduct iron operations under concession agreements. The emergence of this industrial center suggests the possibility of linkage with British Guiana whose interior is being explored (Appendix I, Tabs K-1, D-3, D-8).

In broadbrush terms, then, the potential areas for further land development in South America consist of a set of possibilities for moving towards the interior in specific directions: south from the Panama Canal; east across the Andes into the long piedmont strip; west into Campo Cerrado. In addition, the irrigation, flood control, navigation and hydroelectric potential of the River Plate valley system remain to be exploited; the great urban centers of the southeast to be better linked; and the Amazon flood plains and Guayana to be rationally developed. All these areas will require substantial expenditures of capital for transport; infrastructure; and, in some cases, for significantly increased chemical fertilizer application and water control works. They would still leave the great tropical lowland regions of the Amazon and Orinoco Rivers relatively untouched.

B. Chemical Fertilizers

Latin American chemical fertilizer production relates to the development of frontier regions in two respects.

First,

First, some of the presently known chemical fertilizer resources are located in interior or otherwise undeveloped regions. Their exploitation will involve transport and other infrastructure investment; and they should serve to generate centers for wider industrial and agricultural development. Second, some of the frontier lands will require for their effective exploitation the application of substantial chemical fertilizers; for example, the Campo Cerrado.

The expansion in Latin American agricultural production over recent decades has not kept up with the increasing regional demand for food. That expansion has been based mainly on the opening up of new acreage. Between 1934-48 and 1950, for example, there was only a 5% increase in grain yields in Latin America as a whole.

In the last few years attention to agricultural yields has been increasing in Latin America, as has been the consumption of chemical fertilizers. Nevertheless, it is clear that victory in the race between Latin American demand for food and population increase will have to be based on greater attention to agricultural yields in the generation ahead than in the past. As in Africa (but not in Asia) there is still unused arable land to be exploited in Latin America. But the mere opening up of land will not suffice.

Increased agricultural yields require increased application of fertilizers, pesticides, and improved seeds. It has recently been estimated, for example, that Latin American expenditures on such items, which were about \$600 million in 1960, must rise to \$2.7 billion per annum in 1980 if minimum food requirements are to be met in the region. It is also roughly estimated that \$1.7 billion (of the \$2.7 billion annual expenditure in 1980) could be generated from Latin American resources. To generate this increase in Latin American production of agricultural inputs, an investment of perhaps \$3 billion will be required. The substantial Latin American import requirements for 1980 stem from the fact it lacks known phosphate and potash resources in sufficient quantity to meet this expanded demand.

Chemical

Chemical fertilizer production is, of course, not enough to bring about an increase in yields. It must be made available to farmers at reasonable prices in an environment that also includes fair and reliable prices for their products, relevant technical assistance, credit, and incentive goods. Nevertheless (along with pesticides and good seeds), chemical fertilizers are a critical input.

The accompanying map (Map #5) indicates the principal location of known sources of nitrogen, phosphates, potash, and sulfur in Latin America. The accompanying charts indicate present production; planned production; and resources for whose exploitation arrangements have not yet been made. The major known unexploited potentialities are the gas fields of Venezuela, Bolivia (Sucre area), and Chile (Tierra del Fuego).

C. Minerals

As Appendix IV indicates, the geological resources of South America have been incompletely explored (see Map #6). Specific proposals for training and technical assistance in geology and in mineral and water resource investigations are included in that Appendix.

The major unexplored area believed to contain major mineral resources is the Andes. As Appendix VII explains, the use of satellite photography could rapidly foreshorten the time required to assess its potentialities, while contributing also to hydrological and agricultural studies of South America's resources.

The Canadian Government on February 24, 1966, stated that TIROS pictures "may be of assistance to agencies in fields such as forestry, agriculture, and oceanography."

The proposal raises questions of South American acceptance of procedures which Communists would attempt to exploit as "spying". And there are U.S. security, technical, financing, and procedural problems to be worked out.

