XB-70_Valkyrie.edited.docx

by

Submission date: 09-Nov-2021 10:29AM (UTC-0600)
Submission ID: 1697865167
File name: XB-70_Valkyrie.edited.docx (14.56K)
Word count: 807
Character count: 4488

XB-70 Valkyrie

Name:

Institution:

Course:

Instructor:

Date:

XB-70 Valkyrie

Compression lift is the extra pressure underneath an airplane that generates uplift by using currents produced by its supersonic speeds. It results in significant lift gains for supersonic and hypersonic jets. In 1956, Clarence Syvertson and Alfred J. Eggers uncovered this phenomenon while investigating irregularities in nuclear weapon reentry. Compression lift is a well-known technique in which vessels limit drag by riding their pressure wave in about the same style. The force is not created until hypersonic velocities are achieved, and it is steeply slanted, making it harder to do so in airplanes (Boom Supersonic, 2021). For the complete advantage of benefits, aircraft must be carefully designed. Also, the elevation of the sonic booms changes dramatically with velocity, rendering it even more challenging to build an aircraft that achieves significant lift throughout a broad velocity range. A portion of the flap could recline as much as 65 ° to boost directional control and cruising efficiency while holding the shock wave. Manufacturers employed titanium for 9% of the jets' structure to withstand a situation where continuous thermal heating resulted in jet surface temperatures rising from 246 to 332 degrees (Boeing, n.d.). To eliminate utilizing limited and expensive titanium, manufacturers developed a steel composite sandwich cover made using brazing to attach metal parts instead of soldering, creating a high-strength shell that could withstand the temperature.

The XB-70 of the late 1970s was the only probable operational jet that utilized compression lift technology, but the project was canceled after just two models were produced; therefore, it was only used as a technology demonstrator. The resultant lift of the XB-70 reduced by around 30%, thanks to the compression uplift (Gibbs, 2017). Only testbed versions were piloted, faster speeds concepts utilizing compression lift, but wave riders are intriguing for supersonic engineering. The Boeing X-51 wave rider also uses a compression lift. It enhances its

revolutionary hoisting percentage by exploiting compression lift to use the blast wave produced by its plane as a lifting surface. It is still a well-studied model for revolutionary aircraft with a Mach 5 or faster velocity. According to Boeing (n.d.), from 2010 to 2013, the Boeing X-51A scramjet showcase plane was piloted. It hit Mach 5.1 (5,400 km/h) in its penultimate test launch.

Designed as a warplane in the 1950s, the XB-70 Valkyrie evolved into a hypersonic research jet in the 1960s. It was an engineering spectacle, including its six propellers, distinctive canards, flexible configuration wing pointers, and Mach 3 capability (Boeing, n.d.). Designers hoped that it would be impervious to combat planes by flying at 70,000 feet off the ground. At the time, new missile technologies endangered the sustainability of rising, high-altitude bombers in the1960s. Ballistic missiles were also being deployed at a lower cost. As a response, before any Valkyries were finished or launched, the XB-70 bomber project was abandoned in 1961.

However, a significant amount of money was spent. United States Air Force was still interested in studying high-speed aviation, and NASA had a stake in the project, which was still in its infancy. After deliberations over blueprints and funds, North American developed two test jets, the XB-70A and XB-70B. The six General Electric YJ-93-GE-3 turbocharged engines on the XB-70 are turbojets (Boeing, n.d.). Every engine had an output of up to 30,000 kilograms but was an axial-flow turbine, indicating the airflow was perpendicular to the revolving shaft in the engine's core. The jet had a range of 4,288miles and an endurance flight of 1.87 hours. Its take-off distance is 7400 feet with a climb rate of 7170 feet per minute. The turbines compress air, combine it with gas, and light the high-pressure combination to generate lift (Boeing, n.d.). Afterburners increase power by providing extra gasoline to a hot engine. North Americans manufactured only two XB-70s. The first XB-70 is on exhibit at the National Museum of the

United States Air Force. The other was destroyed in a crash in June 1966 while flying to capture numerous planes in flight.

To sum it up, a compression lift is used in the XB-70 to lift from the force under a supersonic boom. The aircraft generates a blast wave, which causes energy to build up from the front of the inlet manifold splitter and beneath the flap on the airplane's underbelly. The force behind the wave on the head of the jet has no equivalent "counter." The pressure beneath the jet is larger than the level above, resulting in a 30 percent rise in uplift at incredible speeds. Variable curvature flap tips are yet another essential component of the XB-70's performance.

References

Boeing. (n.d.). *Boeing: Historical Snapshot: XB-70A Valkyrie*. Boeing: The Boeing Company. https://www.boeing.com/history/products/xb-70-valkyrie.page

Boom Supersonic. (2021, September 1). *XB-70 compression lift* [Video]. YouTube. https://youtu.be/LpvE9mDpbCc

Gibbs, Y. (2017, August 7). *NASA Armstrong fact sheet: XB-70 Valkyrie*. NASA. https://www.nasa.gov/centers/armstrong/news/FactSheets/FS-084-DFRC.html

XB-70_Valkyrie.edited.docx

ORIGINALITY REPORT

2%	1%	0%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	en.wikipedia.org Internet Source	1%
2	Submitted to Cork Institute of Technology Student Paper	1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		