Guide to Government Aviation Buying . . .
PROCUREMENT FOR AIR POWER

AVIATION WEEK

SEPT. 25, 1950

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WRIGHT: amazed at low operating cost.

Ask H. C. WRIGHT at Nashville

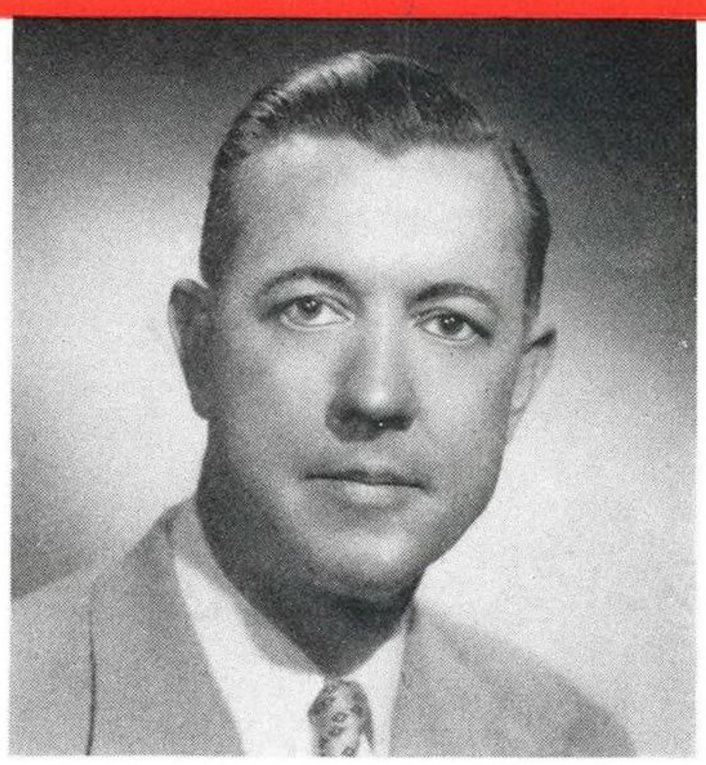
You'll get an enthusiastic answer from H. C. Wright, the capable superintendent of Berry Field. "We've had some remarkable experiences here since we installed high intensity lights, and their performance has been most gratifying to pilots and to the city. The controllable beam eliminates glare while taking full advantage of the high candlepower. The lights are most definitely paying for themselves in improved operation and increased safety for ships and passengers."



FOX: better operations in all kinds of weather

Ask FRANCIS FOX at Worcester

Worcester, Mass., was one of the first city-owned airports with L-M High Intensity Lighting on all runways. Manager Francis T. Fox and members of the City Airport Commission made a very careful check with other airport managers before the decision was made. Captain Fox, a pilot himself, recently told us: "We've had nearly three years of operation now with high intensity lights on all runways. Our lights have proved their value with better operations in all kinds of weather."

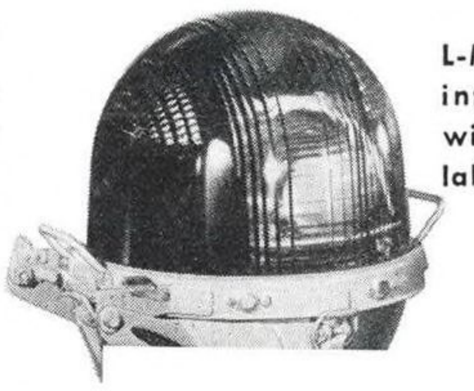


CROSS. pilots see lights 50 miles away.

Ask HANK CROSS at Birmingham

"When I was test flying B-29's here during the war and until 1949, the blackest area was over the municipal airport. The mountains and smog conditions peculiar to Jones Valley added to the problem," writes H. T. Cross, well-known Director of Aviation of Alabama's biggest municipal airport. "Last fall we installed high intensity lighting on all three runways. Airlines, pilots, and tower operators are all most enthusiastic. Pilots report seeing the lights more than fifty miles away. Typical pilot's comment: 'Now I won't be trying to let down on the First Avenue street lights instead of the runway!'"

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AVIATION GAS TURBINES

B.F.Goodrich



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Aviation Week

ABP Member ABC

Volume 53 September 25, 1950 Number 13

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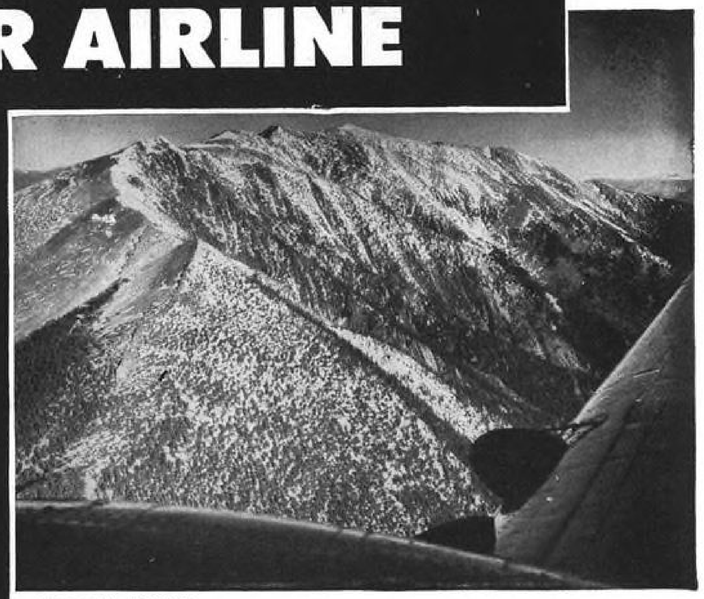
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TEXACO Lubricants and Fuels
FOR THE AVIATION INDUSTRY

To the Industry . . .



Today the USAF faces the task of meeting increased requirements occasioned by the Korean situation and our expansion program. Inevitably, we must depend upon the full cooperation and demonstrated capabilities of America's aviation industry.

To the layman the aviation industry is often considered to be confined to the airframe manufacturers. While this segment of the industry plays a part of major importance, it is pointed out that approximately 50% of today's airplane, dollarwise, is supplied from manufacturers other than this source.

The USAF wishes to encourage competition and increased participation by these other manufacturers in order to broaden the base for emergency expansion of the aviation industry and to meet the accelerated production schedules under our current program. In line with this thinking, the USAF has requested prime contractors to thoroughly survey the field of possible subcontractors before making demands on the government for increased plant facilities. Such a policy, we feel, will have the effect of not only broadening our industrial capabilities and meeting the increased requirements, but will place an increasing amount of Air Force business into the hands of smaller manufacturers.

The dissemination of procurement information to additional potential sources is a valuable service to both the Air Force and the aviation industry.

K. B. Wolfe
Lieutenant-General, USAF
Deputy Chief of Staff, Materiel



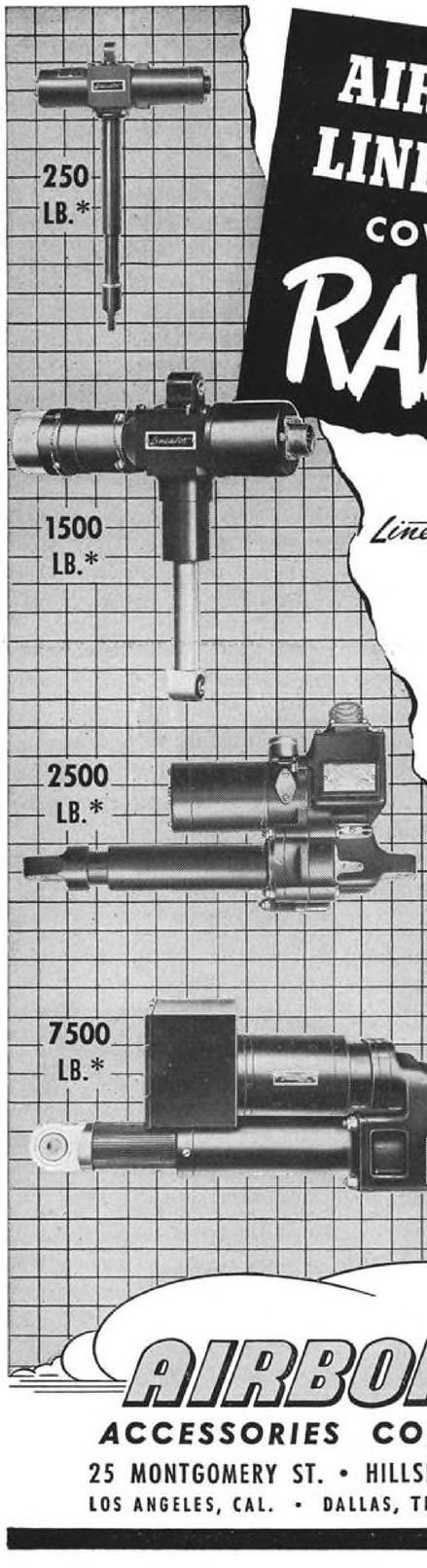
With appropriations secure, we find ourselves facing squarely the job of attaining the production schedules which have been made our goals.

At the moment, all concerned are thrashing around, in the uncertainty of when and what controls will be applied, in efforts to line up facilities, personnel, subcontractors and material.

Inevitably, competition has entered all of these fields. Without it, it is questionable whether very many of us would be putting out all of the effort of which we are capable, and, at this point, the competition serves to emphasize the areas in which we are weakest and to which rectification must be applied.

The Bureau of Aeronautics is undertaking, with all of the means at its command, to alleviate the trials of this period of transition from plans and expectations to requirements to deliver the hardware. Adjustments in programs, assistance in acquisition of facilities and materials, approval of extensive subcontracting, and entertainment of proposals of newcomers to the industry are offered, all with a view to getting the equipment on order on schedule and at a reasonable price, and toward improving our mobilization potential if this be required.

A. M. Pride
Rear Admiral, USN
Chief, Bureau of Aeronautics



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NEWS DIGEST

Rentzel to CAB

Senate confirmation was expected late last week on the nominations of Delos W. Rentzel to become Chairman of the Civil Aeronautics Board, and of Donald W. Nyrop to succeed Rentzel as Civil Aeronautics Administrator. Nyrop has been deputy administrator.

Closer coordination between CAB and CAA is expected to result from the Rentzel appointment, possibly leading to a reunion of the two federal agencies, separated in 1940. In this event CAB Chairman Rentzel probably would also serve as administrator, following the pattern of the Maritime Board and Maritime Administration reorganization (AVIATION WEEK, June 12.)

Edward M. Sturhahn, executive assistant to the administrator, probably will succeed Nyrop as deputy administrator.

Turbodyne to GE

General Electric Co. last week announced completion of final purchase of the Turbodyne Corp. and its Turbodyne propeller turbine engine, confirming AVIATION WEEK's exclusive report of July 31 that GE "moved back into the turboprop field by purchasing the Turbodyne."

C. W. LaPierre, GE Aircraft Gas Turbine division manager, said that purchase included patents, name, and technical data, and that GE would test and evaluate several engines built by Turbodyne.

100 Groups for AF

Joint Chiefs of Staff have asked President Truman for another huge increase in Air Force and Navy plane procurement for fiscal year 1951, as the beginning of a build-up of a 90-to-100 group Air Force, instead of the 69-group level presently planned for.

Navy plane procurement boosts asked would enlarge Navy air strength correspondingly, to equip and operate 12 large and 15 small aircraft carriers, as compared to seven and eight carriers now operated.

Prototype Bill Ready

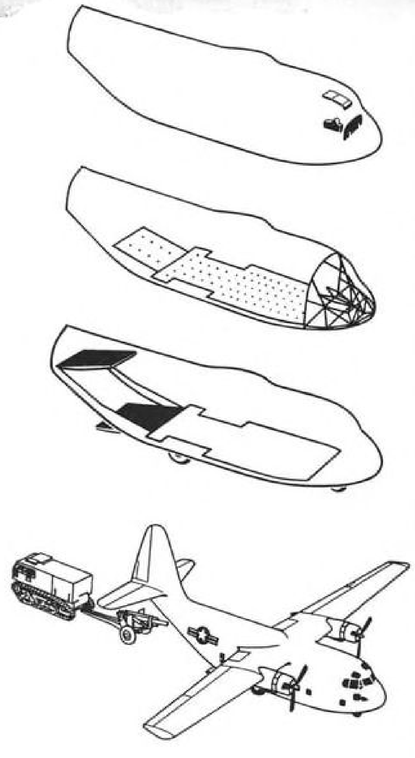
Passage last week by the House of the $12.5 million air transport prototype testing bill virtually completed Congressional action except for Senate concurrence in minor amendments, including one sponsored by the Air Line Pilots Assn. which would make organized labor respresentatives consultants in planning the test program.

AVITRUC
—keeping ahead



World War II emphatically demonstrated the urgent need for versatile cargo aircraft. In today's military logistics, rugged assault transport planes, capable of landing troops and supplies in forward combat areas, or on short unprepared fields are basic requirements.

Avitruc is the result of combined research by Armed Forces and Chase engineers to produce an assault aircraft which meets these specifications.



EFFICIENCY

Standardized cockpit instrumentation provides simplicity of operation, facilitates training of new pilots and reduces familiarization time of experienced flight personnel.

SAFETY

Steel tube nose, raised flight deck, and sturdy bulkhead between cockpit and cargo compartment provide maximum protection for flight personnel. Tie-down fittings each with 10,000 lb. capacity in any direction, on a 20" grid pattern in cargo compartment floor assure load safety, prevent cargo shifting.

ACCESSIBILITY

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PERFORMANCE

Avitruc will carry a useful load greater than its own weight. At "Exercise Swarmer" last spring, two Avitrucs landed, unloaded and were again airborne in less than four minutes, proving conclusively their value as assault cargo aircraft.

Chase AIRCRAFT CO., Inc.
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STROUKOFF AVITRUC

AVIATION WEEK VOL. 53, NO. 13
SEPTEMBER 25, 1950

This Is Your Aviation Market

Your aviation market is larger now than at any time since the war.

Before next June 30:

- **Contracts for $7.5 billion** will be let for new planes.
- **More than $4 billion** in orders will go to subcontractors, material suppliers and vendors of parts.
- **More than $1 billion** worth of avionics will be ordered.
- **More than $7 billion** will be spent by the Air Force on buying, maintaining and flying aircraft; more than $3 billion will be spent by the Navy.
- **At least $2 billion** will be spent by the two services on aviation equipment, some for new planes, the balance for operating, maintaining and overhauling existing planes, and for training.

The largest lump of government aviation funds, of course, will go initially to the manufacturers of airframes and engines: $4.4 billion from the Air Force; $2.2 billion from the Navy; and $1.1 billion from the Mutual Defense Assistance Program.

But your Air Force and Navy market goes beyond the purchase of new aircraft:

- **Roughly 50 percent** of the money budgeted for new planes goes to the airframe manufacturers.
- **About 32 percent** is spent for powerplants and propellers.
- **About 13 percent** purchases electronics installed in the planes.
- **Another 1 percent** buys the armament.
- **Approximately 4 percent** of the money is spent on instruments, landing gear, special handling equipment and tools, and the many other items peculiar to each type of aircraft.

In buying planes, all items except the airframes are "Government Furnished Property" (GFP) which the services buy direct and have shipped to the airframe manufacturers. In fiscal 1951 plans, GFP for new planes totals about $3.3 billion, actually a little more than one-half the expenditures of AF and Navy on new aircraft.

▶ **Additional Purchases**—There is at least $700 million more to be spent on equipment for existing planes, for training devices, for avionics, for ground handling and servicing, for meteorological purposes.

And fuel purchases will amount to several hundred million dollars. In its original budget, the Air Force requested $136,650,000 for fuel and oil. That was before Korea. In its supplemental appropriation request, the Air Force did not disclose how much it was asking for fuel; the Navy did not detail its fuel purchases in either its original or supplemental budgets.

Weapons and ammunition will cost the services about $600 million.

▶ **The Equipment Market**—The military aviation equipment market is the most appealing for aviation business men in general. Since the end of the war, less than a half-dozen new companies have succeeded in getting prime engine or airframe production contracts.

By several ways of reckoning, the Air Force and Navy market for aviation equipment is more than $2 billion, excluding fuel.

And it is a market for thousands of firms.

Reports of the Senate and House Appropriations subcommittees on the Air Force and Navy budgets spotlight some of the major equipment purchases planned under the original budgets. Detailed break-downs of all equipment spending were not included in the supplemental appropriations asked after Korea.

These reports, though preliminary, show the nature of military aviation equipment spending:

- **Weapons and ammunition,** $600 million.
- **Photographic equipment,** $12 million.
- **Flight clothing,** $2.5 million.
- **Shop and warehouse** equipment, special equipment for laboratories, and other purposes, $12.5 million.
- **Meteorological equipment,** $13 million.
- **Training equipment,** $23.5 million.
- **Aircraft spare parts** for maintenance and overhaul, $105.5 million.
- **Weapons spare parts,** $3.5 million.
- **Engine containers,** $2.7 million.
- **Catapults and RATO,** $2.7 million.

Those items total $778 million. Add to that figure the projected Air Force and Naval Aviation avionic expenditures (page 65) totaling $983 million. GFP for new planes, excluding armament and avionics, comes to about $300 million.

That indicates that at least $2.1 billion in military aviation equipment will be contracted for in fiscal 1951.

There's another way to get a line on the equipment purchases. Roughly 18 percent of the new-plane funds will go for equipment (the other 82 percent goes to airframe and powerplant manufacturers). That equals about $1.2 billion. Add to that the $778 million and non-GFP avionics expenditures of $408 million, and you get total military aviation equipment funds of nearly $2.4 billion. So the minimum market is $2.1-$2.4 billion.

▶ **The Trend**—That is the equipment picture as it appears this early in the Air Force and Navy re-equipping program. A study of the services' requirements reveals some trends of what the future may be like:

- **Overhaul and replacement parts** for airframes and engines will be bought in greater amounts.
- **Radio and radar parts** purchases will increase.
- **Training equipment** expenditures will rise.

—William Kroger

What the USAF and Navy Will Spend:

$11,541,611,298

Below are obligations contemplated under the 1951 fiscal year budget. Air Force's budget totals $9,926,304,000, including pay and allowances not shown in table below. Naval aviation's budget, also including pay, totals $3,473,069,000.

U. S. Air Force

	1949 (Actual)	1950 (Estimated)	1951 (Estimated)
Aircraft and related material	$655,881,475	$1,611,081,045	$4,342,406,708
Electronics	49,908,920	120,675,890	115,000,000
Guided missiles	17,745,670	16,269,227	17,000,000
Industrial mobilization	5,642,278	14,998,930	13,974,392*
Special procurement (weapons, vehicles, training aid equipment)	28,422,063	121,625,000	608,600,000
Maintenance and operations	1,000,854,554	1,038,708,312	1,840,762,000
Research	23,893,985	29,146,266	32,824,000**
Development	137,634,019	129,916,385	120,729,000**
Operational engineering	7,619,245	14,537,093	12,450,000**
Reserve: Aircraft, maintenance and operation	24,355,611	22,370,973	16,732,620
Reserve: Installation, maintenance and operation	34,047,081	27,695,892	24,258,380
ROTC	5,700,000	8,667,000	9,600,000
ANG: Aircraft, maintenance and operation	20,147,468	26,771,927	28,297,940
ANG: Installation, maintenance and operation	34,369,352	54,904,351	49,688,200
Totals	**$2,046,221,721**	**$3,237,368,291**	**$7,232,323,240**

* Exclusive of an undetermined allocation from a $70,000,000 appropriation made to the Secretary of Defense for industrial mobilization.

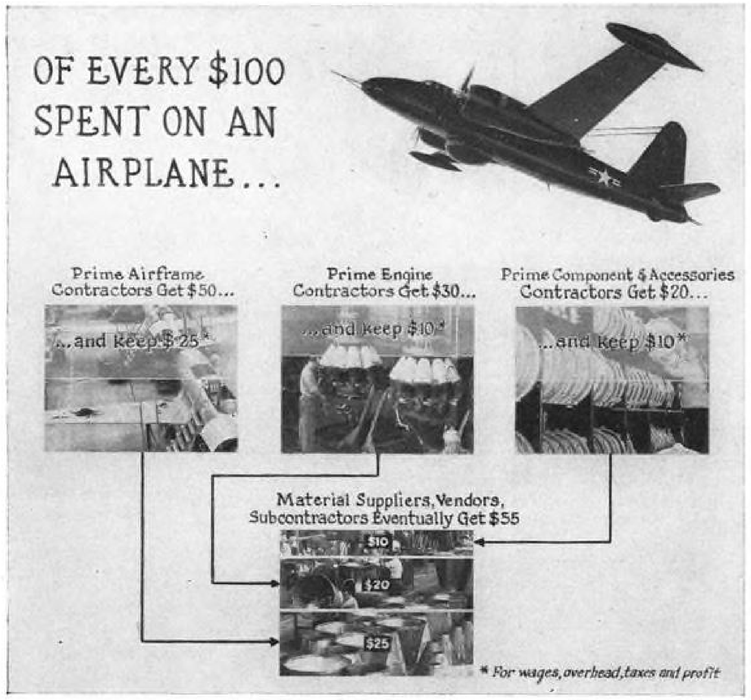
** Exclusive of an undetermined allocation from a $120,000,000 appropriation made to the Secretary of Defense for industrial mobilization.

Naval Aviation

	1949 (Actual)	1950 (Estimate)	1951 (Estimate)
Piloted aircraft procurement	$312,467,350	$540,955,154	$2,278,612,000
Pilotless aircraft procurement	11,223,071	11,700,000	13,000,000
Technical equipment for service training	1,848,898	1,450,000	3,200,000
Aircraft modernization	7,918,680	2,847,000	51,009,000
Ordnance for new aircraft	25,581,117	16,506,520	40,741,000
Flight operations, regular	86,123,974	73,483,349	118,892,000
Flight operations, reserve	20,229,185	19,304,905	20,573,000
Aircraft overhaul, regular	145,271,667	142,083,874	182,921,000
Aircraft overhaul, reserve	44,212,442	40,974,156	43,865,000
Station operations, regular	125,937,923	110,870,251	127,705,000
Station operations, reserve	8,583,240	9,123,599	9,125,000
Supporting equipment, materiel and services	30,671,771	24,136,582	66,079,000
Research and development	110,000,000	77,853,434	102,760,000
Industrial mobilization	6,655,153	4,062,949	13,164,491
Totals	**$936,724,471**	**$1,075,351,773**	**$3,071,646,491**

Mutual Defense Assistance Program

	1950 (Estimate)	1951 (Estimate)
Air Force:		
Aircraft and spares	$65,473,668	$1,052,032,379
Aeronautical equipment and supplies	9,172,236	64,409,738
Electronics and signal equipment	23,339,425	89,137,862
Navy:		
Aircraft, spare parts, and aeronautical equipment and supplies	6,586,000	32,061,588
Totals	**$104,571,329**	**$1,237,641,567**



Where the Aircraft Money Goes

Subcontractors, material suppliers and parts vendors get over $4 billion of the $7.5 billion spent on planes.

By Rudolf Modley*

If your firm sells parts or materials to aircraft makers, or does subcontract work for them, your market may be bigger than you think.

Less than 100 prime contractors will have to spend a total of more than $4 billion with vendors and subcontractors from this fiscal year's aircraft procurement funds.

Out of every hundred dollars spent for military aircraft procurement, about $50 are spent for airframes, $30 for powerplants and propellers and the remaining $20 for communications equipment, armament, and other accessories. The powerplants, propellers and accessories are purchased by the government and furnished to airframe prime contractors for final assembly into the airframe.

But the initial distribution of funds gives no indication of where the money goes. This article will try to establish the ultimate distribution of aviation procurement funds.

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▶ **Airframes**—Let us look first at what happens to the $50 spent on airframes. This money goes to about 20 so-called prime contractors who are the only ones to enter into direct contractual relations with the government to deliver a finished product.

But these companies are not, and never have been able to provide all the material and do all the necessary work by themselves.

Even in 1914, in the early days of aviation, manufacturers spent 17 percent of the value of their products on material, supplies, fuel and purchased energy. Since then, more and more has been purchased from the outside.

By 1937, 26 percent of the value of the products of airframe manufacturers went to pay for outside purchases. No figures have been published by the Bureau of the Census since then on this subject. But the 1949 annual report of Grumman states that its material cost alone amounted to 32.7 percent in that year.

From this we can estimate that roughly one-third of the money received from sales by airframe manufacturers went for outside purchases. Two-thirds represent what is being called the "value added by manufacture."†

▶ **Where Airframe Money Goes**—We may therefore assume that of the $50 presently spent on airframes, about $16.66 goes to pay for materials, fuel, electricity and contract work—with material and contract work consuming at least $16 of this sum.

An even larger share of the $50 will soon go to contract work.

Experience shows that contract work increases rapidly in emergency periods. In World War I, outside purchases jumped from 17 percent in 1914 to 50 percent in 1919. And in World War II, subcontracts increased from 8 percent of total production of airframes in 1940 to 38 percent in December 1944.

The figures for the Republic P-47 fighter production in Farmingdale, L. I., are a characteristic sample of wartime subcontracting:

December	Percent subcontracted
1941	10
1942	20
1943	52
1944	68

With renewed emphasis on subcontracting it is certain that of the $50 going to airframe prime contractors more than $25 will ultimately find their way to subcontractors, vendors, and suppliers of material.

▶ **Engines and Propellers**—Of the $30 which go to manufacturers of powerplants and propellers, an even larger share will go the same way. Even in 1939, outside purchases accounted for 38 percent of the value of engines shipped. By 1947, this had grown to 46 percent. And subcontracting during World War II, both for engines and for propellers, reached substantially higher figures than subcontracting for airframes.

It is therefore reasonable to expect that $20 out of the $30 awarded in engine and propeller prime contracts will go to subcontractors, vendors, and suppliers of material.

▶ **Components and Accessories**—No overall data are available for makers of components and accessories, which covers communications equipment, armament, photographic equipment, instruments and several other such categories.

According to the 1947 Census of Manufactures, aircraft equipment (which includes landing gear, bomb racks, parachutes and airframe subassemblies, but excludes instruments and electrical equipment) manufacturers spent 34 percent of the value of their products in that year for material, contract work, etc.

† In establishing this estimate, allowance has been made for two factors: First, additional allowance has been made for the cost of fuel and electricity; second, adjustment has been made for the fact that Grumman's percentage of material cost appears substantially higher than that of other major airframe manufacturers.

This percentage is about equal to that spent by airframe prime contractors —about one-half—and we shall probably not be too wrong in applying the same ratios to components and accessories which we have applied to airframes.

So, out of the $20 spent on components and accessories, $6.66 now go for material, contract work, etc. But $10 of the $20 will go for these outside purchases when subcontracting becomes more prevalent.

▶ **Ultimate Distribution**—Summing up, we find that out of every hundred dollars spent for military aircraft procurement we may soon expect the following ultimate distribution:

Airframe prime contractors	$25
Engine and propeller prime contractors	10
Component and accessory prime contractors	10
Material suppliers, vendors, subcontractors	55
TOTAL	$100

If we apply the 55-percent figure to $7.5-billion worth of aviation procurement contracts available, we find that about $4,125,000,000 will flow to subcontractors, vendors, and material suppliers.

Where will the orders come from?

▶ **Industry Spends**—The source of all these orders will be the prime contractors and not the government directly. The number of prime contractors is small. Even at the height of World War II, there were in this country only 55 airframe, 20 engine, and 6 propeller facilities operated by prime contractors. Renewed quantity production of military aircraft will probably be based on even fewer plants of prime contractors.

What will be bought—and from whom?

Considering the enormous size of this market it is surprising how little is known about it. But these are some of the things we do know:

• **Metal Market.** Aluminum is probably the most important item on the list of materials. Three pounds of aluminum mill shapes were consumed for every pound of military and transport aircraft shipped in 1947. An additional half-pound of rough and semi-finished aluminum castings were consumed by the aircraft and engine industries.

This consumption rate, which is not very different from that which prevailed during World War II, accounted for more than 50 percent of all the aluminum used in this country in the second quarter of 1944.

There were also consumed in 1947 4½ lb. of steel mill shapes and forms for every pound of airframe weight shipped. Of this, 1¼ lb. were stainless steel and more than 1 lb. other alloy steels and shapes; most alloy steels went into engines. At the height of World War II, the aircraft industry consumed nearly 10 percent of all alloy steel.

• **Subcontracting Market.** Although the extent of subcontracting is based on the time it would require "to perform within the plant that part of the airframe, engine or propeller manufacturing process being produced outside the prime contractor's plant by an independent plant," many of the prime contractors do not even have the equipment to do this work within their plants.

Thus, of 52 establishments in the aircraft industry in 1947 (some of which are not prime contractors) many relied heavily on outside help for metalworking operations. Only four of these plants did their own die casting, eight their own forging and nine their own galvanizing and other hot dip coating. Fifteen had their own foundries, and the same number reported automatic screw machine departments.

Of 49 establishments reporting in the engine industry (30 of which had 100 employes or more), only two did their own die casting, only two their own forging, four their own plate or structural fabrication, five their own galvanizing. Seven had their own foundries, and ten had pattern shops.

• **Electric Motor Market.** The demand of the aircraft industry on the electrical industry can be demonstrated by one example. During 1944, an average of almost 44 fractional horsepower motors were shipped for every aircraft produced during that year. The 4,210,000 motors shipped made up 30.7 percent of total shipments of such motors in 1944.

With military aircraft becoming heavier and faster and more difficult to operate by hand, we may expect an even greater number of motors per plane.

• **Bearing Market.** The use of antifriction ball and roller bearings may serve as a final example. More than 8800 such bearings were shipped per aircraft produced during representative periods of World War II. For a considerable period of time, aircraft use represented more than 40 percent of total shipments.

▶ **Demand to Grow**—Those are only sample indications of the effect which accelerated procurement of aircraft may have on other industries. When referring back to examples based on experiences during World War II, you should keep in mind that aircraft supply contracts then never exceeded 35.2 percent of total war supply contracts.

The relative importance of aircraft supply contracts is much greater at present and all indications are that this increased importance will continue.

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Renegotiation

Learn the principles of the law; your contracts may be affected.

If you do enough business with the government, renegotiation concerns you.

With a few exceptions, all contracts over $1000 for aircraft and related material have been subject to government review of profits, if they were signed after May 21, 1948, when the Renegotiation Act of 1948 first became effective.

But since July 1, 1949, all "negotiated" contracts in excess of $1000, for aircraft or other material have been subject to renegotiation. Also subject are all subcontracts in excess of $1000 under any prime contracts that are renegotiable.

▶ **Little Ones Get Away**—To simplify the complex problem of renegotiating big business dealings with government, legislation provides that renegotiation proceedings will not be conducted with a company unless its gross business under these contracts and subcontracts amounts to more than $100,000 in its fiscal year.

As a result, the small contractor who does less than $100,000 worth of procurement business within any single fiscal year can, for the most part, forget about renegotiation until he becomes big business with enough government contracts to come within the regulations.

Administrative powers for the Department of Defense are delegated by the Defense Secretary to the Military Renegotiation Policy and Review Board, headed by Frank L. Roberts, Room 4E-959, Pentagon Bldg., Washington, D. C.

The board is made up of three chairmen of three second-echelon renegotiation boards—one for each of the armed services.

The top board establishes and administers all policies of renegotiation and procedures and sits in review on appeals by contractors on decisions by the individual service boards. It also assigns contractors to a service board. In cases of joint procurement, the board decides which service board shall handle a specific case for renegotiation. Generally, a case is assigned to a service

board on the basis of predominance of business.

The Policy and Review Board sends out report forms to companies which it has reason to believe have done enough business in a fiscal year to require renegotiation.

Under the renegotiation articles, it is mandatory that a contractor notify the Policy and Review Board within 30 days after receipt of a contract that he has such a contract, has not previously reported under this ruling. If he has previously notified the Policy and Review Board, renotification is unnecessary and only causes excess paper work both for himself and for the government agency.

► **Board Letter**—The recently revised letter which accompanies the form mailed out by the Policy and Review Board states in part:

"The purpose of this letter is to obtain information which will enable the Military Renegotiation Policy and Review Board to determine whether renegotiation proceedings should be conducted with your concern.

"If you had gross receipts or accruals from renegotiable business which aggregated $100,000 or more in your latest fiscal year, the filing of the inclosed 'Standard Form of Contractor's Report' is required. In such case this report must be filed on or before the last day of the fifth month following the close of your fiscal year.

"If your receipts or accruals from renegotiable business did not aggregate $100,000 for your fiscal year you are not subject to renegotiation for such year.

"In that event, it is requested that you file the inclosed form entitled 'Statement by Contractor as to Non-Applicability of the Renegotiation Act of 1948.'

"Neither this letter nor your reply will constitute the commencement of renegotiation proceedings. Upon the receipt of the 'Standard Form of Contractor's Report,' a determination will be made as to which renegotiation division should conduct such proceedings. The filing of this report is in accordance with the requirements of Paragraph 422.222 of the Military Renegotiation Regulations."

Paragraph 422.222 of MRR gives further requirements about the form and is supplied in the "kit" mailed to the contractor together with other applicable regulations and the basic law.

The three service boards and the top board have authority to audit the books and records of any contractor subject to the act, if they decide it is necessary after examining the forms returned by the contractor. The five-month deadline indicated in the letter for filing the report is not an absolute one, however, but can be extended by the board if special circumstances are cited by the contractor.

► **Report Form**—The revised contractors' report form is a statement of his estimated business for the year, product sold, or service rendered, and must be accompanied by a profit and loss statement, statement of surplus and also the balance sheet as of the close of his fiscal year.

To give the aircraft industry a cross-section of what contracts are considered subject to renegotiation the Roberts Board publishes, periodically, lists of contractors and contracts falling under that category.

The lists are particularly useful to subcontractors and may be found in the Federal Register.

► **Segregating Sales**—In presenting renegotiation material to the board, one of the most important tasks that a contractor has to perform is the segregation of renegotiable sales from non-renegotiable sales. To aid the aircraft industry in this connection, the Policy and Review Board has issued a "synopsis of methods for identifying contracts and subcontracts subject to the Renegotiation Act of 1948."

In segregating sales, the board points out:

• **Contracts and subcontracts** entered into before May 21, 1948, are generally not subject to renegotiation.

• **Contracts and independent** purchase orders not part of a blanket order and not in excess of $1000 are not subject to renegotiation, even though several may be under the same renegotiable prime contract. In other words, the fact that separate subcontracts and purchase orders (each for $1000 or less) under the same renegotiable prime contract aggregate more than $1000 does not subject such separate subcontracts and purchase orders to renegotiation.

• **All billings**, regardless of amount, under a renegotiable contract, subcontract or purchase order, must be included in reports of sales subject to renegotiation.

► **Vinson-Trammel Suspended**—One of the most important features of the current renegotiation legislation is that the profit limitation provisions of the Vinson-Trammel Act are expressly declared to be not applicable to any contract or subcontract subject to the Renegotiation Act of 1948.

The Secretary of Defense has delegated to the Secretaries of the Army, Navy and Air Force authority to exempt individual contracts and subcontracts from renegotiation. Similarly he has delegated authority to the Policy and Review Board to exempt contractors and subcontractors by general classes and types.

To make the program workable, the Policy and Review Board has promulgated several class exemptions. Most important of these are:

• **"Collateral item" exemption.** This exemption covers all subcontracts for machinery, equipment or materials used in processing an end product or an item incorporated therein.

The exemption does not apply for the purchaser of such machinery or equipment who has acquired them for the government. The collateral item exemption ruling is due to expire on Oct. 1, 1950, but is very important to subcontractors preparing renegotiation data for periods prior to that date.

• **"Stock item" exemption.** This exemption covers all subcontracts entered into on or after Jan. 1, 1949, and is for items customarily purchased for stock in the normal course of business.

Exemption holds true except when such items are specially purchased for use in performing a contract or higher tier subcontract subject to the Renegotiation Act of 1948.

► **Bible**—Most important document issued by the government concerning renegotiation information is the packet entitled "Military Renegotiation Regulations."

The subscription price is $2.50. For his money the businessman gets a complete set of the latest military renegotiation regulations and any supplemental amendments to statutory regulations which may be published during the 12 months beginning Oct. 1, 1950. Also included in the packet are the numbers of contracts which are subject to renegotiation held by contractors on that date.

These lists are furnished to subscribers in supplemental form as they are prepared during the same period.

The Military Renegotiation and Policy Review Board cannot supply them, so all requests for the regulations (contained in a loose-leaf binder) must be addressed to the Superintendent of Documents, Washington, 25, D. C.

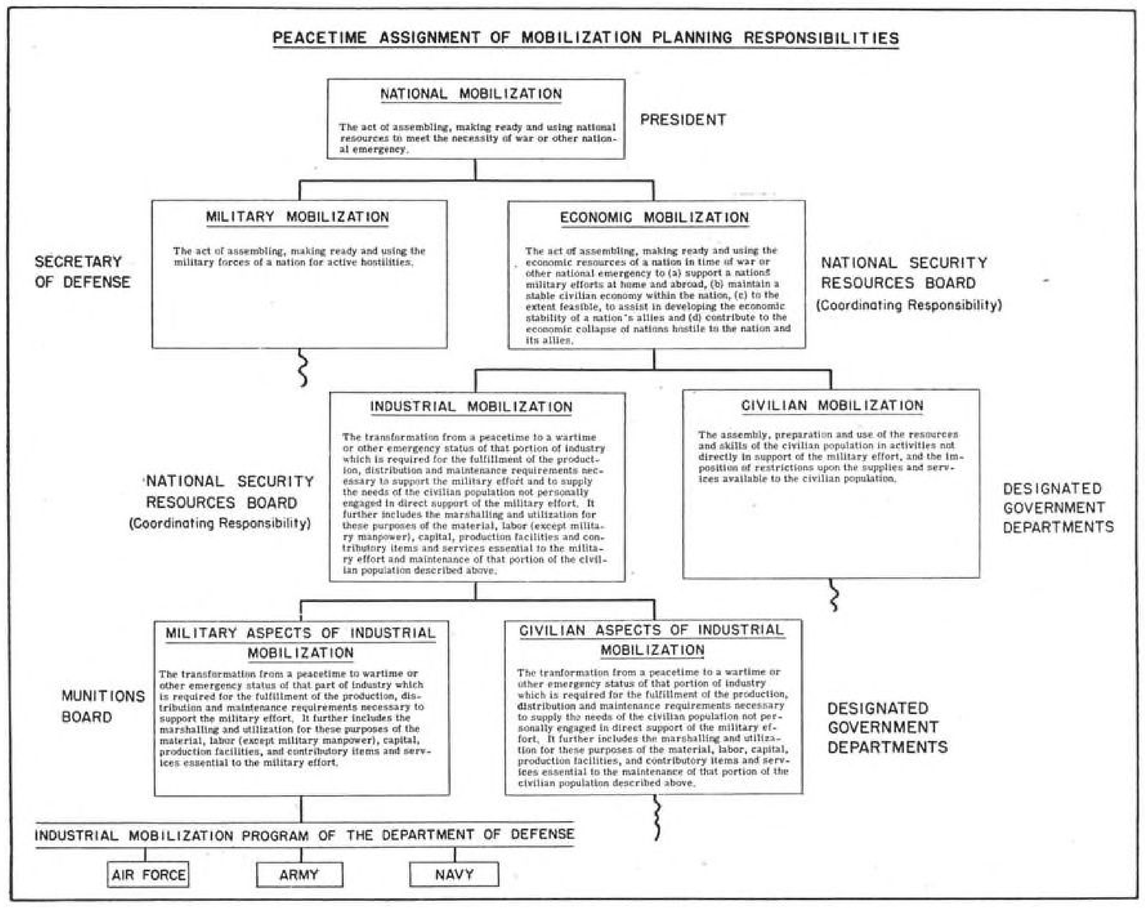
Small Business

For purposes of military contracting, the Department of Defense is utilizing the Department of Labor definition of small business:

Small business is defined as a company whose aggregate number of employes totals less than 500, including its subsidiaries.

Department of Defense is now awaiting a new statistical analysis in preparation by the Department of Commerce which will spell out the difference between small and big business in more qualitative terms.

Department of Defense has no measure of its own.



What Industrial Planning Means

An understanding of how it works should help you prepare your plant to get more defense business.

By Alexander McSurely

Where does industrial planning leave off and production start?

This question is giving planners of the Air Force, Navy and Munitions Board an oversized headache as they readjust their former plans to meet the needs of the Korean crisis and what may follow.

In simple terms the new planning problem for industrial mobilization is this:

To revise the overall plan for all-out production, so that it starts from a higher basic production level—about three times as high as that of the pre-Korean level.

To do the job, the Air Force and Navy aviation planners will have available approximately $43.6 million, on the basis of present plans, for fiscal year 1951 spending. This compares with the $18 million which was allocated under the original 1951 basic budget.

Air Force share of the industrial planning funds will amount to approximately $30.5 million, of which $16.5 million has been added as a supplemental allocation. Navy aviation gets $13.1 million, of which $9.1 million was supplemental to the original budget.

► **Pre-Planning Pays Off**—From a planning standpoint it would have been simpler to go from the pre-Korean level directly into all-out industrial mobilization than to go to the production level now planned, somewhere in between. But as this "part-way" industrial mobilization gets started, the planners are seeing with some satisfaction how the basic planning they have been doing for the last several years is now paying off.

One current example is the contract which has just been signed for the Ford Motor Co. to make Pratt & Whitney R-4360 piston engines in the World War II Dodge plant at Chicago. This came about as a result of planning contracts for licensor-licensee agreements between Pratt & Whitney, and Ford, Buick and Nash to make this engine (AVIATION WEEK March 13).

It is understood that all three of the automobile manufacturers submitted plans for operating the Dodge plant as a separate source of the R-4360 engines, and that the Ford plan was selected. Presumably if the requirements for the R-4360 should mount beyond the combined capacities of Pratt & Whitney and the Ford Chicago operation, Buick and Nash might be called on.

Key factor in the aviation industrial planning is the close cooperation which has been maintained between Air Force and Navy Bureau of Aeronautics to prevent overlaps and duplication. Observers say that probably nowhere else in the Department of Defense has unification and integration of program been accomplished so successfully. This is due in large measure to the fact

that integrated aviation industrial planning of the Navy, Air Force and Army has been a reality since the World War II days of the Joint Aircraft Scheduling Unit, an interservice coordination group.

► **Package Programs**—Air Force and Navy divide their aviation planning into package programs for specific airframes. These are subject to revision in cycles, to insure that new industry research and technical progress have not made them out-of-date.

But the pre-Korean plans have been thrown out of cycle by the new requirements which have necessitated a new look at many of the old plans.