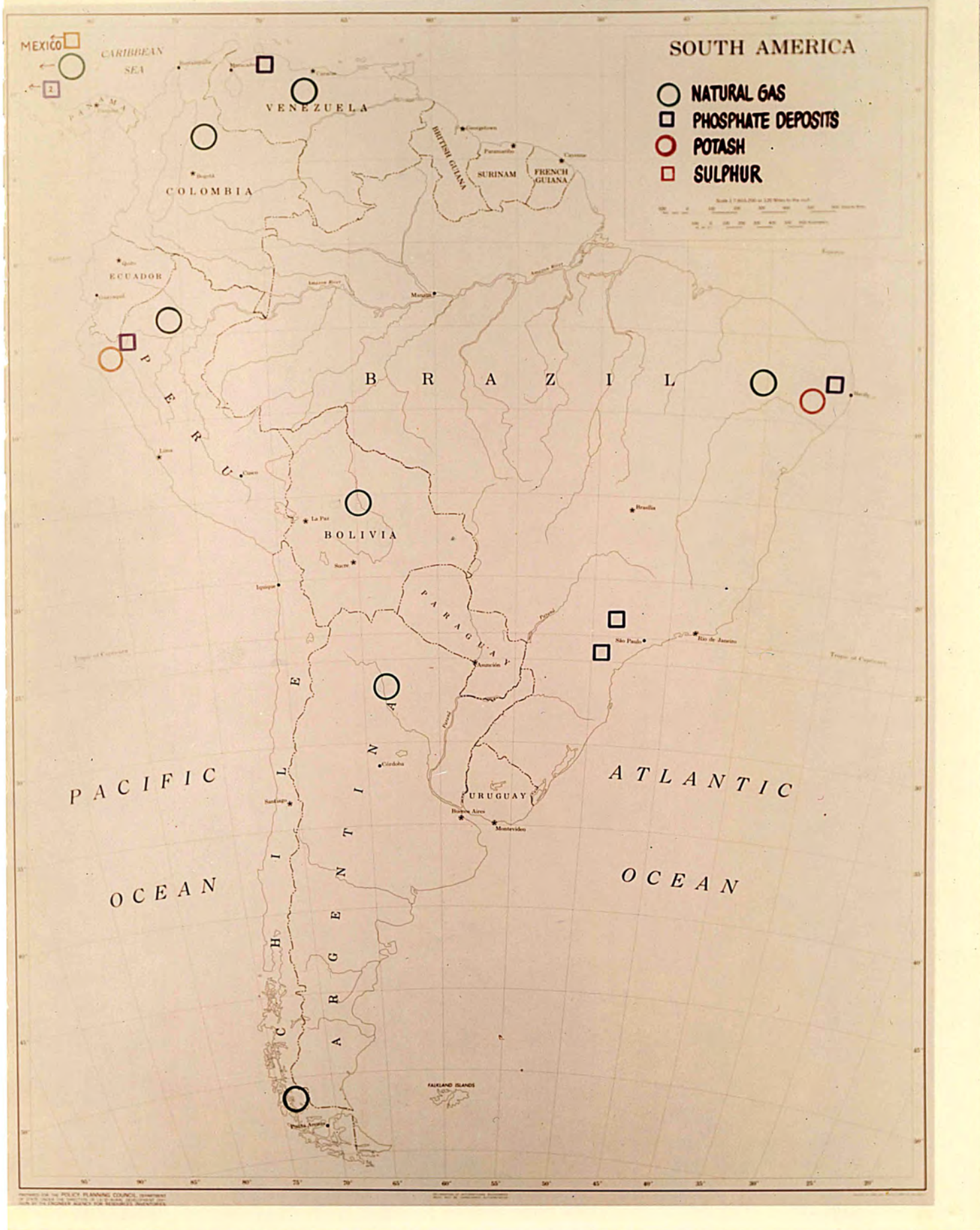
Interdepartmental

Interdepartmental procedures for exploring urgently the creative use of space technology in this context are recommended in Part IV of this report.

D. Financial Resources

The selective development of projects such as those outlined in the preceding pages would require expenditures of billions of dollars from private and public sources. Estimates of the magnitudes involved will require further investigation.

The financing would be for large, occasionally multinational and multipurpose projects of a long-term development nature. A large part of this financing would be for local currency costs. If external financing agencies were to attempt to limit their inputs to imported investment components and to discourage local cost financing this would impose a burden upon local governments beyond their capacities to generate local revenues. Nevertheless the projects must be considered in relation to country and regional capacities to absorb and maintain so that local contributions will have to be considered in the undertaking of these projects.



what does
the photo show—
beside the text?

To Sum Up -

**All present and all potential
cropland would add up to
under 10 Million Square Miles -**

**Translated into Acres
this would be about
6 Billion - or only about
One Acre per Person
at the population level
of the Year 2,000.**

PRESENT and POTENTIAL CROPLAND



Presumably Fertilizer - i.e.
NPK represents Nitrogen, Phosphates
Potassium - but the
chart does not so indicate



LATIN AMERICA
IN 1980

Versus

THE UNITED STATES
IN 1964

Area in square miles

Arable land in acres x 10⁶

Population in 1980

Ag. product value 1964

1964 NPK use (metric tons)

1980 NPK use (metric tons)

LATIN AMERICA

UNITED STATES

7,917,187

1,165

370,000,000

\$10 Billion

9 Million

3,548,974

457

245,000,000

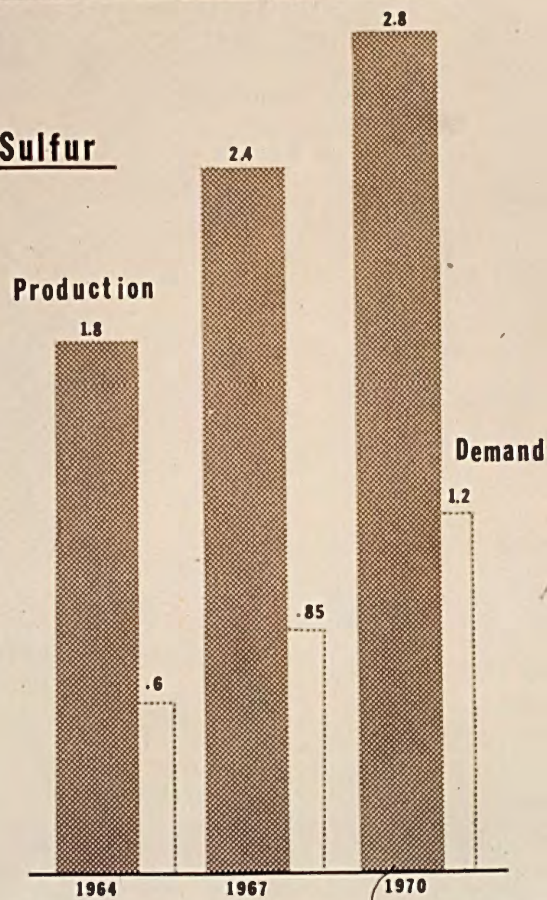
\$20 Billion

9.5 Million

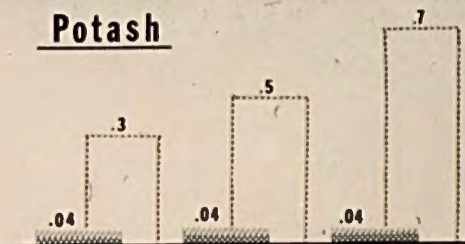
The relationship between Latin American production, local consumption, export, and need varies widely between each of the basic fertilizer ingredients

