Political Culture, Public Policy, and the Development of the American Aircraft Industry to 1945

Jacob Vander Meulen
International Fellow, National Air and Space Museum
Smithsonian Institution

In mid-1942, a pair of Wall Street financial analysts submitted a report on the aircraft industry to the Navy's Assistant Secretary for Air. Despite the explosive market for warplanes, these analysts concluded that "no businessman in his right mind would make a career of aircraft manufacture." The industry's basic problem, in their view, was its reliance on military work which made it too vulnerable to the political process. To them, a healthy, stable aircraft industry in the United States was unattainable because it was "political anathema."[1]

Connecting the aircraft industry's fate to the political process would hardly surprise most obervers today. But the suggestion that the aircraft industry could be a victim of the political process might be unexpected. Such was the conclusion of the Navy analysts, and other experts on the industry, who had watched it suffer through over-capacity, financial weakness, and almost continuous unprofitability during the interwar years. They blamed the way Congress used its regulatory powers over the industry, which came to it as a virtual monopoly buyer and as the maker of military contracting law.

The American aircraft industry's early experiences are a story of entrepreneurship and rapid technological change in a new industry; but they are mainly about the politics of business-government and state-society relations. They offer special insights into how political culture and ideology can shape industry structure, business strategy, technology, and the formation of state agencies.

The trouble with aircraft from the businessman's standpoint was that it figured too prominently in debates over what national political economy ought to look like. The industry was uniquely susceptible to these battles because Congress, through the Army and Navy, paid for 70 per cent of its

[1]"An Investigation of the Financial Condition and Recent Earnings of Aircraft Contractors," for Artemus Gates, May 14, 1942, box 9, entry 131, Records of the Assistant Secretary of the Navy for Air, Record Group 72, National Archives.

BUSINESS AND ECONOMIC HISTORY, Second Series, Volume Twenty-one, 1992.
 ISSN 0849-6825.

output and decided how that output would be bought.[2] Adding to those problems for the industry were the powerful ways aviation resonated within popular culture, insuring that it would absorb special public scrutiny. Aviation had a freshness and technical dynamism and seemed to hold out new prospects for heroic effort in invention, exploration, and combat. At a time when such prospects seemed so rare in an increasingly urbanized, bureaucratized America, aviation struck many as a culturally redemptive force, offering new avenues for social mobility and individual expression [7].

The aircraft industry was tiny but high-profile; it was new and glamorous and struck most everyone as "the industry of the future." Congressmen wanted to direct this industry toward a future of "democratic technology" and free enterprise, a future in which the power of big business and big government was contained. They shaped the industry into an institutional preserve for the anti-trust, anti-state ethic--a bastion for old populist values of economic individualism, equal access, and price competition. They did so despite deep opposition to their policies among airpower experts and leading aircraft manufacturers.

In no sense did the structure of this early high-technology industry resemble what most experts and manufacturers thought was its "natural drift" [4]. To them an integrated cartel was inevitable. They pointed to rising curves in research and development costs and complexity, the dominance of the market by a single military client, and the patent rights that would accrue to a small group of leading firms. These firms, it was thought, would manage a closed system of private airpower arsenals with multi-year funding, advanced research and development teams, and stable groups of skilled workers. They would specialize in one or two of the many types of aircraft needed and share technical innovations with one another. The rapid development of aeronautics and a sophisticated sense of its military possibilities would result from close, active links between firms and officers in Army and Navy aviation.[3]

Indeed to some, such as Herbert Hoover, it seemed that aircraft--by its nature a form of state capitalism--was a model for the "associative state." But as Hoover knew, this depended on Congress' abdication to experts of its spending and oversight powers. It would also have to give up on an ideal of how capitalism should and should not be organized that was quite different

---

[2]The aircraft industry was a military industry. The 70 per cent figure includes interwar Army and Navy purchases of airframes and aircraft engines, parts and accessories measured in dollar value. It does not include military exports which the Department of Commerce listed under commercial sales. Transport, sport and general aviation represented a small fraction of the industry's total business and an even smaller share of the leading firms' business. See the tables in [6, pp. 57, 186].

