Work in Progress Monitoring System

PROJECT REPORT

Dissertation Submitted in partial fulfilment of the requirements for the Degree of

MASTER OF COMPUTER APPLICATIONS

of the Bharathiar University

By

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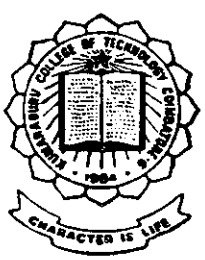

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Kumaraguru College of Technology

COIMBATORE - 641 006.

JUNE 1997

Certificate

This is to certify that this project work entitled

"Work In Progress Monitoring System"

Submitted to

KUMARAGURU COLEGE OF TECHNOLOGY
(Affiliated to Bharathiar University)

in partial fulfilment of the requirments for the award of Degree of
MASTER OF COMPUTER APPLICATIONS
is record of original work done by

Mr. BIJU PUTHENKANDAM,
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during his period of study in the Department of Computer Science and Engineering, Kumaraguru College of Technology, Coimbatore-641006, under my supervision and guidance and this project work has not formed the basis for the award of any Degree/Deploma/Associateship/Fellowship or similar title to any candidate of any university.

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Staff-in-Charge

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CERTIFICATE

This is to certify that the project entitled ***WORK IN PROGRESS MONITORING SYSTEM (WIP)*** *for Overhaul Division, Hindustan Aeronautics Limited, Bangalore done by* ***BIJU PUTHENKANDAM****, submitted in partial fulfilment of requirements of* ***Master of Computer Applications*** *degree has been carried out in our organisation under our supervision from December'96 to May'97 for a period of six months.*

Due to confidentiality of the information pertaining to the project the student is not permitted to take the Source Code and Database outside our Organisation.

We wish him success in all his future endeavours.

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My Uncle, ***Mr. P.A. Scaria*** *, was an ardent cheerleader, supporter and friend thoughout the project. His contributions show in many subt le ways and were indeed instrumental in achieving final results.*

Biju Puthenkandam

SYNOPSIS

The basic objectives of manufacturing is said to be cost, quantity, and schedule. The way in which product flows through the manufacturing process can have a significant effect on productivity and cost. Work In Progress is the amount of products currently located in the factory that is either being processed or in between processing operations. Proper maintenance of the system can avoid significant fluctuations in production schedule, bottlenecks at certain operations, inconsistent utilization of equipment and labour, and large amounts of WIP.

The Work In Progress Monitoring System basically deals with the progress of the Inter Factory Demand / Aircraft On Ground rotables, and Line Aircraft rotables. Two agencies Accessories progress and Airframe progress are involved in overhaul process. The different stages of rotables of Accessories progress and Airframe progress are captured. This system can reduce inventory, save space, and avoid production bottlenecks.

The reports generated by the system can be categorized into aircraft numberwise and rotable part numberwise. The system has got the capability to generate standard reports to facilitate the management to take timely decisions and to get current status of WIP.

The system is menu driven and is very user friendly. The system has been tested with various sets of input data and has been found to be working excellently.

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1. INTRODUCTION

1.1 ORGANISATION PROFILE

In December 1940, a far-sighted industrialist late Walchand Hirachand set up a company called Hindustan Aircraft Limited in association with the Government of Mysore. The company was registered on 23rd December, 1940 as a private limited Company with an authorised capital of Rs. Four Crores. The production line was established in collaboration with the International Aircraft Company of U. S. A for the manufacture of Harlow Trainer, Curtiss Hawk Fighter and Vultee Bomber. The first flight of the Harlow Trainer took place on 17th July, 1941. HAL became the principal overhaul base for the South East Asia command of the Allied Forces in the Second World War. At the end of the Second World War, Government of India took over the management of HAL and it was rechristened as Hindustan Aeronautics Limited.

With the dawn of independence, HAL refined its objectives to work as an instrument of the national policy of achieving self-reliance and took up design and development of aircraft and aeronautical equipment with licence production.

HAL is an organisation where integrated air borne weapon platforms are developed, manufactured and serviced. It is one of the few corporate giants in Asia whose capabilities span the entire range of activity from product conception to after sails support. HAL is also involved in the manufacture and

assembly of system for India's Space Programme. Since the company was found, it has produced over 3000 aircraft and overhauled over 5600 aircrafts.

HAL is a leading public sector organisation coming under the Defence Ministry of India. HAL is engaged in the manufacturing, designing and overhauling of variety of products from basic trainer aircrafts to highly sophisticated aircrafts, their power plants, avionics and aerospace products.

Over the years HAL grew into a high technology vertically integrated aeronautical industry with twelve manufacturing divisions and a Design & Development complex with a capability of design, manufacture and overhaul of aircrafts, helicopters, engines and wide range of accessories and avionics.

The technological base of HAL is also used to play a significant path in its diversification and growth. A variety of complex castings, forging and machined parts made in HAL are used in diesel locomotives naval frigates, earth movers and armoured vehicles. A wide variety of precision items, equipments and assemblies are exported by HAL to leading aircraft and airborne equipment manufactures in the U. K, France, Canada, U. S. A and the C. I. S.

Core business of the company is manufacture, maintenance, repair and overhaul of fighter, transport, trainer aircraft, helicopters, aeroengines, avionics, accessories, ground support equipment manufacture of structural components for satellites and launch vehicles, software development for aerospace applications.

Today **HAL is the largest Aerospace complex in Asia and the fourth largest aircraft manufacturer in the World**. It plays a crucial role in India's ambitious plans for broad based industrialisation, with growing emphasis on not only self-reliance in defence production, but also to become an international partner in Civil Aircraft Manufacturing and Maintenance. HAL has four complexes. They are:

- **Design Complex**
- **Bangalore Complex**
- **Accessories Complex**
- **MIG Complex**

The Design Complex and Bangalore Complex are located at Bangalore. The Accessories Complex is located at Lucknow, Korwa, Hyderabad and Kanpur. The MIG Complex is situated in Nasik and Koraput. In addition HAL has liaison offices in New Delhi, Mumbai, Chennai, Vishakapatanam, Moscow and London.

In Bangalore HAL has its registered office, its corporate office and two Complexes - the Bangalore Complex and the Design Complex.

The Bangalore Complex has seven Divisions. They are:

- **Services Division**
- **Aircraft Division**
- **Foundry & Forge Division**
- **Engines Division**

- **Helicopter Division**
- **Aerospace Division**
- **Overhaul Division**

At the Bangalore Complex, the following works are carried out:

- **Aircraft Manufacturing**
- **Overhauling**
- **Engine Manufacturing**
- **Helicopter Designing, Manufacturing and Overhauling**
- **Manufacturing of Casting and Forging**
- **Manufacturing of Aerospace Structure**
- **Developing software for in-house and turnkey project.**

HAL has set up a 100% EOU in collaboration with British Aerospace-BAe HAL Software Private Limited, with its head office and development centre at Bangalore. It will also be launching another joint venture company at Bangalore and some other places of India for the repair and maintenance of the aircrafts of all the Private Air Taxi operators currently operating in India.

1.2 ABOUT THE OVERHAUL PROCESS

Hindustan Aeronautics Limited, Bangalore Manufactures and Overhauls the JAGUAR and KIRAN aircraft's, while the MIRAGE-2000 series of aircraft have been imported from Dassault Aviation, France. Each one of these aircraft's have a set of manuals which are supplied by the respective manufacturer. These manuals contains information pertaining to all the

serviceable parts of the aircraft All these documents are used to carry out the Major servicing or Overhaul. Each and every rotable of the aircraft is removed and serviced according to the specification outlined in the manuals. The aircraft is given a new lease of life after overhaul.

1.3 SYSTEM OVERVIEW

1.3.1 ABOUT MRP & MRP-II

Material Requirements Planning (MAP) has been an evolving concept in planning and control of operations in manufacturing firms. Its early application in 1960 was a bill of material explosion technique for determining the time phased requirements for individual products and as a method for launching, manufacturing and purchase orders into actual production. The concept of MRP later shifted from that of inventory to scheduling. The closed loop MRP system provides a means of monitoring and obtaining feedbacks from manufacturing and purchasing operations in order to ensure that the manufacturing plans are in fact, being implemented.

The evolution of MRP system has continued in 1980's, to encompass a broad range of planning and control functions in manufacturing, beginning with the development of an integrated set of marketing, financial and manufacturing plans at a executive level. Next is the implementation of these plans at a detailed level in manufacturing i.e. in the plant and at vendors. This view of MRP system increasingly being referred to as Manufacturing Resource Planning (MRP II), involves the use of a formal system for planning and

controlling manufacturing operations. Such system includes a manufacturing database, procedures for updating the database to reflect the actual status of operations, and other computer software to aid in both the development and manufacturing plants and their way in day to day execution.

This is used as a tool to make valid schedules. A set of tools to enable management to control cash-flow, inventories, labour and material purchases. Tools to support marketing better and provide far more useful financial information, tools that enable companies to reduce inventories, improve customer service and overall productivity.

MRP, called "**Material Requirements Planning**" was originally used as an ordering technique. Before Computer come along, ordering was all the inventory people could do. The "Order Launched", when the computer came along they used it to mechanise the ordering.

MRP II is a game plan for monitoring and planning all the resources of a manufacturing company:

- **Manufacturing**
- **Marketing**
- **Finance**
- **Engineering**

It involves using a closed-loop MRP system to generate financial figures. It is literally a simulation of a manufacturing business. They can be used to schedule the factory, schedule vendors, plan requirements for new

equipments more accurately further into the future with more capacity of testing various plans.

MRP II is a set of tools that enables management to run a manufacturing business far more professionally. The system itself is just a simple set of logical techniques that the massive data manipulation capability of the company has made practical. This is also called as "Management Resource Planning" or "Business Resource Planning". It is not a planning that applies to a theoretical agency or a real estate business, but it applies to manufacturing business. The benefits of MRP-II are

- **Reduce inventory**
- **Improved customer service**
- **Improved direct labour productivity**
- **Reduced purchase costs**
- **Reduced traffic costs**
- **Reduced obsolescence**
- **Reduced over-time**
- **Having accountability throughout the organisation**
- **Improved quality of life**

At present MRP-II can be applied economically in companies doing two millions or more in sales, because of the low cost of some of the components hardware and software that is available. The best environment in these companies will be beyond their expectations. MRP which started out ten years ago as a better way to order material, has evolved into MRP-II.

MRP-II is a total company-wide system. It is a way to get all people in the same company working to the same game plan. So to be more precise, it is team work. A company can now plan material, capacity, finance, marketing strategies etc., all with the same system. Above all, these things can be stimulated to provide the management of the company with real planning capability.

1.3.2 ABOUT HAL INTEGRATED PRODUCTION SYSTEM (HI - PRODUCTS)

HAL Integrated System is a range of software products developed and implemented at HAL, Bangalore Complex to achieve integrated production planning, control and materials management in a diverse production environment and different hardware/software platforms. HAL is now offering this system and expertise to manufacturing industries.

HI-PRODUCTS' range of software comprise three main modules viz. **PRIME, COSMOS** and **IMPACT**. The product is in use by blue collared workmen as well as all level of executives.

CAPABILITIES :

- **Creates and maintains product defining data (Process Sheets).**
- **Generates and maintains Gross and Net requirements of parts and materials.**
- **Schedules and monitors parts of the Shop Floor throughout the cycle.**

- Material planning, Provisioning and Control activities integrated with above.
- Tools Scheduling and Monitoring in phase with component manufacturing.

HIGHLIGHTS :

- Universally applicable where products are assembled from constituent parts in a family tree arrangement.
- Customisation to specific industry is easily accomplished.

BENEFITS :

- Facility for constant review of target versus with the help of day-to-day updated information at all levels
- Assembly shortages drastically reduced
- Dynamic material provisioning system to avoid panic situations for procurement.
- Provides a powerful tool for reviewing adequacy of inventory.
- Improved capacity utilisation.

PRIME(Product Information Management and Engineering control)

PRIME comprises of five interacting sub-modules.

MDP - Master Data Processor

BOM - Bill Of Material processor

PCE - Product Cost Estimation

SDG - Shop Document Generator

WLS - Work Load Simulator processor

PRIME masterminds the creation of maintenance of product data with standard reporting and bill of materials such as "Where used list" and "Exploded bill of materials", "Material Summaries". It facilitates build up of product cost from its constituent element with audit trials of scrutiny.

COSMOS(Component Scheduling and Monitoring System)

COSMOS comprises of five sub modules.

PPRS - Planned Parts Requirements System

WIP - Work In Progress monitoring system

ORP - ORder Processing system

CAPS - CApacity Planning System

TMS - Tool Monitoring System

SFM - Shop Floor Management system

COSMOS generates component schedules dynamically taking delivery schedules, leads times and WIP data. It provides pre/post launch hold up reports for monitoring and controlling at all the stages of production. It facilitates order releases in due date sequence after checking availability of materials and tools. It provides comprehensive MIS for production reviews.

