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Compressors for Hyper-Sonic Engines

—A Theoretical Study of Future Compressors for Hyper Sonic Engines

Christine Cherian

St. Berchmans Art and Science College, Changanacherry, India
Email: sbc@sbcollege.ac.in

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Abstract

This paper is an eye opening to the new horizon of the design of operational Compressors in our jet engines. That are compressors usually perform an operation called isentropic process and which levitate the pressure and temperature to the optimum level which require for effective ignition. Basically, our compressors have several sets of blades to perform this function, more precisely saying Rotor and stator blades. Where rotor blade provides air molecule to push at very high velocity to the Stationary blade and when the air Enders to the Stator, the stator races its pressure to move on to the next stage. And we call this set of Stator and rotor as a stage ref [1]. However, in this work, I consider the geometry of the incoming air molecule and how it transforms its physical quantities such as Pressure and temperature ref [2]. For that I tie the concept of Thermodynamic and mechanics on the platform of Tensor analysis ref [3]. That is, I consider the quantities like Pressure, Temperature and rate of flow are their corresponding vector spaces and energy related quintets like heat, work as the scaling elements on the above vector space. And quantities such as entropy enthalpy and specific heat capacity are corresponding physics of it. Considering the advantages, one of the important advantages of this approach is the applicability of results of this work to the formulation of blade less compression Example: Ram and Scram jet engine. Again, the relevant upgrading which is essential for future hypersonic air crafts can achieve from this study and this will be a mile stone for bright air and space travel. To conclude, this approach will be a great transformation on the conventional idea for realization of compression for operational Scram and Ram jet engines ref [4] [5].

Keywords

Adiabatic Compression, Power Compressor, M-B Distribution, Riemann Geometry, Matric Tensor, High Energy Molecule Ref, Bessel Function, Efficiency of the Compressor, Poly-Entropy Efficiency

1. Introduction

In most of the time, people are looking for manufacturing new meshing for exploring the unreachable heights. Now we are trying to make our space dreams come true. To make it real, we need an ultra-modern engine for flying our air craft in to the unending space. But unfortunately, our conventional rocket engines and rocket are not capable to solve our expatiations. So, we need a best, smart, reusable, green and sophisticated engine for levitating our air plane to the space.

Again, the luxurious air travel can happen only in the air plans, but rockets are not providing that much comfort to the passengers and at the same time the risk factor is very high. So, we need an engine like our own Gas turbine, which capable to travel in air and space.

We are looking for a reusable space meshing for lifting off our starlight's and people to the out-side space. Falcon project and Hi fly space crafts are experimenting continually to fulfill this goal. So, we need a space craft like we can take off it from an airport and touch down on the airport.

In my engine, it can perform like a conventional turbofan engine on the platform of embedded scram rocket propulsion which solve all our requirements on an engine.

Statement of Main Problem

Basically, the major problem of operational Scramjets is the requirement of velocity of mac 3 and over cost. Because of this, many organizations and space teams are still using conventional Rocket engine to use in space. Another thing is the question of security. In general, Scram jets travel at the speed of mac 6 and above and our traditional piles need to bring risk to control the craft and the payload. When they decrease the speed the self-compression capability of Air molecule will lose so they should maintain the ship above the speed of mac 3. Organizations like NASA ISRO ESA and Russian Space Agency are looking for the solution of this set of problems ref [6] [7] [8].

2. Solution

In this case we need a sophisticated compressor which capable to compress air by its self even if it has the speed several mph and this should be compress air at any ambient condition.

For that I have a compressor model which capable to solve the necessity of high speed for happen the self-compression ref.

In this model it has multiple compressors like LPC and HPC in Turbo Fan engine. But this multiple compressor didn't have any moving parts such as rotor and starter blades. That is where we operate the compressor self-generated high ambient environment such as High temperature and rate of flow.

Adopting the concept of thermal and statistical mechanics it can be state that our air molecule is obeying Maxwell Boltzmann statistic. We derive that

$V_{rms}=\sqrt{\frac{3KT}{m}}$ and this equation says that when T increases velocity RMS increases. Rate of flow can define as $V = Area * v_{rms}$ and by increasing of velocity RMS it can flow to the Chamber of the Compressor ref [9].