[3]"An Outline with Reference to the Procurement of Aircraft for the United States Government which Will Reduce Price, Speed Up Development, Guarantee a Constant Supply, and Sustain the Creative Elements of the Industry," May 16, 1924, microfilm reel 5.68.1, Records of the Aeronatical Chamber of Commerce of America. Copies of this aircraft trade association's records are available in the Library of the National Air and Space Museum, Washington, D.C.

from the associationalist vision of political economy. Populist agrarians on Capitol Hill had no such intention. They said "no" to the industry's "natural drift" and imposed their own version of state capitalism, one more attuned to an earlier era of republican proprietary capitalism. Through the interwar years, aviation industries were lightning rods for populist resentments. Rural Democrats upholding the Bryanite faith and the New Freedom, western Republican Insurgents in the Robert M. LaFollette mold, populist Senators centered loosely around William E. Borah of Idaho--even Homer T. Bone, the Senator from Washington State--these lawmakers made personal duties of monitoring price-competitive, open bidding in aircraft procurement and making sure that military-industrial relations were as distant and as adversarial as possible. They wanted to thwart an "Aircraft Trust" which supposedly emanated from "Wall and Pine" and was in league with military men who would together plunder the taxpayer and foment war.[4]

Their natural suspicions were fanned by the wastage of nearly half a billion 1918 dollars during the great aircraft production fiasco of World War I. They saw this as the result of a corporate conspiracy, the work of an "Aircraft Trust," rather than a failed attempt by auto-industry experts to mass produce fabric and wood bi-planes according to Henry Ford's new methods.

Such populists, aided by the press, set the terms of debate on the government's approach to aircraft. But the full house legislators who voted with them were motivated by a deeper, genuinely felt unease about their changing world, the broad directions of their society and polity, the threats to individualist values. Congress' control over aircraft offered a unique way to make a statement of protest and resistance against change.

Congressmen enforced price-competition in military aircraft, despite evidence of no aircraft trust, of the industry's hardships, and of the delays imposed on military aeronautics and the nation's airpower. They voted down associationalist procurement reform in the Air Corps Act of 1926 and prevented the National Recovery Administration from implementing it during the early New Deal in a "code of fair competition." These were two key victories for congressional authority and for the old anti-trust current with long-lasting consequences for the aircraft industry and for American military political economy.

Congress' approach was prompted solely by ideological concerns and desires to preserve congressional oversight of military supply; no organized interest lobbied for price-competitive aircraft. Manufacturers and the executive branch from the White House down to military flyers were virtually united through the interwar years in their opposition to price-competitive aircraft procurement.

But Congress rejected their views, acting independently and effectively. It controlled market size, contracting, as well as the industry's "intellectual property." It simply refused to recognize property rights to aircraft designs bought by the military, even though these were privately financed. It thus

---

[4]For a popular critique of the imaginary "Aircraft Trust" see [3, pp. 119-67]. On the congressional populists see [2, 5].

cancelled the only real leverage aircraft manufacturers had over their market and could enforce a trajectory for the industry's development wholly different from the one foreseen by Hooverian business progressives.

Boeing Airplane, for example, did not own the famous B-17 Flying Fortress design. It was always public property, even though Boeing had designed it in Seattle on its own initiative and at great cost. Advance payments were barred by law. Only winning prototypes were paid for by the military at prices set before construction began and before the inevitable cost overruns. These were 70 per cent for the Flying Fortress. The Army Air Corps was obliged to seek the low bid on B-17 production among competitors in low-wage areas, such as Los Angeles where Douglas Aircraft operated or in Baltimore where the Glenn L. Martin Company was located. Boeing got the work but lost money through the 1930s and curtailed its R & D, whose costs it could not amortize. The company's 1935 breakthrough in the complex technology of heavy aerial bombardment was essentially frozen until its vigorous efforts to develop the B-29 beginning in 1941. Its persistent efforts to build inter-firm linkages to contain competition, limit new entry, share technical developments, and stabilize labor relations were continually thwarted. Only a loan underwritten by the Reconstruction Finance Corporation kept Boeing afloat in the late 1930's.[5]

Various aspects of the aircraft business sustained and made possible Congress' restrictive approach. They explain why there was a significant U.S. aircraft industry, despite Congress's abuse. They explain why American aircraft firms may have produced generally inferior combat planes--fighter and naval attack craft in particular--but was still capable of some striking successes, especially in air-cooled engines like the Pratt & Whitney and Curtiss-Wright products, and in commercial craft like the Douglas Commercial-3 and the spectacular Lockheed Electra.

