What remains of the aerospace era? The challenges of a little-known industrial heritage
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Introduction

At the start of the Cold War, the United States and France developed military-industrial complexes comprised of offices, laboratories, factories, and worker housing projects. These facilities are still widely used in France, more rarely in the United States where they have been assigned to new activities when they have not been destroyed. Today, while the military mobilization culture that saw them be born has given way to market concerns, linked with a reduction in defense budgets, these buildings have lost some of their meaning. How to give them meaning again? To what extent could the history of science and architecture help to preserve them in a way that is relevant to contemporary societies? The study of two regions in which this aerospace heritage is particularly developed – California and Aquitaine – allows us to consider a few avenues while completing a fairly meager historiography, especially on the French side¹.

“Aerospace Modernism” in Southern California

In the 1960s the Cold War moved to the suburbs of Southern California, into new communities built around and largely dependent upon high-tech defense industries. Deliberately located at a distance from Los Angeles (ground zero in the thermonuclear age), these white collar suburbs offered a striking contrast to the blue collar suburbs that had grown up around older factories and defense plants built closer to the urban core during World War II. Orange County, to the south of Los Angeles, still largely citrus groves and agricultural land in the 1950s, became the largest concentrations of the military-industrial complex in the US, with more workers in guided missiles, space vehicles, and defense electronics than Los Angeles County and all its legacy aircraft factories.
Aerospace giants moved their space age divisions to suburban campuses whose names—Autonetics, Nortronics, Aeronutronic—and architecture clearly differentiated them from the old aircraft assembly divisions back in the city. “With its broad lawns and strands of towering trees, the sprawling Hughes Aircraft aerospace complex looks more like a college campus than an industrial outpost of the Cold War,” one journalist observed of its new Fullerton facility. Architect William Pereira designed Ford Aeronutronic’s division in the beachside resort of Newport Beach with a glass-enclosed lobby that seemed to be floating on water, a “futuristic architectural gem set amidst lawns and newly planted trees.” For its Space Systems Center Douglas Aircraft chose Huntington Beach. The architectural firm of Daniel Mann Johnson and Mendenhall (DMJM) designed a campus befitting the scale and daring of a moon mission. One local reporter said he could sense “its industrial beauty and feel its dedication to winning the space race.” Its one-of-a-kind buildings, including a space simulation laboratory that could test full-size spacecraft at temperatures and pressures equivalent to orbiting five-hundred miles above the earth, and a semi-circular structures laboratory for torture testing full-sized rocket stages at temperatures and dynamic loads encountered during lift off, gave the place a futuristic feel. Space Systems Center and its 10,000 scientists and engineers transformed Huntington Beach from a “gritty neighborhood built by big oil to a seaside community surrounding a country club” popularly known as ‘Surf City'.
The suburban neighborhoods built up around the plant featured single-family homes with the same kind of mid-century modernist aesthetic as the Space Systems Center lobby. Following the lead of its competitors, North American Aviation relocated its Autonetics division to Anaheim, to a campus designed by A.C. Martin, Jr., who had previously done impressive headquarters for TRW, the Aerospace Corporation, and other Southern California aerospace companies. Instead of conventional factory layout, his electronics manufacturing building included touches like tropical gardens in the lobbies, aluminum solar louvers on the executive floors, and lava rock walls and glass entries screened with artful tile and metal designs. Autonetics built a 20-acre recreation center for its employees and their families with a three-section swimming pool, exercise rooms, a steam bath, baseball fields, tennis courts, and a pitch and putt golf course that could have passed for a private country club. When completed in the mid-1960s, Autonetics was the largest single military electronics facility in the US, with 3.3 million square feet of floor space and 36,000 workers. After Autonetics filled in its entire 265-acre Anaheim site, with trailers to handle the overflow, it purchased 1,320 acres in Laguna Niguel, in southern Orange County, about equidistant from Los Angeles and San Diego. Victor Gruen, an Austrian émigré who had literally written the book on shopping centers and malls, did the master plan for Laguna Niguel, one of Southern California’s earliest and largest master planned communities. To design its $20 million facility, Autonetics hired William Pereira, an obvious choice given his
distinctive style of aerospace modernism. Taking a cue from the Metabolists and other avant-garde architectural theorists of the 1960s, Pereira conceived the project as a single megastructure climbing up the hillside as seven-tiered textured concrete ziggurat, in neo-Babylonian brutalism.