But the where the compressor works as adiabatic, so we cannot increase the heat energy. To solving that we provide high ambient Temperature jest before its Enders to the compressor casing and maintain this condition in the compressor casing, by this we can create random motion of air molecule ref. [10]-[16].

3. Theory

3.1. Explanation of the Theory

This theory is a study of the variations of dual space with vector space and its corresponding coordinates. Basically saying the quantity's like pressure, temperature and rat of flow are the elementary parameters which one can analyses the dynamics of the state of the system. These elementary quantities combine each other in different configuration to give the kinematics of the state. So they can consider as the vector spaces of the state. The nature of the Vector Space are listed below.

All axioms of the vector space should be full fill by the choosing of basics for these quantities over the state of the system and the transformations would be defined by using the algorithms of Tensor analysis.

For a finite consideration of a system, the considering system should be the only one space over the molecular space. It means that all other quantities (as vector space) should be its functions. For example considering the ideal gas equation we can say Temperature as a function of Pressure and Rate of flow (for fluid dynamics).

Determination of covariant and contra variant transformations and covariant operations can define bellow.

The changes happens over the considering quantities can be define as contra variant transformation and reset of others are covariant transformation. For example the pressure transformation of the state over p-space can define as contra variant and other transformation are covariant.

Quantities like energy, entropy, enthalpy, specific heat capacity, heat capacity and work are define as the covariant quantities of the corresponding vector space and they should be specifies as well.

If we consider a covariant quantity, all other quantities should be their corresponding scaling elements.

3.2. Operational Part of the Theory

(*Case study of dynamics of molecules on an adiabatic compressor to self-sustaining compression for hyper-sonic engines*)

This theory is an analytical study of the air molecule on the compressor. But, the compressor I took heir for study is a blade less self-sufficient to compress, type compressor and this action is happening on the basics of adiabatic compression theorem. Heir I use the idea of Tensor analysis to derive the way of operation of the engine's compressor. That is I approximate the surface of molecular space obeys Reimanns geometry ref [17].

Initially, I consider the quantities on Phase diagram as vector space such as P-Space for Pressure, V-space for volume and T-space for Temperature and work, entropy, enthalpy and specific heat capacity as Scalar quantities and functions. Heir I consider the transformation of vector space quantities as contra variant vectors and the physics of the vector space as covariant vector. However, real molecule presenting space is molecular space, where all the contravariant and covariant operations perform ref [18].

If we consider the P-space, all other quantities are involved like a scalars or variables. Which is the case of other Spaces?

Let consider the Riemann algorithm, we can define our surface as [19].

$$dP^2 = \sum_{j=1}^{3}\left(g_{ij}\cdot\partial P^j\cdot\partial P^i\right) \tag{1}$$

$$dV^2 = \sum_{j=1}^{3}\left(g_{ij}\cdot\partial V^j\cdot\partial V^i\right) \tag{2}$$

$$dT^2 = \sum_{j=1}^{3}\left(g_{ij}\cdot\partial T^j\cdot\partial T^i\right) \tag{3}$$

The matric tensor g_{ij} for each case as

Matric tensor for p-space

$$g_{ij} = \begin{matrix} \hat{P}_1\hat{P}_1 & \hat{P}_1\hat{P}_2 & \hat{P}_1\hat{P}_3 \\ \hat{P}_2\hat{P}_1 & \hat{P}_2\hat{P}_2 & \hat{P}_2\hat{P}_3 \\ \hat{P}_3\hat{P}_1 & \hat{P}_3\hat{P}_2 & \hat{P}_3\hat{P}_3 \end{matrix} \tag{4}$$

That is $\hat{P}_i$ is the basics of the p space

Matric tensor for V space

$$g_{ij} = \begin{matrix} \hat{V}_1\hat{V}_1 & \hat{V}_1\hat{V}_2 & \hat{V}_1\hat{V}_3 \\ \hat{V}_2\hat{V}_1 & \hat{V}_2\hat{V}_2 & \hat{V}_2\hat{V}_3 \\ \hat{V}_3\hat{V}_1 & \hat{V}_3\hat{V}_1 & \hat{V}_3\hat{V}_3 \end{matrix} \tag{5}$$

