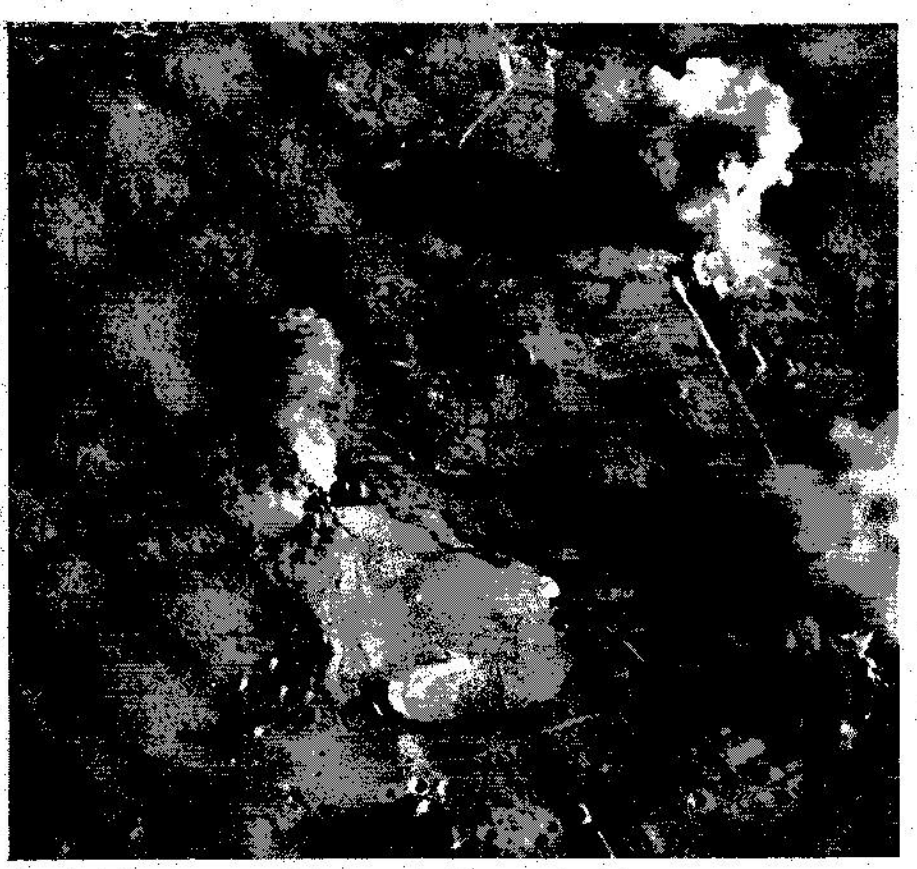
From Our Own Backyard



Old Wars Never Fade Away

In Indochina the U.S. is fighting a war with machines, not men. Vietnam is an ELECTRONIC WAR. The Peninsula, the home of many high-technology industries, plays a significant role in making that war possible.

The North Vietnamese 1972 spring offensive brought the war back to the front pages, but in reality, the war had never stopped.

As President Nixon pulled ground combat troops from Vietnam, fewer Americans died. But the bombing continued. American electronics replaced the GI's.

This Spring President Nixon more than doubled U.S. air power in Indochina. Protected by electronic devices, U.S. planes have bombed railroads, steel mills, power plants, and according to many reports, the Red River dikes. U.S. mines, directed by electronic sensors, block the harbors of North Vietnam.

This PACIFIC STUDIES CENTER report includes three essays describing the technology of the war, the war products of fourteen local institutions, and the growth of local defense industry.

Building Better Mousetraps

"Build a better mousetrap and the world will beat a path to your door."

Americans have always relied on technology to solve our problems. In Indochina, when our leaders learned that the U.S. could not easily "win the hearts and minds" (WHAM) of the people, they turned to Yankee ingenuity.

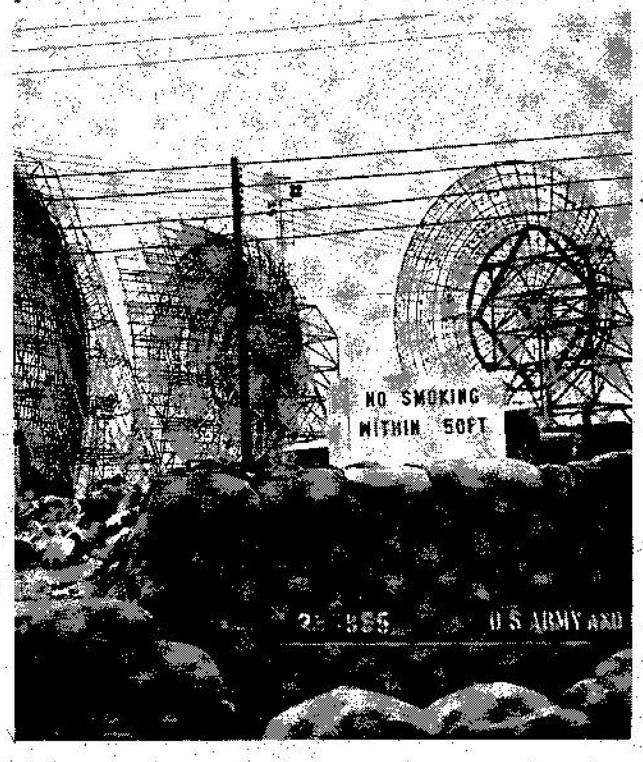
The U.S. military has designed an incredible arsenal of people-traps, but it is not waiting for the world to beat a path to our door. In the past decade the United States has introduced a wide variety of sophisticated weapons to the paths and doorways of Indochina.

