DESIGN OF A COMBUSTION SIMULATION TOOL IN AN ANNULAR CAN TYPE COMBUSTION CHAMBER AS A LEARNING SUPPORT AT THE SURABAYA AVIATION POLYTECHNIC.

Muhammad Wahyu Aditya*
Politeknik Penerbangan Surabaya, Jalan Jemur Andayani I No 73, Kota Surabaya, 60236
**Corresponding Author. Email: whyadtyaa@gmail.com*

Abstract
In gas turbine engines there is a combustion system in the combustion chamber with an annular can typein the engine shop of the Surabaya Aviation Polytechnic. Gas Turbine Engines, especially in the combustion system inthe combustion chamber of the annular can type, are not enough if discussed only in theory, but must also be studied directly through practicum such as the implementation of making Combustion Chamber Simulator with annular can type. This research aims to make a tool by designing a design that is slightly the same as a description of the Combustion Chamber combustion system and supports teaching and learning activities at the Surabaya Aviation Polytechnic. This research uses a qualitative research method by explaining the process of designing a tool, starting with problem identification, data collection, tool design, tool making, tool testing, testing data, then conclusions can bedrawn after getting test results.The design of this tool is designed using stainless steel, because this design requires materials that are not easily corroded for long-term use. This design uses welding and drilling techniques to make the holes listed on the tooldesign. The results of the design of the can annular combustion chamber simulation wake-up tool are obtained by burning evenly with the time difference tested by several respondents obtained an average of 72.6 seconds from the results of tests conducted by several respondents in the percentage that is the working tool, it works well to produce even combustion in the noozle stove.
Keywords: Combustion Chamber, Annular Can, Gas Turbo Engine, How to Design, How to Work

INTRODUCTION

Surabaya Aviation Polytechnic organizes higher education, one of which is Diploma 3 for the Aircraft Engineering Study Program. This study program creates cadets to become experts in the field of aircraft maintenance who are professional and competent. So that he got SKP (License) A1 Airframe, A3 Piston Engine, A4 Gas Turbine Engine, C1 Radio and Electronics, C2 Instrument, and C4 Electrical fromthe Directorate of Airworthiness and Aircraft Operation (DKUPPU) Ministry of Transportation Approval No. AMTO 147/1000.

In the Diploma 3 program for cadets level 2 insemesters 3 and 4 there are Gas Turbine Engine Fundamental and System And Performance Gas Turbine Engine courses in which we learn the conceptsof Gas Turbine Engines, especially TurboFan on the JT8D engine which can still be used and can be learnedup to At the moment.

Related to the system and use, handling on theengine, there are several turbofan engines studied in theengine shop of the Surabaya Aviation Polytechnic which support and support the learning of cadets and cadets at the Surabaya Aviation Polytechnic, one of which is the JT8D engine located in the engine shop of the Surabaya Aviation Polytechnic. This study is very important to discuss because there is one important system that occurs in one of the components in the JT8D engine, namely the combustion system in the combustion chamber with an annular can type in the engine shop of the Surabaya Aviation Polytechnic.

The JT8D is a type of low-bypass turbofan engine (0.96-1) introduced by Pratt & Whitney in February 1963 on the maiden flight of the Boeing 727. It is a variant of the turbojet. The JT8D engine has proven to be extremely durable and reliable, logging more than 673 million flight hours since its introduction.There are eight models in the JT8D family covering a thrust range of 14,000 to 17,000 pounds. Introduced in 1980, the JT8D-200 series offers 18,500 to 21,700 pounds of thrust and is powered exclusively by aircraftfrom the popular MD-80 series. Built with excellent family reliability and low maintenance costs, the JT8D- 200 meets noise and emissions regulations.

For this reason, the results of this study are used to find out starting from the operation of the Combustion Chamber and the working methods that can be used continuously by the Surabaya Aviation Polytechnic Cadets. So that in research this final project proposal takes the title "DESIGN OF A COMBUSTION SIMULATION TOOL

IN AN ANNULAR CAN TYPE COMBUSTION CHAMBER AS A LEARNING SUPPORT AT THE SURABAYA AVIATION POLYTECHNIC".