IMPACT(Integrated Material Planning, Provisioning, Accounting and Control)

IMPACT comprises of the following sub-modules.

MPAC - Material Provisioning And Control

STAC - STore Accounting system

POPS - Purchase Order Progression System

SCON - Stock CONtrol System

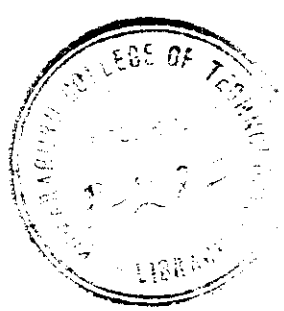
SLIM - Shelf Life Item Monitoring system

COMA - Common Material system

EDAM - Expected Data Availability of Materials

ADEQUACY - Excess/Shortage highlights.

IMPACT covers material planning, indenting, receipts, consumption and accounting. It reviews status at periodic intervals to help in maintaining optimal inventory levels and reduces production holdups.



1.4 About Work In Progress Monitoring System (WIP)

WIP is the amount of products currently located in the factory that is either being processed or in between processing operations. WIP is inventory that is in the state of being transformed from raw materials to finished products.

Work in progress system basically deals with the progress of the RMS/IFD/AOG rotable, and the Line Aircraft Rotables. The different stages of rotable in Airframe Progress and Accessories Progress are captured.

The major assemblies for overhauling of aircraft are called Rotables, and other detailed parts are called structured item, which are directly fitted on the aircraft.

Rotables are of 2 types

1. **Mandatory rotables**:

These rotable have to be serviced/replaced everytime ar aircraft come for overhaul.

2. **Non-Mandatory rotables**:

These have to be serviced depending on their condition.

When an aircraft comes for servicing ,a sale order is generated which is converted into workorders . For each rotable a work order is generated. For each work ordernо the first seven digits represents work order for the aircraft and last three digits are the job card numbers. An inspection of the aircraft and its parts is carried out by inspectors and a check list of the inventory is prepared. This checklist consists of the description of the parts, deficient and surplus details. This checklist is signed by the **HAL** inspector, customer's

inspector (**CRI**) and the pilot. Then the dismantling process begins. Job tickets are issued and a schedule is given for dismantling . After the dismantling process. **PDO** (Parts disposition order) is raised by Inspection. Two agencies **Airframe Progress** and **Accessories Progress** are involved in overhaul. The structural items are repaired by airframe and rotables are identified by unit serial no edged on the instrument and they are always unique. The **PDO** and the parts are sent to Airframe progress from Inspection. From progress these are sent to planning where job card, route card and **MR(Material Requisition)** are raised/issued. The **MRs**, are raised for mandatory parts and these are sent to Material planning (**MPO**).

MR :- consists of workorder number, part number, part name, MR number, pslno (process serial number)

Job card :- workorder number, pslno, partno, part name, details of operation.

Route card :- workorder number, partno, part name, pdono, type of service,operation, sequence, dept, work centre, operation code, start date, completion date.

After clearing the **MR**, they are sent back to planning by **MPO**. The **MR**, job card and route card are sent to progress which send there documents along with the **PDO** to accessories progress. A presurvey is conducted at airframe shop on all systems of aircraft, including structure conditions. Job cards are issued and reconditioning, if necessary is carried out .

In accessories progress, the **MR** are sent to stores and the material are collected. These along with the parts are sent to the shop . During repair , if

some parts are found to be in need of repair or they need to be replaced, then a parts requisition (**PR**) is raised for these non mandatory parts by the shop and sent to **MPO.** Consumables are also included. Once the rotables are serviced, they are given back to accessories progress who send them to airframe progress along with **F530** tags. There rotable are subjected to inspection by the inspectors before installation. This stage is called the equipping stage. Once these parts are installed on the aircraft,they are again inspected by **HAL** inspectors and the customer's inspector (**CRI**) . Flight tests are carried out and subject to the performance of the parts and the aircraft as a whole, the aircraft is signalled ready for collection by the customer.

2. SYSTEM ENVIRONMENT

The Computer System :

Software Requirements :

Operating Environment	:	HP-UX 9.0
RDBMS Package	:	Oracle V 7.0 Tools
		SQL * Plus V 2.0
		SQL* Forms V3.0
		SQL* Menu V5.0
		SQL* Reportwriter V1.1
		PL/SQL V2.0
		PRO * C
		PRO * COBOL

Hardware Requirements :

Hardware	:	HP-9000/807(G30)
Processor	:	68030
Clock Speed	:	48 MHz
Memory (RAM)	:	16 MB
Disk Space	:	300 MB * 3
Terminals	:	Minimum 2 NOs.
Cartridge Tape Drive	:	525 MB (ONE)
Spool Tape Drive	:	1600 BPI (ONE)
Printer	:	900 LPM Line Printer

HARDWARE :

CPU	: HP-PA RISC CPU
	@ 48 MHz
Cache	: 128 KB
Floating Point Processor	: 1 NO
RAM	: 64 MB
Mass Storage	: 1*2 GB
	: 1*2 GB TOTAL : 4GB
SCSI Controllers	: 2 NOs
Cartridge Tape Drive(CTD) 525 M	: 1 NO.
Digital Audio Tape Drive(DAT) 2G	: 1 NO.
Spool Tape Drive(STD) 1600 BPI	: 1 NO.
Line Printer 900 LPM	: 2 NOs.
Console	: 1 NO.
Terminals	: 32 NOs.
1.2 MB Floppy Disk Drive (Thru PC/AT)	: 1 NO.
Ethernet LAN Interface	: 1 NO.

The System Developed Under:

HCL-HP 9000 System Configuration :

System : HP-9000/807(G30) 64 Users

SOFTWARE :

Operating System

HP-UX 9.0
PC-Link
COBOL Compiler
C / ANSI-C Compiler
Ethernet S/W TCP/IP
Super Sort/Merge

Oracle V 7.0 Engine With The Following :

- Export / Import
- SQL * Loader
- TPO (Transaction Processing Operation)
- PL/SQL
- SQL * Net
- SQL * Plus
- SQL * Forms
- SQL * Report Writer
- SQL * Menu
- PRO * C
- PRO * COBOL

THE OPERATING SYSTEM (HP-UX)

The HCL-HP 9000 system uses the HP-UX (ULTRIX) V9.0 operating system which is the HCL-HP version of UNIX. ULTRIX represents improvisation and innovation in the face of need. The HP-UX system is a time sharing system. HP-UX is not structured as a single user OS program. It is a modular integrated set of software.

The HP-UX system serves as an interactive interface between the user and the computer system. The use of software tools instead of single large program distinguishes the HP-UX system from other systems. The HP-UX is a combination of an OS program, utilities and specialised applications that works together to provide an time sharing system that allows multitasking. It differs from other systems in that it has a smaller kernel and relies on utilities to do most of the work.

Salient Features Of Hp-Ux Operating System :

- Multi-user, Multitasking, Communication capabilities
- Hierarchical file structure
- Portability
- Text processing and Documentation aids
- Compiler construction aids
- I/O Independence
- I/O Redirection and Piping capability
- Modular Design
- Increased productivity

3. SYSTEM STUDY AND ANALYSIS

3.1 NEED FOR THE SYSTEM

The basic objectives of manufacturing is said to be cost quantity and schedule. The way in which product flows through the manufacturing process can have a significant effect on productivity and cost. Many manufacturing operations have characteristics such as

* Significant fluctuations in production schedules.
* Bottlenecks at certain operations.
* Inconsistent utilisation of equipment and labour.
* Large amounts of WIP.

These create inefficiencies that can result in the need for more labour and equipment than should be necessary to produce large amount for product required. If ways could be found to have the product flow smoothly and continuously, the process would operate more effectively. Hence need for a new system arises.

3.2 EXISTING SYSTEM

The existing system is a manual system. Various activities that comes under WIP such as Air frame progress and Accessories progress etc. are carried out in manual way. During the various stages of implementation more than 10,000 employees are involved in different domains of WIP. The various process involved in this system are time consuming, labour intensive and in

addition to the above mentioned it is vulnerable to loss of valuable data due to vagaries of nature, theft, and insects like silver fish.

Limitations of the Existing system

It is very difficult to upgrade the system to meet the growing needs of the manager. On-line enquiries are not possible which is very vital for the managers to monitor current status of the system. The existing system is found to be inadequate for timely reports about different status of manufacturing. And also it is found to be error prone, time consuming, expensive, repetitive and difficult to manage.

Also, since the data captured in this module is to be passed to various other modules, an on-line computerisation is necessary. Keeping all these limitations in mind the system is developed accordingly.

3.3 PROPOSED SYSTEM

The proposed system is an on-line computerised system which saves time and gives up to the minute information. Various on-line enquiries and reports are to be produced which helps the management to take timely decisions. The method which have been successfully implemented is **WIP Monitoring System.**

WIP Monitoring System

If work is allowed to move to the next process step regardless of conditions at that step, WIP will eventually build up in front of the steps that have the slowest throughput or are experiencing problems. This is some times

referred to as **"Push" system**, since the product flow is based on pushing the work through the line without regard to the situations ahead of it. On the other hand, if the work is not allowed to move until it is needed at the next step(this could be based on minimum "buffer" requirement), then excessive build ups can be prevented. This can **reduce inventory, save space, and avoid production bottle necks**. Such an approach to controlling WIP is some times called **"Pull" system.**

Advantages of the Proposed system

* Eliminating duplicate and unnecessary efforts.
* Reducing errors.
* Increasing the speed of information interchange.
* Providing more information than was previously.
* Improving the control of data.
* Preventing the use of outdated information.

3.4 SELECTION OF THE SOFTWARE :

One of the option available for computerisation would be to have a stand alone system. But this would be wasteful of the resources. The other option is to have an integrated system where the data flows from one module to another. Hence for this project an **integrated system on UNIX environment** is chosen due to its features like multi-user operations, portability, etc..

ORACLE Relational Data Base Management System provides an array of tools like SQL * Plus, SQL * Forms, PL/SQL, SQL * Reportwriter, SQL * Menu, Pro * C, Pro * COBOL , etc.. which helps the user to develop

applications with relative ease. The special features of ORACLE make its technically superior, flexible and portable. Hence **ORACLE ON UNIX OPERATING SYSTEM** is chosen for our project.

4. SYSTEM DESIGN

4. 1 DESIGN METHODOLOGY AND DEVELOPMENT

The design is a solution - the translation of requirements into ways of meeting them. The design will determine success of the system. The system design is the last phase that indicates the final system and the process of the file system. In the design phase of WIP, the database tables ,input screen design and output record design etc. are designed.

The WIP monitoring system consists of two sub modules - **Airframe Progress** and **Accessories Progress.** Each module has a password and is divided into further three sub modules : **Data Entry, Reports, and Enquiry.**

4.2 INPUT DESIGN

DATA ENTRY

Data entry comes under input design. The input design is the link that ties information system into the world of its users. Input design consists of developing specification and procedures for data preparation, steps necessary to put transaction data in a form that is usable for computer processing.

Main objectives that are guiding us in the design of input stage are

Controlling the amount of inputs.

Avoiding inordinate delay

Controlling errors

User friendly screen format can reduce the burden on end users , who are not highly proficient in computers .An important step in input design

stage is the design of source document. Source document is the form on which data are initially captured . Once the details pertaining to the data, that should be included are elicited ,next step is the design of document lay out. The layout organizes the document by placing important information where it will be noticed and establishing the appropriate sequence of item. The strategies adopted here in designing the data entry forms are in such a way that , it is possible for the user to provide information by following a logical sequence. Main features incorporated in the designing of important forms are ability to delete and modify the existing data and addition of new information.

Customized messages are given in place of system messages , while data manipulation is being carried out. Enforcing integrity constraints , data validation procedures are done in such a way that end user is free from such daily chores.

Data Entry module consists of four sections

Aircraft Number wise

Rotable Part number wise

Engine Details

Rotable Master Manipulation

Aircraft Number wise

In overhaul shop, the company undertakes repairing and maintenance of various aircrafts like Kiran, Jaguar, Mirage etc. During overhaul process the company dismantles the aircraft into various parts. In order to keep track of various components and sub components we have to adopt a

systematic approach. Through this screen we can input various details such as Rotable part number , Unit serial number, job card number Process serial number etc. of different rotables of an aircraft.

Rotable Part number wise

In overhaul shop at a time, it has got a number of aircrafts of same kind at various stages of servicing. All aircrafts of same kind are having same type of rotable parts. Using this screen we can insert various details regarding a particular rotable part number for different aircrafts of same type.

Engine Details

Through this screen we can insert general information of an aircraft such as work order number, Engine serial number, drop tank number etc.

Rotable Master Manipulation

Using the previous screens we have entered basic information regarding rotable parts. Through this screen we can enter, update delete and view detailed information of rotables.