Tons
Units
Millions

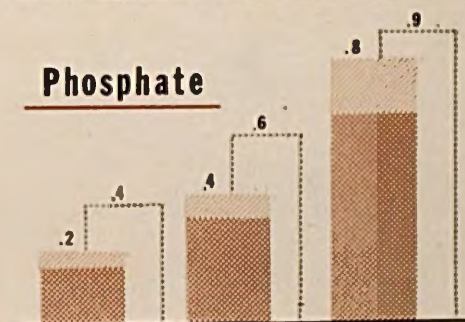
Sulfur



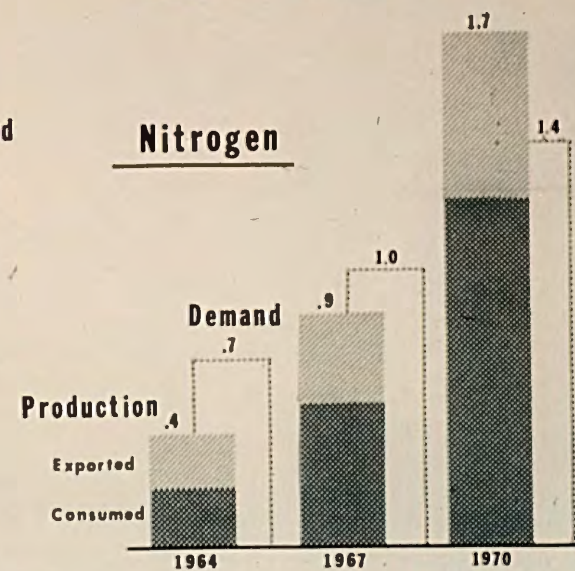
Potash



Phosphate

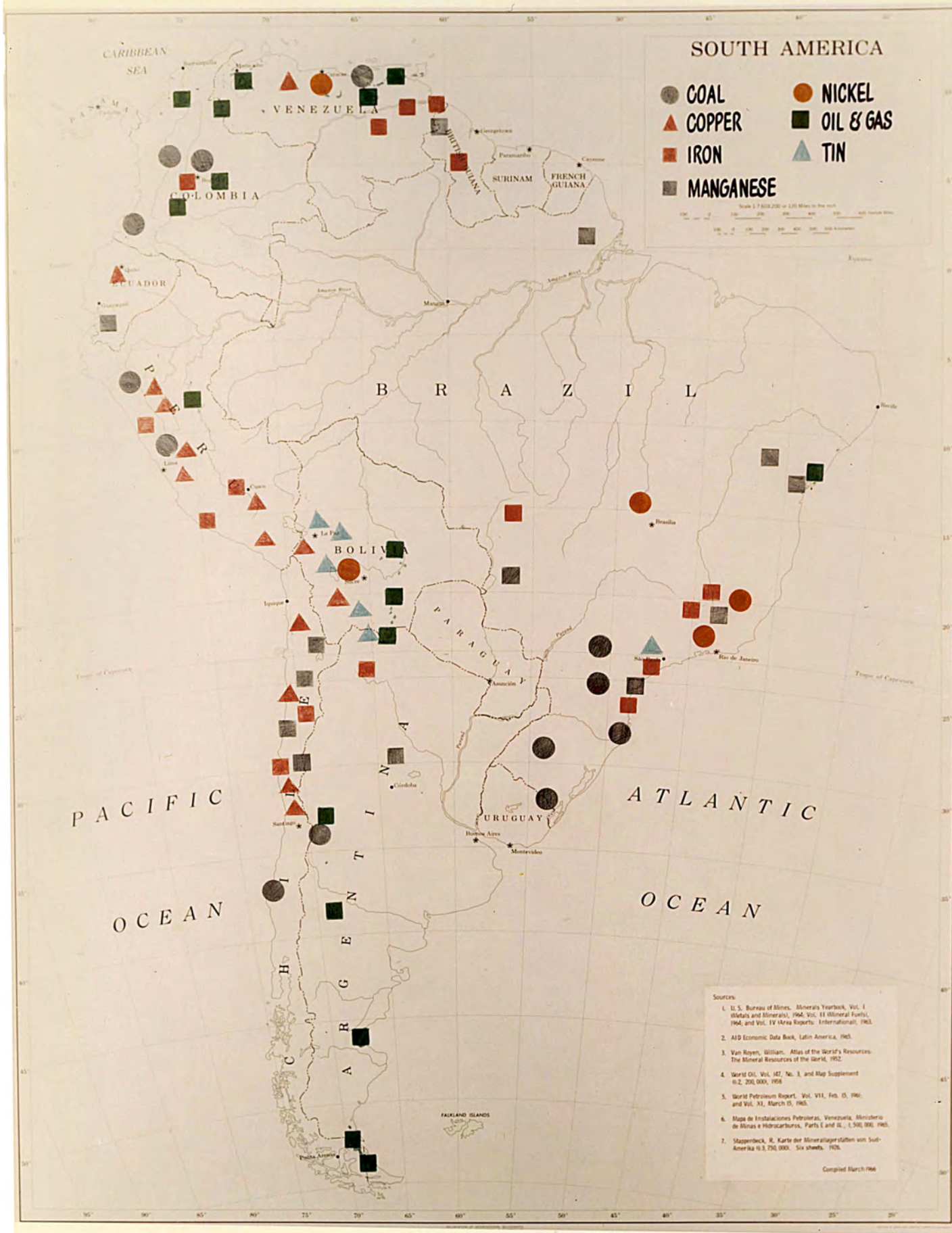


Nitrogen



Announced future expansion in South American fertilizer production emphasizes Nitrogen and Concentrated Phosphate products





↑ Santo Tomé de Guayana
in Venezuela is a real,
live project now.

