PLAINTIFF'S EXHIBIT

MET-331

LIFE COMPANY INVESTING AND SAVING IN HAWAII ; SOME RELATED ECONOMIC MEASURES

During 1959, Life insurance company investing in Hawaii was larger than ever before. The net flow of funds into the Hawaiian economy amounted to some $35 mn. for the 49 U.S. Life companies reporting to the LIAA -- raising their total assets in that State to $172 mn. (chart below). Incidentally, those companies account for the bulk of Life company investments in the Islands; domestic Hawaiian companies and alien companies have relatively few holdings. In fact, the combined investments of all types of insurance companies, including Life as well as non-Life, amount to only a little more than $200 mn.

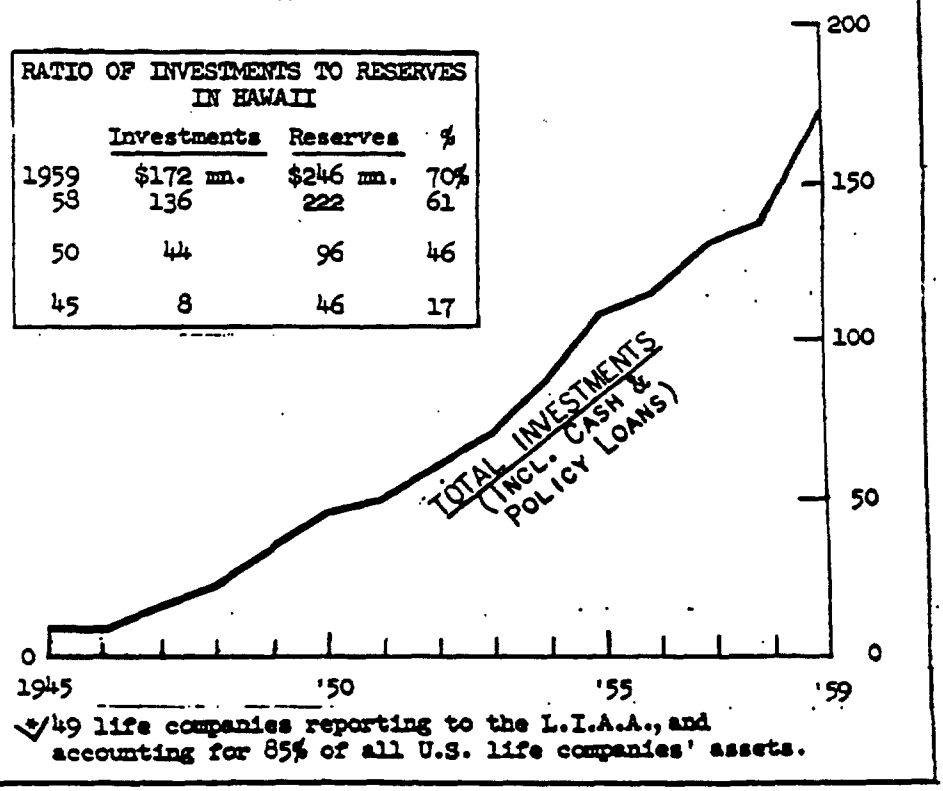
TRENDS IN

U. S. LIFE COMPANIES' */ INVESTMENTS IN HAWAII

($ MILLIONS AT YEAR END)

RATIO OF INVESTMENTS TO RESERVES IN HAWAII

	Investments	Reserves	%
1959	$172 mn.	$246 mn.	70%
58	136	222	61
50	44	96	46
45	8	46	17



*/ 49 life companies reporting to the L.I.A.A., and accounting for 85% of all U.S. life companies' assets.

RESEARCH MEMORANDUM
JUNE 1, 1960

METROPOLITAN LIFE INSURANCE CO.
BUSINESS RESEARCH BUREAU

Reflecting the expansion of investment opportunities in Hawaii, the post-War growth rate of U.S. Life companies' assets there has been much faster than gains in reserves. During the 1950's, investments quadrupled while reserves grew 2 1/2-fold. Consequently, the ratio of investments to reserves now stands at 70%, compared with barely 60% in '58 and hardly 45% in '50; in '45 that proportion was only 17%.

Metropolitan has about $1/2 mn. of assets in Hawaii. Our reserves total some $3 mn.

MAIN TYPES OF LIFE COMPANY INVESTMENTS IN HAWAII

For the combined U.S. companies, the major investment outlets are mortgages, and industrial and utility securities. Mortgage loans run largest; holdings of those at last year end amounted to fully $55 mn., while the other two asset classes stood close to $45 mn. apiece; (see chart on following page).

During '59, industrials took the largest jump, when relatively heavy acquisitions of Hawaiian company securities were made. Up until that time, purchases were mostly issues of U.S. corporations with plants in Hawaii. The change in '59 included relatively large investing in American Factors Limited, and smaller amounts in the Sheraton Hawaii Corp., Aloha Airlines, and others.

During the post-War period, the growth of industrial portfolios has been somewhat sporadic. That contrasts sharply with steady gains in utilities -- reflecting the gradual expansion in electric power and telephone facilities on the Islands. Mortgage loans, too, have been gaining steadily as a result of increased building activity in Hawaii. However, their sharp up-trend far outpaces both utilities and industrials. All mortgages owned by Life companies have been acquired since '50.

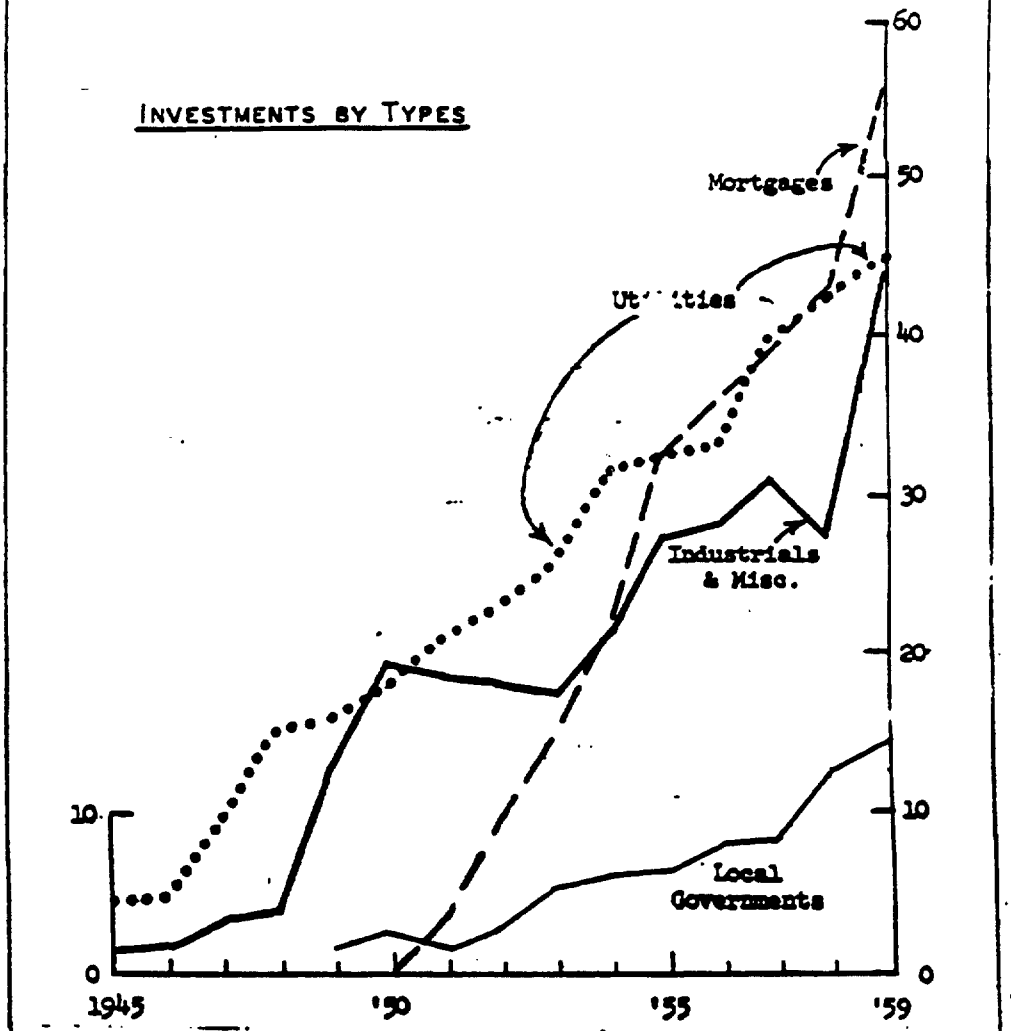
In addition to those major asset classes noted above, Life companies have been adding steadily to their local Government bonds, which now total about $14 mn. Policy loans amount to nearly $11 1/2 mn. and cash about $1 mn.

Metropolitan's assets in Hawaii are mostly industrial securities. But we also, of course, have some policy loans.

TRENDS IN

U. S. LIFE COMPANIES' [1] INVESTMENTS IN HAWAII

($ MILLIONS AT YEAR END)



[1] 49 life companies reporting to the L.I.A.A., and accounting for 85% of all U.S. life companies' assets.