4.3. OUTPUT DESIGN

REPORTS

The system has got the capability to generate standard reports to facilitate the management to take timely decisions and also for the management to get the current status of WIP inventory. The reports produced by the system are found to be legible and meet the current requirements of the management

We can categorize the standard reports generated by the system into two types:

Aircraft number wise

Rotable Part number wise.

Aircraft number wise reports includes the following :

Pending PDOs.

Gives description about pending Parts Disposition Orders in workshop.

Pending MRS.

Gives description about Material Requisition that are found pending in the workshop.

Pending Job cards.

Gives description about pending job cards

Depending on type of service

This reports contains all information about aircrafts depending on their type of service.

Master list of Rotables

This gives the information about rotable part number in the following categories.

Aircraft number wise

System code wise.

Project code wise.

Rotable Part number wise reports involves :

Pending PDOs

Pending MRs.

Pending Job cards.

Enquiry

Enquiries are designed for query purpose. All the data are queried from related tables. The data are not affected by queries as functions like insertion, deletion, modification, etc. cannot be performed.

The main enquiries of the WIP system are as follows:

WPT Enquiry

Rotable Master Enquiry

WPT Enquiry deals with Work in Progress Master file which contains various information like aircraft no.,Unit serial no.F530 tags type of service etc.

Rotable master enquiry deals with rotable master file which contains information like aircraft no., rotable partno, process serial number, job card number .

4.4 DATA BASE DESIGN

The key to integrate an automated design system with an automated manufaturing process is a well structured common database. Both development and manufaturing rely on the frequent use of large amounts of information throughout the process, from the initial design of a product to its production. Without a common database to share information, data must be recreated and reinterpreted at every stage of this process. Such duplicated effort can be avoided by organising and storing the information needed by development and manufaturing in a common database.

The basic functions involved in a database system related to the information required by its users are :

* Defining the data
* Inputting the data.
* Locating the data.
* Accessing the data.
* Communicating the data.
* Revising the data.

While producing the reports, different database tables are joined using the fields contained in them to retreive the necessary information.

In database design, several objectives are considered such as

* Control of data integrity.
* Control of redundancy.
* Control of data secuirity.
* Data independence.
* Data storage protection.

* System performance.
* System functions.
* System compatability.

The Data Dictionary is included in the Appendix

4.5 SCREEN DESIGN

The current trend in software industry is user friendlyness and user flexibility. The two main factors contributing towards this are screens and menus. The screens in WIP are designed so as to provide appropriate help messages and error messsages to direct the user while using the system. The screen formats are user friendly and are interactive in nature. The screen size is standardised.

In situations where fast and accurate responses are required, enquiry facilities whoes output on the screen is desgned. The terminal offers greater speed and secuirity, and it also avoids the cost of daily printing and distribution of listings. Enquiry screens developed for WIP module are included in the Appendix.

TESTING AND IMPLEMENTATION

The implementation is the final and important phase. It involves user training, system testing and successful running of the developed proposed system. The developed system is tested by the user and changes are made according to their needs. The testing phase involves the testing of developed system using various kinds of data.

An elaborate testing of data is prepared and the system is tested using that test data. While testing, errors are noted and corrections are made. The corrections are also noted for future use. The users are trained to operate the developed system. Both the hardware and software securities are made to run the developed system successfully in future.

TESTING

System testing is the stage of implementation which is aimed at ensuring that the system works accurately and efficiently before live operation commences. Testing is vital to the success of the system. System testing makes a logical assumption that if all the parts of the system are correct, the goal will be successfully achieved. The candidate system is subject to a variety of tests: on line response, volume, stress, recovery and security and usability tests. A series of tests are performed for the proposed system before the system is ready for user acceptance testing.

The testing steps are :-

* Unit Testing
* Integration Testing
* Validation

- ❋ Output Testing
- ❋ User Acceptance Testing

❋ Unit Testing :

Unit testing focuses verification efforts on the smallest unit of software design of the module. This is also known as "Module Testing". The modules of the WIP are tested separately. This testing was carried out during programming stage itself. In this testing step, each module is found to be working satisfactorily as regards to the expected output from the module.

❋ Integration Testing :

Data can be lost across an interface ; one module can have an adverse effect on another ; subfunctions, when combined, may not produce the desired major functions. Integration Testing is a systematic testing for constructing the program structure, while at the same time conducting tests to uncover errors associated within the interface. The objective is to take unit tested modules and build a program structure. All the modules are combined and tested as a whole. Here correction is difficult because the isolation of causes is complicated by the vast expanses of the entire program Thus in the integration testing step, all the errors uncovered are corrected for the next testing steps.

❋ Validation Testing :

At the culmination of integration testing, software is completely assembled as a package, interfacing errors have been uncovered and corrected and a final series of software tests validation tests begin. Validation testing can be defined in many ways, but a simple definition is that validation

succeeds when the software functions in a manner that can be reasonably expected by the customer. After validation test has been conducted, one of two possible conditions exist.

(i) The function or performance characteristics conform to specifications and are accepted.

(ii) A deviation from specification is uncovered and a deficiency list is created .

Proposed system under consideration has been tested by using validation testing and found to be working satisfactorily.

*** Output Testing :**

After performing the validation testing, the next step is output testing of the proposed system, since no system could be useful if it does not produce the required output in the specific format. The output generated or displayed by the system under consideration are tested by asking the users about the format required by them. Here, the output format is considered in two ways. One is on screen and another is printed format. The output format on the screen is found to be correct as the format was designed in the system design phase according to the user needs. For the hard copy also, the output comes out as the specified requirements by the user. Hence output testing has not resulted in any correction in the system.

*** User Acceptance Testing :**

User acceptance of a system is the key factor for the success of any system. The system under consideration is tested for user acceptance by

constantly keeping in touch with the prospective system users at time of developing and making changes wherever required.

This is done in regard to the following point :

* Input screen design
* Output screen design
* On-line message to guide the user
* Menu driven system
* Format of ad-hoc reports and other outputs

TEST DATA :

The above testing is done by taking various kinds of test data. Preparation of test data plays a vital role in the system testing. After preparing the test data the system under study is tested using that test data. While testing the system by using test data, errors are again uncovered and corrected by using above testing steps and corrections are also noted for future use

USER TRAINING :

After the system is implemented successfully, training of the user is one of the most important sub tasks of the developer. For the purpose user system manuals are prepared and handed over to the user to operate the developed system. Here the users are trained to operate the developed system. Both the hardware and software securities are made to run the developed systems successfully in future.

IMPLEMENTATION :

Implementation is the process of converting a new or revised system design into an operational one. It is the key stage in achieving a successful new system because, usually it involves a lot of upheaval in the user department. It must therefore be carefully planned and controlled. Apart from planning, the two major tasks of preparing for implementation are education and training of users and testing of the system. Education of users should really have taken place much earlier in the project when they were being involved in the investigation and design work. Training has to been given to the staff regarding the new system. Once staff has been trained, the system can be succesfully implemented.

SYSTEM SECURITY

SECURITY is a critical stage in system development. Every candidate system must provide built-in features for security and integrity of data. Without safeguards against unauthorised access, fraud, embezzlement, fire and natural disasters, a system could be so vulnerable as to threaten the survival of the organisation.

To do an adequate job on security, the risks, exposure, costs and specific measures such as passwords should be analysed to provide protection. In addition, backup copies of software and recovery restart procedures must be available when needed.

The amount of PROTECTION depends on the sensitivity of the data, the reliability of the user and the complexity of the system. The motives behind security are to keep the organisation running, protect data as an asset and seek management support for more installations.

THREATS TO SYSTEM SECURITY :

The list of potential threats are :

- **Errors and omissions**
- **Disgruntled and dishonest employees**
- **Fire**
- **Natural disasters**
- **External attack**

SYSTEM SECURITY MEASURES

After system security risks have been evaluated, the next step is to select security measures.

The measures are :

* IDENTIFICATION
* ACCESS CONTROL
* AUDIT CONTROL
* SYSTEM INTEGRITY

IDENTIFICATION :

It is scheme for identifying persons to the systems based on "Something you know" such as a password or a picture badge, "Something you are" such as a finger print or voice print or "Something you have" such as a credit card, key or special terminal.

ACCESS CONTROL :

Controlling access to the computer facility is secured through encoded cards or similar devices. Encryption prevents intruders from accessing data by scrambling messages across telephones to their destination.

AUDIT CONTROLS :

Auditing must be supported at all levels of management. Audit controls protect a system form external security breaches and internal fraud or

embezzlement. Various software programs are available to help in the audit function.

SYSTEM INTEGRITY :

This line of defence safe guard the functioning of hardware, software, physical security and operating procedures. Proper backup of hardware and software are extremely important.

7. CONCLUSION

The Work In Progress Monitoring System (WIP) has been developed for the present requirements. On-line computerization of activities that is being carried out in Overhaul Division have been necessitated by increasing volumes and complex nature of the information that is to be processed.

On-line information gives the manager ,flexibility to act decisively and in time. The developed system has to a good extent succeeded in rectifying the problems, that are present in the existing system.

Reports generated with live data have proved to be informative. The system can be further enhanced to accommodate a host of features, t hat are currently not included in the system.

The newly developed system consumes less processing time and productivity is increased. All transactions are processed and posted immediately. Since screens provide on-line help messages that are user friendly, any end user can get familiarized with it's usage. As it is developed in ORACLE , it provides all security features of relational data base.

The goals that have been achieved by the developed system are

- It simplifies the operation.
- It reduces the processing time and increase productivity.
- transactions are processed immediately and subsequent posting is also done.
- User friendly screens to enter the data and enquire the data base tables.
- On-line help message to operate the system.

- The intermittent user can easily access the style without much problem.
- Portable and flexible for further enhancement.

RDBMS - AN OVERVIEW

Data Base Management System (DBMS)

A database system is a collection of interrelated data that are to be stored together in a single location. It enables sharing of data among various users as and when required. A DBMS is software with capabilities of organise, manipulate and manage the data.

DBMS have evolved from hierarchical to network to relational models. Today the most widely accepted database model is the Relational model. The relational model has three aspects.

1. Structures:-

Structures are well defined objects that store the data of database. Structures and the data contained within them can be manipulated by operations.

2. Operations:-

Operations are clearly defined actions that allow users to manipulate the data and structures of a database. The operations on a database must adhere to a predefined set of integrity rules.

3. Integrity rules:-

Integrity rules are the laws that govern which operations are allowed on the data & structures of a database. Integrity rules protect the data and the structures of a database.

RDBMS offers benefits such as

- independence of physical data storage & logical database structure.

- variable & easy access to all data
- complete flexibility in database design.
- reduced data storage & redundancy.

Rules For RDBMS

Dr.E.F.CODD presented twelve rules that any database must obey if it is to be considered truly relational. The rules stream from a single rule called the **'Zero Rule'** or the **'Overall Rule'** which could be started as follows.

1. Information rule:

All information in a relational database including table names, column names are represented explicitly by values in tables.

2. Guaranteed Access rule:

Every piece of data in a relational database, can be accessed by using a combination of a table name, a primary key value that identifies the row and a column name that identifies the cell.

3. Systematic treatment of Null rule:

The RDBMS handle records that have unknown or inapplicable values in a predefined fashion. Also the RDBMS distinguishes between zeros, blanks and nulls in records and handles such values in a consistent manner that produces correct answers, comparisons & calculations.

4. Acting on-line catalogue based on the Relational model:

The description of a database and its contents are database tables and therefore can be queries on-line via the data language.

5. Comprehensive data sub language rule:

A RDBMS support several languages but at least one of them allows the user to do all of the followings: define tables/view, query and update data, set integrity constraints, set authorisation and define transactions.

6. View updating rule:

Any view that is theoretically up datable can be updated using the RDBMS. A view is theoretically up datable if changes can be made to the tables that effect the desired changes in the view.

7. High-level Insert, Update & Delete:

The RDBMS supports insertion, updation and deletion at a table level. For example, in SQL delete can be performed on a set of select records.

8. Physical data Independence:

The execution of ad hoc request and application programmes is not affected by changes in the physical data access and storage methods.

9. Logical data Independence:

Logical changes in tables and views as adding/deleting columns or changing field lengths do not necessitate modification in application programs or in the format of ad hoc requests.

ORACLE - AN OVERVIEW

ORACLE is a comprehensive operating environment that packs the power of a mainframe Relational DBMS with your microcomputer. It provides functional programs that you can use as tools to build structure and perform tasks. Because applications developed on ORACLE are completely portable, the programmer can create a complex application in a single-user environment and then move to a multi-user platform.

ORACLE accesses and manipulates the data stored in a relational database using the structured query language (SQL).

