

The airframe industry at last glimpses prosperity on the horizon. But first it must surmount, on the one hand, the hazards of avionic competition and, on the other, the threat of a federally enforced dispersal.

The Wild Blue Chip Yonder

by Charles J. V. Murphy

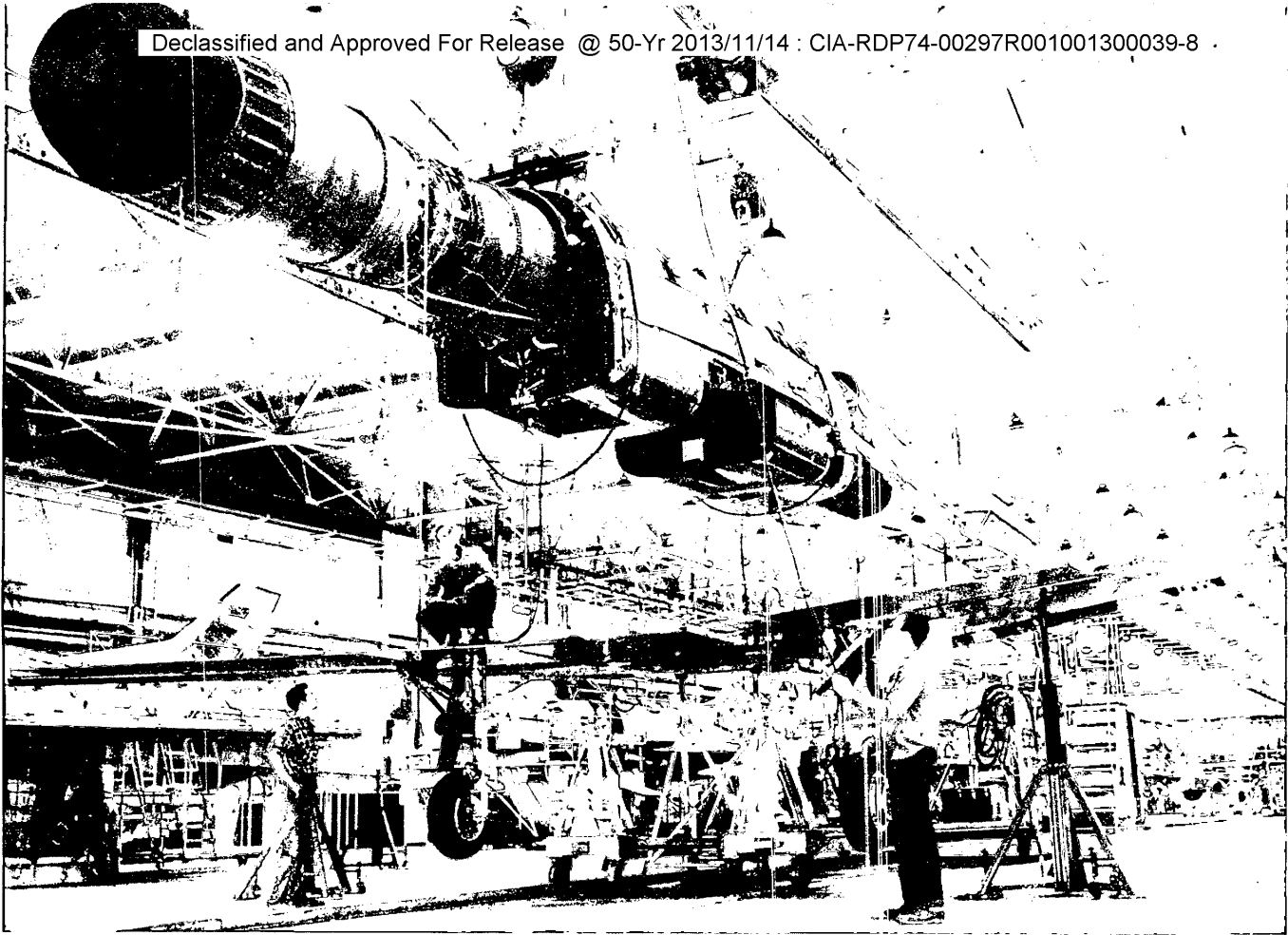
Anybody who spends much time with the airplane builders nowadays finds two rather old-fashioned words cropping up in the conversation—stability and maturity. These are terms that go with an invincible position; and considering that only seven years ago Douglas Aircraft Co. was down to 15,400 employees and that Boeing in 1946 was agonizingly designing aluminum egg beaters, bicycles, and plastic toilet seats to find products for its dying assembly lines, the notion that the aircraft industry has at long last outflown its hazardous past may appear highly presumptuous. Nevertheless, there is no mistaking the savoir-faire, the air of permanence, not to mention the prosperity, that suddenly have become the easy ornaments of the airplane builders. Vanished is the stock figure of the airplane drummer as the Micawber of the manufacturing world, cursing his lot as the remittance man of the military and the fall guy of the airline operators. The feast-and-famine, stop-and-start past has been succeeded by a prosperous present and an exciting future. The present is solidly buttressed by a national strategy that is generating a huge demand for the industry's products; the future is bright with the promise of predictable, spectacular technical advances that will make for a dynamic market. Here is the explanation for Boeing's backlog of \$2.13 billion, Douglas' of \$2 billion, Lockheed's of nearly \$1.2 billion, and for a total industry backlog for military aircraft alone of nearly \$15.4 billion.

