Rocky Mountain Airlines

Information System Proposal

James Gaskin
Wes Grant
Aaron Hardy
Jason Malwitz

Group1A

Contents

System Scope

- Company Background
- Definition and Description of System Scope
- System Capabilities
- Stakeholder Analysis
- Essential Use Case List

RMA Inventory Management System

Rocky Mountain Airlines Information System Proposal

Company Background and Problem Overview

Rocky Mountain Airlines operates a regional airline service in the Pacific-Northwest. The company has been in existence since 1973 and became publicly traded in 1981. As Rocky Mountain Airlines has transitioned to its larger regional presence, the company has formed partnerships with several major airlines. With such partnerships, Rocky Mountain Airlines currently operates as the Delta Connection in Salt Lake City and Los Angeles, as United Express in Los Angeles and as the Continental Connection in selected California markets. This expansion has also brought an increase of passengers carried yearly from 1.5 million to nearly 3 million over a period of 5 years, as well as a 20% increase in total aircraft. RMA utilizes several distinct information systems to fulfill the communication needs of the company, which have been able to support the company's growth thus far. However, as the partnership with United has continued to expand RMA's market share into the San Francisco, Portland, and Seattle/Tacoma areas, management has begun to address the need of an enhanced information infrastructure for managing inventory and associated maintenance activities.

After intensive analysis of the current system, we have found that there are several drawbacks to the current methods of communication. In its current state, inaccurate inventory information requires $150,000 of over-abounding consumable parts and an additional employee to manage the associated paperwork. Also, much of the paperwork dealing with tracking rotable parts has been deemed unnecessary, resulting in many thousands of dollars in unnecessary replacement and refurbishment costs. Finally, we have found that the lack of integration among the current Rocky Mountain Airlines information systems has resulted in redundant data entry, consuming valuable employee time and degrading data integrity. After fifteen years of service, the current information system has been found to be antiquated, and is insufficient to propel Rocky Mountain Airlines into its next phase of expansion.

Definition and Description of System Scope

As detailed in this report, Jjaw Enterprises proposes a networked inventory management system with the purpose of enhancing operating efficiency and reducing future expenditures. The new client-server system will include virtual network capabilities, allowing for instant communication among the various corporate branches dotting the western region. Both the maintenance and parts divisions of Rocky Mountain Airlines will be provided with a dynamic interface, backed by a database system of inventory and maintenance records. This interface will be divided into several modules, including flight logs, standard activities, aircraft, maintenance codes, maintenance locations, part modifications, inventory, purchase orders, maintenance activities, transfer transactions, activity logs, part histories, and maintenance forecasts. These modules will intuitively integrate with each other, as well as both the current "Flight Control" flight release and "RMAS" human resource management systems, to provide a higher level of interactivity and immediacy for the user.

Among the highlights of the new inventory and maintenance management systems, are efficiency in part inventory management, rotable part histories and tracking. Semi-automated order management of these inventories streamlines current ordering procedures to reduce paperwork and unnecessary labor costs and keeps inventories at levels to allow optimization of profits. A second highlight includes automated scheduling for maintenance of aircraft. This system feature will virtually eliminate the risk of not meeting regulatory maintenance requirements and will greatly reduce the logistics of pairing each aircraft with a maintenance facility for required maintenance events. In addition, all maintenance history for each

aircraft will be logged with additional information about each maintenance event including which mechanic performed which maintenance event. Several other major features will be available with the proposed system which are listed below in the system capabilities list. Also included is an essential use case list highlighting primary functions the new system will perform.

System Capabilities
The completed inventory and maintenance management system shall include the following capabilities:

- Log history on all rotable parts including part transfers
- Record maintenance events of each aircraft
- Track real-time location of each rotable part
- Record mechanic name and verify certification level with each maintenance event
- Schedule required maintenance for each aircraft to meet regulatory maintenance deadlines
- Monitor inventory levels and streamline the ordering process
- Filter maintenance forecasts
- Automate assignment of aircraft to maintenance location
- Create and manage maintenance codes and locations
- Manage parts and assemblies and their respective inventory quantities

Stakeholder Analysis
The following table lists stakeholders, their roles, and their focuses in various areas of the project's development:

Stakeholder Category	Stakeholder Name	Project Role	Schedule Focus	Cost Focus	Product Focus	Reporting Frequency
Executive	Brent Roley		High	Medium	Low	Monthly
	John Jamison	Steering Committee	High	High	Medium	Monthly
Sponsor	Jim Ashby	Steering Committee	High	High	High	Biweekly
Business Users	Josh Kotke	Requirements Definition	Low	Low	High	Monthly
	Josh Keller	Requirements Definition	Low	Low	High	Monthly
	Fiona Orolfo	Requirements Definition	Low	Low	High	Monthly
	Jenny Wilcoxen	Requirements Definition	Low	Low	High	Monthly
	Brady Knight	Requirements Definition	Low	Low	High	Monthly

Figure 1 Stakeholder Analysis

Essential Use Cases:
Upon deployment, the system will be capable of satisfying these essential use cases:

- Produce filtered forecast
- Display flight log
- Enter tracked part replacement
- Enter tracked part refurbishment
- Enter routine activity
- Display maintenance codes
- Produce part location history
- Produce part maintenance history
- Transfer tracked part to new location
- Create PO's for manual creation
- Look up mechanic ID
- Look up mechanic credentials
- Look up activity ID
- Look up part number
- Adjust inventory
- Display part information
- Modify/override/print automatically created purchase order

Feasibility and Risk

- Business Benefits
- Risk Analysis
- Risk Analysis Table
- Economic Feasibility
- Economic Feasibility Tables
- Deployment Environment
- Schedule Feasibility
- Technological Feasibility
- Organizational and Cultural Feasibility
- Gantt Chart

Description of Business Case

Business Benefits

The primary business benefits for a new inventory and maintenance management system may be more adequately understood when considering the intangible opportunities that may be missed if the current system is not upgraded. The current management system is already struggling with the demands at the company's existing size. With the proposed United Airlines contract opening new markets and expanding service and growth opportunities for RMA, a new inventory and maintenance management system is absolutely necessary. In addition, RMA has established a good reputation with the FAA in aircraft maintenance and safety. A new system would greatly enhance RMA's ability to continue its favorable relationship with the FAA and improve upon its excellent safety and performance records.

In addition to the intangible benefits associated with a new inventory and maintenance system, there are several tangible benefits to be gained as well. The more immediate benefits will:

- Improved inventory management to keep quantity on hand
- Streamline ordering process to meet immediate needs
- Automate maintenance scheduling system to eliminate the risk of breaking mandatory regulations
- Decrease man-hours needed due to increased efficiency of system
- Decrease paperwork needed due to automated inventory and part history system
- Ease rotable part tracking to find location of specific parts quickly
- Ease look up of rotable part history with detailed information
- Minimize replacement and refurbish costs by maximizing rotable part life
- Associate technician performing maintenance with each maintenance activity for accountability
- Maintain accurate and appropriate inventory levels for both rotable and consumable parts

Risk Analysis

As with any project, substantial risk is associated with the pursuance of the new inventory and maintenance management system. Jjaw Enterprises strives to quickly and accurately identify those risks and take immediate action to nullify any disabling consequences related to those risks. At times this can become a daunting task and it is therefore suggested that a risk management team be organized to identify and monitor all possible risks throughout the project's design, construction, and implementation to ensure a smooth handoff according to schedule. It has been proven that a successful risk management team should be comprised of both project management from Jjaw Enterprises as well as end users and management from Rocky Mountain Airlines. Jjaw suggests including several technically minded end users and RMA's Chief Information Officer (or equivalent) to serve on the risk management team. In turn, Jjaw will supply the project manager, a senior developer, a tester, and a system technician to serve on the risk management team from the consulting side. Such a team provides powerful and dynamic analysis from both sides and has been found to be very effective in eliminating most risks and reducing the consequences of the others.

A preliminary list of possible risks to be incurred by the implementation of the proposed system has been prepared. Many risks are strictly related to the technical implementation of the system such as database conversion problems between the old and new systems. Other risks are related mainly to effective management by RMA such as curtailing employee cutback fears. Yet other risks cause complications both for the Jjaw development team and RMA end users such as scope creep and work flow interruption during installation. Because of this risk diversity, it is imperative that a risk management team be comprised of members from both Jjaw and RMA. These risks along with others identified by the risk management team would be iteratively monitored throughout the life of the project. A preliminary list of possible risks is shown on the following page.

Risk Analysis Table

The following risks have been identified with their accompanying impact, likelihood, anticipation, and overall threat. Others may be identified by the risk management team:

Risk Analysis Table:				
Risk Description	**Impact on Project**	**Likelihood of Occurance**	**Timely Anticipation**	**Overall Threat**
Data compatability issues between systems	High	Medium	Easy	Medium
Hardware order delayed	Low	Low	Easy	Low
Software coding delayed	High	Medium	Difficult	High
Incorrect scheduling	Medium	Medium	Medium	Medium
Scope creep	Medium	Medium	Difficult	Medium
Employee cutback fears	Medium	Medium	Easy	Medium
Computer saviness of company employees	Medium	Medium	Easy	Medium
Employee system acceptance	High	Low	Easy	Medium
Inadequate tech support after installation	Low	Low	Easy	Low
System security risk	Low	Low	Hard	Low
Work flow interuption during installation	Medium	High	Easy	Medium

Figure 2 Risk Analysis

Economic Feasibility

After review of the costs of development and the value of the anticipated benefits, it has been determined that the inventory and maintenance management system is economically feasible for Rocky Mountain Airlines. As shown in the Figure 3, the primary value of benefits for RMA comes from the cost savings in avoiding unnecessary replacement and refurbishment of rotable parts. In addition, RMA will recognize an immediate one-time benefit of $150,000.00 in reduced consumable inventories due to increased accuracy of inventory information provided by the new system. This benefit is shown in year "0" on the "Cost Benefit Analysis" table found on the following page. Due to the efficiency of the new system, RMA would also require one less full-time paperwork employee. This reduction of $35,000.00 in wages payable would be seen as a benefit for each year of the life of the new system.

Benefit/Cost Savings	Amount
Initial Benefits:	
Consumable Inv. Reduction	$150,000.00
Recurring Benefits:	
Efficient Rotable Mgmt.	$732,000.00
Consum. Paperwork Wages	$35,000.00
Total Initial Benefits	**$150,000.00**
Total Recurring Benefits:	**$767,000.00**

Figure 3 Benefit/Cost Savings

The estimated savings resulting from increased efficiency in rotable parts inventory management of $732,000.00 is directly determined from the assumptions made by RMA management that the new system would reduce the CASM (cost per available seat mile) from the current 15.8 cent level to a new 15.75 cent level. This results in a .0005 cost/dollar decrease per every available seat mile flown. If we take these savings (.0005 dollars per available seat mile) and multiply them by the most recent available number of seat miles flown, we get our estimate of benefits from increased efficiency in rotable parts inventory management of $732,000 per year (see Figure 3). Due to a lack of accurate future revenue forecasts, this assumption is made without considering the increased business revenues that would result after RMA acquires the contract with United Airlines. All additional available seat miles added after the acquisition of this contract would also fall under the new 15.75 cent CASM thus providing additional cost savings benefits. As a note of interest, these estimates all rely on the assumption from RMA management that CASM will be reduced by .05 cents per available seat mile. Even a slight change in this assumption would prove to have drastic effects in relation to the benefits acquired from increased efficiency in rotable inventory management. In conclusion, the total estimated recurring benefits from implementing the new system (savings from wages payable and increases in efficiency in rotable parts inventory management) come to $767,000.00 per year where NPV is applied to future years at a discount rate of 10%(Figure 6).

Development Labor Cost Table:				
Qty	Worker	Wage	Hours	Total
1	Project Manager	$140.00	765	**$107,100.00**
2	Sr. Developers	$120.00	1145	**$274,800.00**
3	Jr. Developers	$70.00	908	**$190,680.00**
2	Testers	$90.00	545	**$98,100.00**
3	Technicans	$90.00	128	**$34,560.00**
1	Network Adminstrator	$110.00	208	**$22,880.00**
1	Maintance Support Tech	$50.00	350	**$17,500.00**
	Total			**745,620.00**

Figure 4 Development Labor Cost Table

Hardware Development Cost Table:			
Qty	Hardware	Price	Total
1	PowerEdge 830 Server	$3,815.00	**$3,815.00**
4	Cisco Pix 501 VPN Hubs	$499.00	**$1,996.00**
1	Cisco Pix 525 Gatway	$4,999.00	**$4,999.00**
1	Networking Costs	$1,000.00	**$1,000.00**
1	Miscellaneous Costs	$4,000.00	**$4,000.00**
	Total		**$15,810.00**
	Total of Development Costs:		**$761,430.00**

Figure 5 Hardware Development Cost Table

The development cost of $761,430.00 includes all hardware, software, and labor associated with implementing the new inventory and maintenance management system at Rocky Mountain Airlines headquarters and at the four remote maintenance facilities owned and operated by the airline. It should be noted that an acquisition of a new contract with United Airlines may also necessitate additional maintenance facilities and therefore the system network would have to be extended to those new locations. However, there is insufficient information to make an accurate assumption and so the estimates remain as they are. Rocky Mountain Airlines should ensure that they have proper cash flow to accommodate the initial outlay of $761,430.00 before declaring their economic feasibility.