Data access tools of ORACLE are :

- SQL * Plus
- SQL * Forms
- SQL * Report Writer
- SQL * Menu
- SQL * Graph
- PL/SQL

and it also includes a lot of utilities such as Export/Import , SQL * Loader etc. and programming tools include the series of PRO * programming interface like PRO *C, PRO *COBOL etc. An application developed on ORACLE will be able to keep pace with growth and change.

SECURITY & CONTROL:

ORACLE has several features that ensure the integrity of the database. If an interruption occurs in processing, a roll back can reset the database is a pt. before the disaster. If a restore is necessary, ORACLE has a roll forward command for recreating the database to its most recent safe point. ORACLE provides users with several functions for securing data. Grant and Revoke

commands limits access to information down to the row and column levels. Views are valuable features for limiting access to the primary levels in the database.

PERFORMANCE:

ORACLE has been constantly improved to perform competitively on the largest database. Because RDBMS have been hampered a reputation for slow access limits, ORACLE has had to prove itself continually. ORACLE has unique clustering techniques for storing data on the disk is another performance gain. The active data dictionary which automatically updates and logs modifications to the database provides modifications. ORACLE stores the DBMS kernel in extended memory. So main memory is available for other applications.

DATA ACCESS MANIPULATION TOOLS

The main data access manipulation tools are

SQL * Plus:

This allows users, depending on their access grants, to create, to manipulate or to drop tables from the database. It permits generation of simple reports, capturing the results from a query and formatting them, perform ad hoc query against the database. It is one of the easiest languages to use.

SQL * Forms:

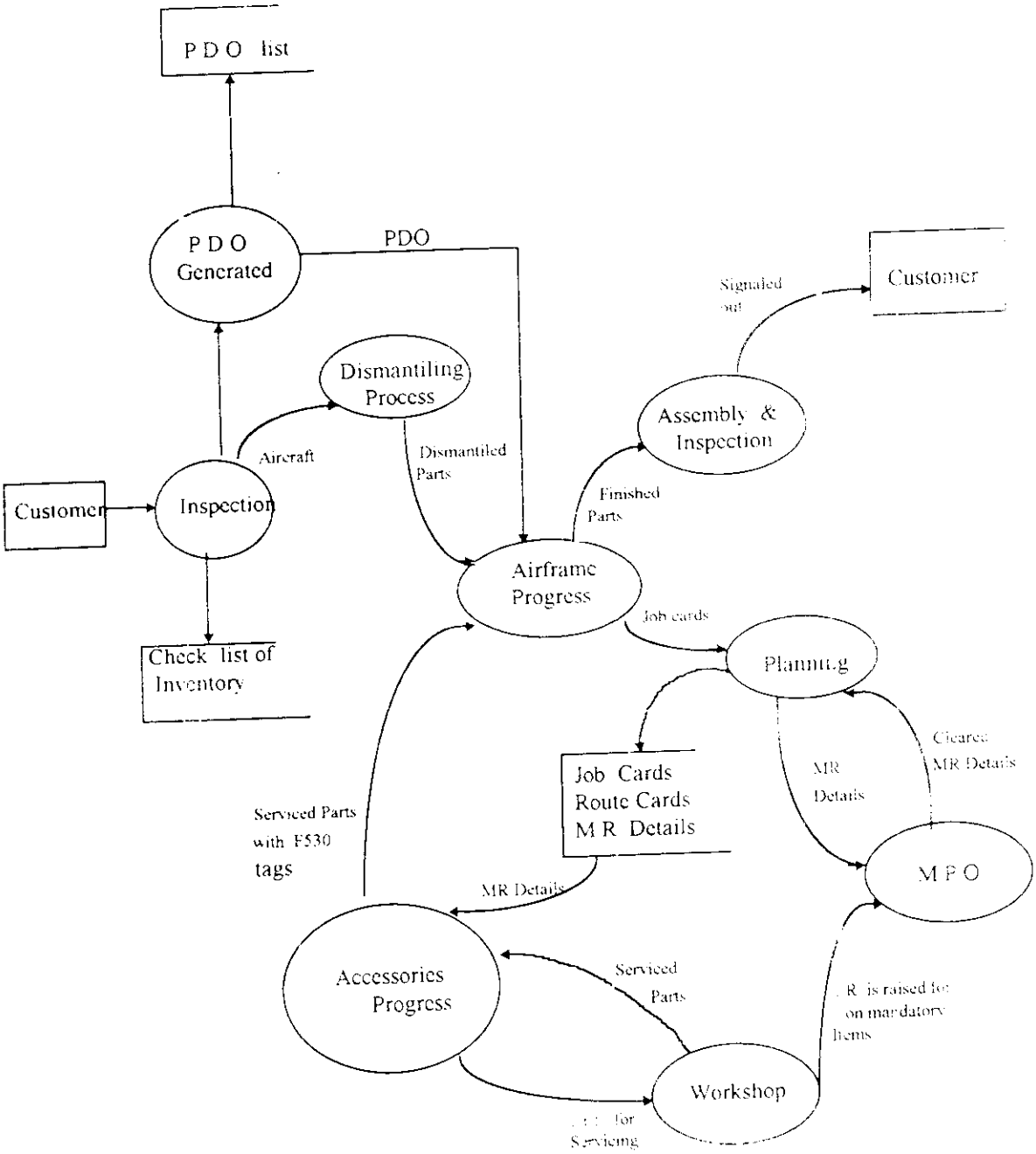
SQL * Forms provides a convenient and easy method for non experts to query a database and update, delete or add information. SQL * Forms offers the facility of incorporating PL/SQL statements and blocks in triggers.

SQL * Report Writer:

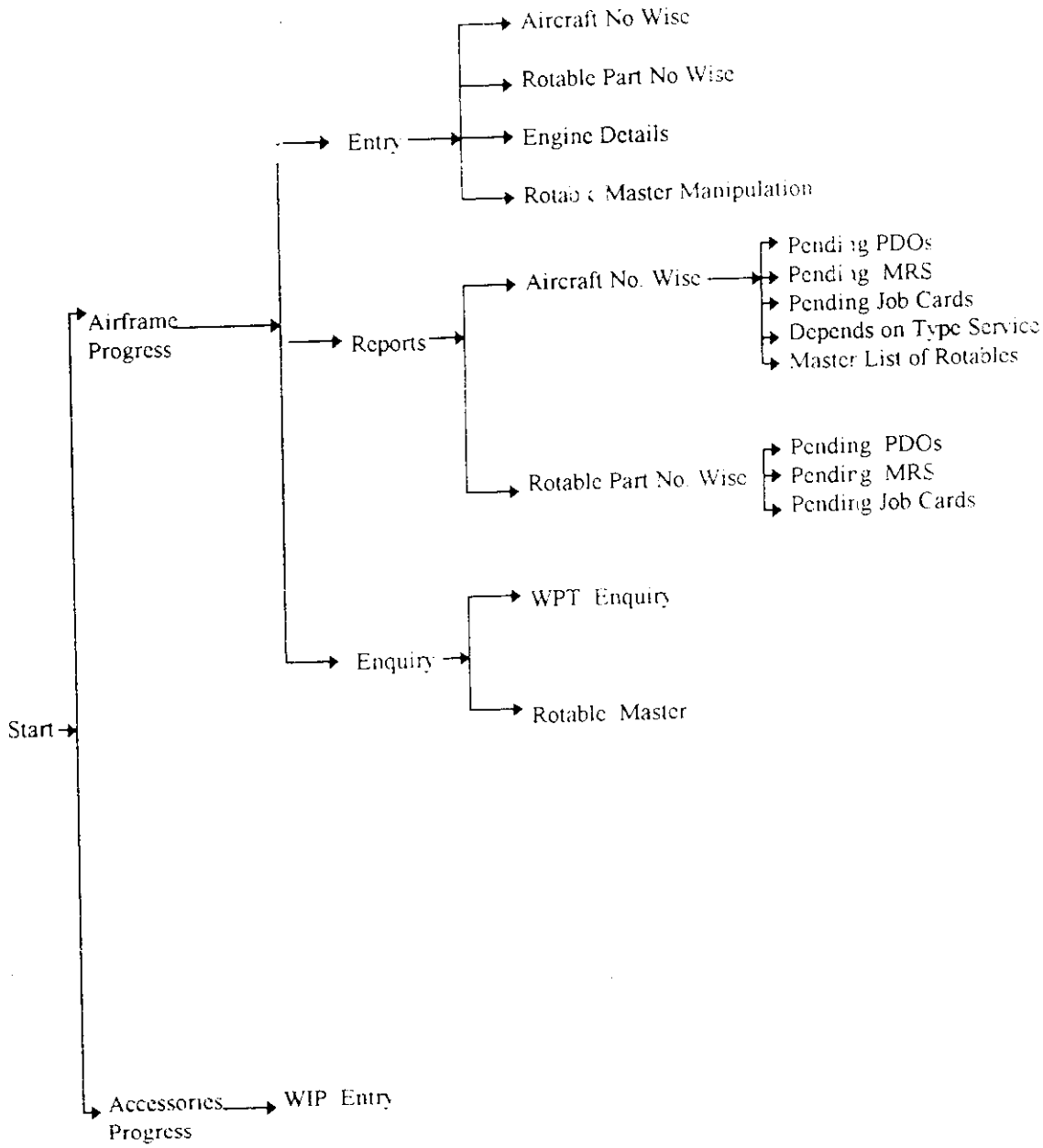
This tool is a menu-driven report formatting tool that uses SQL to create professional reports and merged specifically output. The developing of reports through this is very due to its menu driven nature.

PL/SQL:

This tool permit a set of SQL commands to be clubbed together in a block and given to ORACLE. It provides conditional, looping, procedural capabilities which are traditional to third generation languages. Thus it facilitates procedural capabilities in the RDBMS.



DATA FLOW DIAGRAM



Menu Structure for WIP System

Codification Standards

DIVISION CODE

Division is identified by a single numeric integer. The following are the code for all the division in HAL(BC).

Division Code	Description
0	Service
1	Aircraft
2	Overhaul
3	Foundry & Forge
4	Aero engine
5	Design
6	Helicopter
7	Engine Design
8	Helicopter Design
9	Aerospace

DEPARTMENT CODE

Department is identified by a four digit number.

1	2	3	4

1st digit => Division code.

2nd digit => Direct or Indirect Employee

WORKORDER NUMBER

Workorder number is identified by an 11 digit number.

1	2	3	4	5	6	7	8	9	10	11

1,2 => Project Code

3 => Sale Order

4 => Stage of Work

5,6,7 => Sale order Number

8,9,10 => Serial No.

11th digit => Check digit

TYPE OF SERVICE

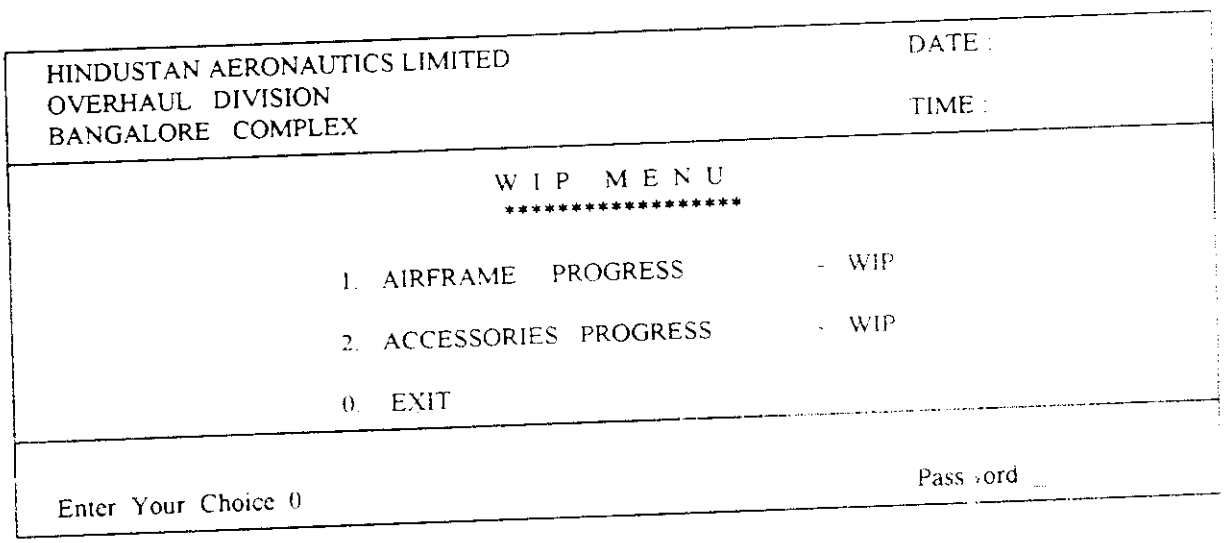
Type of Service is identified by an interger.