This is not to say, however, that the industry itself is under any illusions that maturity, stability, and prosperity mark an end to the long period of trouble. On the contrary, the industry is rather in the position of one of its products, which, having shuddered through the transonic barrier and gained the brighter prospects beyond, is promptly beset by new problems, complex and unforeseen.

Maturity and stability, as applied to the aircraft industry, have special meanings. When, for example, Boeing's Senior Vice President Wellwood E. Beall uses the word maturity, he means that the airplane builders no longer need apologize for their production engineering and techniques. "During the war," he recalls, "whenever Bill Knudsen and other Detroit people came out to our plant at Seattle, they used to rib the hell out of us on account of the impromptu tooling of the B-17 line. And we certainly had a lot to learn about interchangeability. Well, that's all changed now. Our tooling techniques are more sophisticated than Detroit's. Now they send their people to us to learn from our lines."

And the word stability, as used by Arthur E. Raymond, Douglas' engineering vice president, means the opposite of static. It means, rather, a condition of dynamic balance, as of a ship or airplane buoyant in its medium. Mr. Raymond maintains that the technical prospects of his industry are more stable than those of the automotive industry for the reason that the breakthroughs in jet propulsion, electronics, and atomic energy present his industry with an entirely new set of expanding opportunities. "The automotive industry," he notes, "is through its period of fundamental major transition. Practically all it has left is to add chrome—or drop it. But we have change, big change, continuing change, to live on."

Yet, if change means opportunities, it also means competition. For one thing, the aircraft industry's bread-and-butter monopoly—a flying machine controlled by a man—is being seriously challenged by a wide variety of missiles, long-range and short-range, tactical and strategic, offensive and defensive, ballistic and guided. These missiles are potentially capable of taking over many of the tasks now performed by the so-called "inhabited" airplane, and other tasks



North American Aviation's F-100 interceptor, the Super Sabre jet, shown in assembly at the company's Los Angeles plant, is the fastest U.S. aircraft in operational use, somewhat faster than sound. The fuselage, hardly more than a skin for the J-57 engine and afterburner, is being "mated" to the wing. Of concern to airframe manufacturers is the shrinking fraction of the vehicle that they themselves build.

that it could not possibly perform. Moreover, the big technical changes in which the airplane itself has been caught up, particularly in electronics, threaten to reduce the vehicle to the function of a container, or "can," for increasingly complicated and costly electronic gear. Hundreds of companies are crowding the aircraft companies hard for pieces of the missile and electronics business. Because of the competition from new and unexpected quarters, the airframe industry fears that its share of the total dollar cost of the air vehicle will be slowly drained off to the designers and makers of fire-control and navigation systems, computers, scanners, and other electronic gear.

Nothing in recent years has agitated the airplane makers so much as the question of how to fend off this competition and maintain their primacy as designers and assemblers not only of airplanes but of all air weapons systems. The challenge and the differing responses to it (discussed in detail later in this article) have introduced a new and intricate stage in the industry's development. Meanwhile, however, the industry's maneuverability in dealing with the issue has been hampered by Air Force Secretary Harold E. Talbott's abrupt decision to halt the further concentration of the aircraft industry on the east and west coasts.

Secretary Talbott throws a scare

Mr. Talbott has demonstrated in the discharge of his official duties a rare talent for confusing a sound issue. The vulnerability of the Connecticut Valley and southern Cali-

fornia concentrations of the aircraft industry has long given concern. But in putting the industry on notice that the concentration had gone far enough, Talbott conveyed the impression that the Los Angeles and San Diego complex in particular was to be dispersed behind the Rockies. Talbott's later explanation that the government merely proposed to hold defense business in the area at present levels quieted the uproar, but it did not entirely reassure the West Coast aircraft builders, the Los Angeles Chamber of Commerce, Senators Knowland and Kuchel, or the always sensitive southern California congressional delegation.

The truth is that neither the Air Force nor the Pentagon seems to know how much is too big a target, or whether a genuine dispersal program is worth the economic and social costs it would entail. The federal attitude appears to be little more than the impatient expression of a conviction that some kind of start must be made at dispersal, even if the first moves seem random and arbitrary. There is now in force a tentative policy of withholding from the principal coastal aircraft communities contracts for new items if those contracts require additional facilities and engineers. In principle the producers in these places will become eligible for new business only as their existing floor space and engineering talent are released by the completion of work in progress. But as a practical matter this restriction imposes a straitjacket upon coastal producers that will make it extremely difficult, if not impossible, for them to maintain an economic balance between current production and the phasing in of new developmental items. Moreover, military contracts for certain projects now specifically enjoin the successful bidder from doing the work on either coast.

While there is a legitimate case to be made for *some* dispersal, the West Coast producers have not been won over by

The "Big Five's" Postwar Sales and Profits

This chart shows the postwar growth of the top five airframe manufacturers who share 70 per cent of the airframe business. Noteworthy are the rapid shifts in their relative positions, reflecting the rise and fall of particular specializations. Thus Boeing, which failed to make the Big Five in 1946 when military business dried up, has climbed to the top through its monopolies of medium jet bomber (B-47), heavy jet bomber (B-52), and jet tanker programs. Lockheed's and Douglas' pre-Korean ascendancy recalls the days when the transport business, however unprofitable, was the life-giving fraction of the total.