Recurring Expenses	Amount/Year
Support Staff	$45,000.00
Amorization	$76,143.00
System Maintenance	$1,500.00
Total	**$122,643.00**

Figure 6 Recurring Expenses

Several recurring expenses associated with the inventory and maintenance management system also need to be considered by Rocky Mountain Airlines Management. Continuous support staff for the new system will be necessary to ensure that the system remains operable and that end users at maintenance facilities and at headquarters receive the necessary training to use the system. Estimated costs for system technical support is $45,000.00 per year. Managers must also consider periodic maintenance required by the system throughout its life. This maintenance will include software patches and updates/upgrades that will become necessary to comply with and accommodate changing business demands. These maintenance costs are estimated to be $1,500.00 per year. Finally, RMA management must acknowledge that this system will eventually become antiquated and will yet again need replacing. Straight-line amortization has been assigned to the project under an assumption of ten years of useful life after which any additional years of use would be considered as added benefits of the system. These amortization costs make up the majority of the recurring expenses at $76,143.00 per year. Total recurring cost for the new system come to $122,643.00 per year where NPV is applied to future years at a discount rate of 10%.

After preliminary cost/benefit estimates, it has been determined that proceeding with the new inventory and maintenance management system is economically feasible with a payback period of 1 year and 18 days and has a five year return on investment of 64.07% (assuming a 10% discount rate). Under these mentioned assumptions, from an economical prospective we strongly encourage Rocky Mountain Airlines to pursue the development of this new system.

Cost Benefit Analysis	0	1	2	3	4	5	Total
1 Value of benefits	$150,000.00	$767,000.00	$767,000.00	$767,000.00	$767,000.00	$767,000.00	
2 Discount factor (10%)	100.00%	90.91%	82.64%	75.13%	68.30%	62.09%	
3 Present value of benefits	$150,000.00	$697,272.73	$633,884.30	$576,258.45	$523,871.32	$476,246.65	**$3,057,533.45**
4 Development costs	-$761,430.00						**-$761,430.00**
5 Ongoing Cost		-$122,643.00	-$122,643.00	-$122,643.00	-$122,643.00	-$122,643.00	
6 Discount factor (10%)	100.00%	90.91%	82.64%	75.13%	68.30%	62.09%	
7 Present value of costs	-$761,430.00	-$111,493.64	-$101,357.85	-$92,143.50	-$83,766.82	-$76,151.65	**-$1,226,343.46**
8 PV of net of benefits and costs	-$611,430.00	$585,779.09	$532,526.45	$484,114.95	$440,104.50	$400,095.00	
9 Cumulative NPV	-$611,430.00	-$25,650.91	$506,875.54	$990,990.49	$1,431,094.99	$1,831,189.99	
Payback period	**1 year + $559,210.00 / ($31,316.36 + $559,210.00) = .0482 years or 1 year and 18 days**						
5-year return on investment	**($3,057,533.45 - ($761,430.00 + $1,226,343.46)) / ($761,430.00 + $1,226,343.46) = 53.82%**						

Figure 7 Benefit/Cost Savings

Deployment Environment

Jjaw has determined the following deployment information based on the usability of existing hardware and the need for new, state of the art equipment to handle the demands of a robust inventory and maintenance management system. The following is an explanation of each hardware item needed and a description of how those items will be acquired:

- Maintenance Facility Terminals:
  After speaking with RMA management, it has been decided that the existing terminals in each of the four maintenance facilities are adequate to support the demands of the system. These machines are currently being used as "dumb terminals" on the existing system. On the new system these terminals will become an integral part of the system network.
- Headquarter Terminals:
  The new inventory and maintenance management system will necessitate use not only by the four maintenance facilities of Rocky Mountain Airlines, but also by the parts, maintenance planning, records, and maintenance control departments at RMA headquarters. It has been assumed that users within these departments also work closely with other information systems associated with RMA and therefore have terminals that suffice the proposed system's requirements.
- Cisco PIX 501 VPN Devices:
  Because the four maintenance facilities are located at remote sites, it is impossible for direct network lines to be installed from the database server (located at headquarters) to each of the four remote terminals. As a solution to this problem, it is proposed that RMA use Cisco's PIX 501 VPN devices which allow each remote site to tunnel into RMA headquarters' secure network using a virtual private network. It is required that each remote site have a DSL connection through a local ISP of RMA's choice. The Cisco PIX tunnels into the network with the aid of the Cisco PIX 525 gateway which resides on the server end allowing a virtual private network to be established between each terminal location and the server at headquarters. An added benefit of the PIX devices is that they all serve as a reputably secure firewall to protect each terminal. The PIXs also allow for additional terminals to be easily added to the network at any remote location. Four devices will be purchased at an approximate price of $499.00 a piece.
- Cisco PIX 525 Gateway
  The PIX Gateway will reside on the server end and will connect with all remote PIX 501 devices to enable a VPN to be established. This gateway device will then be connected directly to the PowerEdge 830 database server. One device will be purchased at an approximate price of $4999.00.
- PowerEdge 830 Database Server:
  The new inventory and maintenance management system server will reside at RMA headquarters. This will be a Windows based server supporting a client/server environment. One server will be purchased at an approximate price of $3,815.00.
- Networking and Miscellaneous Costs:
  Included in the cost estimates are figures for networking and miscellaneous costs. We are assuming the networking cost will be related to running networking cabling for the new system and also include costs associated with getting ISP's to install DSL connections to each of the four maintenance facilities. Miscellaneous costs are associated with the removal and disposal of the existing system and also serve as padding in case of unexpected costs. Estimated figures for networking and miscellaneous costs are $1,000.00 and $4,000.00 respectively.

Shown below is the hardware development cost table. The next page shows a detailed network diagram to clarify how the newly implemented network will be designed:

Hardware Development Cost Table:			
Qty	**Hardware**	**Price**	**Total**
1	PowerEdge 830 Server	$3,815.00	**$3,815.00**
4	Cisco Pix 501 VPN Hubs	$499.00	**$1,996.00**
1	Cisco Pix 525 Gatway	$4,999.00	**$4,999.00**
1	Networking Costs	$1,000.00	**$1,000.00**
1	Miscellaneous Costs	$4,000.00	**$4,000.00**
	Total		**$15,810.00**

Figure 8 Hardware Development Cost Table

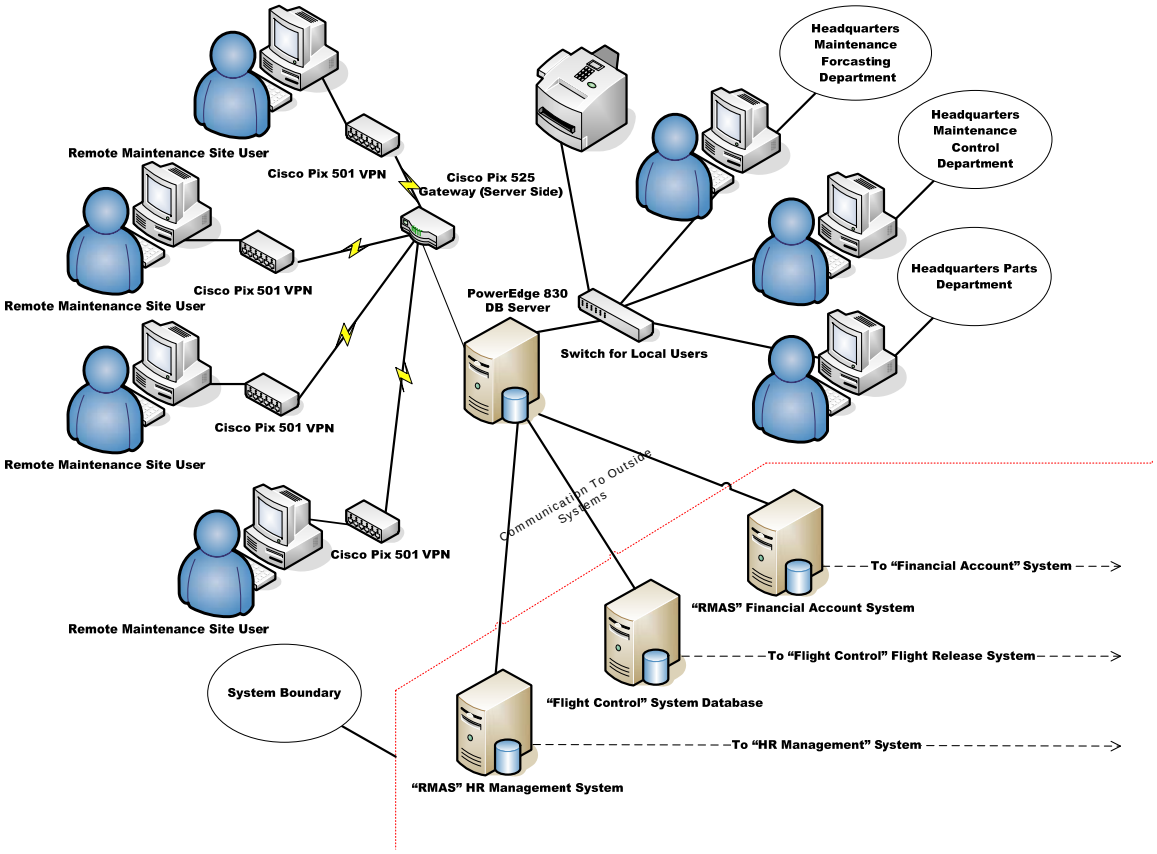


Figure 9 Network Diagram

Schedule Feasibility

At Jjaw Enterprises, we pride ourselves in consistent quality at an affordable price. In addition, we know that time is money, especially when considering business opportunities missed due to slow development of systems. That's why we back our service with the most talented, experienced, and technically capable individuals available to expedite the development process while, in turn, providing the best business solution possible. The proposed schedule will also be consistently monitored both by Jjaw Enterprises project management as well as Rocky Mountain Airlines who will be provided with weekly status updates on progress made and any unexpected risks identified. It is also Jjaw's policy that our project managers maintain an open door policy to RMA management so that any concerns may be adequately communicated at any time.

After extensive review of the proposed system's scope, Jjaw Enterprises has determined that a pilot version of the new inventory and maintenance management system would be deployed at 6 months and that complete handoff of the system would occur two months later at the 8 month deadline. The pilot version would be used only for training and problem resolution issues from the 6th month to 8th month. Upon handoff at 8 months, a direct implementation of the new system would take place and the current antiquated system would be immediately removed. These delivery points have been determined after careful analysis of all individual tasks with their accompanying estimated time frames which can be found in the Gantt chart on pages 13 and 14. These time frames are based upon reasonable deadlines with a significant amount of time set aside for testing and improving in iterations as the project progresses.

Technological Feasibility

You can be assured that Jjaw Enterprises will select a team of its finest business associates and technicians to execute the project solution to its smallest detail. Our company is renowned for its expertise in systems development and in implementing the correct technologies to accommodate the business needs demanded by its users. We have carefully selected proven, time-tested hardware from reputable networking and server suppliers and have customized these hardware selections specifically

for RMA's business problem. We confidently anticipate that all technologies involved in this proposed solution will provide powerful system capabilities, friendly usability, and dependable service for many years to come.

Organizational and Cultural Feasibility

Jjaw has some concerns about computer phobia that may currently exist among employees of Rocky Mountain Airlines due to the current antiquated system being used. We have therefore scheduled a two month pilot program where the new system will be available to all end users on a mock basis only. During this time, training for end users will be provided in a low pressure learning atmosphere. Users will continue to use the old system during this 2 month period for all work related tasks while using the new system for learning purposes only. After this 2 month training period, a direct deployment of the new system will take place at which time all end users will be expected to use the new system to perform all tasks. The old system will then be removed and the new system will be officially handed off to RMA.