Each package plan sets up the requirements for making a specific plane or major component. Manufacturers are listed with peak production rates required. Breakdowns show potential production of each manufacturer, any additional design requirements for high volume production, and the current status of the plane or component. Complete plant assignments for a subcontracting program, and requirements for plant capacity, machine tools and manpower are shown.

► **Mobilization Details**—Details of the expenditures to be made under the additional industrial mobilization budget made available in the supplemental appropriations are not yet firm. As a guide to how the new funds will be expended, however, the pre-Korean basic fiscal year 1951 industrial mobilization budgets are helpful.

Air Force planned to spend $10.5 million of its $14-million total for industrial preparedness measures as follows:

- **Mobilization preparedness,** $2,747,087.
- **Licensor-licensee contracts,** $2,065,994.
- **Subcontractor preparedness,** $370,000.
- **Basic studies,** $100,000.
- **Manufacturing methods,** $4,694,000.
- **Materials planning,** $525,000.
- **Air Force contribution** to Joint Armed Services Medical Procurement Agency, $31,619.

Largest other items in the budget were for maintenance of four reserve Air Force plants, $1,654,000; and for maintenance and corrosion prevention on the Air Force machine tool reserve of 30,287 machine tools and 23,000 other related production equipment items, $605,000.

Navy's basic 1951 aviation industrial planning budget called for spending $2,246,000 on direct contracts for production preparedness; $766,000 for industrial resources studies; 767,000 for machine tool preservation and repair; and $120,000 for reserve plant maintenance.

► **Supplemental Spending**—Without any official program yet crystallized for the large supplemental industrial planning appropriations, it is still logical to predict that the distribution of funds will be somewhat as follows:

- **Subcontractor preparedness contracts** will get heavy emphasis. This field has been almost overlooked heretofore, due to the pared-down mobilization budgets.
- **Steps to put into use** improved manufacturers' methods already developed will have heavy emphasis, as larger volume production is called for. Manufacturing methods which would be uneconomic on the small 215-plane-a-month production rate of June 1950, will quickly pay off when larger numbers of planes are called for.
- **Further research** into manufacturers' methods will be called for. Last January, Air Materiel Command earmarked 58 manufacturers' methods projects for investigation, but had to cut back to 40, because of lack of funds.

Such projects involve improved basic metal-working techniques, new high-volume tooling and production equipment and processes, aimed at saving manhours and materials.

Further extension of licensor-licensee contracts may be anticipated, along with careful up-dating of licensor-licensee agreements currently in force. Some of these previously disclosed by the Air Force cover such mobilization items as: the Wright R-1300 engine for the T-28 North American trainer; General Electric's J-47 and Allison's J-35 jet engines; Curtiss and Hamilton Standard propellers; radio and radar equipment; fire control systems; bombing system components; turbosuperchargers; and airframes of key airplanes in the 1951 procurement program, in cases where licensing presents unusual problems.

► **Substitute Materials**—Special emphasis is expected to go on the continued development of substitute materials for some of the more critical materials now specified in engines and airframes.

USAF's industrial planning division is part of the Air Materiel Command set-up at Wright-Patterson AFB, Dayton, with a corresponding industrial planning office in the Pentagon. Brig. Gen. A. H. Johnson heads the division at Wright Field, and Col. Lee W. Fulton heads the Pentagon office.

Navy's aviation industrial planning office is part of the Bureau of Aeronautics in Washington and is headed by Capt. R. M. Reynolds.

Overall coordination for industrial planning, involving not only the aviation aspects but other military programs as well, is under the direction of Brig. Gen. Edmund C. Langmead (USAF), assistant director of the Munitions Board staff, and chairman of the Munitions Board Aircraft Committee.

Joint Procurement Simplifies Selling

Joint procurement, because of the economies afforded the government both in item cost and in paper work, has steadily expanded and now covers 89 percent of armed services total buying requirements for common items.

The remaining 11 percent is controlled by the individual services for items of single-service equipment.

Ordered by action of the Management Committee of the Department of Defense last year, the Munitions Board now assigns responsibility for the purchase of all combined requirements to one of the three services.

Because of special requirements of the Air Force and Navy, purchases of airframes, aircraft engines and propellers are divided between the two services. However, to eliminate possibility of duplication the Munitions Board has worked out a system of cognizance within the aircraft and principal components field.

- **Ordnance**—All aircraft ordnance materiel, with exception of a few special items, is purchased by the Army for USAF by the Army Picatinny Arsenal, Dover, N. J. Naval aircraft ordnance is purchased by the Bureau of Ordnance, Navy Department, Washington 25, D. C.
- **Fuel**—Fuel and oil requirements of all three services are purchased through the Armed Services Petroleum Purchasing Agency, temporary building 4, Washington 25, D. C.
- **Photographic equipment**—All photographic equipment for the three services with the exception of medical X-Ray film is purchased by the Procurement Division, Air Materiel Command, Wright-Patterson AFB, Ohio.
- **Medical supplies**—All medical supplies for the armed services are bought by the Armed Services Medical Procurement Agency, 84 Sands Street, Brooklyn 1, New York.
- **Hand tools**—Navy Purchasing Office, Navy Department, Washington 25, D. C. is charged with the purchase of all hand tools, edge tools such as saws, mechanics' measuring tools and similar items, for all three services.
- **Paint**—Paints for the armed services, including lac, semi-drying oils, drying oils, pigments and related products are purchased by the Aviation Supply Officer, Aviation Supply Office, Oxford Avenue and Martin's Mill Road, Philadelphia 11, Pa.

Full details as to procurement assignments of the three services are listed in Munitions Board "Index of Military Purchasing Offices." Copies may be obtained by writing to that agency at Washington 25, D. C.

Where the $4.4 Billion Will Go

Procurement plans call for 4485 new planes in 1951 budget; trend is toward more subcontracting.

By Ben Lee

The United States Air Force, with more money to spend than at any time since the close of World War II, is buying 4485 aircraft at a total cost of $4488 million from its share of fiscal '51 funds.

While group structure of the Air Force has not changed materially as a result of the war in Korea, there is an increased procurement emphasis placed upon the needs of tactical air support problems of Army.

► **Background**—In May 1948, Congress, in an effort to speed up aircraft procurement, granted USAF obligational authority of $1962 million for aircraft procurement. The sum represented the requirements for the first year of an ambitious five-year procurement program. This action had been taken in line with recommendations of the Finletter Commission and of the Congressional Aviation Policy Board, which recommended a minimum of 70 groups.

In December 1948, however, the President ordered a cutback of funds to finance only 48 groups.

By that time the Air Force had actually activated 59 groups and planned for 70 groups early in fiscal year 1950. The Air Force problem then became not one of expansion but one of contraction to a 48-group level. To the industry, struggling through postwar recession, it was a heavy blow.

This left Air Force, during fiscal 1950, with an operational force of 3300 first-line combat aircraft, comprising 15 heavy bomber groups, 27 tactical light bomber and fighter groups, and 6 troop carrier groups. Funds were provided for 1084 aircraft from fiscal '50 budgets.

A basic 1951 appropriation of $1711 million was allocated to USAF for aircraft and related procurement. The supplemental budget provided USAF with an additional $2777 million for airplanes and tripled previously planned '51 procurement.

► **AF Mission**—Air Force procurement building for a 69-group structure is aimed at fulfilling a threefold mission:

- **Strategic air force.** The Strategic Command of USAF remains the backbone of U.S. air power. This fact is reflected in specific contracts awarded Consolidated Vultee for B-36 bombers and Boeing Airplane Co. for the 6-jet B-47B and the 4-jet B-47C, plus additional B-50D Superfortresses. Boeing bomber production now will run easily through next year and beyond.

Procurement of the B-36 will round out previously announced strategic heavy bomber groups. Heavy procurement of Boeing's B-47 jet bomber indicates a significant trend toward USAF's previously announced program for an all-jet air force by 1954.

Air Force policy still is based on the assumption that the greatest deterrent to military aggression is the existence of a strategic force capable of inflicting devastating damage sufficient to make aggression extremely unprofitable to any attacker.

- **Air defense.** Secondary mission of USAF is the defense of the U.S. from air attack. To meet this requirement, Air Force has placed sizeable contracts with North American Aviation for the F-86; with Northrop for the F-89; and with Lockheed for the F-90 and F-94, for a total of more than 1300 interceptor planes and all-weather fighter aircraft.

Emphasis on air defense stems from knowledge that Russia has cracked the atomic secret, together with the constant shrinkage of the globe and the ever-increasing range and speed of aircraft.

- **Tactical aviation.** Third mission of the Air Force is the tactical support of land and sea operations. Adequacy of air mobility and tactical support of ground troops has long been hotly debated by Air Force and Army. Air Force, prior to Korea, claimed it was providing all tactical support necessary within the limits of its budget. Korea proved the weakness of this line of reasoning.

As a result, USAF is asking Republic Aviation for F-84 fighter bombers, and Lockheed for T-33 two-place jet trainers and/or reconnaissance fighters, for a substantial total of planes to be used for tactical purposes.

To meet troop carrier needs, Air Force has asked Fairchild Aircraft for a sizeable number of C-119s and Chase Aircraft Co., a newcomer in Air Force contracts, is due for a comfortable production order of assault transports.

- **Heavy airlift.** Air Force has asked Boeing for production of the C-97, and Douglas for the C-123.
- **Trainers.** In the trainer field, Air Force has awarded North American a contract for a substantial quantity of T-28s, and Consolidated Vultee a contract for slightly less T-29s than were ordered in fiscal 1950. These are in addition to the contract awarded Lockheed for dual purpose T-33s previously mentioned.
- **Air rescue.** For air rescue service USAF has asked Grumman for production of the S-16 amphibian, Sikorsky for the H-19, and Piasecki for the H-21 helicopters. These three companies have been asked for a total that should run to more than 100 aircraft.
- **Research and development.** USAF in fiscal 1951 is given $205 million for research and development activities, of which approximately $100 million will be spent on electronic search and detection radar equipment and weapons, namely, guided missiles. The lion's share of the remainder is to be spent in powerplant research and development.

Weapons and weapon utilization are entering final stages of development, moving forward after a long-time lag due to design problems. Foremost in weapons development are air-to-air and air-to-ground guided missiles and homing devices.

► **Turboprop Engine**—Heavy emphasis on powerplant research is towards the propeller-driving gas turbine.

Development of the turboprop and ducted fan engine had been curtailed by Air Force after World War II in favor of concentration on the turbojet. Navy-sponsored research has shown Air Force that Navy claims for turboprop engines and for propellers were not only valid but conservative in the high subsonic speed ranges.

► **Research**—Scientific research as it relates to procurement in the Air Force is concerned not only with the application of the physical sciences to the production of efficient equipment, but encompasses every aspect of aerial war.

This year USAF funds for research and development are considerably increased. Air Force can for the first time concentrate on projects which heretofore had to remain in developmental status because of lack of funds to bring them to successful conclusion.

Guided missile research and development has been stormy and many times unfruitful. Reluctant to discuss guided missile status, Air Force sources unofficially state that "a guided missile will soon become a part of the USAF weapons system."

► **Procurement Method**—Two years ago the Air Force established a purchasing

system (patterned after successful purchasing methods used in private business) known as the "vertical buyer" method.

With this system, primary responsibility and authority for procurement of a specific article is placed in the hands of a single individual qualified by special knowledge and experience. Every buyer is assisted by a cost analyst and a contract writer, and those contracts requiring approval of a higher authority are sent to a procurement committee for review before approval.

This streamlined system has endeared itself to vendors because of its efficiency as well as to USAF because of its capabilities for economical purchasing.

Negotiated contracts play a major role, of course, in Air Force procurement in order to eliminate duplication of investment and undue delay. Competitive bidding, however, continues wherever possible on lesser contracts and where it is assumed to be in the best interests of the Air Force.

▶ **Small Business Aid.** Air Force prime contracts obligate the prime contractor to exert every effort to subcontract work to small business. As a result of this program, small business firms have received upwards of 60 percent of Air Force contracts during this calendar year. Dollar-wise this was only approximately 10 percent of Air Force prime contracts. The bulk of Air Force procurement money goes to buy airframes, engines, propellers, and items of a similar nature.

There is a pronounced trend in USAF procurement projections to place orders for plane equipment through prime contractors instead of by direct government purchase. In many instances this has actually been encouraged by the military to eliminate procurement red tape.

In addition, with the growing complexity of the airframe and the engine, manufacturers are insisting on supplying numerous items of equipment which were previously "government furnished parts." This is the result, apparently, of the highly competitive postwar market and the desire of the manufacturer to supply accessory equipment he feels necessary for the successful tactical employment of his product.

Subcontracting by the prime contractor will increase considerably to implement stepped-up production requests made of prime-contractors by USAF. Production of aircraft is on the increase from approximately 100 planes to 320 planes per month for Air Force.

This increased production will be handled, Secretary of Air Force Finletter has stated, in existing facilities. This means inevitably that small business is due for a deluge of orders from the prime contractor.

Procurement Terms

• **Accessory:** A supplementary device used in conjunction with an end item, contributing to the effectiveness thereof without extending or varying the basic function.

• **Advance Time:** Represents the sum of the contract negotiation time, flow time, shipping time and lead time.

• **Assembly:** A unit of an end item composed of two or more parts fastened together.

• **Attachment:** A supplementary device fastened to, or mounted on a machine, vehicle, apparatus, or other end item to vary or extend the function thereof.

• **Commercial Item:** An article designed for and available on the open market.

• **Contract Negotiation Time:** Relates to AMC only. Represents the time between the initiation of a purchase request for a component until a definite contract is awarded. In those cases that require expedited action to place a contract to insure vendor's production on a basis other than a definitive contract, such portion of time after TWX or letter contract is issued; will run concurrently with the vendor's flow time until a definitive contract has been accomplished. But to insure adequate time increments for initial as well as follow-on procurement, the contract negotiation time becomes an integral part of the planning procedures.

• **End Item:** A unit which, in itself, accomplishes a specific complete function.

• **Flow Time:** Relates to component vendor's plant only. Represents the time between the date the component vendor receives his contract and the time the component is completely fabricated and ready for shipment.

• **General Purpose Item:** An article adapted to more than one application.

• **Government-Furnished Parts or Property (GFP):** Those items of equipment which, under the terms of an AMC contract, the AMC furnishes to the aircraft or aeronautical equipment manufacturer, without charge, for incorporation into end items being manufactured for the USAF, under that contract.

• **Lead Time:** Relates to aircraft manufacturer's plant only. Represents the time between the arrival of the component at the **aircraft plant** and the acceptance date of the airplane (or equipment) in which it is installed. Most of the AMC planning is based on acceptance schedules. Therefore, whenever lead time data is expressed in terms of shop completion it should be adjusted for the difference between shop completion and acceptance schedules. Lead time varies with the rate of production and during the different production periods, according to the following classifications:

a. Pre-Production Period: Represents the time between the date of the input of the first direct manhours in preparation for production and the date of shop completion of the first article. (This period may relate to either component or aircraft production.) During this time there takes place the establishment and stocking up of all assembly lines.

b. Initial Production Period: Represents the time between the shop completion of the first article and the attainment of the peak rate of production or "leveling off" point (assuming fixed production facilities).

c. Peak Rate Production Period: Represents that period from the time peak rate is reached until production is terminated or decelerated.

• **Licensee:** An individual, company, firm or corporation authorized by a licensor to use his proprietary design rights, manufacturing methods, or patents in the manufacture of articles offered for sale.

• **Licensor:** An individual, company, firm or corporation, holding proprietary design rights, manufacturing methods or patents, who enters into a written agreement whereby these rights, methods or patents may be used by other individuals, companies, firms, corporations or the government.

• **Modification:** The physical alteration of a special or general purpose item, accomplished to permit a specific adaption of the modified article.

• **Parts:** An individual piece of an end item or assembly.

• **Prime Contractor:** A contractor who has entered into a written agreement with the government to perform work or furnish supplies.

• **Setback Time:** Represents the sum of the flow time, shipping time, and lead time.

• **Special Purpose Item:** An article restricted by design or physical characteristics to an individual application.

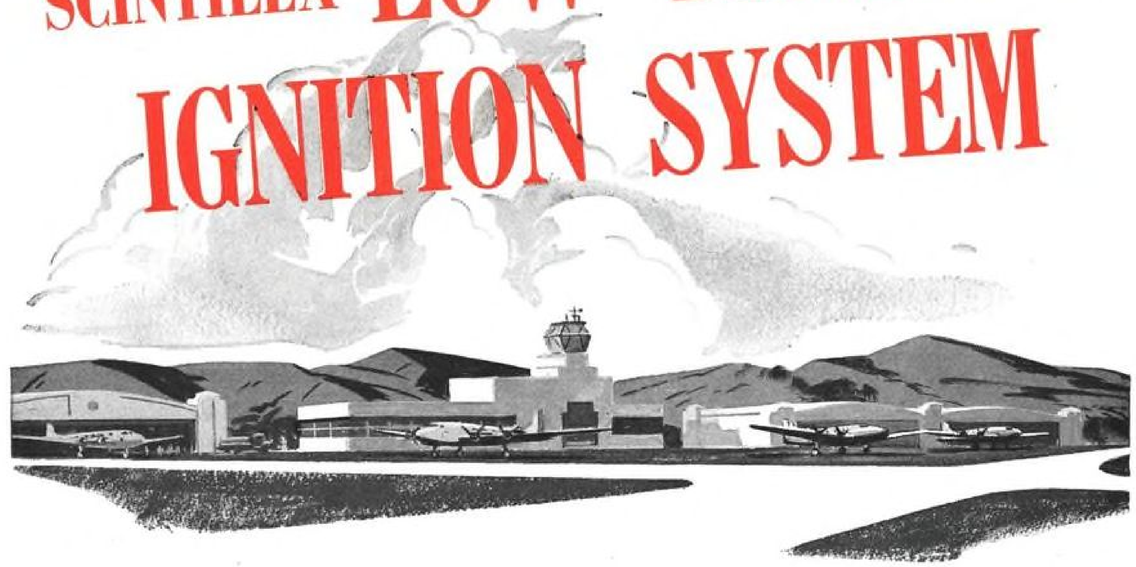
• **Specification:** A description of the technical requirements for a material, an item or a service, including a procedure by which the purchaser can determine whether or not the requirements have been met.

• **Subassembly:** A unit of an assembly composed of two or more parts fastened together.

• **Subcontractor:** A contractor who has entered into a written agreement with a prime contractor to perform work or furnish supplies.



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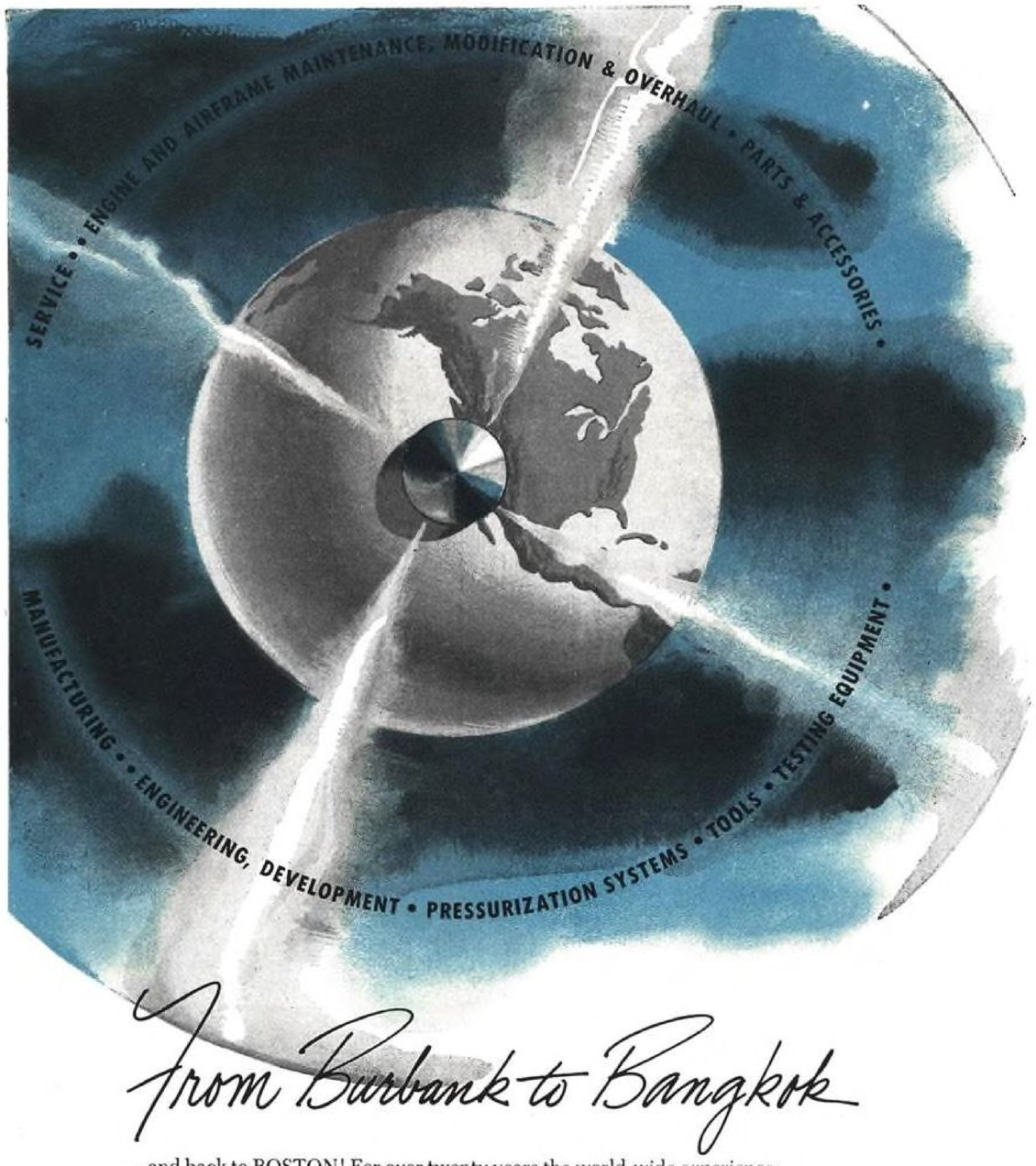
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Field Offices

They can save you time in bidding, and help you if you get a contract.

Expansion of the Air Force procurement program is bringing with it an expansion of the procurement field office organization of the Air Materiel Command to provide additional service to old and new contractors in each region.

Main field office organization is still operated by seven major offices, but in addition, AMC is now opening up some new local offices in other cities where there is a large volume of contracts.

The seven main offices, telephone numbers and commanding officers, are:

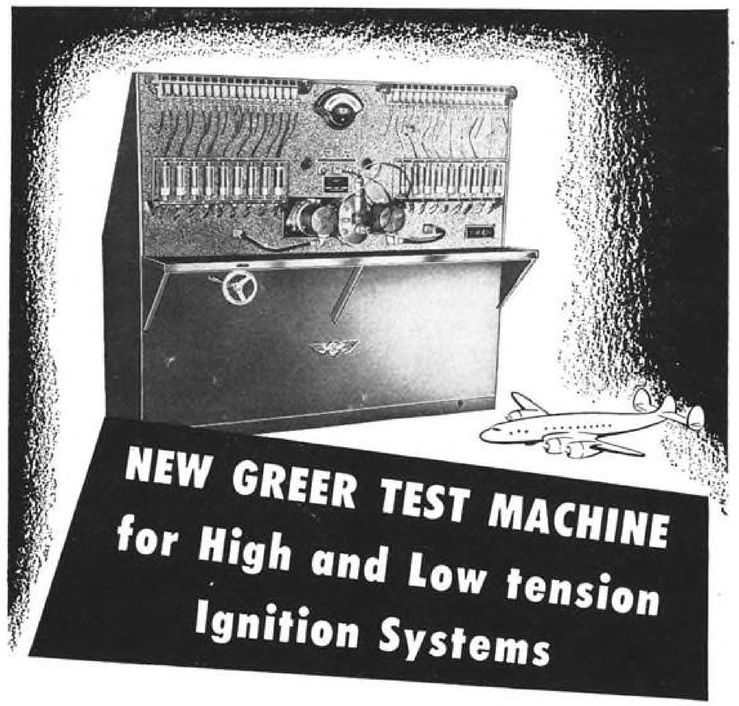
- **Boston:** Liberty 2-6000, Boston Army Base, Boston; Lt. Col. Philip J. Kuhl.
- **Chicago:** Butterfield 8-5800, 1660 E. Hyde Park Blvd., Chicago; Lt. Col. Charles G. Esau.
- **Dayton:** Kenmore 7111, Ext. 65306, Wright-Patterson AFB, Dayton; Maj. Lawrence H. Prugh.
- **Detroit:** Webster 3-8730, West Warren and Lonyo Aves., Detroit; Col. Russell Keillor.
- **Ft. Worth:** 72181 Government Aircraft Plant No. 4; Col. Beverly H. Warren.
- **Los Angeles:** Prospect 4711, 155 W. Washington Blvd., P. O. Box 3849, Terminal Annex, Los Angeles; Brig. Gen. Thomas H. Chapman.
- **New York:** Whitehall 4-1600, 67 Broad St., New York, Brig. Gen. Arthur Thomas.

► **Area-Offices**—Opening of the first new area-office over a year ago at Oakland Municipal Airport, near San Francisco, to serve northern California, proved so successful that additional area-offices are being opened. And in some cases, functions of the plant representatives at major aircraft contractors' plants are being broadened to assist other contractors in their immediate areas.

A new area-office has recently been opened at Cleveland, at 1375 Euclid Avenue (telephone Cherry 7900), which is attached to the Detroit office. The Cleveland office now handles the northern Ohio region, except for the city of Toledo and vicinity which still reports directly to Detroit.

Further decentralization in the near future is expected to result in establishing other offices at such cities as South Bend, Milwaukee, Minneapolis, St. Louis, Wichita and Omaha, in the Middle West; perhaps West Lynn, Mass., and Rochester in New York; and other cities in other areas as needed.

Some idea of the extent of the procurement field office program may be gained from the pre-Korean personnel



Low tension ignition systems in aircraft mean less spark plug erosion, longer maintenance free operation, fewer airline delays, and less flash-over at high altitude. For these reasons, low tension ignition is meeting industry-wide acceptance.

However, regardless of the type of ignition system used, there is one test machine that will test either high or low tension magnetos and ignition system accessories. That machine is the new Greer Hi-Lo Magneto Tester, Model MG-2.

Fully equipped with an infinitely variable speed drive and controls, adjustable spark gap banks and coil racks, aircraft tachometer and other necessary components, this machine is precision-built to indicate at a glance whether the magneto and ignition system components are fit for flight or in need of repair.

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figures of the AMC Directorate of Procurement and Industrial Planning. Of a total strength of 4100, military and civilian, 2660 were assigned to field installations.

Main job of a field office is to administer contracts after they have been executed at AMC headquarters, but this involves a number of other tasks. Quality control of the products purchased is supervised by contractors. Inspectors are responsible to Air Force inspectors. Initial contacts with many companies who are seeking Air Force business for the first time is made in the field offices.

Field specialists for the Industrial Planning division keep a close check on status of facilities and industrial mobilization potential in each area and property accounting is supervised in the field. A few field offices which have principal aircraft plants in their areas maintain a flight operations branch, which directs flight tests for new airplanes purchased or used government planes that are reconditioned under contracts.

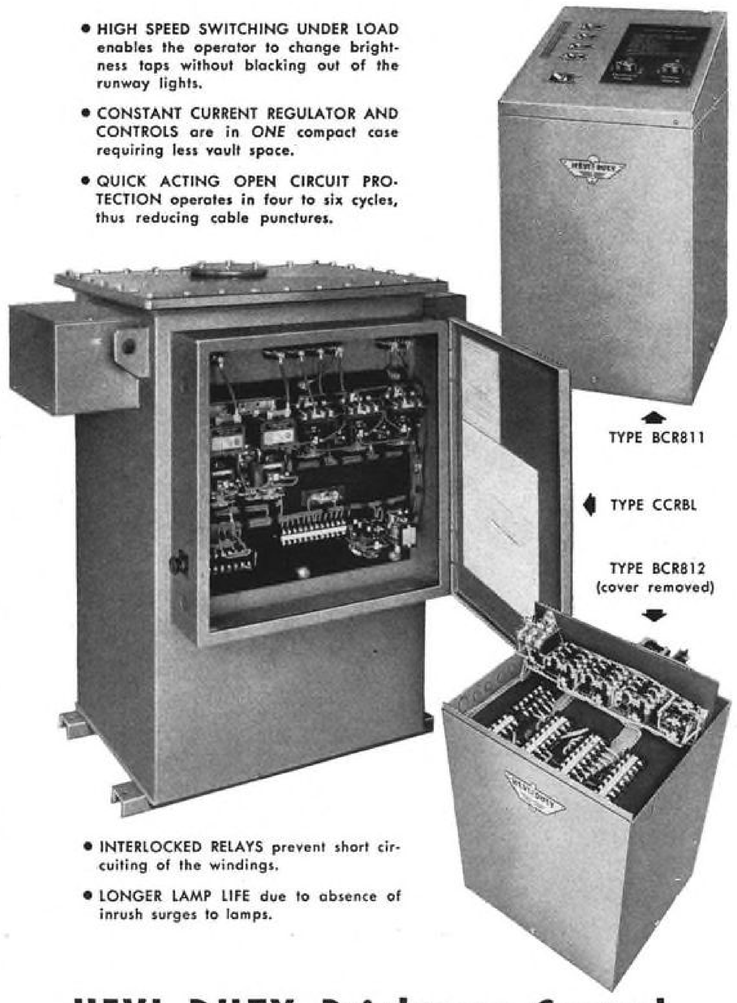
► **How They Help**—You probably would like to know how a small manufacturer can save money by using the regional field offices or sub-offices.

In the first place, it is not necessary for you to go all the way to AMC headquarters at Dayton to find out about invitations for bids and contract awards or to qualify as a USAF source of supply. Representatives in each field office are there to help the contractors in these preliminaries. And lists of bid invitations, and other lists of contract awards, are posted in each major office.

Sample bid requirements for contracts are available for inspection so that you, as a manufacturer, can see whether you want to enter competition on a specific item. If you do, and have qualified as a source of supply, you are instructed to write or wire for a bid kit of your own, to Contracting Officer, AMC Wright-Patterson AFB, Dayton, Ohio, Attention MCPPSX72.

If you get a contract, you will have further dealings with contract officers at your field office. They supervise each contract to completion or termination, interpret contract clauses, and make payments. USAF pays its contractors several different ways depending on contract terms. Sometimes payments are made as often as several times a day.

Quality control of the products bought by the Air Force is one of the biggest field office assignments—approximately half of the field office personnel are in some phase of quality control or inspection. Occasionally this work involves training the manufacturer's inspection force and spot-checking it. A ratio of one USAF inspector to 20 company inspectors is common after a plant inspection system has reached a point considered generally satisfactory.



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- **CONSTANT CURRENT REGULATOR AND CONTROLS** are in *ONE* compact case requiring less vault space.
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REGULATORS
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CCRBL — C.A.A. Specification L828, Sizes 7½, 15, 20 and 25 KW for medium and high intensity series runway lighting control. One compact unit includes the regulator, brightness selector contactors, open circuit protection and local control switch.

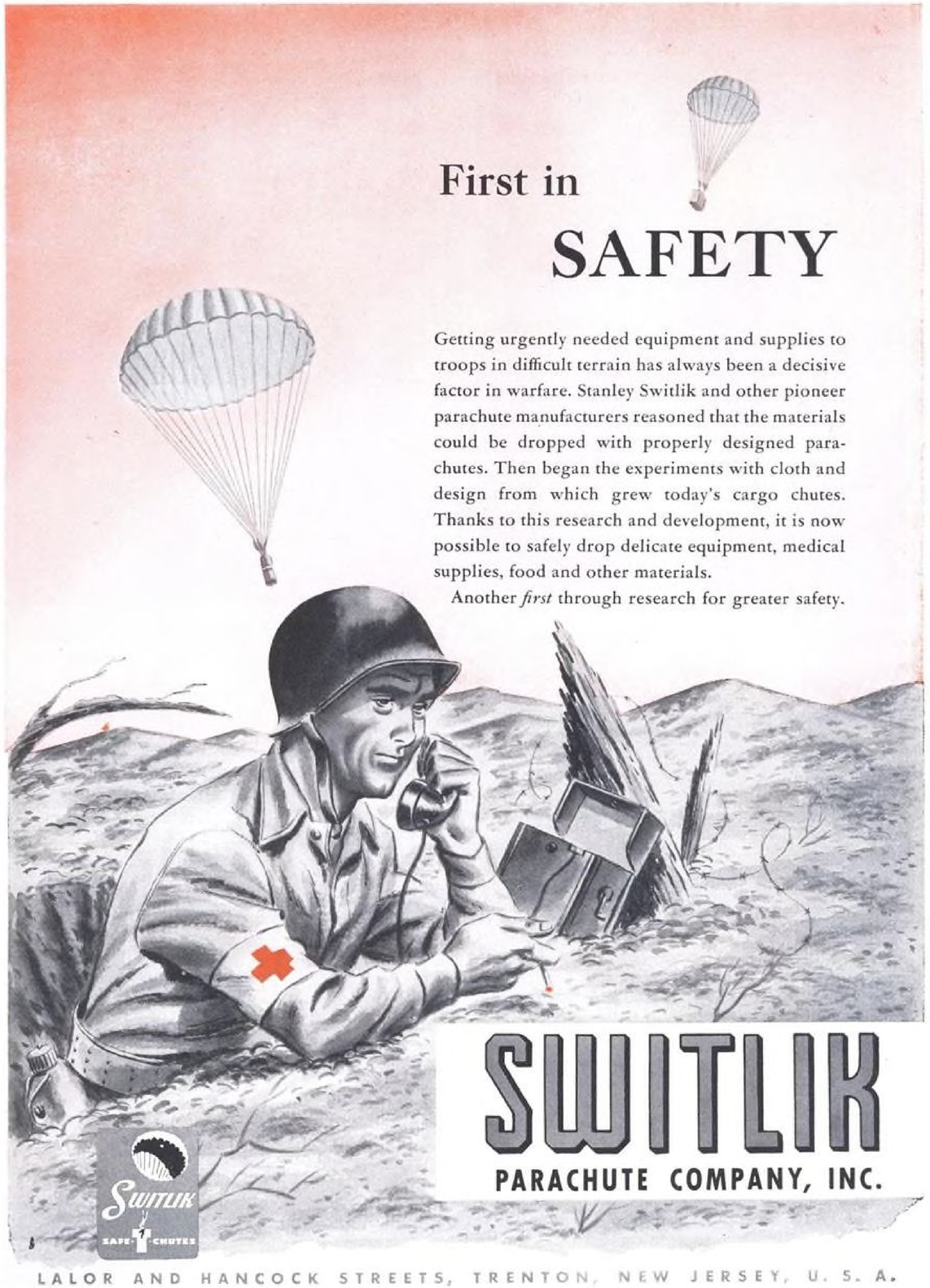
BCR811 — C.A.A. Specification L811, Size 4 KW for direct control has three position brightness and runway selector switches, auxiliary circuit breakers and positive-acting open circuit protection.

BCR812 — C.A.A. Specification L812, Size 4 KW for remote control is equipped with electrically operated relays for high speed switching, and positive-acting open circuit protection.

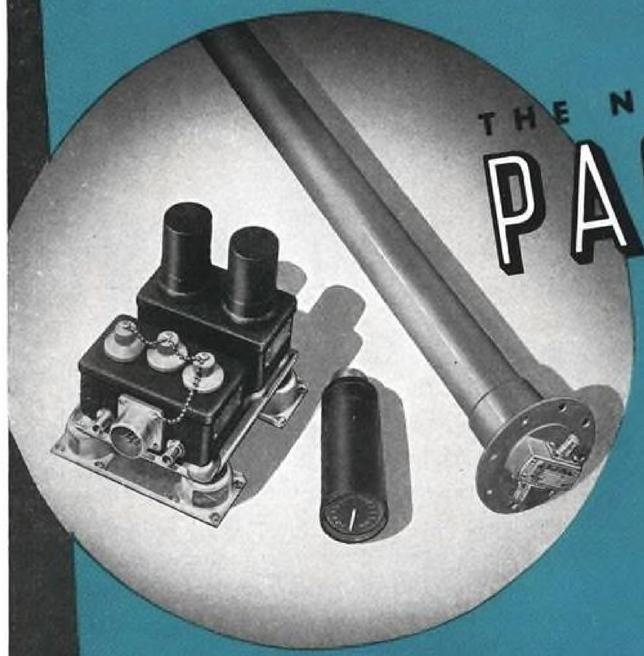
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Where Air Force Does Its Big Business

Air Materiel Command, highly mechanized, is set to handle biggest buying job from over 1 million suppliers.

Dayton—The biggest aviation buying job since World War II has just been tossed in the lap of Air Materiel Command, purchasing agent of the Air Force.

It's a tough test of the industrial planning which has been developed in the postwar years. But because of up-to-date arrangements like the mechanized bid system, and specific industrial mobilization plans for key planes and equipment to be bought, AMC is in better shape to do the job. Top-brass AMC generals say that the buying system is much better equipped to handle this volume of buying now than it was even as recently as one or two years ago.

But if you are a small manufacturer with a product to sell to the Air Force, you will find it harder to get started selling in spite of all these improved buying techniques, and despite the fact that the Air Force is eager to buy.

► **Logjam**—Most of your problems stem from the fact that there are thousands of other small business men who want to sell to the Air Force too, and they all seem to be putting on a simultaneous sales campaign.

The result is that both in Dayton and at the procurement field offices of AMC, the Procurement Division personnel are pretty well swamped with initial inquiries from newcomers.

But if you really want to get Air Force business you'll "sweat out" this initial logjam until you get yourself approved for the bidder's list for items which you are equipped to make or services you can provide.

To get yourself listed you must let your customer, the USAF, know that you have something to offer. Write a letter to: Commanding General, Air Materiel Command Headquarters, Wright-Patterson AFB, Dayton, Ohio, Attention: MCPPXS72.

(Actually of course, Lt. Gen. B. W. Chidlaw, the commanding general, won't ever see your letter, but just the same, that is the proper AMC way to address it.)

In your first letter ask for catalogs of specific items you would like to make. You will receive, a little later, some catalogs, listing in great detail the sub-classes and sub-sub-classes of items which you have indicated you would like to make. Just mark the catalogs and send them back, together with information about your plant, your tooling, facilities etc. And that does it. If your answers are satisfactory, your facility goes into the Air Force listings with the names of about 15,000 other manufacturers. Many names are listed many times for different items. The total list of suppliers of various items, amounts to over 1.5 million listings.

Once you get your name on the list, you can sit back and wait for the Air Force to let you know that it is about to buy an item that you have indicated you can make. But, if you want to get some government business quicker, there are many millions of dollars worth of subcontracts which will be awarded within the next few months (page 85).

► **Subcontracts**—It is an advantage to have your name on the Air Force source list as a subcontractor, too. Often a prime contractor will ask the Air Force for a list of firms who can subcontract his work. And frequently the Air Force will suggest to a prime contractor that he subcontract a portion of his contract, and will supply a list of subcontractors for his guidance.

But there is still no substitute for sales effort. Most good subcontractors get started and keep going, by selling their production capacities to the prime contractors in their regions directly, and you should not overlook this.

Negotiated contracts include those with major Airframe producers, for instance, which naturally are of larger dollar volume than the smaller purchases of maintenance parts or minor operational equipment.

Analysis shows that the Air Force does a much bigger volume of business annually in dollar volume and in number of contracts by negotiating contracts than it does by advertising.

Here are some figures showing the distribution of contracts:

• **In fiscal year 1950** dollar value of contracts let by formal advertising amounted to $92,210,730 as compared to $1,875,367,076 let by negotiation. This represented 3483 advertised bid contracts and 7340 negotiated contracts, or a ratio of 32 to 68 percent.

• **In fiscal year 1949**, advertised bid contracts had a dollar value of $81,127,588 and numbered 4378, while negotiated contracts had a dollar value of $1,275,741,014 and numbered 8426. Ratio was 34 to 66 percent.

It is easy to understand how the dollar volume of subcontracts let by the prime contractors for the 7340 negotiated contracts in fiscal year 1950 could exceed the dollar volume of the adver-

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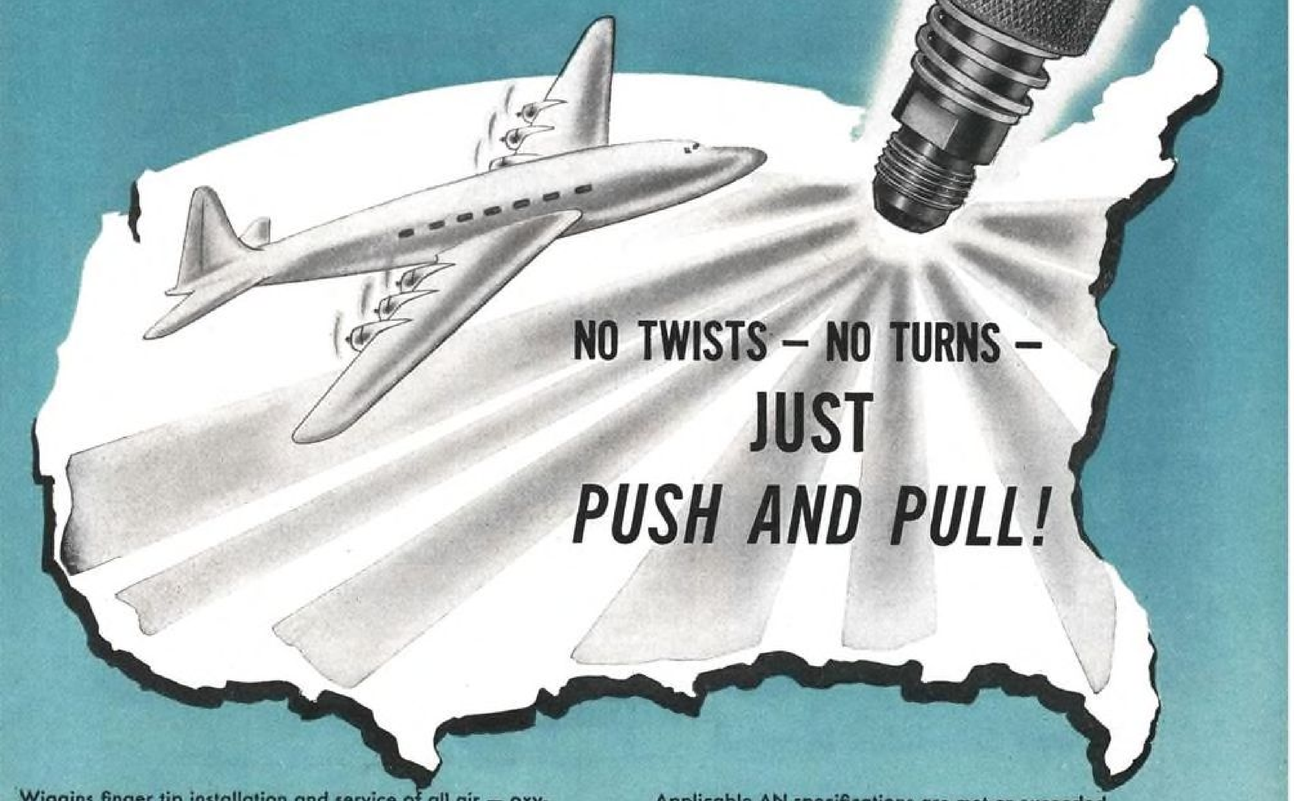
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Applicable AN specifications are met or exceeded.
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tised bid contracts. And this condition, of course, emphasizes the importance of thorough coverage of your subcontracting opportunities.