METHOD

In this research, the research methodology is carried out as a flowchart in the following figure

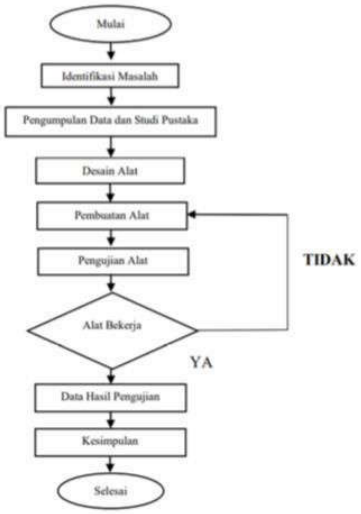

Figure 1. Research Flow Chart

Tool Design

In the design of this tool, the combustion chamber with an annular can type is to facilitate and support learning for cadets in carrying out practicum in the Gas Turbine Engine Fundamental and System and Performance Gas Turbine Engine courses at the Surabaya Aviation Polytechnic engine shop.

Tool design

Preparing a design plan for a combustion chamber combustion simulation tool, there is a 2D combustion chamber combustion simulation tool design and a 3D combustion chamber combustion simulation tool design for practice in the gas turbine engine course with an annular can type in the engine shop of the Surabaya aviation polytechnic.

Figure 2. 2D Design of Combustion Chamber Simulation Tool.

Components of Tools and Materials

In determining the tools to be used and the components must match at least close to the appropriate and suitable criteria.

Determination of Tools Used

The tools used in the process of making combustion simulation combustion chamber as follows:

1. Vernier caliper

A vernier caliper or vernier caliper is a measuring tool that has better accuracy than a ruler because of several differences from a ruler, which has two scales, the main scale in millimeters and a nominal scale. The distance from the two adjacent main scales is 0.1 cm while the distance from the two adjacent nominal scales is 0.09 cm so that the difference between the main scale and the nominal scale is 0.01 cm which is the smallest scale of the caliper (Edi Tri Astuti et al. al., 2021).

Figure 3. Vernier Caliper Scale Reading (Edi TriAstuti et al., 2021)

The accuracy of the vernier caliper is half of the smallest scale of 0.005 cm so that the vernier caliper is suitable for measuring small objects more accurately.

2. Hand drilling machine

A hand drilling machine is a machine with a rotating cutting tool where the direction of the drill bit is on the axis of the machine and the operation uses a hand with a shape resembling a gun. This type of drilling machine is specifically used to make or enlarge holes, tighten or remove bolts (Arif, 2021).

Figure 4. Hand Drilling Machine

3. Welding machine

A welding machine is a device used to connect metals by melting the parent metal and filler metal to produce a connection. The electric welding machine

itself is a welding machine that uses electrical energy as a heat source.

4. Multifuel Pump and Adapter

Multifuel Pump or what can be interpreted as a multi-fuel engine is an engine with an operating system that works in both heavy and light fractions. Multifuel Pump was created with the aim that if the setting is done correctly and at high speed, the combustion that occurs can be more efficient which is sourced from various fuels in it.

5. Air Cooler as Compressor

Air Cooler as Compressor is used to reduce the temperature and maintain the temperature of the water entering the generator stator (generator cooling) (Ananda et al., 2011). In general, Air Cooler cooling is used in generators, condensers, turbines, etc.

RESULT AND DISCUSSION

In the process of making the Can Annular Combustion Chamber Simulation Work Tool before thework until the completion of the tool, there are designsand sizes and specifications of the work tool. Below are the specifications.

Figure 5. Top view of the annular can combustion chamber simulation working tool.

The specifications of this can annular combustion chamber simulation tool are the design of the tool that the author made, so that it can work in accordance with the expectations that the author made. When conducting trials it can work well and according to procedures.

No	Bagian	Ukuran
1.	Tabung *Outter*	Diameter 26cm Panjang 32cm
2.	Tabung *Inner*	Diameter 20cm Panjang 28cm
3.	*Multifuel pump*	Diameter 13cm Panjang 21cm
4.	*Fancooler*	Diameter 15cm Panjang 17cm
5.	Meja	Tinggi 75cm Lebar 50cm

Testing of Design Results

The design of this can annular combustion chamber simulation tool will be functionally tested by several cadets related to the usage procedure attached to Table 4.2, the results of which will be drawn conclusions.