Code	Description
2	Overhaul
5	Bench/S.S.T Check
6	Bay Service
8	On Condition
11	Recharging

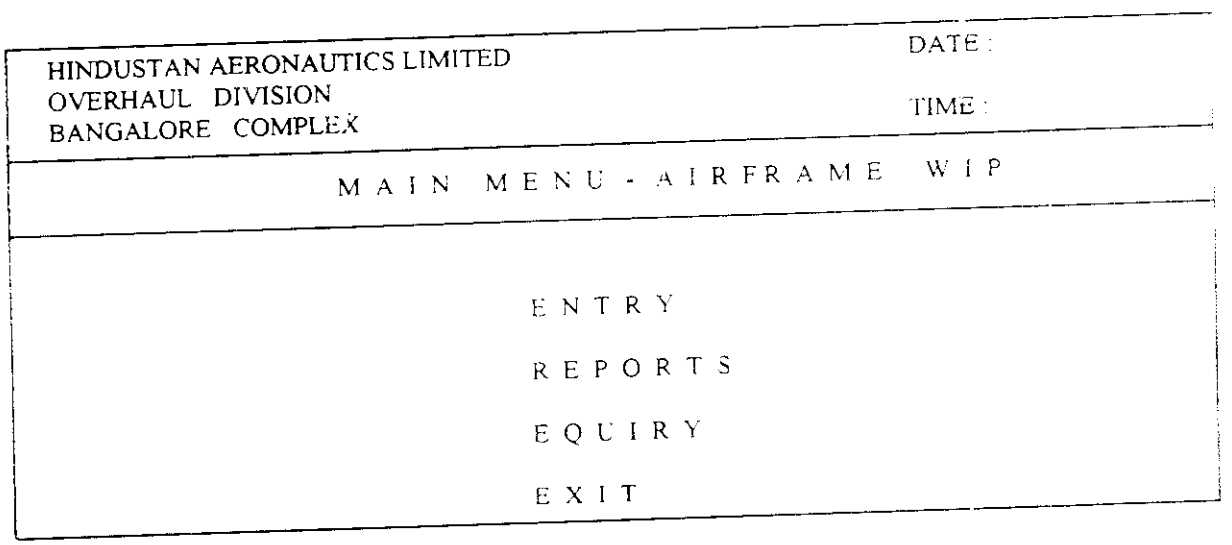
PROJECT CODE

Project Code is defined by an integer

Code	Description
0	None
1	Mirage 2000
2	Chetak Helicopter
3	Cheetah Helicopter
4	HPT 32
5	Canberra
6	AVRO Aircraft
7	Kiran MK I/IA
8	Kiran MK II
9	Jaguar
10	Islander
11	Seaking Helicopter
12	Common
13	Lycoming
14	Outstanding Jobs if IAF
15	Maint. Of IAF A/c
16	Cheetah/Chetak
17	Visiting A/c



WIP Main Menu



Main Menu for Airframe Progress

HINDUSTAN AERONAUTICS LIMITED
OVERHAUL DIVISION
BANGALORE COMPLEX

DATE :

TIME :