► **Research Work**—Perhaps your organization has some skilled scientists or engineers qualified in research work. In that case, there are opportunities for Air Force research and development contracts for you to investigate. Once again the first step is to get your firm's name in a list of potential research contractors.

This time, write to: Commanding General, AMC, Wright-Patterson AFB, Dayton, Ohio, Attention: MCPPXG-2.

Send brief biographical information on your leading research personnel, information on your facilities and previous research work your organization has done, and if you have a booklet about your company's work include it. Later it may be advisable to follow up this preliminary overture with a personal interview, if you make an appointment in advance.

Problem of "qualified products" enters into selling to the Air Force in many cases, and if you are a new hand at Air Force procurement business, this is something else that you should know about.

► **Product Qualifications**—Air Materiel Command has established standards or qualifications for many of the products it buys, and requires any items in these classes to meet these qualifications, before they can be bought.

When you mark your catalogs of products which you wish to make, you may indicate some products which are "qualified." In this case, AMC will send you a list of specifications for the qualified products, with instructions as to how you should take qualification tests.

It is a good idea to submit your product for qualification test before procurement starts. There is seldom time to permit qualification testing of a product between the time a competition is announced and when the contract is awarded.

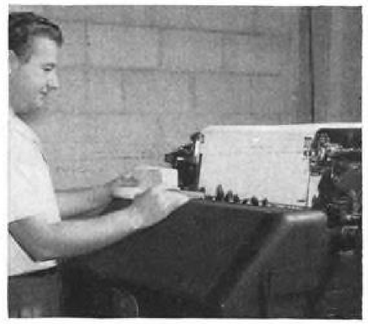
Actual buying at AMC is handled through a team of buying specialists, each handling the contracts for a specific plane, or type of accessory or equipment. There are more than 200 of these buyers.

► **Field Offices**—If you are a new seeker of Air Force business, your first contact will be through the Contractors Relations Office, Room 002, Building 15, Wright-Patterson AFB, Dayton. But you can get much the same information at any one of the procurement field offices at Boston, Chicago, Detroit, Ft. Worth, Los Angeles, New York or Dayton, or at the new suboffices at San Francisco, Cleveland, and other offices that now are being established.

How You Get Invitation to Bid . . .



1. CATALOGS are mailed you on request.



5. LIST of manufacturers is prepared.



2. CARD is made for items you checked.



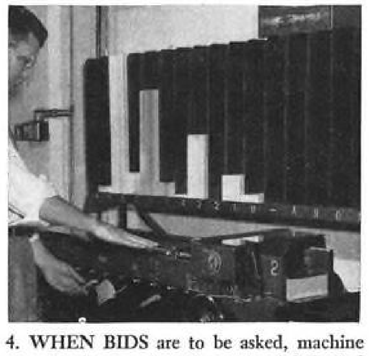
6. ADDRESSOGRAPH plates come from file.



3. CARDS ARE FILED by item code numbers.



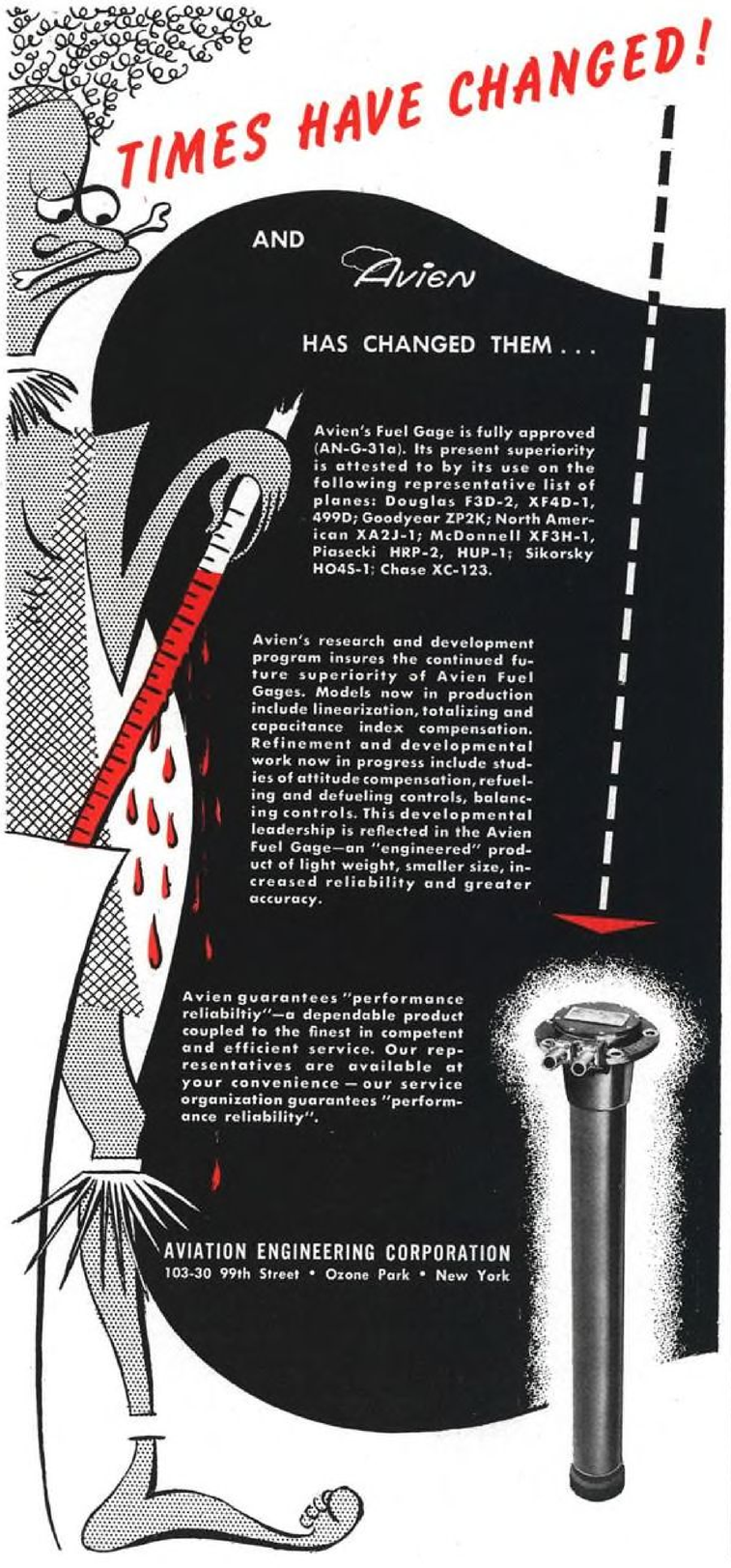
7. POSTCARDS asking you to bid are mailed.



4. WHEN BIDS are to be asked, machine puts cards covering item in alphabetical order.



8. BID SETS are mailed to you if you have returned the postcard.



Invitations for bid are posted at these field offices so that you manufacturers can come in and look at them and decide what you want to bid on. To further stimulate small business concerns to do business with the Air Force, lists of contract awards are posted both in the offices and at Department of Commerce field offices throughout the country.

You will receive notice by mail from AMC of forthcoming competitions when you have been listed on the approved source list. And if you want to bid, you are expected to shoot back a prompt request for a "bid set" containing all the necessary forms to make up your bid. Unless you respond to these invitations, however, the Air Force may drop you from its list, because AMC wants to keep its source list restricted only to those who are active bidders.

► **Bid Bonds**—Whenever you make a bid of $25,000 or more, Air Force expects you to post a guarantee amounting to 20 percent of the total bid. Some contractors post an annual bid bond with AMC to cover guarantees for contracts that they hope to get.

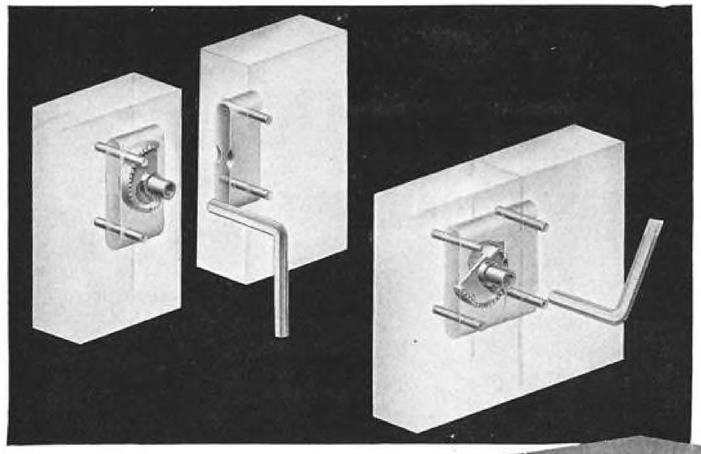
You will find that AMC puts every contract through a thorough checking procedure by various AMC divisions before it is either advertised or negotiated.

The Supply Division checks spare parts and tool requirements; the Budget and Fiscal Division sees to it that funds are available to pay for the equipment ordered; the Industrial Planning Division requirements branch checks on materials needed; the Engineering Division passes approval on drawings and specifications; and the Judge Advocate's Office approves licensing rights and patent clauses.

The buyer actually does most of the handling of the contracts until final approval. Then, if it is a big one of $100,000 or more, the AMC Procurement Committee reviews it. The committee, composed of veteran civilian procurement specialists at Wright Field, also has the privilege of looking into any smaller contract if it considers it necessary.

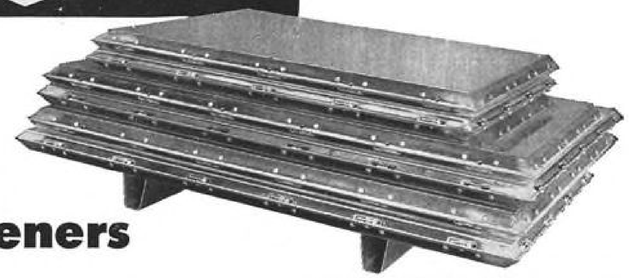
Contracts of $100,000 to $1 million must be reviewed by the Procurement Division chief, Brig. Gen. Phillips W. Smith, while the really king-sized contracts of $1 million and more, have to pass review of the Director of Procurement and Industrial Planning, Maj. Gen. Orvale R. Cook.

Once the contract has been signed the buyer works with Air Force quality control inspectors to see that requirements and schedules are met, decides on permissible contract changes, and finally is expected to handle termination proceedings.



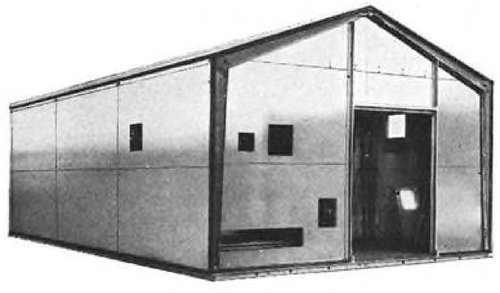
Serrated, tapered cam in male component engages lip of female. Panels are drawn tightly together when cam is turned by hex wrench, screwdriver, or any hand tool.

Lightweight air transport shipping containers, with Roto-Lock Fasteners, knock down quickly for easy return shipment.



PHOTO, COURTESY UNITED STATES PLYWOOD CORPORATION

New Roto-Lock Fasteners Solve Demountable Panel Problems



This portable shelter is made of honeycomb panels developed by the U. S. Plywood Corporation. All panels are attached with Simmons Roto-Lock Fasteners. Portable buildings are also being planned for alert hangars and maintenance hangars for fighter aircraft.

Panels of any material—equipped with the new Simmons Roto-Lock—can be fastened quickly and securely either at right angles or butt joint. No skill is required—just turn the tapered cam to lock, then turn again to unlock. Check these features of Roto-Lock...

1. Roto-Lock exerts sufficient pressure to form airtight and watertight seal when gaskets are used between panels. Carries high-tension loads as well as heavy shear loads—providing a completely structural, insulated connection.
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Portable shelters, air freight and cold-storage shipping containers, walk-in coolers, demountable furniture, scaffolding, and many other designs where demountability is desirable, are using this versatile fastener. All are illustrated in our literature. Write for your copy today.

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SPRING-LOCK...
ROTO-LOCK...

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Handle loads 20 to 40 inch-lbs. at 3000 psi. With or without detents in ¼" to ¾" line sizes. Valves meet or surpass AN specification requirements.



ADEL 3000 PSI SHUTTLE VALVES

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Valves meet or surpass all requirements of Specification AN 6296. Tube OD ¼", ⅜" ½" and ⅝"

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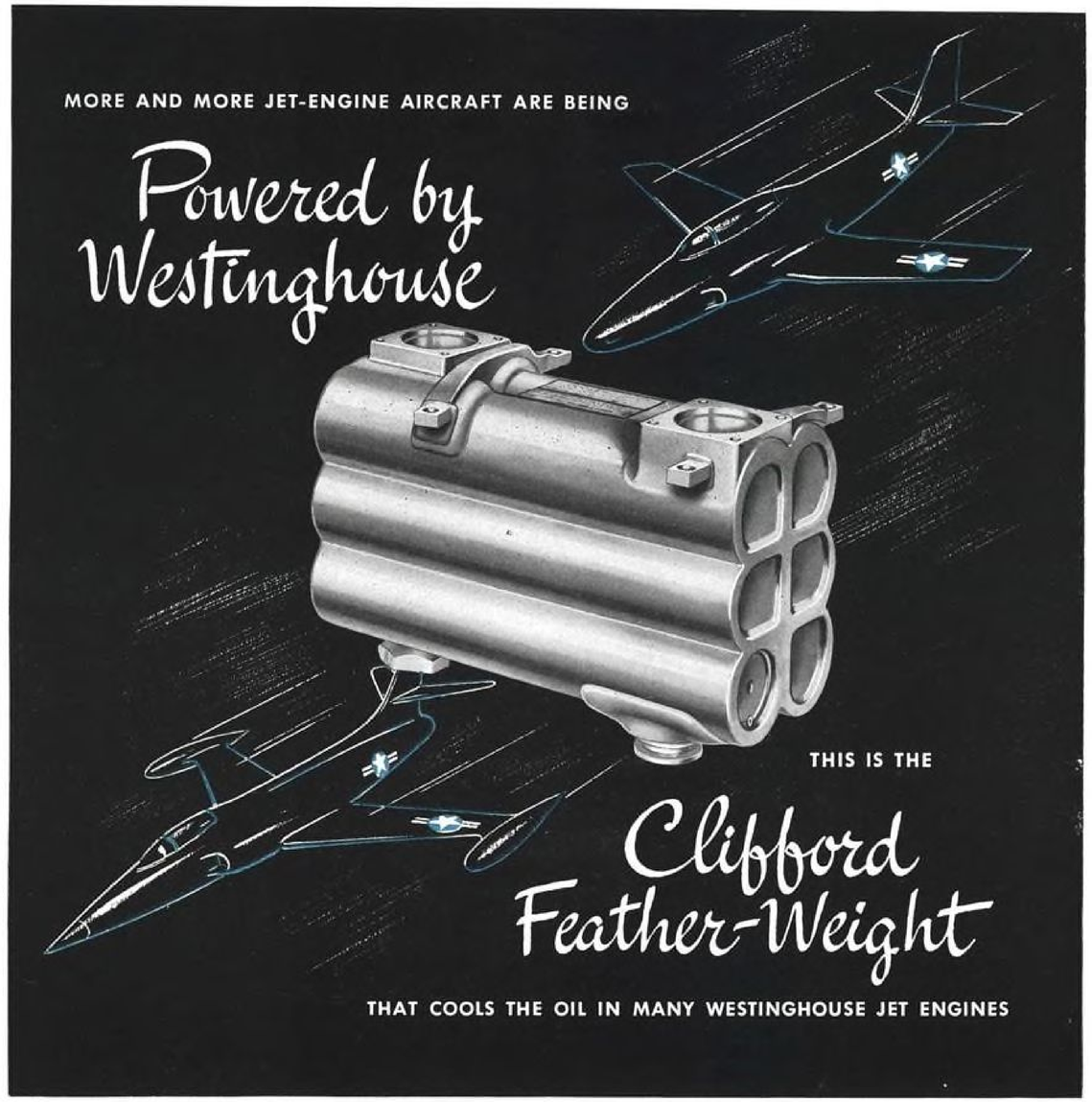
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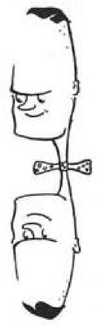
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sometimes two heads are better

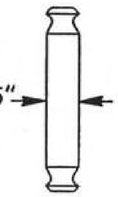


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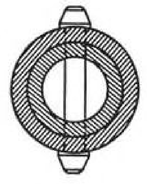


Toolmaker's precision is attained by using the new HI-SHEAR Dowel Pin.

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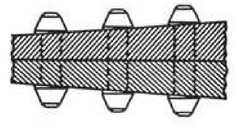


It features the closest tolerance of any aircraft fastener—one-half that of the NAS 334 bolt.



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It is lighter, stronger and easier to install than a taper pin.



The Dowel Pin is available in any size—any length.

Precision fit, flexibility to mold to irregular surfaces and elimination of spot-facing will reduce manufacturing costs.

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Kollsman inventiveness and engineering skill today continue to pace and anticipate the needs of the aviation industry. In this age of supersonic speeds—when an extreme measure of accuracy is vital to safety—Kollsman instruments unerringly point the way to aviation's illimitable future.

*The ancient Greek who, by flying too close to the sun, caused the wax that secured his feathered wings to melt, whereupon he plunged into the sea.

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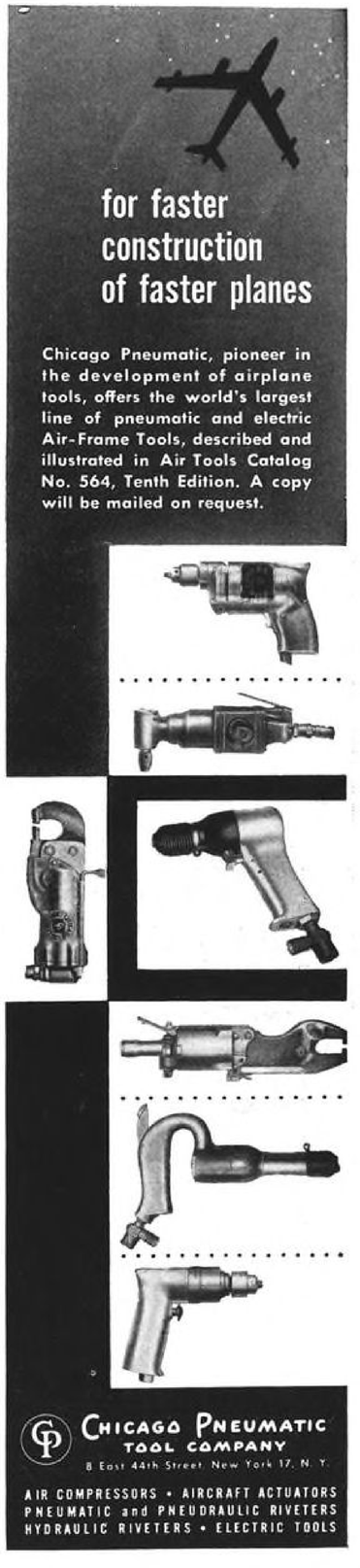
Local Buying

Manufacturers seeking small procurement contracts let locally by individual military installations should advise the commanding officer or the contracting officer at the bases listed below, stating the particular item they can supply.

Invitations to bid, and the procedure to receive these invitations, works much the same as it does at Air Materiel Command headquarters and Bureau of Aeronautics headquarters.

These installations make local purchases (the list was compiled in October, 1949, and lists some bases which may have been deactivated):

- Kirkland AFB, Albuquerque, N. Mex.
- Craig AFB, Selma, Ala.
- Headquarters, Air University, Maxwell AFB, Ala.
- Lawson AFB, Ft. Benning, Ga.
- Warner Robins AMA, Robins AFB, Ga.
- Dow AFB, Bangor, Me.
- 2234th Air Res. Tng., Hansom Airport, Bedford, Mass.
- 1600th ATW, Westover AFB, Chicopee Falls, Mass.
- AF Cambridge Research Laboratories, Cambridge, Mass.
- Grenier AFB, Manchester, N. H.
- 1701st Air Transport Wing, Great Falls AFB, Great Falls, Mont.
- Pope AFB, Ft. Bragg, N. C.
- Greenville AFB, Greenville, S. C.
- Shaw AFB, Sumter, S. C.
- 463rd AFBU, USAF Technical School, Fort Francis E. Warren, Wyo.
- Chanute AFB, Rantoul, Ill.
- 2471st AFBU, Orchard Place Airport, Park Ridge, Ill.
- Stout AFB, Indianapolis, Ind.
- 2467th AFRTC, Baer AFB, Ft. Wayne, Ind.
- Headquarters, 10th AF, Ft. Benjamin Harrison, Indianapolis, Ind.
- Wright-Patterson AFB, Dayton, O.
- 862nd AF Specialized Depot, Wilmington Pike, Dayton, O.
- Lockbourne AFB, Columbus, O.
- 831st AF Specialized Depot, Shelby, O.
- 2757 AFBU, Aircraft Assembly Plant No. 7, 6200 Riverside Drive, Cleveland 11, O.
- Bergstrom AFB, Austin, Tex.
- Perrin AFB, Sherman, Tex.
- Waco AFB, Waco, Tex.
- Sheppard AFB, Wichita Falls, Tex.
- Carswell AFB, Ft. Worth, Tex.
- Goodfellow AFB, San Angelo, Tex.
- Lowry AFB, Denver, Colo.
- Headquarters, 15th AF, 1600 E. Boulder St., Colorado Springs Colo.
- Selfridge AFB, Mt. Clemens, Mich.
- Holloman AFB, Alamogordo, N. Mex.
- Walker AFB,





Cast rings produced by the CENTRI-DIE method—rough and finished machined. Note the variations in diameters and metal sections.

Lebanon

CENTRI-DIE Castings

TRADE-MARK

finest for... **Jet Engine Applications—used in the famous Allison J33 and J35, the General Electric J47, the Pratt & Whitney J42 and the Westinghouse J34.**

CENTRI-DIE, an exclusive process at Lebanon, brings to this country a unique method of casting cylindrical shapes in permanent molds. CENTRI-DIE castings are easier to machine and have improved physical properties: greater density, more uniform strength, finer grain size with better directional flow characteristics. New corrosion and heat resistant alloys, difficult to forge, are often used in CENTRI-DIE castings.

Lebanon has complete facilities for laboratory testing, including a million-volt X-Ray machine. All CENTRI-DIE castings can be made to conform to aircraft specifications.

Write for descriptive literature or contact our engineers; we are always glad to be of service.

LEBANON STEEL FOUNDRY • LEBANON, PA.
"In the Lebanon Valley"



Lebanon also is a major producer of centrifugal castings made in refractory molds—illustration shows typical casting made by this process.

LEBANON *ALLOY AND STEEL* Castings

CIRCLE L

Roswell, N. Mex.
- Biggs AFB, El Paso, Tex.
- Pyote AFB, Pyote, Tex.
- Randolph AFB, Randolph Field, Tex.
- 27th AFBU, USAF School of Aviation Medicine, Randolph AFB, Randolph Field, Tex.
- Kelly Field AFB, San Antonio, Tex.
- Brooks AFB, San Antonio, Tex.
- Lackland AFB, San Antonio, Tex.
- Ellington AFB, Houston, Tex.
- 2583rd Base Sq., Orlando AFB, Orlando, Fla.
- Tyndall AFB, Panama City, Fla.
- MacDill AFB, Tampa, Fla.
- Banana River NAS, Cocoa, Fla.
- Smoky Hill AFB, Salina, Kan.
- Forbes AFB, Topeka, Kan.
- Marshall AFB, Ft. Riley, Kan.
- Sherman AFB, Ft. Leavenworth, Kan.
- March AFB, Riverside, Calif.
- San Bernardino AFB, San Bernardino, Calif.
- 822 AF Specialized Depot, Maywood, Los Angeles County, Calif.
- Muroc AFB, Muroc, Calif.
- Godman AFB, Ft. Knox, Ky.
- Smyrna AFB, Smyrna, Tenn.
- 830th AF Specialized Depot, 3300 Jackson Road, Memphis 1, Tenn.
- 2584th AF RTC, Memphis Municipal Airport, Memphis, Tenn.
- 2465th AF RTC, Wold-Chamberlain Field, Minneapolis, Minn.
- Rapid City AFB, Weaver, S. D.
- Mobile AMA, Brookley AFB, Mobile, Ala.
- Elgin AFB, Valpariso, Fla.
- Keesler AFB, Biloxi, Miss.
- Barksdale AFB, Shreveport, La.
- Ft. Slocum, New Rochelle, N. Y.
- Mitchel AFB, Hempstead, L. I., N. Y.
- Griffiss AFB, Rome, N. Y.
- Stewart AFB, Newburgh, N. Y.
- Enid AFB Enid, Okla.
- Oklahoma City AMA, Tinker AFB, Oklahoma City, Okla
- Offutt AFB, Ft. Crook, Neb.
- Dover AFB, Dover, Del.
- McGuire AFB, Ft. Dix, N. J.
- Middletown AMA, Olmsted AFB, Middletown, Pa.
- 2237th AF RTC, Reading Municipal Airport, Reading, Pa.
- Williams AFB, Chandler, Ariz.
- Davis-Monthan AFB, Tucson, Ariz.
- 2239th AF RTC, Greater Pittsburgh Airport, Corapolis, Pa.
- Mountain Home AFB, Mountain Home, Ida.
- Otis AFB, Falmouth, Mass.
- Las Vegas AFB, Las Vegas, Nev.
- Langley AFB, Hampton, Va.
- 2235th AF RTC, Byrd Field, Richmond, Va.
- Scott AFB, Belleville, Ill.
- Aeronautical Chart Plant, 710 North 12th Street, St. Louis, Mo.
- Ogden AMA, Hill AFB, Hill Field, Utah
- Hamilton AFB, San Raphael, Calif.
- Castle AFB, Merced, Calif.
- Sacramento AMA, McClellan AFB, McClellan, Calif.
- 1501st Air Transport Wing, Suisun, Calif.
- Mather AFB, Sacramento, Calif.
- Chatham AFB, Savannah, Ga.
- Moody AFB, Valdosta, Ga.
- Turner AFB, Albany, Ga.
- Moses Lake AFB, Moses Lake, Wash.
- McChord AFB, Tacoma, Wash.
- Spokane AFB, Bong, Wash.
- Bolling AFB, Washington 20, D. C.
- 1254th Air Transport Squadron, Continental Div., MATS, Washington National Airport, Washington 25, D. C.
- 1050th Air Base Wing, Andrews AFB, Wash. 25, D. C.

Property Classes

United States Air Force keeps an accounting of its widely scattered physical properties by means of a numerical classification system not unlike the system used to classify books in public libraries.

While space does not permit listing of the complete classification listings here, the basic property classes are shown as a service to manufacturers interested in USAF procurement. Manufacturer should know the property class or classes in which his products are placed, and related classes.

USAF Property Classes:

- **Class 01:** Aircraft and aircraft parts. Complete aircraft are in sub-class 01-A, and complete aircraft for ground instruction purposes are in sub-class 01-Z, other subdivisions within the class denote aircraft parts.
- **Class 02:** Aircraft engines and engine parts. Complete aircraft engines are in Sub-Class 02-A. Auxiliary aircraft engines, such as jet assist takeoff units and auxiliary powerplants for electrical systems, are in Sub-Class 02-B. Other subdivisions within this class denote aircraft engine parts.
- **Class 03:** Aircraft and engine accessories and accessory parts. Widely varied "catch-all" class of special-purpose attachments and accessories. Sub-classes include: 03-A, propellers and parts; 0.3-D, wheels, brakes, skis, floats and parts; 03-C, aircraft carburetors and parts, 03-E, turbosuperchargers and parts; 03-F, miscellaneous aircraft accessories ranging from liferafts to lavatories to windshield wipers; 03-G, hydraulic struts and actuating cylinders; 03-H, aircraft ignition systems and parts; 03-I, aircraft fuel systems, hydraulic, vacuum, oil and de-icer systems and parts; 03-J, miscellaneous engine accessories including batteries, mounts, quadrants, etc.; 03-K, breathing oxygen equipment; 03-L, auxiliary fuel tanks; 03-M, transmissions for rotary-wing aircraft.
- **Class 04:** Aircraft hardware, rubber products, bearings.
- **Class 05:** Aircraft instruments, including navigation, flight, engine, and miscellaneous instruments and parts. This class also includes automatic pilots and gyro control mechanisms.
- **Class 06:** Fuels, lubricants and gases.
- **Class 07:** Dopes, paints, cleaning compounds, soaps, glue, wax, etc.
- **Class 08:** Commercial electrical equipment and supplies.
- **Class 09:** Aerial targets and gliders.
- **Class 10:** Photographic equipment and supplies.
- **Class 11:** Aircraft armament, including bombing equipment from bombsights to hoists and shackles, gunnery equipment, turrets and guided missiles.
- **Class 12:** Fuel and oil handling equipment.
- **Class 13:** Special-purpose clothing and

WITTEK

STAINLESS STEEL *Aviation* **HOSE CLAMPS**

For Over a Quarter Century The Standard of The Industry



The Wittek Type FBSS Aviation HOSE CLAMP

Utilizing the Wittek Floating Bridge, the FBSS has been tested and proved for dependable service on all types of aircraft applications.



The Wittek Type WWD Aviation HOSE CLAMP

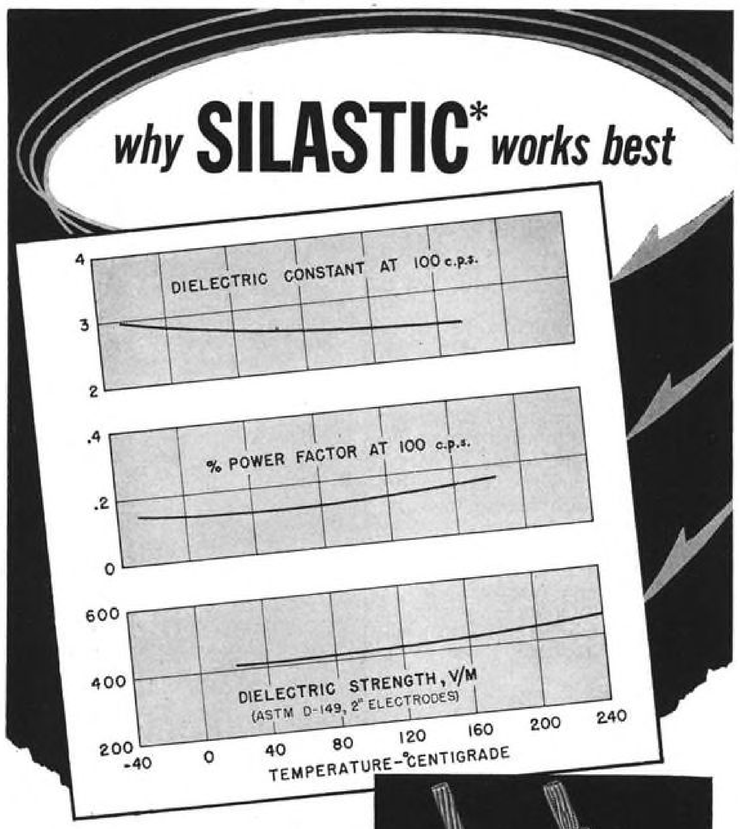
Available in all standard aircraft sizes, the WWD is also furnished in large diameters up to 12" for duct and other special applications. Permits easy installation when hose is in place.

Meet current AN specifications and have C.A.A. approval.

WITTEK Aviation HOSE CLAMPS W M Co.

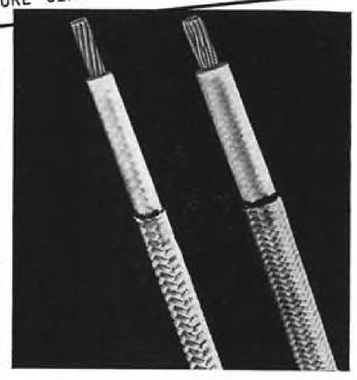
MANUFACTURING CO.
4308 W. 24th Place, Chicago 23, Ill.

why SILASTIC* works best



as a dielectric material from −100° to +500°F.

Over that wide temperature span only Silastic, the Dow Corning Silicone Rubber, remains resilient and retains high resistance to weathering, moisture, oxidation and ozone. Add good dielectric properties to those advantages and you have the reasons why Silastic is an excellent insulating material for high temperature, high voltage cable and for use in equipment where mechanical breakdown limits the effectiveness of resinous insulating materials.



Silastic is extruded over wire and cable ranging in size from No. 22 to 500,000 circular mils to provide insulation at temperatures from −80° to 400° F.*

Many engineers are familiar with Silastic as a remarkably heat stable and oil resistant rubberlike gasketing and sealing material for use between −100 to 500° F. Silastic as a dielectric for ignition and intercommunication cable and for field and armature coils is, however, a relatively new development. That's why Dow Corning has made available reprints of a recent article giving the most up-to-date information on the physical, chemical and dielectric properties of Silastic. To receive your copy, phone the nearest branch office or write for Reprint No. D-21.

*T.M. REG. U.S. PAT. OFF.

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Atlanta • Chicago • Cleveland • Dallas
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FIRST IN SILICONES

personal equipment, including personnel-carrying parachutes, oxygen masks, flying suits, etc.

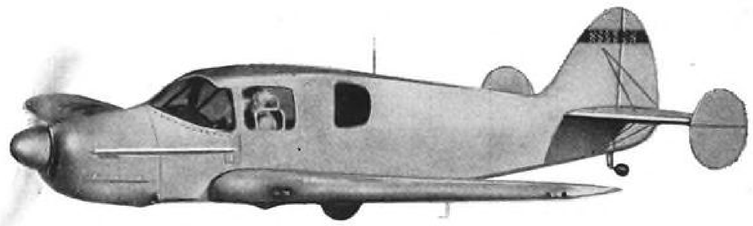
- Class 14: Sub-class 14B, pre-fabricated hangars and buildings.
- Class 15: One-time modification kits, for field changes in aircraft, engines, accessories, etc.
- Class 16: Communications equipment, including airborne and ground radio and radar and parts.
- Class 17: Shops and warehouse machinery, tools and equipment, including powered tools, hand tools, and test and inspection apparatus.
- Class 18: Special tools, calibrating equipment, dies, jigs, fixtures.
- Class 19: Flying field and hangar equipment, vehicles, crash boats, etc.
- Class 20: Aerial delivery equipment and protective covers.
- Class 21: Cordage, leather, fabrics.
- Class 22: Bulk lumber, cork, plywood, veneer.
- Class 23: Bulk metals and composition materials, including sheet, tubing, extrusions, non-electric wire, fiber, glass, plastics.
- Class 24: Chemicals.
- Class 25: Office equipment and supplies.
- Class 26: Ground school equipment.
- Class 27: Excess and surplus property.
- Class 28: Instructional equipment and training aids.
- Class 29: Hardware and miscellaneous supplies.
- Class 30: Publications, drawings, blank forms, training films.
- Class 31: Foreign aircraft, related equipment and material.
- Class 32: Aircraft and equipment for museum or historical purposes.
- Class 99: Miscellaneous items and equipment—printing presses, refrigerators, stoves, gym equipment, chaplain's supplies, mowers, boilers, trays, dental, medical and optical supplies.

Metal for Wood

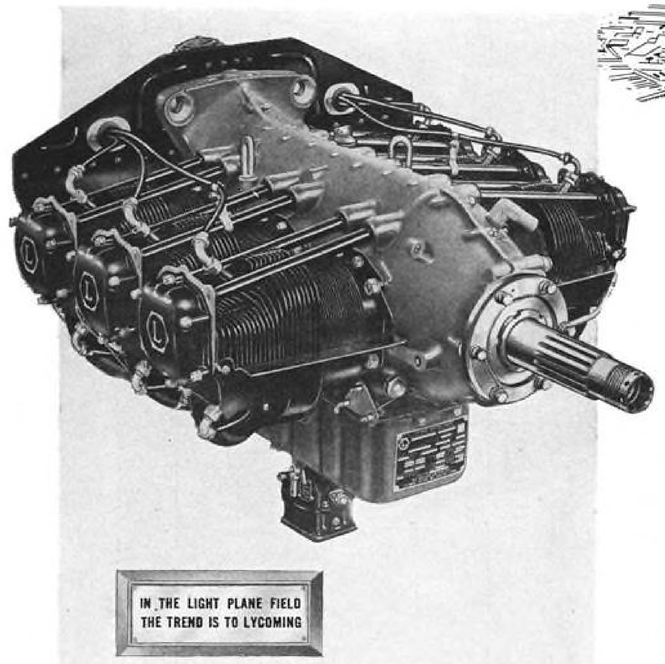
A growing market in the Air Force is for metal engine containers. The service is shifting from wood to metal containers as fast as it can.

And although the original cost of a metal container is higher than that of a wooden box, USAF saves in the end. At the hearings on USAF's fiscal 1951 budget, Brig. Gen. J. F. Early, AMC supply chief, estimated the cost of a metal container for an R-4360 engine at $800. A wooden box for that same engine would cost about $600. But—maintenance of an engine in a wooden box costs $285 a year; if the engine is in a metal container, cost is about $10 per year.

The Air Force says it hasn't been using the metal containers long enough really to establish the life of the container. But in 1947 it took some engines in metal containers and put them in an open field. Two years later the cans were opened and the engines were ready for immediate use.







LYCOMING
POWERS
THE NEW
BELLANCA CRUISEMASTER

The new high-performance, easy-to-fly Bellanca Cruisemaster is **powered by Lycoming.** This popular plane offers many outstanding features for safety and convenience—quick take-off, low stalling speed, fast climb, and high cruising speed. Its sturdy **Lycoming** O-435-A engine provides steady, dependable operation for smooth, quiet flight—with a high factor of safety. And once again, **Lycoming's** creative engineering and precision manufacturing result in unusually low engine maintenance requirements.

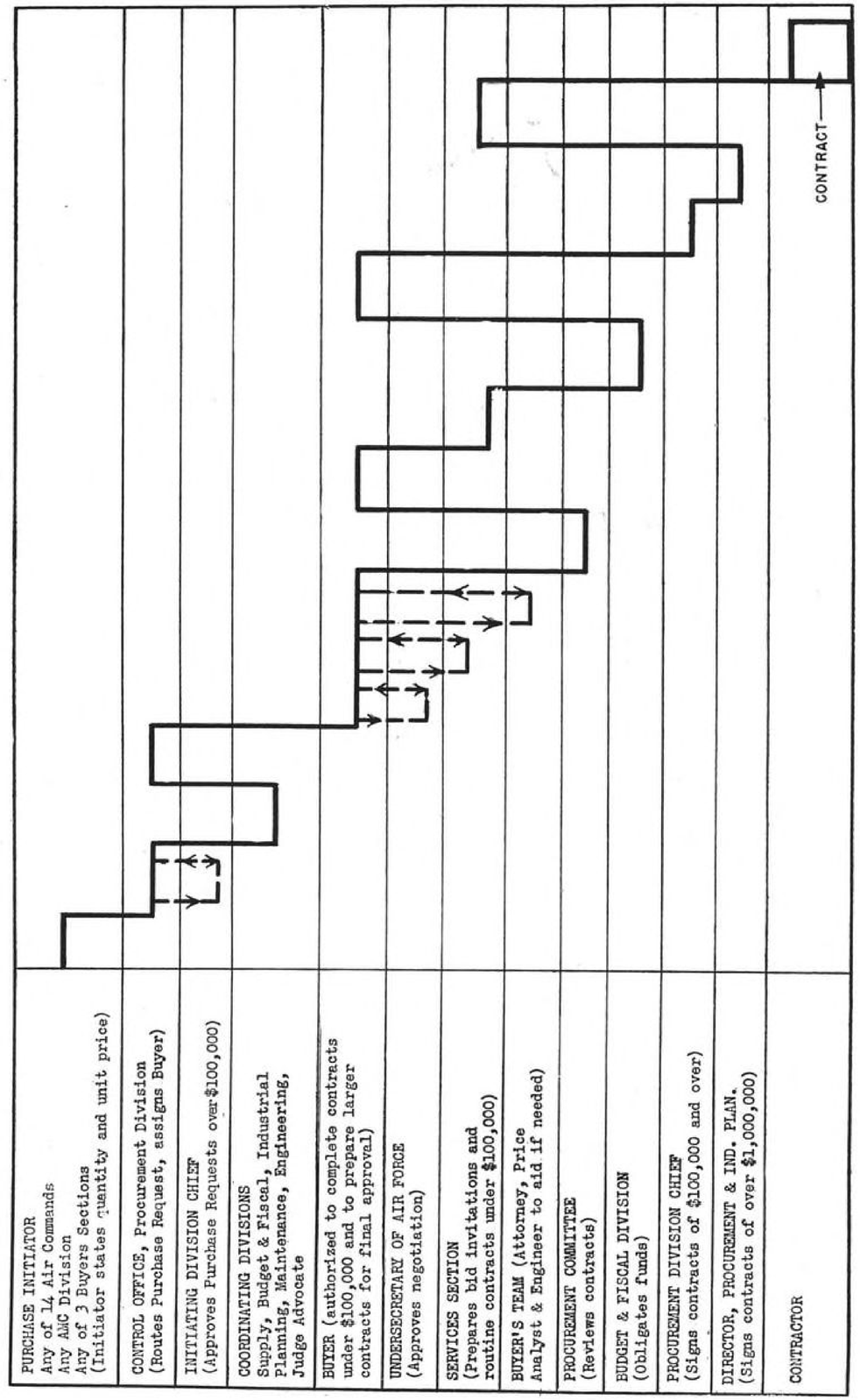
The Cruisemaster's power plant is an improved version of the same rugged 190-horsepower **Lycoming** engine that powered the famous L-5 Liaison Plane under the toughest conditions in every war theatre from the Arctic to the Tropics. You can be sure of your plane when it's . .