Functional Testing

Based on the results of conducting functional testing of tools that have been carried out by the author, several results are obtained which can then be concluded that the work tools that the author makes function with their respective uses and cannot be separated from the procedures for use.

CLOSING

Conclusion

From the results of the overall testing and analysis of respondents Combustion simulation tool Combustion Chamber Type Can Annular.

No	Responden	Putaran Valve (detik)
1	Okfi Raihan	68 detik
2	Nathan C.S	73 detik
3	Almer Faadhilah	77 detik

to the learning process, it can be concluded as follows:

1. simulation of Combustion Chamber Annular Can Type is made by uniting several components, namely stainless steel and iron which are used as the main materials for making work tools.
2. The Combustion Chamber Annular Can Type combustion simulation is operated as one of the learning supports for the D-III Aircraft Engineering Study Programme in Gas Turbine Engine lecture material which is a tool for practical work of the Combustion Chamber Annular Can type combustion process for cadets and cadets.
3. Based on the results of functional testing and testing of combustion simulation tools, the Annular Can Type Combustion Chamber is able to produce the results desired by the author as one of the learning supports in lecture material at the Surabaya Aviation Polytechnic hangar.
4. Based on the results of tests conducted by several respondents with different results and test data, perfect combustion was obtained with an average time tested of 72.6 seconds which resulted in even burning, with good combustion and use in accordance with the attached procedures.

Advice

Realising that the design of the Annular Can Type Combustion Chamber Combustion SimulationTool is still not perfect. For the future, development

needs to be done. There are suggestions submitted for the perfection of the tool, namely:

1. This design can be improved by adding a cover to the outter tube that is used to cover it, because after use it causes heat that sticks so it is dangerous if the limbs come into direct contact with the work tool.
2. The design of this tool can be improved by adding a heat temperature that can be used to measure the temperature before and after the use of the work tool.

REFERENCES

[1] Alfan, A. N., & Ramadhan, V. (2022). Prototype Detektor Gas Dan Monitoring Suhu. Jurnal PROSISKO, 9(2).

[2] Ananda, M., Evalina, N., & Rohana. (2011). Analisis Kinerja Cooling Fan Terhadap Temperatur Air Untuk Meningkatkan Kinerja Generator Di PT. PLN PLTG Paya Pasir. Journal of Physics A: Mathematical and Theoretical, 44(8), 51.

[3] Arif, A. A. Al. (2021). Perawatan Bearing Pada Mesin Bor di Kapal Negara (KN) Kumba PT. Citra Bahari Shipyard Tegal. 2018, 5–15.

[4] Edi Tri Astuti, Mahendrawan, E., Ihat, S., Sutopo, E. H., & Setyowati, A. D. (2021). Pelatihan Pembacaan Alat Ukur Dimensi Jangka Sorong dan Mikrometer Skrup Untuk Pengukuran Teknik di SMK Sasmita Jaya 2, Pamulang Barat, Kota Tangerang Selatan. Pengabdian Kepada Masyarakat, 1(2), 7–16.

[5] Hutama, P. A. (2018). Desain HEI Igniter Untuk Bahan Bakar Gas Dan Minyak Diesel Dengan Mempertimbangkan Kandungan Air. https://repository.its.ac.id/51267/%0Ahttps://repository.its.ac.id/51267/1/241 0100027-Undergraduate_Theses.pdf

[6] I Gusti Ketut Sukadana, S. M. (2015). Teori Turbin Gas dan Jet Propulsi. In Teori Turbin Gas dan Jet Propulsi.

[7] Integrated Training System. (2010). Gas Turbine Engine TTS lntegrated Trai ning System (Vol. 2).

[8] Irshadi, M. H. (2018). Desain Meja Kerja Modular untuk Desainer di Indonesia dengan Sistem Sambungan Tanpa Mur dan Baut.

[9] Muhammad, N. H. (2020). Pentingnya Perawatan hydrant untuk Mengatasi Kebakaran di Kapal Survei Ship Barakuda PT Citra Bahari Ship Yard Tegal. 1–14.