↓ The Atrato-S.I.
project is by far
the shakiest of all
of these.

Part Three: Some Projects Under Way or Under Examination

Against this background, it is useful to examine the extent to which these potentialities are now being exploited or under serious examination. The accompanying maps set out the projects detailed in Appendix I (Map #7) as well as the broad direction of population movements towards the inner frontiers (Map #8). They indicate that work is going forward in South America on, broadly, rational lines; that is, it is precisely in these more promising regions that projects are being constructed, feasibility studies made, and research conducted.

Specifically, the problems of closing the Darien Gap are being systematically surveyed in the context of planning and negotiation for a new trans-isthmian canal.

-- The Hudson Institute has ~~conducted~~^{prepared} a preliminary study for the Colombia Government of the Atrato-San Juan waterway; and the UN is now awaiting a formal proposal from the Government of Colombia for financing a feasibility study.

-- Under the leadership of President Belaunde of Peru, work and systematic consultation have been organized among the governments of Colombia, Ecuador, Bolivia with respect to the Carretera Marginal de la Selva.

-- Extensive research and colonization efforts (planned and unplanned) are going forward with respect to the exploitation of the Campo Cerrado region of Brazil and Paraguay;

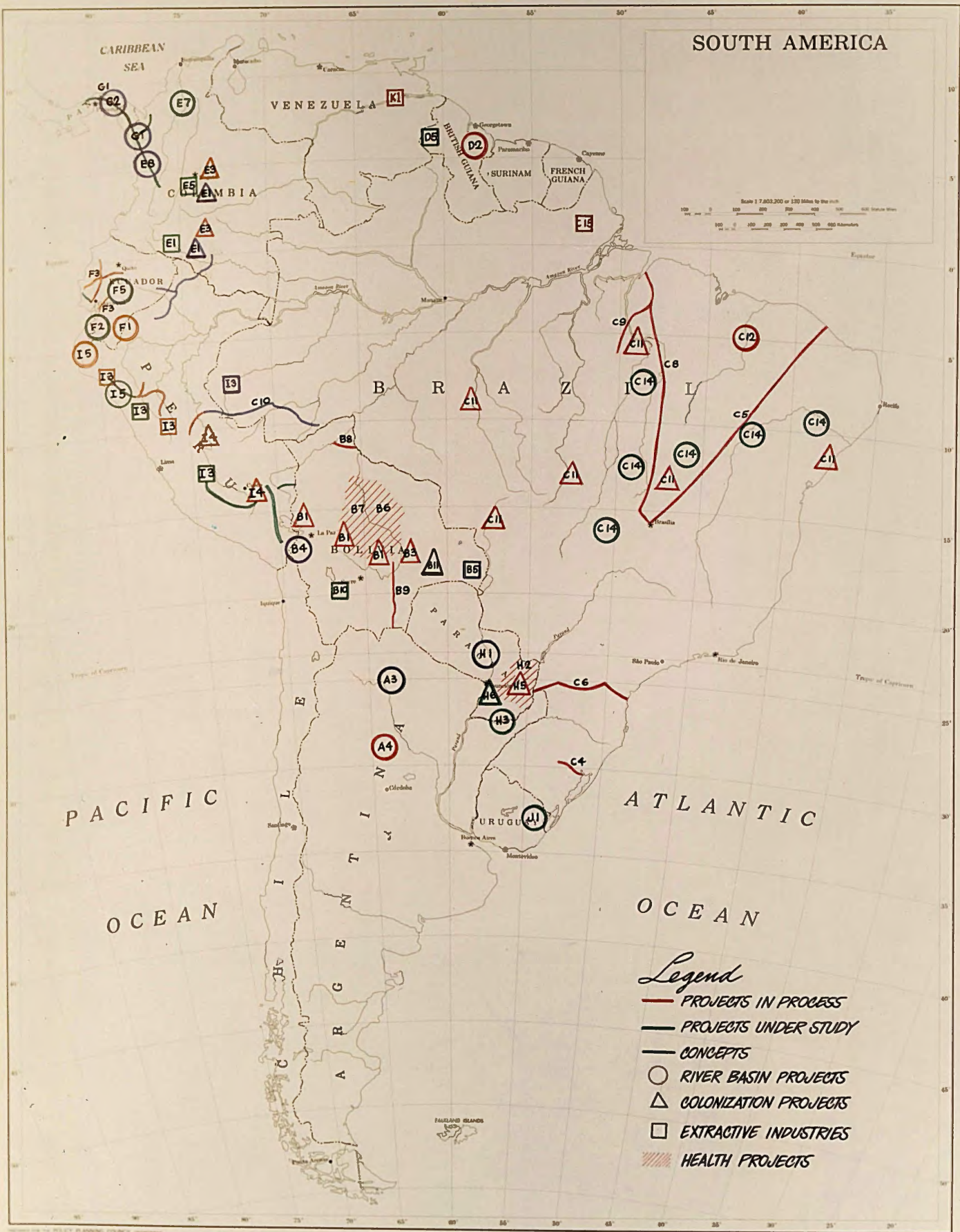
-- ~~and~~ the Guayana region is an active account in terms of study and exploration in British Guiana, ~~as well as~~ the creation of a new, vital industrial center in Venezuela ~~as well as~~

Map #7

1) roads are randomly
selected, e.g.,
how about roads
1, 4, 3, 7, + 9 in Bolivia?