W I P E N T R Y

Aircraft Number wise

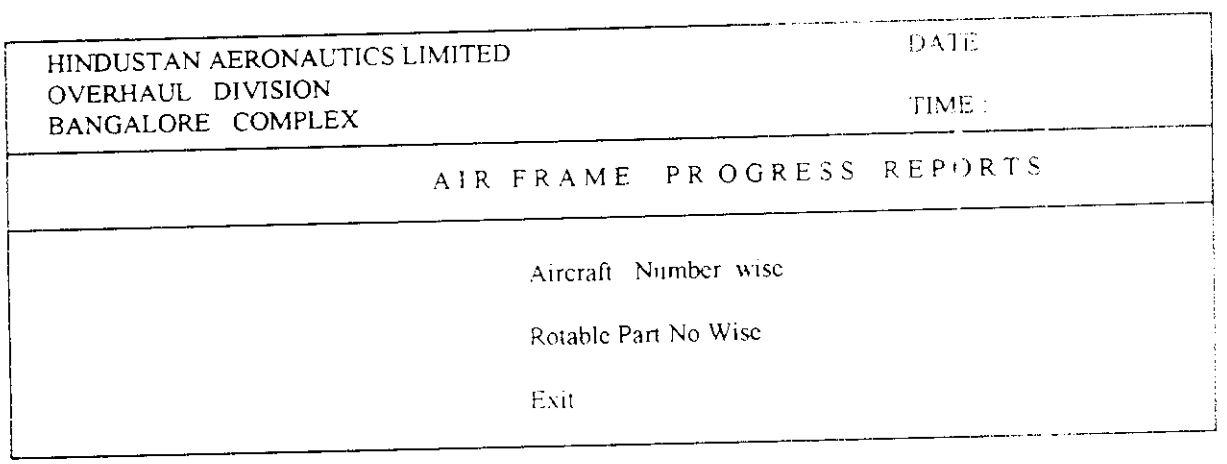
Rotable Part No Wise

Engine Details Entry

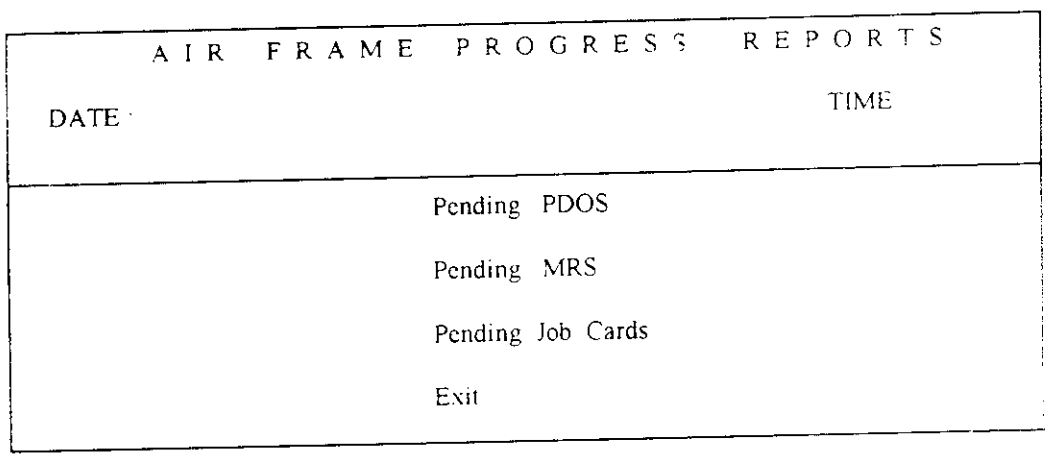
Rotable Master Manipulation

Exit

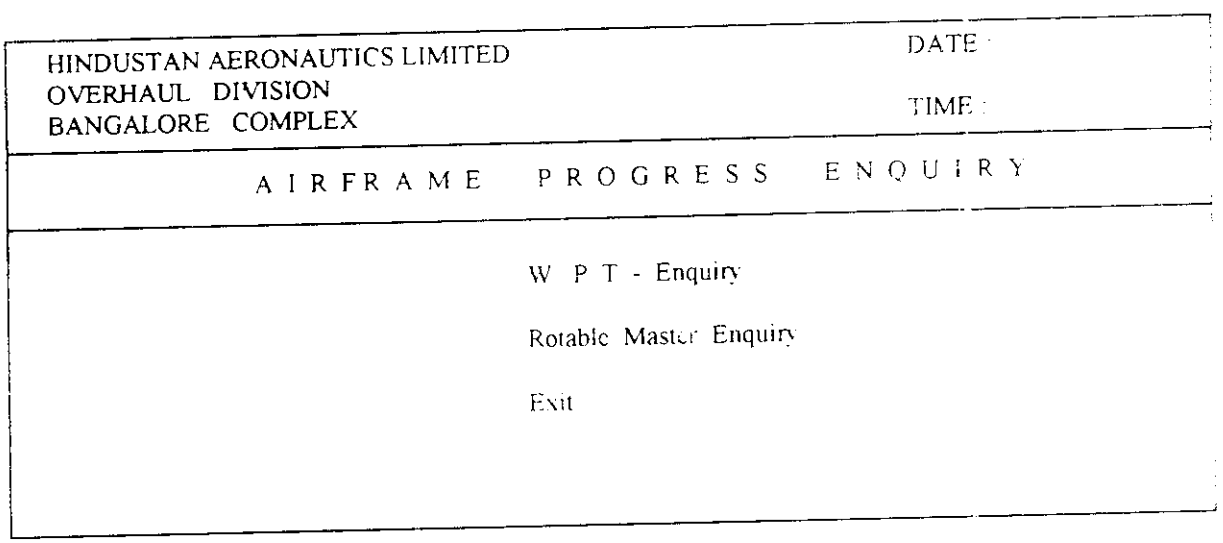
Menu for Airframe Progress Entry Screen



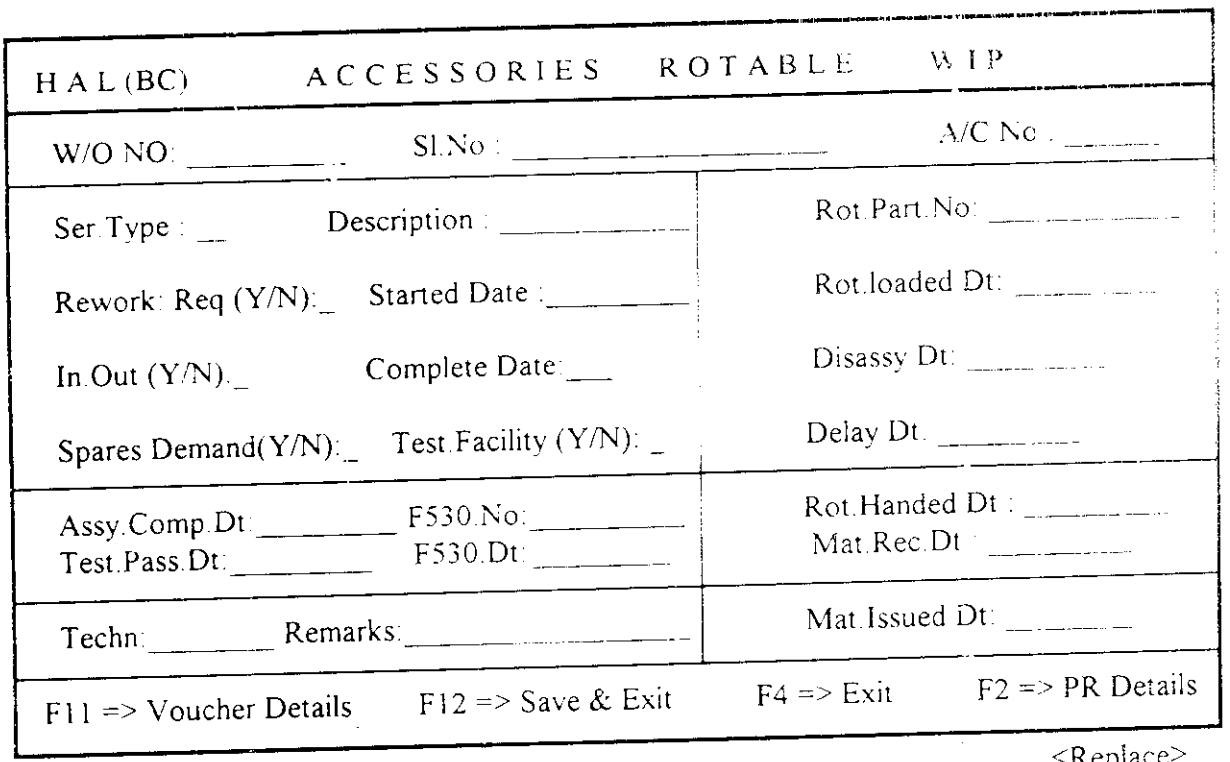
Main Menu for Airframe Progress Reports



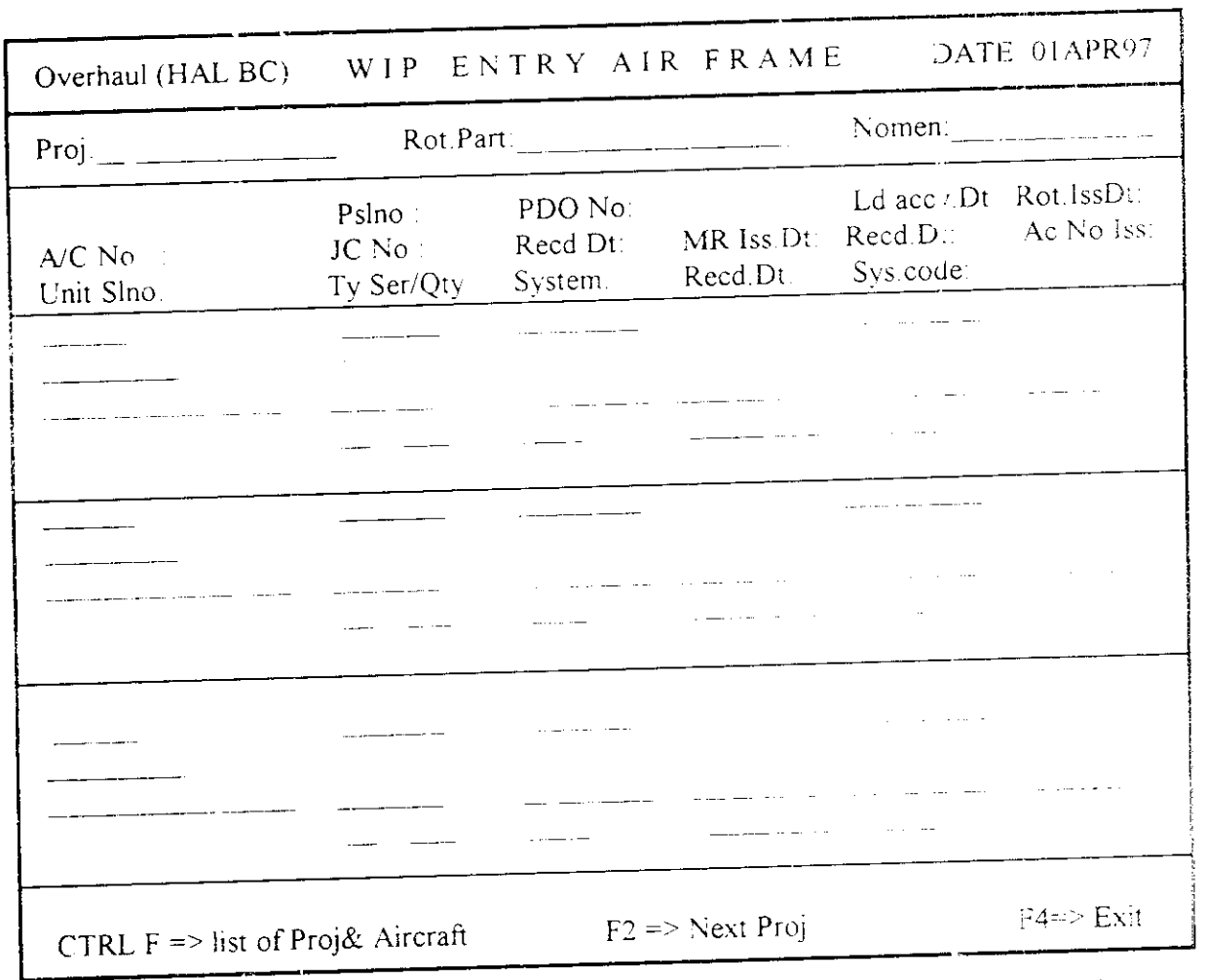
Airframe Progress Report Menu (Aircraft No. Wise)



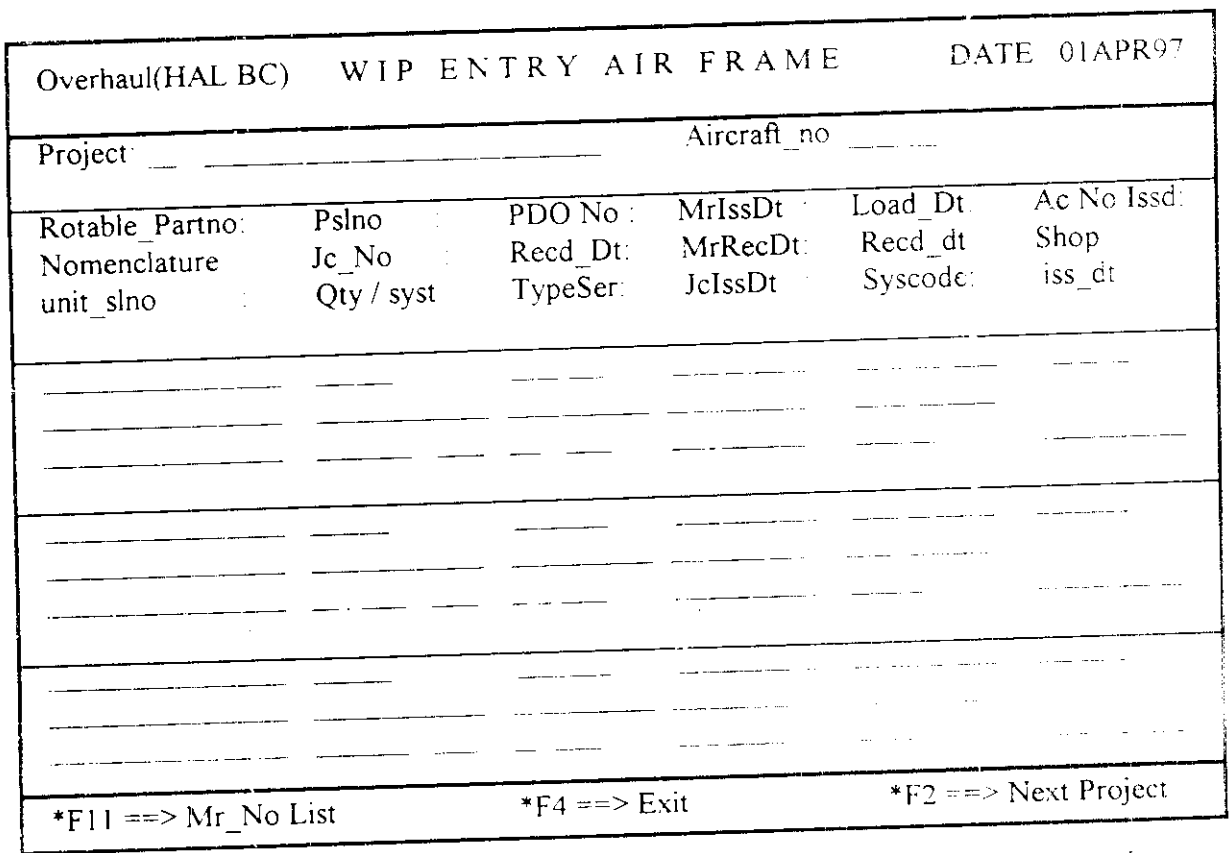
Airframe Progress Enquiry Menu



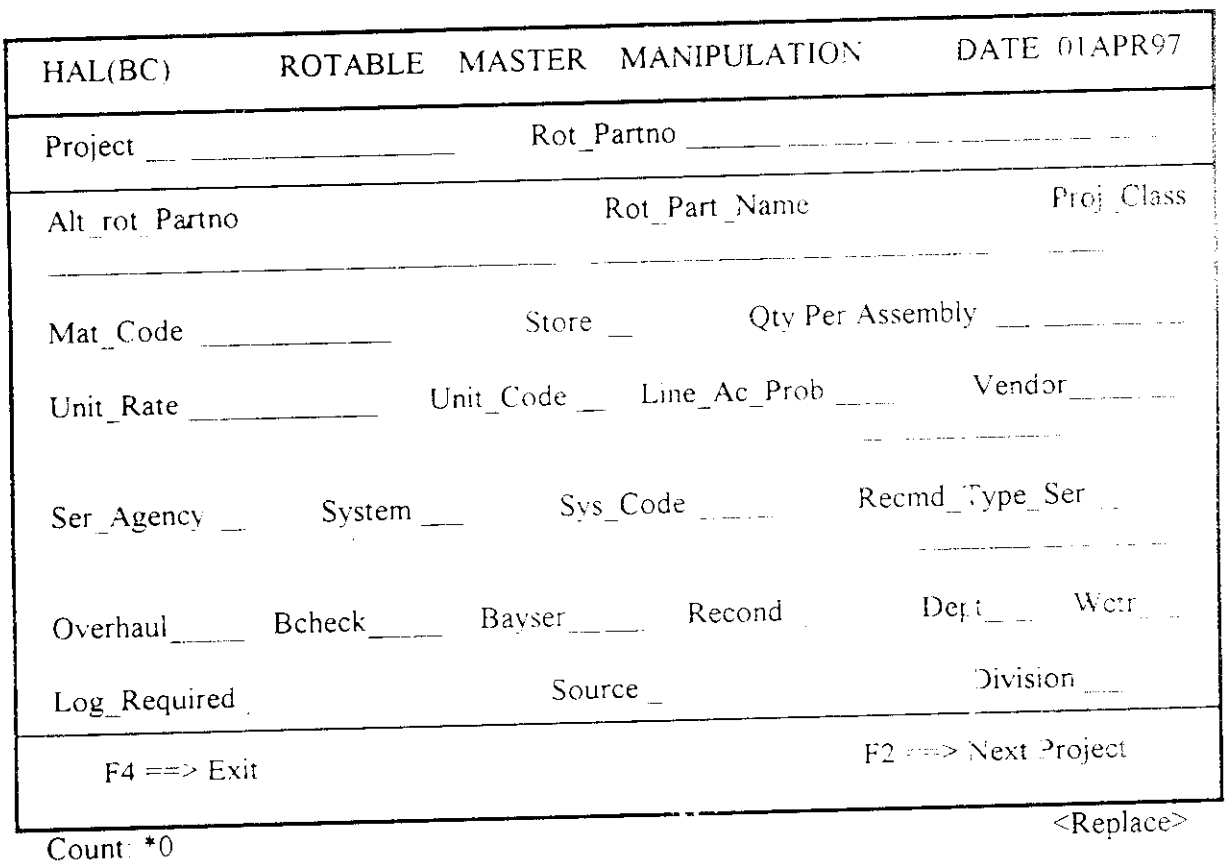
WIP Master file Entry Screen



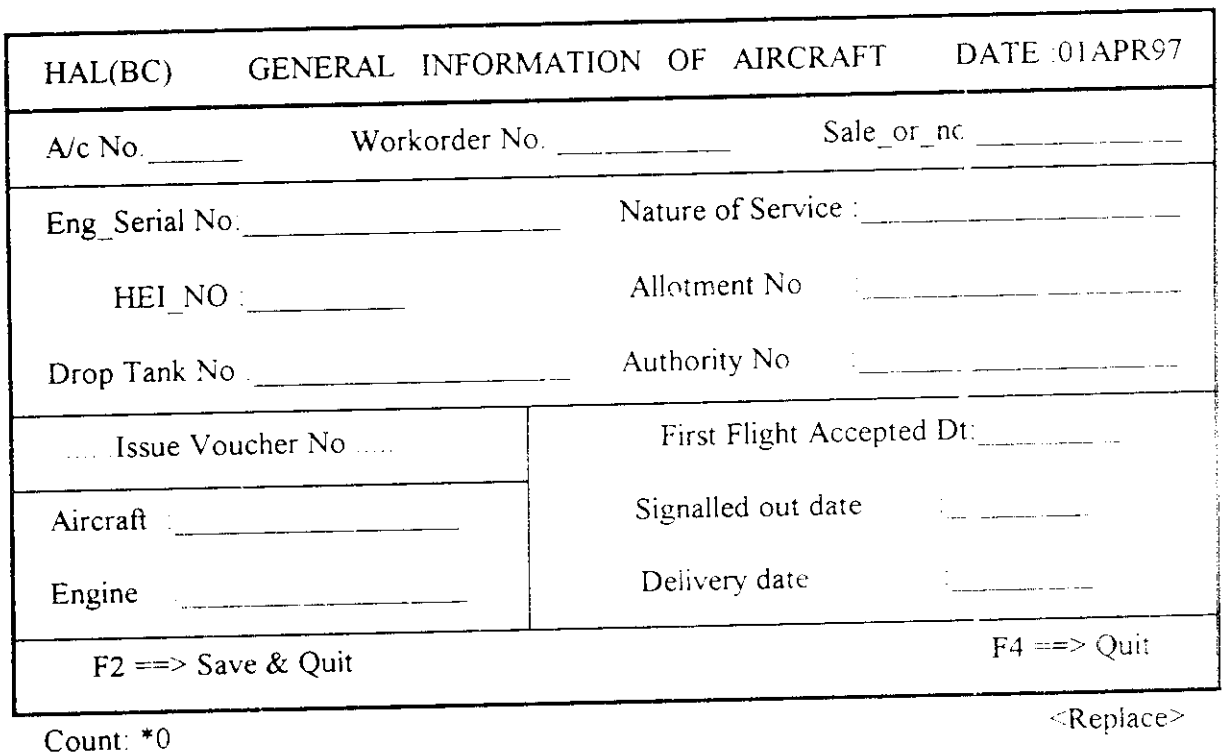
WIP Airframe Entry Screen (Rotable Part Number Wise)



WIP Entry Screen for Airframe Progress (Aircraft No Wise)



Rotable Master file Entry Screen



Entry Screen for Aircraft Information

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(HAL)

MAST R, LIST OF ROTABLES FIRAN AIRCRAFT

Page No : 1
Date :17-APR-97

Aircraft No : 1521?