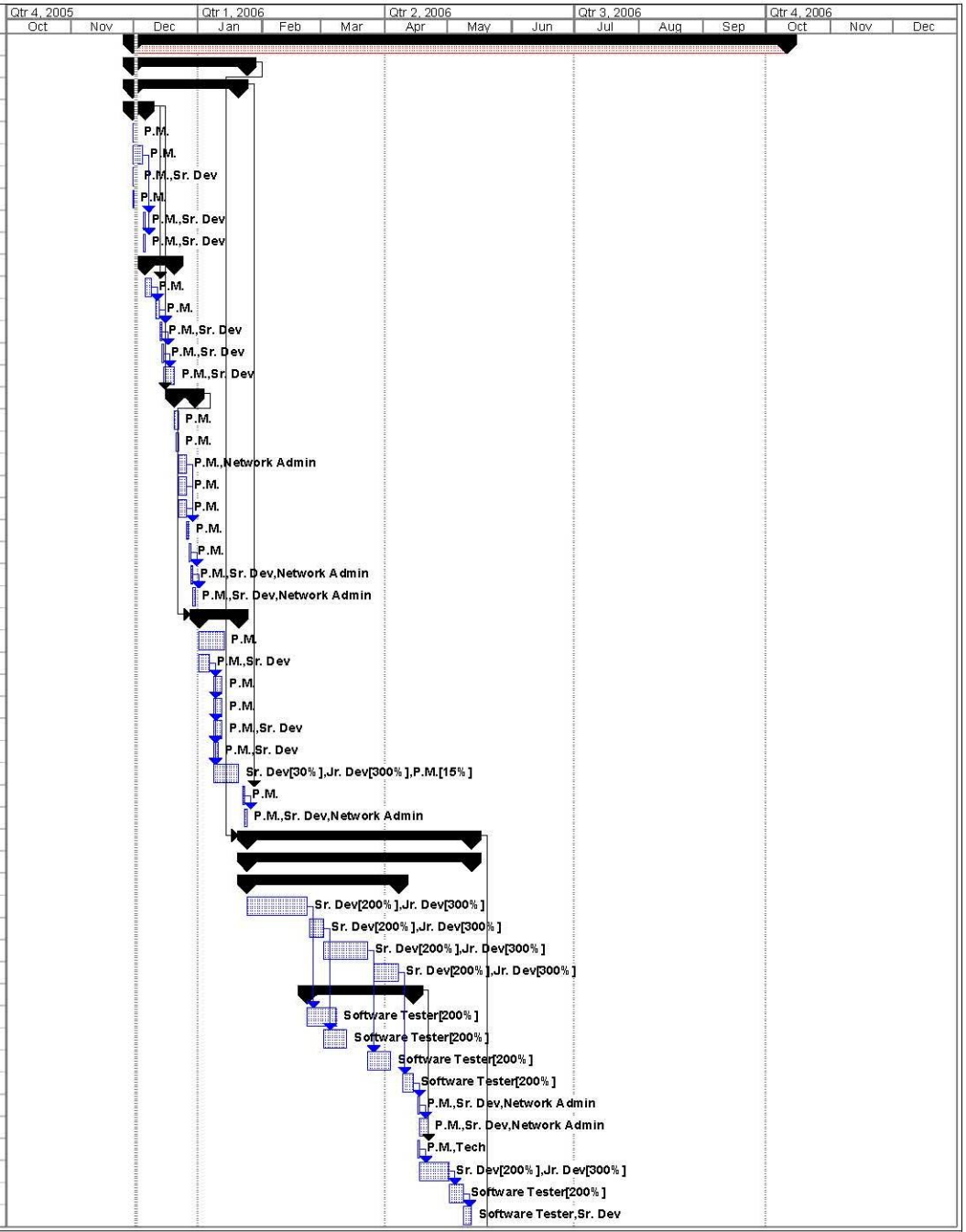
Another concern is related to RMA employees understanding that critical inventory and maintenance events of the past which require paperwork will be streamlined to eliminate unnecessary work. This streamlining will result in the elimination of at least one full-time inventory management position and may spark fears of employment cutbacks within the company. It is Jjaw's belief that RMA has established a good relationship with its employees and that effort to reassure employees of the positive benefits of the new system and resolve any fears related to its implementation will be successful. Jjaw requests that RMA management make special note of these issues and take necessary actions to curtail any possible fears that would delay or seriously hamper the implementation of the new system. It is also suggested that RMA management consult frequently with the project risk management team to ensure that all potential risks are kept in check to avoid any perceived pitfalls. We express our confidence that with careful training and implementation, the new system will bring added efficiency and increased morale to the employees of RMA.

Project Time Estimate and Schedule

The project will be completed within eight months at a cost of $761,430.00. At six months, a fully functional pilot version will be deployed where end users may learn how to use the new system and where touch-up adjustments and usability modifications can be made before the system is handed off. At eight months the system will be officially handed off to Rocky Mountain Airlines and all maintenance, technical support, and upgrades on the system thereafter become the express responsibility of RMA. See pages13 through 14 for a full Gantt Chart outlining detailed events during each phase of the project. It should be noted that these schedule figures are given as estimates only and are subject to change per modification of the existing proposal. Also, all economic figures regarding financial benefits are based on assumptions and should therefore be carefully considered and verified by RMA management.

Figure 10a Gantt Chart for Rocky Mountain Airlines

ID	Task Name	Duration	StartDate	Predecessors
1	**Rocky Mountain Airlines Inventory Management System**	**224.5 days**	**Thu 12/1/05**	
2	**Inception Iteration**	**39 days**	**Thu 12/1/05**	
3	**Analysis & Planning**	**37 days**	**Thu 12/1/05**	
4	**Business and Project Enviroment**	**4 days**	**Thu 12/1/05**	
5	Understand Business Need	2 days	Thu 12/1/05	
6	Define Project Scope	3 days	Thu 12/1/05	
7	Define System Scope	2 days	Thu 12/1/05	
8	Define Project Management Hierarchy	2 hrs	Thu 12/1/05	
9	Discover Technical Skills Needed	1 day	Tue 12/6/05	6
10	Discover Project Work Environment/Tools	1 day	Tue 12/6/05	6
11	**Project Schedule**	**10 days**	**Wed 12/7/05**	
12	Create WBS	3 days	Wed 12/7/05	4
13	Develop Basic Schedule	2 days	Mon 12/12/05	12
14	Determine Needed Resources	1 day	Wed 12/14/05	13
15	Develop Resource Timeline	1 day	Thu 12/15/05	14
16	Develop/Refine Gantt Chart	3 days	Fri 12/16/05	15
17	**Risk and Feasability**	**8 days**	**Wed 12/21/05**	**4**
18	Do Stakeholder Analysis	2 days	Wed 12/21/05	
19	List Tangible Benefits	1 day	Thu 12/22/05	
20	Estimate Equipment Costs	2 days	Fri 12/23/05	
21	Estimate Project Labor Costs	2 days	Fri 12/23/05	
22	Estimate Recurring Maintenance Costs	2 days	Fri 12/23/05	
23	Do Payback, NPV, ROI, for Project	1 day	Tue 12/27/05	21,22,20
24	Organize Risk Management Team	1 day	Wed 12/28/05	
25	Identify Risks	1 day	Thu 12/29/05	24
26	Develop Risk Monitoring Plan	1 day	Fri 12/30/05	25
27	**Design System**	**15 days**	**Mon 1/2/06**	**17**
28	Develop Class Object Diagram	10 days	Mon 1/2/06	
29	Design System Event List	5 days	Mon 1/2/06	
30	Create Fully Developed Use Cases	4 days	Mon 1/9/06	29
31	Design Activity Diagrams	4 days	Mon 1/9/06	29
32	Design System Sequence Diagrams	4 days	Mon 1/9/06	29
33	Develop Use Case Diagram	2 days	Mon 1/9/06	29
34	Design Mock-up Interfaces	10 days	Mon 1/9/06	29
35	Managerial Presentation	1 day	Mon 1/23/06	3
36	Structured Walkthrough	1 day	Tue 1/24/06	35
37	**Elaboration Iteration**	**78 days**	**Wed 1/25/06**	**2**
38	**Code and Test System Modules**	**78 days**	**Wed 1/25/06**	
39	**Code High Risk Modules**	**53 days**	**Wed 1/25/06**	
40	Code Maitenance Activity Modules	21 days	Wed 1/25/06	
41	Code Maintenance History Modules	5 days	Fri 2/24/06	
42	Code Maintenance Forcast Modules	15 days	Fri 3/3/06	
43	Code Transfer Transaction Modules	10 days	Mon 3/27/06	
44	**Test High Risk Modules**	**37 days**	**Thu 2/23/06**	
45	Test Maitenance Activity Modules	10 days	Thu 2/23/06	40
46	Test Maintenance History Modules	7 days	Fri 3/3/06	41
47	Test Maintenance Forcast Modules	7 days	Fri 3/24/06	42
48	Test Transfer Transaction Modules	5 days	Mon 4/10/06	43
49	Reevaluate Potential Risks	1 day	Mon 4/17/06	48
50	Refine System Design and Solve Risks	4 days	Tue 4/18/06	49
51	Conduct User Evaluations on Prototypes	1 day	Mon 4/17/06	44
52	Modify Modules According to Feedback	10 days	Tue 4/18/06	51
53	Test Refined Modules	5 days	Tue 5/2/06	52
54	Test and Ensure Interoperability	4 days	Tue 5/9/06	53

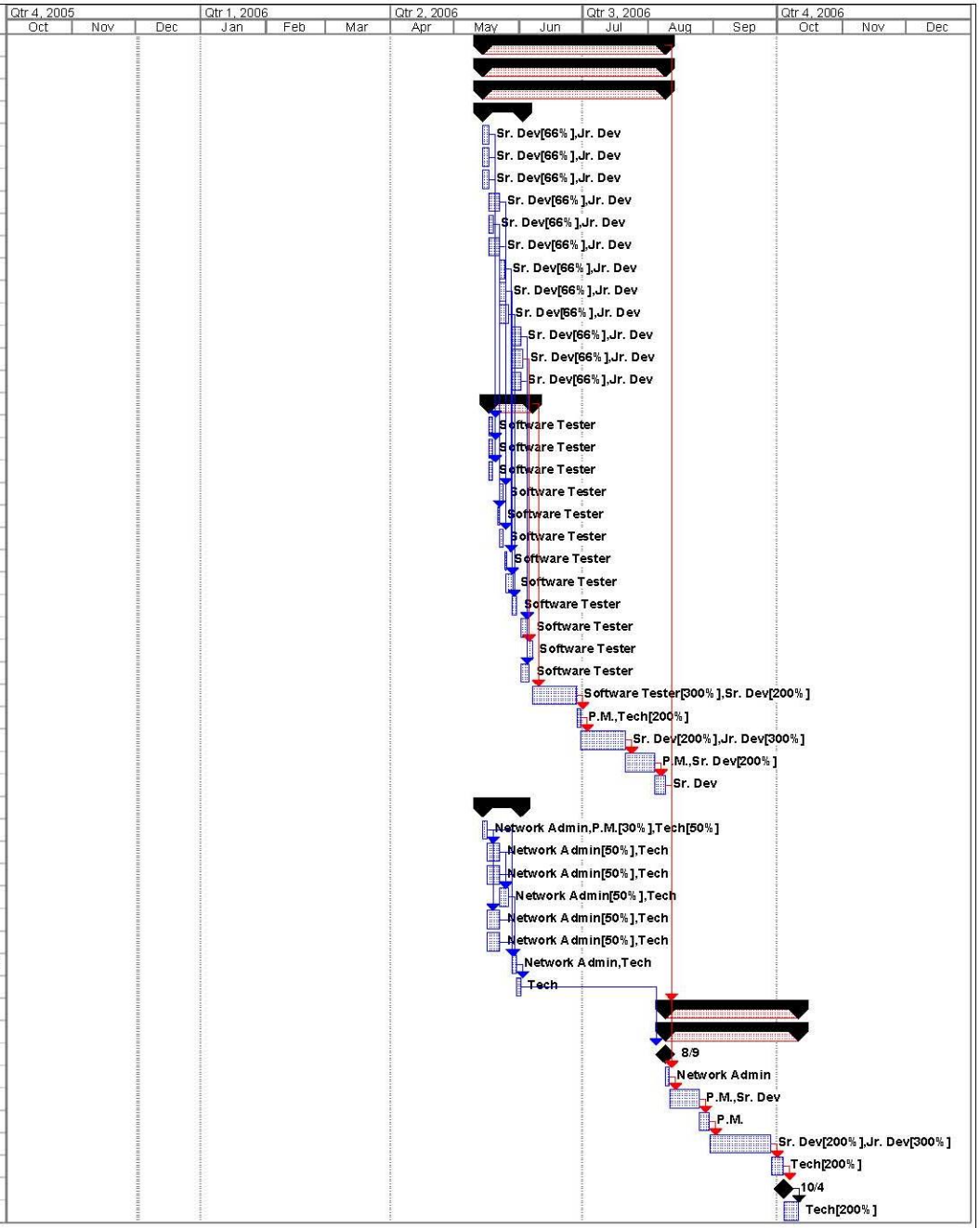


Project: RMAIMS.mpp
Date: Fri 12/2/05

Critical Split Milestone Project Summary External Milestone
Task Progress Summary External Tasks Deadline

Figure 10b Gantt Chart for Rocky Mountain Airlines

ID	Task Name	Duration	StartDate	Predecessors
55	**Construction Iteration**	**62.5 days**	**Mon 5/15/06**	**37**
56	**Refine Software and Install**	**62.5 days**	**Mon 5/15/06**	
57	**Code and Refine Software**	**62.5 days**	**Mon 5/15/06**	
58	**Code Low Risk Modules**	**15 days**	**Mon 5/15/06**	
59	Code Flight Log Modules	3 days	Mon 5/15/06	
60	Code Standard Activity Modules	3 days	Mon 5/15/06	
61	Code Aircraft Modules	3 days	Mon 5/15/06	
62	Code Maintenance Code Modules	3 days	Thu 5/18/06	
63	Code Maintenance Location Modules	2 days	Thu 5/18/06	
64	Code Look-up Modules	3 days	Thu 5/18/06	
65	Code Conceptual Part Information Modules	2.5 days	Tue 5/23/06	
66	Code Rotable Part Information Modules	3 days	Tue 5/23/06	
67	Code Assembly Part Information Modules	4 days	Tue 5/23/06	
68	Code Inventory Modules	4 days	Mon 5/29/06	
69	Code Purchase Order Modules	5 days	Mon 5/29/06	
70	Code External Communications Modules	4 days	Mon 5/29/06	
71	**Test Coded Modules**	**14.5 days**	**Thu 5/18/06**	
72	Test Flight Log Modules	1.5 days	Thu 5/18/06	59
73	Test Standard Activity Modules	1.5 days	Thu 5/18/06	60
74	Test Aircraft Modules	1.5 days	Thu 5/18/06	61
75	Test Maintenance Code Modules	1.5 days	Tue 5/23/06	62
76	Test Maintenance Location Modules	1 day	Mon 5/22/06	63
77	Test Look-up Modules	1.5 days	Tue 5/23/06	64
78	Test Conceptual Part Information Modules	1 day	Thu 5/25/06	65
79	Test Rotable Part Information Modules	1.25 days	Fri 5/26/06	66
80	Test Assembly Part Information Modules	2 days	Mon 5/29/06	67
81	Test Inventory Modules	2 days	Fri 6/2/06	68
82	Test Purchase Order Modules	2.5 days	Mon 6/5/06	69
83	Test External Communications Modules	2 days	Fri 6/2/06	70
84	Test Interoperability Between all Modules	15 days	Wed 6/7/06	71
85	Conduct End User Evaluations on Beta	2 days	Wed 6/28/06	84
86	Modify Modules According to Feedback	15 days	Fri 6/30/06	85
87	Prepare Pilot Version for Release	10 days	Fri 7/21/06	86
88	Transfer Data to New System	3 days	Fri 8/4/06	87
89	**Install System Hardware/Software**	**14 days**	**Mon 5/15/06**	
90	Develop Installation Plan	2 days	Mon 5/15/06	
91	Install Cisco Server Hardware	4 days	Wed 5/17/06	90
92	Install Server Software	4 days	Wed 5/17/06	
93	Install Network Connectivity Devices	4 days	Tue 5/23/06	91
94	Install Workstation Hardware	4 days	Wed 5/17/06	90
95	Install Workstation Software	4 days	Wed 5/17/06	
96	Test Hardware and Network	2 days	Mon 5/29/06	90,91,92,93,94,
97	Test Software Network Stability	2 days	Wed 5/31/06	96
98	**Transition Iteration**	**45 days**	**Wed 8/9/06**	**55**
99	**Finalize System/Implementation**	**45 days**	**Wed 8/9/06**	
100	"Go Live" with Pilot	0 days	Wed 8/9/06	97
101	Verify Data Integrity	2 days	Wed 8/9/06	88
102	Train End Users on Beta	10 days	Fri 8/11/06	101
103	Conduct End User Evaluations	3 days	Fri 8/25/06	102
104	Make Final Adjustments	21 days	Wed 8/30/06	103
105	Deploy Final System	4 days	Thu 9/28/06	104
106	Pass Off System	0 days	Wed 10/4/06	105
107	Tear Down Old System	5 days	Wed 10/4/06	106



