

Wings: A Material History

At first glance Eric Schatzberg's *Wings of Wood, Wings of Metal: Cultural and Technical Choice in American Airplane Materials* may seem like a simple history of the replacement of wooden airplanes by those built of metal. It is, however more complex than that. *Wings* is a history of manufacturing materials in the early twentieth century, it a history of American industrialization in that same period, and it is a history of the ideas of the infallibility of progress and science; the latter of which having the most impact on the choices and designs made by American airplane manufacturers.

The pioneers of all metal aircraft "knew" that metal was the superior choice to replace wood. Many had seen it done in other aspects of engineering. Many times Schatzberg quotes some individual or another mentioning the "natural progression" of bridges or trains from wood from wooden structures to shining examples of metal fabrication. This was the logic that many aeronautical engineers toiled under throughout the first half of the twentieth century. Much of the work done to hurry along the progression towards all metal airplane fabrication led to less than desired results with aircraft. Even setbacks and experimental proof to the contrary why did all metal promoters hold fast to the idea that metal planes would be lighter, safer, and stronger? Because they had seen it happen before.

Flight stresses are not the same as bridge stresses, nor are the similar to those forces that influence railway cars. Schatzberg even points out that testing the tensile strength of many materials was a fool's errand because aluminums horrid buckling under compressive forces. Fool's errand of not, the test results could be shown as conclusive proof in metals superiority over wood, even if the load forces and other tests proved ambiguous at best and metal structures inferior to wood at worst. Examples such as this go far to help Schatzberg illustrate how things like ideologies of a culture, in this case American, and symbolism of a material, metal is superior than wood, underlie and help shape technological change.

Schatzberg's work is well researched and his attention to detail around the manufacturing and uses of Duralumin and the advances of the Alcoa Company reveal that there was a remarkable amount of brain power attentive on the question of manufacturing the perfect aircraft material—as long as it was metal. He compares the corrosion issues of aluminum with the rotting problems that wooden planes suffered to prove that metal was not the cure all flight material in the tropics. For each straw man that the engineers built with rhetoric, Schatzberg presents an instance where metal planes failed as well. Just like the floor panels of the JL-6 the straw men disintegrate.

The strongest argument that can be taken away from this book is not that metal wasn't superior to wood, or that wood was as good as metal, it is that by trying to create a dichotomy between wood and metal materials, early aircraft engineers overlooked what could have been their best answer: a composite material. Modern aircraft operate at speeds and under stresses that were unimaginable to the early engineers and they do so built with composite materials. Composites take the best of both materials and removes some of the more devastating drawbacks, Schatzberg even notes that modern composites are more wood than metal. Had the imminent aircraft makers not been so keen on seeing airplanes follow in the progressive footsteps of bridges or railway cars, perhaps more time would have been taken to look at alternatives to the wood or metal decision.

However progressivist thinking and an adherence to an unproven superiority of metal building materials wasn't the only thing that limited the search for other options. This materials race takes place between the end of the First World War and the conclusion of the World War II. Schatzberg mainly focuses on the American engineering prowess during this time and their exuberant acceptance of Germany's metal military plane prototypes, even though they lost the war, and how it could make them better, cheaper, lighter, faster, and more American. Schatzberg's research also only involves aircraft projects funded and organized by the military. He gives a few side glancing examples of wooden planes being okay for non-military pilots. He even mentions that the Air Mail service sold the remaining JL-6 aircrafts following a series of fatal accidents involving fires, but never says to who in the text. Other people were flying besides the military, who were they and what were their ideas on manufacturing materials? However, this would do little to prove his point that it was those individuals in control that forces the technological advances towards metal.

While trying to reveal that it should have never been a case of wood versus metal Schatzberg falls into the same rhetoric that the prominent metal enthusiasts used—only Schatzberg uses it for wood. “Engineering rhetoric” appears many times throughout his text, usually in close proximity to any new advancement in metal manufacturing techniques. There is a sense that he is dismissive of all metal construction as simply rhetoric of progressivistically minded individuals. Any success of a wooden aircraft, even it is only a piece of the engineering, is lauded as a feat against overwhelming odds. At the same time any metal construction that does not perform to one hundred percent specifications is an out and out failure. These results should have paired with his discussion of composite materials. He also takes great pains to distinguish between all-metal and metal composite planes. He is less particular when discussing wooden plains manufactured with plywood. By Schatzberg logic then, Howard Hughes *Spruce Goose* should have been filed under engineered wood composite.

There is no doubt that Schatzberg's attention to manufacturing detail is paramount to his argument. There are however times when his minutiae detail gets in the way of his larger narrative. His use of the British mosquito bomber and the *Spruce Goose* could have been utilized less as icon novelties and more to prove that not everyone was working on a way to replace all wooden aircraft with metal ones. He refers early on to German work on metal aircraft manufacturing and design during the First World War as “ambiguous.” *Wings* goes a long way to illustrate that it had an extremely large impact on American manufacturing and engineering decisions. The wars serve as time markers and the prominent drivers of innovation in aeronautical engineering.

He briefly touches on the impact the treaty of Versailles had on airplane research and development in Germany following the Armistice. As with the Mosquito Bomber and the *Spruce Goose*, these are more quaint little asides and actual issues at large. While German engineers and plane manufacturers were able to produce new aircraft abroad, they could do little in their own country after 1920. Many German aircraft companies were erected in American and while he says the JL manufactures didn't put any American manufacturers out of business, he explores the exporting of ideas very little.