POWERED BY LYCOMING

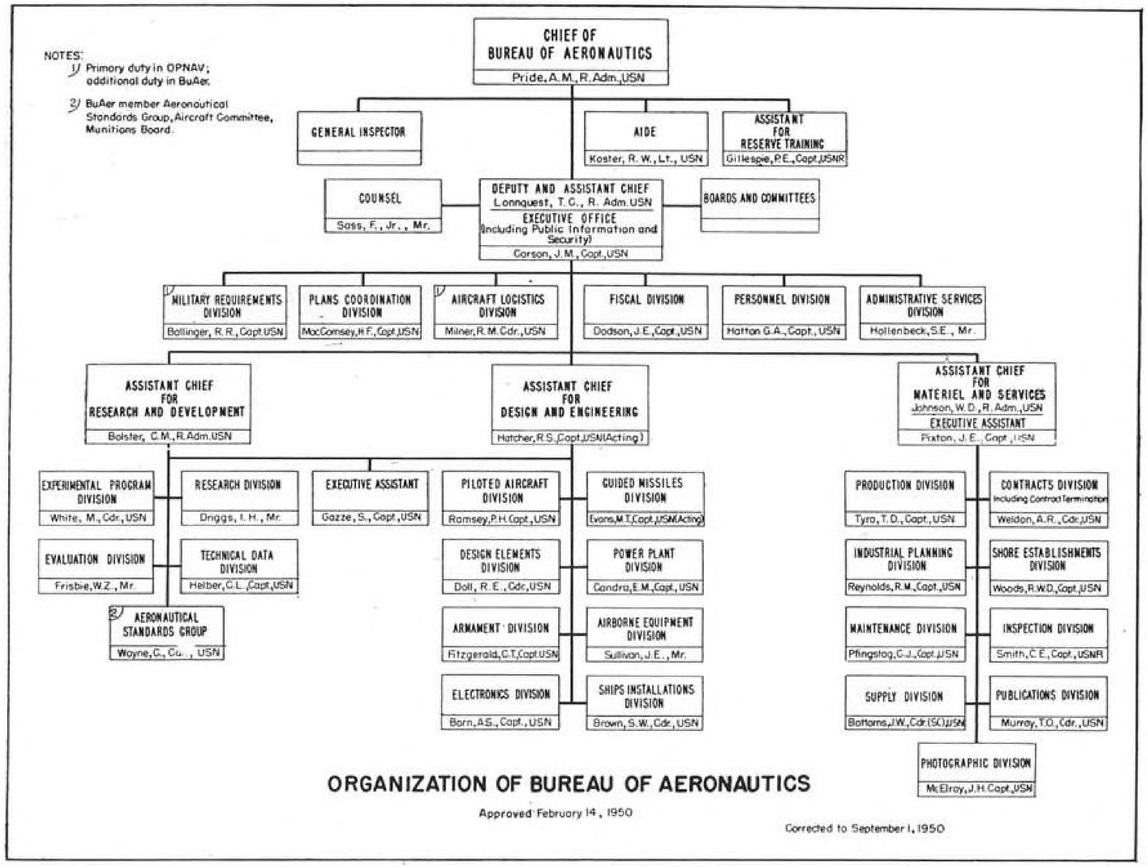
LYCOMING-SPENCER DIVISION
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AIRCRAFT ENGINES AND RELATED PRODUCTS • AIR-COOLED INDUSTRIAL ENGINES AND RELATED PRODUCTS
PRECISION MACHINE PARTS • RESIDENTIAL AND COMMERCIAL BOILERS • STEEL PLATE FABRICATION • GRAY IRON CASTINGS

How USAF Purchase Requests Become Contracts



SELLING TO THE NAVY



ORGANIZATION OF BUREAU OF AERONAUTICS

Approved February 14, 1950

Corrected to September 1, 1950

How the Navy Plans to Spend $2.3 Billion

You deal with the Bureau of Aeronautics if you have equipment to sell for the 3000 new-plane program.

The shift forced on overall U. S. defense strategy by the Korean conflict has given renewed importance to Naval and Marine aviation. It has resulted in a tripled plane procurement budget.

Navy Bureau of Aeronautics now has more than $2.32 billion to buy a total of 3347 fighters, attack planes, patrol bombers, transports, helicopters and trainers.

Naval aircraft procurement at the time of preparation of the fiscal 1951 budget was dangerously low. It had suffered, along with other Navy functions, the crumbling effects of postwar demobilization, almost two years of budget shrinkages, a year of moderate expansion and a period of rapid cutback. The cutback occurred in mid-1948, when department roles and missions were redefined at the Key West conference.

The regular fiscal '51 budget, prepared in light of a strained international situation, gave Navy $750 million for 980 aircraft, barely enough to maintain a token air arm. Impact of the Korean conflict and the resulting $10.5-billion supplemental budget gave Navy an additional $620 million for 1067 aircraft. This was augmented a few weeks later in a supplemental budget which gave Navy $950 million more for 1300 additional airplanes.

► **Par for Navy Air**—Decision for the supplemental $950-million budget came following an agreement by the Joint Chiefs of Staff that Naval aviation should be maintained in the same "state of relative readiness" as the Air Force. Aircraft procurement programs of both services were to base on the same rate of modernization, the JCS said. This decision of the JCS permits Navy to approach maximum efficiency with sufficient planes on order to keep Naval air power 100 percent modern.

Under the President's supplemental bill, Navy was authorized to procure 1067 aircraft, which left Naval aircraft 465 planes below the 1950 approved procurement program and about 3400 operating aircraft below the 1949 program. The second supplemental program, providing for 1300 additional aircraft, brings Naval air power close to its minimum goal.

► **Expanded Procurement**—Expanded Naval procurement of aircraft for fiscal '51 is controlled by the Bureau of Aeronautics in Washington. It is

QUALITY · SERVICE · PRICE

Send blueprint or sample today for your quotation

AIRCRAFT COMPONENTS

Fast, economical service on stampings of brass, steel, stainless steel, aluminum, copper, plastic—any material that can be punched.

Press capacity to 100 tons, 24 inches square, shallow draw (to ¾").

Small quantities available at low cost due to special facilities—a valuable feature before going into volume production.

LAMINATED AND ONE-PIECE SHIMS

Laminated shims are stamped from sheets of LAMINUM, "the metal that peels." LAMINUM is "solid" metal built up of layers of .002 or .003 inch shim brass or steel, metallically bonded together. The laminations peel easily with a penknife. This feature provides a handy spacing adjustment *right at the job.*

One-piece shims without the lamination feature are also available, cut to your specifications.

LAMINATED SHIM CO.

INCORPORATED

GLENBROOK CONNECTICUT

AN APPROVED AVIATION SUPPLIER FOR 26 YEARS

directed, as in the past, by a three-pronged effort of Research and Development, Design and Engineering, and Material and Services divisions.

• **Research and development.** Under regular 1951 funds Navy was budgeted a total of $190,269,000 for research and development. Of that amount, aircraft and facilities have totalled $75 million. As a result of the revised '51 budget, basic and supplemental research and development was authorized $250,753,000 of which aircraft and facilities get $102,760,000.

The result is that Navy, forced last year to a cutback across the board in research and development, is once again pressing for prototype development of new jet and turboprop aircraft, as well as increased emphasis on guided missile development.

► **BuAer Procurement**—Procurement under Bureau of Aeronautics generally works in this fashion:

• **Experimental contracts.** The Research and Development division is headed by Rear Admiral C. M. Bolster. He is in charge of all experimental programs. Contracts for research and development fall into two groups—research contracts (those with no end product in sight); and development contracts (those which will call for an end product).

• **Development contracts.** Design and Engineering division is headed by Capt. R. S. Hatcher. This division formulates the program for development of specific items required in a large scale production program. Armament, electronic equipment, powerplant and airborne equipment are among the items controlled by branch chiefs under the Design and Engineering division. Each branch devises its own individual requirements for item equipment.

• **Material and services.** When specific requirements have been crystallized, they channel through Material and Services division headed by Rear Admiral W. D. Johnson. The division coordinates all actual procurement in the form of directives upon concurrence of Chief of Naval Operations. These procurement directives become, eventually, the sought-after Naval procurement contract.

BuAer in Washington is the prime agency in buying Naval aviation's planes, powerplants and instruments. It coordinates on armament and other GFP (government furnished property) with the Naval Aviation Supply Office. NASO (see page 51) buys all spare parts and raw materials required in the Naval aviation maintenance program, and reorders from manufacturers spares necessary for specific plane types.

Most Naval air procurement is accomplished through negotiated contract. Procurement of items such as air frames, engines and propellers, is based upon recommendations of special-

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never before such luxury!



Custom interiors! Glamorous "Cloud Club" relaxation . . . lounge chairs, divans, tables, music, and congenial traveling companions! Efficient Hostesses. And 23 years of Capital dependability. No extra fare. Fly today aboard a CAPITAL CONSTELLATION!

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Girard Perregaux, Official Watch . . .

Our business is everybody's business

America is involved in another emergency, and the nation is gearing for national defense. And once again, industry is demonstrating that the task of building materiel for our armed forces is not confined to a few major contractors. It requires teamwork by all kinds of industry — large and small. National defense is everybody's business.

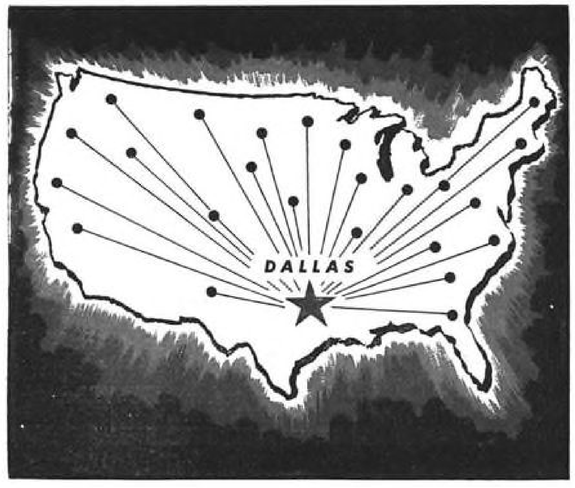
Nowhere is the need for such teamwork more clearly recognized than in the aircraft manufacturing industry. But it is not teamwork desperately assembled at the beginning of a crisis and quickly disbanded when the crisis is passed. It is practiced in peace, as well as in time of emergency.

For example, Chance Vought Aircraft has been in the business of building military airplanes for more than 30 years. And in all that time it has fostered, as a matter of policy, a close working relationship with a large family of allied companies — large and small, but mostly small. They feed into our plant expertly-made components which we incorporate in the finished airplanes.

Some of these companies make such major items as valves, pumps, moldings, plastics, castings, landing gear struts, forgings, and hydraulic assemblies to Vought's designs. Others supply so-called "government furnished equipment," which includes engines, propellers, radar, cockpit instruments and all kinds of electronic equipment. Still others fabricate standard aviation products — sheet stock, rivets, machine screws and many others. We also buy goods and services, from electrical power to paper clips, essential in the operation of any business enterprise. Each company, therefore, is an integral part of Vought's business, however small its participation may be.

By spreading work among a number of companies in peacetime, Vought remains smaller than it would be if it were manufacturing about everything it needs. Therefore, its expansion or contraction as dollar volume of sales fluctuates, is not drastic. And since Vought is not the only customer of its subcontractors and suppliers, these companies are not seriously disrupted if our business slackens off.

In a national emergency, such as the one we are now facing, this kind of teamwork with little business really pays off. With such a dependable network of skilled subcontractors and suppliers, Vought is equipped at all times to handle, quickly and efficiently, any task that might be assigned by the military services.

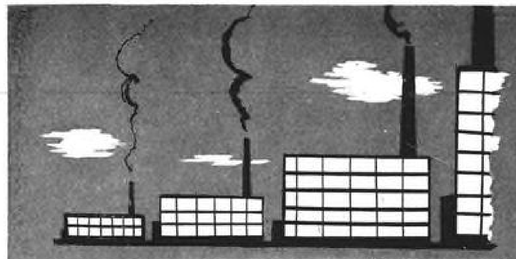


The network of companies, large and small, which feeds products and services into Chance Vought is nationwide.

CHANCE VOUGHT AIRCRAFT

DALLAS, TEXAS

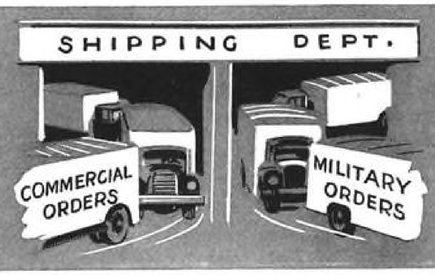
ONE OF THE FOUR DIVISIONS OF
UNITED AIRCRAFT CORPORATION



Chance Vought is an important customer of more than 2,000 subcontractors and suppliers throughout the nation. Most of them are small, employing from 50 to 500 persons. Others are large, some much larger than Vought. Each has a product or special skill we need to help us manufacture intricate, delicate, precision products for modern, high-speed aircraft.



If you want proof of the interdependence of large and small businesses, take a look at the financial side of the picture. Of every dollar received by Vought for airplanes, more than 32 cents is spent for the products of other companies — mostly small ones — on our production team. The amount paid out last year totaled many millions of dollars.



Companies which do work for Vought must adhere to extremely fine tolerances on some products. It is a matter of record that many of these companies, having earned reputations for quality production in aviation, are eagerly sought out by non-aviation manufacturers who want the same quality. This helps them to prosper in peacetime, and preserves skills and manufacturing techniques essential to our national defense in an emergency.

HEAT RESISTANCE NEEDED?

Specify COHRLASTIC SILICONE RUBBER FABRICS

NEW... yet proven

For

★ Gaskets
★ Diaphragms
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COHRLASTIC Silicone Rubber Fabrics have proven their merit in thousands of industrial applications requiring special characteristics:

Temperature resistance (Range −100°F to +500°F)
Resilience over the entire temperature range
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COHRLASTIC is available in 36" rolls of various thicknesses, and different constructions. Write for technical data sheets and specific information regarding your end use.

THE CONNECTICUT HARD RUBBER CO.
414 EAST STREET, NEW HAVEN, CONN.

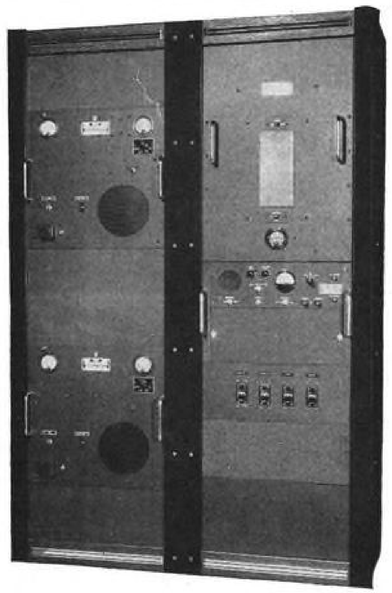
FORWARD with FRONTIER

America's Newest and Largest Feeder Airline

With the merger of Monarch Air Lines, Challenger Airlines, and Arizona Airways to form Frontier Airlines, the new corporation's route extends from Billings, Montana, to Nogales, New Mexico ...to Denver and Salt Lake City. Small wonder they chose, for dependable flights over rugged mountain terrain, navigational aids by Aerocom!

Aerocom's complete package-type dual automatic beacon transmitter insures that your radio beacon will be on the air at all times! Each dual unit contains 2 100-watt transmitters, automatic keyer, an automatic transfer unit, and an antenna tuner.

A letter from you will bring descriptive literature and engineering data on this and other Aerocom products designed to help you solve your communication, navigation, or meteorological problems.



Consultants, Designers and Manufacturers of Standard or Special Electronic, Meteorological and Communication Equipment

AER-O-COM
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AERONAUTICAL COMMUNICATIONS EQUIPMENT, INC.
3090 Douglas Road, Miami 33, Florida

ist officers. Requirements proposed by these specialists for a specific item are usually so complex that the list of vendors who can comply with the established requirements is considerably narrowed.

► **Incentive Plan Popular**—In 1942 Navy established an incentive-type contract which offered a manufacturer a profit premium for efficient production. Through the lean postwar years this plan has continued to pay off.

It works in this way:

BuAer procurement officials and the manufacturer agree on the best negotiable price which includes a standard rate of profit. If the manufacturer builds his plane at a higher cost than that specified in the contract that excess cost is split between Navy and the contractor.

If, on the other hand, the planes are produced at less than the specified cost, the manufacturer is permitted 20 percent of the savings as a profit, with Navy benefiting from the remaining 80 percent. The more efficient the manufacturer becomes, the larger his profit.

Navy Property

Navy property is classified by a numerical system similar to that used by the Air Force. This simplifies the accounting and keeping track of the many items purchased by Navy.

The manufacturer and subcontractor should know what classes cover his products. This will expedite his dealings with the government.

These are the Navy classes:

- Class 6: Anchors, buoys, mooring hooks.
- Class 8: Gages, patches, pumps, valves, valve parts.
- Class 11: Compressors (stationary and portable), pumps, refueling units.
- Class 12: Cable fittings (bushings, turn buckles, shackles, etc.).
- Class 14: Compounds, greases, lubricants, oils, solvents.
- Class 15: Electric cable, wire.
- Class 16: Wireless communication apparatus and parts (radar, radio, sonar, including peculiar test equipment, and accessories).
- Class 17: Airport and seadrome lighting, batteries, fuses, circuit breakers, switches, meters, warning devices, plugs, receptacles, lights, resistors, junction boxes, shop equipment (general).
- Class 18: Photographic equipment and supplies, precision instruments, test equipment.
- Class 21: Cord, rope.
- Class 22: Cable and wire (non-insulated).
- Class 23: Emergency and rescue equipment.
- Class 24: Duck, canvas.
- Class 26: Bins, refrigerators, tables.
- Class 27: Dry goods.
- Class 29: Toilet articles.
- Class 31: Lighting apparatus (non-electric).
- Class 32: Heat insulating material.
- Class 33: Gaskets, hose and fittings, packings, rubber, plastics.
- Class 37: Special clothing, related accessories.
- Class 38: Brushes.
- Class 39: Lumber, plywood.
- Class 40: Machine tools.
- Class 41: Hand tools.
- Class 42: Hardware.
- Class 43: Bolts, nuts, rivets, screws, washers.
- Class 44: Rigid tubing.
- Class 45: Tube and pipe fittings, hydraulic hose assemblies and fittings, valve fittings.
- Class 46: Metal bars, rods, ingots.
- Class 47: Metal matting, plates, sheets, strips.
- Class 48: Aluminum alloy extrusions.
- Class 51: Gas cylinders, chemicals, chemical agents.
- Class 52: Aircraft finishes, cements.
- Class 53: Packaging, marking materials.
- Class 57: First aid and laboratory equipment.
- Class 58: Fire extinguishers and parts.
- Class 63: Tableware (aircraft).
- Class 64: Galley gear (general aircraft).
- Class 65: Aircraft stoves, ranges, galley appliances.
- Class 66: Machinery (cleaning and sewing machines, etc.).
- Class 69: Materials handling equipment.
- Class 77: Anti-friction bearings, plain bearings.
- Class 80: Aircraft, heavier-than-air (complete) (HTA).
- Class 82: Airframe structural assemblies, landing gear, ground handling equipment (HTA).
- Class 83: Aircraft accessories and components of hydraulic, fuel, vacuum and de-icer systems (excluding carburetors and pumps); tires and tubes, parachutes, heaters, oil separators etc.
- Class 84: Aircraft engines (complete).
- Class 85: Aircraft engine parts and test equipment; peculiar engine tools and test equipment.
- Class 86: Aircraft pumps and components of carburetion, ignition, starting, electrical supply systems.
- Class 87: Aircraft propeller systems, including peculiar parts and tools.
- Class 88: Aircraft instruments and automatic pilots, and parts, tools, test equipment peculiar thereto.
- Class 89: General handling equipment for aircraft (preheaters, energizers, work stands, nose hangers, etc.).
- Class 90: Aircraft catapults, barriers, arresting gear.
- Class 91: Airships, lighter-than-air (LTA), complete.
- Class 92: Airship structural assemblies and landing gear (LTA).
- Class 93: Special aeronautical training devices and parts peculiar thereto.
- Class 94: Aircraft armament, aviation ordnance, aviation fire control equipment.
- Class 96: Rockets, guided missiles.

Capital AIRLINES
Capital Constellations

Carry MAPCO Hot Food Ovens and Liquid Containers

SETTING new standards for service and passenger comfort, Capital's new Constellations leave nothing to be desired. Sound planning in galley equipment matches the other functional appointments which so successfully distinguish these aircraft.

Mansfield Aircraft Products Company is singularly honored to have its Hot Food Ovens and Liquid Containers selected by Capital Airlines for service in its new Constellations.



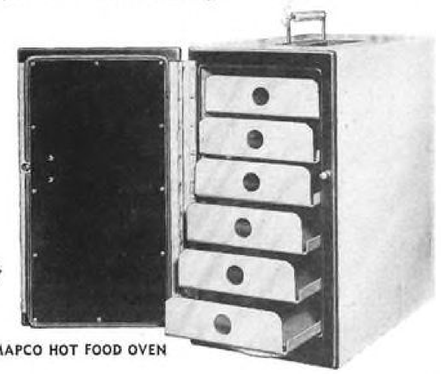
Mapco Liquid Containers are an important adjunct to the renowned food service of Capital Airlines.



MAPCO LIQUID CONTAINER

Designed especially for aircraft service. Equipped with either or both 24 and 110-volt circuits for in-flight service or preparation at food centers. Insulated and hermetically sealed. Thermostatically controlled. Has dry-ice well for cold beverages.

Maintains selected food temperatures of 135° to 190° for any desired period of flight or time. Thermostatically controlled with selector switch. Choice of 24 and/or 115-volt circuits for use in both in-flight service and work at food preparation centers.



MAPCO HOT FOOD OVEN

MANSFIELD AIRCRAFT PRODUCTS COMPANY
Manufacturers of Complete Air-Borne Galley Equipment
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CECOSTAMP

Model "L"
The Hardest Hitting Cecostamp Ever Built



Wider Range of Work: TheModel "L" Cecostamp can handle a wider range of work than previous models. This increase in striking energy is effected by increased ram weight.

Easier Operation: Concentration of controls makes for ease of operation. Working area has been cleared of obstructing surfaces. Operating valve handle and control valve handle, worked together, run the Cecostamp and keep the operator solidly poised for quick, accurate blow control.

More Accurate Operation: Valve porting and valve rigging give smoother, surer ram action, making it possible to strike similar blows regardless of die height. The steel bolster plate makes for rapid die changes and more accurate setting of dies.

Greater Safety: Operational hazards have been largely overcome. Controls are centralized for safety and ease of operation. Frame-to-anvil bolts and springs are recessed in the anvil avoiding hazards to clothing. A safety cylinder head prevents damage from piston over-travel. Positive self-positioning safety rests, built into the side frames between the guides, hold the ram when changing dies or working between dies. Operating valve handle must be held down before throttle control valve can operate.

Lower Maintenance Costs: New shock absorbing features have been incorporated to cushion vital parts, as for example, the Fabreeka pads at the frame-to-yoke joints. Automatic lubrication of valve, cylinder and guides prolongs the life of these parts. Lubricator turns on automatically as soon as machine is operating. Valves are cast integral with the yoke, eliminating piping and air losses.

Write for a copy of Bulletin 30-L-O

CHAMBERSBURG SINCE 1897

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



Rear Admiral S. E. McCarty



Captain F. L. Hetter



Commander H. F. Kuehl



Captain F. W. Hesser

Your Navy Market for Spare Parts

BuAer decides what planes will be bought. To sell replacement items for those planes, talk to ASO.

Navy buying for new plane airframes, engines and accessories in the next 18 months is going to multiply.

Plane orders scheduled for fiscal '51 are far above last year's.

And maintenance spare parts procurement will jump even more.

▶ **Supply Depot**—The Aviation Supply Office orders the Navy's supply of spare parts for aircraft, plus standard Navy hardware. It is located at the Naval Aviation Supply Depot in Philadelphia, and is under the command of Rear Admiral S. E. McCarty, SC, USN, aviation supply officer, and his deputy-assistant, Captain F. L. Hetter, SC, USN. Admiral McCarty is also the commanding officer of the NASD, and Captain Hetter is the executive officer. Commander H. F. Kuehl, SC, USN, is the ASO executive assistant.

Responsible for maintaining proper stock levels of standard Navy commodities is the General Stores Supply Office, commanded by Captain F. W. Hesser, SC, USN, also located at the Naval Aviation Supply Depot. Most of this material is procured through the ASO Purchase Group. Capt. F. W. Hesser, SC, USN, is in charge.

Total ASO-administered business this fiscal year will crowd a half-billion. ASO has more authority than any other Navy supply field organization. It makes about 90% of the parts procurement decisions for Naval aviation, based upon Bureau of Aeronautics delegated authority. Other Navy supply field offices make fewer decisions.

Biggest step-up for the aviation supplier will be in negotiated contracts. But public bid contracts will jump too, for aviation spares and general Navy hardware and commodities.

▶ **Spare Parts Job**—The three main functions of ASO on spare parts are:

- **Provisioning spare parts** for new planes. ASO orders the spares for all new Navy planes and engines.
- **Re-stocking spares** for Navy planes and engines now operating.
- **Plant single-service procurement** of spares for the Air Force from companies like Pratt & Whitney and Westinghouse, over which the Navy has cognizance.

ASO's purchases of general commodities are for:

- **All standard** Navy hardware and raw materials.
- **Single-service buying** for Air Force and Army for certain commodities.

In spite of the big increase in new

ASO Buying Activity

Who buys what, how much, and on what type of contract.

ITEM	HOW BOUGHT	FISCAL 1950 CONTRACTS
(Provisioning—Buying by Provisioning Controller Dan Cone for new planes, engines.)		
Airframe*	Negotiated, prime	$32,485,390
Engines:		
Jet	Negot., prime	46,476,000
Recip	Negot., prime	8,252,000
Accessories (standard)	Bid, vendor	1,403,441
Equipment (instruments, etc.)	Negot., vendor and bid, vendor	3,641,707
(Annual Maintenance—Buying by Purchase Officer O. W. Stafford for Stock Control.)		
Airframe*	Negot. or bid; prime or vendor originally supplying usually wins contract	7,760,000
Engines:		
Jet	" " "	11,500,000
Recip	" " "	6,675,000
Accessories (standard)		62,593,000
(Navy Hardware, etc.—Buying by Purchase Officer O. W. Stafford for General Stores.)		
Hardware and raw materials	Mostly bid	60,000,000
Miscellaneous		40,000,000
Total ASO Procurement Responsibility		**$280,786,538**

* Airframe procurement here usually includes electric, etc., parts peculiar to type.

For Passenger Comfort and Pleasure

New Capital Airlines Constellations use LORD DYNAFOCAL MOUNTINGS





We salute the new Capital Airlines Constellations . . . the last word in luxury aloft! Passengers enjoy a new sense of luxurious comfort as they relax in the lounge or "Cloud Club" of these new Lockheed Queens of the Air.

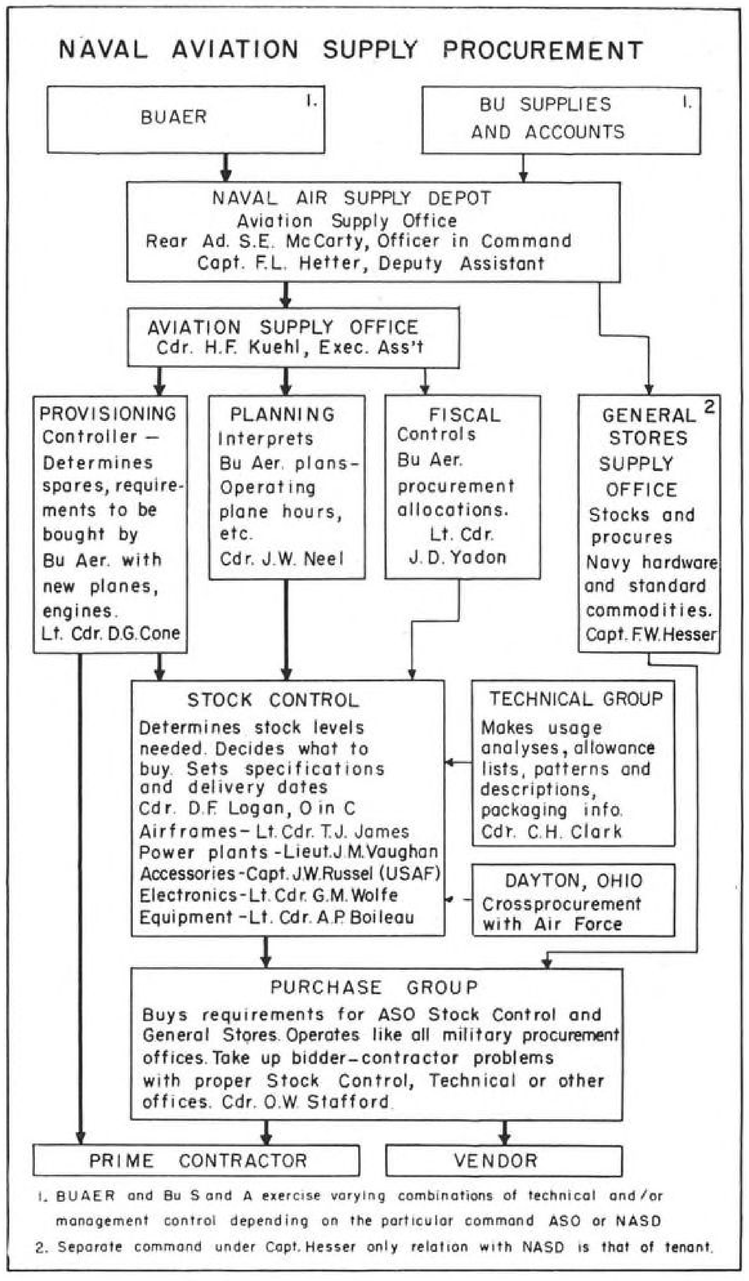
Many do not know that much of their comfort and pleasure depends upon the skillful engineering that produced the LORD Dynafocal Engine Mountings that protect them from the vibration of powerful engines. But they do know that they are enjoying the most pleasant and restful method of travel.

LORD engineers specialize in methods for controlling vibration in aircraft and all other types of mechanical products. They can make your product more desirable . . . more salable . . . by giving it smoother, quieter operation. Submit details of your problems to Product and Sales Engineering Department.

LORD MANUFACTURING COMPANY
ERIE, PENNSYLVANIA
Canadian Representative:
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LORD BONDED RUBBER
Vibration-Control Mountings . . . Bonded-Rubber Parts

NAVAL AVIATION SUPPLY PROCUREMENT



1. BUAER and Bu S and A exercise varying combinations of technical and/or management control depending on the particular command ASO or NASD
2. Separate command under Capt. Hesser only relation with NASD is that of tenant.

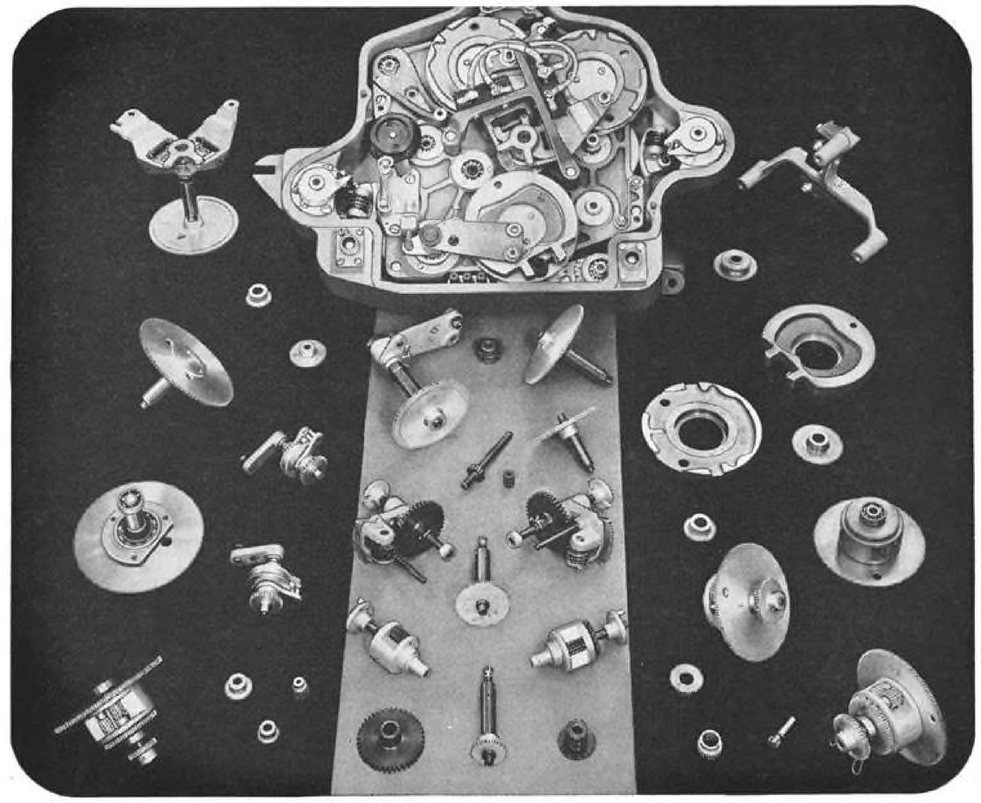
plane procurement and provisioning, ASO won't be buying much on an emergency basis. Most of the huge increase in ASO spare parts buying will be for stock. So, while ASO may want early delivery on many negotiated purchases, it won't be ready to pay high prices. BuAer and ASO have reviewed their supply set-up since Korea, and find ASO has no bad supply problems.

► **New Plane Spares**—ASO has perfected a system of buying from prime contractors enough spares with the original airframe to maintain it during its planned lifetime. This is called provisioning. Engine and accessories provisioning is similar, but for shorter period.

The story of provisioning the Douglas F3D Skyknight (first contract just completed) shows how provisioning system refined and integrated by Provisioning Controller Dan Cone works.

In September, 1948, BuAer sent a letter of intent to Douglas for development and production of 28 jet night fighters, designated F3D. The contract

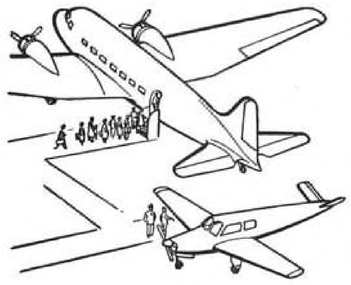
In a **"control unit"** the need for PRECISION points to **STEEL PRODUCTS ENGINEERING!**



from the smallest gear to the largest assembly

For a precision assembly such as this control unit, for aircraft and similar mechanisms of intricate parts—gears, cams and differentials—must be built to exact tolerances. Aircraft engineers know they can depend upon Steel Products for the precision workmanship required in design, manufacture, assembly, and testing of complex units like this. For precision contract manufacturing, in aircraft or other industries, send your inquiry or blueprint for quotations; or write for booklet showing plant facilities.

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Plane owners agree—

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(HOURS PER REPLACEMENT)

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PACKARD

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IGNITION CABLE

Years of leadership in cable development and progress has resulted in Packard becoming the standard cable in the aviation industry.

It is no secret that Packard high-altitude aircraft ignition cable gives unequalled resistance to heat and cold, moisture and abrasion, age and corona under all atmospheric conditions—from sea level to ceiling—in all parts of the world.

It is well known among owners of all types of planes that Packard aircraft cable gives more *hours per replacement.*

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PACKARD ELECTRIC DIVISION
GENERAL MOTORS CORPORATION
WARREN, OHIO



AVIATION SUPPLY OFFICE: Behind the door lies a half-billion dollar market.

called for delivery by September, 1950. Spare parts for concurrent delivery by Douglas were budgeted at 26% of total contract value. This was the budget BuAer allowed Provisioner Cone for airframe spares and accessories and electrical "parts peculiar" (spares for accessories and electrical that are not standard on other type planes).

Because this original F3D procurement was before Korea, the spares were to be of the type for maintaining the plane through a peacetime operating life. That meant about 30 percent of spare parts cost was for maintenance-replacements and 70 percent for overhaul. Wartime spares provisioning raises the quota for maintenance parts (like exhaust pipes, tailpipes, shroud assemblies, actuators) but overhaul items (like forgings and castings) are needed in less quantities. This is so because when planes are fighting their maintenance requirements are much heavier, but fewer planes get back home, so less overhaul parts are needed per new plane procured.

▶ **Planning Spares**—Planning the provisioning list for the first F3D started well before completion of engineering drawings. The idea was to get concurrence of spares manufacture and delivery with original airframe—this to save on unit cost and time.

One month before completion of drawings (February-March, 1949) Cone called a full-scale meeting of his F3D provisioning team. The team includes military and civilian personnel of ASO, BuAer, and field overhaul activities plus fleet operating personnel, and Douglas and its vendors.

▶ **Provisioning Team**—First the team coded every part of the airframe and accessories (20,000 items), using blueprints 95 percent completed. Then the team figured replacement rate per operating plane hour (OPH) on every normal replacement part—about 2000. (Maintenance and overhaul parts are what count; crash damage parts are figured to be re-supplied from cannibalized planes). Then the experts decided who should supply what spares (O&R, Navy manufacture, prime contractor, vendors).

ASO set the number of each spare ordered per plane. Stock Control technicians figured this from records on probable OPH life and deployment of the plane, according to latest strategy layout sent ASO Planning Office by BuAer and Fleet.

By late March, 1949, ASO had issued a complete spare parts list. Douglas then started production on the prototype. Full spares list was manufactured concurrently—for 5-year life, three service tours and two major overhauls, which was the peacetime life and deployment. (See chart, page 57.)

Over the next 12 months, provisioning schedules were under frequent review. About June, 1950, Cone called a final team meeting for the 28-plane contract. This was three months before delivery of the 28th plane (delivery was at three planes per month).

▶ **Repeat Contract**—Even before shop completion of the first F3D-1, Douglas got a contract in September, 1949, for 70 more F3D-2s. The first increment of 20 was to start shop fabrication within four months, by January 9, 1950.

The new contract called for concurrent delivery, by Douglas and subcontractors, of spare parts with these 70 planes. That meant a provisioning team would have to meet in November—two months before starting fabrication. The team convened and worked for ten days, planning spare parts allowance list and the manufacture and delivery schedules.

So right now, every group of Skyknights delivered comes with a list of spares originally calculated to maintain the group a lifetime. The spares are worth one-third as much as the airframe itself.

This ASO provisioning scheme used to get some opposition. Some contractors said the Navy planners could not succeed in their aim. But they are all for it now.

Here is how fine the provisioning science can get: Not long ago the Air

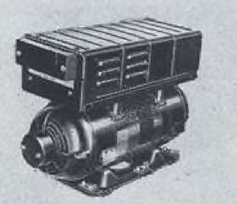
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meeting your needs with proved . . .

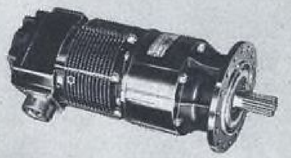
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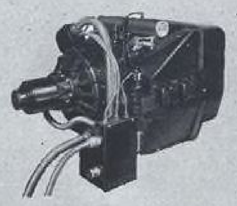
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These are but a few of the types of aircraft electrical equipment now in production at J & H. They're units we've successfully developed and engineered . . . based on your demands —for smaller, lighter, more dependable packages of power.

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Superior Performance *plus* ADVANTAGES of STANDARDIZATION



DOUGLAS DC-4



LOCKHEED CONSTELLATION



CONSOLIDATED VULTEE CONVAIR 240

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PAN AMERICAN WORLD AIRWAYS

Uses VICKERS

HYDRAULIC EQUIPMENT

Pan American World Airways derives a double advantage from the use of Vickers Hydraulics; first, it has the best aircraft hydraulic equipment available; second, it obtains the many benefits of standardization.

Vickers Hydraulic Equipment has proved by hundreds of thousands of hours in the air its claims of longer life, greater dependability, better performance and lower maintenance.

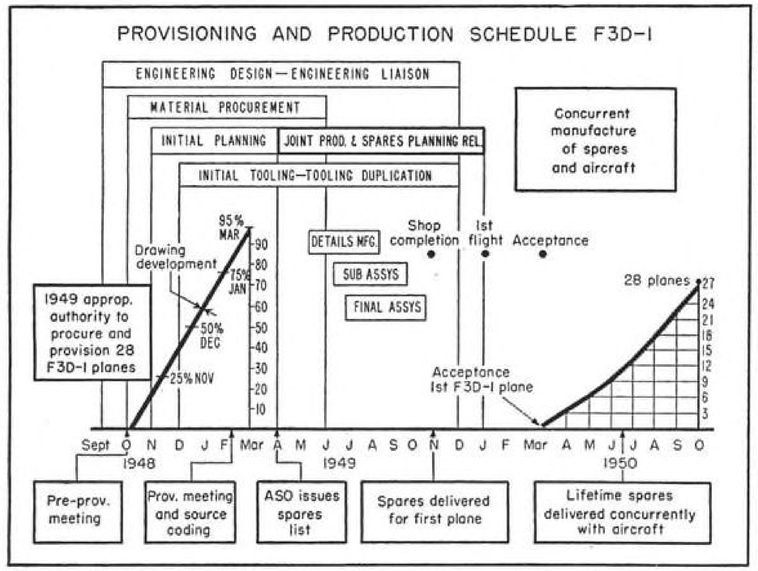
The interchangeability resulting from standardization means a smaller and more flexible inventory of spare parts. It minimizes the number of test and inspection fixtures. It makes for quicker and easier training of maintenance personnel through the need for familiarization with fewer products.

Ask for Bulletin 49-53 describing Vickers Hydraulic Equipment for Aircraft.

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
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Detroit 32, Michiagn

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

4339



Force and ASO each submitted a provisioning list of spares for a new jet engine. The AF list was larger than the ASO list. But when the two forces got their supply technicians together, they found both lists were too big. Experience on this engine now shows the final AF-ASO figuring was near perfect.

► **Engines Provisioning**—Provisioning Navy engines, propellers and accessories is the same basic story. But with these the initial provisioning is for only a fixed period of time or for a fixed number of maintenance and overhaul cycles.

As with airframes, initial provisioning is through the prime contractor. This is to assure proper coordination as technical changes come through. But after the first provisioning order, Stock Control maintains the stock level by quarterly requisitions to the Purchase Group to make up stock deficiencies. Purchase buys spares from the lowest bidder. Usually the low bidder on restocking procurement is the original provisioning vendor, since he has the equipment already set up. Thus, Contractor A may subcontract exhaust stocks to Contractor B on original provisioning, and from then on, Contractor B may re-supply ASO stocks of that item direct.