Project: RMAIMS.mpp
Date: Fri 12/2/05

Critical | Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

System Components

- Fully Developed Use Cases
- Activity Diagrams
- System Sequence Diagrams
- Graphical User Interfaces

The diagrams listed above are provided for the following use cases:

- ❖ Enter Tracked Part Replacement
- ❖ Enter Tracked Part Refurbishment
- ❖ Enter Completed Standard Activity
- ❖ Produce Filtered Forecast
- ❖ Produce Tracked Part Maintenance History
- ❖ Transfer Tracked Part To New Location
- ❖ Produce Filtered Activity Log

Use Case Name:	Enter Tracked Part Replacement	
Scenario:	Control enters tracked part replacement	
Triggering Event:	Tracked part replacement submitted	
Brief Description:	After a tracked part is replaced, maintenance control opens the "Maintenance Activities" application module followed by clicking the "Replace" tab. First, the serial number of the new part is entered. The description and current location of the part is displayed. Then, the serial number of the old part is entered, followed by the location and the mechanic id (mechanic lookup is available). The mechanic name will then be populated. Finally, the date and time of maintenance is entered and the activity is submitted.	
Actors:	Maintenance control	
Related Use Cases:	Lookup Mechanic Name	
Stakeholders:	Maintenance Control Maintenance Management Corporate Headquarters	
Preconditions:	Parts must exist Location must exist Mechanic must exist	
Post conditions:	New completed maintenance record must be created	
	Actor	**System**
Flow of Events:	1. Enters old serial number 2. Enters new serial number 3. Enters maintenance location 4. Enters mechanic id 5. Enters date of maintenance 6. Enters time of maintenance 7. Submits entries	1.1 Populates part description field 1.2 Populates current part location field 4.1 Populates mechanic name field 7.1 Accepts tracked part replacement
Exception Conditions:	4.1 If the user does not know a mechanic's ID, then he/she can use the mechanic lookup (look up mechanic ID use case)	

Figure 11 Use Case for Enter Tracked Part Replacement

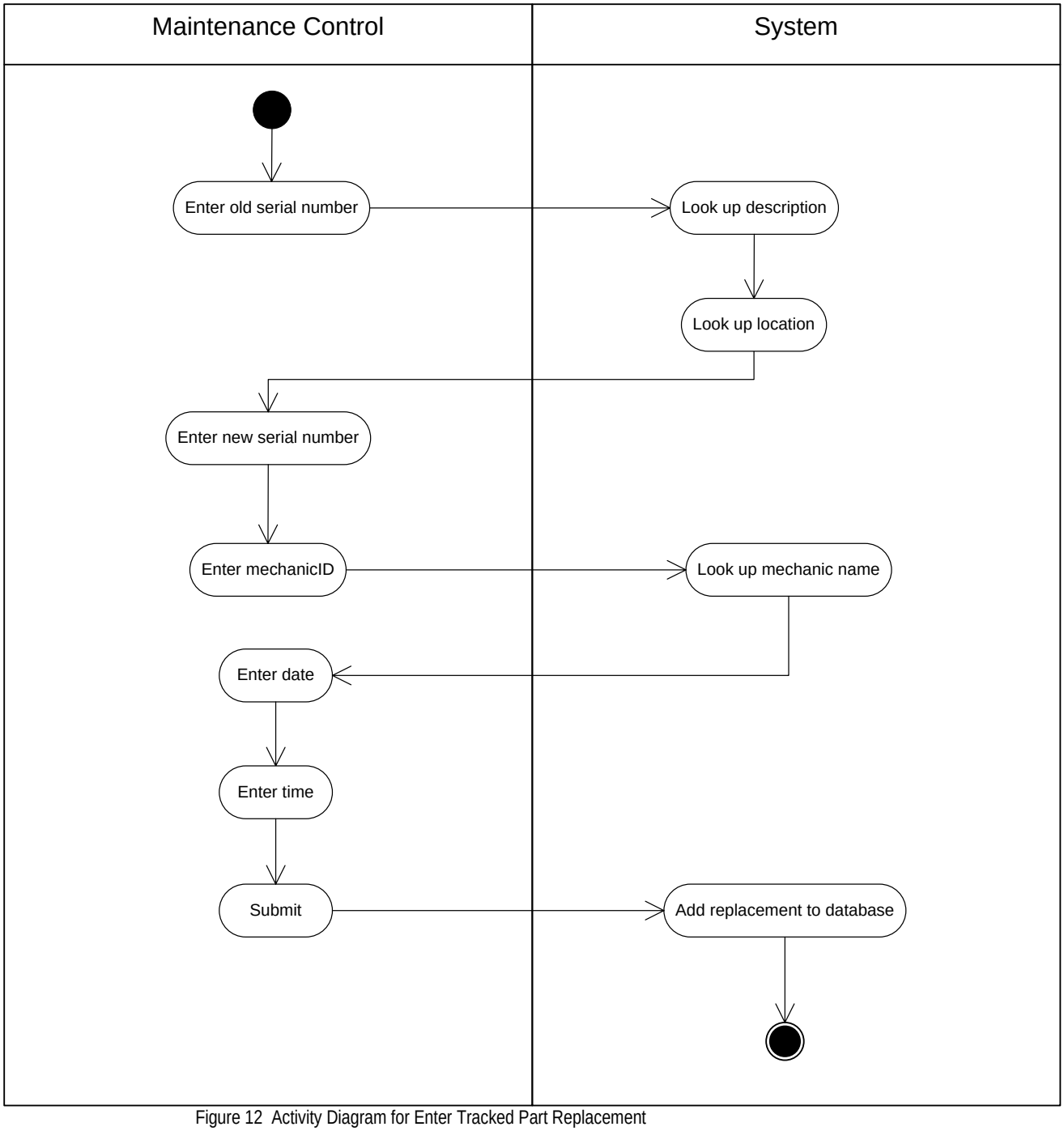


Figure 12 Activity Diagram for Enter Tracked Part Replacement

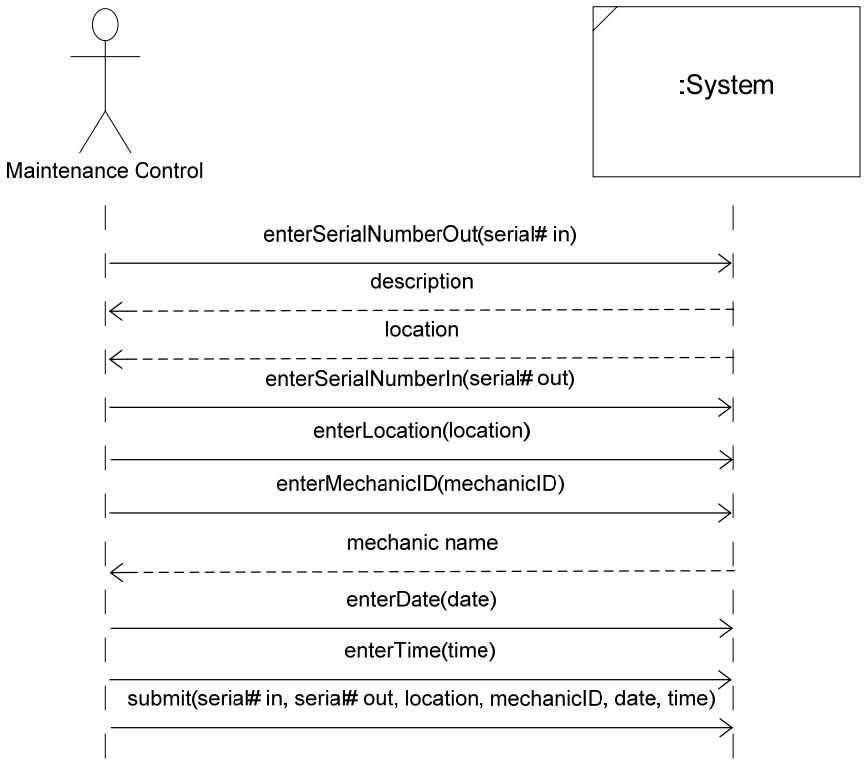


Figure 13 System Sequence Diagram for Enter Tracked Part Replacement

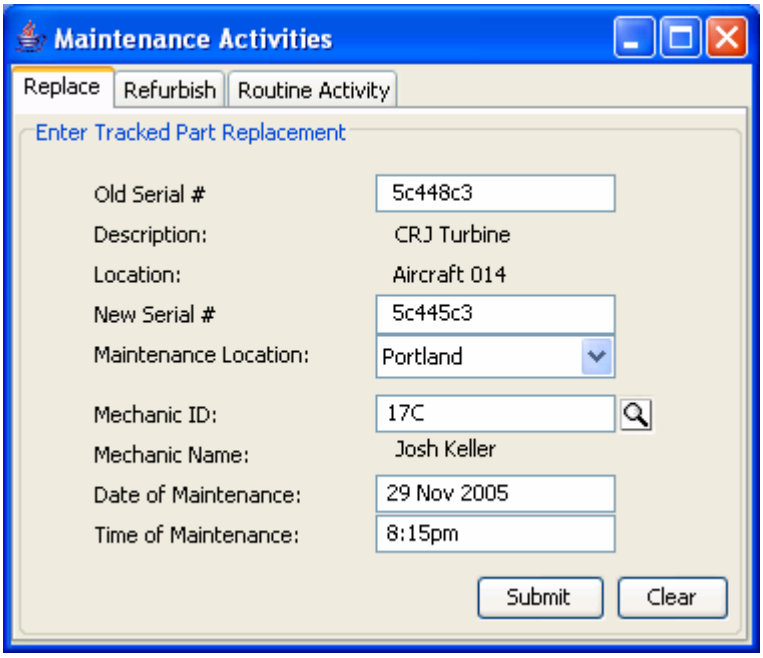


Figure 14 Graphical User Interface for Enter Tracked Part Replacement

Use Case Name:	Enter Tracked Part Refurbishment	
Scenario:	Control enters tracked part refurbishment	
Triggering Event:	Tracked part refurbishment submitted	
Brief Description:	After a tracked part is refurbished, maintenance control opens the "Maintenance Activities" application module, followed by clicking the "Refurbish" tab. First, the serial number of the refurbished part is entered and then the part description field is populated. The location and the mechanic id are entered. The mechanic name will then be populated. Finally, a maintenance date and time is entered and the refurbishment is submitted.	
Actors:	Maintenance control	
Related Use Cases:	Lookup Mechanic Name	
Stakeholders:	Maintenance Control Maintenance Management Corporate Headquarters	
Preconditions:	Part must exist Location must exist Mechanic must exist	
Post conditions:	New completed maintenance record must be created	
	Actor	**System**
Flow of Events:	1. Enters serial number 2. Enters location 3. Enters mechanic id 4. Enters date 5. Enters time 6. Submits entries	1.1 Populates part description field 3.1 Populates mechanic name field 6.1 Accepts tracked part refurbishment
Exception Conditions:	4.2 If the user does not know a mechanic's ID, then he/she can use the mechanic lookup (look up mechanic ID use case)	