2) why show the
Chocó location for the
road in the Darien Gap,
The Atrato location is
much more probably the
one to be chosen.

SOUTH AMERICA





Context for ^{Policy} Decisions

- 1) What is time horizon over which the policy decisions are to be made? 5 years, 10, 20, 30? This choice affects many of the answers.
- 2) Benefits analyses -
How to judge ^{subjective} social gains vs. pure monetary benefit/cost ratios or rates of return.
3. Problems of
 - a) U.S. share in costs of development, ^{by type of project}
 - b) financing problems ^{relative to local vs. imported funds}

~~Should US share in~~
What should be future
U.S. share in cost
of Darien Gap work.
Previous rate of 2/3
eng. costs is (too) high.

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-- and the Guayana region is an active account in terms of the creation of a new, vital industrial center in Venezuela as well as study and exploration in British Guiana.

Map #7

Legend Map

Map of South America
Probable Areas of Attraction

Part Four: Policy Issues

In contributing to the rational exploitation of the inner frontiers of South America, we are evidently faced with a question of how to accelerate most effectively an on-going process, already headed in, broadly, the right direction.

Specifically, we confront or shall confront in the immediate or mid-range future the following policy questions.

1. Should the Darien Gap link in the Pan American Highway be closed? The Highway issue must be related to decisions about Panamanian and North Colombian development; the timing, location and character of canal construction; and decisions about the Atrato-San Juan waterway scheme in Colombia. The Bayano hydroelectric power scheme in Panama (now under IBRD study) should also be related to the whole Darien development.

Suggested action: Each of the elements in the Darien Gap complex has thus far been treated separately. As the various feasibility studies near completion and the canal treaty negotiation proceeds, it is urgent that the Bureau of Inter-American Affairs initiate a systematic study of the relations among all the elements: Panamanian development (including the Bayano project); the new canal; the proposed Atrato-San Juan Waterway; and the Pan American Highway.

2. What are the optimum next steps in the development of the Carretera Marginal? This involves decisions both as to the appropriate scale of international support and the types of roads to be supported, notably the economic value of north-south links versus access and feeder roads.

Suggested action: The Bureau of Inter-American Affairs should retain a consultant to update as soon as possible our view of next steps in the development of the Carretera Marginal. The TAMS report needs review and refinement in

several

several directions, technical and economic. Consideration should be given to individual sections of the international road to determine whether there is a need for external financing and, if so, what are the most appropriate sources of such financing. Appendix III contains an illustrative list of some of the sections, the feasibility of which is being studied at this time.

3. Is the scale of present efforts (national and international) to explore, study, and colonize the Campo Cerrado about right? Most of this region falls in Brazil. The Country Team in Brazil should be consulted concerning the following three further ways of associating the U.S. with the opening up of the Campo Cerrado.

a. Integrating resource surveys of the more accessible areas. A soils map appears an urgent requirement. Given the apparent correlation between vegetation type and fertility, an aerial photo-mapping of vegetation combined with spot ground surveys should provide the most rapid method of developing such a map.

b. Field research to correlate soil deficiencies and amendments with soil type and to relate this with specific crops and pastures should be expanded. A corollary problem is to develop the most effective system for supplying this area with fertilizers; e.g., the extent and type of fertilizer raw materials in the area should be examined and the feasibility of local development relative to fertilizer imports from other regions of the country.

c. Possibilities of upgrading the livestock industry and the pastures on which it is based. Crop production should be developed on farms of sufficient size to permit advanced technology (including mechanization) in order that the products can be competitive in the Sao Paulo-Rio de Janeiro market, despite the higher freight charges due to the long transportation haul.

4. To what extent could specific multinational projects accelerate South American integration, including the settlement of outstanding bilateral quarrels between Peru and

Ecuador

Ecuador; Bolivia and Chile; Brazil and Paraguay; Argentina and Paraguay; Venezuela and British Guiana? In accordance with our agreement with Felipe Herrera, the Board of Governors at the recent Inter-American Development Bank annual meeting in Mexico City created a special fund to finance feasibility studies for multinational projects by making a transfer from the Fund for Special Operations to a newly created fund for such feasibility studies to be administered by the IDB. The U.S. will be prepared to supplement the feasibility study fund from AID resources in support of specific projects that might be agreed from time to time between IDB and AID.

Suggested action: In parallel with the acceleration of feasibility studies and planning for multinational projects, the Bureau of Inter-American Affairs should explore other ways of attacking the limited number of such opportunities. In the case of the Sete Quedas project between Brazil and Paraguay, for example, we should continue to encourage the IDB to take the lead. In other cases, the country team might be in the best position to develop such opportunities.

5. What are the costs and effective rate of return on capital invested (direct and indirect) in various colonization schemes? How do these costs compare with the countryside to the city? What are the lessons to be learned from the experience of successful and unsuccessful colonization efforts: planned; unplanned; semi-planned? AID is arranging for a special summer study project to consider this problem.

Suggested action: The Bureau of Inter-American Affairs should initiate a study, possibly in conjunction with interested multilateral institutions, which would lay out, in an orderly way, all the elements that ought to be systematically considered in a rational cost-benefit analysis of colonization in Latin America.

6. Does the proposal to use orbital and other remote-sensor systems for the measurement of land and geological formations make sense? Appendix VII exposes the potenti-

alities

alities and problems associated with the use of satellite photography for resource studies in South America. In this connection, it should be noted, that there have already been discussions with Mexican and Brazilian authorities looking to an experiment with sensors. The scheme is to use high-altitude aircraft to test sensors (infrared, ultraviolet and others) against known features on the ground. The Brazilians, it is understood, are pleased with the plans for this project; but opinion in Mexico is reportedly divided, with some concern for U-2 overtones.