Engine provisioning is based mainly on usage data. A constant flow of this is scientifically collected and figured by accounting machines from Stock Control's quarterly stock control records.

Engine provisioning teams operate like the airframe teams, but instead of blueprints, they have every part right in the room with them.

► **Routine spares buying**—ASO manages and buys its supply of almost all Naval aviation spares replacements from vendors on both bid and negotiated contracts. First job of ASO is to figure out how much it needs of every item. That's done by Stock Control, under Cdr. D. F. Logan.

Here are the heads of some of the more important Stock Control divisions:

- **Accessories**—Captain J. W. Russel (USAF).
- **Airframes**—Lt. E. G. Dalbey.
- **Power Plants**—Lt. J. M. Vaughan.
- **Electronics**—Lt. Cdr. G. M. Wolfe.

To figure their exact needs, these officers must first know:

- **How many OPH** will each plane fly the next year?
- **Where will the planes** be operating? The more distant or warlike the operation, the more inventory is needed to stock supply lines, depots, and ships.

ASO Planning Officer Cdr. J. W. Neel gives Stock Control these two answers, after interpreting BuAer's strategic plan and fleet tactical disposition.

Then Stock Control officers compute their needs, in line with latest usage factors and inventory level requirements.

ASO system stock control of engine parts is entirely operated by business machines and cards. This is the only known automatic military supply system in the world. It even keeps track of hours between overhaul on every engine, along with all the technical changes made on that engine. So spare parts procurement in this line is wellnigh airtight efficiency.

Stock Control checks inventory against estimated one-year requirements. Where there's a shortage, it issues a requisition. Fiscal Officer Lt. Cdr. J. D. Yadon checks that the requisition is within the budget, then sends it to Purchasing Officer Cdr. O. W. Stafford.

► **Purchase Group**—In fiscal 1950 the

a Great Name Carries On..

WARNER!

FOR years, the Aviation Industry has respected the name "Warner" in aircraft hydraulics.

Always it has meant *quality* and *precision work* of the highest calibre.

Now, reorganization has breathed new vitality into its research, management and production.

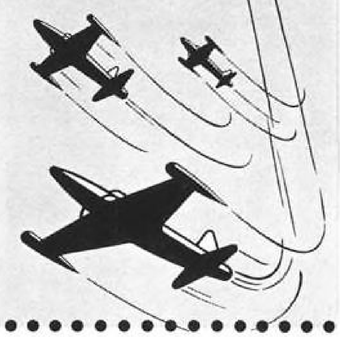
Warner is in the Aviation Industry to stay.

It continues as always to make its famed Hydraulic Valves.

Besides this new leadership, the only change is from the name Warner Aircraft Corp. to Warner Division, Clinton Machine Company.

You can expect even greater things from Warner—sound improvements, finer products—

Products worthy of carrying on the great name they bear!



Warner DIVISION
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Relays

FOR AIRCRAFT



DOUBLE POLE—DOUBLE THROW

A-309 — BALANCED TORQUE DESIGN
(A) Complete. (B) Interior construction.

Basic relay unit incorporates the principle of dynamically balanced rotary armature, producing exceptional resistance to shock, vibration and acceleration, much greater than currently specified in aircraft and related applications. (Used also in two types of No. 48-119, shown below.)

(A)

(B)

10 Amp.
SIZE: 2 1/8" × 2 3/8" × 1 3/4"
WT: 6 3/4 Oz.

NB-57-C MICRO SWITCH
Single Pole. Double Throw. DC. 24V, 12V or 6V. Wt. 5.7 Oz.

ND-47-E SEALED RELAY
Single Pole. Double Throw. Factory Sealed. Wt. 5 Oz.

48-119 RELAY
AN Connector Type.
Hermetically Sealed.
DP-DT—10 Amp.

48-119 RELAY
Octal Plug-in Type.
Hermetically Sealed.
DP-DT—10 Amp.



We are proud of our contribution to the Capital Constellation and our congratulations are extended to Capital Airlines and Lockheed Aircraft Corp. on its inaugural.

Electrical Products Corporation serves the Aircraft Industry with highly specialized electrical parts, engineered by an expert staff and manufactured under rigid quality control in one of the most complete plants in the West. The organization is available for solution of aircraft problems in electrical design.

Inquiries and inspection of engineering and manufacturing facilities are invited.

Electrical Products CORPORATION

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ASO Purchase Group awarded 15,000 contracts totaling over $200 million. About 50 percent of this was in negotiated contracts, the rest publicly advertised competitive bids. The total for fiscal 1951 should exceed this amount with some increase in negotiated contracts.

Purchase Group buys these general categories:

- **Almost all aviation spare parts** for restocking. (This is to maintain originally provisioned inventory of engine and accessory spares at one year, and to build up airframe spares where original provisioning was inadequate.)
- **All common standard hardware** and commodities for Navy (General Stores), except chemical, textile, office supplies, lumber.
- **Commodity single-service** purchase items, like paint, marine lifesaving equipment, clocks.
- **Company single-service** procurement of spares.

► **Spares needed quick**—Korea war outfitting and a big jump in the procurement budget gave ASO a test. This was the first emergency load placed on Naval aviation since it was fully integrated at the end of the war.

Here is how changing world conditions work through to changes in Navy procurement needs, and how ASO meets them:

The Korea emergency meant a big change in U. S. strategy as of June 27. Going on a war footing means more maintenance parts needed.

Take Corsair wheels as an item. Korea means not only more Corsair squadrons sent direct to the Pacific. It also means a whole new plan of Corsair deployment at home and abroad for some time to come. That changes the supply picture.

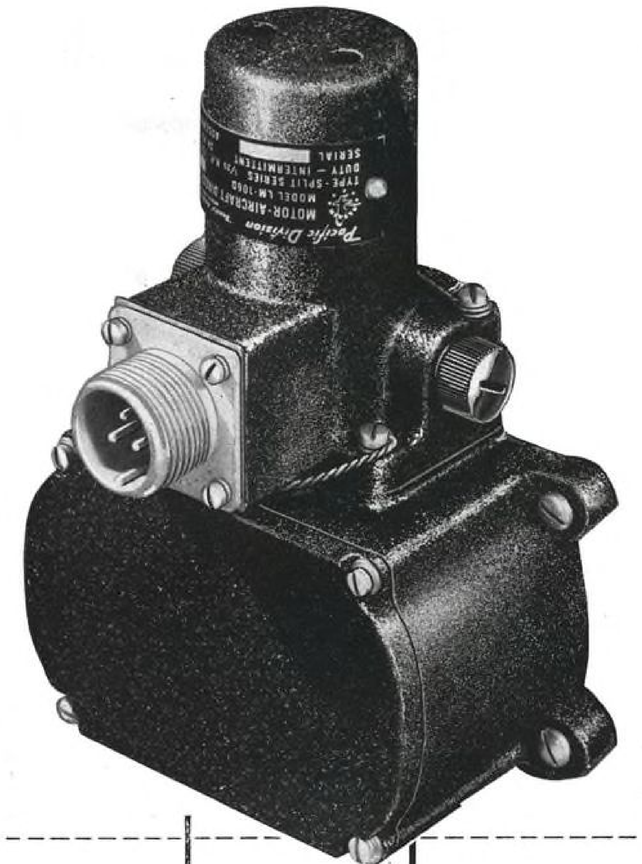
The chain of events leading to fiscal 1951 Corsair spare parts contracts is this:

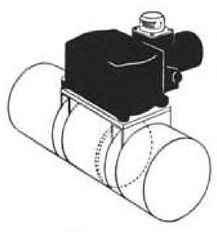
Chief of Naval Operations tells Commander Air Force, Pacific Fleet and other commands the new deployment plan. ComAirPac tells ASO Planning Officer Neel that X Corsair squadrons will go to the far Pacific immediately, Y to Hawaii, etc. And BuAer tells Neel that the permanent deployment and operating schedule as seen by the high command is thus and so. Planes out there will stay out double the tour of duty they used to, and planes will operate more hours per day.

Planning collects this information. It turns it into number of operating plane hours, deployment of planes by type and number. The job of the planning group is to transform strategy and tactics into supply data that Stock Control Officer Logan can use.

How Many Spares?—Stock Control now figures how many wheels the X Corsair squadrons in the Pacific will

Let the Geneva-loc actuator simplify your installation





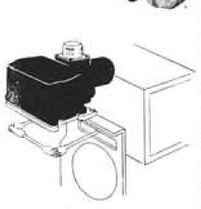
Geneva-loc Air Valve



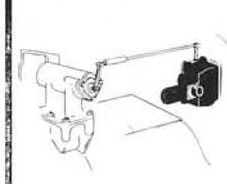
Geneva-loc Hydraulic Valve



Geneva-loc Fuel Valve



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Investigate how the 466635 telescoping safety link can remove the adjustments from the linkage giving you a complete adjustment-free system with minimum of installation time and maximum service.

1. Volume production means low cost
2. Five years' use means time-tested reliability
3. The absence of all adjustments means less service troubles

The Standard Geneva-loc Actuator is ideally suited for installations which are used intermittently. Where more frequent operation is required, a noise-free Geneva-loc is available which will not interfere with radio reception.

Pacific Division
Bendix Aviation Corporation
NORTH HOLLYWOOD, CALIF.

PRODUCT OF Bendix AVIATION CORPORATION

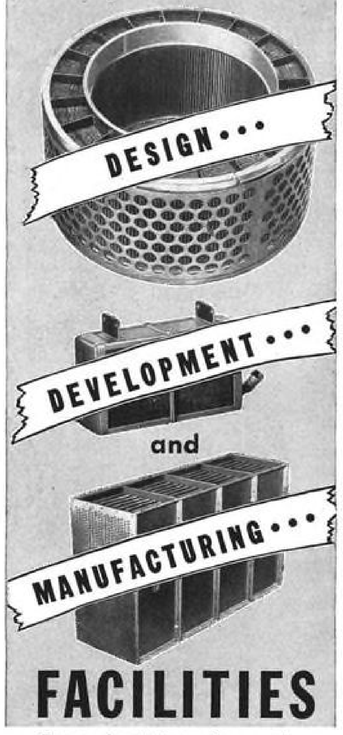
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General Offices: Dept. 170-J, Racine, Wisconsin
Plants at Racine, Wisconsin, and Mattoon, Illinois

need, and when. It also finds how many wheels the other Corsair outfits will need. Logan's men come up with final figures based essentially on these factors:

• **Corsairs in advanced areas** will fly, say, twice as many OPH as they did before.

• **The carriers will put** into one of several forward bases.

All forward bases must stock twice as much as before, although only one of these bases will actually be drawn upon at once. (Trouble is, Navy can't predict which base a carrier will stop at, so ASO must stock them all.) This inventory insurance is unavoidable in forward areas. It is called the "pipeline supply factor."

Up-shot is that Planning tells Stock Control that the X Pacific Corsair squadrons will go aboard ship with a Z-day allowance of spare parts instead of the old Y-day. And the forward bases will need Z-day stock, instead of Y.

ASO Stock Control converts this into two sets of orders:

• **Furnish a-b-c Corsair wheels** immediately from stock, from Pacific Coast depots first, and NASD Philadelphia and NASD Norfolk later.

• **ASO Purchase Group must buy** a-b-c more wheels for delivery Dec. 15, and another a-b-c for delivery by June 1, 1951.

This is to bring stocks up to inventory required to keep all existing Corsairs operating tactically now and for the planned combat life of the craft thereafter. This is in accordance with the newest deployment plan sent down to Planning by BuAer and Fleet commands.

► **Buys spares**—ASO Purchase Group will probably negotiate a contract for the first a-b-c wheels with the vendor or prime contractor who can quote earliest delivery and a reasonable price.

But on the second a-b-c wheels, they may prepare and issue a public invitation to bid.

How big an operation is ASO Stock Control and Purchasing? ASO handles several hundred thousand separate items, of which Corsair wheels are just one.

Right now, ASO Purchasing is out to buy enough of everything to raise its stock level of these items to requirements level as dictated by the present international situation.

► **How Long?**—One month after Korea, ASO Stock Control had figured its new needs for almost all items.

By mid-July, ASO had already ordered items it knew would be short. And it had begun negotiations with vendors on many other items. Present stocks of all items are good for an average of one to two years.

With its big backlog demand now tabulated, ASO will buy heavily over the next 18 months. Maintenance spares will be in biggest demand.

Tips on Selling to ASO

- Follow standard procedure for military procurement offices.
- If you are not already on ASO Bidders List for items you can supply, write Purchasing Officer, ASO, Philadelphia 11, Pa., and state nature of items you are interested in supplying. ASO will furnish you necessary forms by mail.
- Bid on invitations, or else explain why you did not bid. Just a post card is sufficient.
- Do not go to ASO about mobilization plans. Mobilization is handled centrally by the Munitions Board, Washington, D. C. For Navy products, Office of Naval Material, Washington, D. C. cooperates with the Munitions Board.
- Do not go to Washington to get ASO business. It's all handled independently by ASO in Philadelphia.
- Do not ignore delivery dates and specifications in Invitations to Bid, and this applies to packing and packaging specifications as well as material specifications. These are contractual obligations. They mean just what they say—no more, no less.
- You are welcome to visit ASO, but if your only purpose in visiting is getting on the mailing list for bids, a letter to this effect will serve as well as a visit.

Commercial transport planes of every aircraft builder in the United States are equipped with

DYNAMIC AIR BLOWERS

. . . used for recirculation of hot and cold cabin air; defogging of windshields and astrodomes; destratification in critical areas; cooling of electronic equipment, generators, alternators, voltage regulators; air sampling for fire control and thermostatic control; man-cooling and ventilation.

In 1942 Dynamic Air Engineering, Inc., designed and perfected the FIRST AXIAL FLOW BLOWERS for use as airborne equipment, and between 1942 and 1945 manufactured more than 50,000 axial flow blowers installed on military aircraft. Since 1942, this organization has been on that job to the exclusion of all other types of blower equipment, and with accumulated engineering time of over 160,000 hours.



All of this "know how" is available for the asking when you have a project requiring airborne blower installation . .

DYNAMIC AIR

has plowed in more than 160,000 hours of engineering — 19 years of research — plus 8 years of manufacturing aircraft blowers and heaters; all available on a moment's notice!



MODEL #M142A-6A
(2 stage.) 27 volt DC. Boeing 377 Stratocruiser main cabin recirculation. 3,700 CFM at 4" Static Pressure. Diameter 14". Weight 45 lbs. Duty continuous.

MODEL #M141C-1A
(1 stage.) 27 volt DC. Boeing 377 Stratocruiser condenser cooler, 2 per airplane. 3,700 CFM at 4" Total Head Pressure. Diameter 14". Totally Explosion Proof. Wt. 49 lbs.





MODEL #M8862B-8B
(2 stage.) 27 volt DC. Constellation main cabin recirculation. 2 per airplane. 1,300 CFM at 8" Static Pressure. Diameter 9". Pressure tight to 7 PSI. Wt. 35 lbs.

MODEL #M8862F-9A
(2 stage.) 27 volt DC. Special modification of M8862B-8B. Performance identical. Martin 202 Airliner ground heating and cooling. Diameter 9". Wt. 35 lbs.





MODEL #M8922A-9A
(2 stage.) 27 volt DC. Special modification of M8862B-8B. 1,785 CFM at 8" or 1,560 CFM at 10" Static Pressure. American Airlines CV 240 cooling of refrigeration aftercooler. Diameter 9". Wt. 36 lbs.

MODEL #M8921A-1A
(1 stage.) 27 volt DC. Special adaptation from M8862B-8B for Navy P2V airplane. 1,200 CFM at 6" Static Pressure. Diameter 9" Wt. 21 lbs. Other information restricted.





MODEL #M7861K-1B (1 stage.) 115 volt, 60 cps, AC. Used by several Electronics Mfrs. for tube cooling. 450 CFM at .5" Static Pressure. Diameter 8". Wt. 9 lbs.

MODEL #M7861N-2A
(1 stage.) 115 volt, 60 cps, AC. Identical to M7861K-1B except for configuration.





MODEL #M6862CL-1A
(2 stage.) 27 volt DC. Designed for Martin modified DC-4 airplanes in use by Eastern Airlines, Capital Airlines, Braniff, C&S and others. Main cabin ground heating and ventilation. 690 CFM at 5" Static Pressure. Dia. 7". Wt. 11⅛ lbs

MODEL #M6862A-6A
(2 stage.) 27 volt DC. Modified for higher performance for TWA Boeing 307 and Peruvian Airways and others on C-54 modifications. Ground heating recirculation and cooling. 900 CFM at 6" Static Pressure. Dia. 7". Wt. 19 lbs.





MODEL #M6862G-9A
(2 stage.) 27 volt DC. Modified M6862CL-1A for Midcontinent Airlines and others for use on CV 240 airplane, maincabin heat. and vent. 800 CFM at 4" Static Pressure. Dia. 7" Wt. 15 lbs.

Pictures shown here are actual photographs of only a portion of the active models available and are intended to show the numerous configurations available. All data subject to change without notice.

In many instances the modification of an active, proven model to suit your particular application problem will save days, weeks or even months of time. It will also remove most of the uncertainties which enter into a new installation. Proven performance with dependability and low maintenance cost is something more than expectancy or a promise — it is already shaken down — *it is*.
More than 100 models of D.A.E. Inc. blowers are in service today on current aircraft. They represent 10 basic models with 90 modifications to meet particular needs or specifications. A few examples of "originals" and modifications are shown here. Modifications to suit your needs are available.



MODEL #M5862X-9A
(2 stage.) 27 volt DC. Pan American Constellation 049 main cabin recirculation. 450 CFM at 7" Static Pressure. Dia. 6". Wt. 10 lbs.

MODEL #M5861AD-8A
(1 stage.) 27 volt DC. Stewart-Warner USAF Glider Packaged Heater Unit. 340 CFM at 5" Static Pressure. Dia. 6". Wt. 7¼ lbs.





MODEL #M4862K-1C
(2 stage.) 208 volt AC, 400 cps, 3 phase. B-36 airplane heat. & vent. system, 4 per airplane. 200 CFM at 2½" Static Pressure. Dia. 5". Wt. 5½" lbs.

MODEL #M4862J-6B1
(2 stage.) 27 volt DC. 377 Stratocruiser Empenage de-icing recirculation. 325 CFM at 4" Static Pressure. Dia. 5". Wt. 6¼ lbs.





MODEL #M4862L-1B1
(2 stage.) 27 volt DC. DC-6 airplane voltage regulator cooler, 2 per airplane. 275 CFM at 5½" Static Pressure. Dia. 5". Wt. 6.3 lbs.



MODEL #M4582AD-2A
(2 stage.) 27 volt DC. NAA B-45 airplane heating system and ground ventilation. 225 CFM at 6" Static Pressure. Dia. 4.75" Wt. 9 lbs.





MODEL #M4582B-6A
(2 stage.) 27 volt DC. Constellation 649, 749 & 1049 flt. deck booster, heat. & vent. 300 CFM at 4" Static Pressure. Dia. 4.75". Wt. 8.75 lbs.

MODEL #M4582B-1C1
(2 stage.) 27 volt DC. 377 Stratocruiser generator cooling. 4 per airplane. 275 CFM at 5" Static Pressure. Dia. 4.75". Wt. 8.75 lbs.

MODEL #M4581A-3A
(1 stage.) 27 volt DC. & 400 cps AC. Constellation 649 and 749 defoggers. Westinghouse and General Electric and others for electronic tube cooling. This blower also made for 400 cps AC current. 145 CFM at 1.5" Static Pressure. Dia. 4.75". Wt. 4.2 lbs.



MODEL #M4581A-2B
(1 stage.) 27 volt DC. & 400 cps AC. Same as M4581A-3A except for housing configueration.



MODEL #M4581A-2BA
(1 stage.) 27 volt DC. Special modification of housing for Westinghouse Electronics. Otherwise same as M4581A-2B.





MODEL #M4381B-1B
(1 stage.) 27 volt DC. & 400 cps AC. Westinghouse and Bendix electronic cooling, several models. 110 CFM at .4" Static Pressure. Dia. 4½". Wt. 1.75 lbs.

MODEL #M4381B-1C
(1 stage.) 27 volt DC. & 400 cps AC. Modification of M4381B-1B to plastic special shape housing. 90 CFM at 4" Static Pressure. Dia. 4½" Wt. 1.40 lbs.





MODEL #M2881A-1
(1 stage.) 27 volt DC. & 400 cps AC .Used on numerous electronic installations for tube cooling. 60 CFM unrestricted. 36 CFM at .80" S.P. Dia. 3" Wt. 1¼ lbs.



MODEL #M2881A-2A
(1 stage.) 27 volt DC., cps & 400 cps AC. This model can be modified with several types of housing and for several types of current. It can also be built in "two-stage" to double the pressure characteristic. 1 stage performance 60 CFM at .2" or 35 CFM at .8". Dia. 3". Wt. 1¼ to 2 lbs. depending on modification.



MODEL #M2881F-3
(1 stage.) 27 volt DC. permanent magnet motor. 60 CFM at .2" or 30 CFM at .5" S.P. Dia. 3". Wt. 8 oz.



MODEL #M2881F-8A
(1 stage.) Same as other M2881 units. Shown here for type of housing.



MODEL #M1921N-1
(1 stage.) 27 volt DC. or 400 cps AC. 32 CFM at .2" or 20 CFM at .5" S.P. Dia. 2". Wt. 7½ oz.



MODEL #M1921N-1A
Same as M1921N-1 except housing.

These small 2" diameter blowers can be made in any of a number of housing configurations to suit tight space limitations.

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Delta Air Lines
Eastern Air Lines
KLM (Royal Dutch Airlines)
Mid-Continent Airlines
National Airlines
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Lycoming-Spencer, Div. AVCO
M.I.T. Experimental Dept.
Nashville Corp., Div. AVCO
Philco Corp.
Raytheon Mfg. Co.
Reeves Instrument Co.
Sperry Gyroscope Co.
Stewart-Warner, Southwind Div.
Surface Combustion Corp.
Westinghouse Electric & Mfg. Co.

Avionic Spending and What It Buys

	Fiscal Year Budget 1949	1950	1951
AIR FORCE			
GFP for new planes	$62,000,000	150,000,000	400,000,000
Other (incl. Research & Development)	137,408,920	206,675,890	258,000,000
Total AF Avionics	**199,408,920**	**356,675,890**	**658,000,000**
NAVY			
GFP for new planes	32,000,000	55,000,000	175,000,000
Ship and shore (BuShips)	15,000,000	16,000,000	75,000,000
Other (incl. R & D)	27,138,680	18,247,000	75,000,000
Total Navy Avionics	**74,138,680**	**89,247,000**	**325,000,000**
CAA			
Establishment airways	22,440,000	37,450,000	21,500,000
Test & evaluation	1,650,000	1,250,000	1,400,000
Total CAA Avionics	**24,090,000**	**38,700,000**	**22,900,000**
OTHER			
Defense Dept. R & D	.....	.....	40,000,000
Air Navigation Development Board	100,000	7,000,000	5,365,000
Bureau of Standards	3,042,370	3,100,000	3,150,000
Scheduled Airlines	1,500,000	3,500,000	5,000,000
Civil Aircraft	500,000	1,000,000	1,500,000
Export	1,000,000	1,500,000	2,000,000
Total Other Avionics	**6,142,370**	**16,100,000**	**57,015,000**
Total Avionics Procurement	**303,779,970**	**500,722,890**	**1,062,915,000**

Bigger Opportunities for Avionic Sales

Natural growth of requirements, plus defense needs, plus possible allocations makes billion-dollar demand.

Procurement of avionic, electronic and electrical equipment makes up one of the fastest growing markets in the U. S.

In this fiscal year (1951) avionic purchases will exceed $1 billion—double last year's figure and three times that of fiscal 1949.

And new demands by the military may push this year's total even higher.

Small business gets more than one-fourth of total avionics money, or nearly $300 million this fiscal year. About $150 million of this should be spent with small firms that have not figured in avionics production before.

The combined impact of military orders and the television boom has brought a severe shortage of standard components, such as tubes, relays, transformers and resistors. This is crimping production schedules of prime contractors to the military services.

► **Allocations Ahead**—A typical piece of avionic gear for the Navy Bureau of Aeronautics is about 13 percent (by value) standard components, 47 percent special parts, and 40 percent labor, assembly and overhead. The shortage of standard components means just one thing: allocations to civilian products soon unless there is an unexpected gain in capacity. With allocations, manufacturers of both finished products and sub-assemblies must either turn to military business or suffer a decline in volume.

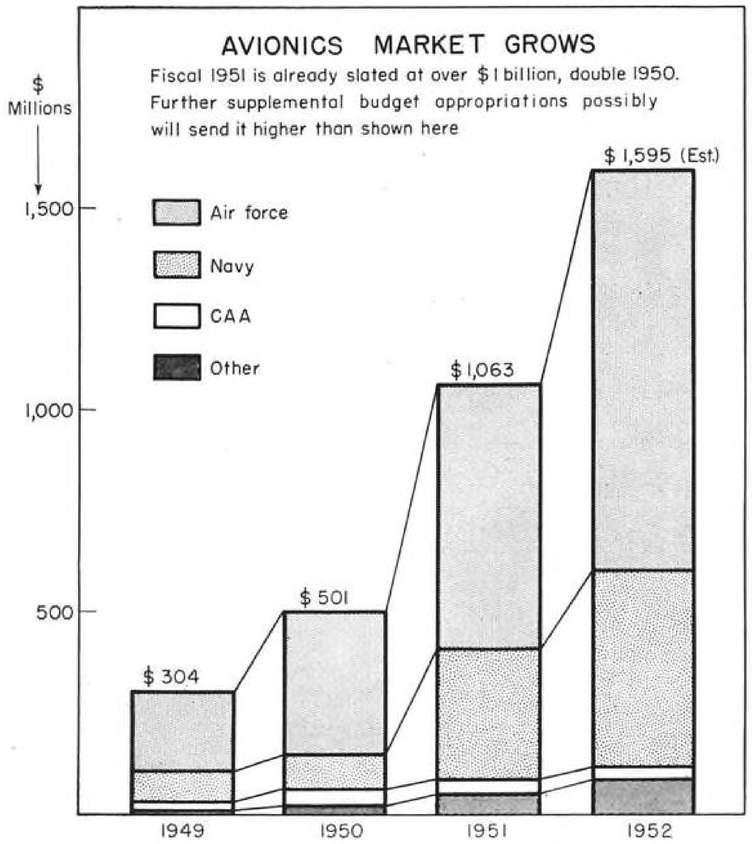
The Air Force and Navy have taken the shortage complaints of their prime contractors to the Munitions Board. The Board now is under great pressure to allocate scarce parts needed by avionics contractors and subcontractors.

Resistor and tube manufacturers are operating at full capacity, with deliveries of resistors in 25-40 weeks. Condenser output is at capacity, but still in short supply.

This standard components group is the only bottleneck now, and it is the only potential bottleneck in case of mobilization. There is no worry about capacity of fabricators of finished assemblies and sub-assemblies.

► **Air Force Spending**—Money now earmarked for avionics procurement and research and development contracts in fiscal '51 breaks down this way: Air Force will spend about two-thirds of the billion-dollar total, or $658 million; $400 million of that is Government Furnished Property for new planes. Ground equipment and refitting of old planes will come to $208 million (UHF airborne sets, IFF, Navigation, and the radar fence included). And another $50 million in avionics is slated for replacement items and miscellaneous "buried items" (avionic equipment not readily identified as such in budget figures).

Small business will get about 20 percent of that money—or roughly $150 million. Air Force buys in such large quantities that larger corporations get a bigger share of Air Force contracts than they do from BuAer. (BuAer avionics spending goes about 50 percent to small business. Its quantities are smaller.)



▶ **Navy Spending**—Navy will buy about $325 million of avionics, roughly half the Air Force budget. BuAer will spend about $250 million of this—$175 million for GFP for new planes, $50 million to refit old planes and other miscellaneous spending, and about $25 million for spare parts.

Bureau of Ships and Bureau of Ordnance will spend easily another $75 million, most of it for ship and shore radar and communications gear.

BuAer lets about half its contract value to firms employing less than 500. BuShips estimates about 20 percent of its prime contracts go to small business. So there is about $140 million in new contracts waiting for small business.

▶ **Research and Development**—Research and development budgets for the services are secret now, so you can't tell how much will be spent overall in research and development of avionic devices. But in the supplemental Defense Department budget submitted after the start of the Korean action there is $140 million set aside for all kinds of research and development. It is estimated that $40 million of that sum will go into avionics. That is in addition to avionic research and development included in the regular and supplemental fiscal '51 budgets.

Research and development work is wide open to small firms. If you have a small but excellent engineering or scientific staff, you stand to do well if you go to the various agencies spending money on avionics research.

One small firm with a top-notch staff right now is doing a $300,000 annual business with BuShips, yet started with assets of $10,000. That's an extreme example, but still it gives an idea of what can result if your staff has special knowledge of some phase of avionics that is needed in the research and development program.

▶ **Chances for Business**—The big jump in military avionics spending offers a good opportunity for many companies now doing little or no government work. On the new types of gear being called for, almost all potential makers start even in the race to get contracts. Only the original developer has an edge on tooling and experience in that piece of equipment. And often the holder of the development contract hasn't the capacity necessary for volume production.

That's one reason an avionics firm ought to go after government business now. Here's another: you need a hedge against full-scale mobilization that would lop off materials for your civilian production. To get listed with the Munitions Board and scheduled for mobilization work, you have to have the recommendation of one of the procurement agencies. So it's best to start right now trying to get government avionics contracts.

You'll get a sympathetic reception. Procuring agencies have been working hard to get more firms to bid on avionics contracts. Price is only part of the buyers' problem. What they want more than anything else is a reliable product—one that can be counted on never to fail in the air when the pilot needs it.

If you can make a reliable product, the procurement agencies want to hear from you. They may stop inviting another firm to bid if your product proves more trustworthy.

▶ **Competition Wanted**—You can get a monopoly position sometimes in certain avionic items. If your product on a standard-type article is accepted after testing, you are put on the "qualified products list" for that item. Then demand for it will come automatically from the Air Force and Navy directly, and from prime contractors doing work for them.

On many items, including types of resistors, transformers and tubes, there is only one single supplier on the "qualified products list." But the procurement agencies hope for more competition. Many items that are nearly monopolies as far as military avionics procurement is concerned could easily be made by companies other than the ones that are listed. All they have to do is make a sample to specifications and get it approved.

Because of greater secrecy, plus urgency, more avionics business is on a restricted, negotiated bid basis, instead of being publicly advertised. Thus, many potential competitors are automatically excluded from the market if they have not taken the initiative in seeking out the procurement agencies and their demands.

▶ **Capital Available**—Some firms fail to get into military avionics business because they think they do not have enough working capital to take on a rigid military production schedule in addition to their commercial work. But under the Assignment of Claims Act, you can get a loan for government work.

This act makes it possible for you to obtain a loan from any qualified financial institution by assigning your contract payments by the government to the lender. Also, the Reconstruction Finance Corp. may help small firms.

▶ **Chief Buyers**—Biggest avionics buyers are Air Force, BuAer, and BuShips. That is the present set-up. Over the long term, the Civil Aeronautics Administration, the airlines, and other

Shooting a bird...

IN THE AIR AGE

THIS IS "shooting a bird" at the U. S. Naval Air Missile Test Center, Point Mugu, California.

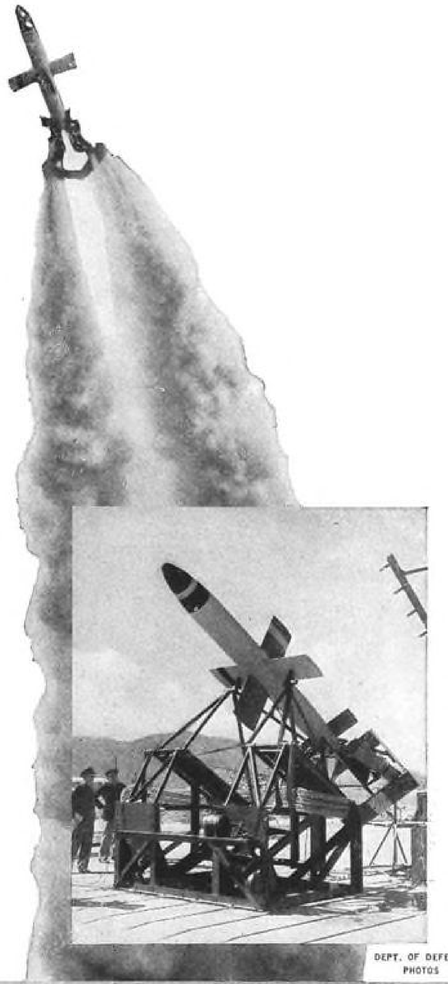
The "shoot" is the launching of a missile, while the "bird", in this particular case, is the Fairchild CTV-N-9a guided missile.

In a matter of seconds the missile is hurled high into the atmosphere with a deafening roar, propelled by its reaction type motors and auxiliary booster. Separation of the booster occurs as the missile speeds higher and higher into space, stabilized and controlled by the "intelligence" of its electronic guidance systems.

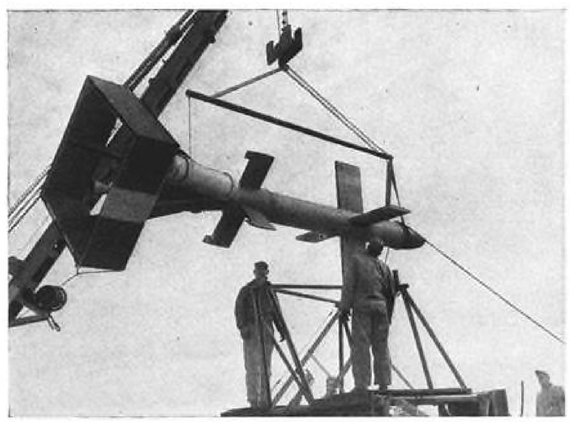
Soon the launching crews and ground observers no longer see the missile . . . but its path is being carefully plotted as it hurls toward its target . . . now under its own homing control.

This "shooting a bird" is but one phase of the Lark project. It is an operation requiring split-hair timing and perfect coordination. It is the result of teamwork between the Bureau of Aeronautics, Navy Department, the Naval Research Laboratory and Fairchild engineers and represents a combination of the best in aerodynamic design, electronic controls and precision manufacturing.

Here is another example of a Fairchild *first* and of "shooting a bird" . . . in the Air Age.



DEPT. OF DEFENSE PHOTOS





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- **Take the initiative** in getting your firm listed with the proper agencies. Remember, much of avionics research and development is secret.
- **Get your firm security-checked** immediately by nearest Air Force or Navy inspector.
- **On research and development** work, send a representative to the office you are seeking business from. Research and development isn't a commodity; each job is likely to be unique. Electronics technical offices have to be careful in screening potential contractors. In seeking research and development work you must even list educational and social activities of your executives and researchers.
- **If you are a subcontractor** on avionics equipment be sure your prime contractor has a ready-reference list of parts you supply him. When more spares are needed in a hurry, procurement offices sometimes cannot find out who made the components of the original piece of equipment.
- **Be sure your product is reliable.** That's more important than cost. Avionic equipment must be more dependable than any other type of item bought.
- **Get on the "qualified products"** list. This will establish a long-lived market for items so listed.
- **Try for research work** if you have a small but good engineering staff. Some problems that need solution: communications antennae of 100 to 1000 mc. that will withstand high speed but be small enough to have low drag; radar countermeasure equipment.

avionics markets will grow to greater stature. But right now, Air Force and Navy are the giant customers.

The Air Force central procurement set-up gives the seller a big break. Through contact with the Air Materiel Command at Dayton, you can get detailed item listings of classes of avionic material bought. Regional offices make it easier for you to get a good look at the thousands of avionic items, for which you may want your company listed as a potential seller.

Some more important avionics classes are:

- **Class 16**—Communications Equipment; this includes all radar and communications equipment components, accessories and parts.
- **Class 03**—Aircraft and Engine Acces-

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Manufacturer	Model
Allison Division General Motors Corp.	V-1710
Continental Motors Corp.	R-1790 R-9A R-895 R-536 R-402 R-268
Jacobs Aircraft Engine Co.	R-755 R-915
Lycoming Division AVCO Mfg. Co.	GSO-580
Pratt & Whitney Division United Aircraft Corp.	Wasp Jr. (R-985) Series B4 Wasp Jr. (R-985) Series B5 Wasp (R-1340) Series H1 Wasp (R-1340) Series H2 Twin Wasp (R-1830) Series C3
Pratt & Whitney Division United Aircraft Corp. (Continued)	Twin Wasp (R-2000) Series D5 & D13 Twin Wasp (R-2180) Series E1 Double Wasp (R-2800) Series CA, CB Wasp Major (R-4360) Series B3 & B13
Ranger Aircraft Engines Division Fairchild Engine & Airplane Corp.	6-440 SGV-770
Wright Aeronautical Corp.	Cyclone 7 (R-1300) Series C7BA1 Cyclone 9 (R-1820) Series C9HE, C9HD3, C9HD1 Cyclone 14 (R-2600) Series C14BB1 Cyclone 18 (R-3350) Series C18BA1, C18BA3, C18BD1

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	J33-A-21	
	J33-A-23	
	J35-A-10	450
	J35-A-17	
	J35-A-23	
	XT-38	501
	XT-40	500
Frederic Flader, Inc.	J55-FF-1	124
General Electric Co. Aircraft Gas Turbine Division	J47-GE-9	TG-190
	J47-GE-11	
	T31-GE-3	TG-100
Pratt & Whitney Division United Aircraft Corp.	J42-P-4	JT-6
	J42-P-6	
	J-48	JT-7
Westinghouse Elec. Corp.	J34-WE-22	24C
	J34-WE-30	
	J34-WE-32	
	J34-WE-34	
	J34-WE-38	
	J40-WE-8	40E
	J40-WE-10	
	J40-WE-12	

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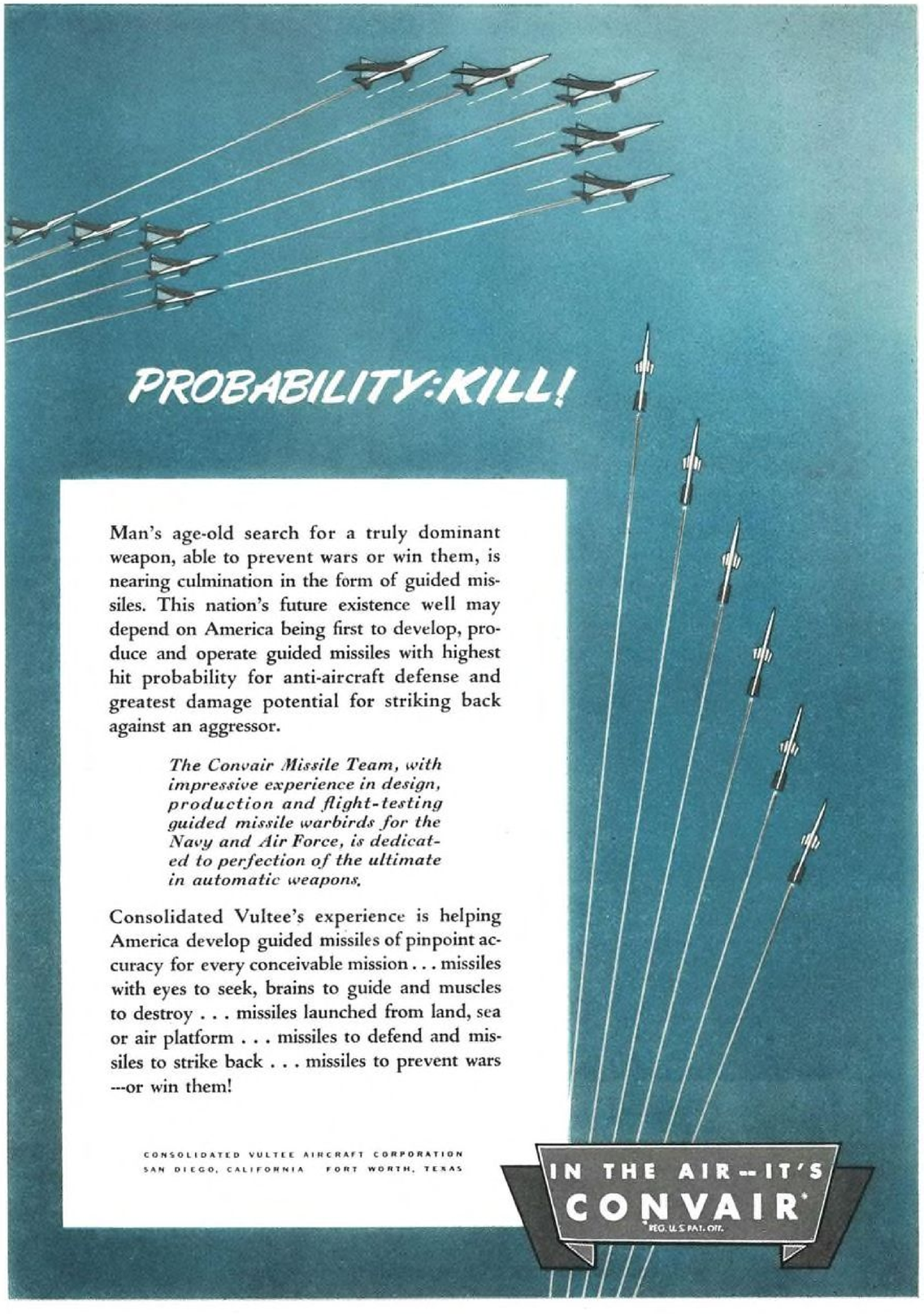
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sories and maintenance parts.

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- **Class 02**—Aircraft Engine and Maintenance parts.

Because avionics are included in so many types of equipment classifications, you will find it best to visit any one of the Air Force Procurement Field Offices. You can see all the class breakdowns. Then you won't miss any items you can make.

Note that the Signal Corps buys a sizeable chunk of avionics for Air Force, through its Philadelphia procurement office.

If you have a staff with engineering and scientific experience, you may get your company on the Air Force engineering source list. Research and development contracts are let to firms on this list. To get on the list, you should send a man to Wright-Patterson. He will then meet the proper people in the laboratories of the Engineering Division and the buyers of avionics in the Procurement Division.

▶ **Navy Buying Bureaus**—The Navy is set up on the bureau system, for the sake of fighting efficiency. This makes avionics procurement a little more difficult than it is through the Air Force. But all major buying offices are located in the Navy Building in Washington.

BuAer production division, electronics section, buys airborne avionics. This is the largest Navy avionics procurement agency. A large part of BuAer procurement is in small orders for small items of equipment peculiar to one aircraft model.