Figure 15 Use Case for Enter Tracked Part Refurbishment

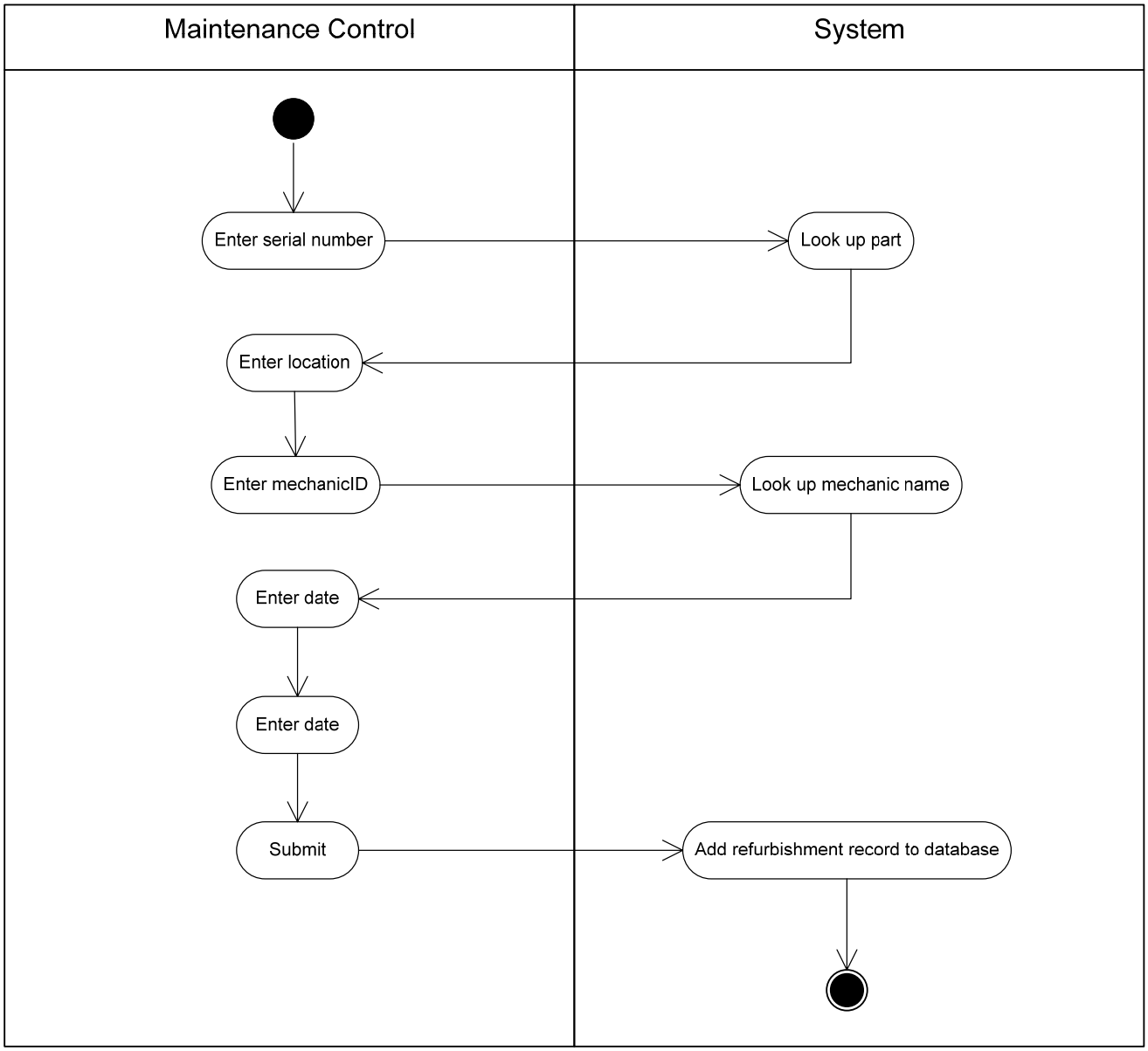


Figure 16 Activity Diagram for Enter Tracked Part Refurbishment

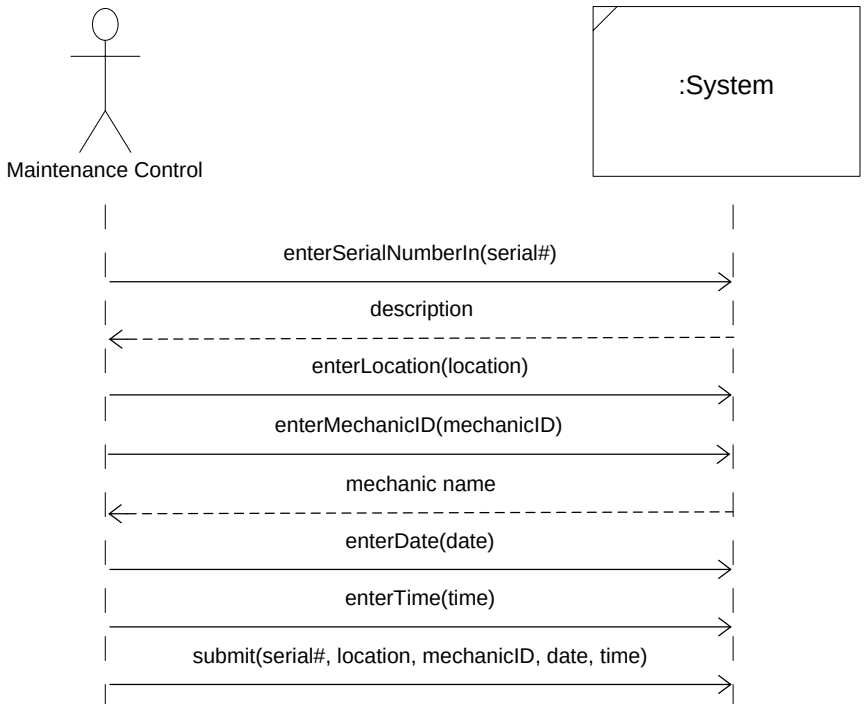


Figure 17 System Sequence Diagram for Enter Tracked Part Refurbishment

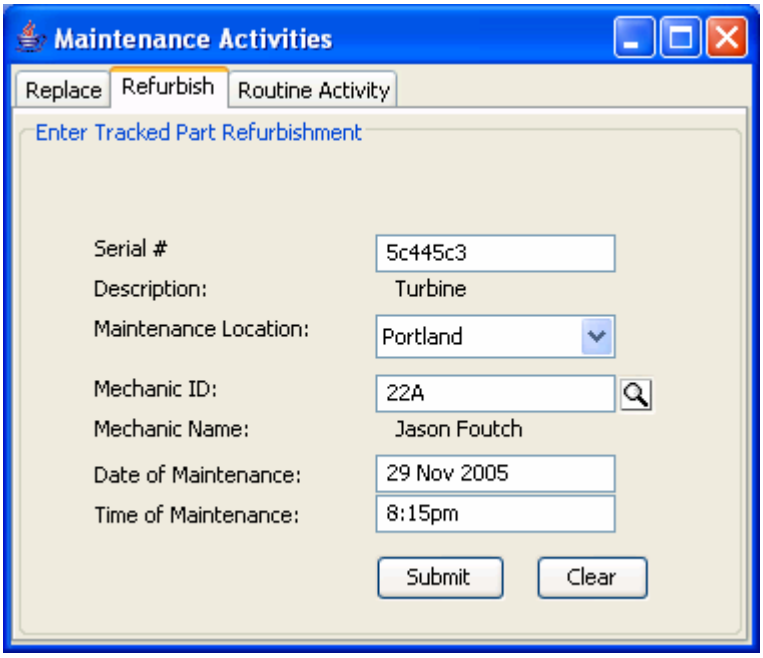


Figure 18 Graphical User Interface for Enter Tracked Part Refurbishment

Use Case Name:	Enter Completed Standard Activity	
Scenario:	Control enters completed standard activity	
Triggering Event:	Completed standard activity submitted	
Brief Description:	After a standard activity is performed, maintenance control opens the "Maintenance Activities" application module, followed by clicking the Routine Activity tab. If the activity performed was a miscellaneous activity, maintenance control will click the button labeled "Create Miscellaneous Activity", otherwise, the standard routine activity is entered as usual. Firstly, an activity ID is entered (if unknown, lookup is available). The description field is then populated appropriately. A location is then entered along with a mechanic ID (if unknown, lookup is available). The mechanic name field is then populated appropriately. Finally, a maintenance date and time is entered and the routine activity is submitted.	
Actors:	Maintenance control	
Related Use Cases:	Lookup Activity Description Lookup Mechanic Name	
Stakeholders:	Maintenance Control Maintenance Management Corporate Headquarters	
Preconditions:	Conceptual parts (w/ sufficient quantity) associated with the activity must exist Activity must exist Location must exist Mechanic must exist	
Post conditions:	Standard maintenance activity record created	
	Actor	**System**
Flow of Events:	1. Enters activity ID 2. Enters location 3. Enters mechanic ID 4. Enters date 5. Enters time 6. Submits standard routine activity	1.1 Populates activity description field 3.1 Populates mechanic name field 6.1 Accepts routine activity information
Exception Conditions:	1.1 If the user does not know an activity's ID, then he/she can use the activity lookup (look up activity ID use case) 4.3 If the user does not know a mechanic's ID, then he/she can use the mechanic lookup (look up mechanic ID use case)	