That is $\hat{V}_i$ is the basics of V space

Matric tensor for T space

$$g_{ij} = \begin{matrix} \hat{T}_1\hat{T}_1 & \hat{T}_1\hat{T}_2 & \hat{T}_1\hat{T}_3 \\ \hat{T}_2\hat{T}_1 & \hat{T}_2\hat{T}_2 & \hat{T}_2\hat{T}_3 \\ \hat{T}_3\hat{T}_1 & \hat{T}_3\hat{T}_2 & \hat{T}_3\hat{T}_3 \end{matrix} \tag{6}$$

$\hat{T}_i$ is the basics of T space

Initially we consider as air molecule did not have any curvature with our principle axis and that can be express as

Curvature of P space before racing the ambient condition (P). Without ender to the compressor casing

$$R^l_{ijk}P = 0 \tag{7}$$

Curvature of V space before racing the ambient condition (V). Without ender to the compressor casing

$$R_{ijk}^{l} V = 0 \tag{8}$$

Curvature of T space before racing the ambient condition (T). Without ender to the compressor casing

$$R_{ijk}^{l} T = 0 \tag{9}$$

When the APU and LO pump suck the air in to the compressor, it has a curvature and the transformation equations are given below ref [20].

Curvature of incoming hot air, before it mixes with the hot air on the compressor (Transformation of Pressure)

$$A_{l`n`m`}^{i`j`} \overline{P}^{\mu} = B_{n`m`k`}^{\mu\lambda} \overline{P}^{\mu} \tag{10}$$

Curvature of incoming hot air, before it mixes with the hot air on the compressor (Transformation of Rate of flow)

$$C_{l`n`m`}^{i`j`} \overline{V}^{\mu} = D_{n`m`k`}^{\mu\lambda} \overline{V}^{\mu} \tag{11}$$

Curvature of incoming hot air, before it mixes with the hot air on the compressor (Transformation of Temperature)

$$E_{l`n`m`}^{i`j`} \overline{T}^{\mu} = F_{n`m`k`}^{\mu\lambda} \overline{T}^{\mu} \tag{12}$$

where transforming quantity $A_{l`n`m`}^{i`j`}$, $B_{n`m`k`}^{\mu\lambda}$, $C_{l`n`m`}^{i`j`}$, $D_{n`m`k`}^{\mu\lambda}$ are expand on the following format

$$A_{l`n`m`}^{i`j`} = R_{n`m`k`}^{i`j`} + \frac{\partial \overline{p}^{i}}{\partial P_{l`}} \left( \frac{\partial}{\partial x_{i`}} \frac{\partial}{\partial x_{j`}} \right) \Gamma_{\mu\mu}^{\mu} \tag{13}$$

$$B_{i\,j\,k}^{\mu\lambda} = \frac{\partial^2 p^{l`}}{\partial p_{i`} \partial p_{j`}} + \Gamma_{i`j`}^{\lambda} \frac{\partial \overline{p}^{i}}{\partial p^{i}} \frac{\partial}{\partial x^{i}} \tag{14}$$

$$C_{l`n`m`}^{i`j`} = R_{n`m`k`}^{i`j`} + \frac{\partial \overline{V}^{i}}{\partial V_{l`}} \left( \frac{\partial}{\partial x_{i`}} \frac{\partial}{\partial x_{j`}} \right) \Gamma_{\mu\mu}^{\mu} \tag{15}$$

$$D_{i\,j\,k}^{\mu\lambda} = \frac{\partial^2 V^{l`}}{\partial V_{i`} \partial V_{j`}} + \Gamma_{i`j`}^{\lambda} \frac{\partial \overline{V}^{i}}{\partial V^{i}} \frac{\partial}{\partial x^{i}} \tag{16}$$

$$E_{l`n`m`}^{i`j`} = R_{n`m`k`}^{i`j`} + \frac{\partial \overline{T}^{i}}{\partial T_{l`}} \left( \frac{\partial}{\partial x_{i`}} \frac{\partial}{\partial x_{j`}} \right) \Gamma_{\mu\mu}^{\mu} \tag{17}$$

$$F_{i\,j\,k}^{\mu\lambda} = \frac{\partial^2 T^{l`}}{\partial T_{i`} \partial T_{j`}} + \Gamma_{i`j`}^{\lambda} \frac{\partial \overline{T}^{i}}{\partial T^{i}} \frac{\partial}{\partial x^{i}} \tag{18}$$