SOME OTHER SIGNIFICANT SOURCES OF CAPITAL IN HAWAII

Commercial banks are the largest financial institutions in the Islands. Total deposits of Hawaiian banks now run nearly $700 mn.; about nine-tenths of those are held by the two largest banks, Bishop National and The Bank of Hawaii.

As a possible source of longer-term credit, commercial banks' time deposits have been increasing steadily (table below). They now amount to $260 mn., compared with only $180 mn. in '55. Like Life insurance companies, the banks have also stepped up their acquisitions of mortgages to help meet the heavy demand for that type of financing. The ratio of those to time deposits now runs about two-thirds, contrasted with less than one-half in '50.

Following Life companies, which are the second largest institutional source of funds, Hawaiian Savings and Loan Assns. rank third with about $110 mn. of assets at last year end. Like Savings and Loan Assns. in the rest of the U.S., those in Hawaii have also enjoyed rapid expansion during the past decade; their assets have gained nearly four-fold since '50. Nearly nine-tenths of those are, of course, invested in mortgages.

(There are no mutual savings banks in Hawaii.)

SAVING AND INVESTING THROUGH:
($ Millions, year end)

	A. Hawaiian Commercial Banks			B. Hawaiian Savings & Loan Assns.		
	Time Deposits	Mortgages	%	Assets	Mortgages	%
1959 Est.	$260	$175	67 %	$110	$95	86 %
58	252	157	62	99	87	88
57	216	127	59	93	82	88
56	189	121	64	83	73	88
55	182	114	63	(Not avail.)		
50	192	87	45	29	25	86

TRENDS IN CONSTRUCTION ACTIVITY

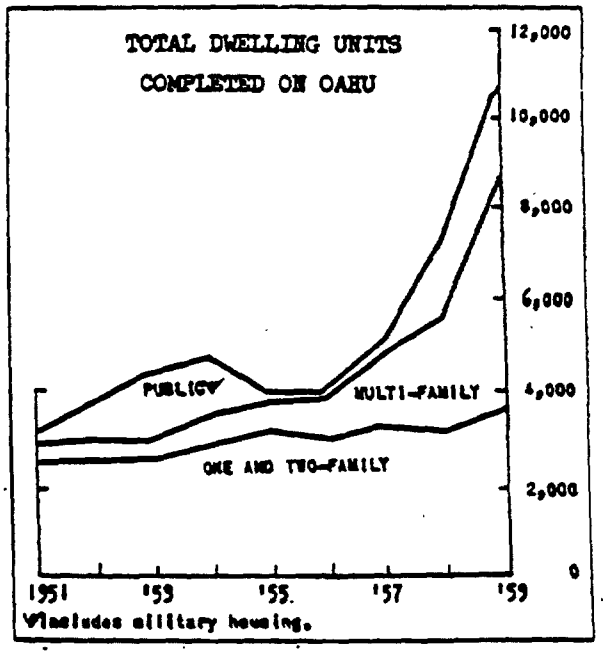
During the past few years, construction activity in Hawaii has been increasing in leaps and bounds. Last year alone expenditures hit $215 mn., or double the level only three years ago and treble '50 (table). Fully nine-tenths of that building took place on the island of Oahu.

CONSTRUCTION EXPENDITURES
($ Millions)

	Oahu	Total Hawaii
1959 Est.	$200.0	$215.0
58	161.3	174.4
57	122.6	133.6
56	101.9	110.5
55	85.9	94.2
1950	60.2	67.8

Naturally, rising building costs have figured importantly in expanding construction expenditures. However, the basic reasons hinge upon gains in population, rising family income, and building required by the growth of tourism, transportation, manufacturing, defense, schools, public utilities, and retailing.

Residential construction in Hawaii accounts for about half of total expenditures -- about the same proportion as in the entire U.S. Last year, dwelling units completed on Oahu numbered over 10,000, or somewhat more for all of Hawaii (chart at right). By far the greatest number is privately financed.



During the 1950's construction of one- and two-family houses has grown steadily, but only modestly. The strongest expansion occurs in private multi-family houses. Last year more units were provided in those than in one- and two-family houses for the first time in history. Waikiki, which is one of the most rapidly developing areas on Oahu, is currently most active in apartment house building.

Government nonresidential construction accounts for about one-third of all expenditures; and commercial, industrial, etc. makes up the remainder (about one-sixth). Much of the problem in stimulating industrial construction concerns the scarcity of building sites. State and municipal governments have sizable land holdings, and private ownership tends to be concentrated among relatively few individuals. Where land is available for sale, the cost is extremely high. Usual practice is to lease sites over long periods, but such practice has not been attractive to manufacturing companies.

The high level of total construction expenditures last year shows no signs of abating this year. In fact the first four months of '60 run well ahead of the same time a year ago. Some of the larger construction projects in their early stages are handily listed below.

SOME SIGNIFICANT CONSTRUCTION PROJECTS IN HAWAII
PLANNED OR UNDER WAY AT START OF 1960
($1 Mn. and over)

	Units	Cost
Single Family Homes:		
Waialae Nui Ridge	161	$4,600,000
Apartment Buildings:		
Seaside Towers (Co-op)	126	2,500,000
Hawaiian Trade Winds, Inc. (Co-op)	104	1,500,000
Atkinson Drive Apts.	112	1,340,000
Hotels:		
Waikiki Apartment-hotel	461	8,000,000
New Sheraton Hotel	400	5,000,000
Hawaiian Village addition	439	5,000,000
Pohainani	200	3,000,000
Prince of Peace	247	2,500,000
Reef Tower addition	200	1,000,000
Skylark	200	1,000,000
Other:		
Honolulu International Airport		6,400,000
Bishop Bank		3,000,000
Church College Dormitories		2,000,000
Kalihi Channel Bridge		1,300,000
Sea Life Oceanarium		1,250,000
Waikiki International Terminal		1,150,000
Kamehameha School		1,100,000

GROSS OUTPUT OF GOODS AND SERVICES

Although new construction represents an important investment outlet in Hawaii for Life companies and other institutional investors, building accounts for only about 15% of Gross Output of goods and services in the State. Moreover, for broader perspective this fact is significant: Hawaii's economy has been growing at a fast pace -- even faster than the rest of the U.S. -- but it still represents less than one-third of 1% of our National economy (upper table).

GROSS OUTPUT✓ OF GOODS AND SERVICES

($ Billions)

	Hawaii	Total U.S. (excl. Hawaii)	%
1959	$1.55 Est.	$479.5	0.32%
1958	1.40	441.7	0.32
1956	1.25	419.2	0.30
1952	1.05	347.0	0.30

✓(Department of Commerce Gross National Product concept).

AGRICULTURAL PRODUCTION

In Hawaii's economy, agriculture is still a basic industry even though it is declining in relative importance. Sugar and pineapple make up most of agricultural output, which amounted in '59 to about $320 mn., or 20% of Hawaii's Gross Product. Sugar production recovered again last year, following the labor strike in the first half of '58. However, its current level is only about the same as four or five years ago; that is also true of pineapples (table below).

Virtually no opportunity now exists for Life company investment in agricultural production. Five domestic companies in the industry control almost

AGRICULTURAL PRODUCTION IN HAWAII

($ Millions, during year)

	Total	Sugar Products	Pineapple Products	Other
1959 Est.	$320	$145	$120	$55
58	279✓	107✓	124	48
57	298	146	110	42
56	305	148	117	40
55	295	146	110	40
1950	249	124	97	28

✓ Decline largely because of labor strike in sugar industry for four months ending June 6, 1958.

every phase of activity, from planting to final sales, through ownership of plantations, processing plants, and transportation corporations. The total long-term debt for the five controlling companies amounts to under $20 mn., most of which is in the form of term loans from banks. None of the subsidiaries of those companies has any long-term debt outstanding.

IMPORTANCE OF MANUFACTURING IN HAWAII

The dollar volume of Hawaiian manufacturing and processing (excluding agricultural output) totaled only $115 mn. in '59, or about 7 1/2% of Gross Product. Last year's manufactures showed a modest improvement over '58 -- compared with virtually no prior change from year to year since '55 (table). More than 250 establishments are involved in this production -- a number of which are mainland firms, such as Swift, Simmons, Serta, American Can, Flintkote, Zee, Meadow Gold and Foremost. The industries having the largest number of firms are printing, publishing and clothing.

MANUFACTURING & PROCESSING IN HAWAII
(excluding agriculture)
$ Millions

1959	$115 Est.
58	104
57	103
56	105
55	103
54	93
50	65

Practically all firms which are domestic or Island-based (as opposed to mainland) are very small; and those that are incorporated have little if any long-term debt outstanding. Thus Life company investment opportunities tend to be limited largely to mainland firms doing business in Hawaii.

Development of manufacturing in Hawaii hinges largely on the following factors: (1) availability of mineral resources, (2) sources of fuel for energy, (3) cost of ocean transportation, (4) availability of industrial sites, already noted above in the section on Construction.

Hawaii is relatively poor in known mineral resources; but rather large deposits of bauxite were discovered as recently as the 1950's. Consideration is being given to the development of those deposits by processing into aluminum for export. Titanium, pumice and clay have also been recently found.