Fiscal years	1946	1947	1948	1949	1950	1951	1952	1953	1954	
BOEING	Sales	14.0	21.7	126.9	286.8	307.3	337.3	739.0	918.2	1,033.2
	Pre-tax profit	-3.7	-0.4	2.9	8.0	24.2	19.8	49.8	58.8	76.7
DOUGLAS	Sales	106.7	128.5	118.6	117.4	129.9	225.2	522.6	874.5	915.2
	Pre-tax profit	-2.0	-14.8	11.1	10.7	13.2	18.6	33.5	61.5	80.0
LOCKHEED	Sales	112.7	134.4	125.6	117.7	173.3	237.2	438.1	820.5	732.9
	Pre-tax profit	-8.1	-2.2	7.8	6.6	15.1	9.8	17.5	48.3	45.8
NORTH AMERICAN	Sales	55.8	19.9	94.1	124.2	143.0	177.7	315.3	634.7	645.8
	Pre-tax profit	6.5	-7.3	10.8	11.7	13.6	15.2	20.3	40.1	52.5
REPUBLIC	Sales	29.5	38.3	49.8	47.7	57.7	130.4	412.2	411.8	323.5
	Pre-tax profit	-14.0	-5.8	2.8	1.5	4.6	8.1	27.4	29.0	19.6

Millions of dollars

the policy as it has been defined. For one thing, they have serious doubts that their top technical people would willingly give up the California life. For another, they find it difficult to reconcile the dispersal program with strategy—a subject that they do know something about. The national air-atomic strategy assumes that any big war would be fought to decision with the forces in being at the start of hostilities. The traditional idea of a broad mobilization that would swing into production at the outbreak of war is presumably as obsolete as the B-17. The Pentagon civilian secretariat seems thus to be reversing the cliché that it is only the generals who plan for war by starting where they left the last one. Be that as it may, the West Coast producers tend to interpret the ban on further expansion by them as a possibly politically inspired move, favoring hinterland industries that are aggressively maneuvering for the new military business, especially in missiles and electronics.

So long as this suspicion persists there will be continuing concern, at least among the West Coast airframe manufacturers, over (a) the extent to which they may be required to migrate into the hinterlands, with the trials that attach to decentralization, and (b) the degree to which they may be excluded from the new weapons business outside and beyond the classical airframe. North American's expectations concerning additional missile developments at Downey have been momentarily chilled by the freeze on further West Coast growth. Boeing is under orders to move its Bomarc air-defense missile out of Seattle. Aerojet-General, another Los Angeles producer that is developing a propulsion unit for the Atlas intercontinental ballistic missile, has been told to transfer its production to Missouri. And Lockheed's plan to invest \$10 million in a missiles laboratory at Van Nuys, in the Los Angeles area, has been at least temporarily upset by the Air Force's refusal to give it business.

Congress looks into profits

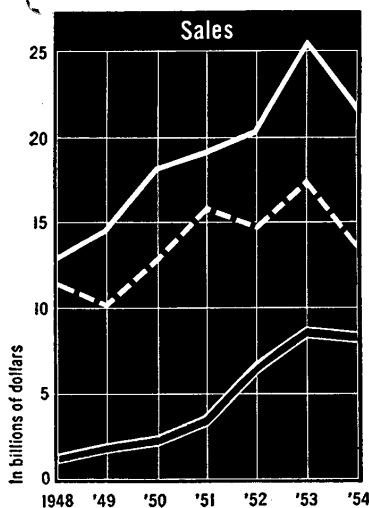
Another issue unsettling to the industry is the threatened congressional attack upon its 1954 profits record. Two Democratic-controlled House bodies—the Armed Services Sub-

committee under Representative Hebert of Louisiana and the Defense Appropriations Subcommittee under Representative Mahon of Texas—are digging into the subject. Chairman Mahon has said that defense profits "have been soaring as though they were jet propelled." In actual fact, the aircraft industry's average net profit on sales in 1954 was only 3.8 per cent, compared to the national manufacturing average of 5.9 per cent. However, the objective of the investigation as regards the airframe manufacturers is to demonstrate that since more than 70 per cent of their tooling and facilities were provided by the government, the conventional sales-net return ratio is not a valid measurement. It is the industry's return on net worth that interests Mr. Mahon. He has already called attention to two unidentified examples—one, patently Boeing, whose profit last year after taxes was, by Mr. Mahon's calculation, "about" 45 per cent of net worth; and another, patently Douglas, whose profit was "about" 37 per cent of net worth.

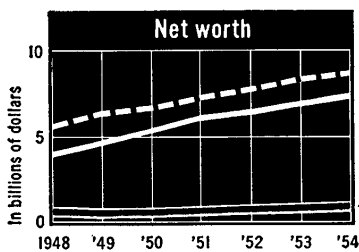
A survey by the First National City Bank of the 1954 earning records of thirty-eight aircraft and aircraft-supply companies shows an aggregate net profit of about \$272 million for the group, a 54 per cent increase over their combined 1953 total of \$176 million. The high, possibly too high, net of some producers reflects, in part, the elimination of the excess-profits tax and, in part, the savings in costs through increased efficiency under fixed-price contracts as the producers move along the learning curve. What now disturbs many in the industry is the possibility that the Renegotiation Board, responsive to the heat from Capitol Hill, may impose more spartan standards than have so far prevailed.