Again, on the next stage, the manipulated ambient air mix with the air that is present inside the compressor casing. In that particular time, the Equations (10)-(12) can be re defined as below. That is, the air that present in the compressor possess a change or its molecular space curved into the next stage and the geometrical definition for that can deduce from Equations (10)-(12).

That is, The curvature of p-space of the molecule that locate in the compressor, after react with the incoming hot air having the same ambient condition.

$$g^{hn} R^{\mu}_{i,j,k,m} P = \left(\frac{\partial P_i}{\partial x^i}\right)_{\frac{\partial T^i}{\partial x^i}} \left(\Gamma^i_{ij} - \frac{\partial V^i}{\partial x^j}\Gamma^i_{ii}\right) + \left(\frac{\partial P_i}{\partial x^i}\right)_{\frac{\partial V^i}{\partial x^i}} \left(\Gamma^i_{ij} - \frac{\partial T^i}{\partial x^j}\Gamma^i_{ii}\right) + C^i_{ij} \quad (19)$$

The curvature of *T*-space of the molecule that locate in the compressor, after react with the incoming hot air having the same ambient condition.

$$g^{hn} R^{\mu}_{i,j,k,m} T = \left(\frac{\partial T_i}{\partial x^i}\right)_{\frac{\partial P^i}{\partial x^i}} \left(\Gamma^i_{ij} - \frac{\partial V^i}{\partial x^j}\Gamma^i_{ii}\right) + \left(\frac{\partial T_i}{\partial x^i}\right)_{\frac{\partial V^i}{\partial x^i}} \left(\Gamma^i_{ij} - \frac{\partial P^i}{\partial x^j}\Gamma^i_{ii}\right) + E^i_{ij} \quad (20)$$

The curvature of *V*-space of the molecule that locate in the compressor, after react with the incoming hot air having the same ambient condition.

$$g^{hn} R^{\mu}_{i,j,k,m} V = \left(\frac{\partial V_i}{\partial x^i}\right)_{\frac{\partial A^i}{\partial x^i}} \left(\Gamma^i_{ij} - \frac{\partial v^i}{\partial x^j}\Gamma^i_{ii}\right) + \left(\frac{\partial T_i}{\partial x^i}\right)_{\frac{\partial v^i}{\partial x^i}} \left(\Gamma^i_{ij} - \frac{\partial A^i}{\partial x^j}\Gamma^i_{ii}\right) + D^i_{ij} \quad (21)$$

where we are approximating the excitation of Incoming air to the level of the molecular space which present on the compressor casing.

So there is no change that going to happen in the above set of quantity rater than changing its molecular coordinates *i*, *j*, *k* to $i^{`}$, $j^{`}$, $k^{`}$ and that is we can take the same equation of Transformed *T*, *P*, and *V*.

The curvature of Transformed *p*-space of the molecule that locate in the compressor, after react with the incoming hot air having the same ambient condition.

$$g^{hn} R^{\mu}_{i,j,k,m} \bar{P} = \left(\frac{\partial \bar{P}_i}{\partial x^{i`}}\right)_{\frac{\partial \bar{T}^i}{\partial x^{i`}}} \left(\Gamma^i_{ij} - \frac{\partial \bar{V}^i}{\partial x^{j`}}\Gamma^i_{ii}\right) + \left(\frac{\partial \bar{P}_i}{\partial x^{i`}}\right)_{\frac{\partial V^i}{\partial x^{i`}}} \left(\Gamma^i_{ij} - \frac{\partial \bar{T}^i}{\partial x^{j`}}\Gamma^i_{ii}\right) + \bar{C}^i_{ij} \quad (22)$$