We're familiar with some of these weapons: supersonic bombers, light-weight tanks, helicopters that can lift tanks or carry half-a-company of South Vietnamese troops on their skids, and computers that count how many Vietnamese still think Americans are nice guys.

We've heard a lot about the *electronic war*, but it's shrouded in mystery and secrecy. What is the electronic war? What is the electronic battlefield? How smart is a "smart bomb?"

One if by Land

According to legend, Paul Revere used two lanterns, a belfry, and a horse to "spread the alarm" that the Redcoats were coming. Such *communications* might have done the job in 1775, but modern armies need quicker channels to communicate voice, code, and "computer-talk." We take for granted our telephones, radios, and TV networks. But until recently Vietnam, Laos, and Cambodia relied on railroads and telegraphs to pass news on.



When the U.S. military moved into Vietnam, it built hilltop transmitters, installed switchboards, and distributed radios of all sizes to its troops, bases, ships, vehicles, and aircraft. World War II and Korean War radio equipment didn't work well, so the Pentagon hired the nation's best university and industrial researchers to improve it.

Now that U.S. ground troops are leaving Indochina, they are leaving much of their equipment to the South Vietnamese. Since most of it is difficult to operate and repair, American military "advisers" and civilian engineers are staying behind to help out.

Electronic Battlefield

The U.S. has always had the firepower to destroy the NLF or North Vietnamese, if only U.S. troops or bombers could find them. But the guerrillas have used the land, the weather, and the night to cover their operations.

To find the guerrillas and their supply operations the U.S. introduced what is now known as the *electronic battlefield*. American scientists have designed devices which detect heat, metal, ground vibrations, sound, truck ignition noise, and even body odor. They have produced devices which see in the dark and through dense jungle foliage.

Most of these sensing devices are planted in the ground or dropped from aircraft. These "unattended sensors" transmit radio "beeps" to alert computers of "enemy" presence. The computers analyze the beeps, compute the size and motion of the enemy, and either display the information to human commanders or actually dispatch aircraft or artillery themselves, with no direct human input.

The "starlight scope," which allows infantrymen to see in the dark, mounts (like binoculars) on rifles or higher caliber weapons. More complicated devices are mounted on helicopters and larger "gunship" airplanes.

The electronic battlefield cannot know whether the targets it detects are guerrillas, woodcutters, women, children, water buffalo or tigers. But U.S. strategists don't care. In rural Indochina the U.S. must assume that woodcutters, women, children, water buffalo, and tigers are all working for the guerrillas. Said one U.S. Air Force officer in Thailand, "Nobody out there is anything but unfriendly anyhow."

Anti-ship mines are a sea-borne electronic battlefield. The mines that the U.S. has dropped into the waters of North Vietnam have sensors which detect changes in water pressure, the presence of metal, and sounds.

Electronic Warfare

To the military, *electronic warfare* does not describe all electronics used in war. It specifically applies to the use of radar to detect missiles and airplanes and the use of electronic "countermeasures" to confuse or destroy enemy (North Vietnamese) radar.

Simply, radar detects aircraft by broadcasting radio waves. Planes reflect the waves. By measuring the time it takes the waves to bounce back, radars pinpoint the planes' locations.

To counter North Vietnam's radar defense, American planes drop metal foil to simulate extra aircraft, broadcast competing radio waves to confuse the radar receivers, and fire missiles which "home-in" on North Vietnamese radar transmitters.

Electronic Warfare is one of the most advanced areas of electronics. Each side is continaully designing new equipment and techniques to confuse the other.

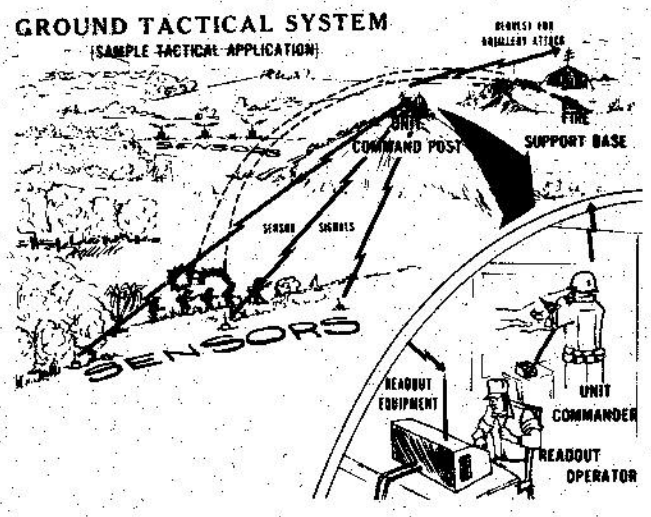
Hitting the Target

Bombing has come a long way since World War II, when bombardiers looked through cross-hair bomb sights to find their targets. To eliminate human error the Navy and Air Force have automated their aim.