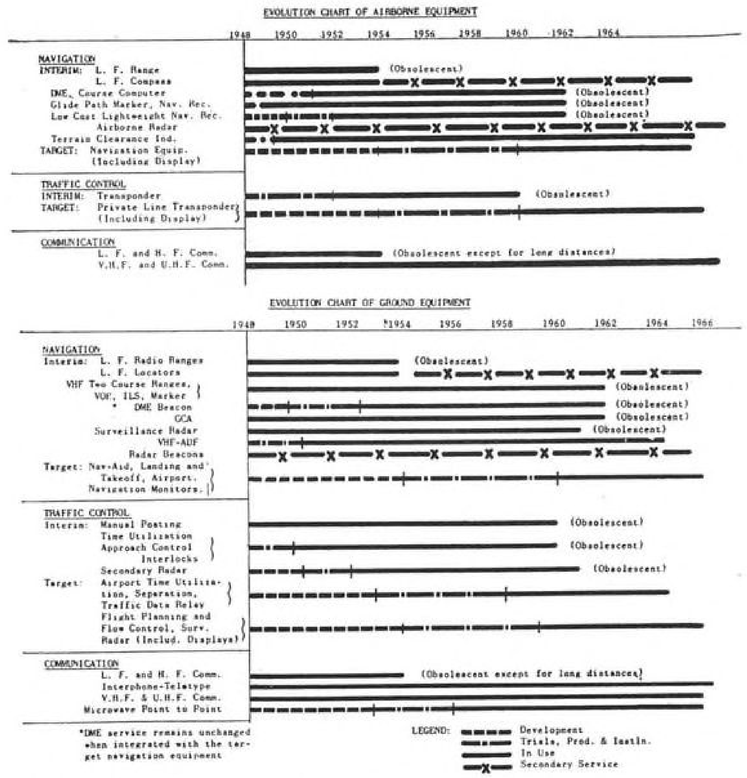
BuShips, on the other hand, lets most of its prime contracts for large and complex units.

BuAer Electronics Division does research and development planning, sets requirements, does engineering design, and lets engineering and development contracts. Research contract scheduling, and development to production stage, works like most research planning.

After evaluation and modification of a piece of equipment, Electronics Division awards a small-quantity production contract to the developer. This item is now produced on a design for later large-scale production. Then the second production contract, this time in quantity, is let on negotiated competitive bid by the BuAer Production Division. Company submitting the best offer gets the job.

▶ **CAA Buying**—All CAA avionics procurement contracts are by public invitation to bid. CAA technicians draw up specifications, and the procurement office (Washington) issues bid invitations and advertisements.

Right now, CAA procurement is slated at about $23 million, so the bidding list is stabilized. But CAA buyers say they would welcome the many other firms not on their list. Only reservation is that bidders must be prepared to meet delivery date specified. Some sizeable companies have occasionally contracted to deliver on a date they aren't sure they can make. This throws CAA programs off schedule.



ON SCHEDULE—This chart of all-weather airways development was laid out two years ago. Fact that work is exactly on schedule has a meaning for bidders: don't promise a delivery date you can't meet.

▶ **The big future**—Aside from the military avionics market, there's a great future in the all-weather navigation and traffic control program of the Air Navigation Development Board. The ANDB coordinates research and development work aimed at making all-weather flight a reality—for military as well as civil aircraft and airports.

The present military crisis will speed up ANDB's $1 billion plan. So the day when there will be huge civilian demand for avionics is rapidly drawing closer. The sooner ANDB's development is completed, the sooner there will be large-scale orders for such avionic gear as airborne transponders.

Transponders are radar beacons carried by aircraft for identification by ground or other airborne radar search sets. ANDB already has the green light to speed up its development of transponders. That's because our radar fence, among other things, will have to distinguish friendly airliners from hostile intercontinental bombers. When ANDB's transponder development work is finished, airlines may order transponders in mass quantities.

The original ANDB all-weather program has moved exactly on the schedule conceived three years ago. Now it's being accelerated. That will mean CAA, as well as airlines and private craft, will be stepping up avionics spending.

▶ **ANDB and Military**—The ANDB program is far more important than its annual $5 million research and development budget would indicate. Military avionics procurement is tied in with ANDB procurement. Thus ANDB coordinates its developmental work with the organizations responsible for tactical avionics. So military planes fighting the enemy use multi-million-dollar quantities of avionics developed for use on the common all-weather system.

And this means the all-weather equipment is far cheaper per unit—because of its mass production for the military.

ANDB does its work under policy guidance of the Research and Develop-

ment Board of the Defense Department, as well as the Navigation Panel of CAA and civilian agencies. An all-out war mobilization would mean research facilities would be swamped. ANDB would use its powers to assign projects to the most immediately useful ends, often stopping long-range projects to get immediate ones finished and installed. So it's well to know what types of equipment will be needed.

► **Transition Program**—Here are the near-term equipment projects that ANDB is working on for CAA and the military:

Study of airport time utilization techniques—completed. Specifications for developmental models of the equipment are being written. This project will later tie in with another project under study—flight-path planning equipment.

Development of R-Theta transponder and associated ground components is being speeded up. Twenty airborne units and one complete ground station are scheduled for delivery next spring for evaluation.

Development of airport surface detection equipment (ASDE)—Terminal Aids Evaluation Center will evaluate developmental model next month. Contract for development of engineering model is already let.

Omni-bearing-distance evaluation program is complete. It is about ready for production, but some distortion has been found to occur at low altitude near rough terrain.

Evaluation of Navascreen will show the great control efficiency that is possible with orderly screen layout. Within two years centralized Navascreen displays will be ready for installation.

Development of pictorial computers is under way on three different types. These will draw a line on a chart, giving the pilot a continuous picture of his position and course.

Many more projects involve modifications of existing gear. Among these are development on directional VHF localizer array; moving target indicator; and 1000-mc. ground master oscillator, a modification of ground DME.

Major Buyers Of Avionics

Air Materiel Command, Wright-Patterson Air Force Base, Dayton, O.—Air Force airborne and ground electronics and electric equipment.

Watson Laboratories, Red Bank, New Jersey—Research and development equipment and contracts for ground installations.

Bureau of Aeronautics, Navy Department, Washington—Airborne equipment and research and development contracts.

Bureau of Ships, Navy Department, Washington—Complete units and major subassemblies, shipboard and ground radar and communications.

Bureau of Ordnance, Navy Department, Washington—Anti-aircraft fire-control radar and communications.

Navy Electronics Supply Office, Great Lakes, Ill.—Spare parts and smaller components for BuShips equipment.

Naval Aviation Supply Office, Philadelphia, Pa.—Spare parts and components for BuAer equipment.

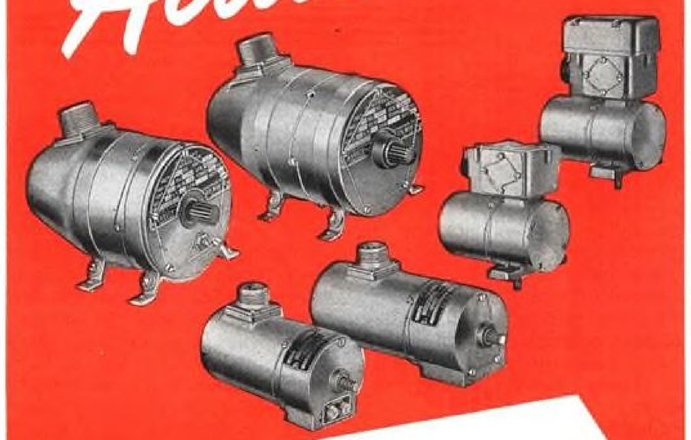
Army Signal Corps Procurement Agency, Philadelphia, Pa.—Procurement of some ground equipment and research and development for Air Force.

Procurement Branch, Civil Aeronautics Administration, Washington—All civil avionics procurement; also procures and installs some for Air Force and Navy.

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A Growing, But Exacting Market

Guided missile construction demands new and delicate skills. If your plant has them you are needed.

By David A. Anderton

Guided missiles have turned out to be a different breed of cats than airplanes—much to the annoyance of the aircraft manufacturers who are in the throes of building the things.

Some of the annoyance can be reduced by subcontracting the job to manufacturers who have the specialized skills needed to turn out missiles. But one slowdown has been that many prospective subcontractors don't know that they have the tools or skills to do the job.

And the reason for this is a necessary evil—military security.

That's one factor that is going to make it difficult for subcontractors and prime contractors to get anything accomplished in their first few meetings. The prime contractor can't tell much about the missile until the subcontractor's personnel are cleared to receive such information.

The subcontractor, quite frankly, may not want to go to the trouble of getting cleared until he can see what he is going to be working on, and judge whether the game will be worth the candle.

Now, we're about ready to build some missiles.

But what kinds? How big? How heavy? What materials?

To answer these questions, it is necessary to explain a little about missiles in general.

▶ **Class Status**—It would seem that in the United States, interest centers about three general classes of missiles:

- **Bombardment:** Typified by the German V-2.
- **Anti-aircraft:** Exemplified by Boeing's Gapa, or Ordnance's Nike.
- **Air-to-air:** To be used by fighters and bombers instead of the more-conventional machine guns or cannon.

These categories also serve to divide the missiles into size groups. Bombardment missiles are big; AA missiles, medium-sized; air-to-air missiles, small.

Further division into genus and species exists. Missiles can be supported by lifting surfaces, or not. They can have rocket engines, ramjet engines, turbojet engines, or no engines.

They can also fly at supersonic or subsonic speeds, in the atmosphere, outside of it, or in both places during their brief lives.

In short, they are a different breed of cats.

It isn't possible to talk much about specific types of missiles. But suppose that a couple of representative varieties of missiles are explained in some detail, as examples of what might be.

▶ **Two for Bombing**—Bombardment missiles are currently envisioned as one of two types:

- **Pilotless aircraft,** probably subsonic, powered by a turbojet, flying within the atmosphere, presenting no new problems.
- **Artillery projectiles,** probably supersonic, powered by rocket motors, flying through the atmosphere and outside of the atmosphere, presenting lots of new problems.

In the former category, the aircraft manufacturers are at home. They and their usual subcontractors can handle the job very nicely.

There is a crying need in the artillery-type missile, though.

▶ **Study in Blue**—A manufacturer receives a stack of blueprints. After his staffs have studied them for several weeks, they find that they are to build a 50-ft.-long, 5-ft.-diameter rocket-powered missile. From its sharply pointed nose to its blunt tail, it is covered with gleaming stainless steel skin. Its ribs (or bulkheads or frames) are stainless, also. There are stainless tail surfaces. The sleek skin hides two large tanks for fuel and oxidizer; a framework for the rocket motor; electronic gear; a warhead.

The bill of materials reads aluminum alloy, stainless steel, copper, platinum, carbon, cold-rolled steel, pure aluminum, wood, lead.

The 60-in. framing rings are to be held within a concentricity of $\frac{1}{32}$ in. Tail surfaces are to be aligned with the centerline of the missile within 0.1 deg. Thrust line through the motor must match the missile centerline equally well. The outer skin must be polished—mill finishes are not acceptable. All joints must be butt joints, with not more than a $\frac{1}{32}$-in. gap.

To the manufacturer, who may have been building farm equipment, this all comes as somewhat of a shock.

But it is all necessary, to wring the last drop of performance out of the missile.

Tail surface alignment, for instance. When the missile plunges towards its

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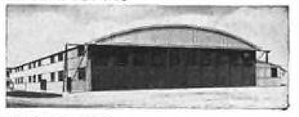
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target on the surface of the earth, it is slamming along at supersonic speeds. It is not being controlled through steering action, because its fuel (and therefore the power source for auxiliary drives) was consumed long before. It falls freely, kept on its calculated course only by the weathervaning action of the tail fins. They have to be set accurately, to avoid building in an error due to aerodynamic force caused by misalignment. And they have to be consistently accurate from missile to missile, to keep the dispersion pattern of many rounds small.

► **Clean Nose**—Polished skin and butt joints keep the missile clean—aerodynamically speaking. By eliminating the hills and valleys of conventional aircraft skin, and by refusing to use lap joints, the drag of the missile has been kept to a minimum for the configuration.

Besides the obvious reason that it is always good to have low drag, there is another good and sufficient reason for smoothness.

Missile design is basically conservative—we know so little, even yet. Aerodynamicists have to work in a poorly charted field where basic theory is inadequate, and practical experience lacking; where even the experts disagree. So, to be safe, the aerodynamicist is careful. He specifies low drag finishes, because he knows that if the missile does not meet its performance requirements, somebody is going to come right back to him. It is a form of insurance, this external smoothness.

Concentricity, of course, means that two rings made by different manufacturers and mated, will not leave a drag-producing bump or ledge. So for smoothness, as well as interchangeability, close tolerances in concentricity are demanded.

► **Subcontractors' Meat**—In this basic structure, most prospective assemblies for subcontracting are sections of the airframe—the instrument or control compartment, the midsection, the tail fins or tail cone.

There's more to the missile than meets the eye. Underneath the skin of the control compartment, there are precision gyros, for control; integrating accelerometers, for power regulation. There might be a radio beacon for tracking, or command receiver for ground-air linkage. This is the bailiwick of the instrument manufacturers and the specialty machine shops.

Farther back in the missile body there are tanks for fuel. They may have to be stainless steel, pure aluminum, K-Monel. But basically, these tanks are pressure vessels and they can be made by suppliers to the chemical and foods industries or they can be made by sheet metal shops.

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machine parts. The head, which injects fuel and oxidizer into the combustion chamber, is a machine job without peer. In fact, most of the motor parts call for extraordinary skill in machine tool work, possessed only by first-class toolmakers. Here, then, is another possible set of subcontractors —precision machine shops and toolmakers.

Throughout the structure, stainless steel has to be welded. The welds have to be ground, to reduce drag, but have to maintain full strength, regardless. Many of these welds must be pressure-tight up to two atmospheres. And experience with stainless steel welding, particularly on thin sheet stock, is not extensive in this country.

In the sheet metal work, large-size rolls are necessary. Sheet in size up to 6-ft. width and to ⅛-in. thickness will be handled.

► **Anti-Aircraft Missile**—So far, only one class of missile has been considered. Now is the time to say something about a hypothetical anti-aircraft missile.

Chances are that this one will be powered by a ramjet engine; that it will have wings as well as tail surfaces; that it will be about 20 ft. long, 2 ft. in diameter.

Biggest difference between this class and the bombardment missiles is that the ramjet engine requires air which limits its operation to the region of the atmosphere.

Popularly, and quite erroneously, the ramjet has been called the "Flying Stovepipe." It isn't nearly as simple as all that.

The basic flow process sounds simple—air is taken in the front end, compressed by the forward speed of the missile, mixed with fuel, burned in a combustion chamber and pushed out the exhaust nozzle.

Entrance velocities are on the order of a few hundred feet per second; exit velocities, several thousand.

Heat release for a ramjet might be about 60 million Btu. per cu. ft. per hr.; one-tenth of that is high for an ordinary furnace.

The air that goes through the missile must be handled just as carefully as the air which passes over the outside. This doubles production and manufacturing problems.

Now, all the inner surfaces must be glassy-smooth, with the possible exception of the combustion chamber. Previous remarks about finishes, tolerances and concentricity hold even more stringently.

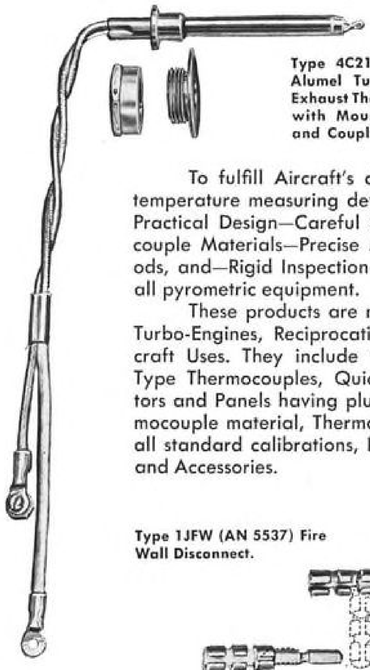
As an example of a possible treatment for the external surface, one subcontractor recently suggested that the way to build a particular ramjet was to make it with over-thick skin, assemble it and then set it between centers on a

THEY MEET

AIRCRAFT'S MOST RIGID SPECS!

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Type 4C21R Chromel Alumel Turbo-Engine Exhaust Thermocouple with Mounting Boss and Coupling Nut.

To fulfill Aircraft's demand for accurate temperature measuring devices, we incorporate Practical Design—Careful Selection of Thermocouple Materials—Precise Manufacturing Methods, and—Rigid Inspection in the production of all pyrometric equipment.

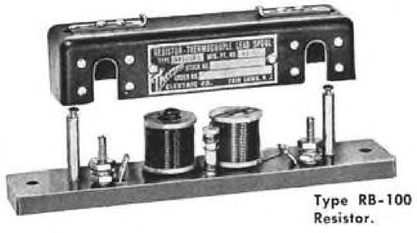
These products are made for all types of Turbo-Engines, Reciprocating Engines and Aircraft Uses. They include "AN" and Standard Type Thermocouples, Quick Coupling Connectors and Panels having plugs and jacks of thermocouple material, Thermocouple Lead Wire in all standard calibrations, Indicating Pyrometers and Accessories.

Type 1JFW (AN 5537) Fire Wall Disconnect.





Type 2B07B Iron Constantan Bayonet Immersion Contact Thermocouple Angle type — for Cylinder Head.



Type RB-100 (AN 5534) Resistor.

For accurate, dependable aircraft temperature measuring equipment —Specify Thermo Electric and be assured of reliability.

SEND FOR CATALOG SECTION 12-C

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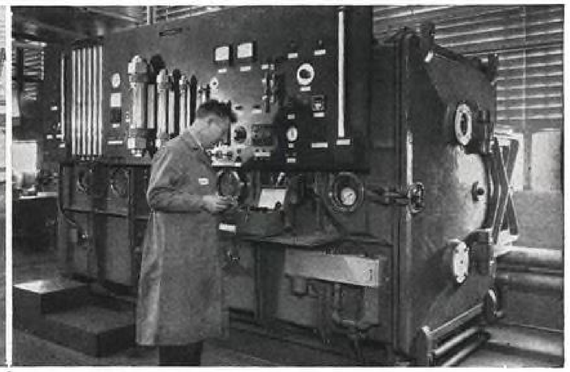


Why Top Airframe Manufacturers *Specify*

South Wind AIRCRAFT HEATING



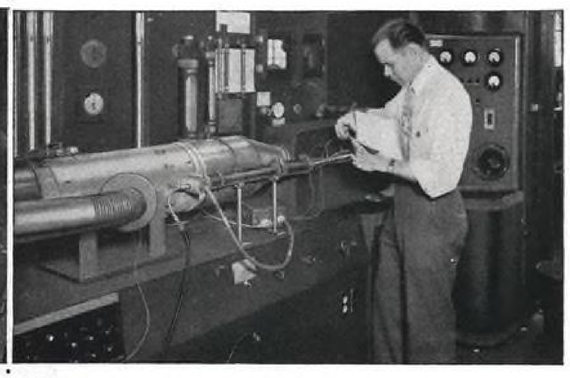
South Wind Engineering developed the first combustion heater to be used in production aircraft. Ever since, South Wind has been designing and building lightweight aircraft heaters unsurpassed for long-life performance, safety and dependability —specifically developed for the individual requirements of every known type of aircraft. Today, South Wind equipment heats the nation's leading aircraft.



South Wind Research and Development Facilities are second to none! This large Altitude Test Chamber is typical of the specialized equipment that insures top-notch dependability from every aircraft heater built by South Wind. Each model is subjected to the most rigorous life and performance tests at altitudes in excess of 40,000 feet and refrigeration to temperatures below —65 degrees F.



South Wind Production Facilities are specifically adapted to the specialized techniques of aircraft parts production. Only government certified welders, for example, work on South Wind aircraft heaters. This heli-arc welding of the tube bundle on an aircraft heat exchanger requires top-notch precision and skill to withstand the great thermal stress of exhaust-gas flow in high-altitude operation.



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Another Product of STEWART WARNER

grinder and grind to external contour.

Such a procedure, while expensive for one ramjet, would be reasonable for many; further, it was considered necessary to match the requirements of flow conditions. It eliminates part interchangeability, but engineers were willing to compromise in that case. They had already decided to use selective assembly of parts for their ramjet, anyway.

► **Epilogue**—That, in as much detail as is possible, is the beginning of the story on building missiles.

Each class will have its special problems. Nothing was said about air-to-air missiles, for example, where the skilled machinist will have to be a watchmaker to be able to fit everything into a 6-in. diameter body. And nothing has been said about the difficulties of machining carbon such as the Germans did (with something like 50-percent spoilage) in making rudders to operate inside the hot exhaust blast of the V-2. Or about any of the myriad tasks confronting the ex-builders of farm machinery, granite-working equipment or truck bodies, as they acquire vocabularies, technical and profane, that they never had.

The missile program will call for seeking-out and coordinating subcontractors on a scale never before seen.

Missile Market Starting to Grow

The extent to which guided missile development and production has to be cultivated was sharply outlined by Major Gen. Carl Brandt, Air Force director of requirements, in testimony on his department's appropriation:

"Guided missiles," said the general, "differ markedly from other combat weapons in many ways. . . . Guided missiles have virtually no history. There are no guided missile combat organizations today. We are just beginning to train the instructors who must train the airmen to man those organizations. . . .

"It is apparent that . . . missiles . . . should be procured as soon as research and development supplies a missile that appears suitable."

Although Air Force experience with guided missiles, as Gen. Brandt pointed out, has been limited, testimony on the appropriation bill showed that there are some estimates available as to the missile spare parts market. Depending on the complexity of the missile, its spare parts requirements will be from 10 to 20 percent of the original cost of the missile. Spare parts cost for the electronic parts of the missile will run higher than 20 percent of the original cost.





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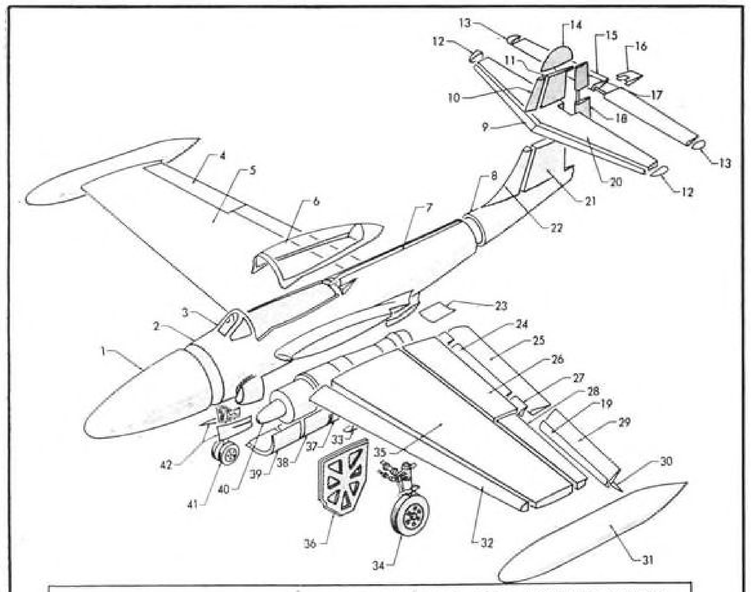
When Globemaster pilots open their throttles for take-off, the mighty engines of this mammoth plane develop still an *extra* surge of power *over and above* their maximum horsepower rating, thanks to the dependable aid of LEAR-ROMEC water injection pumps. Although this sturdy pump (standard equipment in all Grumman F7F-2, F7F-3, F8F-1 and F8F-2 airplanes, as well as in the Douglas Globemaster C-124) weighs less than 12 pounds with motor, it is rated at 400 gallons of antidetonate fluid an hour at 2500 rpm. A diaphragm-balanced relief valve maintains adjustment under extremes of atmospheric or supercharge pressure, and is adjustable to any desired discharge pressure. Lubrication is provided by the liquid passing through the pump. To prevent corrosion, all dissimilar metals are insulated with non-conducting materials. Full engineering specifications and test reports on the RD-7900 water injection pump illustrated above are available upon request. Bring your pump problems to LEAR-ROMEC, specialists in the design and manufacture of precision aircraft and industrial devices for over twenty years.



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7. FUSELAGE ASSEMBLY—AFT SECTION
8. EMPENNAGE ASSEMBLY
9. LEADING EDGE ASSEM.—HORIZ. STABILIZER
10. LEADING EDGE ASSEMBLY—UPPER VERTICAL
11. STABILIZER ASSEMBLY—UPPER VERTICAL
12. TIP ASSEMBLY—HORIZONTAL STABILIZER
13. TIP ASSEMBLY—ELEVATOR
14. TIP ASSEMBLY—VERTICAL STABILIZER
15. ELEVATOR ASSEMBLY
16. FAIRING ASSEMBLY—HORIZONTAL STABILIZER
17. RUDDER ASSEMBLY—UPPER
18. RUDDER ASSEMBLY—LOWER
19. AILERON
20. STABILIZER ASSEMBLY—HORIZONTAL
21. VERTICAL STABILIZER—LOWER
22. LEADING EDGE ASSEM.—LOWER VERT. STABILIZER
23. DOOR ASSEMBLY—FUSELAGE LOWER
24. SLAT ASSEMBLY—LANDING FLAP INBOARD
25. FLAP ASSEMBLY—LANDING
26. INBOARD TRAILING EDGE ASSEMBLY
27. SLAT ASSEMBLY—LANDING FLAP OUTBOARD
28. OUTBOARD TRAILING EDGE ASSEMBLY
29. BRAKE ASSEMBLY—UPPER DIVE
30. BRAKE ASSEMBLY—LOWER DIVE
31. TANK ASSEMBLY—WING TIP
32. LEADING EDGE ASSEMBLY—WING
33. DOOR ASSEMBLY—ENGINE NACELLE, NUMBER 4
34. GEAR ASSEMBLY—MAIN LANDING
35. PANEL ASSEMBLY—WING MAIN
36. DOOR ASSEMBLY—MAIN LANDING GEAR INBOARD
37. DOOR ASSEMBLY—ENGINE NACELLE, NUMBER 3
38. DOOR ASSEMBLY—ENGINE NACELLE, NUMBER 2
39. DOOR ASSEMBLY—ENGINE NACELLE, NUMBER 1
40. ENGINE ASSEMBLY AND ACCESSORIES
41. GEAR ASSEMBLY—NOSE LANDING
42. DOOR ASSEMBLY—NOSE LANDING GEAR

F-89 SCORPION breakdown shows major assemblies, many of which are subcontracted.

How to Get Subcontracts

The small firm will get about a $2.7-billion share of fiscal 1951 procurement, if it is qualified.

There is going to be plenty of room for the small businessman and subcontractor at the $7.5-billion fiscal 1951 aircraft banquet table. But he probably won't be invited unless he seems able to handle the rich fare.

The prime contractors will not be blocking the door. In fact, in many cases, they will be running interference for the smaller man.

Some, such as Pratt & Whitney Aircraft division of United Aircraft Corp., will share half—and more—of their business with subcontractors. This has been P&W policy since Frederick B. Rentschler established the firm in 1926. Others, such as Wright Aeronautical Corp., will share a much smaller proportion.

But a good guess would be that at least $2.7 billion of the fiscal '51 aircraft procurement budget will be spent with subcontractors. This does not include the money which will pay for raw materials and for off-the-shelf supplies.

►**Who'll Be There**—Who will be invited to the table? For the most part, the man that asks to be. But he will usually have to measure up to some prime contractor's idea of what a proper guest should be. And his size isn't the main thing. Some subcontracts are handled best by shops of 20 men. Some subcontracts require plants employing thousands.

The best assurance of an invitation is previous satisfactory dealings with a prime contractor. If there has been no previous business relation between the parties, the contractor will most likely be interested in how the little man stands with regard to:

• **Finances.** Can he handle an order, or will the expense of getting it out cripple him before payment is made?

• **Equipment.** Does he have the necessary tools and equipment to do the job on schedule, or will he have to start scrounging around for machinery when the order comes in?

• **Know-How.** Is he familiar with tight aviation tolerances, special materials, special service-approved welding techniques, and general peculiarities of the aircraft field?

• **Location.** Is his plant close enough to the prime contractor to permit free to-and-from travel of engineers and inspectors for close liaison? Close-by location will also reduce vulnerability to transportation tie-up and will, of course, mean lower transportation costs.

• **Reliability.** How does the subcontractor's delivery, price, quality stack up against promised performance?

►**How Big?**—How big is a subcontract anyway? Could it, say, be a power package for a Lockheed Constellation? Or the aft section of a C-97, jet pods for the B-36? Or doors for the Navy UF? Or parts for GE's J-47 jet engine? Or a gear cage for P&W's R-2800 engine?

It can be any of these, and lots more. Rohr Aircraft Corp. subcontracts the Constellation power package for Lockheed. Ryan is a Boeing subcontractor on the C-97, and a Convair subcontractor on the B-36, among other things. R.E.F. Co., on Long Island, N. Y., makes all the doors for Grumman's Navy UF order. And so on down the line.

A subcontract may be big or small. And the company that lands it may also be big or small. But don't expect a shop employing 20 men in the owner's garage to land a subcontract for B-36 wings.

►**First Meeting**—How does a subcontractor come to the attention of a prime manufacturer? Usually he writes. He may write to the materials manager, production manager, manager of subcontracts—the title varies from company to company. A safe bet would be to address opening correspondence to

Director, Subcontracts Department. It will be routed to the proper office.

These are good points for the subcontractor to cover in this opening letter:

- **Type of work** he is prepared or equipped to do.
- **Type of work** or products his company has made.
- **Machinery, tools, gages** and inspection equipment in the plant.
- **Special skills** possessed by his personnel.
- **Capacity of plant** for production of the subcontract, and room for later expansion.
- **Previous experience** with aviation products and processes. This includes working to fine tolerances, and the anodizing and heat treatment of parts.
- **Financial position** of the company.

Best chances for subcontract will usually be found close to home, but this is true of the West Coast area more than elsewhere. P&W, in Connecticut, deals with about 4600 firms in 34 states, including 129 in California. Sperry, on Long Island, N. Y., goes as far as Detroit for subcontractors. Republic Aviation has subcontractors in Chicago, Cleveland and Akron. Eastern manufacturers seem more willing to look far from home for the right man.

As the mobilization tempo speeds up, and the best subcontractor prospects are lined up, manufacturers will probably become willing to look farther afield, and will probably be forced to relax some of their other standards for subcontractors.

▶ **Something to Offer**—But right now, there is not much room for the man who thinks he would like to get some of this lucrative aviation business which he hears is floating around, but has nothing concrete to offer the manufacturer. This probably also leaves out the small man whose only qualification is a desire to get into war work because his sources of raw materials are drying up.

If the business-seeking subcontractor's original letter of application sounds promising, the major contractor will follow it up. Procedure varies. An interviewing team may visit the prospective subcontractor. Or he may be invited to send a representative to the big plant. A sales engineer is a good man for this job. He'll know what the company has produced and what it can produce. He ought to bring samples with him—or photographs, if samples are too big. Copies of the plant floor plan, showing machinery location, storage space, inspection areas, will help.

▶ **Foot in Door**—If the prospective subcontractor passes these tests with flying colors, he may soon have his first order. Or, at worst, he will have his foot in the door, with the prospect of being called to bid on some job later. Republic Aviation will often pass along to other manufacturers the name of a subcontractor it cannot use but who sounds promising.

About once a month, the sales engi-

Definitions

Prime manufacturers are going to lay out about $2.7 billion for subcontracts in the next fiscal year. In addition, huge sums will go for vendors' items and suppliers' items. Each company has its own idea as to what these groups comprise, but here is a pretty good consensus:

- **Subcontract:** Work done according to the design and specifications of the prime contractor. (But Convair says it is anything farmed out during a period of expansion, but normally done at home.)
- **Vendor supplies, parts:** Products designed by the seller, or produced to trade specifications.
- **Supplies:** Raw materials and process materials, such as sheet stock, bar stock, tubing.



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★ Smith-Morris, Pioneer Developer of Retractable Air Intake Screens for the Air Force, Makes No Compromise with Safety.

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A new MICRO "first" for aviation is this fully enclosed, hermetically sealed precision switch. Sealed and pressurized, this switch is unaffected by altitude, temperature, dirt, fungus, moisture, condensation, oil, gasoline or other fluids. Designed to conform to drawing AN3210-1.

[MICRO catalog listing 1HS1]

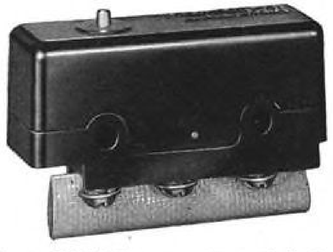
New Subminiature—the Smallest, Lightest Precision Switch Built



This MICRO precision switch measures 49/64" long, 3/8" high by 1/4" wide—has less than 1/15th of the volume and weight of the standard MICRO snap-action switch. Electrical capacity tests indicate a rating of 5 amperes, 115 to 220 volts a-c; 2 amperes, 28 volts d-c.

[MICRO catalog listing 1SM1]

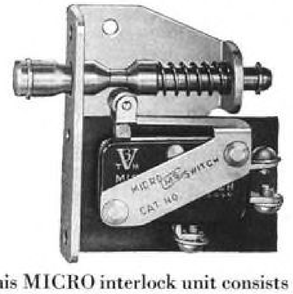
A Double-Pole, Double-Throw Circuit in Basic Precision Switch Size



A new MICRO snap-action switch designed to provide simultaneous operation of both poles regardless of actuation speed. At 28 volts d-c, it has a capacity of 5 amperes, inductive load, per pole. A complete line of housings and actuators is available for use with this switch.

[MICRO catalog listing DT-2R-A7]

Small, Compact Door Interlock Switch To Withstand Severe Aircraft Vibration



This MICRO interlock unit consists of a combination mounting bracket, rod actuator and roller leaf-actuated V3-type switch. It is designed for applications where unusual dependability and high electrical ratings are required. It is particularly advantageous where extreme vibration is a problem.

[MICRO catalog listing 3AC5]

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MICRO . . . first name in precision switches

neer should check back with the prime contractor to keep his company's file alive. This is also a good time to supply a list of any equipment added since the last visit.

Once a subcontractor is lined up, most of the prime manufacturers will go all out to help him.

• **Convair**, for instance, will give him planty of supervision at the start; it will provide master tools, jigs and fixtures; it will provide bolted models which can be taken apart to show how the part is constructed; it will offer the benefit of its know-how. Convair will send field inspectors to see that the subcontractor's inspection methods are properly set up, but will not accept responsibility for the part until deliveries are made.

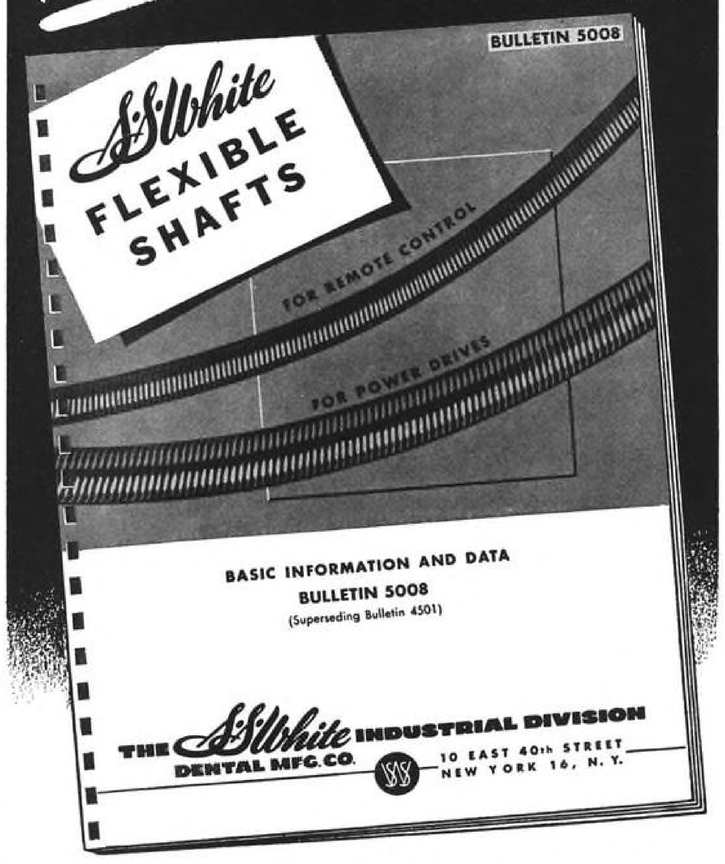
• **Grumman** helps its subcontractors get scarce priority materials. In addition to sending along a bolted model, Grumman men work very closely with the subcontractor to solve his production problems. Before production starts, a few of the subcontractor's key men go to Grumman for a month or two to work on the complete units on the regular assembly line. These foremen and leadmen get to know the product pretty well, and that cuts down on later mistakes. Grumman's policy is to okay all proposed jigs and fixtures, so that they will fit in smoothly if the prime contractor decides to use them in making the part in his own plant. The company helps its subcontractors in legal matters, such as drawing up contracts and fulfilling government regulations.

• **Republic Aviation**, about a year ago, started a program of instruction on Air Force inspection specifications in use at that time. A group of roving inspectors made the rounds straightening out inspection problems.

• **Sperry Gyroscope** policy is to pay the subcontractor for designing of tools and the tools themselves. The company has offered its own standards, pointed out mistakes as it saw them, and furnished the Sperry quality control manuals as a guide. It has provided manuals on testing procedures, kinds and quality of tools, symbols and markings used on prints, and so on. In past dealings, Sperry has stationed assistance teams in each subcontractor's plant. The teams usually have included four engineers, two inspectors, two methods men, a tester and a procedure man. The procedure man was the official go-between who smoothed out wrinkles.

▶ **Progress Payments**—Although the prime contractors are interested in financial stability, it's still no crime to be poor. And many potential subcontractors are a little wary about taking on business involving complicated or large assemblies which cost considerable time and money, especially when

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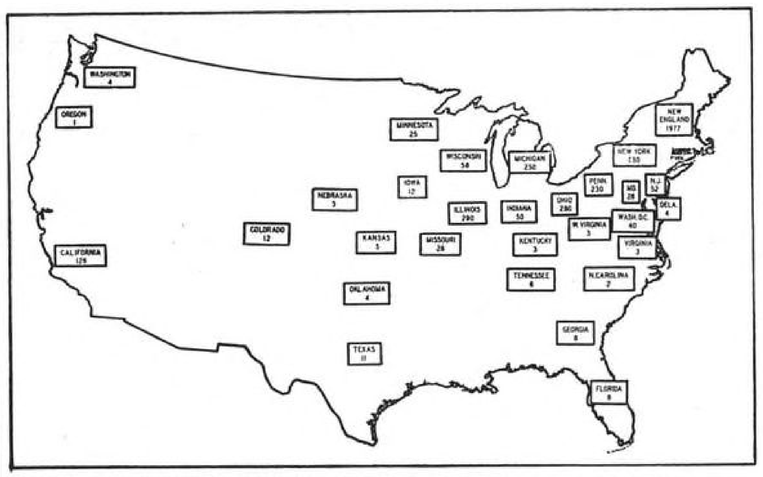
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Company_____

Street_____

City_____ Zone____ State_____

A



PRATT & WHITNEY'S 4600 subcontractors are all over the map, with 129 in California.

they think that payment will be delayed until final acceptance.

In most cases this is a needless worry. Progress payments are often made as the job goes along, with final payment after acceptance. Convair makes progress payments on long-term contracts, but requires an inspection audit check to see how the work is coming along. Grumman in some cases makes a monthly evaluation of partially completed parts. It pays as much as 85 percent of the contract value of an assembly before it is finished. But because of the expense involved, this system is not generally used except for smaller companies, and then only until production starts rolling.

Northrop generally pays on acceptance of the delivery. Republic rarely makes progress payments, and when it does, tries to keep them to 50 percent of the contract price, and certainly below 75 percent. Sperry occasionally makes progress payments, although it also considers the required evaluation troublesome and expensive. The top figure here is also 75 percent.

▶**Manners at the Table**—When a prime manufacturer settles on a subcontractor for an assembly, he is, in effect, putting all his eggs in one basket. The subcontractor now is his one source of supply for this item. The work is no longer under his roof, and except for his inspection teams and liaison personnel, he no longer has direct control over the product till it reaches him in finished form. Unfortunate experiences in this respect in World War II have made the big boys wary, and they will be far more choosy in selecting subcontractors in the present situation. The chosen companies will have to keep on their toes. Here are some things to watch:

• **Adequate and complete** inspection systems should be set up.

• **A leash should be put** on overenthusiastic salesmen. Occasionally in the past, a subcontractor has found his plant oversold to the point where it could not produce on time all the work on the books. In a case like this, he is often tempted to sub-subcontract the work. But many prime manufacturers object to this, as they feel that errors will be minimized by keeping the work under one roof. In any case, a subcontractor should get permission before planning to sub-subcontract.

• **Minimum wage**, renegotiation and other federal laws, applicable to the prime manufacturer, sometimes apply also to the subcontractor.

The advantages of landing subcontract work are clear.

• **The orders are often substantial.**

• **Payment is assured.**

• **Material shortages** and priorities problems are usually overcome.

• **Draft claims** on skilled personnel for military service may be eliminated.

• **Licensing arrangements** may be made, enabling the subcontractor to use the patents of larger organizations.

Let's see how subcontracting has worked out for a couple of firms which have been doing it for several years.

▶**Rohr Aircraft Corp.**, Chula Vista, Calif., has grown from a 1940 five-man operation in Fred Rohr's garage to a 3000-employe force, working in a 600,000-sq. ft. plant located on a 60-acre site. Employment may reach 5500 by July, 1951.

Rohr did it by taking the most difficult part of the airplane—the power package—and developing so much tooling and production know-how that prime contractors can't afford to do the work themselves. Rohr now supplies prime contractors with ready-to-install power packages.

Sales were $1,493,000 in the year ending July 31, 1941. The following

WHAT'S DOING IN DALLAS

Aviation Industry Gives Dallas Big Role

TEMCO builds bomber assemblies, overhauls C-54s, converts aircraft in former North American plant; Chance Vought busy on Navy Corsair, Cutlass orders. Braniff's El Conquistador serves Latin America; Pioneer Air Lines in new Dallas home.

■ **Today the largest** U. S. inland city, Dallas is also one of the important inland* aircraft and airline centers.

In Dallas, C-54s are being overhauled for the Air Force; the Navy Corsairs now making headlines in Korea are being built; a basic military trainer is made; a light-plane plant is in operation; Pratt & Whitney Wasp Jr. engines are being overhauled for the military; major assemblies are being made for the Boeing B-47 bomber.

In Dallas, a leading international airline and a leading regional airline have their headquarters.