Most important in the early twenties were the personal commitments to this new technology among young and often wealthy designer-entrepreneurs like William E. Boeing, Glenn Martin, Clement M. Keys, who built the Curtiss-Wright Corporation, and Henry Ford, who lost millions on early metal commercial designs. These men, and others, such as Donald Douglas, Chance Vought, Igor Sikorsky, Leroy Grumman, Clyde Cessna and Reuben Fleet, who established Consolidated Aircraft, had enthusiasms for aircraft that defied rational business calculation and prompted them to absorb regular losses and to continue playing by Congress' restrictive rules. The craft handwork and small batch orders that defined aircraft production during the 1920s and early

---

[5]The RFC also supported Martin and Lockheed Aircraft at key moments. Congress's punitive measures against the industry were thus offset to some degree by another branch of the state. Other state agencies aided the industry, such as the National Advisory Committee on Aeronautics, whose main contribution was testing the aerodynamics of the manufacturers' designs; the Bureau of Foreign and Domestic Commerce of the Commerce Department, which helped find export markets; the Export-Import Bank which financed many export deals; the Post Office which subsidized air transport; and the U.S. Army and Federal Bureau of Investigation which helped manufacturers, especially in Southern California, defeat a movement for effective labor unions in aircraft.

1930s meant low fixed-cost requirements. Industry participation was within the reach of any newcomer with basic expertise and access to some capital to invest in prototypes. The costs of prototypes were rising quickly but were still in the $250,000 range during the 30s. And the range of different aircraft types, along with rapid rates of obsolesence, meant many windows of opportunity for newcomers as well.

Helping significantly to underwrite the enthusiasms of aircraft entrepreneurs and Congress's regulatory framework was the aviation securities bubble of 1927-29, which fed on the aviation frenzy sparked by Charles Lindbergh's epochal cross-Atlantic flight and bloated the treasuries of aircraft firms with millions in new capital. This cash, generated overwhelmingly by no-par value common stock, helped firms to cover losses into the mid-1930s, to finance the technical leap from stick-and-wire biplanes to high speed, metal monoplanes, and to design such legendary craft as the DC-3 and the B-17.

Exports helped this beleaguered industry stay viable too. Sales of obsolescent military craft mainly to Third World countries provided three fourths of the industry's R & D and expansion capital during the 1930s. Also critical was an unorganized work force which allowed firms to pay substantially inferior wages. This was key because of the industry's very high wage component, which with white-collar salaries, represented about 65 per cent of value added by manufacture. Wages for skilled aircraft workers, among the nation's best manufacturing craftsmen, were about 30 per cent below rates for the unskilled in the auto industry. Ironically, workers paid much of the price for contracting rules arranged by populist lawmakers on behalf of the "little man." In effect, Congress exploited aircraft workers who often shared their employers commitments and enthusiasms for a life in aircraft. Until the late 1930s, building planes was for most workers a diverse and stimulating job, a chance to use skills that were needed less and less on the nation's assembly lines and to develop new ones that were unique to aircraft production.

But if a fairly competent industry was underwritten in these ways, Congress' regulation patterned its structural and technical development and its geographical location. Price competition meant an over-built industry whose losses subsidized the nation's airforces and its early air transport system. It meant intense rivalry and secrecy among firms, endless delays, and dispersed, duplicated, and wasted effort.