The Bureau of Inter-American Affairs -- at the suggestion of the OAS -- is now studying several pilot proposals for the use of sensing devices by low-altitude aircraft. These efforts will, it is hoped, produce means to gather detailed data for direct application to development programming more rapidly and efficiently than the traditional methods now being employed.

Suggested action: An interagency committee should be promptly created to staff out this complex problem and report to the President as soon as possible. It would cover: (a) security problems, (b) spacecraft and launcher, (c) acceptable sensors, (d) methods for utilizing data collected, (e) funding, (f) a scenario for proposing this project for South American governments, which would include institutional arrangements for managing the project on a multinational basis. A very tentative scenario is as follows:

Bilateral discussions in Latin American capitals, possibly by a State/AID-NASA team, would probably be the most effective way to take initial soundings of Latin American reactions to the proposed program. If the reception were favorable, a formal proposal could then be made at a multinational conference, for example, a meeting of Foreign Ministers of the OAS. The first step in planning the details of the project might be the convening of a panel of experts from all the nations concerned. Through this panel, we could hope for agreement

on a

on a schedule for a satellite launching, priorities regarding types of information to collect, and methods of utilizing data collected through the program. Depending on political developments up to that stage, we could either move to establish a permanent inter-American organization to follow through with the program or rely on an essentially bilateral approach.

Further, the Bureau of Inter-American Affairs should accelerate its evaluation of low-altitude sensor systems and support the necessary pilot studies to speed development programming activities in agriculture, mining and rural planning.

7. How shall we support the CIAP effort -- and the President's August commitment -- to bring about a regional effort in the field of chemical fertilizer production, trade and distribution?

Suggested action:

- (a) Providing a fertilizer consultant to CIAP.
- (b) Providing TVA experts to help CIAP conduct pre-feasibility investigations of investment possibilities.
- (c) Expanding the U.S. Geological Survey raw materials study which now only covers the state of knowledge on mineral deposits principally of phosphates, potash, and sulphur.
- (d) Expressing its willingness to join in consortium financing of multi-country fertilizer projects where feasible.
- (e) Supporting and encouraging industry to explore and make appropriate investments in fertilizer production and marketing in Latin America, via direct contacts with the David Rockefeller group and the IBRD chemical fertilizer effort being mounted by George Woods.

8. Should

8. Should CIAP set up a permanent working group on the development of the inner frontiers of South America, within the Inter-Agency Advisory Group?

Suggested action: The U.S. member of CIAP should discuss with his colleagues the possibility of setting up an inter-agency advisory group on the development of the frontiers of South America.

9. Should CIAP envisage publishing a popular report on the state of projects and potentialities later in 1966, after the report of the Development and Resources Corporation is made?

Suggested action: After the report of the Development and Resources Corporation (headed by David Lilienthal) is made this summer, we should consider the advisability of asking CIAP to publish its recommendations or some other document which would dramatize the relation between multinational projects and the larger objectives of Latin American social and economic development and integration.

10. Where shall continuing responsibility for monitoring this field be centered in the U.S. Government; and what regular interdepartmental arrangements should be made?

Suggested action: The responsibility for pressing forward and monitoring the work on the frontiers of South America should be assigned to the Assistant Secretary for Inter-American Affairs.

11. Should the U.S. take a more flexible position on local currency financing of development projects?

Suggested action: Even though most Latin American nations are making serious efforts to increase the quantity of local private and public savings, they are frequently unable to meet their national investment requirements. Efforts to open frontier areas, develop new and enlarged institutions (land banks, agricultural credit systems,

rural

rural infrastructure projects, etc.) and to participate in multinational projects will further strain their financial resources. These types of projects require large magnitudes of local currencies.

Because of the U.S. balance of payments situation, AID has been under increasing pressure to interpret conservatively its policy toward financing local currency needs of development projects. In order for the U.S. to have a dynamic role in contributing to this new emphasis in development, both directly with the Latin American Governments and in consortium with the international lending agencies, the Bureau of Inter-American Affairs should seek the agreement of the AID Director and the Secretary of the Treasury to a policy of financing local costs of certain infrastructure projects as part of an over-all program for opening frontier areas.

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THE FRONTIERS OF SOUTH AMERICA

Appendix VI

Deployment of Armed Forces on
South America's "Inner Frontier"

DECLASSIFIED
E.O. 12356, Sec. 3.4
NEJ 93-347
By inf, NARA, Date 3-3-94

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ARMED FORCES DEPLOYMENT ON
SOUTH AMERICA'S "INNER FRONTIER"

The South American countries with borders on the "inner frontier" of the continent are Brazil, Venezuela, Colombia, Ecuador, Peru, Bolivia and Paraguay. Of these countries only Peru, Bolivia and Paraguay have any significant orientation to the interior. Peru has hopes of finding population outlets on the eastern slopes of the Andes and has an Amazon outpost at Iquitos. Bolivia and Paraguay are landlocked countries which seem to have an impulse toward developing on all frontiers, rather than on the standard Latin American pattern of orientation toward urban coastal development.

Brazil. Military deployment along the inner frontier of Brazil is small, yet it exceeds the proportion of civilian interest in the area. Army, Navy and Air Force detachments in this area are responsible for a variety of missions, including internal security, control of smuggling and supplementing limited transportation facilities. It was in recognition of the developmental role of Air Force transport in the Amazon that the U.S. supplied five C-130 aircraft to this service under the Alliance for Progress. (See attached memo on Brazil).