The Renegotiation Act expired last December. President Eisenhower has asked that it be reinstated for the two-year period ending December, 1956. Congress undoubtedly will do this. Meanwhile the board, having worked through the 1951 docket, is exploring the 1952-53 record, company by company. Nothing spectacular is likely to come out of its review of these years. The excess-profits tax having then been in force, any action by the board to recapture sizable earnings from any particular producer would be offset by

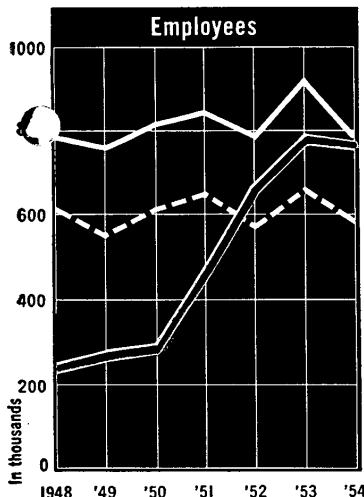
Air Growth vs. Automotive and Iron and Steel



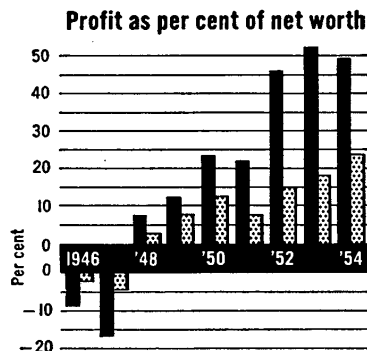
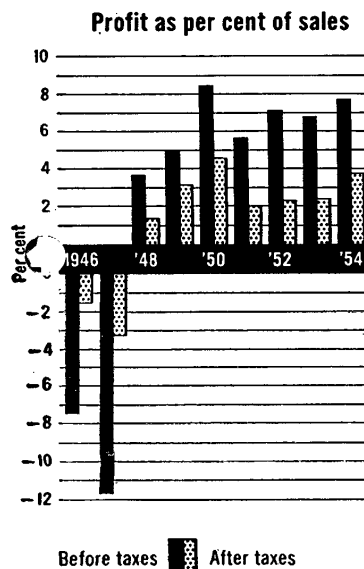
— Motor vehicles and parts
 - - - Primary iron and steel
 — Aircraft and parts



*Source: First National City Bank



These charts show the growth of the aircraft industry since 1948 in terms of sales, employment, and net worth relative to that of the automotive and the iron and steel industries. The key factor is the net-worth ratio. Despite a 490 per cent gain in sales, the aircraft industry's net worth increased only 64.6 per cent, compared to a net-worth increase of 60 per cent for steel (on a 20 per cent gain in sales) and 82 per cent for automotive (on a 67 per cent sales jump). Explanation for the gap: the high proportion of government-owned aircraft facilities, 70 per cent of the industry total.



Return on Net Worth

Based on the experience of seventeen companies, this chart indicates rather than sums up the industry's actual postwar record. It points up the low return on sales (3.8 per cent in 1954 and 2.4 per cent in 1953) and the high return on net worth (24 per cent in 1954 and 18 per cent in 1953).

corresponding tax credits. However, the 1954 outlook, because of the political overtones, is tricky. Publicly the major airplane builders profess confidence that their profit record will stand any fair scrutiny. In judging what constitutes a reasonable return, the Renegotiation Board, as well as the services, has taken into account the comparative efficiency of individual producers in reducing costs, meeting schedules, and otherwise fulfilling their obligations. As Roger Lewis, Assistant Secretary of the Air Force for Matériel, puts it, "It takes just as much hay to feed a plug as to feed a race horse—and our rule is to reward quality." Another factor is also taken into account—what the companies do with their profits, the ratio between what is shoved out in dividends and what is plowed back into the business. Here the record of the Big Five airframe manufacturers—Boeing, Douglas, Lockheed, North American, and Republic—is good. Last year they retained as a group about 65 per cent of their earnings. The big plowback bespeaks a concerted effort to reduce their common dependence upon direct government financing. How far the detachment process can be extended will depend largely upon the Renegotiation Board's ability to preserve the present incentive system in the face of the likely Democratic blast against high profits.

Strategy founds a community

Serious though these problems are, and painful as their resolution may prove, they cannot obscure the most important fact about the aircraft industry and its suppliers. That fact is that the industry has become the most important pool of technical talents in the economy. Last year it passed the automotive industry, for the first time in peacetime, as the No. 1 manufacturing employer of labor. From July through October its total working force averaged nearly 756,000 against about 710,000 for the industry that heretofore has symbolized the American productive genius. And the aircraft industry also claims to have stood first, by an even wider margin, in the size of its payroll. Its figure for last year was \$4 billion.

To be sure, this eminence was only briefly held. Last November, Detroit once more moved in front. As a result of its tremendous production push behind the 1955 models, the automotive labor force surged in March to about 927,000 workers while the aircraft industry's employment was dipping slightly to 752,000. Yet even second place is impressive for an industry that only twenty years ago ranked 135th among U.S. industries in employment (15,000 workers) and 169th in sales (\$45 million).

Three factors essentially are responsible for this growth. The first, of course, is the massive buildup of air power, and especially of the 137-wing Air Force, that began with the Korean crisis. The second is the gathering momentum of the shift to a national air-atomic strategy. The third is the strategic assumption that the power conflict with the Soviet system may continue, short of general war, for several decades. In light of that assumption, U.S. air power, being a wasting asset in the qualitative sense, must be steadily replaced in line with accelerating technical advances.