In some systems computers on the ground actually navigate aircraft to their targets, electronically releasing bombs at pre-designated spots. The Air Force hopes to take this one step further, sending out unmanned bombers which are "operated" by men and computers on the ground. Already the U.S. is sending up unmanned aircraft for reconnaissance and electronic warfare in areas of Laos and Vietnam with heavy anti-aircraft defenses. All communications between aircraft and ground station are, of course, by radio.

"Smart bombs" have made the news a lot lately. These are bombs which adjust their downward flights to "home in" on their targets. To aim the bombs fliers focus bomb-mounted TV-cameras on the targets before releasing the bombs or shine laser (narrow, one-color light) beams on the targets. The Pentagon has credited these expensive smart bombs with deadly accuracy over North Vietnam.

As U.S. *ground combat* troops leave the Indochina theater, electronics and air power take up the slack. Today sensors communicate automatically (by radio) with computers that help dispatch aircraft and use radio communications to direct bombers which drop bombs which automatically find their targets.



From Senate Hearings on the Electronic Battlefield

The electronic battlefield and electronic warfare are not invincible. Recent North Vietnamese and NLF battlefield successes have proven that. But the electronics permit the United States to stay in Vietnam.

Faced with a reluctant army and a public which demanded that the troops be brought home, President Nixon announced his "Vietnamization" program. But Saigon troops either will not or cannot fight well. Faced with the alternative of withdrawal, Nixon has fallen back on America's better mousetrap—massive bombing and the automated electronic war.

Some of the Biggest

This is a list of some of the major war contractors on the Peninsula. After each company name appears the company's total local and national (if available) sales directly to the Defense Department for fiscal year 1971 (July 1, 1970 to June 30, 1971). Unfortunately, the Defense Department does not publish data on sub-contracts (contracts from Defense contractors).

The number before each company keys its location on the map.

1. AMPEX. Redwood City: $4 million

Most of Ampex's production involves magnetic recording units. For instance, Ampex makes the AN/ALH-4 electronic countermeasures "recorder/reproducer" for the B-52 bomber.

2. APPLIED TECHNOLOGY, division of ITEK. Sunnyvale: $16 million; Stanford Industrial Park (Palo Alto): $9 million.

Stanford researchers formed Applied Tech to produce electronic warfare equipment that they were researching in Stanford's electronic labs. Applied Tech produces the "Wild Weasel," the electronic package that directs U.S. missiles at air defense sites in North Vietnam. Applied Tech, which merged with Itek in 1967, is moving its Palo Alto operations to Sunnyvale.

3. DALMO-VICTOR, a division of TEXTRON. Belmont: $3 million; National: $325 million.

Dalmo-Victor makes night-vision devices, radar-homing-and-warning (RHAW) systems for electronic warfare, and electronic test equipment. Dalmo-Victor manufactures the B-52's AN/APS-105 radar-receiving set and it supplies parts for the AN/APQ-92 search radar for the A-6 carrier-based attack aircraft.

Nationally Textron's Bell Helicopter division makes the UH-1 and Huey Cobra helicopters for Vietnam.

4. FMC CORP., formerly FOOD MACHINERY AND CHEMICAL. San Jose-Santa Clara: $98 million; National: $127 million.

FMC's major local products are the M113 Armored Personnel Carrier, which spearheaded the 1971 Laos invasion, and the LVTP-7 amphibious assault vehicle. FMC also works on anti-personnel fragmentation bombs at its Santa Clara labs.

5. GTE SYLVANIA, subsidiary of GENERAL TELEPHONE AND ELECTRONICS. Mountain View: $29 million; National: $106 million.

Sylvania's major local work is electronic warfare. Its AN/FLR-9 Electronic Countermeasures set has been installed as part of a larger electronic warfare system at the U.S. base in Udorn, Thailand. Its AN/ALR-40 countermeasures set is used on the EA-3B and EA-3C electronic warfare aircraft. Sylvania has developed unattended sensors for the Ho Chi Minh Trail, and the company is studying devices for "identifying friend or foe" in Vietnam-type situations.

6. HEWLETT-PACKARD. Palo Alto: $11 million; Santa Clara: $3 million; Mountain View: $2 million.

Hewlett-Packard is a leading producer of electronic test and measuring equipment and components. According to an H-P spokesman, the company nationally sells nearly $50 million annually, or one eighth of its total sales, to the Department of Defense or Defense contractors (for military work).

Local Hewlett-Packard plants produce components for the M-514 artillery fuze, which triggers explosives just before hitting the ground, and digital displays for electronic warfare. Other H-P plants produce ground support equipment for unmanned reconnaissance aircraft and test-set parts for TV-guided smart bombs.