Southern California lost 150,000 aerospace jobs from 1988 to 1996, and another 130,000 in the following decade. “The Crash of Blue Sky California” hit suburbs like Anaheim and Fullerton hard as household names like Douglas, North American Aviation and Northrop disappeared in a wave of mergers, and with them entire aerospace complexes. In 1995 Hughes closed down its modern-day company town in Fullerton that for four decades had delivered on the promise of the American Dream for its employees. Boeing bought the division in 1996 then closed it a decade later and moved the last 3,700 workers to other plants. All that remains of Autonetics in Anaheim is an enormous monument to aerospace workers erected by Boeing in 2009. Ford demolished the Aeronutronic campus and redeveloped the property for 500 single-family luxury homes. Rockwell International bought the Laguna Nigel ziggurat but never occupied it. When the Air Force cancelled a major defense contract Rockwell traded the building to the federal government, which turned it into office space. More valuable for residential development than as a single building, it too faces demolition, though Preserve
Orange County has been seeking cost-effective strategies for adaptive reuse. These places are the living legacies of a war with few other monuments, even if the contributions of their forgotten cold warriors have never been fully acknowledged.

The ballistic “Thirty Glorious years” in Aquitaine

Today, the Aquitaine region, in the south-west of France, has leaders in the aerospace industry such as ArianeGroup, Dassault, Safran, Thales, the French Directorate General of Armaments, heirs to companies and public institutions established in the 1960s.

The land-use planning in the service of “la Grandeur”

At the end of the 1950s, according to General de Gaulle, the reconstruction of France’s “Grandeur” requires the development of a French deterrent force, independent of the American ally. As part of this ambition, a dozen of facilities are created in Aquitaine, between 1959 and 1965, making it possible to develop, test, and study the propulsion stages of strategic surface to surface and sea-ground ballistic missiles, and of the launcher of the first French satellite, Asterix, put into orbit in 1965.

The choice of Aquitaine is the result of a decentralization process planned by the State, highly claimed by Jacques Chaban-Delmas (1915-2000), mayor of Bordeaux, deputy of Gironde, president of the French national Assembly, and moreover a strongly supportive of the nuclear power. Arguing of an industrial underdevelopment in the south-west of France – it is the north-east which indeed benefited the most from the industrial revolution – he obtains in particular in 1959 that the Poudrerie Nationale de Saint-Médard-en-Jalles (PNSM) manufactures solid propellants to propel French ballistic missiles. Therefore, it becomes relevant to group together around the Poudrerie the companies involved in the development of ballistic devices. To this “industrial district”, are added the geographical advantages of Aquitaine. The region has a long seafront that allows ballistic test launches to be carried out towards the Atlantic without risk. This is what decided the French minister for armed forces, Pierre Messmer (1916-2007), to set up there in 1962 the “Landes Test Center” (Centre d’essais des Landes) to continue the studies conducted until then in Algeria, following the Evian agreements.

In total, in six years, 19000 hectares have been devoted to aerospace activities in the Gironde and the Landes, and nearly 5000 people worked there in 1965. Within the urban area of Bordeaux, between 1960 and 1980, a half of the jobs created in decentralized factories were related to aerospace sector.
La localisation des principaux établissements collaborant au sein du complexe balistique bordelais dans les années 1960.

(figure 5)

A French version of the aerospace modernism

These new activities contribute to enrich the Aquitaine landscape with new industrial architecture and housing. In industrial sites, architects and engineers create long, sleek, concrete buildings that are largely glazed. Each has a function: offices, laboratories or social services, and they are arranged around green spaces or pools reflecting the facades. Inside, a
well-kept design is also developed. For example, the offices of National Society for the Study and Construction of Aircraft Engines (Sneccma) in Blanquefort created by the Chief Architect of Civil Buildings and National Palaces (BCPN), Jean Fayeton (1908-1968), have Pyrenean marble stairs, air conditioning, and removable partitions that allow you to adjust the size of the spaces. On the contrary, technical buildings embody the need for secrecy and security to confine the large devices imposed by the Big Science. Industrial halls resemble the long big boxes invented during World War II, some reaching up to twenty meters high in order to integrate elements on a missile in an upright position. In the pyrotechnic zone, the materials are adapted to the risks of explosion, either thanks to a light metallic siding which can be blown by an explosion, or thanks to thick concrete walls to stop a deflagration.