Figure 19 Use Case for Enter Completed Standard Activity

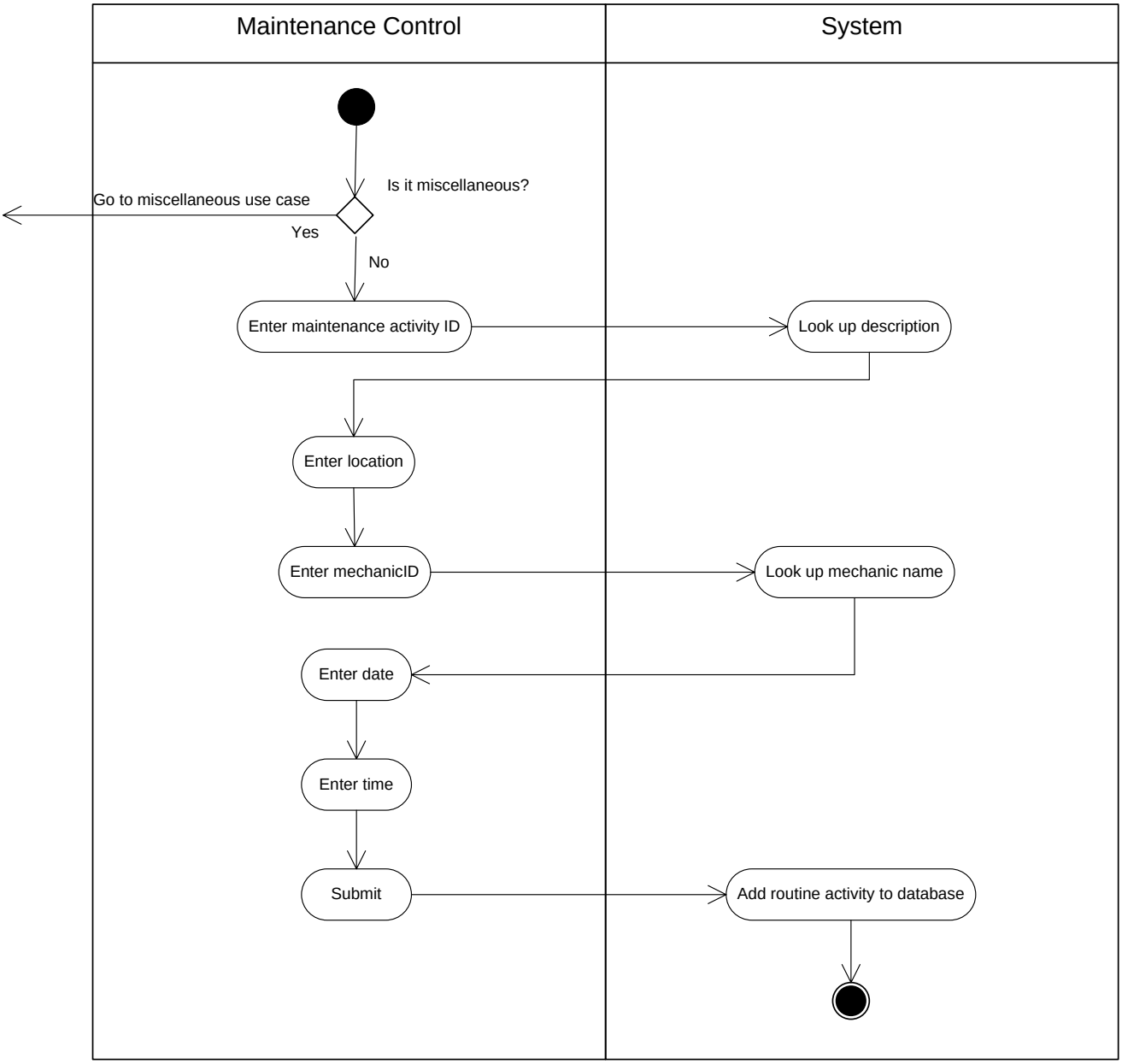


Figure 20 Activity Diagram for Enter Completed Standard Activity

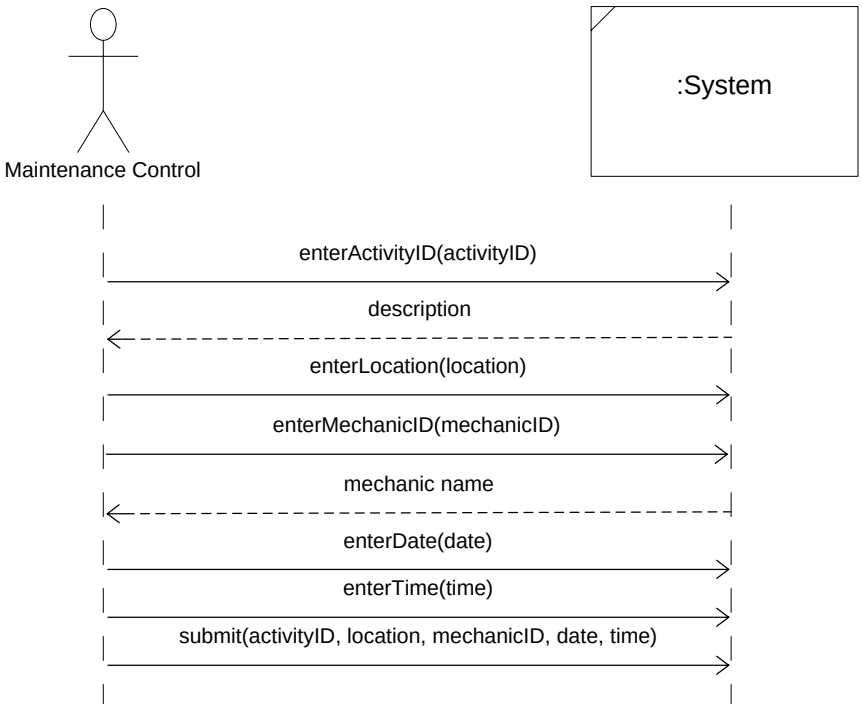


Figure 21 System Sequence Diagram for Enter Completed Standard Activity

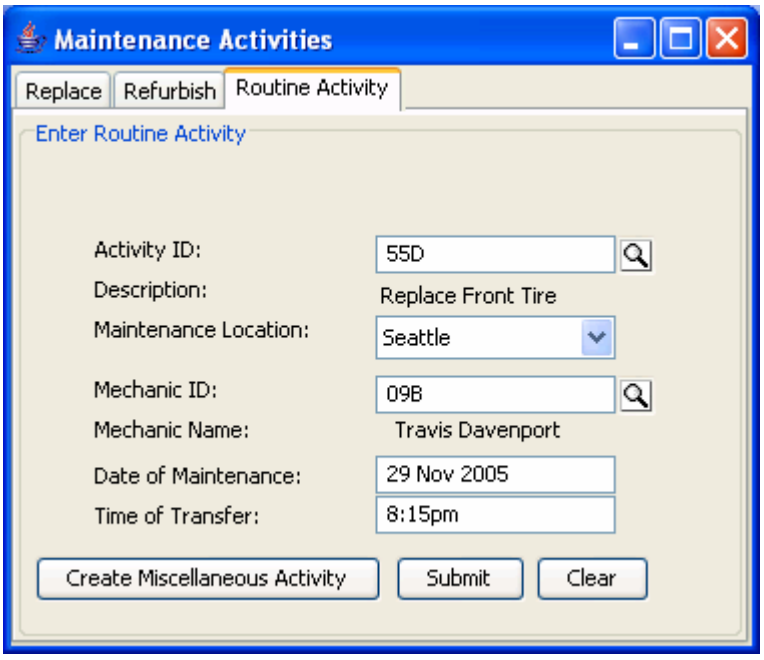


Figure 22 Graphical User Interface for Enter Completed Standard Activity

Use Case Name:	Produce Filtered Forecast	
Scenario:	Planning requests filtered maintenance forecast	
Triggering Event:	Request for filtered maintenance forecast	
Brief Description:	When maintenance planning chooses to view the filtered forecast report, the "View Filtered Forecast" application module is opened. The filters are used to define the parameters of the report. The user then clicks the "produce report" button. The system generates and displays the report. The user can later choose to print the report.	
Actors:	Maintenance control	
Related Use Cases:		
Stakeholders:	Maintenance Control Maintenance Management Corporate Headquarters	
Preconditions:	Selected aircraft and location must exist	
Post conditions:		
	Actor	**System**
Flow of Events:	1. Enters aircraft tail number 2. Enters location 3. Enters preferred period 4. Click "Produce Report" button 5. Clicks "Print" to print report	4.1 Produces forecast report 5.1 Prints report
Exception Conditions:	5.1 If the user does not choose to print the report, he/she can review the report and exit	

Figure 23 Use Case for Produce Filtered Forecast

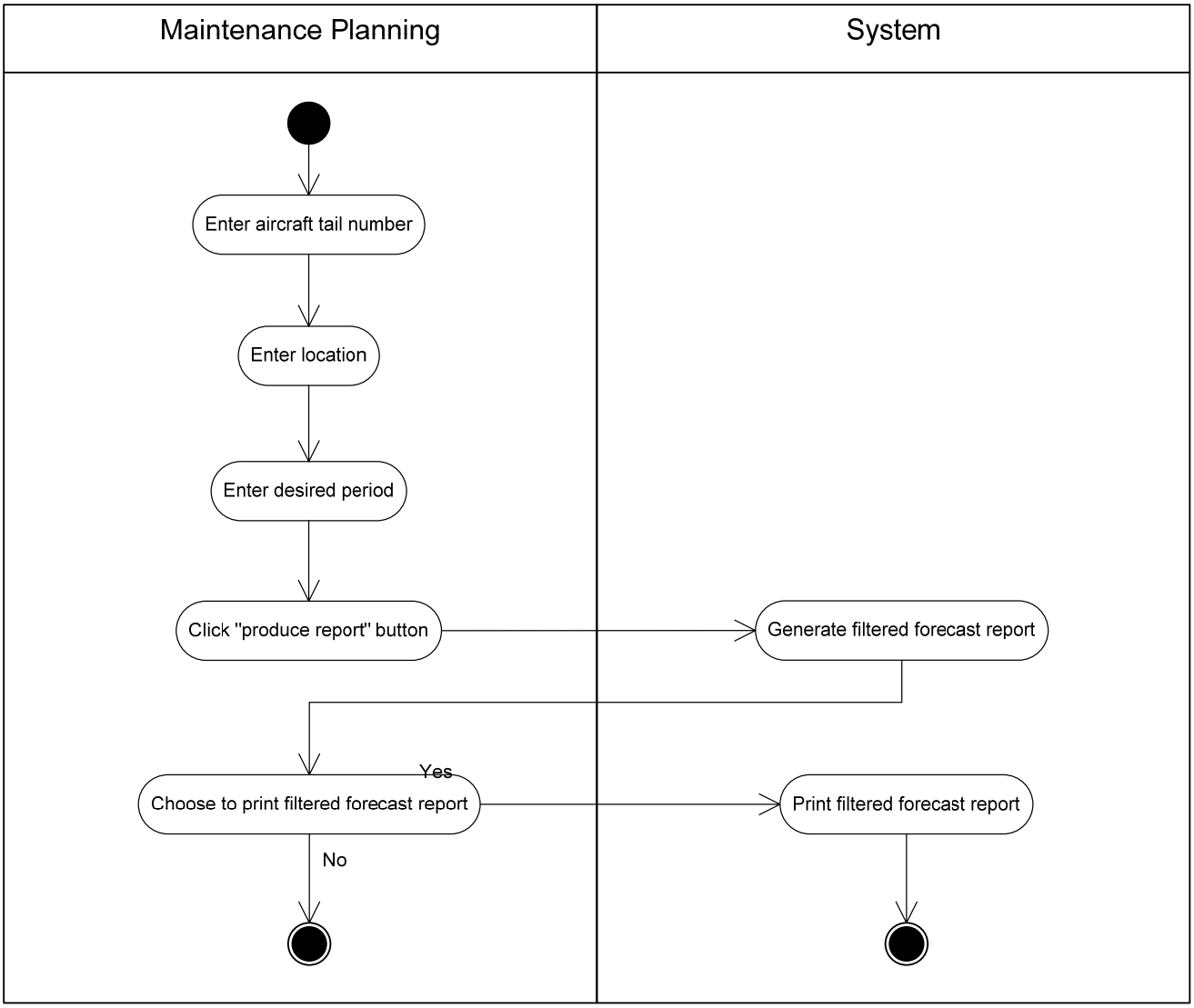


Figure 24 Activity Diagram for Produce Filtered Forecast

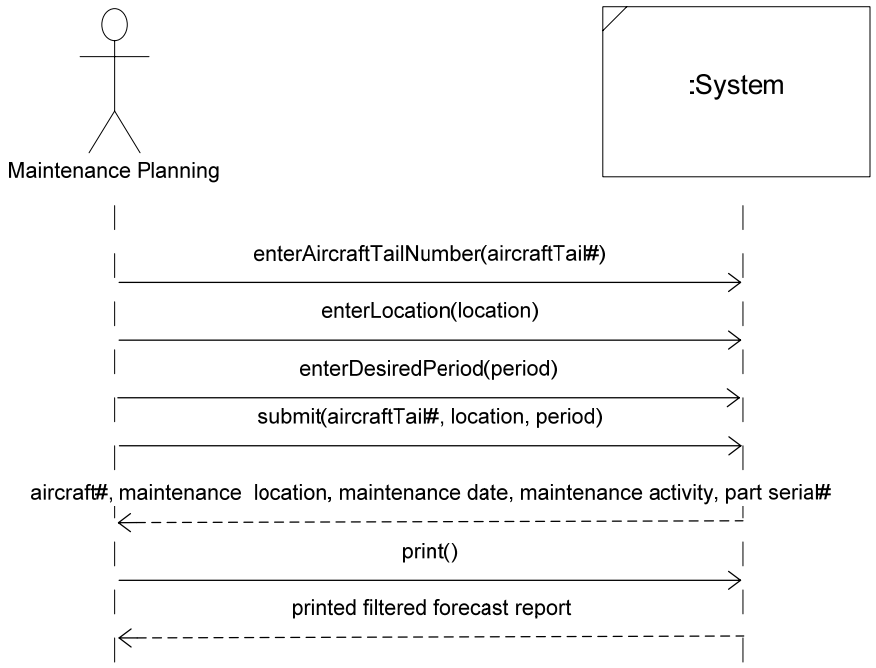


Figure 25 System Sequence Diagram for Produce Filtered Forecast

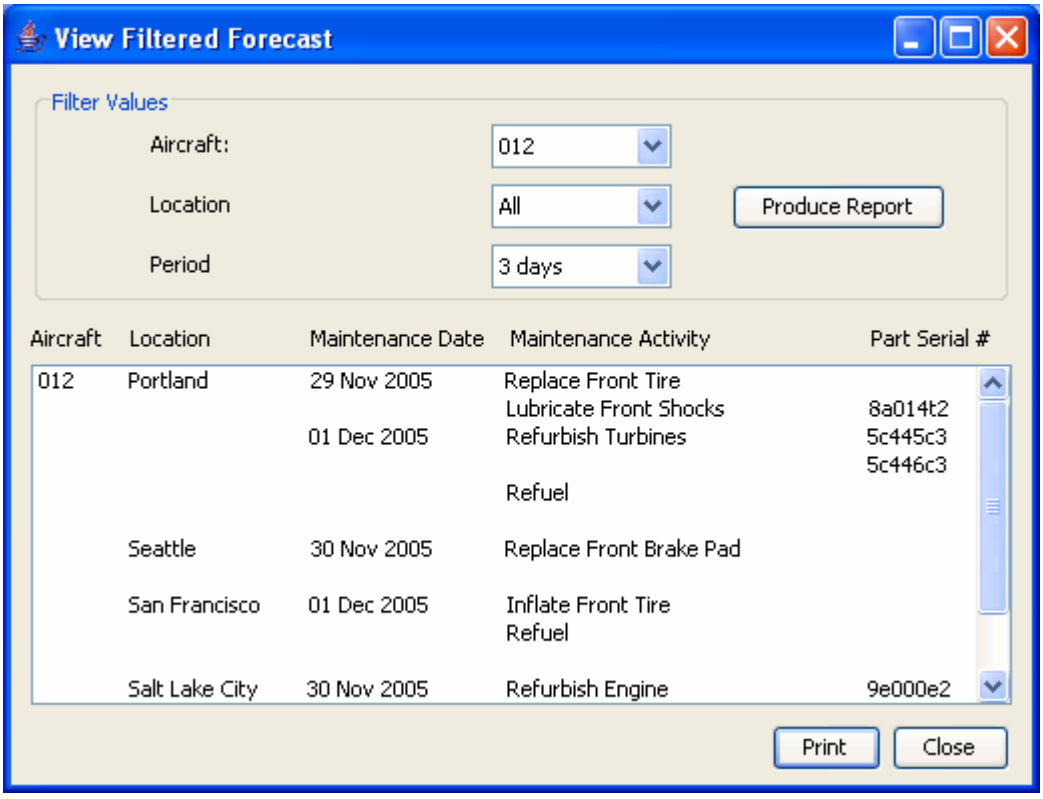


Figure 26 Graphical User Interface for Produce Filtered Forecast

Use Case Name:	Produce Tracked Part Maintenance History	
Scenario:	Parts requests tracked part maintenance history	
Triggering Event:	Request for tracked part maintenance history	
Brief Description:	When maintenance control chooses to view the maintenance history report, the "Tracked Part History" application module is opened and the maintenance history tab is selected. The serial number for the tracked part is entered. The system generates and displays the report. Later, the user can choose to print the report.	
Actors:	Maintenance Control	
Related Use Cases:	Produce Tracked Part Location History	
Stakeholders:	Maintenance Control Maintenance Management Parts Department Parts Management Corporate Headquarters	
Preconditions:	Part (associated with its past maintenance history) must exist	
Post conditions:		
	Actor	**System**
Flow of Events:	1. Enters serial number 2. Clicks "print" to print report	1.1 Creates and displays tracked part maintenance history 2.1 Prints report
Exception Conditions:	2.1 If the user does not choose to print the report, he/she can review the report and exit	