Venezuela. The National Guard (Armed Forces of Cooperation) has a few small units in the frontier areas of the interior, including the southern llanos area and the Guayana highlands regions away from population centers (see attached memo on Venezuela).

Colombia. Evidently the armed forces do not have units of any significance along the interior frontier except a few gunboats on the Putumayo River, bordering Peru.

Ecuador. The Ecuadoran armed forces have a jungle "division" in Pastaza, at the headwaters of the Amazon. This is an unpopulated area and evidently the location of an Army unit here has no economic significance.

Peru.

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Peru. The Peruvian armed forces have put more units and engaged in more development-oriented activity along the inner frontier than the other South American military establishments. The Army is especially involved in these operations. The headquarters of its jungle division are at Iquitos, and units are posted about in small population centers of the area. An Army Recruit Training Center, one of five in Peru, annually trains several thousand conscripts drawn from the surrounding area. The Army conscript training includes literacy and vocational training as well as the customary basic military training. The Army is also active through its engineering units in building or maintaining about 350 miles of road in the eastern foothills of the Andes. It has recently undertaken in extension of its road-building activities a colonization effort in the remote east and north central areas leading from the mountains into the Amazon jungle region. The Air Force and the Navy provide transportation to remote areas in the montana and selva regions, medical facilities and mapping services.

Bolivia. The Bolivian equivalent of a Navy, the River and Lake Force, has most of its personnel in the Beni-Pando area, a total of about 1,000, plus a navigation school, headquartered at Riberalta. The Army also has an engineer battalion stationed at Riberalta, and the Air Force has an installation there.

In Santa Cruz the Air Force maintains an aviation school. The Army has units located in the City of Santa Cruz and at Robore toward the Brazilian and Paraguayan borders.

Paraguay. The Ministry of Defense has responsibility for road building and maintenance in the northern half of the country, including the vast Chaco area. In this largely frontier area the Army is generally in

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charge of administration and also has the bases and other facilities that make it the logical vehicle for a road-building program. More than half of the 450 km. road built from Asuncion into the Chaco during 1955-61 was built by the Army, while the remainder was built by a U.S. construction firm. The U.S. Military Mission and AID have provided equipment and training to the Paraguayan Army for continuing operations in road construction. The Air Force also provides some access to interior areas where roads are poor or lacking.

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ATTACHMENT #1

MILITARY DEPLOYMENT ON BRAZIL'S INTERIOR BORDER

Deployment of the Brazilian armed forces is determined largely by the distribution of the general population -- heavily concentrated in the littoral -- and by a view of the hemisphere that regards Argentina as the most likely adversary. Thus, one-third of the Army's ground forces are assigned to the Third Army and located in the southernmost state, Rio Grande do Sul. The First, Second, and Fourth armies are located, respectively, in Rio de Janeiro, Sao Paulo and Recife, all coastal cities. Thus, very little is left for the interior border.

The Army's VIII Military Region and the Air Force's 1st Army Zone are responsible for the borders with French Guiana, Surinam, British Guiana, Venezuela, Colombia, Peru and about half of Bolivia. The Fourth and Fifth Military Regions are responsible for the remainder of the Bolivian border and most of the Paraguayan border.

The principal function of the southern commands is to control smuggling. To carry out this function, as well as normal internal security functions, the 2,500-man Fourth Cavalry Division is maintained at Campo Grande, Mato Grosso. Supplementing the Army in this task is the Navy's tiny River Force at Ladario, Mato Grosso, consisting of three boats.

The 2nd Air Group operating from 1st Air Zone headquarters at Belem, Para, operates 11 amphibious PBY aircraft along the length of the Amazon River. The military mission of this group is minimal. The PBY's principal mission is to reinforce the inadequate transportation infrastructure of the Amazon basin. Thus, mail, medical supplies and official travellers often constitute the cargo of these planes. It was in recognition of this

developmental

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developmental role that the U.S. last year gave five C-130 aircraft to the Brazilian Air Force as part of the Alliance for Progress rather than as military aid.

Military deployment along the inner border is obviously small, yet it exceeds the proportion of civilian interest in the area. The agricultural frontier lies far to the east. North of the twentieth parallel, farming is still confined to the eastern third of the nation. Also, the real frontier is moving eastward, not westward. While the western states show some population growth year by year, a much greater wave of internal migration is taking place away from the rural hinterlands toward the coastal cities.

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Attachment #2

DEPLOYMENT OF ARMED FORCES IN DEVELOPING FRONTIER
AREAS OF VENEZUELA

Definition of area. The developing frontier areas of the Venezuelan interior are the grasslands, or llanos, and the Guayana highlands. The llanos region consists of seven states (Apure, Barinas, Portuguesa, Cojedes, Guarico, Anzoategui, and Monagas) enclosed by the Andes and coastal mountains to the northwest and north, by the Orinoco delta to the east, and by the Orinoco river to the south. The area contains about 1/3 of the territory of Venezuela. It is a flat, grassy plains region suitable for grazing. The Guayana highlands is the area south of the Orinoco river -- the state of Bolivar and the Amazon territory, which together make up about 1/2 of Venezuela's territory. This area is a complex of plains, hills, and mountains, most of which are densely forested.

Deployment of military units - general. The National Guard (Armed Forces of Cooperation) has among its numerous missions the safeguarding of boundaries, the coastline, and natural resources; consequently it is the principal military force in the frontier areas of the interior. The Army is deployed principally in the populous coastal and Andes areas. There are some units in the frontier areas, but they are generally located in the principal population centers. The Army does not appear to have established small posts outside of the cities where units are headquartered; whereas the National Guard units are broken down into smaller units which staff small outposts in the outlying areas. There is very little information as to the location of these National Guard outposts, but in all cases where information is given below concerning units located in an interior city, it may be assumed that the personnel are deployed in small towns and villages in the general area of the unit's headquarters.