■ **Today, Dallas has** an aviation industry with about a $40,000,000 annual payroll and local purchasing of about $19,000,000 annually.

All along the line, the pace is being stepped up.

Consider TEMCO (for Texas Engineering & Mfg. Co.). Since the Korean war, this versatile, adept company has put on over 1,500 new employees, bringing the total above 3,000.

It has put into use 175,000 additional sq. ft. for a total of 1,229,500-sq.-ft. in the mammoth Plant A of the former North American Aviation plant.

■ **This is the impressive picture** at bustling TEMCO:

C-54s are being overhauled. TEMCO did a major portion of such overhaul for the Berlin airlift.

Air Force F-51s are being reconditioned.

Major assemblies for the B-47 are being built (an "undisclosed quantity").

An airline major overhaul is in progress—10 DC-4s for Eastern Air Lines, some passenger, some cargo.

And at Randolph Field, Texas, the TEMCO T-35 all-purpose trainer, the "Buckaroo," is participating in evaluation tests.

TEMCO has in its brief history become the talk of the industry for two big things: (1) Amazing capacity for handling quantity and diversity of work; (2) versatility for peace as well as war operations (making vending machines, truck bodies, etc., side by side with aircraft).

■ **Next door neighbor** to TEMCO in North American's wartime Plant B is Chance Vought Aircraft. The story of the migration of this division of United Aircraft from Connecticut to Texas is part of post-war industrial history.

At Chance Vought, payroll is running about $18,000,000 for this year. Some 4,800 workers are on the job, and more are being hired.

Here is where the F4U-5 Corsair and the F7U-1 twin-jet Cutlass are made.

■ **Dallas is headquarters** for Braniff International Airways, with 11,700 certificated miles of routes, a fleet of about 33 planes worth $11,000,000, flying some 55,000 passengers monthly.

Braniff planes serve a 9-state U. S. heartland, and eight Latin American countries. Its hemisphere-linking DC-6 El Conquistador flies a dramatic route from Chicago all the way to Buenos Aires.

■ **Pioneer Air Lines,** formerly at Houston, moved May 1 into its newly built facilities at Love Field, Dallas. This 5-year-old line operates a fleet of 11 DC-3s, serving the broad reaches of Texas and New Mexico. It has 391 employees.

Recently, Pioneer's president, Brig. Gen. Robert J. Smith, was appointed vice chairman of the National Security Resources Board in Washington.

■ **Flying executives** and pilots of big-company planes throughout the U. S. know one Dallas name just as the motorist knows the corner gas station. This is Southwest Airmotive Co.

It is now moving into its fifth hangar at Love Field. One of about four Pratt & Whitney authorized overhaul stations in the country, SAC is now doing engine work for the AAF.

As part of the Dallas aviation picture, there are about 76 other firms in the field.

Also: Love Field in 1950 will, by latest CAA count, handle more private plane operations than any other airport in America.

■ **A Dallas man,** George Haddaway, publisher of Southern Flight, Dallas, is chairman of the Aviation Development Advisory Committee, which just turned in its plan for protection and utilization of civil non-airline aviation in wartime.

Dallas is becoming a leading center for motorless flight. This August, the National Soaring Contest was held in Dallas.

*For copy "America's arsenal belongs inland . . .," published by Mid-Continent Industrial Council, write Dallas Chamber of Commerce, Dept. B., Dallas 2, Texas.



THINK OF DALLAS

. . . and you think of beautiful girls. Blonde, blue-eyed Marion Slicker is a Pioneer Air Lines hostess. On one of her 3-day runs, she flies from home-base at Dallas to Amarillo (398 mi.), Amarillo-El Paso (362 mi.), back to Amarillo, Amarillo-Houston (682 mi.), Houston-Dallas (287 mi.).

LUSCOMBE *(Thumbnail sketch of a Dallas industry)*

By Julian Stag

Luscombe Airplane Corp. is back in production at the Garland, Texas, plant in the Dallas area.

This company is known in the personal plane field for its all-metal Silvaire craft, some 4,000 of which are in use throughout this country and abroad. Additionally, Luscombe now will be working on subcontracts for military manufacturers.

Originally, Luscombe moved to Dallas from the Eastern seaboard in 1945, seeking open spaces and choice flying climate.

Caught in the post-war slump in the light-plane field, Luscombe last year suspended production. TEMCO of Dallas offered a reorganization plan, approved by the Federal court, under which it acquired control.

Since TEMCO took over, some 150 to 200 people have been put to work.

DALLAS BRIEFS

The Statler Hotels have selected a site for a new 800-room Hotel Statler in Dallas, and Republic National Bank has begun work on its new 36-story building.

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TEXAS ENGINEERING & MANUFACTURING COMPANY paid for this advertisement for the Dallas Chamber of Commerce in the interest of Dallas development. It is a "special edition" of "What's Doing In Dallas," a monthly series of full pages now running in AVIATION WEEK'S sister publication, BUSINESS WEEK, reporting on the business front in Dallas. Next ad appears in BW, Oct. 7. Would you like copies of this advertisement, others in the series, or other information? Address: Dallas Chamber of Commerce, Dept. B—Dallas 2, Texas.



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year they were $9,500,000, and two years later $76 million.

• **War Products.** Principal products during the wartime period were complete power package units for the B-24 Liberator, the PB4Y-2 Privateer, the PB2Y-3 Coronado; cowlings for the PBY-5 Catalina; nose and boom doors for the Lockheed P-38 Lightning and cowling for the Lockheed Hudson bomber.

After the war, orders arrived for power packages for the postwar Constellation, for C-54 conversions, Convair-Liners, Boeing B-50s and C-97s, Chase C-122s. Rohr also makes the complete exhaust system for Convair's B-36.

Since Korea, new orders have been received for both power package installations and exhaust systems and current orders have been increased. Rohr is buying new equipment for increased production and may have to expand its plant facilities again.

• **Tooling Savvy.** Tooling savvy is what makes Rohr click. When the company can't buy machinery, it builds what it needs. Examples are a home-made combination stretch forming and compression forming press now in the works. And special long-armed automatic micrometers that check the thickness in the middle of a long exhaust tube.

Rohr hasn't any shortcuts to success for subcontractors. But Bert Raynes, chief of the tooling division, points out that prime contractors farm out only the difficult assemblies. They keep the simpler fabrication in their own plants until accelerated production demands more factory space for assembly.

Also the subcontractor usually has to submit a competitive bid. This can be expensive. It cost Rohr $20,000 to make a survey on one bid; then the company didn't get the order.

• **Rohr Subcontracts.** Rohr contracts out a sizeable amount of its own work —about a dozen assemblies and up to 3000 different machined parts. The assemblies are parts needing metal forming, which the company sends out when its facilities are taxed.

Because most of the outside work is machining, Rohr's outside production crew specializes in that line. It checks a prospective subcontractor to see if he can turn out work of aircraft quality. It also checks financial responsibility. When Rohr contracts out for parts it wants to know they'll be delivered.

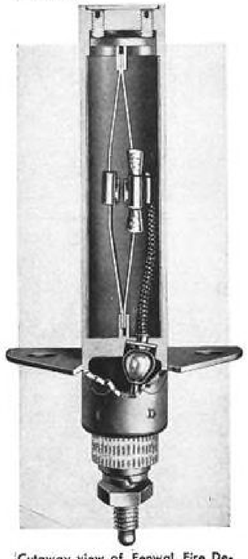
In letting a subcontract, Rohr looks over possible sources for equipment, potential work load, and so on. Then the company selects three or four to bid on a job. All things being equal, the job will go to the lowest bidder.

Rohr maintains a record of subcontractors—their success at meeting delivery promises, quality of work, and

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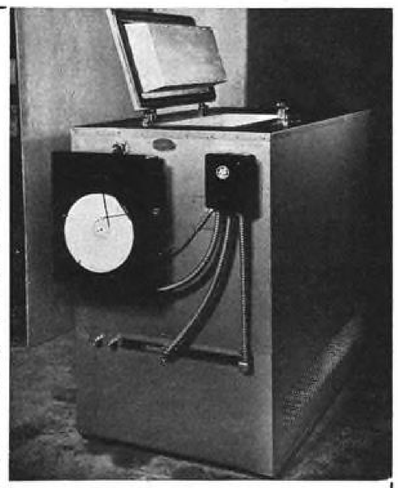
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a quarterly record of rejections. The company tries in every way to help its subcontractors eliminate the need for rework. It supplies subcontractors with information of all sorts, a book of shop practices required by Rohr customers, and other aids.

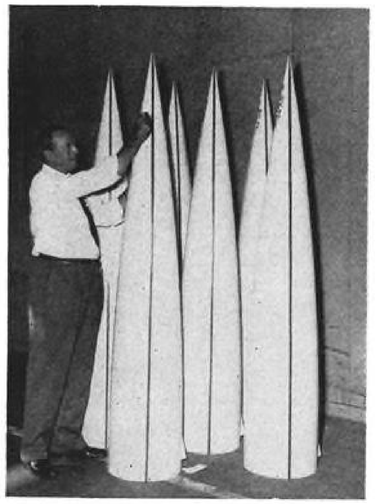
Rohr likes to have its sources as close to the factory as possible.

► **Ryan Aeronautical Co.**, San Diego, Calif., is about half prime contractor and half subcontractor, but is hardly typical of small manufacturers who might venture into aviation subcontracting work as a result of expanded aircraft production. With an established name and reputation, Ryan doesn't have to go out and sell itself.

However, it has suggestions based on its experience in subcontracting.

• **Good Record.** Most important, a prospective subcontractor should establish a good record for on-schedule delivery and quality workmanship. Prime contractors have a tendency to go back to dependable sources.

The type of work a subcontractor can get will depend a lot on his experience. For example, Ryan, with long years of experience in stainless steel fabrication, was a natural for subcontracts of jet engine parts. The company says subcontracting isn't easy. In lean times the prime contractor will tend to pull the work back to his own plant. Also the subcontractor has to gear his whole program to the prime contractor's master schedule.



NOSE SECTIONS of Aerobee rocket are made by Ryan as subcontractor for Aerojet.

Ryan has made stainless steel exhaust systems for years, alongside of its plane building work. The company got in the manifold business to help smooth out the peaks and valleys of plane building.

Some of Ryan's subcontract activities are aft sections of the C-97, droppable fuel tanks, exhaust systems for piston engines, turboprop tail pipes, jet engine tail pipes, jet pods for the B-36, and components of the J-47 engine.

This AVIATION WEEK roundup of the nation's major prime contractors has covered the points which apply to most of them. Other items of importance are included in the individual write-ups which follow.

► **Boeing Airplane Co.**, with plants at Seattle and Wichita, has been committed to a large subcontracting program for several years.

After World War II, Boeing found itself in a better position than most aircraft manufacturers, with military demand for three of its planes—the B-50, C-97 and B-47. William M. Allen, Boeing president, suggested that the government should place orders with the thought primarily of getting the most airplane for its money, not of keeping all the manufacturers solvent. The manufacturer who got such orders should do what he could to parcel out work among less fortunate manufacturers, Allen advocated. In line with Allen's speech, Boeing followed a large subcontracting program.

• **Substantial Subcontracts.** Early in 1949, about 37 percent of the B-47 airframe was subcontracted. This per-

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centage was reduced somewhat later in 1949 and early this year, but was increased again with the Korean situation. The exact extent of Boeing's present subcontracting program is not revealed, either in terms of dollars, specific assemblies or airframe weights, but B-47 work now subcontracted probably exceeds 37 percent.

The percentage on the B-50 and C-97 probably is lower, because these projects have been in existence longer and Boeing had to do most of this work at its Seattle and Renton plants to keep its work force together.

Total amount of work now subcontracted, percentagewise, is roughly comparable to what it was during World War II. The new orders Boeing has received increased the subcontracting program "substantially."

Except for the B-47 program, the additional work has been placed principally with suppliers previously participating in Boeing projects. In virtually all cases, the suppliers who received C-97 and B-50 subcontracts several years ago are in a position to furnish the assemblies and parts needed for new work recently authorized.

Boeing's Wichita division, faced with new requirements, is expanding its subcontract program for the B-47. Partly responsible for this was a decision, reached after consultation with civic and military officials, to try to avoid any expansion program which would further tax the City of Wichita's already-overloaded water, sewage and power facilities. Most of the Wichita division's subcontracting thus will be carried on outside of Wichita, although within the Midwest, as far as is practical and possible.

▶ Consolidated Vultee Aircraft Corp., San Diego, Calif., has about thirty subcontractors and about 800 regular suppliers.

Of its present work, about 20 percent of the T-29 is contracted out. That includes the landing gear and powerplant. The figure on the B-36 is from 10 to 15 percent. The dollar value is not given.

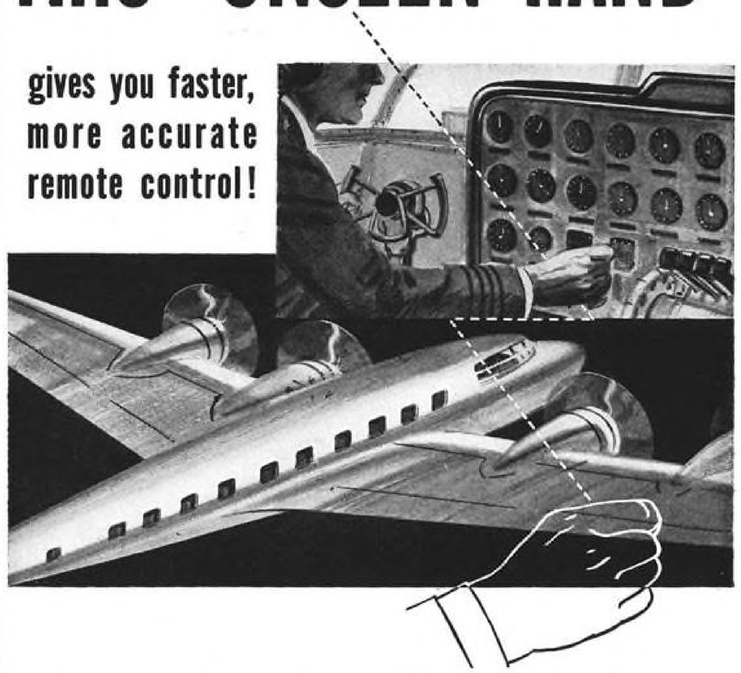
Under potential business prospects, Convair's subcontracted work will soon go up to about 30 percent on a man-hour and weight basis.

Geographic location is important, as some components may not make rail and highway clearances. (Ryan had to knock off the bottom layer of planks from the flat cars that carry the C-97 aft fuselage sections so that they would clear.)

During preliminary contacts with prospective subcontractors, Convair discusses its contract procedures. The company explains that it expects subcontractors to improve their rate of efficiency. Convair also studies the

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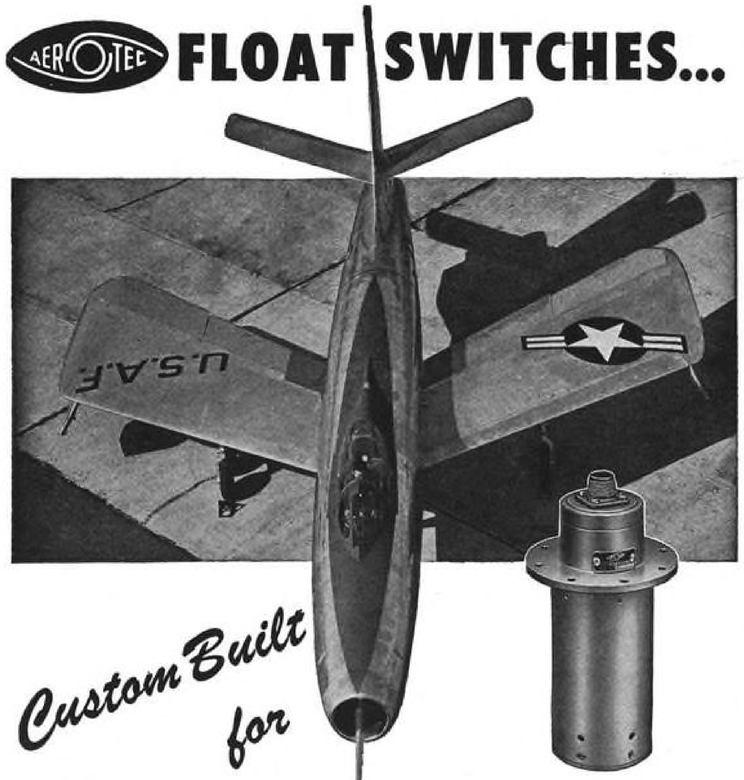
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prospective subcontractor's method of cost analysis and reporting.

• **Seeing the Site.** After Convair gets a general picture of the plant, and studies its labor area, it takes steps to determine what the cost and rate of efficiency might be for the prospective subcontractor and its ability to accelerate production.

Convair gets proposals on what the subcontractor thinks he can do. It sets up curves from this information and compares the cumulative average the prospective subcontractor expects to establish against existing standards. Standards are Convair's own experience or reasonable judgment.

To Convair the rate of improvement or the production efficiency factor is of prime importance.

Convair has a definite preference for companies with previous aviation experience, and for companies who have retained that experience in their plants. (For example, one subcontractor from World War II who went into making aluminum house trailers kept alive his skill at fabricating aluminum.)

• **Schedules Not Set.** Convair hasn't firmed up its production schedules yet. It is proceeding cautiously in lining up subcontractors, hoping balance of expected schedules come through.

Convair believes the prime contractor should have the prerogative of placing his business where it can best be served, hopes the government will let prime contractors line up their own subcontractors, for the most part. The company says it takes six months to get a new subcontractor in full swing.

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▶ **Douglas Aircraft Co.,** Santa Monica, Calif., has been in the peculiar position of performing as much work on subcontract as it subcontracts on its own projects, at various times since the war.

Douglas took part in the Boeing B-50 program, doing about 10 percent of the ship. And since the war it hasn't contracted out more than about 7½ to 10 percent of its overall production.

Douglas' subcontractor list is down to about 500. That's a far cry from the huge volume of subcontractors the company built up in the heyday of World War II, when the volume of planes turned out was 50 times as great.

Douglas has a huge capacity at its three plants with productive capacity three times as great as present production. Even so, the company manages to send a trickle of business to its subcontractors to keep up liaison with them. Mostly Douglas sends out for special parts and die castings. Nearly all assembly work is done in the Douglas shops.

• **Home Farmers.** Douglas' three plants —Santa Monica, Long Beach, and El Segundo—farm out work among themselves, too. That keeps employment levels uniform, enables Douglas to work at an economical level.

To date, recent orders are not far enough along for the company to determine how much work must be subcontracted. But it is a safe bet subcontractors will get a bigger slice of the pie. Right now, though, Douglas is not hunting for subcontractors. The company still has a great number of them left from the last war. At that time the company actually set up in business a number of subcontractors.

Douglas has about 1000 regular parts suppliers.

• **Experience Preferred.** People with previous experience making aircraft parts, not necessarily for Douglas, are preferred. They understand aviation tolerances, production standards and related problems.

Location is important, too. Douglas prefers subcontractors who are in the immediate area, so the prime contractor can keep control of the project.

Douglas interviewed hundreds of subcontractors during World War II. Then it contracted out 55 percent of the finished planes. A number of Douglas employes set themselves up as subcontractors, opening machine shops or small assembly plants.

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Metals division, headed by Harry Woodhead, former president of Convair. Western Pressed Metals sells machine time, currently is bumping out fenders and other parts for General Motors.

► **General Electric's** Lockland, Ohio, assembly plant is turning out J-47 turbojet engines. Major subcontractors supplying parts for this engine now number 280, from all parts of the nation. They are making:

- **Accessories,** such as fuel regulators, lube pumps and flow dividers.
- **Hardware,** including nuts, bolts, fittings, gaskets, and packings.
- **Parts and subassemblies,** including turbine wheels, compressor rotors and stators, exhaust cones, and combustion chambers.
- **Raw materials,** including castings, forgings, and plates.

► **Grumman Aircraft Engineering Corp.,** Bethpage, N. Y., has farmed out fabricated parts for a long time, principally because the government advocated it. The viewpoint was that the big plants which did not have something to offer at the present time should still be kept luke-warm and slightly active just in case they were needed later on.

This activity was also designed to avoid letting too many employes go because of lack of work. At least the key men could be kept in the plants, very essential in case more men were hired in a hurry.

- **Three Contracts.** Grumman now has three Navy contracts on the fire: for UFs, AFs, and F9Fs.

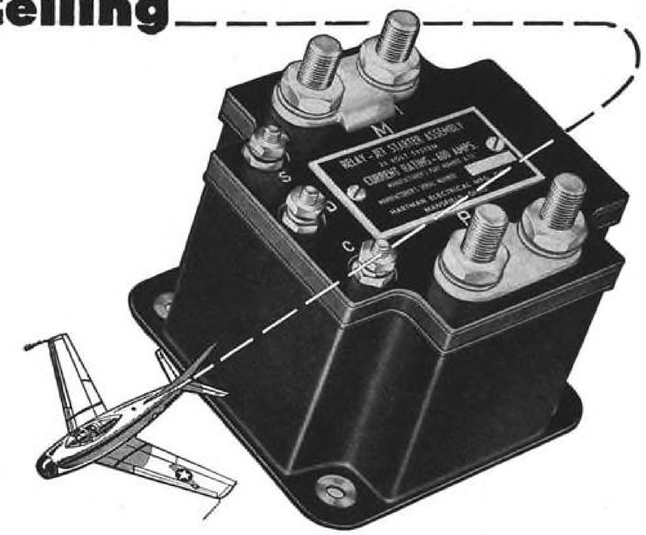
The UF has 21 doors. This includes escape hatches, wheel well doors, access doors, and so on. This plane was already set up for production and most of these doors were to be made in the plant. However, subcontracting was advocated and now all the doors are made outside. About 50 percent of this plane, in material is made outside. This is about 35 percent of the total cost of the plane. The big difference between the two figures is because all the tools and jigs that Grumman had set up were transferred to the subcontractor.

Grumman also supplies a large percentage of the raw material, especially hard-to-get or non-standard stock. Therefore, these charges are not added to the contract price and the actual dollar value farmed out is not as great as the total value of the completed part.

Some of the purchased parts that Grumman sends to the subcontractors have had some machining and that also reduces the dollar value of the contracts. The subcontractor usually buys standard stock parts (nuts, bolts, washers, etc.).

- **Build-up Ahead.** Grumman is getting ready for a substantial build-up, as set

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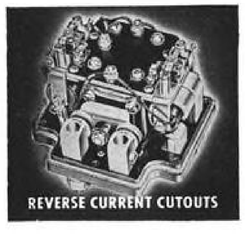
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forth in present industrial mobilization talks, but this will not actually start until November, with the peak coming next September. Until the government does appropriate some of the forthcoming money, not too much will be done in the way of expanding subcontractors or hiring new personnel.

Geographical location does not play an important part in choosing subcontractors for fabricated parts. Machine parts are a different story. Grumman tries to keep these localized, primarily to cut down on inspectors' traveling time. But some are located as far as New Jersey and Pennsylvania. Mostly, the business is kept in Grumman's own backyard.

The subcontractor's workmanship and accuracy and past production record are important to Grumman.

► **Hamilton Standard division** of United Aircraft Corp., E. Hartford, Conn., buys from about 1500 subcontractors and vendors in 29 states. Sixty percent of these are in Connecticut and New York, but some are as far away as California.

To Ham Standard, a subcontractor is a manufacturer who contracts to make a part or component to the design of the prime contractor.

A vendor is a company or individual which sells a device or finished product of its own design.

► **Lockheed Aircraft Corp.**, Burbank, Calif., admits to only one subcontractor—Rohr Aircraft Corp. of San Diego.

Rohr makes the complete ready-to-install power packages for the Constellations.

But the company has over 2500 regular parts suppliers.

About 40 percent of the Constellation (in dollar value) is outside purchase—seats, wheels, etc. The figure for military ships runs to about 35 percent of the contracts in dollar value.

Right now Lockheed is cataloging all information on subcontractor possibilities—their machinery, plant space, potential production, etc. The company wants to have on file a good list of sources in case of greater demand.

Lockheed specialists examine and visit the plant of each prospective subcontractor. The company says it will probably give out small jobs to start.

Lockheed prefers companies with previous aircraft experience, people who understand aviation tolerances and specifications.

The company says it is cautious in selection of its subcontractors because it has just been given the Air Force inspection privilege. Lockheed was the first company selected to perform on a trial basis inspection work previously handled by Air Force inspectors. The company is anxious to maintain its present quality control.

► **North American Aviation, Inc.**, Los Angeles, has about 330 subcontractors

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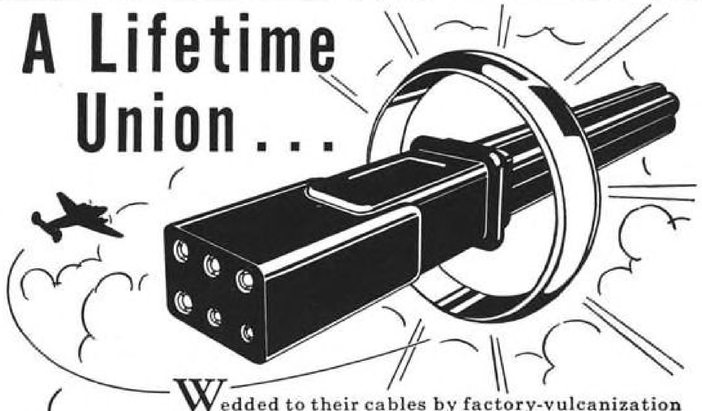
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now. That's according to North American's definition of subcontracts—subassemblies. It doesn't include catalogue items, raw materials, supplies, services of general operators, contractors, etc.

North American contracts out many assemblies it could do in its own plant. But it tries to subcontract to the maximum in line with Air Force policy.

The company is unable to separate its strictly airplane suppliers from its vendor list. But approximately 3300 people sell everything from paper clips to sensitive electronic devices to North American.

Approximately 22 percent of the dollar value of plane contracts is subcontracted out to first-tier subcontractors.

• **Know-How.** Know-how and adequate facilities are two of the things North American looks for in lining up a subcontractor. Geographical location is important, too. NAA likes to have subcontractors in the local area for expediency, would prefer them right across the street.

In the last war a number of North American's workers set up their own shops with a few thousand dollars. Mostly they did milling machine and lathe work.

► **Northrop Aircraft, Inc.,** Hawthorne, Calif., presently uses about 350-400 subcontractors. That includes about 50-75 people who make castings and forgings to Northrop specifications. The subcontractor list also includes people who do outside machining or plating, some who make parts like spacers to specification. But it doesn't include suppliers who supply articles "off the shelf."

Northrop's present table of subcontractors is small because it hasn't had too many fat orders until Korea. But Northrop is tooling up for increased production on the F-89 Scorpion all-weather interceptor, and it's a good guess the number of subcontractors will soon double or triple

Northrop has about 2000 active suppliers. About 1500-1600 are regular suppliers. These figures do not include government furnished parts.

• **Lined Up.** Northrop's vendor (parts supplier) list will be expanded only if it is necessary to look for more sources. The company already has lined up at least one source for every item it might buy.

Northrop contracts out 49 percent of the airplane in terms of material. No figures available on the amount of the plane subcontracted in terms of value.

The company's buyers have the prerogative of choosing the best subcontractor to do the work. That's because they bear the chief responsibility for getting the work in on time.

• **Location Important.** Geographic location is very important to Northrop.

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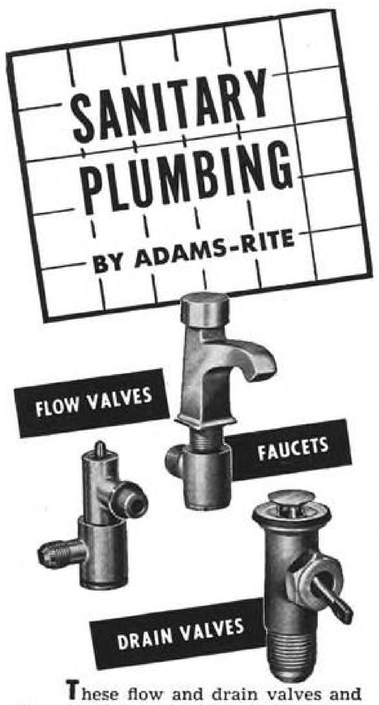
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The company prefers to subcontract to local sources. Chief reason is that close liaison is demanded for all the numerous changes that take place while an airplane is in production. Los Angeles has a tremendous source of subcontractors, so there is little problem there.

Northrop doesn't necessarily look for a plant of some size to start with. Of course, large assemblies require a pretty big plant. But otherwise the ability to do the work—on schedule—is paramount.

The company has seen cases where a one-man shop was a welcome addition to the list of subcontractors. In many cases, he said, small plants can do the job more efficiently and at a lower unit cost. The big ones sometimes are too bogged down in paper work.

► **Pratt & Whitney Aircraft Corp.,** East Hartford, Conn., follows Frederick Rentschler's long-established policy of sending out at least half of its work. It is still dealing with nearly all the 200 suppliers on its original list of 25 years ago. The list itself has grown to 4600 names.

Many companies in the Hartford area have built their whole business around P&W subcontracting.

Typical subcontracts include castings, forgings, gears, compressors, turbine blades, miscellaneous hardened and ground parts, screw machine parts, etc.

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Vendor items include valves, carburetors, magnetos, fuel pumps, control devices, Pliofilm envelopes, gaskets, bearings, fasteners, self-locking nuts, etc.

Supplier items are raw materials and process materials, such as sheet stock, bar stock, tubing, plating materials, etc.

► **Republic Aviation Corp.,** Farmingdale, N. Y. has tried to keep practically all of the better subcontractors that worked for it during the war. Since the end of the war, it has doled out small orders to the reliable firms just to keep them open and on the books.

At present Republic is doubling its production from 1½ to 3 planes a day and doesn't need any additional subcontractors, since the present ones can handle this increase easily.

Republic has about 30 percent of its volume production out in subcontracts, amounting to around 25 percent of the dollar values.

Possibly 15 percent of certain original equipment and assemblies come from the West Coast since that's the principal place of their manufacture. Usually though, subcontracts don't go farther than Chicago.

• **Whole Part.** When a part is farmed out, Republic prefers the subcontractor to make the whole part. No work is done on the material by Republic, either before or after the part is completed. Entire responsibility is on the subcontractor for the quality of workmanship of that unit.

The most vulnerable side of the small subcontractor is his lack of a suitable inspection system. He should try to maintain adequate quality control. A Rockwell hardness tester is a must for a subcontractor.

Any welding work must be done by a certified Air Force or Navy welder, depending on which service the prime contract is with.

Normally, the lowest bidder gets the contract award. If the figure is very much lower than the next bidder or Republic's estimate, the process by which the subcontractor arrived at his figure is checked. Sometimes it may be a new twist and a good idea, or again it may be a matter of under-estimating. Republic doesn't want bad pieces to show up or be delayed on delivery dates.

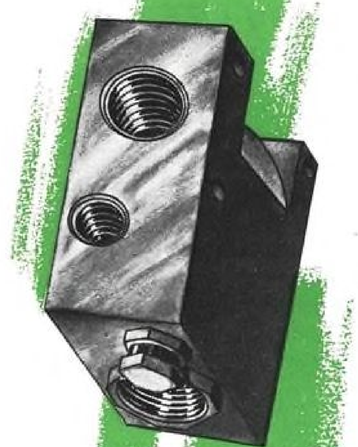
Republic thinks the small man should throw at least 10 percent of his plant into subcontract work. The ideal set-up would be to use about 50-60 percent. To get this much space in that kind of production, it would be best to have two or three small orders. Even when going full blast, the volume should represent more than one order, possibly three or more. This is so cancellation of one will not put the company in a hole. Republic now has about 325 subcontractors.

(Continued on page 111)

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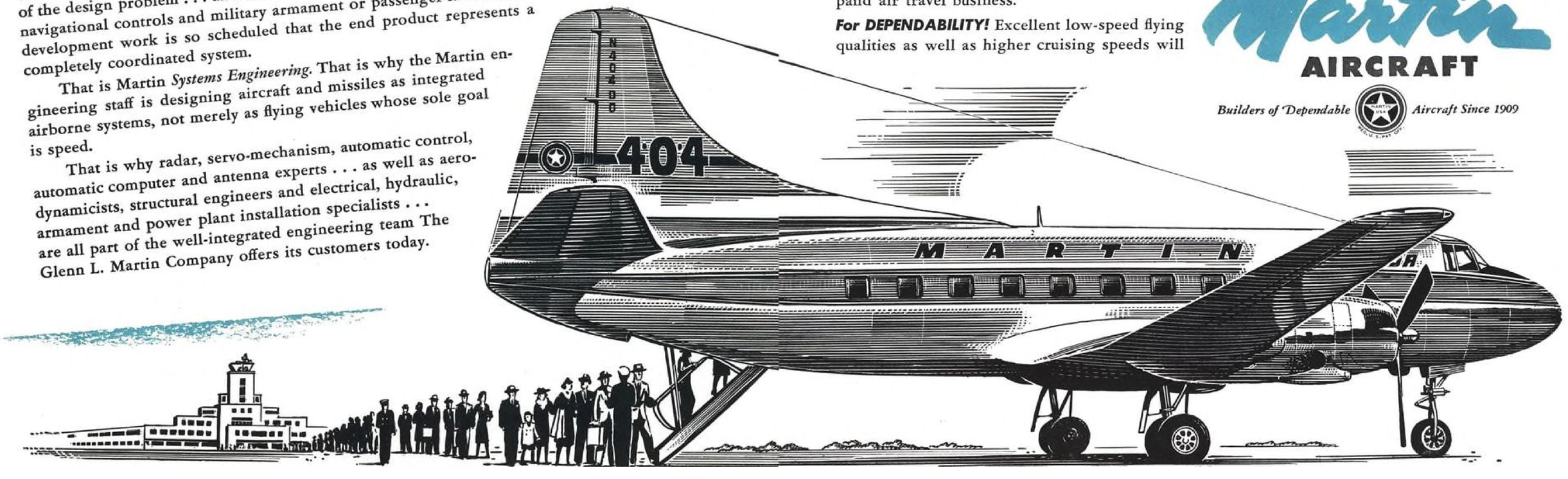
For DEPENDABILITY! Excellent low-speed flying qualities as well as higher cruising speeds will result from the 4-0-4's efficient wing and flap design. Built-in aerodynamic stability will permit wide range of passenger and cargo loading.

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New Stratocruiser Hangars at Minneapolis provide needed service facilities at minimum cost

These three aircraft servicing hangars, recently completed at Minneapolis–St. Paul International Airport in Minneapolis, give Northwest Airlines an additional 98,000 square feet of hangar space. The largest unit (interior shown above), with a floor area of 35,000 square feet, houses two Boeing Stratocruisers. Each of the other two, with an area of 31,500 square feet, will handle 3 Martin 2-0-2's and 1 Douglas DC-4 simultaneously. Stock room, shops and office space are included in a separately roofed structure between two of the hangars. Total cost for this complete installation was $1,150,000 – about $11.73 per square foot.

HERE'S real economy in new hangar construction – made possible by taking full advantage of the low-cost construction obtainable with Luria Standard Hangars.

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The transportation problem becomes important when production is critical, as in wartime. So, for the sake of insuring deliveries, Republic thinks that large orders should be split between two or more suppliers. Thus tie-ups in one section of the country need not delay final assembly of the aircraft. This lesson may be of use to subcontractors too, when they order.

Republic suggests that now is the time to line up subcontractors as a means of holding onto technicians who may be getting restless as defense work and higher salaries go elsewhere.

► **Sperry Gyroscope Co.**, Great Neck, N. Y. has done a thorough job of subcontracting its largest peacetime contract.

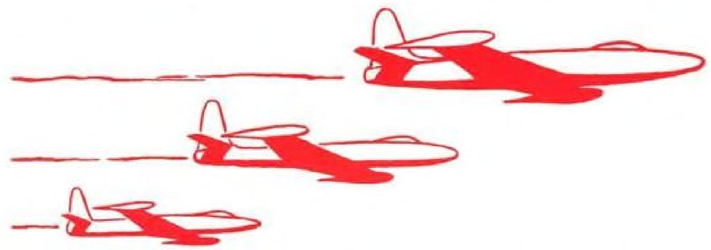
This contract is for an automatic radar anti-aircraft gun fire-control unit, ground operated. It is a large piece of machinery comprising many separate components, or "assembly packages." These 74-75 units were designed to be made separately, and it was found that about 40 could be subcontracted out.

• **Plant Survey.** Sperry started off with a survey of all the firms that could logically be expected to handle its work. This dope was gotten from records of past business transactions, Thomas' Register, classified lists of advertisers, etc. Firms were picked that were known to do certain kinds of work. The best suited firms were determined by reputation, character, past or present correspondence, and listed for further study.

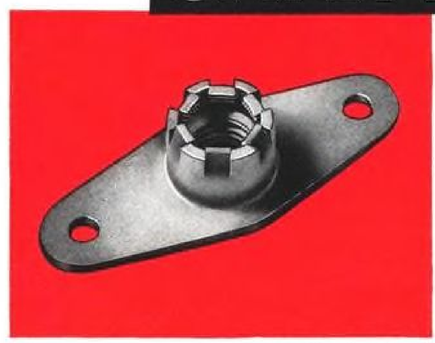
The initial list of 110-120 was narrowed down to about 40 or 45 companies who were visited. All that was available to show the type of work required were photos of the separate parts of the machine. This initial visit determined the best suited firms and the ones that could not handle the specific kind of work at all. The list went down to about 25 firms who were now sent available blueprints.

The idea was to have about 3 different places interested in each package or type of package. It was possible and desirable to combine two or more similar units, such as the azimuth and elevation indicators. Some of these units used the same chassis and only slightly different components which made their assembly and manufacture by the same firm desirable.

• **Pioneer Visit.** If a company indicated it was interested, a "pioneering visit" was made by a group of engineers, inspection, quality control, and methods people to see the kind of a place they would be doing business with. If it was okayed by the inspecting groups, formal prints went out and bids asked for each assembly. A breakdown of each bid was also required. Later, these prices were compared to Sperry's estimates. (Up to this time Sperry had only



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built two prototypes with a third under construction.)

As the quotations came back, they were reviewed with the main thought to the lowest bid. Other considerations were the delivery dates promised and the expected capacity of the plant to meet these delivery dates.

• **Quality Control.** One very important factor was the degree of quality control employed at the plant. This is the "lifeblood" of Sperry since all the units are guaranteed and here rests their reputation. It was absolutely necessary for each plant to have some form of quality control and the better systems were given greater consideration.

Finally about a dozen subcontractors were signed up. The entire operation took about four months but Sperry feels it will more than justify itself when the parts start rolling in.

For this particular order, about 40 percent will be farmed out. This amounts to about 30 percent of the contract value, or roughly $20,000,000.

Small machining and tool work is given out quite a bit. Any good qualified shop can expect to get a fair amount of this work in the near future, if production is increased enough to warrant it.

Anyone interested in subcontracting for Sperry is invited to send in any kind of brocure, pamphlet or other literature describing available facilities and the work done.

Interviews are granted to any prospective subcontractors who visit the plant, although a phone call first is suggested. All correspondence is kept on file. Sperry is pretty well set right now, but the company is always looking for subcontractors who can meet its standards, as policy is to have three or more good firms bidding on each order—with the contract often split between the two lowest ones.

Officials feel that any good, reliable man should have no trouble getting as many subcontracts as he can handle. The outlook for firms which are financially shaky is not so good at the present time.

▶ **Wright Aeronautical Corp.**, Wood-Ridge, N. J., is making a study to determine what its volume of production will be and just how much of that should go to subcontractors. At best, Wright doesn't do very much outside work. It is all machining operations—no assemblies. Wright wants to do all of the work itself that it possibly can. If any work is given to subcontractors, they are expected to do the complete job. Wright doesn't do any work on the part before or after the vendor's work.

• **Security.** Almost all suppliers who work for Wright must be classified for military security reasons. This process starts off with government inspection, usually by FBI men. Then they enter into a secrecy agreement with the Wright organization.

Wright now has about 30-35 subcontractors on the books. Very few were kept on after the war—the idea was to keep its own plant busy first.

Geographical location is not important to Wright. Work is received from as far as Chicago and Detroit, coming in by truck. Economic reasons are more important now in determining who shall get an order rather than keeping the work right in Wright's own backyard.

Air Force Buying Moving Into High

The heavy outpouring of Air Force expenditures for defense is typified by a recent week's contracts received for processing by the Chicago AF Procurement Field Office.

Contracts valued at $6,485,210 were received, according to Lt. Col. Charles G. Esau, chief of the office. Of these, seven, exceeding $500,000 each, went to manufacturing facilities in the 14-state area served by the office. The area includes Illinois, Wisconsin, Minnesota, North Dakota, South Dakota, Wyoming, Montana, Colorado, Kansas, Iowa, Missouri, Nebraska, northern Michigan, and northern Indiana.

A dollar total for August was not yet available, but during July, 1060 contracts were handled, with $185 million still to be paid by the government to contractors, as of the end of that month.

Col. Esau suggested that businesses seeking subcontracts get in touch with prime contractors with whom they worked in World War II. Additional information may also be obtained from local chambers of commerce, trade association offices, state employment offices, Department of Commerce offices, and at the Information for Bids rooms of the various AF procurement field offices.

Big Contracts Seen For Boeing-Seattle

Boeing Aircraft Co. is clearing the floors of its Seattle plant in anticipation of good-sized USAF contracts resulting from the Korean trouble. The Air Force already has asked the company to make proposals concerning various projects. These have been made and now Boeing is awaiting the military's decision.