Moreover, any assessment of the industry's prospects must take into account certain psychological and social factors. The U.S. is becoming, militarily and sociologically, more and more the world's foremost air community. There is hardly a village with any pretensions to machine skills that does not draw income from the aircraft industry. North American Aviation does business directly with 10,000 firms, United Aircraft with 7,000. The Aircraft Industries Association estimates that the national web of subcontractors

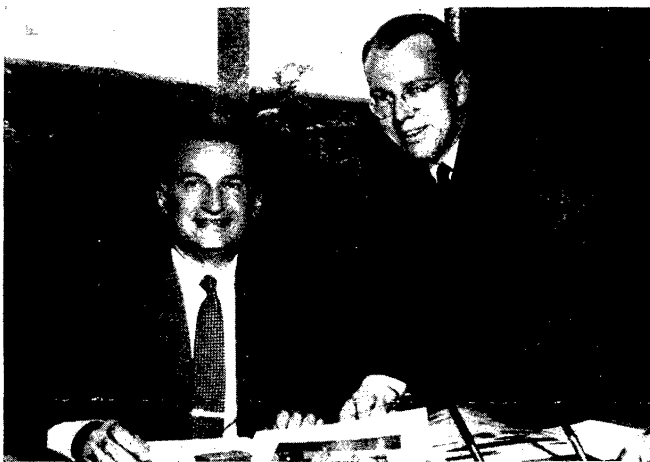
and suppliers includes more than 50,000 different firms. And in the Los Angeles area, the aircraft plants employ 28 per cent of the total manufacturing force.

The industry's impress upon the national economic pattern is deepened by its impact upon national habits. More Americans now travel by air than use either Pullman or rail coach in getting about the country beyond commuting distances. And as a vehicle for crossing the oceans, the airplane's margin of popularity over the steamship is even wider. Sixty per cent of all intercontinental travelers departing from or entering the U.S. use the airlines. Moreover, the first-quarter statistics of the Air Transport Association show a 19 per cent increase in the volume of domestic air travel over the same quarter last year.

Cracking the jet market

The size of the jump surprised the airplane builders. They had been afraid that the peak of the postwar re-equipment of the airlines had been passed. Last year the total commercial sales of the leading airplane builders still in the transport market—Douglas, Lockheed, and Convair (a division of General Dynamics)—were \$283 million (exclusive of the sales of small private and executive aircraft). For 1955 the forecast for the commercial-transport business is about \$370 million, and until recently it was gloomily assumed that there would be a steady fall-off thereafter. But the continuing boom in air travel has persuaded the plane builders that the commercial market is actually stronger than had been anticipated. Moreover, the sharpening competition among the airlines for traffic, especially on the red-carpet non-stop continental runs, is certain to bring them into the market sooner than expected for turboprop and jet equipment.

Douglas, in fact, decided on its own to hurry up the commercial jet market. Without waiting for a firm order from any of the airlines, it has announced its plan to build the DC-8 jet transport. This 80 to 125-passenger machine, to cost an estimated \$4,500,000 and to be ready in 1959, will raise the cruising speeds on the transcontinental routes to 550 miles per hour. Although there were no takers as this article went to press, Douglas was confident that before long it would be doing business with the major domestic airlines.



Dr. Simon Ramo, left, and his partner, Dr. Dean Wooldridge, exemplify the technical revolution agitating the airframe industry. Physicists both, they are the nation's foremost missile experts. In making them systems managers of its super-priority Atlas program for the intercontinental ballistic missile, the Air Force jolted the airframe industry.

Meanwhile, Lockheed has opened the turboprop market by winning (against Douglas) American Airlines' design competition for such a craft to replace the piston-powered, forty-passenger Convair-Liner "340," which today practically monopolizes the short-haul scheduled traffic. The Lockheed Electra will seat sixty-four passengers, cruise at 400 miles per hour plus. American Airlines has ordered thirty-five, costing \$65 million, for delivery in 1958. And between now and the advent of those models, Douglas and Lockheed will square off for the last big play of the piston-powered competition—the battle for the transoceanic trade between Douglas' DC-7C (the Seven Seas) and Lockheed's variant of the Super Constellation. The first is to go into service late next year, the latter about mid-1957.

Compared to the military business, the industry's commercial business represents little more than the gravy on the meat. For example, in the instance of Douglas, whose total deliveries in the first quarter were running at an annual rate of \$859 million, the commercial side of the ledger accounted for only 13 per cent of all sales and 18 per cent (or \$332 million) of the backlog. In the case of Lockheed, with first-quarter sales at an annual rate of \$760 million, the proportions are as follows: commercial business, at the indicated annual rate of \$167 million, 22 per cent of gross sales, and 15.5 per cent of the backlog.

Douglas and Lockheed together have 92 per cent of the total current commercial business. Convair's commercial backlog, represented entirely by orders for its medium transport, has dwindled to \$10 million. The company withdrew from American Airlines' competition for the short-haul turboprop. It has a design for a big jet transport competitive with Douglas, for which Howard Hughes is negotiating on behalf of T.W.A. Martin has been out of the commercial market for the past two years. And though Boeing is straining to enter the play for the long-range jet-transport business, with a model based on its "707" jet tanker, the Air Force has ruled, at least for the present, that its facilities cannot be diverted from military production.