Manufacturing in Hawaii also tends to be curbed because of the high cost of transporting oil and coal to the island for fuel requirements. The

development of an atomic energy plant, which is currently under consideration, may help alleviate the problem of fuel supply for power sometime in the future.

The high cost of ocean transport makes it difficult for Hawaiian manufacturers to compete in the mass markets on the mainland. With markets limited mainly to Hawaii, advantages of mass production cannot, of course, be fully realized. As a result, it is often cheaper to bring finished goods in from the mainland. The future possibility of sufficiently fast and cheap ocean or air transport would naturally be helpful to changing this situation. However, an early solution does not seem likely.

PUBLIC UTILITIES

Electric power output continues to expand at about 10% a year, as it has ever since '50. A significant part of that expansion has been financed through long-term debt, thus providing an important outlet for Life company investing. Central generating plants rely mainly on oil for fuel; however, the use of atomic energy is being explored to help provide for future needs. The bulk of electric power is produced by public utility companies (mainly Hawaiian Electric; table), but some defense installations and plantations have their own generating systems.

MEASURES OF OUTPUT FOR:

	Hawaiian Electric Co.✓ millions of KWH per year	Hawaiian Telephone Co.✓ # of telephones in service
1959 Est.	1,200	187,000
55	820	143,000
1950	522	99,310

✓ See also text reference.

Telephones in service have also been growing steadily but at a somewhat slower annual rate than electric power. Hawaii's telephone system is operated by a single locally owned company (Hawaiian Telephone). Direct cable service connects it with the U.S. mainland and foreign countries.

SOME SIGNIFICANT ECONOMIC FACTORS CONCERNING LIFE COMPANY INVESTMENT OPPORTUNITIES IN (1) ALASKA AND (2) HAWAII

Although Alaska and Hawaii have or will soon attain Statehood, the flow of life company funds into those areas, as for other states, continues to be directed basically by the economic forces of supply and demand for capital. Investment opportunities and potentials may suddenly seem to brighten as the two new states shed their "territorial" status. However, even as territories, Alaska and Hawaii were included as part of the United States.

That has long been true under N.Y. State investment law, which naturally applies to the one-third of all U.S. life companies' assets domiciled in N.Y. State. Moreover, that proportion expands to about four-fifths if one adds in also those companies domiciled in other states but doing business in N.Y.; those, too, must of course conform substantially to N.Y. law.

At the start of 1959, U.S. life companies*/ had invested about $50 mn. in Alaska and some $135 mn. in Hawaii (chart). In both areas, virtually all of those investments have been made since the War, and the bulk of them since 1950. The expansion has been far steadier in Hawaii than Alaska. For the latter there has been no growth at all in total investments during the past five years.

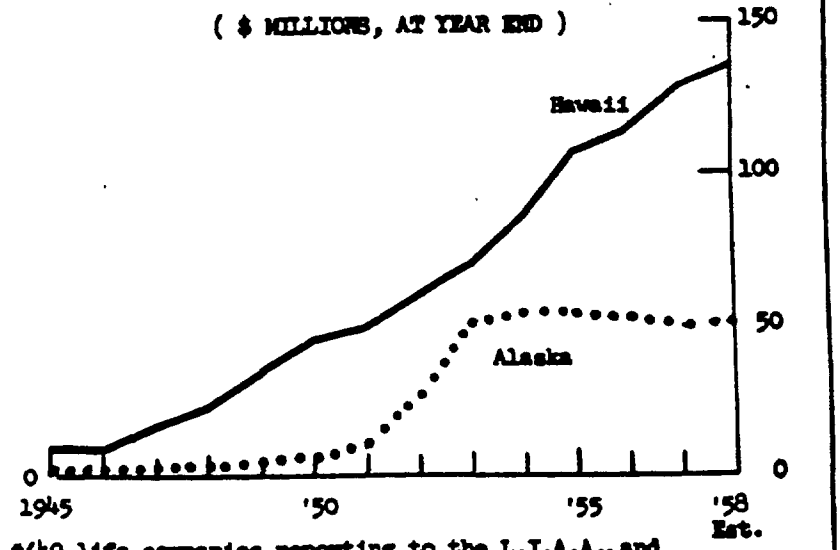
However, in terms of potential investment outlets, Alaska seems to offer more opportunity than Hawaii.

TRENDS IN

TOTAL ASSETS INVESTED IN ALASKA AND HAWAII

BY U.S. LIFE INSURANCE COMPANIES*/

($ MILLIONS, AT YEAR END)



*/49 life companies reporting to the L.I.A.A., and accounting for 85% of all U.S. life companies' assets.

RESEARCH MEMORANDUM
MAY 22, 1959

METROPOLITAN LIFE INSURANCE CO.
BUSINESS RESEARCH BUREAU

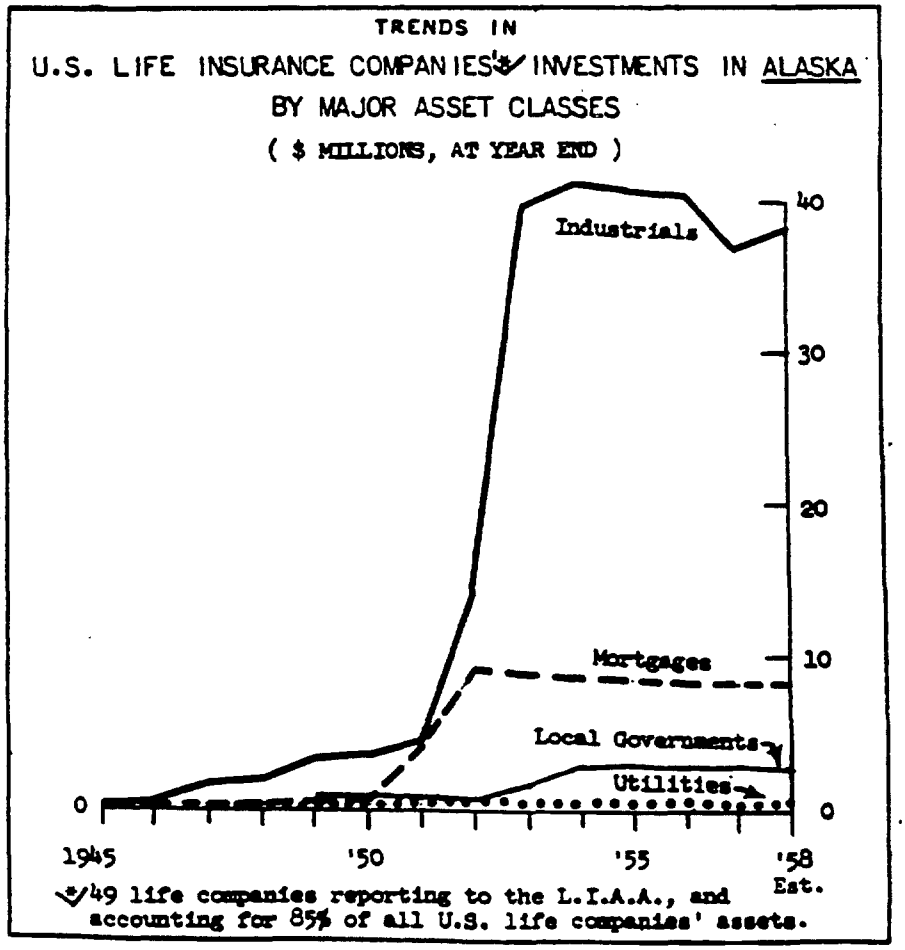
(1) ALASKA

A CROSS-COMPARISON OF LIFE COMPANIES' MAJOR INVESTMENT CLASSES IN ALASKA

The combined life companies' $50 mn. of assets in Alaska are invested primarily in industrial bonds (chart). Those now total about $38 mn., or slightly below the high a few years ago. Mortgage loans have run on a plateau of about $8 mn. since the early 1950's; local governments stand relatively unchanged at under $3 mn., and public utilities less than $1/2 mn. Thus, each of those investment classes, as for the total mentioned before, shows a striking lack of expansion for roughly the past five years.

Investments in industrials were relatively insignificant until 1952-53, when the companies purchased bonds of the Ketchikan Pulp Company at $36 mn.; incidentally, Metropolitan alone acquired $16 mn. Following that significant purchase, the combined companies' holdings of industrials have eased off somewhat as bonds are retired under sinking fund provisions.

Those securities helped to finance the construction of an ultra-modern pulp plant which began producing in 1954. The pulp is suitable for rayon and cellophane, or can be refined into nitrocellulose as a basis for explosives.



TRENDS IN INVESTMENT-ECONOMIC DEVELOPMENTS IN ALASKA

Measured in terms of annual production, the fishing and canning industry has long overshadowed all others in Alaska (see table through 1957, latest available). Even though recently tapering off somewhat to an annual output of $79 mn. in 1957 (chiefly salmon), fish products still nearly treble either mining or timber and pulp, at $29 mn. apiece; and furs and farm products are relatively insignificant by comparison.