Optimism was further developed by Sen. Warren G. Magnuson, who predicted, after conferring with AF officials, that Boeing-Seattle can expect between $400-$500 million in orders,



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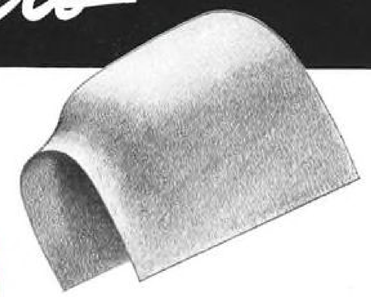
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For sheet parts

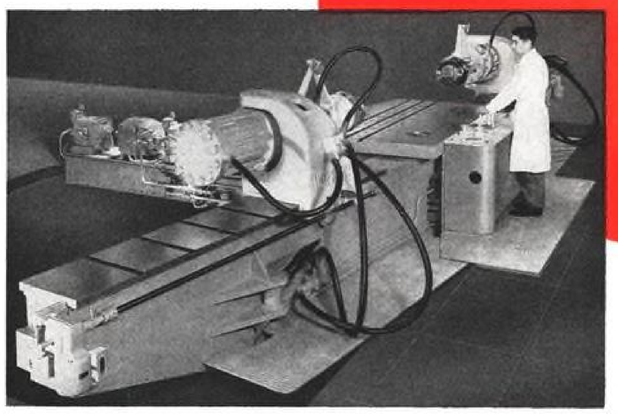


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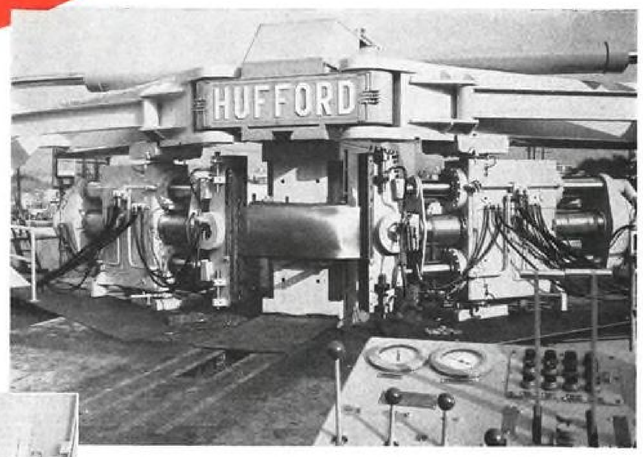
MODEL A-12 One of the newest high production Hufford machines for forming extrusions. Handles all shapes as well as narrow sheets. Each arm operates independently or both can be operated simultaneously. Model A-12 meets the demand for parts requiring tonnage capacity greater than that supplied by the well-known Model A-10. Max. tension at 2000 psi—118,000 lbs.

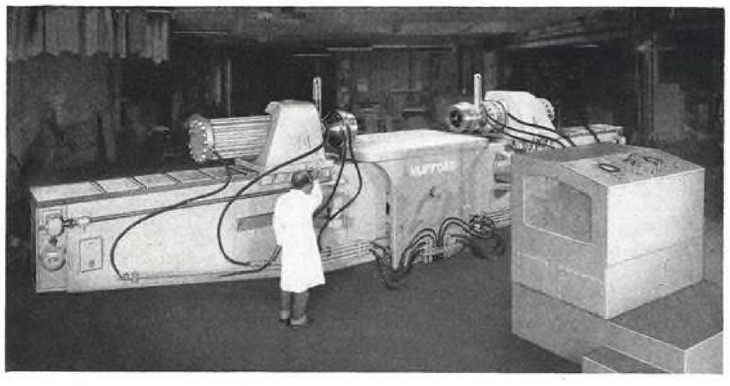
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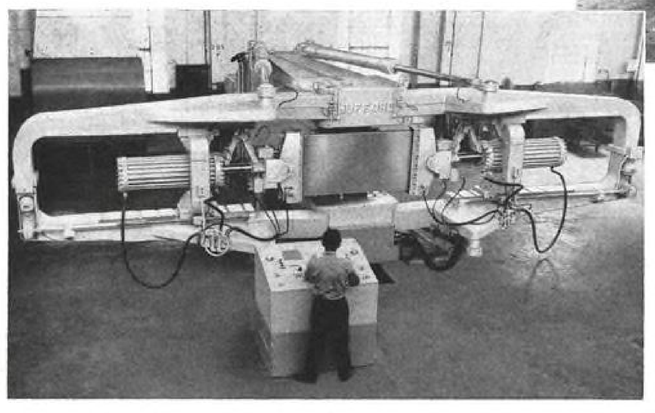




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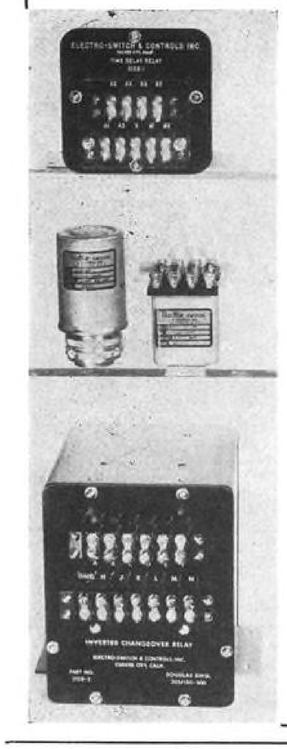
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because of the pool of skilled aircraft workers in that area.

In light of these developments, the company not only has canceled previously scheduled employe layoffs, but has been advertising for skilled machinists and tooling engineers. Boeing's vice president-manufacturing Fred Laudan says that 100 skilled machinists are needed immediately.

Present schedules call for completion of a B-50 Superfortress contract this fall; other work includes making parts for nearly 100 B-47 Stratojet bombers and the C-97 transport. In addition, preliminary construction has been started on the XB-52. The company is now striving to rush these orders through so as to have facilities clear for new work.

Security Regulations

Revised Munitions Board security regulations covering government contractors are coming out. They will deal with security clearance of a contractor's facilities as well as his employes.

Major changes apply to clearance of employes on classified contracts. Where a manufacturer has contracts with more than one government department, only one department will make the security checks, to avoid duplication.

When a worker moves from one employer to another, his record will be cleared through a central security index file maintained in Washington. Thus, a worker will be able to carry his clearance status along with him from one job to another.

In many cases only parts of a contract will be classified. This will reduce the number of workers who will have to be cleared for security.

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Aviation Boom Grows in Wichita

Wichita—The aviation industry in this Midwest city is booming with the usual bottlenecks of labor, materials, and housing looming just over the horizon.

Boeing-Wichita is the biggest of the airframe and components manufacturers around here, a group which includes Beech, Cessna, Swallow and Skyline, Inc. Boeing-Wichita is just entering into production of the six-engined B-47 jet bomber.

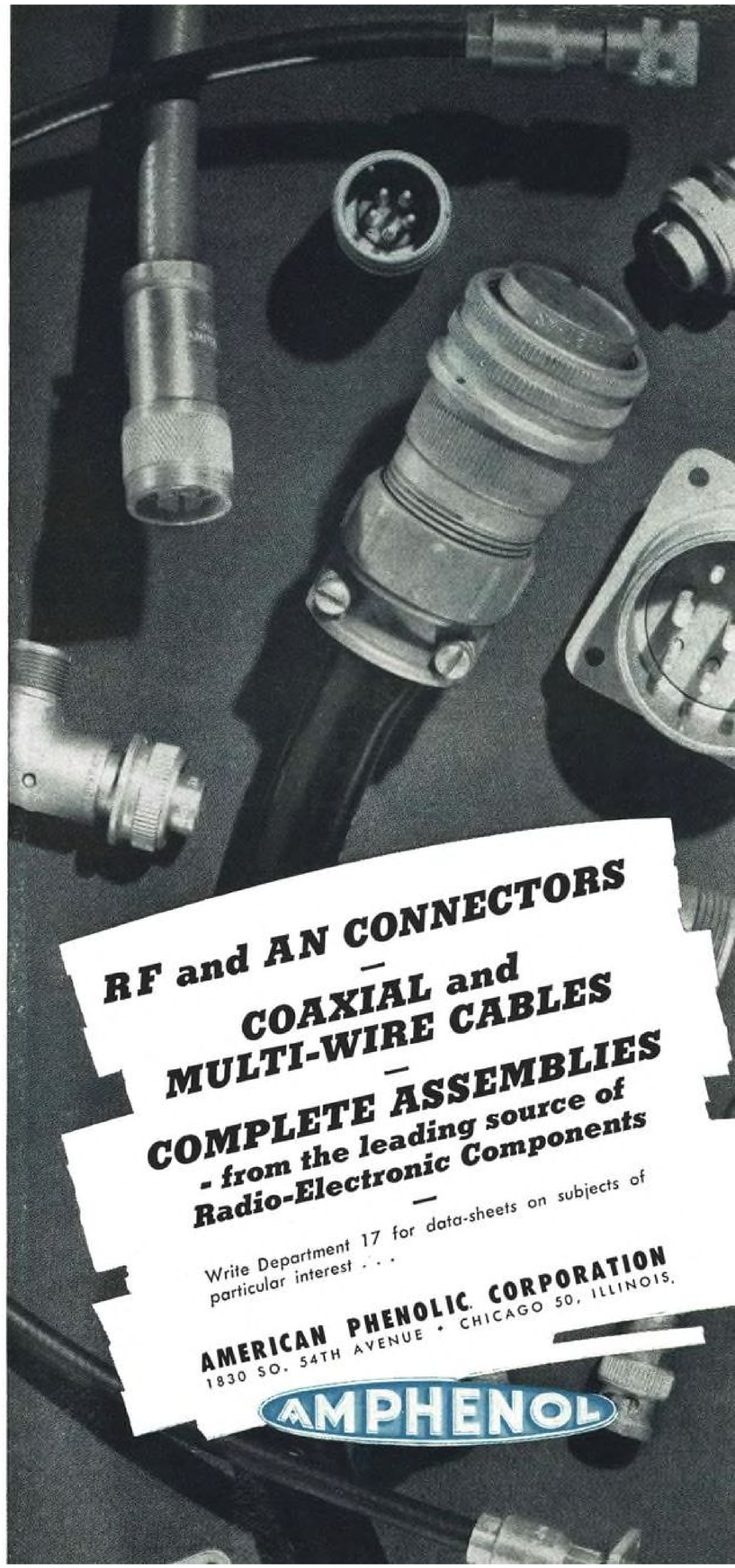
Currently, Boeing employs approximately 11,500 personnel on two eight-hour shifts and a third stub shift. Plans are to increase employment gradually to 15,000 by December 1, in order to meet USAF requests for trebled production.

USAF plans to have its first B-47 wing operating by mid-1951. Air Force has asked Boeing to step up production of more than 180 of the all-jet bombers, so contract is completed by mid-1952, instead of in 1953 as originally planned. Five of the big bombers have been built. Four more are nearing completion.

Production of the bomber is being eased along through considerable subcontracting both in the Wichita area and elsewhere. All three of the other local manufacturers, Beech, Cessna and Swallow, are engaged in B-47 work. Swallow Airplane will confine itself to small parts manufacture, Cessna to a major assembly project and Beech will likely engage in B-47 modification at its newly acquired Herington AFB, Kan., facility. The Herington facility was used during World War II as a B-29 modification center.

The expectation is that Beech will be called on for mass modification of over 400 of the Boeing medium bombers. Approximately 70 of them will be the B-47C, with four jets.

Beech, in addition to producing to meet a heavy commercial business, is currently making jettisonable 265-gal. F-80 wingtip fuel tanks. It is also continuing rehabilitation of Navy Beechcraft utility planes (about 150 are on the Beech ramps now). The company expects also to build between 400 and 500 Bonanzas before the end of the year.



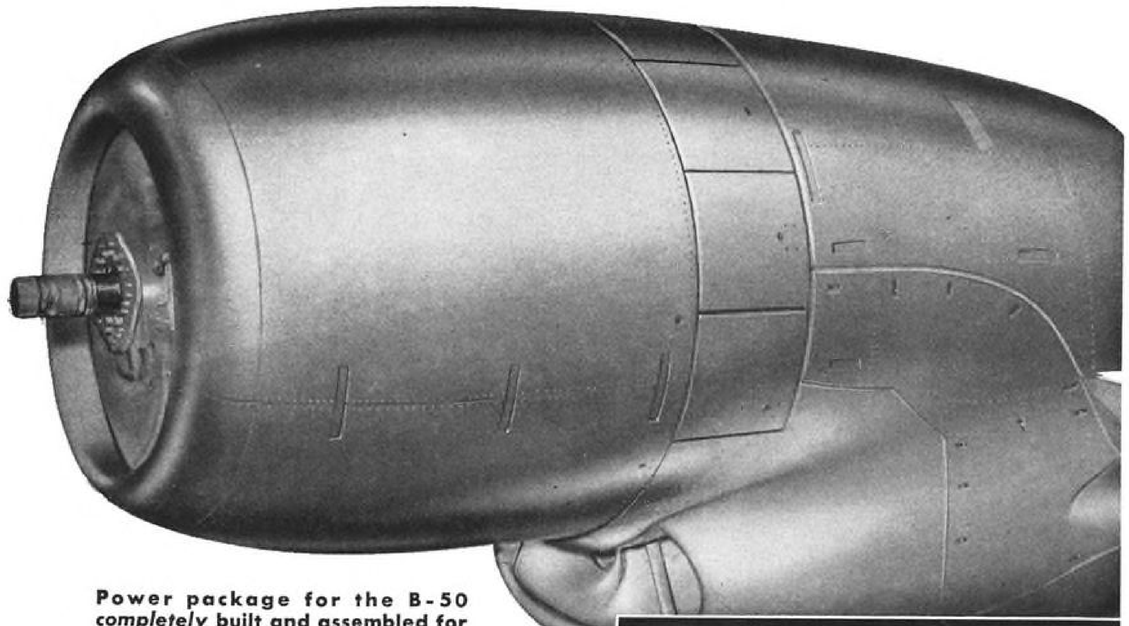
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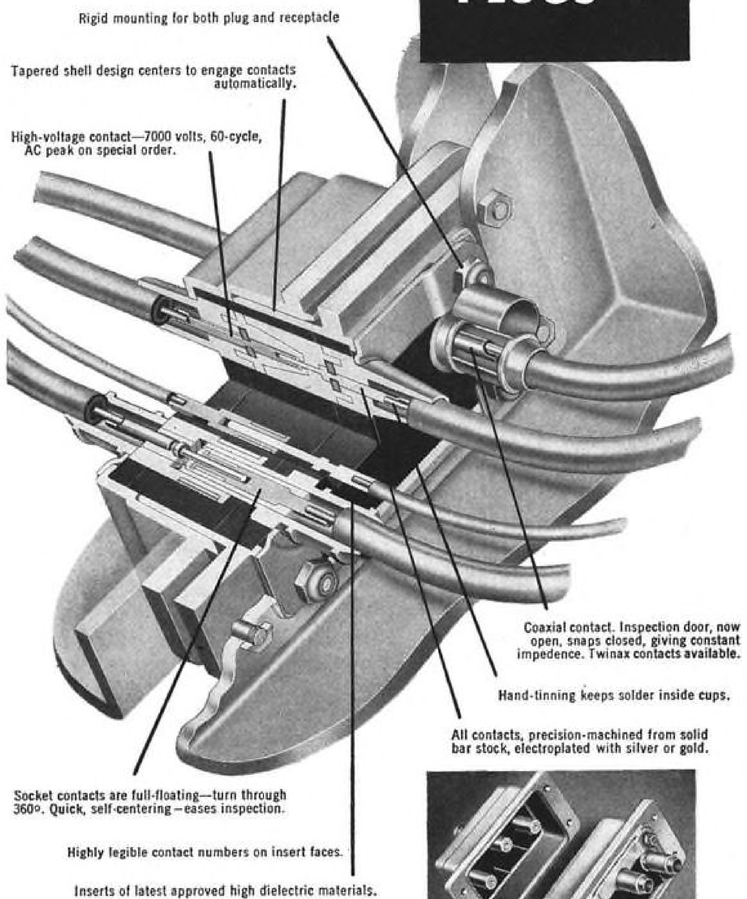
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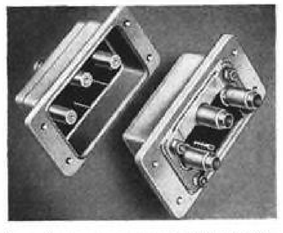
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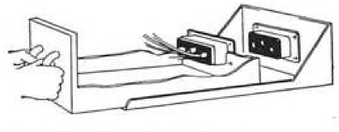
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How USAF Helps A Subcontractor

A subcontractor is once removed from the government agency that granted the prime contract on which he is working, but on occasion the government agency will go to bat for him to see that he gets his money.

This cropped up earlier this year at the hearings before the House Appropriations Committee on the Air Force fiscal 1951 budget.

Just where the government's responsibility to the subcontractor begins and ends has been a fine legal point since subcontracting flowered during World War II. Going over the ground again with Lt. Gen. K. B. Wolfe, USAF chief of procurement, Rep. Harry Sheppard, of Calif., was told that the Air Force watches the prime contractors' accounts pretty closely.

▶ **Watchdog**—Before the Air Force will make a partial payment on a prime contract it checks the contractor's accounts to be sure he has discharged his obligations to his subcontractors. "That is the only hold we really have on him (the prime contractor)," said Gen. Wolfe, "when he comes in and asks for partial payments or advance payments."

Other than that, the Air Force tries to stay away from relations between the prime and subcontractor. In certain contracts, the service will tell a contractor he may use subcontractors, just to assure the contractor that he will not be breaching his agreement if he farms out part of the work.

▶ **Legal Responsibility**—But when the Air Force puts such a proviso in a contract it becomes a legal matter whether the government has any responsibility to the subcontractor. Gen. Wolfe pointed out that the prime contractor negotiates directly with the government on renegotiation and redetermination of the contract price. This isn't always true of subcontractors; they have to leave it up to the prime contractor to look out for their interests.

And more than once, according to Gen. Wolfe, "the little businessman has to come back to us and complain that he is not being treated by the prime contractor the same as the prime contractor is being treated by us."

It seemed to be the opinion of both Gen. Wolfe and Rep. Sheppard that the prime contracts should be framed in such a way that it would be clear that all responsibility to subcontractors began and ended with the prime contractor.

But they both also agreed that to accomplish that end would require a very thorough legal survey of the entire situation.



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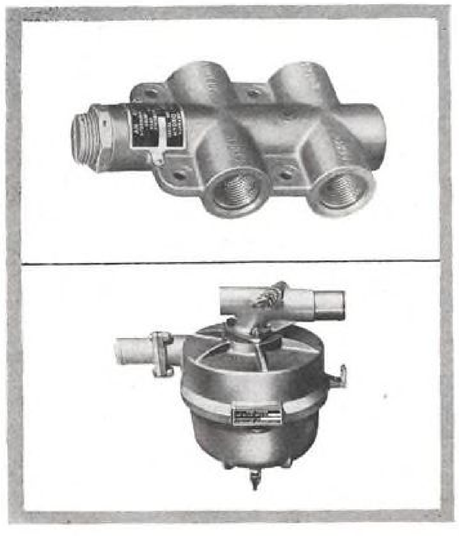
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The Outlook for the Labor Supply

If you have to hire for defense work you may have trouble getting certain skills in certain areas.

If you think you will have to hire new employes to fill defense orders, here is the way the situation looks.

Manpower is getting tighter, particularly in aircraft centers. This applies both to overall labor supply and to skills necessary to aircraft production.

No manpower controls—compulsory, that is—are being considered in Washington under the "current situation"—meaning a war confined to Korea. But there are a number of voluntary measures already in the works, or contemplated, to help alleviate the manpower shortages cropping up in key production areas. These include:

- **Giving priority** to defense contractors at the state employment offices in handling requests for workers and in referring job applicants.
- **Training programs** for production workers, like the apprenticeship program in apprenticeable crafts and the Training-Within-Industry for supervisors of the last war.
- **Draft deferment** for young men on the "critical occupations" list of July 24, 1950, issued by the Labor Dept.

Secretary of Labor Maurice J. Tobin is working with the Defense Dept. and Selective Service in formulating a deferment policy, as directed by President Truman in his executive order of Sept. 9 implementing the Defense Production Act.

- **Asking women** and others who have left the labor force, particularly those with World War II job experience, to return to the plants.
- **Encouraging longer hours.** Sometimes this is necessary to make up for a shortage of special skills. Some are working 60 hours a week in Seattle, say reports reaching the U. S. Employment Service.

Here is what has been happening:

Nationwide, the tightening of labor supply is reflected in the drop in unemployment from 3.2 million to 2.5 million and the increase in jobs to a record 62.3 million.

Tight Supply—Locally, it can be seen in the increasing number of areas with tight labor supply. In July, for instance, before defense production could really get going, employment went up in 130 of the 143 major industrial areas sur-

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veyed by USES. Unemployment dropped in 99 areas despite the influx of summer workers. Nineteen were so-called "A" areas with less than 3 percent unemployment.

Job openings filed with local employment offices which couldn't be filled in the local area rose from 13,000 in July to 22,000 in August.

Skilled labor scarcities hit aircraft production centers hardest. Most frequent shortages reported were for mechanical, electrical and aeronautical engineers; machinists and machine tool operators; tool designers and tool and die makers. There is a general tightness in all metalworking jobs.

USES reports employment rising sharply in Wichita, Seattle, Los Angeles and San Diego. Indianapolis and Dallas were among the "A" tight labor supply areas in July. Nine aircraft centers improved their unemployment classification, Seattle moving up two notches.

► **Employment Report**—Here is a rundown of the situation in aircraft centers as reported by USES for July:

• **Baltimore.** Steel mills on three shifts. Some lengthening of hours. Defense contracts spur employment gains. Some skilled occupations short.

• **Boston.** Employment up, but not pinching.

• **Bridgeport, Conn.** Metalworking employment rising, will go higher. Shortage developing in skilled workers.

• **Buffalo.** Labor demand to skyrocket if defense contracts under negotiation materialize. Skilled and semi-skilled worker shortage likely. Several plants to reopen. Another will add second shift.

• **Chicago.** Labor supply tightening. Skilled worker shortage getting acute.

• **Cincinnati.** Spot labor shortages appearing, but not yet slowing production.

• **Columbus, O.** Spot labor shortages may slow production in foundries, metal fabrication, machine shops. Some out-of-area recruitment.

• **Cleveland.** Spot shortages of skilled factory workers intensifying, but not expected to hinder planned fall expansion in manufacturing.

• **Dallas.** A tight labor area with less than 3 percent unemployment. Jobs at postwar high. Aircraft gains figure in rise, further expansion expected. Immigration and commuters augment labor supply. Some aircraft skills short.

• **Detroit.** Jobs at peacetime high. Labor reserve dwindling markedly. Overtime in shortage occupations forestalling production tie-ups.

• **Ft. Worth.** Employment up slightly, but unemployment also up due to immigration. Labor supply generally adequate, but out-of-area recruitment anticipated for skilled aircraft jobs.

• **Hartford, Conn.** Machinery jobs rising. Shortage of skilled factory workers.

• **Indianapolis.** Unemployment cut in half despite layoffs due to steel shortage. Tight labor supply area; less than 3 percent unemployment.

• **Kansas City.** Skilled labor shortages increasing. Some relaxing of hiring standards except for those eligible for the draft.

• **Los Angeles.** Aircraft employment up. "Skill-rusty" job-seekers coming back. Fall outlook: recruiting difficulty in some metals jobs.

• **New Haven.** Labor supply generally adequate. Some scarcity of skilled workers.

• **New York.** Marked expansion forecast for early winter, especially in metalworking. Rigid hiring specifications prevalent.

• **Philadelphia.** Metalworking leads job upswing. All industries planning expansion. Labor generally adequate, but shortages occurring in a few skilled occupations.

• **St. Louis.** Labor stringencies not severe, but demand for skilled workers growing.

• **San Diego.** Aircraft leads job upswing. Some aircraft skills short, but no relaxing yet of hiring standards.

• **Seattle.** Unemployment cut sharply. Sizeable immediate expansion forecast in aircraft, already experiencing skilled labor shortages and largely on 60-hour week.

• **Toledo.** Moved out of depressed area classification. Strong upturn in metal fabrication, glass and other industries.

• **Trenton.** Jobs up. Shortage of skilled workers likely to develop.

• **Wichita.** Aircraft expansion leads big employment gain. Spot labor shortages, primarily skilled aircraft workers. Out-of-area recruitment under way.

Wage Laws

Walsh-Healey Act covers many subcontractors in the aircraft industry.

Government contracts of more than $10,000 are subject to the 1936 Walsh-Healey Public Contracts Act covering wages, hours and working conditions.

Except in airframe assembly, a subcontractor also must comply with the requirements of this public contracts law if the prime contractor, in subcontracting the work, is deviating from the regular industry practice. When that happens, the subcontractor is considered to be a "substitute manufacturer" and thus he moves into an area within the reach of the law.

Any subcontractor to an airframe assembler, however, is automatically a bona fide subcontractor, not covered by the public contracts law, because of a ruling issued in 1940 by the administrator of the Wage-Hour and Public Contracts Acts. The ruling still stands.

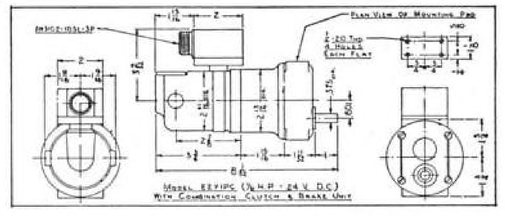
► **Airframe Exception**—This specific exception to the rule was made in subcontracting airframe assembly because at that time, in 1940, the vast increase in airplane production threw out of gear the regular practices of airframe assemblers.

The change was such that the administrator, in a letter to the industry, made an official ruling that there no longer existed any "regular" practices in airframe assembly that could be used as a guide. Therefore, he ruled, any manu-

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facturer supplying an airframe assembler was a bona fide subcontractor and thus not covered by the Walsh-Healey Public Contracts Act.

The exemption does not apply to other parts of the aircraft industry. A subcontractor not filling a contract with an airframe assembler must observe this law if he is doing a job which, under regular practice, is usually done in the industry of the prime contractor.

Furthermore, he is covered by the law if he produces the final product for which the government has contracted.

What is meant by the "regular" industry practice and "final product" rules?

• **"Regular" practice rule** means this: If airplane engine producers customarily make their own valves, this would be considered a regular practice. Then any company with a government contract to deliver airplane engines would be deviating from the regular practice if it subcontracted for valves, even though this particular company always has let valve work out. A subcontractor doing this valve work would be considered a "substitute manufacturer" and thus covered by the law.

When in doubt about what the regular practice is, you can find out by writing to William R. McComb, Wage-Hour Administrator, Washington 25, D. C. On request, he will also send you Rulings and Interpretations of the Public Contracts Act, which will be helpful in understanding the law.

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Wage Booklets

Two publications of the Bureau of Labor Statistics may help you on wages.

• **Wage Structure, Airframes, 1949** analyzes the wage structure, the wage rates and related wage practices of 22 airframe manufacturers in May-June, 1949. A summary appears in the BLS Monthly Labor Review, January, 1950. The detailed survey may be obtained by writing the Bureau of Labor Statistics, Washington 25, D. C.

• **Job Descriptions for Wage Studies, Airframes,** gives the detailed descriptions of some 75 aircraft jobs. BLS follows them in collecting airframe wage data. It may be obtained by writing BLS.

► **Public Contracts Act**—What do the terms of Public Contracts Act provide?

• **A minimum wage** must be paid for all work on a government contract or a subcontract which is covered by the law, as explained above. In aircraft, it is $1.05 an hour, computed at hourly or piece rate. More favorable wages in union contracts are not affected.

• **Apprentices and handicapped** workers may be paid less than $1.05 if you get approval from the wage-hour administrator, but apprentices may not be paid less than 75 cents.

• **Time-and-a-half overtime** must be paid after 8 hours a day and 40 hours a week (unless you have a guaranteed annual wage contract with a union).

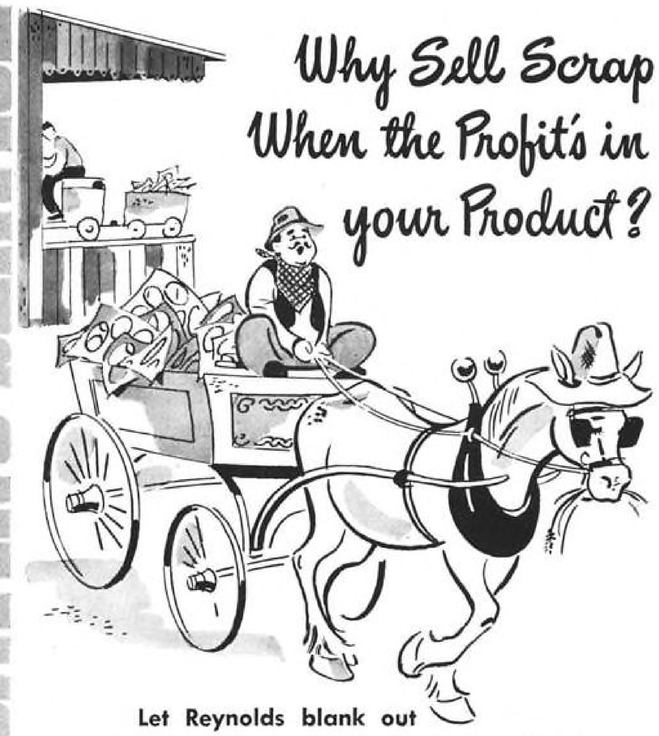
• **Child labor.** Boys under 16 or girls under 18 may not be employed on these contracts. Penalty: $10 for each worker every day he or she was employed in violation of the law.

• **Certain safety** and sanitary standards must be observed.

• **Detailed payroll records** must be kept.

The minimum wage was raised and the industry definition revised on July 8. The official definition and other data pertaining to the aircraft industry are contained in Section 202.23 of Title 41, Chapter II, Part 202, Code of Federal Regulations. A copy may be obtained from the Administrator.

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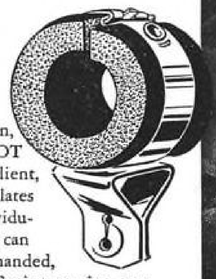
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Keeping Secrets

You must have security clearance to get any classified contracts.

Before you will be allowed to produce aviation equipment for the government, you must be able to protect aviation secrets from the enemy. This rule applies to contractors and subcontractors alike.

▶ **Before Getting Contract**—Before you can even get a look at a classified contract in order to prepare a bid, you must have a "facility security clearance."

This consists of:

• **Examination of the plant** to see that it is physically suited to protect war secrets.

• **Check on officers,** directors, owners and any key employes who will have access to classified matter.

Facility clearance will be denied if the plant, shop, laboratory or other place where the work will be done is physically unsuited to assure protection against espionage, sabotage or other subversive efforts.

It will also be denied if any key person who will have access to the classified matter is "unsuited" according to standards set up by the Army-Navy-Air Force Personnel Security Board.

Clearance will be denied a company owned or under the control or influence of foreign interests "under circumstances which may jeopardize the security interests of the United States," or if any key employes cannot be cleared.

Clearance usually will be denied to an employe who:

• **Has been involved** in treason or sedition.

• **Is under the influence** of a foreign government which might jeopardize our security.

• **Has supported the overthrow** of our government by force.

• **Has disclosed classified** information to persons not authorized to receive such material.

• **Does not have the integrity,** discretion or responsibility necessary to keep a government secret.

• **Is or has been a member** of one of the subversive organizations on the lists that are issued from time to time by the Attorney General.

In contracts for aircraft, parts and accessories, a special alien questionnaire (NME Form 49) must be filed by all aliens who have access to the plans or specifications, or construction, or will participate in the contract trials, whether or not access to classified matter is involved.

Security clearance will not necessarily be denied because you happen to have a non-alien employe who cannot be cleared. Rather than dismiss the employe you may put him on non-classified work.

Decision to deny clearance is made by the ANAFPSB. Unless clearance is denied because of the plant's physical elements, you may appeal a denial to the Industrial Employment Review Board in the Pentagon.

▶ **Before Beginning Work**—Loyalty, integrity and trustworthiness of employes working on classified contracts is deemed essential to minimize security risk incidental to the handling of military information by a contractor of war materials.

Investigations are made by the department concerned with the contract. Classified military information may not be given an employe until he has been "cleared."

"Background investigation" is made of all employes who will have access to "top secret" matter and of all aliens who will have access to any classified information. This is a full investigation of the employe's activities over the past ten years.

"National agency check" is made of those employes with access to "secret" data. This is a check of FBI and armed forces intelligence files. If derogatory information is turned up, then a background investigation is made.

No check is made of an employe with access to "confidential" or "restricted" matter unless he is an alien or there is evidence that he is a security risk.

Employes also may appeal denial of clearance to the Industrial Employment Review Board.

To expedite contracts, clearance requirements may be modified to a certain extent.

Clearance records, both as to facility and employes, are kept in a Central Index File at the Pentagon, so that clearance checks won't have to be duplicated.

▶ **After Work Begins**—Responsibility for plant protection rests basically with management. However, plant management should maintain liaison with local military commanders. It is responsible, too, for the security of classified information which may come into its possession as a result of its contracts. Suspected acts of sabotage or espionage should be reported to the nearest FBI office.

More detailed information and many other views and suggestions of the Defense Dept. are contained in a 24-page pamphlet, "Principles of Plant Protection," just issued. It was prepared by the Industrial Security Division, Office of Manpower, Munitions Board, and is available for 15 cents from the Superintendent of Documents; Government Printing Office, Washington 25, D. C.

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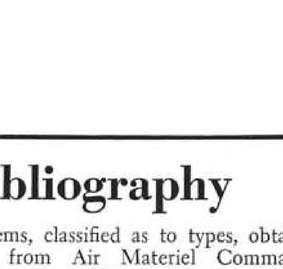
Procurement Bibliography

Here is a list of useful catalogs, service buying information, and laws governing procurement:

- **A Guide for Selling to the United States Air Force,** 1949, obtainable from the Contractors' Relations Branch, Procurement Division, Air Materiel Command Headquarters, Wright-Patterson AFB, Dayton, Ohio or at the Procurement Information Center, Pentagon, Washington 25, D. C.
- **Selling to the U. S. Navy,** 1948, obtainable from U. S. Government Printing Office, Washington 25, D. C., price 15 cents, or (free) from a Navy procurement office.
- **How to Sell to the United States Army,** 1950, obtainable from U. S. Government Printing Office, Washington 25, D. C., price 30 cents, or (free) from an Army procurement office.
- **Index of Military Purchasing Offices** of Army, Navy Air Force, and Marine Corps, obtainable from Procurement Information Center, Pentagon, Washington 25, D. C. This is an index by commodity type, but it omits electronics.
- **Index of USAF catalogs** of items purchased and copies of selected catalogs of items, classified as to types, obtainable from Air Materiel Command Headquarters, Wright-Patterson AFB, Dayton, Ohio, attention MCPPXS.
- **Armed Services Procurement Regulations,** Parts 1-15, obtainable from Government Printing Office, Washington 25, D. C.
- **Federal Register,** contains regulations of government agencies, including procurement regulations, as they are promulgated, obtainable from Government Printing Office, Washington 25, D. C., price $15.00 a year.
- **Public Law 413,** the Armed Services Procurement Act, 80th Congress, 1947, is still the basic law governing military procurement, obtainable free from House Document Room, Capitol, Washington, D. C.
- **Index for Specifications and Bulletins Approved for U. S. Air Force Procurement,** obtainable from Procurement Division, Air Materiel Command Headquarters, Wright-Patterson AFB.
- **Military Renegotiation Regulations Under Renegotiation Act of 1948,** sold on subscription basis with revisions by Government Printing Office, Washington 25, D. C., price $2.50 a year.

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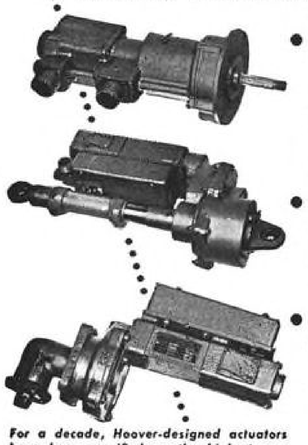
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4. Illustrated Jig-Tooling Dictionary

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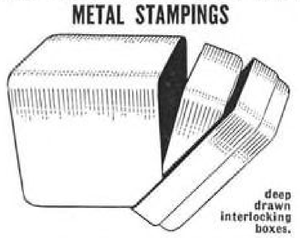
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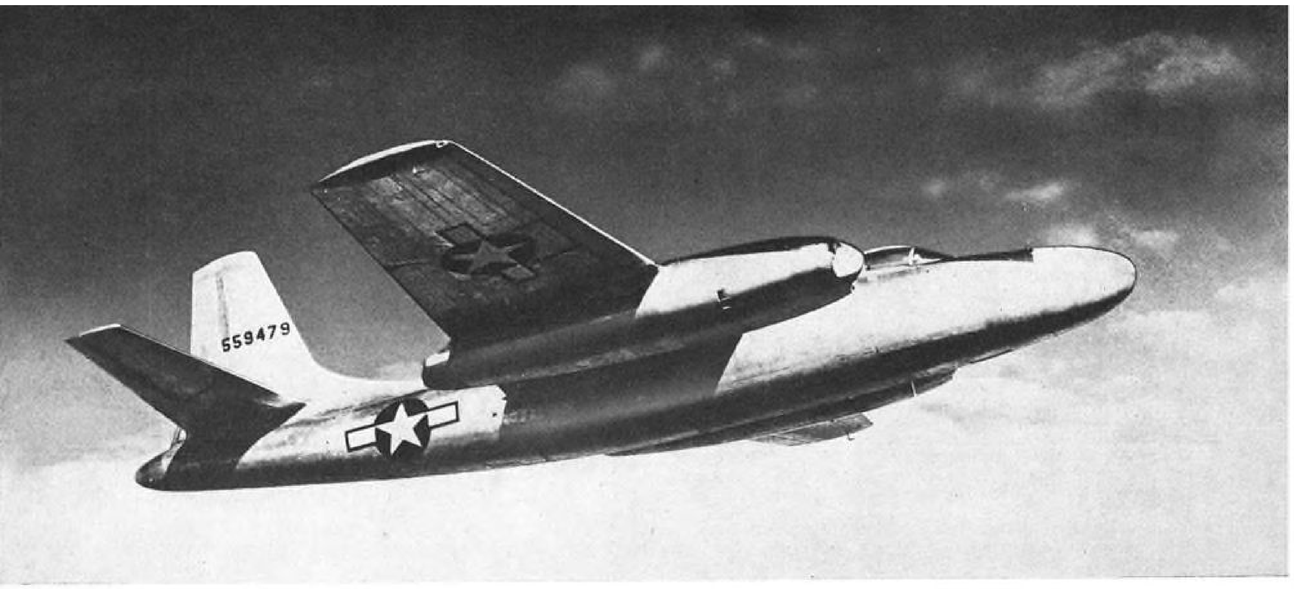
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600 mph Guinea Pig

Duplicating operational conditions while multiplying operational flying time, this North American B45 Tornado is piling up flying hours to find out how good General Electric turbojets are.

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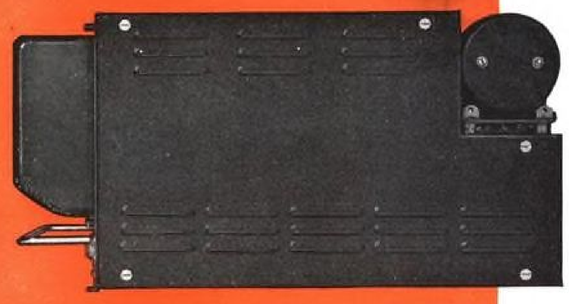
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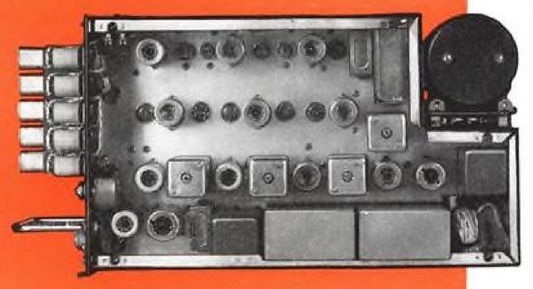
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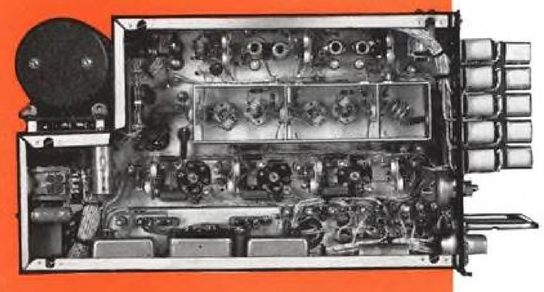
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51V-1 glideslope receiver, covers in place



Collins 51V-1 chassis (right side)



Collins 51V-1 chassis (left side)

Glideslope Receiver

51V-1

...inside and out

THIS is the new Collins 51V-1 glideslope receiver for aircraft. Note the orderly design, and the accessibility of all tubes, components, and wiring.

The 51V-1 provides reception of 90/150 cps tone modulated glideslope signals on any of the twenty channels in the uhf range of 329-335 mc. This receiver together with Collins 51R navigation equipment will fulfill ILS receiving requirements for military, commercial and private aircraft. The design of the 51V-1 is based on "Glideslope Receiver Characteristics" issued by Aeronautical Radio, Inc., and on U. S. Airforce specifications.

Output circuits of the 51V-1 receiver feed standard ID-48ARN deviation indicators including flag alarm. By means of the flag alarm the pilot has a positive indication of the reliability of the glideslope signals and instrumentation.

The 51V-1 control circuits are integrated with the standardized R/θ channeling system with channel selection provided by means of a Collins 314U remote control unit.

More complete information, in the form of an illustrated bulletin, is yours on request.

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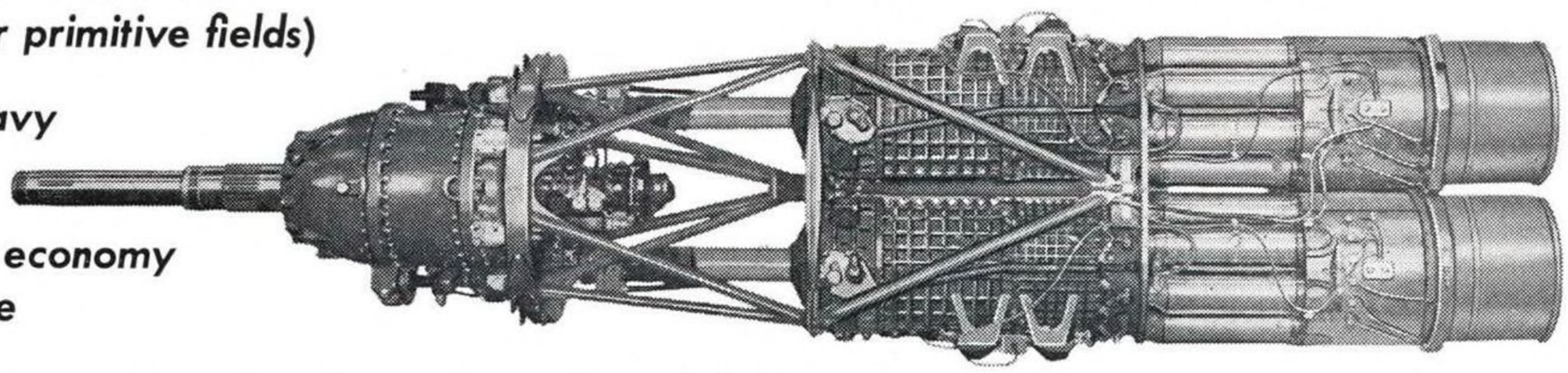
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