David Packard, the company's chairman, served three years as President Nixon's Deputy Defense Secretary, functionally the Pentagon's chief administrator. Six of Hewlett-Packard's 17 directors are currently Stanford Trustees or administrators, while three others formerly held such positions.

7. LITTON INDUSTRIES. San Carlos: $4 million; Sunnyvale: $3 million; National: $516 million.

Litton's major local products are electronics and electronic tubes. The San Carlos facility, for instance, produces parts for the AN/ASG-15, the B-52's tactical fire-control system (which means it aims weapons).

Nationally Litton's major military project is the production of Naval destroyers.

8. LOCKHEED MISSILES AND SPACE COMPANY, division of LOCKHEED AIRCRAFT. Sunnyvale: $427 million; Stanford Industrial Park: $8 million; National: $1,510 million.

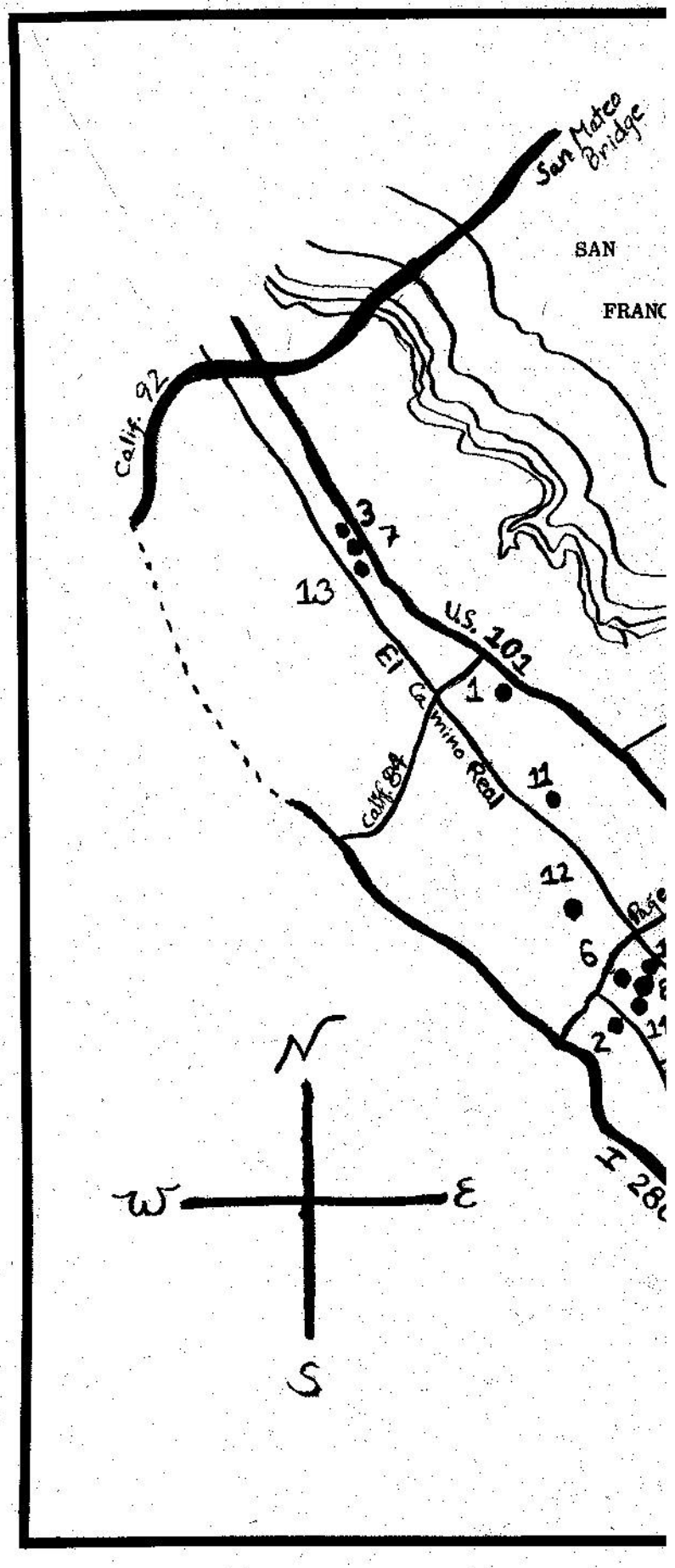
Lockheed's major local products are the Polaris and Poseidon undersea missile systems. Lockheed-Sunnyvale manufacturers the YO-3A quiet reconnaissance plane for Indochina and a "super-secret truck-spotting device" for duty over the Ho Chi Minh trail. Lockheed also works on the AN/APQ-109 for the F-4 Phantom jet, the U.S. Air Force's mainstay in Indochina.