Losses and an unpredictably politicized market meant apathy toward aircraft in the investment community. Key firms remained owner-operated into the war years. Much like their counterparts in the period's "sick" industries, aircraft manufacturers spurned collective activity and trade associations. They cut prices and sought to reduce their high variable costs, mainly workers' wages and engineers' salaries. They bitterly fought organized labor and opposed independent collective bargaining with their specialized workers. Others, such as Consolidated Aircraft of Buffalo, and the General Motors-controlled North American Aviation of Baltimore, moved their operations to low-wage, open-shop areas in Southern California.

Through the interwar years the industry developed at odds with the complex nature of its product and the dynamism of its technology. The only hope for profit was in production work where R & D might be amortized.

Whatever the technical possibilities or the personal inclinations for advance among designers, the managerial imperatives under Congress' rules were toward minimizing R & D costs, designing craft that could be easily reproduced, and reorganizing the shop floor to resemble unskilled auto assembly.

But it was only the larger batch-orders from Washington and abroad after 1936 that allowed firms to begin acting effectively on these imperatives. Then, design and production costs were aggressively shaved. Shop floors were increasingly mechanized and rationalized as the industry spedup metal-working tasks. Jobs were broken down so they could be filled by the unskilled. The building began of a national supply and sub-contracting network for innumerable parts and accessories and new steps in cost, stock, and transaction control were taken.

Firms began building an infrastructure for mass-produced warplanes during the second half of the 1930s. This process, however, was not market led. Visions of large-scale airpower did not congeal into military doctrine and a steady mass market until 1940-41. It was Congress' business rules, scorned by experts since the First World War, that led to a mass-production aircraft industry before the fact. Steady market growth sustained the process toward a mass-output posture, but the process itself was pushed by the cost-minimizing pressures of procurement law. Big wartime orders only supplemented the industry's dynamics.

Congress' rules positioned the industry ideally for the doctrine of overwhelming airpower. As late as 1940, it was still carrying some 50 per cent over-capacity and featured wide swings in employment. Most aircraft manufacturers would have agreed with the late 1940 observation of Lockheed's president: "there are very few things in this industry that large orders would not cure."[6]

During the war, there were bottlenecks and confusions and some firms were much less successful than others, but the industry's overall achievement was fantastic. Putting aside ongoing debates on the military value and morality of large-scale airpower, the aircraft industry's performance must be judged a great success for the nation. Building on their pre-war initiatives, firms expanded up to twenty-fold in size making up the nation's largest industry by 1943. Total direct employment reached 2.5 million. Huge branch plants and modification centers were erected across the nation, and quickly put into operation. Nearly 300,000 aircraft of many types were built and maintained by a stream of spare parts. Sophisticated control systems were put in place to monitor this kaleidoscope of socio-economic activity and to vastly improve efficiency. Yet this national system for mass-produced airpower proved flexible enough for technical improvements to current models and for the deployment of such outstanding new designs as the Republic P-47 Thunderbolt, the North American P-51 Mustang, the Vought F4-U Corsair, the Douglas A-26 Invader, and the Boeing B-29 Superfortress.

---

[6]Robert E. Gross, quoted in [1].

Photo by Patrice Gilbert

This B17-G was built in 1944 at the new Douglas-Long Beach plant which was part of the "B.V.D." consortium. The Air Corps encouraged a highly effective production agreement among Boeing, Douglas and Vega (a Lockheed subsidiary) that turned out some 12,500 Flying Fortresses. Most of these flew in the European Theatre of Operations. The engines are R-1820 air-cooled 1,200 horsepower radials, probably built at Paterson, N.J. by Wright Aeronautical, a Curtiss-Wright firm. This aircraft, now very rare, was recently photographed at Geneseo, N.Y. It was modified to appear as an earlier B-17F for the movie remake *Memphis Belle*.

World War II was mostly a stellar performance by aircraft firms. They were aided by the suspension of old procurement laws, by virtually unlimited public funds, and by the imagination of private managers, military contracting officers, and civilian bureaucrats in federal war agencies. Equally important, was the depth of the nation's material and labor resources, the efforts especially of millions of migrant men and women who filled the plants day-by-day and conservatively endured long hours, relatively low wages, and poor representation.