Slno	Potable Partno	Nomenclature	System Code	Description	Pdo No	Pdo Recd Date	Mr Issd Date	Mr Recd Date	Jc Issd Date
1	03?11YA01	ELECTROSELECTOR VALV	HY16	Overhaul					
2	?143000	V/UHF TRANS REC.VLC2	HY15	Overhaul					
3	?143?03	ADF RECEIVER ARC610	L605	Overhaul					

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(BC)

LIST OF ROTABLE WAITING FOR PDCs

Date :17-APR-97

Aircraft No : 1423

Slno	Rotable Partno	Nomenclature	Quantity	Description	Pdo No	Pdo Recd Date
1	306A/23.07.99.00J	Fuel Quantity Meter	1	Overhaul		
2	306A/235/AS/com/1	ASI (3360.164-5/P4)	1	Overhaul		
3	306A/AG40701	TACHO GENERATOR	1	Overhaul		
4	3063/31429	R M I	1	Overhaul		
5	310D/N20221? AX3	TRANS RECEIVER STAND	1	Overhaul		
6	310D/N24603 DFA73A-1	ADF RECEIVER	1	Overhaul		
7	620359	FLUX VALVE	1	Overhaul		
8	1.001?2.007	ELECTROSELECTOR VALV	1	Overhaul		

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(BC)

LIST OF ROTABLE WAITING FOR MRS

Date :17-APR-97

Aircraft No : N5212

Slno	Rotable Partno	Nomenclature	Quantity	Type of Service	Pdo No	Pdo Recd Date	Mr Issd Date	Mr Recd Date	Jc Number	Jc Issd Date
1	N1400U0	V/UHF TRAI	1	Overhaul			12-FEB-97			
2	N1403U1	ADF RECEIV	1	Overhaul			12-FEB-97		61617930007	
3	03811YA01	ELECTROSEL	1	Overhaul			12-FEB-97		61617930007	

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(BC)

LIST OF PENDING JCB CARDS (Rotable_part no Wise)

Page No : 1
Date : 17-APR-97

Rotable Part No: U140003

Slno	Aircraft No	Nomenclature	Quantity	Description	Pdo No	Pdo Recd Date	Jc Number
1	U2483	V/UHF TRANS REC.VUC2	1	Overhaul			
2	U3712	V/UHF TRANS REC.VUC2	1	Overhaul			
3	U2505	V/UHF TRANS REC.VUC2	1	Overhaul			
4	U5721	V/UHF TRANS REC.VUC2	1	Overhaul			
5	U3242	V/UHF TRANS REC.VUC2	1	Overhaul			
6	U2512	V/UHF TRANS REC.VUC2	1	Overhaul			
7	U2474	V/UHF TRANS REC.VUC2	1	Overhaul			
8	U1111	V/UHF TRANS REC.VUC2	1	Overhaul			
9	U5423	V/UHF TRANS REC.VUC2	1	Overhaul			

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(BC)

LIST OF PENDING JOB CARDS (Aircraft No Wise)

Date :17-APR-97

Aircraft No : H225

Slno	Rotable Partno	Nomenclature	Quantity	Description	Pdo No	Pdo Recd Date	Jc_number
1	306A/23.07.00.00	Fuel Quantity Meter	1	Overhaul			
2	306A/235/AS/cpm/1	ASI (3360.164-5704)	1	Overhaul			
3	306A/AGA0701	TACH) GENERATOR	1	Overhaul			
4	3063/31428	R M I	1	Overhaul			
5	3109/4202219 AA3	TRANS RECEIVER STAND	1	Overhaul			
6	3109/4246G3 DFA73A-1A	ADF RECEIVER	1	Overhaul			
7	620359	FLUX VALVE	1	Overhaul			
8	1.30122.007	ELECTROSELECTOR VALV	1	Overhaul			

PROJECT Kiran_Mk_I/IA

Slno	Rotable Partno	System	Loc	Rotable Part Name	Type Service	Pslno_Oh	Pslno_Bc	Pslno_Bs	Qty
1	A140000	HY15		V/UHF TX RX	Overhaul	1701			1
2	A140301	LG05		ADF RECEIVER	Overhaul	17061			1
3	520359	FU06		FLUX VALVE	Overhaul	17011			1
4	03811YA01	HY16		ELLECTROSELECTOR VAL	Overhaul				1
5	1.00122.007	HY03		ELLECTROSELECTOR VAL	Overhaul				1
6	461.00.244.00	EL29		GYRO MAGNETIC COMPAS	Overhaul	17030			1
7	500.1.02952	IN17		T P ACTIVATOR	Overhaul	17035			1
8	505560	IN12		GROUND PRESSN.CONNEC	Overhaul	17145			1
9	51833Y,SCW/6987	OX05		UC SELECTOR	Overhaul	17039			1
10	5242D/09978	RA02		VALVE AIR RELEIF	Overhaul	17099			1
11	5285(MK..3),51657	AP22		MAGNETIC INDICATOR C	Overhaul				1
12	568-1-24822-00	AP16		FUEL BOOSTER PUMPC/W	Overhaul	17175			1
13	SCW/2452	AP20		DIMMER SWITCH	Overhaul	17155			1
14	5165Y	HY13	2	MAGNETIC INDICATOR	Overhaul	17043			2
15	524610	AP40	1	GROUND PRESSN. CONNE	Overhaul	17052			2
16	57333-004	RA51	1	FIRE EXTINGUSHER	Overhaul	17086			2
17	5910-999	OX57	5	CONDENSER	Overhaul	17028			2
18	SC/540	IN20	2	PUSH SWITCH	Overhaul	17023			2
19	SCW/2091	IN45	1	PUSH SWITCH	Overhaul	17022			2

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(HAL)

LIST OF ROTABLE WAITING FOR MRS

Date : 17-APR-97

Rotable Part No : 9140731

Slno	Aircraft No	Nomenclature	Quantity	Type of Service	Pdo No	Pdo Recd Date	Mr Issd Date	Mr Recd Date	Jc Number	Jc Issd Date
1	U2454	ADF RECEIV	1	Overhaul			01-JAN-97		61617990004	
2	U2463	ADF RECEIV	1	Overhaul			01-JAN-97		61618010005	
3	U3212	ADF RECEIV	1	Overhaul			01-JAN-97		61617930007	
4	U2505	ADF RECEIV	1	Overhaul			01-JAN-97		61617910008	
5	U5321	ADF RECEIV	1	Overhaul			01-JAN-97		61618000000	
6	U3242	ADF RECEIV	1	Overhaul			01-JAN-97			
7	U2512	ADF RECEIV	1	Overhaul			01-JAN-97		61618140006	
8	U2474	ADF RECEIV	1	Overhaul			01-JAN-97		61608100009	
9	U5423	ADF RECEIV	1	Overhaul			01-JAN-97		61617990004	

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(BLR)

LIST OF ROTABLE WAITING FOR PDCs

Page No : 1
Date :17-APR-97

Aircraft No : M223

Slno	Rotable Partno	Nomenclature	Quantity	Description	Pdo No	Pdo Recd Date
1	306A/23.07.00.000	Fuel Quantity Meter	1	Overhaul		
2	306A/235/AS/com/1	ASI (336).164-5/P4)	1	Overhaul		
3	306A/AGA0701	TACHO GENERATOR	1	Overhaul		
4	3067/31428	R M I	1	Overhaul		
5	3100/M294210 AA3	TRANS RECEIVER STAND	1	Overhaul		
6	3100/M24603 DFA73A-1	ADF RECEIVER	1	Overhaul		
7	620359	FLUX VALVE	1	Overhaul		
8	1.00122.007	ELECTROSELECTOR VALV	1	Overhaul		

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(BC)

MASTER LIST OF ROTABLES KIRAN AIRCRAFT

(SYSTEM CODE WISE)

Aircraft No : U2463

Slno	Rotable Partno	System Code	Nomenclature	Description	Pdc No	Pdo Recd Date	Mr Issd Date	Mr Recc Date	Jc Issd Date
1	N140000	HY13	V/UHF TRANS REC,VLC2	Overhaul					
2	0891LYA01	HY1a	ELECTROSELECTOR VALV	Overhaul			01-JAN-97		
3	N140301	LG05	ADF RECEIVER ARC610	Overhaul					

HINDUSTAN AERONAUTICS LIMITED, OVERHAUL DIVISION(BC)

LIST OF ROTABLE WAITING FOR POCs

Date :17-APR-97

Aircraft No : U223 Type of Service :Overhaul

Slno	Rotable Partno	Nomenclature	Quantity	Poc No	Poc Recd Date	Mr Issd Date	Mr Recd Date	Jc Number	Jc Issd Date
1	306A/23.07.00.000	Fuel Quantity Meter	1					61618120005	
2	306A/235/4S/com/1	ASI (3360.164-5/P4)	1					61618120005	
3	306A/AGA0701	TACHO GENERATOR	1					61618120005	
4	3068/31429	R M I	1					61618120005	
5	3100/N202219 AX3	TRANS RECEIVER STAND	1					61618120005	
6	3100/N24003 DFA73A-1	ADF RECEIVER	1					61618120005	
7	620359	FLUX VALVE	1					61618120005	
8	1.00122.007	ELECTROSELECTOR VALV	1						

Appendix H
Data Dictionary

Application-id : W I P
Type : Table
Retention Procedure : Permanent
Table Name : WPT_WIP
Table Description : Work in Progress Master file

Name	Null ?	Type	Description ?
DIVISION		CHAR(1)	Division Code
PROJECT		NUMBER(2)	Project Code
APPLICABLITY		VARCHAR2(1)	Applicability is used to specify mandatory items
WORKORDER		VARCH2(11)	Work Order Number
UNIT_SLNO		VARCHAR2(20)	Unit Serial Number
ROTABLE_PARTNO		VARCHAR2(24)	Rotable Part Number
ROTABLE_STRIP_PARTNO		VARVAHR2(24)	Rotable Strip Part Number
AIRCRAFT_NO		VARCHAR2(6)	Aircraft Number
MAT_CODE		CHAR(18)	Material Code
QUANTITY		NUMBER(4)	Quantity Required
MR_PRESENT_DT		DATE	Material Requisition Present Date
ROT_LOADED_DT		DATE	Rotable Loaded Date
ROT_DISASSY_DT		DATE	Rotable_disassembly Date
SPARES_DEMAND_ STATUS		VARCHAR2(1)	Spares Demanded Status
REWORK_REQD_ STATUS		VARCHAR2(1)	Rework required Status
REWORK_IN_OUT_ STATUS		VARCHAR2(1)	Rework In Out Status
REWORK_STARTED_DATE		DATE	Rework Started Date
REWORK_COMP_ DATE		DATE	Rework Completed Date
TEST_FACILITY_STATUS		VARCHAR2(1)	Test Facility Status
ASSY_COMP_DATE		DATE	Assembly Completed Date
FUNC_TEST_PASS_STATUS		VARCHAR2(1)	Function Test Pass Status
FUNC_TEST_PASS_DATE		DATE	Function Test Pass Date
F530_NUMBER		VARCHAR2(12)	F 530 Number
F530_DATE		DATE	F 530 date
ROTABLE_DELY_ DATE		DATE	Rotable Delay Date
PDO_RECD_DATE		DATE	Parts Disposition Received Date
TYPE_OF_SERVICE		VARCHAR2(2)	Type of Service
JC_RC_MR_RECD_ DATE		DATE	Jobcard received date
MR_ISSD_DATE		DATE	Material Requisition Issued Date
MR_RECD_DATE		DATE	Material Requisition Received Date
JC_ISSD_DATE		DATE	Job Card Issued Date
ROT_HANDED_TO_ ACCESS_DATE		DATE	Rotables Handed Date to Accessories
ROT_RECD_FROM_ ACCESS_DATE		DATE	Rotables Received date From Accessories

Name	Null?	Type	Description
AC_NO_ISSUED		VARCHAR2(6)	Isuued Aircraft Number
ROT_ISSD_DATE		DATE	Rotable Issued Date
HANDED_TO_PACK_DATE		DATE	Handed Date to Packing
RECV_FROM_PACK_DATE		DATE	Recieved Date from Packing
HANDED_TO_26ED_DATE		DATE	Handed Date to 26ED
PSLNO		CHAR(5)	Process Serial Number
JC_NUMBER		VARCHAR2(11)	Job Card Number
PDO_NO		NUMBER(6)	Parts Disposition Number
PDO_DATE		DATE	Parts Disposition Date
NOMENCLATURE		VARCHAR2(43)	Rotable Part Name
REMARKS		VARCHAR2(40)	Remarks
TECHNICIAN		VARCHAR2(8)	Technicians
ROT_RECD_FROM_ AIR_FRAME_DATE			Rotable received date from Air Frame

Application-id : **WIP**
Type : Table
Retention Procedure : Permanent
Table Name : **ROTABLE_MASTER**
Table Description : rotable parts Master details