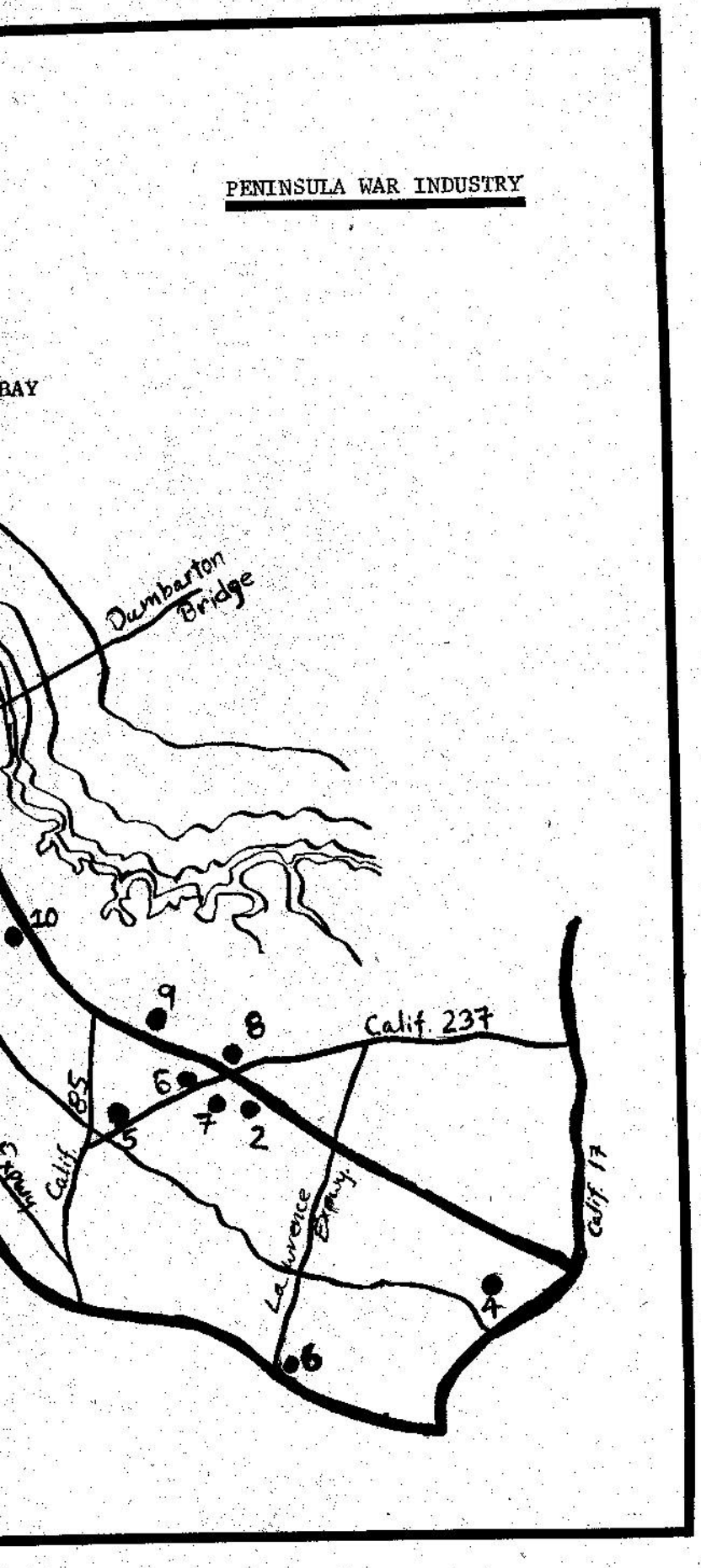
Lockheed nationally is noted for its manufacture of military transport aircraft, including the giant C-5A. Such aircraft played a key role in the April 1972 escalation of the war, rapidly moving ammunition, supplies, men, and equipment to Southeast Asia.

9. MOFFETT NAVAL AIR STATION and AMES RESEARCH CENTER.

Moffett is the Peninsula's only military base. Planes from Moffett patrol the California coast. Though Moffett's mission is not directly connected to the war, pilots trained at Moffett reportedly fly in Indochina.

Ames Research Center is a NASA (National Aeronautics and Space Administration) facility, but it does military work as well. Ames conducts and supervises some helicopter research for the Army, and it houses the ILLIAC IV, a huge, super-fast computer. The military also often uses the Gargantuan wind tunnel at Ames to test





aircraft and aircraft prototypes.

10. PHILCO-FORD, subsidiary of FORD MOTOR COMPANY. Palo Alto: $76 million; National: $218 million.

Philco-Ford's local specialty is satellite communications. The Philco-built military satellite network broadcasts photographs from Indochina to the Pentagon. Earlier this year the Air Force awarded Philco-Ford in Palo Alto a $200,000 contract to build an "Integrated Surveillance — Airborne Command Post" for the electronic battlefield.

Philco-Ford's other plants also produce devices for the electronic battlefield, and one Philco division installed the sophisticated communications system serving American bases in Thailand.

11. STANFORD RESEARCH INSTITUTE. Menlo Park: $20 million. National: $25 million.

SRI is a non-profit "Think Tank," doing over 40% of its work for the military. SRI war work includes design and testing of the electronic battlefield, tropical communications studies for Indochina and Thailand, electronic warfare research, war-gaming of tactical nuclear weapons, logistical studies of amphibious landings, social science counterinsurgency in Thailand, and research for the ABM.