TRENDS IN
VALUE OF PRODUCTION IN SIGNIFICANT INDUSTRIES IN ALASKA
($ Millions, during year)

	Fishing & Canning	Forest Products	Minerals	Furs	Farm Products
1935	$ 31.2		$18.8	$2.7	n.a
40	36.4	(not available)	28.7	3.2	$0.5
45	58.9		10.2	4.0	n.a.
50	100.2	$ 4.4	17.9	5.8	1.8
55	69.7	29.7	25.4	6.2	3.5
56	94.6	34.4	23.4	5.7	4.2
57	79.5	29.0	28.8	5.3	4.5

However, the highly seasonal fishing industry has offered little opportunity for life company investing. True, that industry shows possible future development for new uses of waste products and nonmarketable fish for year-round processing into fish oils, vitamins, animal feeds, and fertilizer. But perhaps far more significant as an outlet for life company funds are minerals and forest products.

MINERAL PRODUCTION AND PETROLEUM

In the past, mining was limited largely to high-value, low-bulk metals such as gold, silver, platinum, and high-grade copper; in fact gold still represents fully one-fourth of total output. Alaska is also the largest producer of mercury in the U.S., and the only primary producer of platinum-group metals. Chromite is also mined in substantial volume.

In recent years, over half of the mineral value produced in Alaska came from coal and common sand and gravel. The latter are used extensively in the construction of Army, Navy, and Air Force installations; incidentally military construction represents the bulk of all building

in Alaska. Coal has been mined largely for internal use; but recently Japanese steel interests have been studying the prospects of importing it from Alaska to save substantially on the price currently paid on U.S. coal shipped from Hampton Roads.

Note in the table below how mineral production in 1957 was distributed among the various geographic regions of Alaska. Even uranium has been located in the Southeastern area and development is now in progress.

VALUE OF MINERAL PRODUCTION IN ALASKA DURING 1957, BY REGIONS*

Region	$ Thous.	Production in order of value
Alaska Peninsula	$818	Sand and gravel.
Aleutian Islands	4,242	Sand and gravel, stone.
Bristol Bay		
Cook Inlet-Susitna	5,048	Coal, sand and gravel, stone, gold, silver.
Copper River	119	Gold, sand and gravel, stone, silver.
Kenai Peninsula	1,027	Sand and gravel, chromite.
Kodiak	192	Stone, sand and gravel.
Kuskokwim River	3,370	Mercury, platinum-group metals, gold, sand and gravel, silver, gem stones.
Northern Alaska	12	Coal.
Northwestern Alaska	21	Gem stones, sand and gravel, gold, silver.
Seward Peninsula	1,780	Gold, sand and gravel, silver.
Southeastern Alaska	698	Sand and gravel, uranium, stone, gold, gem stones, silver.
Yukon River	11,471	Gold, coal, sand and gravel, stone, silver, antimony, lead.
Total Alaska	28,792	

* No mineral production from Bearing Sea region.

For the future, perhaps petroleum offers one of the brightest prospects for mineral development -- and possible outlet for life company funds. Extensive exploration has been under way since the first oil discovery in the Kenai Peninsula area in 1957. That location is significant since it is the center of Alaskan population, with mild climate, good harbors, and year-round transportation.

Virtually every major U.S. oil company has Alaskan interests and scores of independents and private corporations are vying for land. The acreage under lease or applied for expanded during 1958 from 10 mn. acres to about 40 mn. acres. It is estimated that the companies expect to spend some $200 mn. to $300 mn. over the next half-dozen years or so on exploration and drilling.

FOREST PRODUCTS

Although the pulp industry has provided the only significant outlet for life company investing in Alaska in the past, opportunities in this area are, of course, not exhausted. Increased interest is focused on Alaskan forests, especially with the rising world demands for cellulose.

Another pulp plant, about equal in size to the one in Ketchikan, is under construction at Sitka, and is expected to start producing by the end of this year; however, over half of this one is being financed with Japanese capital. Upon completion, most of production will be exported to Japan for use in rayon fiber products. Several other projects are in the planning stage.

In spite of the abundance of forests in Alaska, it imports more lumber than it produces because of inaccessibility and the distance from the major supply in Central Alaska. Timber cut mostly in the Southeastern and South Central coastal regions is absorbed by the home market. Present demand for Alaskan timber products exceeds production by almost 100 mm. board feet annually -- indicating opportunity for establishing new sawmills, as well as expanding existing plants.

POWER

The enormous hydroelectric resources of Alaska still are essentially untapped. Numerous sites already explored by Army engineers indicate about 20 mm. kilowatts of potential capacity -- more than double the developed water power of the Pacific Northwest. However, there has been no rush in capital investment, because of the high cost involved. Low cost power in the Interior so far is inaccessible.

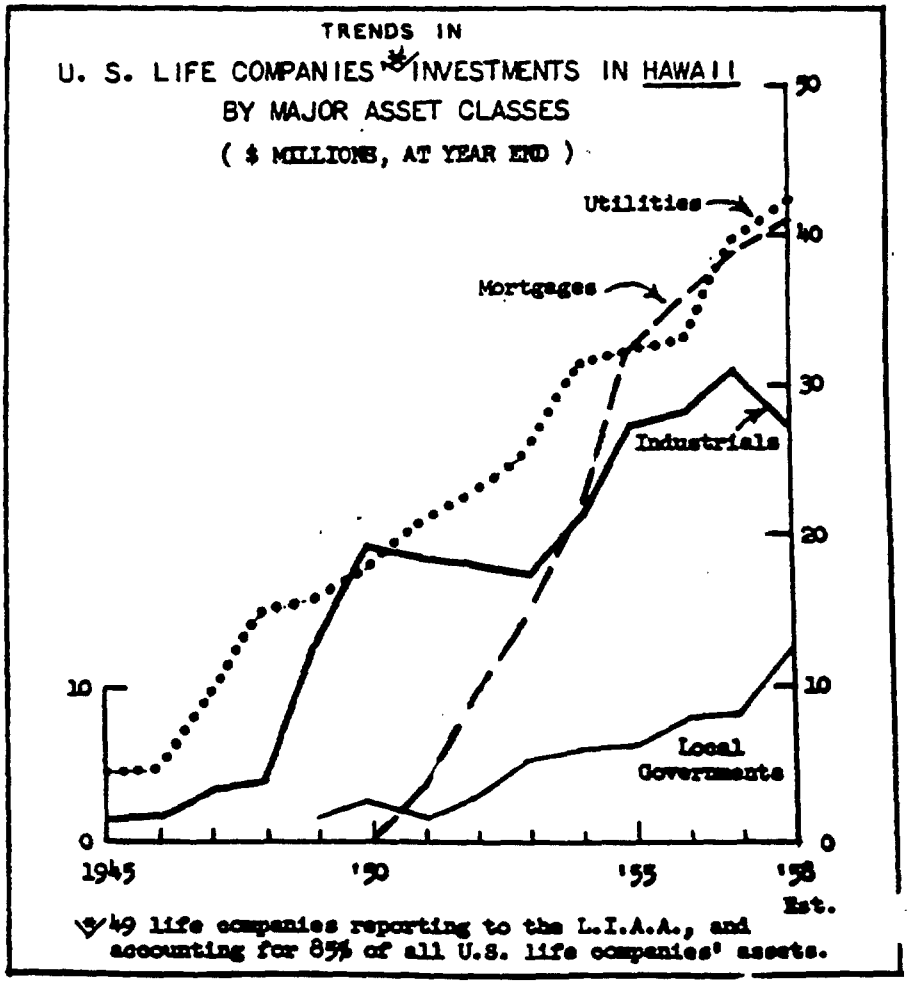
The aluminum industry has been interested in two major projects but, as yet, neither has been feasible for development. Harnessing of power in the next few years may possibly be limited to a few small projects close to existing markets.

(2) HAWAII

A CROSS-COMPARISON OF LIFE COMPANIES' MAJOR INVESTMENT CLASSES IN HAWAII

The combined life companies' $135 mn. of assets in Hawaii are distributed mainly among mortgage loans, public utility securities and those of industrial corporations (chart). Both mortgages and utilities now stand above $40 mn., apiece; and industrials run close to $30 mn. In addition, the companies own some $12 mn. of local governments. Metropolitan, incidentally, has about $1/2 mn. of industrials in Hawaii, but no other investments. (Domestic Hawaiian life companies and alien companies have relatively few investments in the Islands, when compared with U.S. companies.)

Among major investment classes for U.S. companies, public utilities have shown the steadiest growth since the War -- reflecting the marked expansion in electric power and telephone facilities. Mortgages have registered all of their strong gains since 1950; they cover both housing as well as commercial properties. For industrials, which are mostly issues of U.S. corporations with plants in Hawaii, expansion has been somewhat sporadic since the War. Investments grew rapidly during the late 1940's, leveled off for a few years, then resumed their upward trend in the mid-1950's, but lately eased off somewhat.



1/ 49 life companies reporting to the L.I.A.A., and accounting for 85% of all U.S. life companies' assets.

TRENDS IN INVESTMENT-ECONOMIC DEVELOPMENTS IN HAWAII

Measured in terms of annual production, the growing and processing of agricultural products represents by far the largest industry in Hawaii (table). Output of those has been steadily running at about $300 mn. annually, during the past five years or so. However, in contrast to that relatively unchanged level of activity, construction expenditures have lately boomed to $170 mn. in 1958.