Name	Null ?	Type	Description
PROJECT	NOT NULL	NUMBER(2)	Project Code
ROTABLE_SLNO		NUMBER(3)	Rotable Serial Number
ROTABLE_PRODN_SLNO		VARCHAR2(3)	Rotable Production Serial Number
VENDOR		VARCHAR2(7)	Vendor
ROTABLE_PARTNO	NOT NULL	VARCHAR2(32)	Rotable Part Number
ROTABLE_STRIP_PARTNO		VARCHAR2(32)	Rotable Strip Part Number
ALT_ROTABLE_PARTNO		VARCHAR2(32)	Alternate rotable_part Number
ALT_ROTABLE_STRIP_ PARTNO		VARCHAR2(32)	Alternate Rotable Strip Part Number
ROTABLE_PART_NAME		VARCHAR2(60)	Rotable Part Name
MATERIAL_CODE		VARCHAR2(12)	Material Code
PROJECT_CLASS		VARCHAR2(4)	Project Class
STORE		VARCHAR2(2)	Store Code
QTY_1		NUMBER(10)	Quantity on Straiker
QTY_2		NUMBER(10)	Quantity on Trainer
QTY_3		NUMBER(10)	Quantity
QTY_4		NUMBER(10)	Quantity
QTY_5		NUMBER(10)	Quantity
QTY_6		NUMBER(10)	Quantity
UNIT_RATE		NUMBER(10)	Unit Rate
UNIT_CODE		VARCHAR2(2)	Unit Code
SOURCE		VARCHAR2(1)	Source

Name	Null ?	Type	Description
LINE_AC_PROBABILITY		NUMBER(3)	Line Aircraft Probability
SERVICE_AGENCY		VARCHAR2(2)	Service Agency
SYSTEM		VARCHAR2(3)	System
SYSTEM_CODE		VARCHAR2(5)	System Code
RECMD_TYPE_SERVICE		VARCHAR2(2)	Recommended Type Of Service
PSLNO_BC		VARCHAR2(5)	Bench Mark Process Serial Number
PSLNO_OH		VARCHAR2(5)	Overhaul Process Serial Number
PSLNO_BS		VARCHAR2(5)	Bay Service Process Serial Number
DEPT		VARCHAR2(4)	Department
WCTR		VARCHAR2(3)	Work Centre
LOG_REQD		VARCHAR2(1)	Log Required
DIVISION		NUMBER(1)	Division Number
PSLNO_RC		VARCHAR2(5)	Reconditioning Process Serial No

Application-id : **W I P**
Type : Table
Retention Procedure : Permanent
Table Name : **ORT_IV_RV**
Table Description : It describes Issue Voucher No and Receipt Voucher No

Name	Null ?	Type	Description
PROJECT		CHAR(2)	Project Code
SALE_OR_NO		VARCHAR2(14)	Sale Order Number
WORK_OR_NO		VARCHAR2(16)	Work Order Number
ISSUE_VOUCHER_NO		VARCHAR2(18)	Issue Voucher Number
ISSUE_VOUCHER_DATE		DATE	Issue Voucher Date
RECEIPT_VOUCHER_NO		VARCHAR2(18)	Receipt Voucher Number
RECEIPT_VOUCHER_DATE		DATE	Receipt Voucher Date
UNIT_SERIAL_NO		VARCHAR2(30)	Unit Serial Number
F530_NO		VARCHAR2(25)	F 530 Number
CATGORY		VARCHAR2(1)	Category
REMARKS		VARCHAR2(25)	Remarks
RV_REMARKS		VARCHAR2(25)	Received Voucher Remarks

Name	Null ?	Type	Description
NOMENCLATURE		VARCHAR2(43)	Nomenclature
AC_NO		CHAR(10)	Aircraft Number
AUTHORITY_NO		VARCHAR2(30)	Authority Number
DIVI		CHAR(1)	Division Code
STRIP_PART_NO		CHAR(22)	Strip Part Number

Application-id : **W I P**
Type : Table
Retention Procedure : Permanent
Table Name : **ADV_JOB_TICKET**
Table Description : Advice Job Ticket

Name	Null ?	Type	Description
ADV_DIVISION		CHAR(1)	Division
ADV_PROJECT		CHAR(1)	Project
ADV_PSLNO		CHAR(5)	Process Serial Number
ADV_PR_ISS_NO		CHAR(2)	Parts Requisition Issued Date
ADV_PROJECT_CODE		CHAR(1)	Project Code
ADV_BATCH_NO		CHAR(2)	Batch Number
ADV_SLNO		CHAR(5)	Serial Number
ADV_WORKORDER		CHAR(13)	Work Order Number
ADV_MR_CODE		CHAR(1)	Material Requisition Code
ADV_BATCH_QTY		CHAR(3)	Batch Quantity
ADV_BATCH_QTY_EA		CHAR(2)	Batch Quantity Each
ADV_COUNT		CHAR(4)	Count
ADV_PART_NO		CHAR(22)	Rotable Part Number
ADV_PR_FLAG		CHAR(1)	Parts Requisition Flag
ADV_ITEM_NO		CHAR(4)	Item Number
ADV_DEPARTMENT		CHAR(4)	Department
USER_ID		VARCHAR2(8)	User Identificatio:
ADV_ACNO		VARCHAR2(6)	Aircraft Number

Application-id : **W I P**
Type : Table
Retention Procedure : Permanent
Table Name : **MPT_MR_HEADER**
Table Description : Material Plannig Material requisition Header

Name	Null ?	Type	Description
MR_NO	NOT NULL	CHAR(6)	Material Requisition Number
MR_YYMM	NOT NULL	CHAR(4)	Material Requisition Year/Month
MR_DATE		DATE	Material Requisition Date
WORK_ORDER		CHAR(11)	Work Order Number
DIVI	NOT NULL	CHAR(1)	Division
PROJECT	NOT NULL	CHAR(1)	Project Code
PROJECT_CL		CHAR(4)	Project Class
STORE		CHAR(2)	Store
PART_NO		CHAR(22)	Rotable Part Number
PART_NAME		CHAR(43)	Rotable Part Name
ALT_PART_NO		VARCHAR2(32)	Alternate Rotable Part Number
MATERIAL_CODE		CHAR(12)	Material Code
PSLNO		CHAR(5)	Process Serial Number
MR_APP_FLAG		CHAR(1)	Material Appropriation Flag
MR_TO_MPO_DATE		DATE	Material Requisition to MPO date
REQUIRED_QTY		NUMBER(10.2)	Required Quantity
APPROVED_DATE		DATE	Approved Date
MR_PRESENT_TO_STORE		DATE	Date MR Presented to Store
CONTROL_QTY		NUMBER(10)	Control Quantity
TALLY_ID		CHAR(1)	Tally Identity

Application-id : **W I P**
Type : Table
Retention Procedure : Permanent
Table Name : **MPT_PR_HEADER**
Table Description : Material Planning Part requisition Header

Name	Null ?	Type	Description
PR_NO	NOT NULL	NUMBER(6)	Parts Requisition Number
PR_DATE		DATE	Parts Requisition Date
PROJECT_CLASS		CHAR(4)	Project Class
STORE		CHAR(2)	Store
ROTABLE_PARTNO		CHAR(22)	Rotable Part Number
ROTABLE_UNIT_SLNO		CHAR(30)	Rotable Unit Serial Number
PSLNO		CHAR(5)	Process Serial Number
WORKORDER		CHAR(11)	Work Order Number
PROJECT		CHAR(1)	Project Code
TYPE_OF_SERVICE		CHAR(1)	Type of Service
MATERIAL_CODE		CHAR(12)	Material Code
SALE_ORDER_NO		CHAR(13)	Sale Order Number
SALE_ORDER_DATE		DATE	Sale Order Date

Application-id : **W I P**
Type : Table
Retention Procedure : Permanent
Table Name : **MPT_MR_DETAIL**
Table Description : Material Planning Material Requisition Details

Name	Null ?	Type	Description
MR_NO	NOT NULL	CHAR(6)	Material Requisition Number
MR_YYMM	NOT NULL	CHAR(4)	Material Requisition Year/Month
SHEET_NO		NUMBER(3)	Sheet Number
MAT_CODE		CHAR(12)	Material code
PART_NO		VARCHAR2(24)	Rotable Part Number
STRIP_PART_NO		VARCHAR2(24)	Rotable Strip Part Number
PART_NAME		VARCHAR2(43)	Rotable Part Name
SPLIT_MR_NO		NUMBER(6)	Split MR Number
QTY_IPP		NUMBER(10,2)	Quantity
QTY_REQ		NUMBER(10,2)	Quantity Required
QTY_ISSUED		NUMBER(10,2)	Quantity Issued
NO_OF_ISS		NUMBER(3)	Number of Issued
QTY_CUR_ISS		NUMBER(10,2)	Quantity Currently Issued
ITEM_NO	NOT NULL	NUMBER(3)	Item Number
UC_CODE		CHAR(2)	Unit Code
VALUE		NUMBER(10)	Value
STATUS		NUMBER(1)	Status
CASH_ST		CHAR(1)	Cash Status
APP_ST		CHAR(1)	Appropriation Status
CPL		CHAR(1)	Item Number
PR_ITEM_NO		NUMBER(3)	Parts Requisition Item Number
VOUCHER_NO		NUMBER(6)	Voucher Number
VOUCHER_DAT		DATE	Voucher Number Date
WORK_ORDER		CHAR(11)	Work Order Number
PRNO		NUMBER(6)	Parts Requisition Number
APPR_DATE		DATE	Appropriation Date
SSDATE		DATE	System Date

Application-id : **W I P**
Type : Table
Retention Procedure : Permanent
Table Name : **ORT_PROJ_CODE**
Table Description : Order Requisition Project Code

Name	Null ?	Type	Description
CODE_NO	NOT NULL	NUMBER(2)	Project Code
DESCRIPTION		VARCHAR2(25)	Project Description

Application-id : **WIP**
Type : Table
Retention Procedure : Permanent
Table Name : **TEMP_IV_RV**
Table Description : Issue Voucher Number Receipt Voucher Number

Name	Null ?	Type	Description
E_ISSUE_VOUCHER_NO		CHAR(18)	Engine Issued Voucher Number
E_ISSUE_VOUCHER_DATE		DATE	Engine Issued Voucher Date
ENG_SERIAL_NO		CHAR(20)	Engine Serial Number
HEI_NO		CHAR(10)	High Energy Engine Number
DROP_TANK_NO		CHAR(20)	Drop tank Number
WORK_OR_NO		CHAR(11)	Work Order Number
NATURE_OF_SER		VARCHAR2(20)	Nature of Service
AUTHORITY_NO		VARCHAR2(20)	Authority Number
ALLOTMENT_NO		VARCHAR2(20)	Allotment Number
FIRST_FLIGHT_ACCE		DATE	First Flight Date
SIGNALLED_OUT		DATE	Signalled Out Date
DELIVERY_DATE		DATE	Delivery Date
AIRCRAFT_NO		VARCHAR2(6)	Aircraft Number
AIR_ISSUE_VOUCHER_NO		VARCHAR2(18)	Aircraft Issue Voucher Number
AIR_ISSUE_VOUCHER_ DATE		DATE	Aircraft Issue Voucher Number Date

Application-id : **WIP**
Type : Table
Retention Procedure : Permanent
Table Name : **ORT_TYPE_SERVICE**
Table Description : Order Requisition Type Of Service

Name	Null ?	Type	Description
TYPE_SERVICE		VARCHAR2(2)	Type of Service Code
DESCRIPTION		CHAR(24)	Description

Application-id : **W I P**
Type : Permanent
Table Name : **ORT_WORK_ORDER_DETAIL**
Table Description : Order Requisition Work Order Details

Name	Null ?	Type	Description
WORK_OR_NO	NOT NULL	VARCHAR2(16)	Work Order Number
SUB_WO_NO		VARCHAR2(16)	Sub Work Order Number
ITEM_NO		NUMBER(3)	Item Number
PART_NO		VARCHAR2(25)	Rotable Part Number
PART_NAME		VARCHAR2(43)	Rotable Part Name
SPECIFICATION		VARCHAR2(40)	Specification
RATE		VARCHAR2(30)	Rate
QTY		NUMBER(3)	Quantity
PRICE_CHARGE		VARCHAR2(100)	Price Charge
PSL_NO		VARCHAR2(5)	Process Serial Number
AIRCRAFT_NO		VARCHAR2(20)	Aircraft Number
PART_CODE		VARCHAR2(18)	Part Code
AIR_DES		VARCHAR2(75)	Aircraft Description
QTY_ACCEPT		NUMBER(3)	Quantity Accepted
QTY_REJECT		NUMBER(3)	Quantity Rejected
AMENDMENT_NO		NUMBER(2)	Amendment Number
STRIPPART		VARCHAR2(25)	Strip Part Number

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