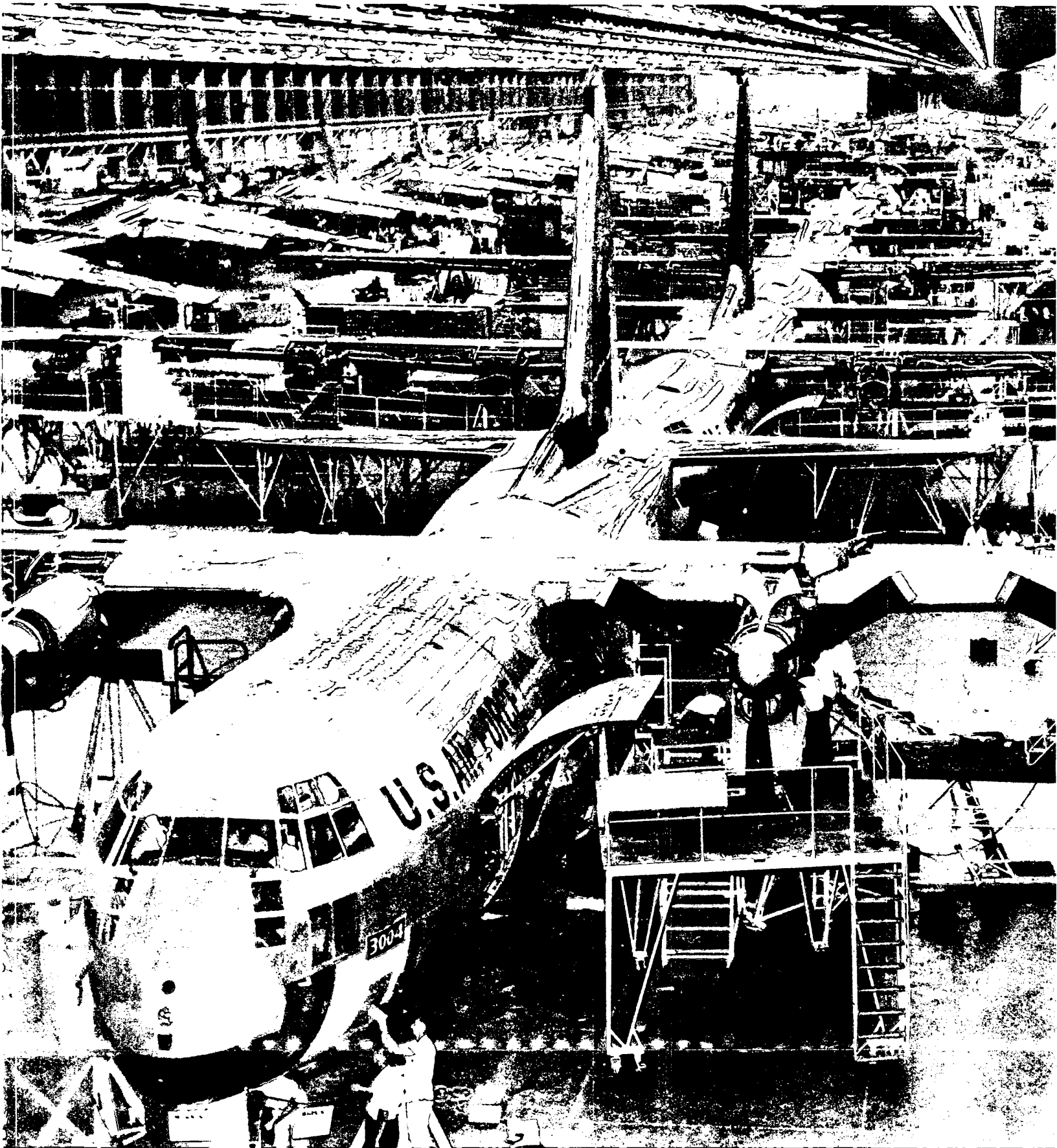
At this juncture, then, the blue-chip commercial business is concentrated, all but a fraction, in two companies—Douglas and Lockheed—although it does not follow that Boeing or Convair will allow the duopoly to continue unchallenged. And if one were to relate the aircraft industry's total 1954 commercial business to its total sales, the former would amount to only 4.6 per cent of the aggregate. Yet the \$382 million of annual business generated by that fraction is a healthy portent in an industry whose total sales in 1949 were only \$1.8 million.

The Pentagon riddle

Thus, for the first time in peacetime, the aircraft industry stands on a fairly solid economic base. Yet it is still dependent for its existence as a big industry upon national policy. The significant change in its status is that whereas before and just after World War II the controlling aim of federal-subsidy policy was to keep life flickering in a certain number of gifted producers as a hedge against war needs, national strategy today is acutely dependent upon the industry's continuing productivity and inventiveness. It has become at

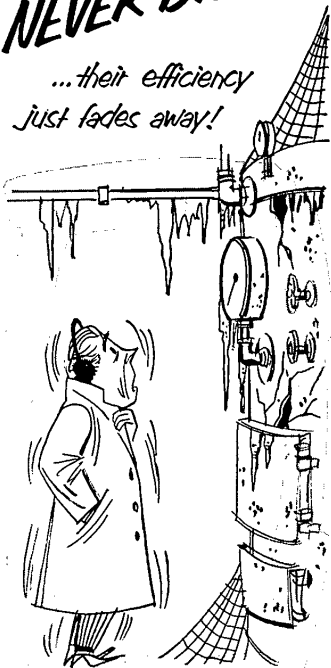
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Shown on the right is Lockheed's assembly line at Marietta, Georgia, for its C-130 military turboprop cargo carrier and transport. A commercial turboprop is soon to go into production for the airline trade. Having won American Airlines' competition, Lockheed is now in a position to dominate the future short-haul turboprop market.