TRENDS IN
VALUE OF PRODUCTION IN SIGNIFICANT INDUSTRIES IN HAWAII
($ Millions, during year)

	Total Agricultural Products	Sugar Products	Pineapple Products	Other	Construction
1947	$229.2	128.3	74.0	26.9	73.0
50	249.2	123.9	97.0	28.3	68.0
55	295.1	145.5	110.0	39.6	94.0
56	304.8	148.0	117.0	39.8	113.0
57	298.0	146.0	110.0	42.0	135.0
58	279.3*	107.0*	124.3	48.0	170.0

* Decline largely because of labor strike in sugar industry for four months ending June 6, 1958.

AGRICULTURAL PRODUCTION

The relatively stable output of agricultural products in Hawaii is made up primarily of sugar, at about $150 mn. a year (except for the strike in 1958), and pineapple at about $110 mn. to $120 mn. annually. Although some expansion might occur if demand rises for those products in the future, nevertheless potential growth tends to be limited by the fact that much of the available arable land is already under cultivation. Thus there seems to be little probability for significant expansion in the number or size of sugar mills and pineapple canneries, which now represent the largest plants in Hawaii, and account for well over three-fourths of the total value added by manufacture in the area. In end result, opportunity for life company investment in this field seems relatively limited.

CONSTRUCTION

The sharp increase in construction activity in Hawaii to $170 mn. in 1958, is caused mainly by gains in residential building, both in Defense areas and in new suburban communities. In 1959, the largest residential development in the history of Hawaii has been announced by the Bishop Estate and Henry J. Kaiser. It is expected to provide housing and other facilities for 50,000 people, at an ultimate cost of about $350 mn.

In nonresidential building, offices and shopping centers are significant; hotels are growing rapidly to accommodate sharp gains in tourist trade. There have also been heavy expenditures on military installations.

Although much of Hawaiian construction is either publicly or privately financed for military purposes, life companies have enjoyed steady expansion of mortgage investments, as noted earlier. Moreover, the climate for such expansion continues favorable.

PUBLIC UTILITIES

The steady expansion of life company investing in public utilities in Hawaii reflects largely the fact that electric power output has been rising at 7 to 8% a year ever since the War. Although central generating plants rely mainly on fuel oil, the use of atomic energy is being explored to help provide for future needs. Some Defense installations and plantations have their own generating systems, but the bulk of power is produced by public utility companies.

Telephones in service have been growing at about the same steady annual growth as electric power. Hawaii's telephone system is operated by a single locally owned company; direct cable service connects it with the U.S. and foreign countries.

MINERAL RESOURCE POTENTIALS

Although Hawaii's industry has involved mainly the processing of agricultural products up to now, sizable deposits of bauxite, titanium, pumice and clay have recently been found. They may promise to be economically exploitable in time.

HAWAII -- MARKET POTENTIALS

INSURANCE AND ECONOMIC GROWTH TRENDS

Hawaii comprises 6 main islands and many other smaller ones. Thus, ships and planes are the essential means of transportation between them and the mainland. However, fully 3/4 of the entire Hawaiian market is found in the one Island of Oahu, upon which Honolulu is situated. The accompanying map and bar chart, taken from a special report by the Bank of Hawaii, bring this sharply into focus.

Summarizing the economic picture of Hawaii:

1. Economic growth rates generally match those for the U.S. mainland.
2. Government operations, including military, play a dominant role in Hawaii's economy.
3. Several large U.S. and Canadian Life companies are operating in Hawaii.
4. The above seems to point to a promising insurance market on the Island of Oahu.

For perspective as to Hawaii's position among the States, we show the next higher and lower ranking ones as to:

	Personal Income		All Cos.' Combined In Force	
Next Higher Agency State	Del.	$ 1361 mn.	Maine	$ 2265 mn.
Hawaii		1272(43rd)		2241(40th)
Next Lower Agency State.	Idaho	1173	New Mexico	2128

Three-fourths or more of the people live and work on Oahu, and they receive more than four-fifths of all wages and salaries. This island, whose land area is less than one-tenth of the total, accounts for an even larger proportion of trade, services, manufacturing, and construction. Exhibit 1 shows not only the relative size of the islands but also their importance economically. Some of the reasons for its economic importance are listed in the lower panel of this exhibit.

Government operations, Federal and local, and including military, pay almost half of all wages and salaries, as seen in Exhibit 2. This contrasts with less than one-sixth in continental U.S. Federal military payrolls, alone, accounted for about a fifth of all wages and salaries of the Islanders vs. only 3% on the mainland. Naturally, the Government's role in the Islands was even greater during World War II. But government plays a larger role today than in 1940 or '50.

Tourists, of course, help to make trade the next largest dispenser of wages and salaries. This comes to about a sixth (Exhibit 2), or a bit more than in 1940 or '50. The share of farm wages and salaries is down from 20% in 1940 to around 7%.

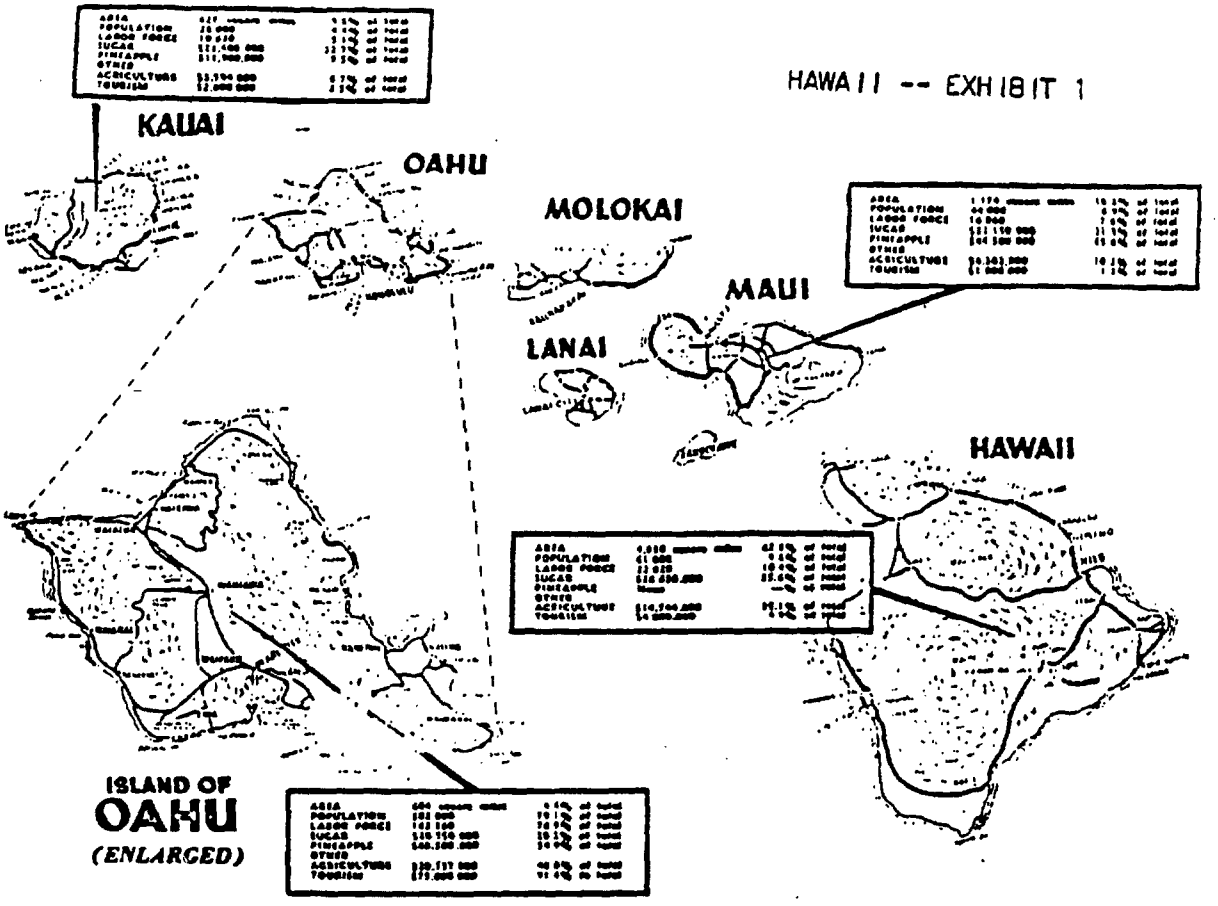
Since 1950, the market in Hawaii, as measured by total personal income, expanded about the same as that for U.S. as a whole. However, population of the islands grew twice as fast. Per capita income, therefore, did not keep up with the U.S. Growth trends for these and other market measures are shown in Exhibit 3.

Life insurance has expanded faster in Hawaii than in U.S. Combined Life in force at the end of 1959 was 3 times as much as in '50, compared with little more than doubling for the U.S. Between 1950 and 1958 (latest available) Life premiums paid by Hawaiians more than doubled. According to the Institute of Life Insurance, inforce on Military personnel stationed in Hawaii is not included in the totals.

Exhibit 4 compares Trends in personal income with combined inforce.