(figure 6)

Finally, with regard to housing, here again, functionality and rationality dominate. To accommodate the 3000 employees of the Landes Test Center, in particular the repatriates from Algeria, the State wishes to densify several existing villages nearby, mainly Biscarrosse. The Aquitaine Agency of André Grésy (1925-2018) and Jean-Raphaël Hébrard (1927-2006), and the Parisian BCPN architects Jean Monge (1916-1991) and Philippe Canac (1928-2018), then offer large-scale housing units. This logic of “Grand Ensemble”, invented in the urgency of post-war Reconstruction, indeed remains at the time the embodiment of urban modernity. The buildings, thanks to prefabricated and standardized elements, are thus erected quickly and at a lower cost, in reinforced concrete and hollow bricks. Wood slats for the balcony railings, slate or stoneware sidings for the walls, however, brighten up the facades.
Conclusion

On both sides of the Atlantic, two versions of aerospace modernism are emerging in the southwestern United States and France. While the size of the complexes differs from one country to another, the “think factories” of the aerospace era have in common the embodiment of innovation, both in administrative and technical buildings, and in worker housing projects. These elements call for the preservation of these architectural witnesses, despite the unsuitability of certain spaces for contemporary functions. Firstly because, except on polluted sites, industrial heritage is an architectural resource, a real energy investment as the Dublin Principles\(^3\) have already postulated. Secondly and above all, interpreting these buildings in this way enables citizens to see the interactions between the scientific sphere and the social and geopolitical context, and even to initiate debates on the subject. The French historian of science Dominique Pestre thus developed the notion of a “knowledge regime” (régime de savoirs) to characterize these interactions over a given period\(^4\). He postulates that over time, several regimes have followed. In the case of the aerospace industry, the shift from arsenal logic to market logic is exemplary of the type of regime change described by Pestre. The aerospace heritage, for those still in use, should thus be an opportunity to demonstrate how institutions have met the challenges of moving from one knowledge regime to another.

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\(^3\) See Dublin Principles.
\(^4\) See Pestre (2014).
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FIGURE 1 Location of major aerospace contractors in the Los Angeles region. © coming soon
FIGURE 2 Douglas Space Systems Center and surrounding suburbs in Huntington Beach. © coming soon
FIGURE 3 William Pereira’s neo-Babylonian ziggurat for Autonetics in Laguna Nigel, 1971. © coming soon
FIGURE 5 Detail of the location of the main collaborating plants within the Bordeaux aerospace complex in the 1960s. The Society for the study and production of ballistic devices (SEREB) coordinates the work of the *Poudrerie* (PNSM) which produces the propellants, with companies responsible for manufacturing missile shells and engines (Company for Reaction Propulsion Studies (SEPR), Snecma), and with the completion and testing centers (CAEPE). The aeronautical company Dassault assembles the Mirage IV nuclear bomber in Mérignac and produces the Jericho missile in Martignas, intended for Israel. Today, except the CAEPE in Moulin-Bonneau which belongs to the army and the Dassault factories, all these facilities have joined ArianeGroup. © Région Nouvelle-Aquitaine, Inventaire général du patrimoine culturel, Sophie Capelle, 2021.
FIGURE 7 The new buildings in Biscarrosse in 1965. © Cim

1. Concerning the United-States, you can consult the bibliography on science and technology during the Cold War and on the history of the corporate architecture, in particular: Leslie, Stuart W., 2013, “Aerospaces : Southern California architecture in a cold war world”, *History and Technology, An International Journal*, vol. 29, n°4, p. 331-368. In France, post-1945 industrial and administrative architecture is still little investigated; in the aerospace industry, only a few former employees have worked on it. Our recent publication thus paves the way for this field of research: Maison-Soulard, Laetitia and Vincent Frigant, *L’industrie aérospatiale en Nouvelle-Aquitaine : un siècle d’histoire et de patrimoine*, Bordeaux, Le Festin, 2020.

3. Adopted by the First General Assembly of ICOMOS on November 28, 2011 with regard to industrial heritage.