

Portable Trolley Box Design As Practice Support At Aviation Polytechnic Surabaya

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ABSTRACT

Every time we visit a shop in the hangar we will find many tools, because tools are tools for cadets and instructors to do maintenance or repairing in the hangar. Trolley is a common tool to make it easier for humans to carry, move, lift something. Trolley is also a dead tool and not machined, then the trolley is run manually by being pushed, it can be seen in all types of trolley that has a handle as a handle to push. And there has not been found a portable trolley box in the hangar to facilitate cadets when carrying out practice or maintenance. To achieve this goal, it is necessary to design and build a portable trolley box that will be used by cadets when carrying out maintenance or repairing in shop or in hangar. This article discusses how to design and build a portable trolley box tool designed by the author himself. By using the help of additional applications such as solidwork, the author can make this design. The results showed that the portable trolley box design has the ability to carry and store tools and components needed for maintenance with a larger size and also more. The conclusion from the research results of this portable trolley box design is that it can facilitate cadets in maintenance or aircraft maintenance.

Keywords: *portable trolley box, tools, maintenance*

1. INTRODUCTION

Every visit to Hangar 147D/010 to perform maintenance or inspection on aircraft cadets certainly need tools. The existence of this Trolley makes it easier for cadets to carry or move tools from a shop to carry out maintenance or inspections. A trolley may be a non-motorized equipment that works without a motor; hence, it is physically moved by being pushed. This will be observed in all types of trolleys that have handles for pushing.

Politeknik Penerbangan Surabaya or commonly abbreviated as Poltekbang Surabaya is one of the official campuses under the auspices of the Transportation Human Resources Development Agency (BPSDMP). Serves as a place to learn, train and print human resources, especially in the air matra. Especially in the aircraft engineering study program itself there is an AMTO certified by DKPPU, which has Storage 147D/010. With these offices, students become talented human resources who are competent in aircraft support to anticipate accidents.

The purpose of this portable Trolley box design is to support practice at the Surabaya Aviation Polytechnic campus which is more precise at Hangar 147D/010. With this facility, cadets become superior human resources in aircraft maintenance so that aircraft accidents do not occur. It is hoped that with this portable Trolley box, cadets can make it easier to carry out inspections and maintenance on aircraft or trainers in Hangar 147D/010. For aircraft technicians Trolley box is quite important when carrying out maintenance or inspection on the aircraft because the problems that exist if there is no Trolley can cause scattered tools, difficulty finding tools, difficulty carrying tools during maintenance or inspection, etc. This portable trolley box is expected to be used to carry tools that are often used for maintenance such as screwdrivers, hammers, wrenches, pliers, socket sets, torque wrench, meters, and other tools. The purpose of using Trolley at the time of inspection or maintenance of this aircraft is for neatly arranged tools, more security is maintained when performing maintenance, tools are easier to find, tools are easier to carry, larger capacity to carry tools.

2. METHODS

Research starts from identifying existing problems, then collecting previous research related to the manufacture of trolley. After the previous research, the next step is to make the design as desired. Furthermore, the manufacture of the tool is carried out, after the tool is completed, testing of the tool will be carried out to see whether the tool can work as designed or not. If the tool works successfully then it will be taken to analyze the test results and draw conclusions, if the tool is not in accordance with the design then repeat the method from the design / tool making section.

2.1 ENGINEERING DESIGN

Planning and development involves describing, organizing, and creating an outline or course of action from partitioned components into a cohesive and utilitarian unit. As such, the concept of planning and development involves the act of decomposing the explanations that occur into a program package and then creating or outlining the steps on a framework.

Agree with Maulani, G., Septiani, D., & Sahara, P.N. in Girsang (2018), "Planning and development includes creating and creating applications or frameworks that do not yet exist in certain institutions or protests." Planning framework points to improve an organization or company to minimize errors. Nowadays, trolleys are very instrumental in helping human activities, where people need trolleys to transport goods (Albertus Vendy Adhitiya, 2014). A trolley is a type of conveyance that is done by being manually pushed or physically done by laborers or administrators on a mechanized production line or similar company (Rizki Mashuda, 2021).

The trolley tool box serves as an instrument for storing various working devices such as torque, hammers, screwdrivers, forceps, and other instruments. When an item is damaged or needs maintenance, various devices are needed to be repaired, such as a cart that can hold various items in one place.