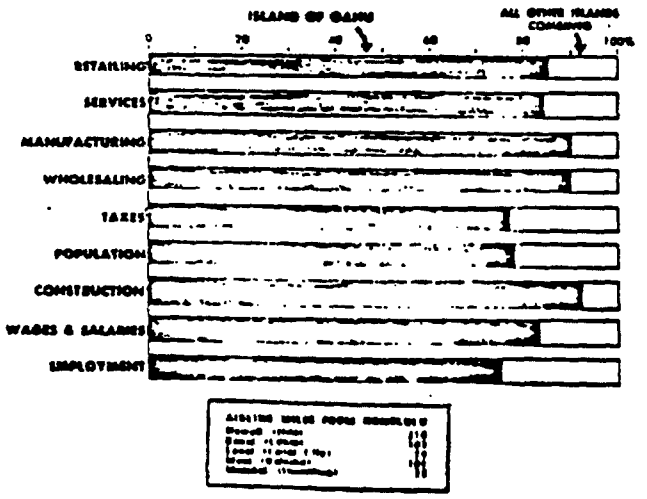
(Abstracted from 5/15/59 Survey)

HAWAII -- EXHIBIT 1



OAHU - OPERATIONAL CENTER OF HAWAII'S ECONOMY

HOW IMPORTANT AMONG THE ISLANDS ? --. SOME REASONS FOR ITS CURRENT POSITION



1. Expansion of defense activity
2. Increase in tourist trade
3. Diversification of industrial production
4. Increase in importance of government services and employment
5. Centralization of management, banking, insurance, and utilities in Honolulu
6. Honolulu's role as central :
   a. Shipping and airport for overseas freight and travel
   b. Point of contact with all parts of the world
   c. Point for inter-island transportation
   d. Market for all islands

HAWAII -- EXHIBIT 2

How Major Industries Share In Wages and Salaries Paid In Hawaii

	Percent of Total Each Year					
	1940	'45	'47	'50	'57	'58
Government	34.1%	73.4%	41.1%	32.8%	45.2%	44.0%
Federal Military	14.5	45.9	14.7	13.9	20.9	19.4
" Civilian	9.5	23.8	18.7	15.7	14.4	14.5
Local	9.5	3.7	7.7	10.4	9.8	10.0
Trade, Retail & Wholesale	13.4	6.0	13.2	14.5	14.0	15.2
Factory	10.1	4.8	9.9	10.4	8.5	8.3
Service	7.3	3.6	6.9	7.8	8.4	8.5
Farm	20.1	5.8	12.3	12.5	8.2	7.2
Contract Construction	6.1	2.2	6.6	4.9	5.7	7.0
Transportation	4.5	2.5	5.3	4.9	4.6	4.4
Finance, Insurance & Real Estate	2.2	0.8	1.8	2.2	2.5	2.6
Communications, & Public Utilities	2.8	0.9	2.2	2.5	2.4	2.4
All Other	0.6	0.2	0.6	0.6	0.3	0.3
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

HAWAII -- EXHIBIT 3

MARKET GROWTH TRENDS IN HAWAII

Market Measures	Unit	Actual 1940	'45	'47	'50	'57	'58	'59	Perc Chan 195 fro 195
Personal Income									
Total									
a. Incl. Military	$ mn.	250	1010	720	690	1100	1150	1270	+ 6
b. Excl. "	"	220	610	640	620	930	990		+ 5
Total per capita									
a. Incl. Military	$	580	1330	1380	1400	1820	1850	1940	+ 3
b. Excl. "	"	550	1330	1310	1310	1670	1710		+ 3
Wages & Salaries									
a. Incl. Military	$ mn.	180	870	550	510	830	870		+ 7
b. Excl. "	"	150	470	470	440	650	700		+ 5
Proprietors	$ mn.	30	90	90	60	90	90		+ 6
Business	"	25	85	80	50	80	80		+ 6
Farm	"	3	5	6	7	10	11		+ 5
Rents, Dividends, & Interest	$ mn.	35	55	65	80	120	130		+ 6
Transfer Payments	$ mn.	6	20	25	40	50	55		+ 13
Population									
Total	thous.	430	820	530	490	610	630	660	+ 2
Civilian	"	400	460	490	470	550	580	600	+ 2
Life Insurance Measures									
All Companies'									
Combined Life In Force*	$ mn.	210	340	430	710	1830	2070	2240	+ 19
Combined Life Premiums*	$ mn.	6	10	13	17	36	39		+ 12

* Excluding Military, according to I.L.I.

and transported to the stucco bins for storage. From the bins the stucco is [illegible] to be loaded into [illegible] for shipment.

The silos are at the south end of the plant; near the north end are large bins for the storage of white rock. Farther on are the buhrstone grinders for grinding the rock fine and the "kettles" in which it is calcined. The "kettles" and rotary kiln calciners do not produce exactly the same type of calcined gypsum, because in the "kettles" the flame is separated from the charge while in the calciners the products of combustion and the charge are intimately mixed.

The warehouse occupies the middle portion of the plant on the side adjacent to the water. Here are located the machines for mixing and packing plaster, the stucco bins and the laboratory. Much of the warehouse floor space is used for storing bags of plaster. On the street side is the section of the plant in which are made building blocks and wall board.

Permissible Standards of Dustiness

It is generally conceded that the extent to which a hazard from silicosis or other form of pneumoconiosis might exist is indicated by the concentration in the industrial atmosphere of free silica or asbestos particles of respirable size. However, experience with mixed dusts, for instance silica and iron oxide, shows that the response of the body to inhaled silica is modified by the presence of the iron oxide. Animal experiments with artificial mixtures of quartz and calcined gypsum resulted in a delayed but typical reaction to the quartz. Apparently the protective action of the gypsum was a mechanical one, a clumping of quartz particles in-

to light [illegible] knowledge of the [illegible] generally customary to [illegible] free silica in the air-floated dust and regard gypsum and other non-siliceous constituents as merely diluents. The evidence from the present and previous surveys in the gypsum industry strongly suggests that this assumption is not universally applicable.

A concentration of five million particles of free silica per cu. ft. of air has been tentatively suggested as a limit above which pulmonary fibrosis may occur. This value is for dust samples collected with the Greenburg-Smith impinger apparatus and counted by the standard light field technique of the U. S. Public Health Service. The light field method reveals particles which are larger than a minimum size estimated to lie between 0.7 μ and 1.5 μ. Since the impinger apparatus collects and retains the majority of particles much smaller than that limit, down to 0.2 μ or smaller, a dark field method by which even smaller particles are made visible is also employed. There is no generally-accepted standard for safe dust concentration determined by the dark field method and it is used merely as an adjunct to the light field technique and as a guide in interpreting the general dust condition.

Good housekeeping standards demand that the amount of even apparently harmless non-siliceous dusts be kept within reasonable limits. A value of 100 million particles per cu.ft. of air (light field count) is sometimes given as a maximum concentration for any dust to which men are continuously exposed.

Dusts encountered in Plant

Although there is some variation in the composition of air-borne dust in the plant, the principal constituent is generally

raw or original gypsum. The principal dust of the mine is the rock dust, the calcium and some silica. The principal dust of the plant is calcined gypsum dust predominates in the atmosphere, the fiber paper and the board plant. Also suspended in the air of the warehouse are particles of sand, wood fiber, jute fiber, lime, organic materials employed as a retarder, and occasionally small amounts of substances such as asbestos and talc used in special plasters. Much of the dust set up when sand is unloaded from the boat is undoubtedly quartz, since that mineral is in excess in the sand. In the operation of grinding buhrstone a dust which is almost pure quartz is generated.

Quartz and sand (owing to its quartz content) can be classed as definitely hazardous. Asbestos also falls in the same category but so little is used that it can be neglected. Clinical and experimental evidence has led to the conclusion that the inhalation of gypsum dust is relatively harmless; in fact, there is some basis for the belief that it has a protective action by enfolding quartz particles into clumps which settle out of the breathing zone. The other kinds of dust mentioned are regarded as unlikely to cause any type of pneumoconiosis.

Dust Concentrations in Plant

Dust samples were collected with the Greenburg-Smith impinger apparatus used in previous dust surveys for the U. S. Gypsum Co. The dust particles were counted by the light field method of the Public Health Service and also with dark field illumination as recommended by some investigators. Counts for both methods are tabulated at the end of this report. Most of the samples were collected in 95 per cent alcohol; for a few 25 per cent alcohol was substituted so that only quartz and other insoluble particles would

remain undissolved.

Unloading raw material

Both gypsum and sand are received by boat. Dust samples for the unloading of gypsum could not be taken because no shipment of rock arrived during the survey. However, any dust raised would be principally gypsum and should not be harmful. Sand is unloaded by means of a bucket elevator which lifts the sand from the boat and discharges it on a conveyor belt in a small room. The dust concentration inside the room is quite high, being 160 million particles per cu. ft. of air. Since this dust is derived from sand which contains a large amount of quartz (by chemical analysis 80 per cent), it is dangerous. Therefore the man working in this machinery should wear a respirator when inside the room; on the outside he is exposed to little dust because it is dissipated by the wind.