The curvature of Transformed *T*-space of the molecule that locate in the compressor, after react with the incoming hot air having the same ambient condition

$$g^{hn} R^{\mu}_{i,j,k,m} \bar{T} = \left(\frac{\partial \bar{T}_i}{\partial x^{i`}}\right)_{\frac{\partial \bar{V}^i}{\partial x^{i`}}} \left(\Gamma^i_{ij} - \frac{\partial \bar{P}^i}{\partial x^{j`}}\Gamma^i_{ii}\right) + \left(\frac{\partial \bar{P}_i}{\partial x^{i`}}\right)_{\frac{\partial \bar{V}^i}{\partial x^{i`}}} \left(\Gamma^i_{ij} - \frac{\partial \bar{P}^i}{\partial x^{j`}}\Gamma^i_{ii}\right) + \bar{E}^i_{ij} \quad (23)$$

The curvature of Transformed *V*-space of the molecule that locate in the compressor, after react with the incoming hot air having the same ambient condition

$$g^{hn} R^{\mu}_{i,j,k,m} \bar{V} = \left(\frac{\partial \bar{V}_i}{\partial x^{i`}}\right)_{\frac{\partial \bar{A}^i}{\partial x^{i`}}} \left(\Gamma^i_{ij} - \frac{\partial \bar{v}^i}{\partial x^{j`}}\Gamma^i_{ii}\right) + \left(\frac{\partial \bar{V}_i}{\partial x^{i`}}\right)_{\frac{\partial \bar{v}^i}{\partial x^{i`}}} \left(\Gamma^i_{ij} - \frac{\partial \bar{A}^i}{\partial x^{j`}}\Gamma^i_{ii}\right) + \bar{D}^i_{ij} \quad (24)$$

where C^i_{ij}, E^i_{ij}, D^i_{ij} can be written as

$$C^i_{ij} = \frac{\partial V^i}{\partial x_i}\frac{\partial^2 p_i}{\partial V_i \partial x_j} + \frac{\partial T^i}{\partial x_i}\frac{\partial^2 p_i}{\partial T_i \partial x_j} \quad (25)$$

$$E^i_{ij} = \frac{\partial V^i}{\partial x_i}\frac{\partial^2 T_i}{\partial V_i \partial x_j} + \frac{\partial P^i}{\partial x_i}\frac{\partial^2 T_i}{\partial P_i \partial x_j} \quad (26)$$

$$D_{ij}^{i}=\frac{\partial A^{i}}{\partial x_{i}}\frac{\partial^{2}V_{i}}{\partial A_{i}\partial x_{j}}+\frac{\partial v^{i}}{\partial x_{i}}\frac{\partial^{2}V_{i}}{\partial v_{i}\partial x_{j}} \tag{27}$$

and there transformed quantity $\bar{C}_{ij}^{i}$, $\bar{E}_{ij}^{i}$, $\bar{D}_{ij}^{i}$ can be written as

$$\bar{C}_{ij}^{i}=\frac{\partial\bar{V}^{i}}{\partial x_{i}}\frac{\partial^{2}\bar{P}_{i}}{\partial\bar{V}_{i}\partial x_{j}}+\frac{\partial\bar{T}^{i}}{\partial x_{i}}\frac{\partial^{2}\bar{P}_{i}}{\partial\bar{T}_{i}\partial x_{j}} \tag{28}$$

$$\bar{E}_{ij}^{i}=\frac{\partial\bar{V}^{i}}{\partial x_{i}}\frac{\partial^{2}\bar{T}_{i}}{\partial\bar{V}_{i}\partial x_{j}}+\frac{\partial\bar{P}^{i}}{\partial x_{i}}\frac{\partial^{2}\bar{T}_{i}}{\partial\bar{P}_{i}\partial x_{j}} \tag{29}$$

$$\bar{D}_{ij}^{i}=\frac{\partial\bar{A}^{i}}{\partial x_{i}}\frac{\partial^{2}\bar{V}_{i}}{\partial\bar{A}_{i}\partial x_{j}}+\frac{\partial\bar{v}^{i}}{\partial x_{i}}\frac{\partial^{2}\bar{V}_{i}}{\partial\bar{v}_{i}\partial x_{j}} \tag{30}$$

$g^{hn}R_{i,j,k,m}^{\mu}$ is the Ricc tensor or curvature tensor of the surface of the molecular space by interacting with the molecules that coming from APU and LO.