Drafting, also known as design, is the process of translating a concept or market need into detailed information that can be used to create a product. Product development is a very broad process that includes product design. In this design utilizes the main material of assental iron with a design size of 60cm x 35cm x 85cm with a maximum load strength of 50kg. The main material in making this tool uses S45C Assental Iron. Here is the design of the portable Trolley box tool that will be made by the author:

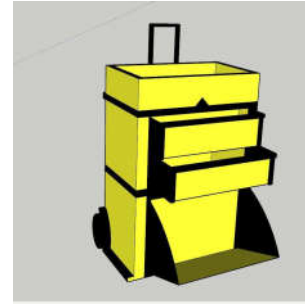


Figure 2. 1 Design

The materials and dimensions used as the design of this tool are as follows:

Material:

1. Assental Iron

Assental iron has the main advantage of being crawler-proof and also has good corrosion resistance. Besides being durable this material is also strong in bearing loads.

2. Iron Plate

This material is used as the base and also the outer layer of the main frame, of course by using different thicknesses on the base and also the outer layer.

Dimensions:

- 1) Trolley length 60cm
- 2) Trolley width 35cm
- 3) Trolley height 85cm
- 4) Handle height 55cm
- 5) Handle width 20cm

2.2 Tool Testing Technique

The folding trolley test plan for this conveyance uses loads and calculations based on material specifications. The author designed this tool with a maximum capacity of 50kg, but referring to the safety factor guidelines, the author uses 20% of the maximum capacity as a test which means using 60kg as his test. The author uses the Solidwork application to measure and test the strength of the Trolley tool. For testing the strength of the tool itself, it uses the Simulation feature available in the Solidwork application

2.3 Data Analysis Technique

Testing the device may be an important step after completing the trolley handle. The testing plan includes a particular evaluation of the framework of the tool with the items in the box. The testing plan includes taking after viewpoints:

1. Guaranteeing that the carried items coordinate the capacity of the stack.
2. Affirming that the conveyed items fit the size of the trolley.

The load capacity on it is like a portable trolley box designed to withstand a maximum load of up to 50kg or each shelf reaches 12.5kg each, according to the safety factor reference, the load that will be used on this portable Trolley box is 60kg or each shelf reaches 15kg each.

3. RESULT AND DISCUSSION

3.1 Design Result

The next step after planning a convenient tool stash trolley is to test and analyze the device. The equipment testing stage can be an important step to decide whether the designed/built instrument can be used as planned. The reason for this testing is to evaluate the adequacy of the outlined versatile tool compartment trolley, aiming for a more productive capacity.

The portable trolley box as a tool transport device was made in two stages: component manufacturing and component assembly.



Figure 3.1 Portable Trolley Box

Trolley tool testing is done to find out the components in this tool whether in accordance with the design that has been planned or not. The author uses 20% of the maximum load as a safety factor for this portable trolley box. That is by adding 20% of 50kg as the maximum load. With the formula:

$$50 + \frac{20}{100} \times 50 = 60$$

Quoted from Joseph P Vidosic and his journal Machine Design Project, safety factor is a factor used to evaluate so that the planning of machine elements is guaranteed safety with minimum dimensions... Here are the safety factor numbers:

- sf = 1.2 - 1.5: controlled conditions and working stresses can be determined with certainty
- sf = 1.5 - 2.0: known materials, load environmental conditions and stresses are fixed and can be determined easily.
- sf = 2.0 - 2.5: materials that operate on average with known load restrictions.
- sf = 2.5 - 3.0: known materials without being subjected to tests. Under average load and stress conditions.
- sf = 3.0 - 4.5: known materials. Uncertain load, stress and environmental conditions.
- Repeated loads: Number 1 to 5
- Shock loads: Number 3 - 5
- Brittle Materials: Number 2 - 5 multiplied by 2

This portable trolley box is made with a maximum strength of up to 60kg. But the load that will be applied only reaches 50kg. Then the safety factor value is:

$$\text{Safety Factor} = \frac{\text{Maximum Load}}{\text{Actual}}$$

$$\text{Safety Factor} = \frac{60\text{kg}}{50\text{kg}}$$



Figure 3. 2 Shelf Condition



Figure 3. 3 Shelf Condition



Figure 3. 4 Condition of Shelf



Figure 3. 5 Condition of Shelf 4

3.2 Discussion

Evidence of testing portable trolley box tools can carry tools and equipment with a weight that matches the strength of the box material. With a maximum weight that can be transported 60kg is expected to make it easier and more efficient for cadets to carry tools and

equipment without having to use other tools when working in the hangar.

From the test results, it can be seen that the Trolley can be used to help and store and carry tools with large dimensions and weight according to man power. This trolley can be fairly effective for carrying tools with large dimensions and weight in large enough quantities when doing maintenance.

4. CONCLUSIONS

From testing the design, the following conclusions can be drawn:

1. How to make a portable trolley box design is to make a design, prepare tools and materials, the process of cutting, forming, and welding, the painting process and the process of assembling the tool.
2. Making this design is assisted by an application called solidwork, and also sketchup. This design was made to help and facilitate the work of cadets during maintenance or inspection in the hangar.

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