Transporting and calcining raw rock

Underneath the raw rock storage silos is a tunnel in which is the conveyor belt that transports raw rock to the crusher. The dust concentration in the tunnel was 30 million particles per cu. ft. of air. After being crushed the rock is lifted to the top of the building and then passed down through screens. One man works around these screens and the average concentration to which he is exposed was found to be 34 million particles per cu. ft. of air. The crushed rock is then calcined. There was only a moderate amount of dust around the calciners, the counts being 14 million for the calciner feed man, 13 million for the calciner fireman and 19 million for the tube mill operator.

Next to the "bottles" the dust concentration was 75 million

particles per cu. ft. of air. Much of this dust was land plaster (ground gypsum) which was being loaded into cars near by. Near the sandstone grinders, where the rock is calcined in the "kettles" is ground, the concentration of dust was less than 7 million particles per cu. ft. of air.

Chipping buhrstones

Buhrstones are nearly pure quartz and the chipping of them creates a dust that is definitely hazardous. The dust count for that operation was more than 17 million particles, a value [illegible] is above the safe limit. An exhaust system of dust removal was installed after the dust samples had been taken and it is believed that the concentration has now been reduced to a safe value.

Block and board plant

[illegible] the machine making gypsum blocks the dust concentration was 6 million particles per cu. ft. of air. For the board plant the dust counts were 9 million on the platform where the upper paper rolls are unwound and terra alba accelerator added; 19 million on the floor below where the semi-fluid gypsum is poured on the paper sheet; and 7 million near the machine cutting rocklathe boards. Since the dust in these localities is principally gypsum, the foregoing concentrations cannot be reported as hazardous.

Mixing and packing plaster

The mixing and packing of plaster produce concentrations of dust that are quite high, as shown below. (Cement plaster is nearly 99 per cent calcined gypsum and sanded plaster is about 28 per cent calcined gypsum and 71 per cent sand.)

Dust Concentration Produced by the Mixing and Packing of Plaster

Kind of Plaster	Light Field Dust Count	
	Mixing Plaster	Packing Plaster
Cement Plaster	401.9 million	448.1 million
Sanded Plaster	713.1 million	896.1 million

It appears that an exhaust system of dust removal reduces the dust concentration to a safe minimum by nearly one-half. Thus, the above counts of 448 and 896 million were for a packer with exhaust ventilation; counts for samples taken at the Oakfield plant near a packer without an exhaust system were 911 and 1821 million.

Much dust is put in suspension when packing into bags with long valves; the light field count for that operation being 821 million as the dark field count having the extremely high value of 7317 million. The packing machine is equipped with exhaust ventilation but it is probably rather ineffectual because an opening in the brick, left uncovered to allow weights to be changed, interferes with effective suction. This condition should be remedied and the full value of the exhaust system realized.

When packing 5 pound paper bags with plaster of paris the exposure to a concentration of 10 million particles per cu. ft. of air. This dust (calcined gypsum) as well as the hand plaster (ground gypsum) packed in jute bags is not considered to be dangerous.

In a report of a recent survey made at the Oakfield plant on March 18 - 20, 1936 attention was directed to the dust condition associated with the mixing and packing of sanded plaster. It was observed that the hazard presented by those operations was less serious

then the total dust concentration alone would indicate [illegible] proportion of [illegible] the original mixture. The same condition has been found to exist at the Bexley Brighton plant. This is revealed by comparing samples collected in 75 per cent alcohol and in 95 per cent alcohol. In the former gypsum dissolves leaving only quartz and other insoluble particles, but in 95 per cent alcohol the gypsum particles do not dissolve. Counts for these samples are as follows;

Relative dust counts of samples collected in 95 per cent and in 75 per cent alcohol

Operation	Light field dust count	
	75 per cent alcohol sample	95 per cent alcohol sample
Mixing sanded plaster	400.3 million	92.3 million
Packing sanded plaster	200.1 million	1.7 million

The count for mixing sanded plaster, 75 per cent alcohol sample, is higher than one would expect and may be due to the presence of many organic particles, such as wood fibers, in the air near the mixer. Weight is given to this explanation by the chemical analyses below, which show a higher ignition loss for the mixer sample than for the packer sample.

In order to obtain accurate knowledge of the composition of air-borne dust generated when sanded plaster was being mixed and packed, a suction motor equipped with a dust collecting bag was operated as described below.

Mixing sanded plaster

Motor was placed on top of scales, at breathing level, and operated for 40 minutes. Wt. of dust collected = 1.157 gr.

Packing sanded plaster

Motor was suspended at breathing level, 4 ft. from man at Bates packer, and operated for 20 min. Wt. of dust collected = 0.160 gr.

Chemical analyses of the dust collected and also of sanded plaster ready for shipment were then made. The results are tabulated below.

Chemical Analyses of Sanded Plaster and Gypsum Plaster Dust

	Sanded Plaster	Air-borne Dust	
		near mixer	near packer
Acid soluble material	30.6%	78.7%	78.4%
Acid insoluble material	62.5	5.0	10.8
Ignition loss below 110°	1.9	4.3	0.9
Ignition loss above 110°	2.0	11.9	9.9
	100.0	100.0	100.0
Total insoluble SiO_2	56.8	1.5	0.4
Estimated free SiO_2 (quartz)	50	2	3

These analyses of air-borne dust show that only a small fraction of the quartz in the sanded plaster mixture diffuses an appreciable distance into the surrounding air, either at the mixer or at the packer. This condition may be due to the large size of quartz particles or to the tendency of gypsum to form aggregates with the quartz. In either case the quartz would not be air-floated readily but would settle out.

From the above data it is evident that the mixing and packing of sanded plaster are operations which are not nearly so hazardous as they would appear to be. But neither can they be said to be entirely without danger. Packing sanded plaster produced a dust concentration of 590 million particles per cu. ft. of air; and about 3 per cent of the dust was quartz. If all particles were the same size there would be nearly 18 million quartz particles in a cubic foot of air. This would be a dangerous concentration. Undoubtedly the particles of quartz are larger than those of gypsum and therefore the concentra-

[illegible] per cent alcohol sample [illegible] of the water [illegible] confirms this conclusion. Furthermore, the clumping action of gypsum [illegible] reduces to a very low figure the number of quartz particles actually inhaled. This [illegible] account for the [illegible] among men [illegible] and packing [illegible] plaster.

[illegible]

[illegible] million particles per cu. ft. of air [illegible] fairly constant. [illegible] are [illegible] million. [illegible] exposed to that high concentration [illegible] there [illegible] dust in suspension while the [illegible] is being filled. The dust is mostly gypsum with some jute fibers.

[illegible]

At intervals a man must go inside the stucco bins and [illegible] stucco into holes in the floor. Clouds of dust are raised by this operation, producing the exceedingly high concentration of [illegible] million particles per cu. ft. of air. Although the dust is all [illegible] gypsum and therefore relatively harmless, it would appear desirable to work out a [illegible] of feeding stucco which would not require a man to work inside the bin.

The count for a dust sample collected in a passageway on the third floor of the warehouse was about 14 million. This sample represents an average exposure of men trucking plaster.

Considerable dust is raised when motors are blown out

with compressed air, th[illegible]

[illegible]

re[illegible] particles smal-ler than about 1 μ are present. The man who blows out motors wears a respirator and [illegible] the neces-sity of his continuing to do so, especially since the dust may contain many quartz particles.

The dust concentration in the machine shop was about 3 million particles per cu. ft. of air and in the laboratory it was about 2 million.

Summary and Conclusions

1. It is recommended that the concentration of free silica (quartz) dust to which men are exposed be kept less than 5 million particles per cu. ft. of air. It is urged that a serious effort be made to meet "good housekeeping" requirements so that no man will be exposed continuously to dust of any kind in concentrations greater than 100 million particles per cu. ft. of air. These values refer to light field counts.

2. The man helping unload sand from the boat should wear a respirator when he is inside the house over the conveyor belt.

3. [illegible]stone chipping without an exhaust system appears to be hazardous. It is believed that the suction device recently installed may eliminate the hazard.

4. Mixing and pressing plaster produce dust concentrations far above "good housekeeping" limits. When the plaster is a [illegible] plaster, large amounts of quartz are used but analysis of the air-floated dust shows that little quartz is suspended in the atmos-phere. However, owing to the high dust concentration, even the

[illegible] efficient exhaust system. If this is impracticable, [illegible] should wear respirators.

5. [illegible] which lead plaster to flake should be removed as [illegible] to be [illegible] from remaining the exhaust system ineffective.

6. [illegible] concentrations of dust encountered by [illegible] dust is [illegible] ventilation would help.

7. [illegible] dust [illegible] is extremely high dust concentration. It would seem possible to [illegible] dust, [illegible] dust.

8. [illegible] dust contain [illegible] which may be [illegible] particles. A question [illegible] removing the [illegible] suspension [illegible].