12. STANFORD UNIVERSITY: Stanford had $8 million in contracts from the military in fiscal 1971, plus a few million more in grants.

An anti-war sit-in in 1969 forced Stanford to end secret research, but Stanford researchers still perform a variety of basic research and applied development tasks for the military.

13. VARIAN ASSOCIATES. Stanford Industrial Park: $11 million. San Carlos: $4 million.

The Klystron tube that the Varian brothers invented at Stanford is still the company's major product. Varian produces tubes for radar, communications, and electronic warfare. Varian also produces night-vision devices and magnetic detectors. According to the Defense Marketing Service, roughly one third of Varian's annual sales are to the government, including $7 million directly related to the War. Varian produces parts for the AN/AWG-10 "Multi-Mode Fire Control System" which directs bombs and rockets from the F-4 Phantom jet.

14. WATKINS-JOHNSON. Stanford Industrial Park: $8 million.

Watkins-Johnson does about two thirds of its work for the government. It produces advanced electronic devices for reconnaissance, surveillance, and electronic countermeasures. For example, Watkins-Johnson supplies parts for the B-52 bombers' AN/ALR-20 electronic countermeasures receiver, and the company manufactures the AN/APR-34 communications monitoring set.

Dean Watkins, the firm's founder and Chairman, was a Stanford Professor and later a Trustee. Now he is a University of California regent.

These are only some of the large local war industries. United Technology and Westinghouse in Sunnyvale are large Defense contractors, but little of their local work is used in Indochina. Smaller local firms, such as ESL, Argo Systems, Energy Systems, GTE Lenkurt, and Teledyne Microwave Electronics, to name a few, produce electronics for the Indochina War. And semiconductor manufacturers, such as Fairchild, National Semiconductor, Signetics, and American-Microsystems produce components for military applications, but they don't sell much directly to the military.

The Peninsula Has a Complex

Each year the Department of Defense spends ONE BILLION DOLLARS on the Peninsula, from Belmont to the Northern tip of San Jose. The Peninsula is one of the nation's leading aerospace-electronics complexes. Local corporations are leaders in supplying advanced technology to the military. Despite the area's widespread opposition to the Indochina War, local industries designed or manufactured much of the sophisticated equipment now used in Indochina.

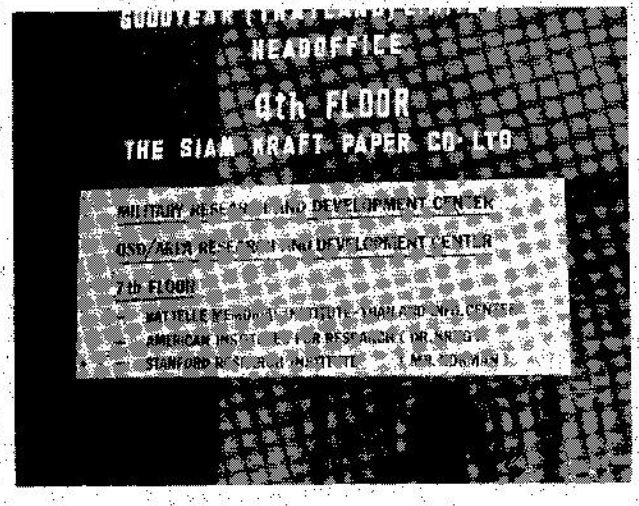
This community has not always been a "sanctuary" for the U.S. military. Since World War II Stanford University, West Coast finance and industry, and the Federal Government have teamed up to build a high-technology, warfare-oriented industrial complex on the Peninsula.

Until the late forties, Santa Clara County and southern San Mateo County were primarily agricultural areas. Woodside and Redwood City had grown up as lumber towns. San Jose was the world's prune capital. Orchards and farms covered the flatlands. Summer cottages for San Francisco's well-to-do dotted the area. In Palo Alto stood Stanford University, but throughout the first half of the century it resembled a country club, not a modern university.

The anti-Japanese war in the Pacific stimulated fantastic growth in the Bay Area. FMC in San Jose grew from a small manufacturer of farm machinery into a major producer of military vehicles. Small electronics firms, such as Hewlett-Packard, expanded to meet war needs. To the north, bay shipyards and ports exploded with activity.

Following World War II America's leaders, fearing depression, designed a permanent war economy. They formed a new Department of Defense, pushed a big defense budget, and encouraged the nation's scientists and engineers to enlist in the fight against "Communism."

When the Russians orbited Sputnik in 1957 American rulers whipped up popular enthusiasm for additional aerospace and Defense spending.

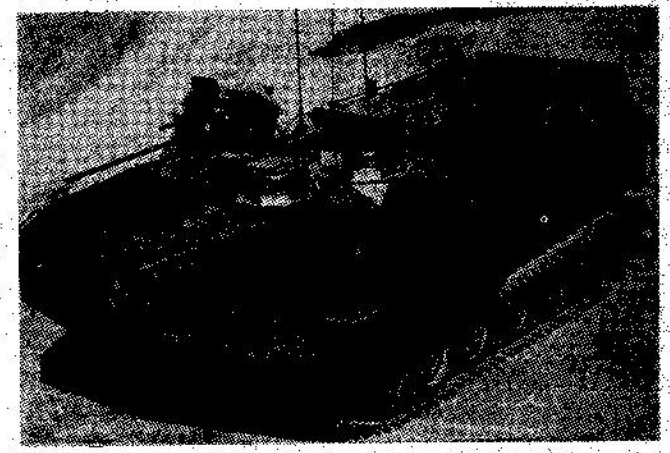


SRI'S Thailand Office

But Why the Peninsula?

