

IMPROVED PART IDENTIFICATION AND REQUISITION USING 3D ILLUSTRATED PARTS CATALOGUES IN AEROSPACE AND DEFENSE

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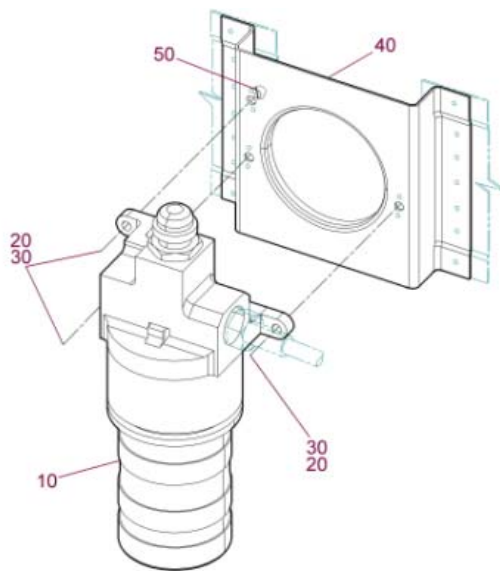
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Abstract— Part identification and requisition is being carried out in aerospace and defense using Illustrated Parts Catalogues that are in hardcopy format. This paper introduces the concept of 3D Illustrated Parts Catalogues, which are interactive allowing maintenance personnel to easily identify parts of military equipment for requisition and storage.

Keywords-Illustrated Parts Catalogue; Interactive; Simulation; Catalogue

I. INTRODUCTION

An Illustrated Parts Catalogue used to assist maintenance personnel in the identification, requisitioning, storing & issuing of parts for all types of aircraft systems. Illustrations are given in left hand side of the catalogue and the pages are even numbered.



INSTALLATION OF HP FILTER

Figure 1. IPC Illustration of HP Filter

The parts constituting the assembly illustrated are given in a tabular form on the right hand side of the catalogue and the pages are odd numbered. The details entered in tabular form are explained below.

- The part number column shows the manufacturer's part number (or the standard number)
- The nomenclature column gives the name of each part
- The quantity per assembly column indicates the quantity of a part required for the illustrated assembly

FIG/ITEM	PART NO.	NOMENCLATURE	QTY/ ASSY.
		1 2 3 4 5 6 • • • • •	
		INSTALLATION OF HIGH PRESSURE FILTER (06T-7R-0040-000-000)	REF
10	FIL-02-0001	• HIGH PRESSURE FILTER	1
		ATTACHING PARTS	
20	6X20-HS1002-GL11	• • • • • HEXAGONAL HEAD BOLT	3
30	3401A-1.5-6-12	• • • • • WASHER-PLAIN	3
40	06R-7R-1040-000-00A	• BRACKET ASSEMBLY	1
50	3381A-06	• • TWO LUGGED SELFLOCKING NUT	3
-60	HS1014-26-06	• • UNIVERSAL HEAD RIVET	6
-70	HS1006-40-10	• UNIVERSAL HEAD RIVET	10
-80	HS1006-40-12	• UNIVERSAL HEAD RIVET	4

-Item not illustrated

IPC Text Page of HP Filter

An Illustrated Parts Catalogue is organized into chapters that deal with different aircraft systems. Within these chapters are sections and within these sections are subjects. A subject consists of figures and their associated parts.

II. ILLUSTRATED PARTS CATALOGUE- FUNCTION

A. Induction

When aircraft is inducted into the armed forces, a certain percentage of parts as spares are to be procured to maintain the aircraft for a period of two or five years depending upon the

contract. The spare parts are procured as mentioned in the Illustrated Parts Catalogue.

B. In-Service

1) Equipment Depot

The procured spare parts are stored at the Equipment Depot. The Illustrated Parts Catalogue is used to identify and issue these spare parts.

2) Operating Units

During maintenance, spare parts are required. The Illustrated Parts Catalogue is used to identify these spare parts and its quantity required for requisition from Equipment Depot.

3) Base Repair Depot

Certain repairs are also carried out at the base. The Illustrated Parts Catalogue is used for identification and requisition of spare parts from Equipment Depot

III. 3D ILLUSTRATED PARTS CATALOGUE

Kristof and Satran (1995) say organizing interactive content is more than just sorting information into categories, but also includes "prioritizing" content based on what the target audience needs to know or do. In a 3D illustrated parts catalogue, the parts list table is interactive and linked to a 3D model. When a part in the list is clicked, its associated part in the 3D model is highlighted and vice-versa. The 3D model can also be rotated, zoomed and panned to understand its individual parts. When the mouse is moved over an individual part represented in the 3D model, its information in terms of part number and nomenclature can be displayed. Interaction and interactivity are fundamental to all dynamic systems, particularly those involving people (Jong, Ton, Sarti, Luigi, 1993). An animation can be created showing the object being disassembled and revealing its individual parts. "Computer simulation affords teachers and instructional designers a powerful tool for sustaining knowledge retention and transfer" (Bill, 2001, p. 5).