Figure 27 Use Case for Produce Tracked Part Maintenance History

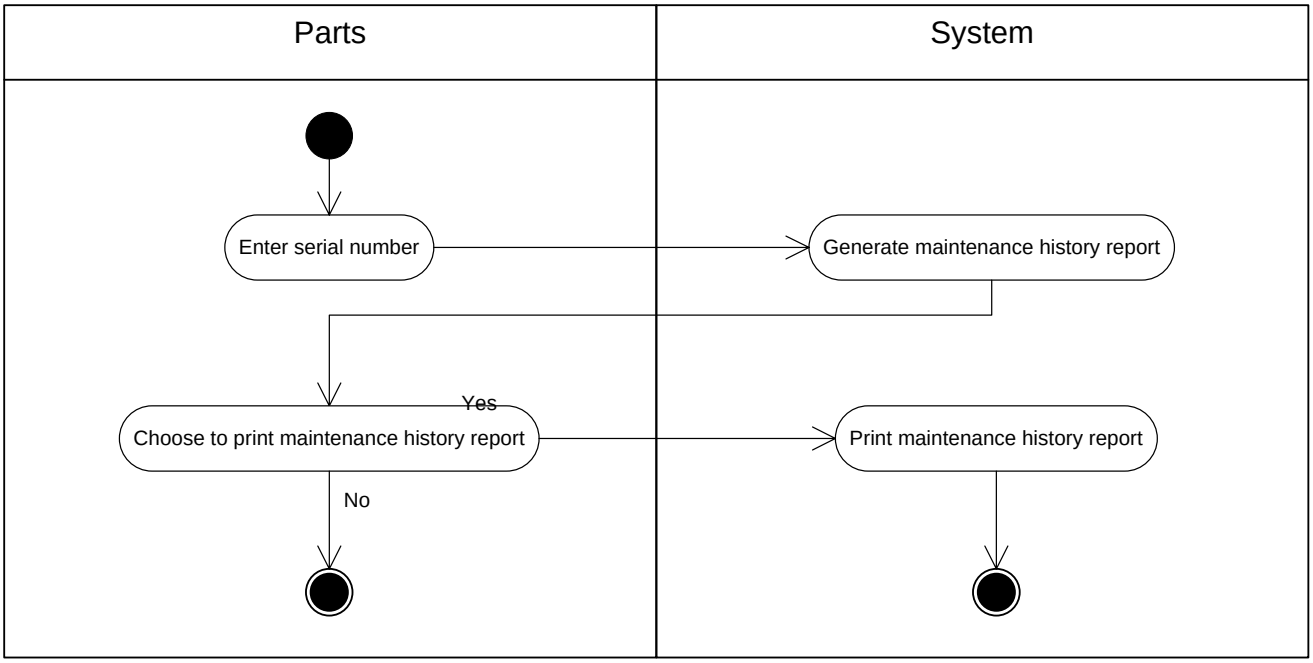


Figure 28 Activity Diagram for Produce Tracked Part Maintenance History

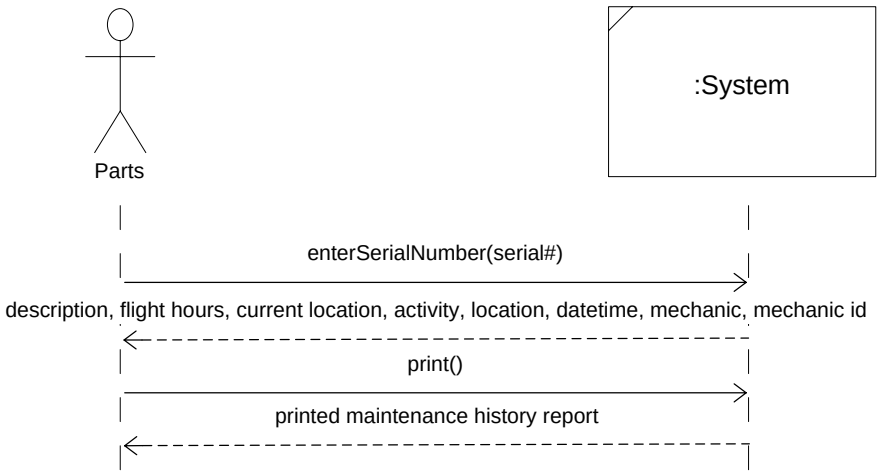


Figure 29 System Sequence Diagram for Produce Tracked Part Maintenance History

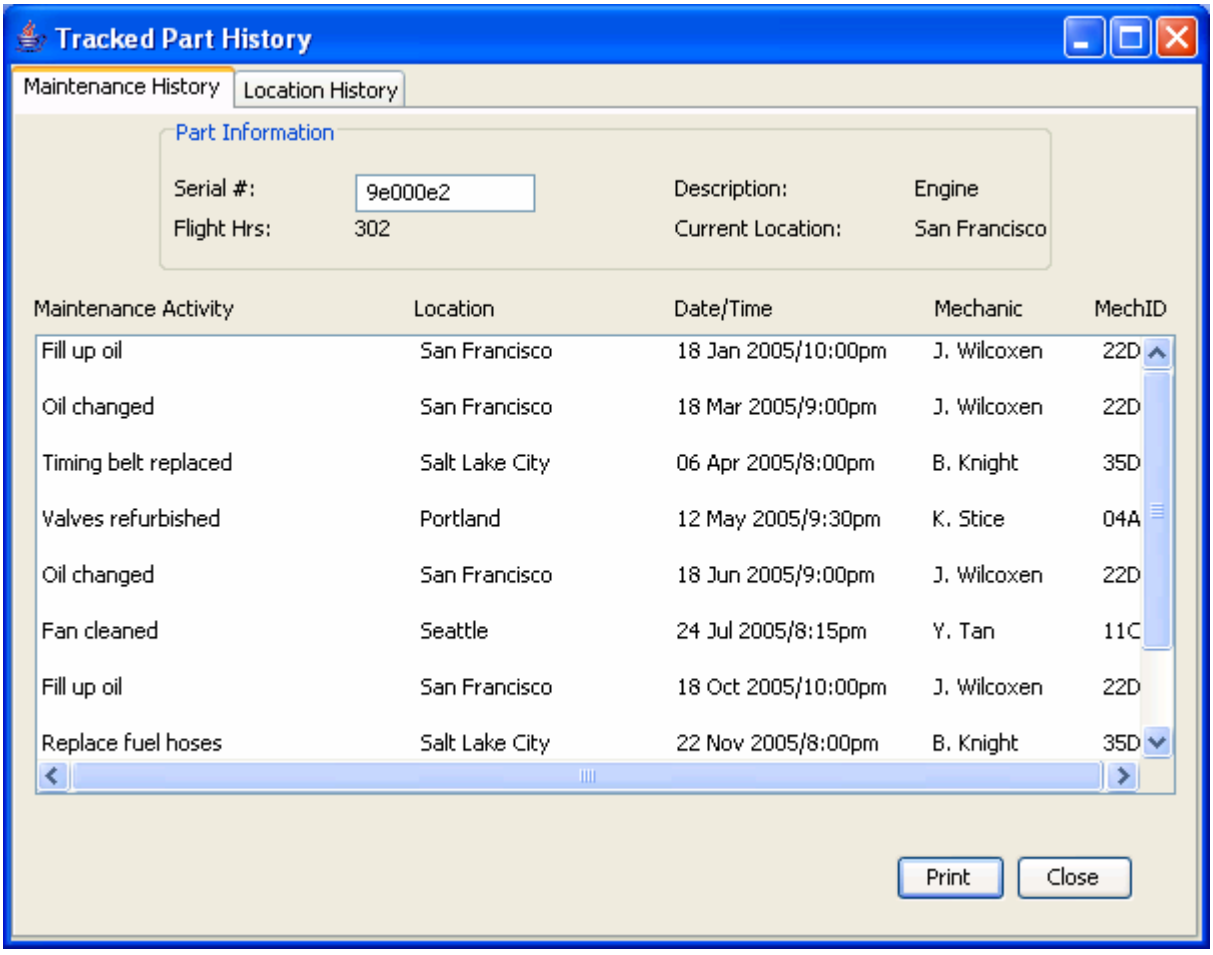


Figure 30 Graphical User Interface for Produce Tracked Part Maintenance History

Use Case Name:	Produce Tracked Part Location History	
Scenario:	Parts requests tracked part location history	
Triggering Event:	Request for tracked part location history	
Brief Description:	When maintenance control chooses to view the location history report, the "Tracked Part History" application module is opened and the location history tab is selected. The serial number for the tracked part is entered. The system generates and displays the report. Later, the user can choose to print the report.	
Actors:	Maintenance Control	
Related Use Cases:	Produce Tracked Part Maintenance History	
Stakeholders:	Maintenance Control Maintenance Management Parts Department Parts Management Corporate Headquarters	
Preconditions:	Part (associated with its past maintenance history) must exist	
Post conditions:		
	Actor	**System**
Flow of Events:	1. Enters serial number 2. Clicks "print" to print report	1.1 Creates and displays tracked part location history 2.1 Prints report
Exception Conditions:	2.1 If the user does not choose to print the report, he/she can review the report and exit	