Stanford University, more than any other institution, is responsible for the local development of the aerospace-defense industry. Recent campus anti-war demonstrations have forced the University to cut back its direct ties to the military, but Stanford is still the center of the Peninsula military complex.

Frederick Terman, Stanford's Provost Emeritus and Dean Emeritus of Stanford's Engineering School, was the key architect of the complex.



LVTPX-12—Landing vehicle tracked personnel experimental, FMC Corporation prototype of the new LVTP-7 series.

"We have been pioneers in creating a new type of community, one that I have called a 'community of technical scholars,'" he explained. "Such a community is composed of industries using highly sophisticated technologies, together with a strong university that is sensitive to the creative activities of the surrounding industry. This pattern appears to be the wave of the future."

Terman and his Stanford colleagues planted the seeds of the local electronics industry even before World War II. Terman encouraged his electrical engineering students to go into business. Bill Hewlett and David Packard formed Hewlett-Packard, the electrical instruments giant. John Kaar formed Kaar Engineering. Meanwhile Physics Professor W.W. Hansen persuaded the University to provide laboratory space for the Varian brothers, Russell and Sigurd. The Varians invented the klystron tube, a key component of radar, while working in the Stanford labs. In 1948 they set up their own company, Varian Associates.

During the World War Terman went to Harvard to head the military's Radio Research Laboratory. When he returned he brought back some of the nation's brightest young electrical engineers and a vision of his "community of technical scholars." By attracting federal research money, he built Stanford's Electrical Engineering Department — eventually the Engineering School as a whole — into one of the nation's best.

Meanwhile leading West Coast businessmen were

Stanford Industrial Park, circa 1962

planning a research organization, connected to Stanford, to do applied research for their companies. In 1946 they formed the Stanford Research Institute (SRI), which soon discovered, like Terman, the benefits of military funding. Stanford broke its legal ties with SRI in 1969-70 when anti-war demonstrators demanded that SRI stop its war and counterinsurgency research, but the two institutions continue to cooperate.

Stanford and SRI helped local business growth and attracted other corporations to the Peninsula. The university trained not only young engineers and scientists, but the Engineering School set up the Honors Cooperative Program, through which Engineers already in industry could take classes at Stanford. Today fully one third of Stanford's fifteen hundred engineering graduate students are enrolled through Honors Co-op. Many even take Stanford classes at their offices, over a special TV-network established in 1969.

Stanford and the Research Institute serve industry in other ways. SRI contracts to solve research problems. Stanford and SRI researchers consult for local companies. Stanford sponsors conferences and offers library, technical information, and computational services.

As the University grew, more engineering professors and students followed in the footsteps of Hewlett and Packard, forming their own companies. Some of these "spin-offs," such as Microwave Electronics and Applied Technology, have been swallowed up by other companies. Others, such as Watkins-Johnson and Varian, have made it on their own.

To aid and encourage such spin-offs, Terman created an "industrial park" with a climate conducive to high-technology industry. In 1951 he convinced Varian, then headquartered in San Carlos, to build a plant on the Southeastern corner of Stanford land. Hewlett-Packard followed suit in 1952, leasing a nearby section of Stanford vast acreage. In 1954 Stanford officially announced the formation of the Stanford Industrial Park, to be developed around Varian and H-P. Newer spin-offs found convenient plant sites in the Industrial Park, while the University earned income from the leases. Today Industrial Park firms, mostly electronics, employ over twenty-thousand people.

In 1956 Lockheed built a research facility in the new industrial park. Stanford and the Peninsula business climate attracted the huge Southern California aircraft manufacturer. Lockheed was so pleased that in 1957, when it formed its Missiles and Space Division, the new division set up shop in nearby Sunnyvale. Today Lockheed Missiles and Space Company's Sunnyvale facility is one of the nation's largest defense plants.

Stanford and its growing industrial environment brought many more firms to the area, including Sylvania, Philco-Ford, Westinghouse, and United Technology.

Transistor inventor William Shockley came to teach at Stanford in 1958. He formed the Shockley Transistor corporation, which located in the Stanford Industrial Park. Shockley Transistor failed, but its young technocrats went on to form the core of Fairchild Semiconductor. *Electronic News*, in a feature labelled "Silicon Valley," traced the development of the semiconductor components industry to Shockley Transistor and Fairchild. (Semiconductors are the building blocks of modern electronics. They include transistors and "integrated circuits" made of silicon compounds.) *Electronic News* called Santa Clara Valley "Silicon Valley" because the area is now the world's electronic components capital.

Many people are beginning to question the Peninsula's path of progress. Too many jobs are dependent upon Federal spending. And too often the products are killing Vietnamese, not improving the human condition.