Not: Where equation number (22)-(24) are the corresponding equation, like Equations (10)-(12), on the casing of the compressor and equation number (19)-(21) are the fundamental non transforming correspondence of the Equations (10)-(12).

On the basics of the above equation, I find several physical quantities, below

4. Work Done by hot Incoming Air to the Manifold of the Hot Air Having Same Circumstance

This gives an insight on me to find the work done by the incoming hot molecule over the molecule that is presenting on the compressor casing and I derive the expression of the work done by incoming hot air on the manifold of the hot air molecule which is present on the compressors casing. This derivation is based on the equation number (10), (13) and (14).

Work done by the incoming hot air molecule on the presenting hot air molecule of the secondary compressor casing shall be define as below

$$\bar{w}^{\mu}=\frac{1}{2}x^{i`}\cdot w_{i`}\frac{\partial\left(\log\left(g_{ii`}\right)\right)}{\partial x^{i}} \tag{31}$$

Heir I consider, $\bar{w}^{\mu}$ work done by incoming hot air, $x^{i`}$ is the direction of propagation of the incoming molecule, $w_{i`}$ is the work done on the direction of $\hat{\imath}$, x^{i} is the direction of propagation of hot air cluster after they combine, and $g_{ii`}$ is the matric tensor of the direction $I$ and $I`$.

5. Temperature Study's and Relations of Pressure and Temperature with Initial Values

5.1. Velocity Requarments

The temperature of the molecule at before it mixes with molecules in the compressor has been obtained as a form of Bessel function. That is $T_i = j_n x + j_{-n} x$.

But for all negative gamma function consider as zero. The T_i initial temperature before it Enders to Compressor casino can be define as

$$T_i = j_n x \tag{32}$$

Finally the velocity (rms) of the incoming hot air as shown below

$$V_{rms} = \sqrt{\frac{3KA`j_n x}{m}} \tag{33}$$

where

$$n = \frac{1}{S}\left(\sqrt{(KAt)^2 \Omega - k * KAt}\right) \tag{33.A}$$

and

$$x = \frac{KAt}{S} \tag{33.B}$$

and

$$j_n x = \sum_{i=0}^{f} (-1)^f \frac{1}{\Gamma(n+f+1)} \cdot \left(\frac{KAt}{S}\right)^{n+f} \quad \text{Ref [3]} \tag{34}$$

and K = coefficient of thermal conductivity, k is Boltzmann constant, A = area of cross section of out let nozzle, t is the time taken for completing a cycle S = entropy, $A`$ is the coefficient of Bessel function and Ω is thermodynamic probability, and f is the total number of stages that undergo the air on a cycle

5.2. What Happen on Secondary Compressor?

After observing the compressor, the pressure and temperature are increase like a geometrical progression and this can be express as below ref [21] [22].

That is the final pressure after f stage compression can be define as

$$p_f = p_i * \left(\frac{N}{1-\eta}\right)^{f-1} \tag{35}$$

p_f is the final pressure after F sage compression, p_i Is the initial Ambient pressure, N is the rate of flow ratio of initial and final stages and η is the compressor efficiency associated with poly-entropic efficiency

Similarly, the temperate expansion after F stage can be define as

$$T_f = T_i * \left(\frac{1}{1-\eta}\right)^{f-1} \tag{36}$$

T_f is the final temperature after F stage compression happens, T_i is the initial Ambient Temperature and η is the compressor efficiency associated with poly-entropic efficiency ref [23] [24].