The objectives of using 3D Illustrated Parts catalogues are to reduce the time spent in part identification and requisition by 30% or more.

IV. CASE STUDIES

A case study was carried to find out the time taken for part identification and requisition of the following assemblies on an aircraft using a 3D Illustrated Parts Catalogue as compared to a hardcopy publication

A. Brake Control Valve-2

Brake Control Valve is a part of the Hydraulic System. The brake control valve is used to control the hydraulic fluid pressure supply to the brake units. It is used during parking and emergency braking.

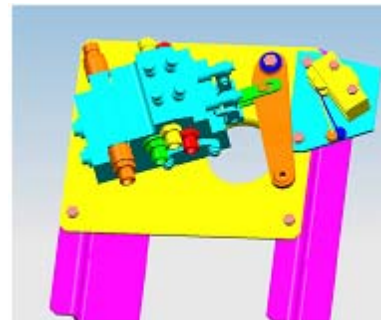


Figure 3. Brake Control Valve

B. Anti-Skid Control Unit

Antiskid Controller Unit is a part of Landing Gear System. The Antiskid Controller Unit (ACU) is used to avoid tyres from skidding during landing. This unit is activated when the landing gear is extended. It is mainly used to maintain the directional stability of the aircraft. When one wheel exceeds the speed of the other, it releases the brake of the wheel that is slow.

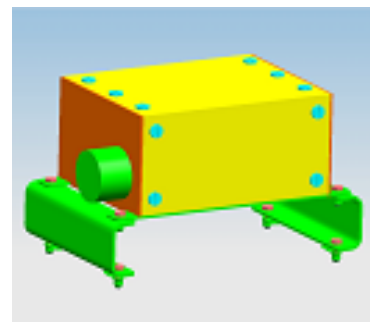


Figure 4. Antiskid Controller Unit

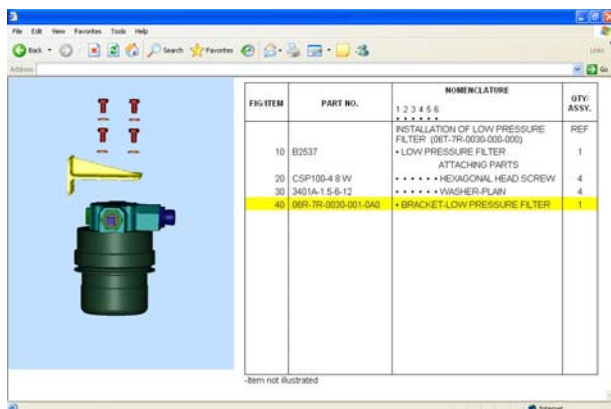


Figure 2. 3D Illustrated Parts Catalogue

C. Emergency Oxygen Unit and Cylinders of Oxygen Unit

Emergency Oxygen Unit And Cylinders Of Oxygen Unit belongs to the Life Support System. The emergency oxygen

system supplies oxygen when main oxygen system fails and during ejection. It consists of a cylinder installed behind the ejection seat.



Figure 5. Emergency Oxygen Unit and Cylinders of Oxygen Unit

D. Cabin Sealing

Cabin Sealing is a part of Environmental Control System. The cabin sealing system prevents pressure leakages and maintains pressurization in the cockpit at all flight conditions. This is achieved using an inflatable canopy silicon rubber pressure seal. The seal is installed around canopy arch, side frames and across canopy deck.



Figure 6. Cabin Sealing

E. Windscreen

Windscreen is a part of Fuselage. Windscreen gives visibility to the pilot. The windscreen bubble is attached to the frame and a rubber strip is provided in-between the bubble and the frame for sealing. The windscreen is designed to withstand the cabin pressurization, temperature variation and collision at certain speed.

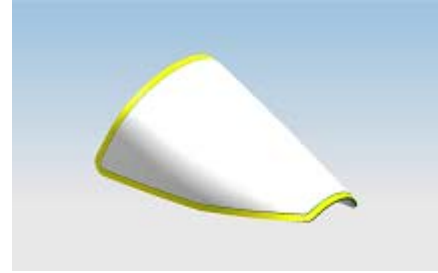


Figure 7. Windscreen

TABLE I. PART IDENTIFICATION USING HARDCOPY AND 3D ILLUSTRATED PARTS CATALOGUE

<i>Installation</i>	<i>Part identification using hardcopy</i>	<i>Part identification using 3D Illustrated Parts Catalogue</i>
Brake Control Valve-2	35 minutes	24 minutes
Anti-Skid Control Unit	29 minutes	20 minutes
Emergency Oxygen Unit and Cylinders of Oxygen Unit	33 minutes	21 minutes
Cabin Sealing	28 minutes	19 minutes
Windscreen	30 minutes	21 minutes

V. CONCLUSION

Collection and analysis of metrics demonstrates that the use of 3D Illustrated Parts Catalogues reduces the time spent in part identification by 30% or more allowing easy identification, requisitioning, storing & issuing of parts for all types of aircraft systems.

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