It's a long way from prunes to semiconductors. Where next?

This pamphlet was prepared for the Pacific Studies Center by Lenny Siegel in July, 1972. The opinions expressed are his own and do not necessarily represent the Pacific Studies Center.

Copies of this pamphlet can be purchased in bulk from PSC for $6.50 per 500 copies.

For more information or documentation, please visit the Pacific Studies Center's office and library at 1963 University Avenue, East Palo Alto. The office is normally open from 10 am to 6 pm on weekdays. PSC's phone is 322-4664.

PSC also publishes the bi-monthly *Pacific Research and World Empire Telegram*, which carries documented research articles on U.S. foreign policy and the political economy of the Pacific Basin. Individual subscriptions (in the U.S.) to *Pacific Research* cost $5.00 for twelve issues (two years).

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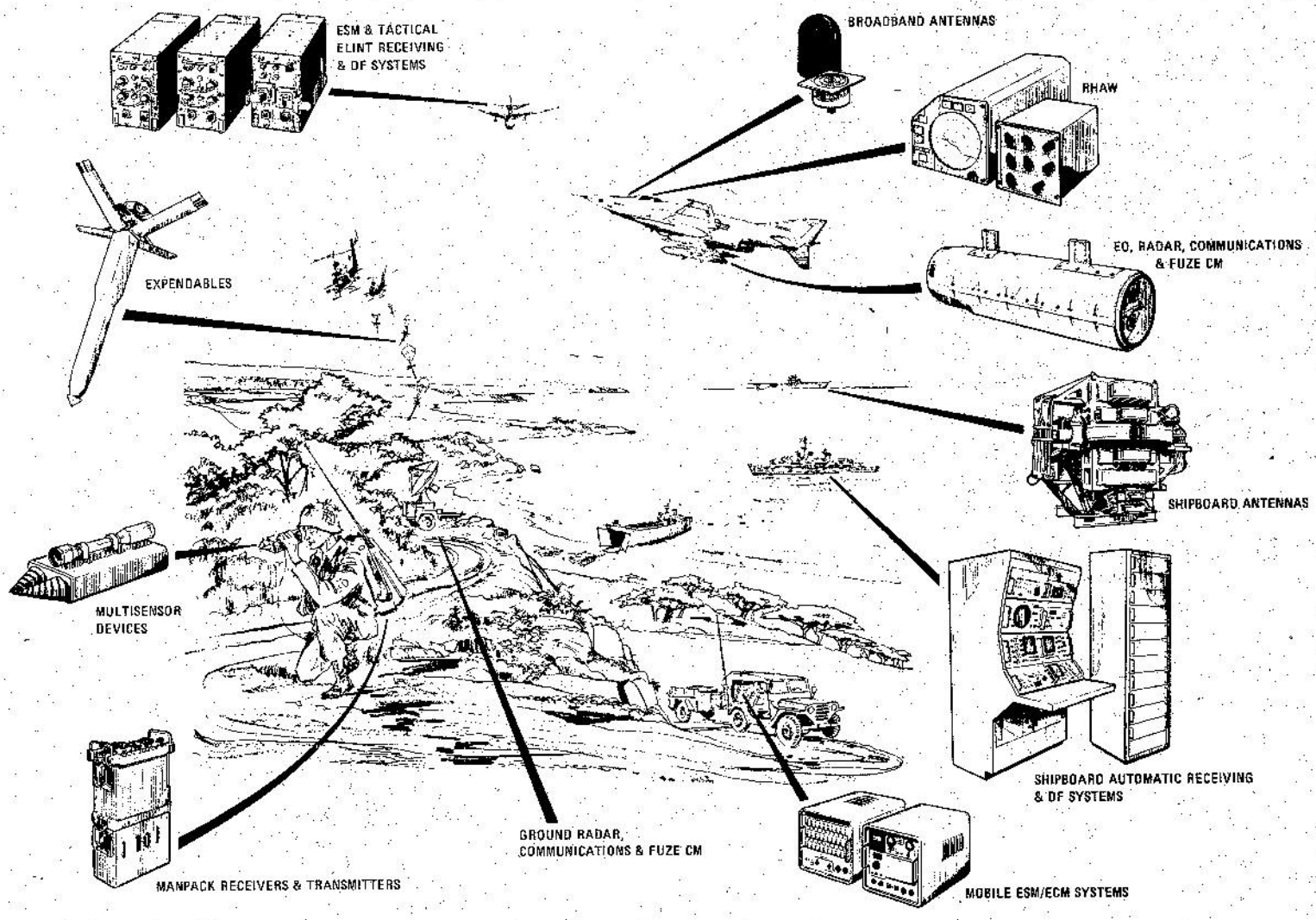

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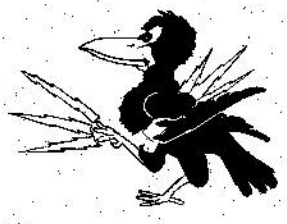

We reprint portions of this GTE Sylvania advertisement from *Electronic Warfare* magazine.