So, the entry of each molecular flow the molecular space curved into the combusting chamber and this is called pulsed compression. In each stage, it operates the compression as the digitized format

In short, initially we increase the temperature of the molecule on the secondary compressor and we bypass the air from APU and LO to it. In each entry of air molecule, the compression will happen one by one

6. Way of Operation

Initially, we supply air molecule to the compressor casing from APU and LO pump and we systematically increase the temperature of the cluster for reaching the curtail velocity. It should attain this speed jest before its ender to the Compressor casing. There has a cluster of molecules of air on the Compressor casing and it has the temperature which the incoming cluster has. The air molecule on casing undergoes a directional alignment on the direction of the incoming air molecule.

Finally, the air began to flow in the direction of an incoming air molecule. Where this process happens on the secondary compressor and their primary compressor has allowed entering the ambient air molecule directly to the casing and undergoing the single stage compression.

7. Prototype Proposal

The compressor of the hypersonic engine requires binary, analogic to turbofan version of the jet production, type system. It has a configuration of HPC (High-Pressure compressor) and LPC (low-pressure compressor). In this version of the binary compressor, the air requires high temperature in HPC and this has the ability to drive the hot air into the direction of propagation of incoming hot air (according to (10)-(12), (19)-(24)). So we can obtain a perfect flow of air through the compressor, without having any moving blades. This version of compression is known as power compression and the compressor performing this can define as power compressor.

This has the ability to do compression to the Combusting chamber at zero ambient velocity of the aircraft.

HPC require multiple compression stages to perform highly efficient compression (according to Equations (35) and (36)). However, LPC is a single stage compressor which can access outside air directly from ambient conditions. But the power compressor didn't access air, directly from ambient conditions. This means that about 99.9999 percent of the air that presents on the power compressor is supplied from APU and LO.

Initial, the combusting chamber attains compressed air from HPC and mixed with fuel to get a hot stream of the jet. After it reaches the mac 3, the LPC began to compress air and again, it mixes with the hot air coming from HPC and guides this to the combusting chamber.

8. Result and Discussion

When we are introducing the hot air flow to the same ambient atmosphere, the molecular space which presents on the path of flow will curve and this is fundamental for pulsed Compression and Digitize compression

Again, the pressure and temperature can increase like an exponential with the order of increase in stage and where pressure increase rapidly with Ratio of rate of flow, but Temperature did not increase that much faster Bessel formulism substantiate this argument. In the velocity (RMS) will increase gradually with the square root of Temperature.

However, considering the decrease of area of cross section the rate of flow didn't increase but decrease like arithmetically

9. Summary

To conclude, the multiple compression stages of a power compressor can be used to build low-speed compressors for the single stage compressors on a scramjet engines. This can be archived by concentric flow of high energy air molecules on the power compressor to operate a digital form of compression, called digitized compression.

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I am expressing my sincere thanks to the online grammar checking site for helping to solve my errors in literature https://www.grammarcheck.net/editor/. Again I display my greetings to the book that I studied in my university English class Marilyn Anderson, Madhucchandan sen and Pramod K Nayar, *critical thinking, academic writing and presentation Skills,* Fifth impression, 2013, Pearson, 7th floor, A-8(A), sector-62,Noida, UP 201309, India.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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[24] https://www.youtube.com/watch?v=KjiUUJdPGX0

List of Key Simple

Section 2, v_{rms} root mean square velocity of moving air Colum, k Boltzmann constant, T Temperature, m mass flow, V is the rate of flow, A is the area of cross section.

Section 3.2, ∂p is the small area element 3 dimensional p space, ∂V is the small area element 3 dimensional V space, ∂T is the small area element 3 dimensional T space, g_{ij} matric tensor of the *p*, *v*, and *t* spaces, $\hat{P}_1, \hat{V}_1, \hat{T}_1$ are the basics vectors of corresponding spaces, *R* is the Curvature tensor, Γ^i_{ij} is the Christopher symbol, x_i is the direction of flow.

Section 4, w^μ work done by air flow, w_i component of work along I.

Section 5.1, $j_n x$ Bessel's function, A_1 coefficient of Bessel's series.

Section 5.2, P pressure, R ratio of rate of flow, T Temperature an η the isentropic compressor efficiency.