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Blue Chip Yonder

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once both the stiffening element in the national military posture and also an innovator of broad social change. To that extent, it has now ceased to be a marginal and chancy activity kept alive by sporadic subsidy. Nevertheless, the planned rate of Department of Defense spending is the one reliable barometer of its general condition.

So far \$54 billion

The situation is as follows: Including an estimated appropriation of \$6.1 billion for fiscal 1956 just beginning, the three services—Air Force, Navy, and Army—have had available an aggregate of about \$53.8 billion for the purchase of aircraft and aircraft parts, since the beginning of the Korean war, only five years ago. Of this sum about \$31.3 billion has already been spent. There is left, therefore, still unexpended but in large part obligated by contracts, a balance of nearly \$22.5 billion to finance future deliveries. The federal payout for military aircraft for fiscal 1955 just ended came to \$8.2 billion. The estimate for fiscal 1956 is nearly \$7.3 billion, or 11 per cent less.

At the planned rate of expenditures, which roughly reflect deliveries to the military, the Defense Department presumably will still have on its books a year hence—that is, at the beginning of fiscal 1957—an unexpended balance of nearly \$15.2 billion for the further purchase of military aircraft. This sum is figured to represent about twenty months of production at the tempo presently scheduled for the period. In other words, without additional appropriations the Air Force's program is already financed into the spring of 1958. The Navy, with an unexpended present balance of about \$4.8 billion for aircraft, will at the same stage be financed about six months beyond—i.e., into the fall of 1958.

The buildup of the 137-wing Air Force is scheduled to be completed by spring of 1957. Until recently, Pentagon planning had proceeded on the conservative surmise that further additions to the Air Force's aircraft inventory would be on a "sustaining" rate, geared to compensate for obsolescence and operational wastage. Inevitably this policy would have meant a drastic slowdown of production—by one-third to one-half.

However, recent intelligence reports of Soviet technical progress

have shaken the confidence of the Pentagon in its estimates of what should constitute an adequate sustaining rate. The Soviet qualitative progress, even after one discounts the more sensational "scare" aspects, has been impressive in the two elements bearing most directly upon control of the air—interceptors and long-range bombers. The May decision to accelerate the output of B-52's is certain to be followed in the near future by another decision to hasten into production several models of supersonic interceptors, now in prototype development, whose appearance in the inventory would otherwise have been delayed. The combined effect would be to postpone indefinitely anything like the big cutback in appropriations that was hoped for in the fiscal 1957 budget.

Among the companies certain to benefit from the new programs are Lockheed, with its F-104 interceptor, reportedly in the Mach 2 range (twice the speed of sound); McDonnell, with its F-101, a long-range fighter; and Republic, with its F-105 fighter bomber. The Convair F-102 all-weather interceptor is already in production and the present pace is sure to be quickened.

Of two worlds

During the next five years or more the airframe producers can bank on at least one and probably two more major production sequences of the classical interceptor, of high Mach number, practically automatic in flight and action, but still monitored by a man in the cockpit. And the same promises to hold true of the long-range bomber, of which at least one supersonic model (Convair's B-58, the Hustler) is in intense development.

However, during this twilight interval, numerous missile programs, competitive with the airplane in practically all of its military uses, will be gathering momentum. In fiscal 1955 combined expenditures in this category by the three military services were over \$518 million, equal to about 6 per cent of the federal outlay for aircraft. For fiscal 1956 estimated outlay will be about \$675 million, equal to 9 per cent of scheduled federal spending for aircraft; and for fiscal 1957 tentative schedules call for about \$1 billion.

Missiles essentially are automatic air weapons and therefore present a logical projection of the airframe market. But the airframe manufacturer's technical ability to dominate the expanding margin is in doubt.

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Managerial revolution

The whole managerial approach to weapons development is being radically changed. Because the effective solution of specific tactical situations requires simultaneous advances in new forms of propulsion, electronic guidance, and control as well as aerodynamics, the new trend is to nominate as weapons-system manager either a company or research group and make it generally responsible for developing the weapon in all of its various components in logical sequence. And it is precisely because most of the problem areas are the specialties of the avionics industry—a generic term applied to electronic, electrical, and optical companies making equipment for airborne weapons—that the airframe industry is worrying about its franchise in the air. At stake is the question of which will end up as weapons-system managers—i.e., project managers—of the valuable programs as they materialize.

Twenty-four major missile systems, ranging from relatively simple tactical items to intercontinental nuclear-armed projectiles, are under development. The airframe industry has over-all responsibility for nine of these; the electrical and/or electronics industry for seven; the automotive and rubber industries for four. Four other systems are presently assigned to government or university research groups. Only two programs have produced successful missiles—the Army's ground-to-air Nike, for close-in anti-aircraft defense, and the Air Force's air-to-air Falcon, for interceptor defense. Both systems were designed and managed by electronic organizations—the first by Bell Telephone Laboratories under Western Electric Co., the prime contractor, the other by Hughes Aircraft. The other missile systems are all lagging from one to five years behind schedule. And the recent crisis in the Atlas program points up

the acute difficulties besetting the airframe companies in attempting to master the province of the analytical physicist.