Order of battle -- llanos.

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Order of Battle -- llanos. The state of Guarico is the heartland of the llanos. It is the most highly developed agricultural state in the region partly as a result of its proximity to Caracas (the state's northern boundary and capital city -- San Juan de los Moros -- are only about 50 miles south of Caracas). There is an Army division in San Juan consisting of one horse cavalry battalion (450 men and about 300 horses) and one ranger battalion (350 men). There are also two National Guard companies headquartered in San Juan (about 220 men), who probably staff small posts in the states of Portuguesa and Cojedes as well as Guarico. In the City of Barinas, Barinas state, there is a National Guard company of about 100 men; and in the state of Apure, there are two Guard companies at San Fernando de Apure, the capital, and another at Guas-dualito (total about 350 men). Apure lies along the northern side of the notch that forms the southwestern border with Colombia and is the most undeveloped frontier of the llanos. The two llanos states to the east of Guarico - Anzoategui and Monagas - are usually thought of as different from the rest of the llanos because of the substantial amount of oil production developed in those states. Nevertheless, they are geographically part of llanos. In Anzoategui, most of the military units are located along the non-llano coast; but there is a National Guard company in San Tome (about 125 men). In Monagas, there are Guard companies at Caripito, Punta de Mata, and Guiria (total about 450 men). There is also an Army infantry battalion of about 540 men at Maturin. Caripito and Maturin are centers of a highly developed petroleum production area and cannot therefore really be considered to be part of a developing frontier area. The National Guard units in this area are probably mainly involved in guarding the production and pipeline installations.

Order of battle - Guayana highlands. Together with the llanos state of Apure, the Guayana highlands state of Bolivar and the Amazon territory comprise the most

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clearly frontier areas of the interior. In mineral rich Bolivar state, there National Guard companies (total about 500 men) located at Puerto Ordaz, Ciudad Bolivar, and El Dorado (probably at the penal colony). There is also an Army division consisting of an infantry battalion (350 men) located in Ciudad Bolivar. In the Amazon territory, there is only a National Guard company of about 150 men at Puerto Ayacucho.

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APPENDIX VII

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THE FRONTIERS OF SOUTH AMERICA

Appendix VII

The Use of Satellites for Resource
Studies in South America

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THE USE OF SATELLITES FOR RESOURCE STUDIES IN
SOUTH AMERICA

1. The Need for Resource Studies. The task of rationally developing natural resources, particularly in the Andes, requires a more thorough knowledge of the geology and geography of that area than now exists. The exploration of such rugged terrain by traditional methods is an inherently slow-moving project. The prospect is for many more years of effort before the real potential of the interior can be adequately assessed.

2. What Satellites Can Do. The use of satellites could speed up this process and permit regional development planning to go forward more intelligently and systematically. In a matter of days, satellites could photograph enormous areas of the interior, thus producing information for studies of the geology, hydrology, and agricultural potential of the region. With more complicated sensing devices, satellites could collect additional data relevant to sub-surface mineral exploration, and to hydrological and agricultural studies. NASA, the Department of Agriculture, the U.S. Geological Survey, and the Corps of Engineers are all interested in this method of data collection and can supply detailed information about techniques. It would be important politically for such a program to be completely unclassified, along the lines of the TIROS or Lunar Orbiter programs, and this appears to be possible. The operational part of this program could probably get under way no later than 1967.

3. Advantages and Disadvantages. A major political problem may be the attitude of South American and other countries toward a method of exploration which the Communists will probably label "spying." If the agitation made significant headway, the whole project might be damaging to over-all U.S. interests. This bespeaks careful handling of the proposal, to the end that the South American governments not only give their consent but also actively cooperate

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in this effort. Against this potential disadvantage are the following advantages:

- (a) The project is demonstrably useful economically.
- (b) It would highlight U.S. interests in using space technology for the benefit of other nations.
- (c) It would reaffirm our belief in the Alliance for Progress.
- (d) It could demonstrate our interest in furthering the advance of the developing countries generally.
- (e) It would be a plus for the U.S. side of the "space race" providing a wholesome counterbalance to Soviet (and U.S.) exploration of the moon and planets.
- (f) It would inaugurate the systematic use of a technology which is increasingly being discussed in the open literature. (N.B.: Canadian Government statement of February 24, 1966 that it expects TIROS pictures "may be of assistance to agencies in fields such as forestry, agriculture, and oceanography.")

4. Getting the Program Started. The first step should be the establishment of an inter-agency committee to devise a specific proposal. State/AID, Defense, Interior, Agriculture and NASA should be represented on the committee. A report for the President should be possible by June 30, 1966, which would cover: (a) security problems, (b) spacecraft and launcher, (c) acceptable sensors, (d) methods for utilizing data collected, (e) funding, (f) a scenario for proposing this project to South American governments, which would include institutional arrangements for managing the project on a multi-national basis. A very tentative scenario is as follows:

Bilateral discussions in Latin American capitals, possibly by a State/AID-NASA team, would probably be the most effective way to take initial soundings of Latin American reactions to the proposed program. If the reception were favorable, a formal proposal could then be made at a multi-national conference, for example, a meeting of

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Foreign Ministers of the OAS. The first step in planning the details of the project might be the convening of a panel of experts from all the nations concerned. Through this panel, we could hope for agreement on a schedule for a satellite launching, priorities regarding types of information to collect, and methods of utilizing data collected through the program. Depending on political developments up to that stage, we could either move to establish a permanent inter-American organization to follow through with the program or rely on an essentially bilateral approach.

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