All these efforts had happy results in the defeat of the Axis. They also had happy results for traditional public policy-making in America. Massive military spending, mainly for labor-intense airpower, meant a way out of one of the basic dilemmas of the Great Depression: the need for ongoing state intervention to spur demand and absorb the unemployed; yet the state's weaknesses in a political culture of voluntarism, anti-bureaucracy, congressional rights, and business prerogative. The deadlock of public policy was perhaps never more pronounced or frustrating than in the late 1930s as the economy dipped deeply, as the conservative 76th Congress was sworn in, and as business opinion turned sharply against the New Deal.

The fact that the pre-war industrial base for aircraft was ready and able--poised for mass production--meant that the industry had only to be greatly expanded, not created or restructured. Few institutional initiatives or redistributions of power that would aggravate Congress and tradition were needed outside the War and Navy Departments--two of the oldest and most conservative federal agencies. The new contracting and investment authority of the War and Navy Departments could be relied on to build on the aircraft industry and to plan successfully a national system of airpower supply, while sidelining the more comprehensively reformist and interventionist policies of New Deal liberals and industrial unionists.

The aircraft program was an unprecedented effort in industry planning but of a highly restrained type. The military's control over contracting and investment involved unprecedented departures in business-government relations. But its use of these powers on such a massive scale was not the outcome of consensual planning among the various social groups directly involved. With Congress' blessing, organized labor was wholly excluded from the process and bureaucrats in civilian war agencies such as the Defense Plant Corporation, the War Production Board, and the War Manpower Commission, essentially followed and serviced the procurement leads of the Army Air Force and Navy Bureau of Aeronautics.

Nor was input into the planning process sought by the military from the industry as a whole. The military worked on a firm-by-firm basis instead. Its reach into the affairs of aircraft firms went no further than contracting and investment and occasional emergency trouble-shooting. Sub-contracting, material supply, hiring, labor relations, scheduling, accounting, even R & D, were essentially up to prime contractors to arrange and be responsible for.

Such was the overall thrust of the air program that even stubborn, high-profile cases of delay and incompetence, such as the Curtiss-Wright Corporation and Ford Willow Run, could be tolerated by the military and

dealt with at arm's length and in ad hoc ways. Firms were also left to worry about their separate positions in whatever the market or politics of the post-war period might be--a point that made our 1942 Navy analysts view aircraft businessmen as not in their right minds, but to praise them nevertheless for their contributions to the nation.

The wartime military-industrial complex for aircraft was a curious mix of a new statism and the status quo. It represented a big step forward in state intervention but also a big half-step backward. Such minimalist policy options were available because of the industry's pre-war dynamics and the way they meshed with World War II airpower doctrine. Congress regulated the interwar aircraft industry in accord with populist ideological principles enforcing traditional competition and equal access. It rejected an associationalist aircraft industry, preventing the development of political strength by either aircraft manufacturers or their employees which might have imposed upon Pentagon operations during the war and afterward.

From this wartime admixture of the old and the new followed decades of military interventions in the nation's social and economic life. The scale of these interventions had widespread effects, including the nurturing of the aerospace sector as well as the transformation of whole regional economies. In terms of national public policy-making, military supply continued to help keep viable a political culture of the limited state, anti-planning, and congressional oversight.

References

1. "How Many Planes When?" *Fortune*, (August 1940) 49
2. Ronald L. Feinman, *Twilight of Progressivism: The Western Republican Senators and the New Deal* (Baltimore, 1981)
3. James V. Martin, "Aircraft Conspiracy," *Liberation*, (March 1924).
4. C.A. Pearce, "Aircraft Manufacturing Industry," April 4, 1934, Division of Research and Planning, National Recovery Administration, Box 6045, Records of the NRA, Record Group 9, National Archives.
5. Ray Tucker, *Sons of the Wild Jackass* (Boston, 1932)
6. J. Vander Meulen, *The Politics of Aircraft* (Lawrence, KS, 1991) 57,186.
7. J.W. Ward, "The Meaning of Lindbergh's Flight, *American Quarterly*, 10 (Spring 1958) 3-16.