Sample No.	Operation Represented	Location	Date and Sampling Time	Collecting Fluid	Remarks	Particles per cu.ft. of air = in millions		
						Light Field above 10μ	Light Field 5 to 10μ	Dark Field (Tyndall) (Condenser)
1	Unloading sand from boat	Sample taken inside house where chute fed by elevator from boat discharges sand on conveyor belt	June 1, 1936 F 3.39 p.m. S 3.30 9 min.	95% Alcohol	Man is inside house about one-third of time; when outside is quite little exposure because dust is blown away. Man on boat not supposed to touch dust. Good ventilation inside house; door 6 feet away open.	0.91	160.7	[illegible]
2	Working in tunnel under silos	Sample collected at breathing level 30' inside tunnel and next to conveyor belt	June 4, 1936 F 10.08 p.m. S 10.00 8 min.	"	Rock was being discharged from chute 30' farther on in tunnel. Moderate draft of air.	0.30	29.0	41.2
3	Working over rock screens at top of silo building	Sample taken at breathing level in middle of floor to represent average location; near place where man shovels crushed rock into chute	June 5, 1936 F 11.36 p.m. S 11.30 6 min.	"	Man is on this floor most of time; on floor below most time some of the time. Good ventilation.	0.98	31.9	71.5
4	Celeiner feed man	Sample taken at bin at end of celeiners; this represents an average location for man	June 3, 1936 F 11.10 p.m. S 11.00 10 min.	"	Good ventilation	0.20	14.2	25.3
5	Celeiner fireman	Flask held at breathing level on platform in front of celeiner gages.	June 5, 1936 F 10.26 p.m. S 10.20 6 min.	"	Celeiner firemen here nearly all of the time. Good ventilation.	0.09	13.3	34.7

Sample No.	Operation Represented	Location	Date and Sampling Time	Collecting Fluid	Remarks	Particles per cu.ft. of air (in millions)		
						Light Field		Dark field
						above 10μ	below 10μ	(plankton counter)
6	Tube mill operator	Sample collected at breathing level, 4 min. on tube mill floor and 6 min. on conveyor floor, over area covered by tube mill operator.	June 1, 1938 F 10.35 p.m. S 10.50 15 min.	90% Alcohol	both tube mills [illegible] were in operation Good ventilation	0.14	18.9	72.6
7	Working at kettles	Flask held at breathing level, in front of furnaces	June 2, 10.6 F 11.50 p.m. S 11.40 10 min.		A spout [illegible] stream of lead plaster [illegible] into oven. Much dust set up by this. Good ventilation.	0.07	[illegible]	1.4
8	Tending buhrstone grinders	Sample taken opposite and 8' from the middle one in a row of buhrstone grinders	June 8, 10.6 F 9.46 p.m. S 9.40 6 min.		Good ventilation; open windows 10' away	0.03	6.8	.9
9	Chipping buhrstones	Flask held 1' from man chipping buhrstones	June 7, 1938 F 3.50 p.m. S 3:10 10 min.		Strong drafts of air through open door 6' away and open window 10' away. Exhaust from air hammer blows chips away from man. Man chips buhrstone 1/4 of time. Rest of time tends buhrstone grinders.	0.04	17.6	4[illegible].9
10	Working at block machine	Sample collected at breathing level, 1' from block machine, between men working at machine.	June 7, 1938 F 6.00 p.m. S 6.10 10 min.		Fair ventilation	0.06	24.8	18.4

Sample No.	Operation Represented	Location	Date and Sampling Time	Collecting Fluid	Remarks	Particles per c.ft. of air (in millions)		
						Light Field		Dark Field
						above 10μ	below 10μ	(Impinger Counter)
11	Working in board plant at paper rolls	Sample taken on platform holding upper paper rolls, at locations near paper roll and [illegible] to represent an average condition.	June 3, 1938 F 10.30 a.m. S 10.50 20 min.	98% Alcohol	Terra alba (land plaster) added to the mix in small lots on this floor. Good ventilation	0.04	9.7	[illegible]
12	Feeding semi-fluid gypsum to board machine	Sample collected at breathing level, 1' from operator, at place where semi-fluid gypsum is poured on paper sheets.	June 1, 1938 F [illegible].0 p.m. S [illegible].20 20 min.	"	Good ventilation; open [illegible] 20' away.	0.13	14.7	[illegible]
13	Cutting off Rockite boards	Sample taken 2' from machine cutting Rockite boards in two, 2' from stack on which boards are stacked.	June 3, 1938 F 11.40 a.m. S 11.50 10 min.	"	Nine men working in this vicinity. Very good ventilation; open window 6' away.	0.04	6.5	16.1
14	Mixing cement plaster (fibered)	Flask held at breathing level 4' from hopper at about middle of area covered by men.	June 1,1938 F 9.40 a.m. S 9.40 0 min.	"	Two men working near mixer. Fair ventilation; open window and door 30' away.	1.9	491.9	777.1
15	Mixing sanded plaster	Sample collected at positions occupied by men filling mixer (near hopper and scales)	June 1, 1938 F 11.40 a.m. S 11.40 0 min.	"	Cover on hopper open most of time. Mixer is below floor level. Little ventilation.	1.9	323.1	949.1
16	"	Sample taken in front of hopper	June 3, 1938 F 3.46 p.m. S 3.40 6 min.	"	Little ventilation.	1.1	304.3	[illegible]
17	"	"	June 3, 1938 F 3.00 p.m. S 3.10 10 min.	98% Alcohol	Same as sample #16 except that collecting fluid was 98% alcohol	0.1	[illegible]	[illegible]

Sample No.	Operation Represented	Location	Date and Sampling Time	Collecting Fluid	Remarks	Particles per c.ft. of air (in millions)		
						Light Field		Dark Field
						above 10μ	below 10μ	(Tyndall Condenser)
18	Poking cement plaster (fibered)	Flask held at breathing level midway between two men packing cement plaster at Bates packer.	June 1, 1936 F 9.00 a.m. S 9.00 0 min.	98% Alcohol	Machine has exhaust system of dust removal. Two men each loading 3 bags work at packer. Good ventilation; open door 30' away.	2.33	440.1	1007.0
19	Packing sanded plaster	Flask held about 1' from head of man operating Bates packer.	June 1, 1936 F 1.30 p.m. S 1.30 0 min.	"	Machine has exhaust system of dust removal. Little ventilation; open door 40' away.	3.0[illegible]	536.1	2034.7
20	"	"	June 1, 1936 F 2.00 p.m. S 2.00 0 min.	98% Alcohol	Same as sample #19 except that collecting fluid was 98% alcohol.	0.16	6.7	24.4
21	Packing land plaster in jute bags	Sample collected at breathing level 1 - 2' from man at Bates packer.	June 3, 1936 F 1.40 p.m. S 1.40 0 min.	98% Alcohol	Machine has exhaust system. Open door at back (for convenience of operator in changing bags) renders system rather ineffectual. Little ventilation.	[illegible]	[illegible]	[illegible]
22	Packing plaster of paris in 8 lb. bags	Sample taken between machine packing 8 lb. bags with plaster of paris and machine sewing them.	June 6, 1936 F 1.55 p.m. S 1.40 0 min.	"	Four men work here. Good ventilation.	0.11	44.[illegible]	177.2
23	Sewing burlap bags	Flask held at breathing level 2' from girl sewing bags. Girl 8' away, stamping and wiring bags, exposed to less dust.	June 1, 1936 F 10.30 a.m. S 10.20 a.m. 10 min.	"	No exhaust system of dust removal. Fair ventilation; open window 10' away	1.31	536.[illegible]	[illegible]

Sample No.	Operation Represented	Location	Date and Sampling Time	Collecting Fluid	Remarks	Particles per cu.ft. of air (i.e. millions)		
						Light Field		Dark Field
						above 10μ	below 10μ	(Tyndall Condenser)
24	Working at bag wheel.	Sample taken in passageway 15' from closed room where bag wheel was shaking burlap sacks.	June 3, 1936 F 4.30 p.m. S 4.40 10 min.	95% Alcohol	Man works part of time filling bag wheel, part of time in passageway when bag wheel is running. Little ventilation; some circulation of air through open door.	0.[illegible]	[illegible]	[illegible]
25	Working in stucco bin.	Flask held at breathing level, 6' inside stucco bin, close to man scraping stucco into holes in floor.	June 8, 1936 F 1.10 p.m. S 1.15 5 min.	"	Heavy clouds of dust raised occasionally by falling stucco No ventilation. Very hot.	8.07	2,171.4	17,437.6
26	Trucking on 3rd floor of warehouse	Sample taken in passageway where electric trucks carrying sacks are passing.	June 4, 1936 F 8.30 p.m. S 8.39 9 min.	"	Motor packer 20' away loading burlap bags. Good ventilation.	0.11	13.[illegible]	80.6
27	Blowing dust out of motors with compressed air.	Flask held close to man blowing out motors (1' away for one-third of sample, 3' away for remainder).	June 4, 1936 F 2.43 3/4 p.m. S 2.50 6 3/4 min.	"	One small and one large motor blown out. Man wears respirator.	10.20	527.7	3[illegible].3
28	In machine shop.	Sample collected at breathing level in middle of machine shop near planer.	June 4, 1936 F 1.51 p.m. S 1.10 14 min.	"	Fair ventilation	0.01	2.[illegible]	9.1
29	In laboratory	Sample taken inside laboratory 8' from door which was nearly closed.	June 4, 1936 F 4.58 p.m. S 4.[illegible] 10 min.	"	Good ventilation; open window in opposite wall 20' away.	0.02	5.[illegible]	29.3