Atlas is the code name for a Manhattan District type of research effort to develop for the Air Force a reliable intercontinental ballistic missile, known in the trade as the ICBM. Although still in the rudimentary stage, with the prototype some years away, the project is moving along at a \$100-million-a-year pace. It is altogether possible that five to seven years hence the national investment in this one weapon will approach \$6 billion.

The evolution of Atlas is of special concern to the airframe industry for two reasons; first, because the project threatens to intersect the role of the strategic airplane and, second, because the missile itself is potentially so important an item in the future air-weapons catalogue. Convair's predecessor com-

pany, Consolidated Vultee, began experimenting with the missile in 1946. The company kept the project alive after the Air Force lost interest. Then, after Soviet progress with a comparable weapon finally caused the American enterprise to be raised, during the Korean buildup, to the status of a major research undertaking, Convair was given systems responsibility for organizing a team of subcontractors and suppliers to bring the ICBM into being.

Trouble developed; the program lagged. Last winter the Air Force took over the direction of the entire project on a "crash" basis. It engaged, as its technical advisers, two physicists, Drs. Dean Wooldridge and Simon Ramo, who last year set up their own electronic firm, Ramo-Wooldridge Corp., in partnership with Thompson Products. This is the same pair whose brilliant development of the Falcon missile and various fire-control systems for

Hughes (see FORTUNE, February, 1954, "The Blowup at Hughes Aircraft") established them as the nation's top experts on missiles and military electronics. Although Convair is to build the weapon casing and do the final assembly, it no longer has system management of the missile; that role has passed to Ramo and Wooldridge.

The move was a bitter demonstration of the criticism by military-research experts and physicists that the industry had been slow to equip itself in the new technologies. Of the major airframe companies, only North American so far has made a systematic effort to prepare a strong position. It set up an aerophysics laboratory in 1946; it is developing its own rocket engine, as well as its own fire-control and navigation systems. "Our business," says Chairman James H. ("Dutch") Kindelberger, "is the development and production of all air weapons—including airplanes." North American is working toward a fully integrated design and manufacturing position in the missile and electronic fields with a view of negotiating the technical transition as it evolves.

As befits an airframe producer securely established in lush pastures, Douglas has so far taken a conservative line. It is satisfied, for example, to be a subcontractor to Western Electric in the Army's Nike program, fabricating the vehicle and launching device. Douglas is involved in half a dozen different missile programs, in several of which it is the prime contractor, but its policy, expressed by Engineering Vice President Raymond, is "not to try to integrate these other operations under our own roof but to work with outside specialists."

Gross's choice

Lockheed's strategy, as laid down by President Robert E. Gross, has been more opportunistic—"either to work our way gradually into electronics or buy into a going company in that field." Having failed last year in an effort to buy Hughes Aircraft, Gross undertook to recruit a stable of physicists for his own missile laboratory—a move temporarily frustrated by the Air Force's ban on West Coast expansion. However, it is altogether unlikely that Lockheed's maneuverings for a strong electronic position have ended. On the contrary, the struggle between the airframe manufacturers and the avionics industry for control of future air weapons systems is certain to introduce the most intensively competitive situation the former have so far experienced. END

Pigeon Hole Parking

Two brothers, Vaughn and Leo Sanders, of Spokane, Washington, have come up with a new attack upon the parking problem. Their system, Pigeon Hole Parking, consists of two lines of steel or concrete tiers, which may be up to ten floors high. Each tier has a line of car stalls (see picture). One or more (sometimes as many as four) elevators run on tracks between the tiers. A car is parked on the elevator, which automatically lifts and slides it into a stall. Cars can be returned to street level in forty-four seconds. In the ... twenty-seven of the ... have been built throughout the U.S., and two in Venezuela. Nine are under construction in the U.S., Canada, and Venezuela.

The Sanders brothers came to Spokane from northern Washington in 1932, looking for work. Vaughn became a timber broker, and in 1944 he bought a small sawmill in Northport, near the Canadian border. Leo worked as a truck and bus driver and after the war bought a service station in Northport. Their frequent trips to Spokane made them aware of the acute parking problem, and Leo insisted the solution lay in perching cars in roosts. They built two experimental models and after demonstrating them with great success in downtown Spokane for the Better Parking Association, Vaughn set out to find financing and a manufacturer. He picked the Peters Co., a Portland, Oregon, hydraulic-engineering firm,

to make the elevators. The Sanderses undertook to build the rest of the units themselves.

The first Pigeon Hole Parking lot was built in Spokane in late 1950. This 142-car unit, four tiers high, served by one lift, cost \$36,400. (The largest to date is a 432-car installation under construction in Spokane.) In 1951 the Sanderses formed Pigeon Hole Parking, Inc., capitalized at \$2 million. Since then a lot of stock has been sold to the public but the Sanderses retain control; Vaughn is president, Leo vice president.

Today, the price of equipping a lot with Pigeon Hole Parking varies from \$900 to over \$1,000 per stall, depending on type of construction (i.e., steel or concrete, open or covered). Pigeon Hole sells franchises to companies, allowing them the right to buy the equipment. Franchise holders also pay a royalty fee per stall, sometimes spreading payments over twenty years.

The more new cars, the better business will be for Pigeon Hole. Last year the enterprise grossed \$1,680,000, netted \$301,180; this month the Sanderses will pay out \$70,000 in dividends.