Figure 31 Use Case for Produce Tracked Part Location History

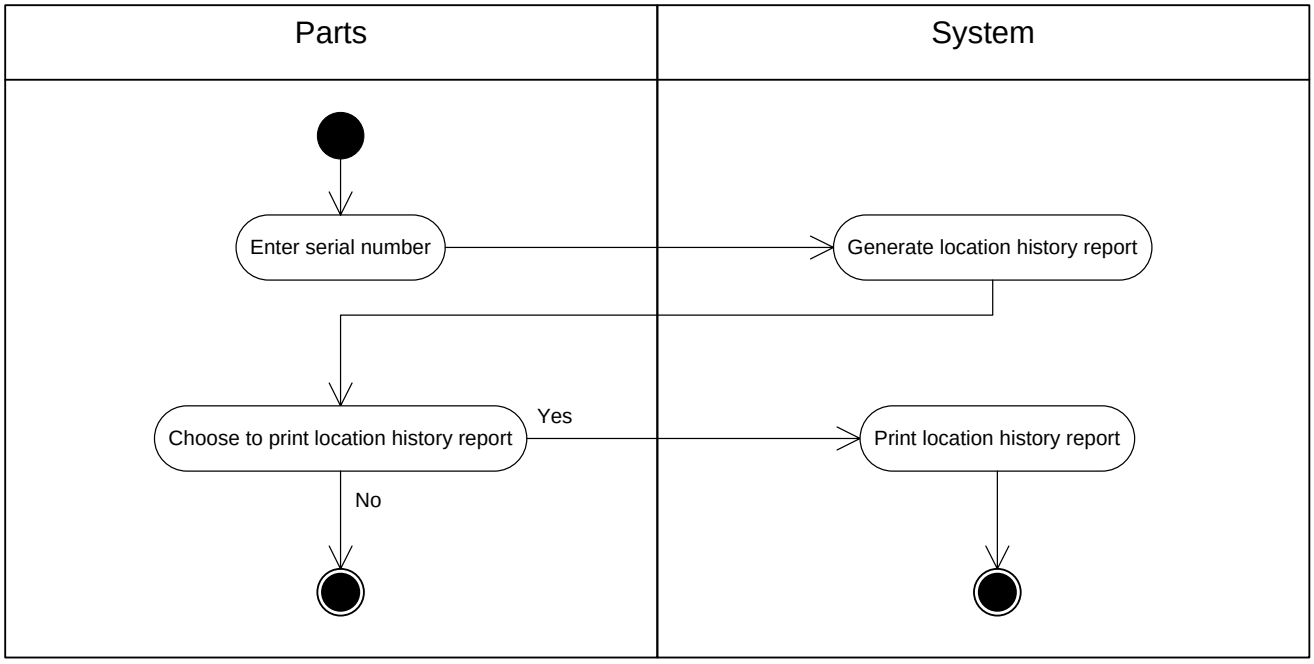


Figure 32 Activity Diagram for Produce Tracked Part Location History

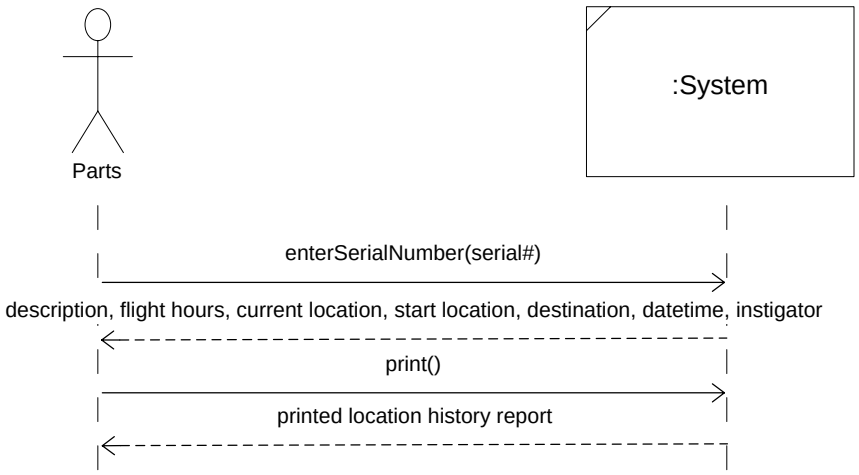


Figure 33 System Sequence Diagram for Produce Tracked Part Location History

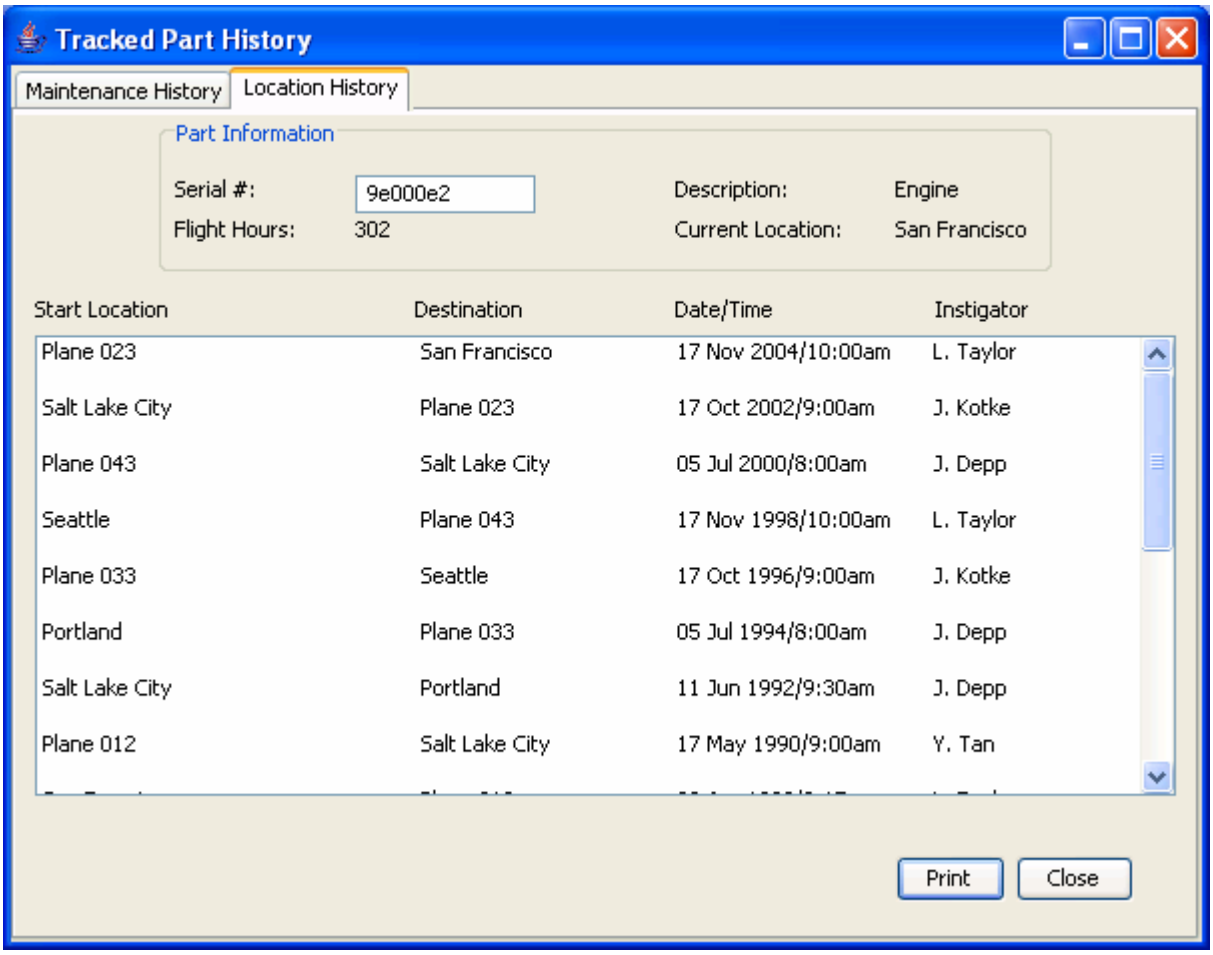


Figure 34 Graphical User Interface for Produce Tracked Part Location History

Use Case Name:	Transfer Tracked Part To New Location	
Scenario:	Parts transfers tracked part to new location	
Triggering Event:	Request tracked part transfer to new location	
Brief Description:	When a tracked part is transferred to a new location, Parts opens the "Tracked Part Transfer" application module. A serial number is entered for the tracked part to be transferred. The system then populated the part description field. The origin, destination, and instigator are then entered. Finally, a date and time for the transfer is entered and the transfer is submitted.	
Actors:	Maintenance Control	
Related Use Cases:		
Stakeholders:	Parts Department Parts Management Corporate Headquarters	
Preconditions:	The tracked part must exist Both locations must exist	
Post conditions:	Transfer record must exist in the database	
	Actor	**System**
Flow of Events:	1. Enters serial number 2. Enters origin 3. Enters destination 4. Enters instigator 5. Enters date of transfer 6. Enters time of transfer 7. Submits transfer	1.1 Populates part description field 7.1 Accepts part transfer
Exception Conditions:		

Figure 35 Use Case for Transfer Tracked Part To New Location

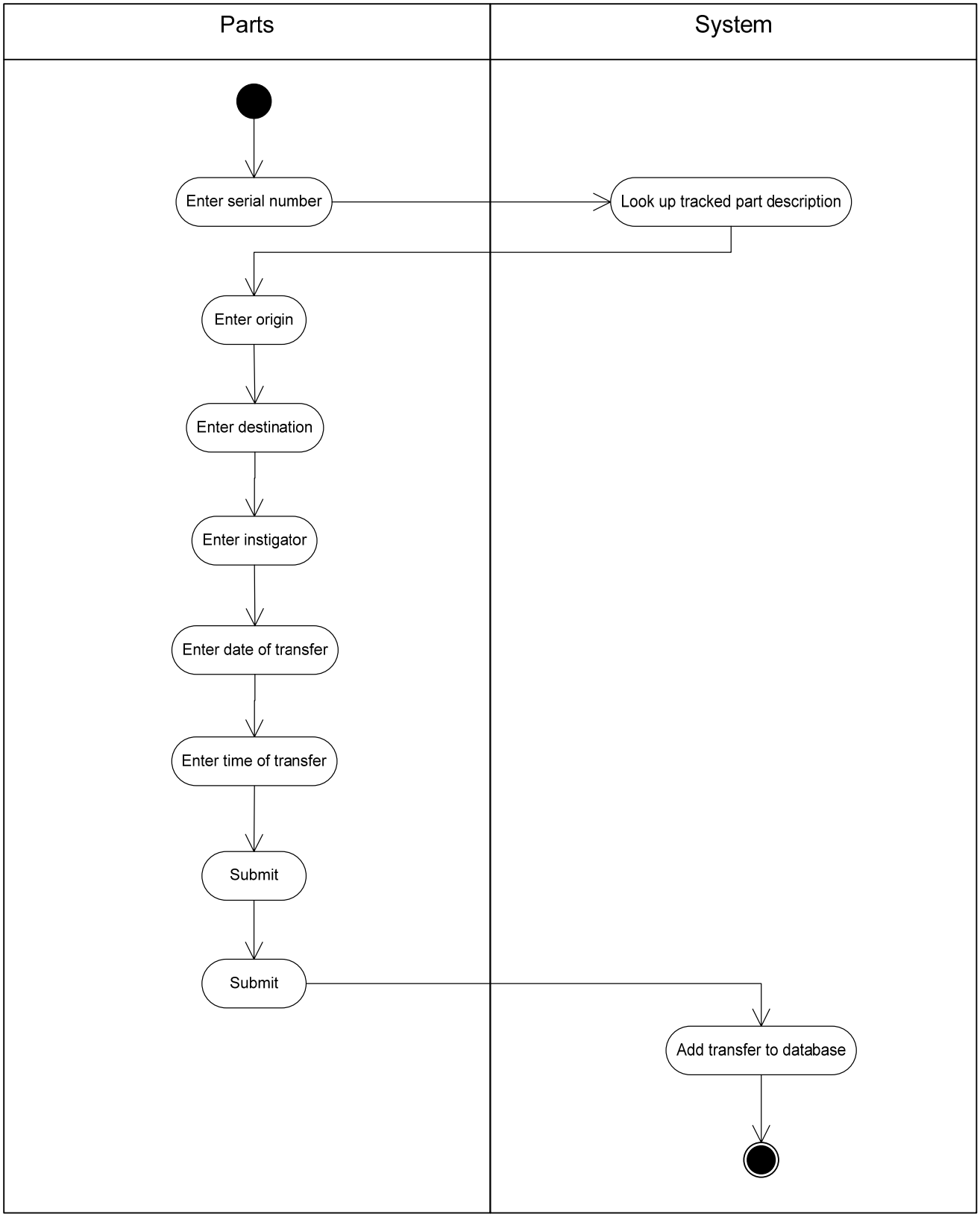


Figure 36 Activity Diagram for Transfer Tracked Part To New Location

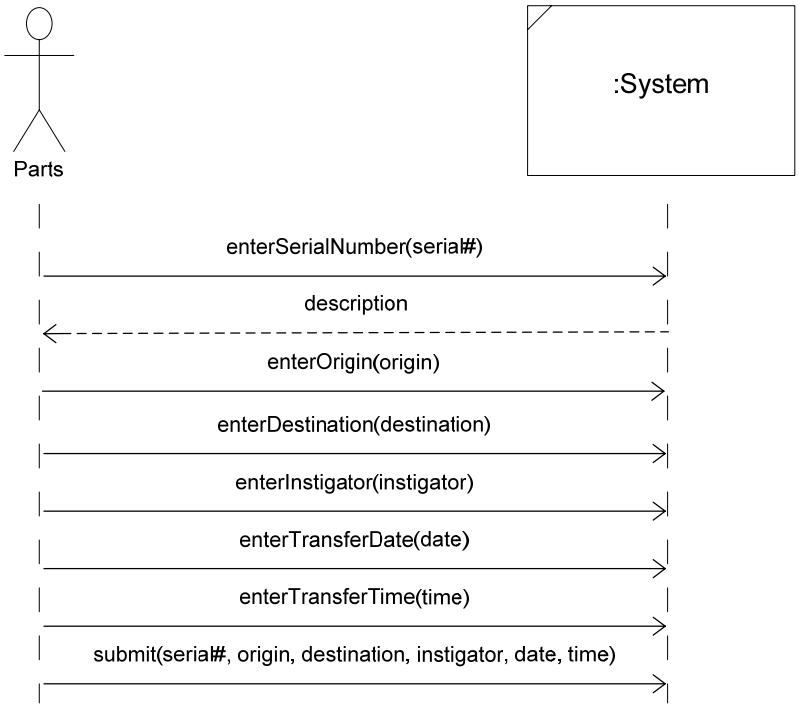


Figure 37 System Sequence Diagram for Transfer Tracked Part To New Location

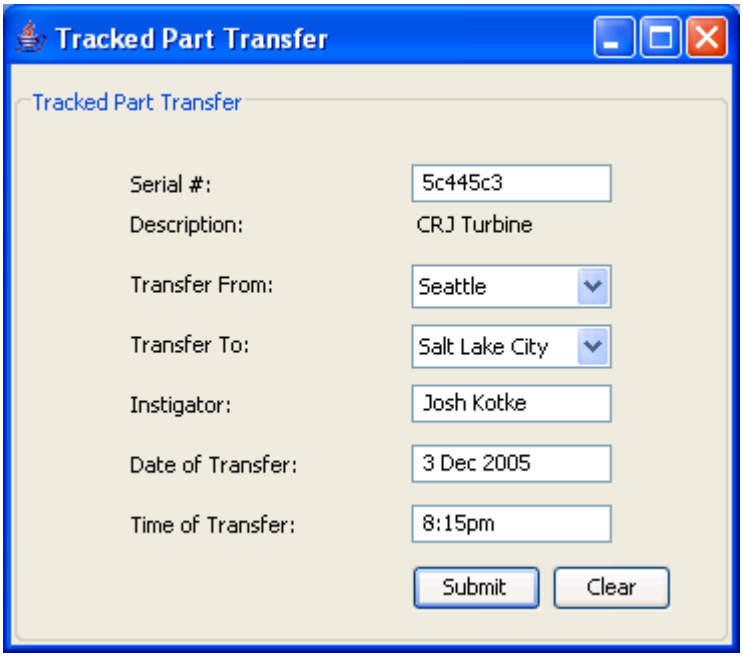


Figure 38 Graphical User Interface for Transfer Tracked Part To New Location

Use Case Name:	Produce Filtered Activity Log	
Scenario:	Planning requests filtered activity log	
Triggering Event:	Request for filtered activity log	
Brief Description:	When maintenance control chooses to view the filtered activity log, the "Filtered Activity Log" application module is opened. The filters are then used to define the parameters of the activity log. The user then clicks the "Produce Activity Log" button to produce the log. The system generates and displays the report. Later, the user can choose to print the report.	
Actors:	Maintenance Control	
Related Use Cases:	Produce Filtered Forecast	
Stakeholders:	Maintenance Control Maintenance Management Parts Department Parts Management Corporate Headquarters	
Preconditions:	Selected activities and locations must exist	
Post conditions:		
	Actor	**System**
Flow of Events:	6. Enters location 7. Select aircraft 8. Enter begin date 9. Enters end date 10. Clicks "Produce Activity Log" 11. Clicks "Print" to print log	4.1 Produces log 5.1 Prints log
Exception Conditions:	5.1 If the user does not choose to print the report, he/she can review the report and exit	

Figure 39 Use Case for Produce Filtered Activity Log

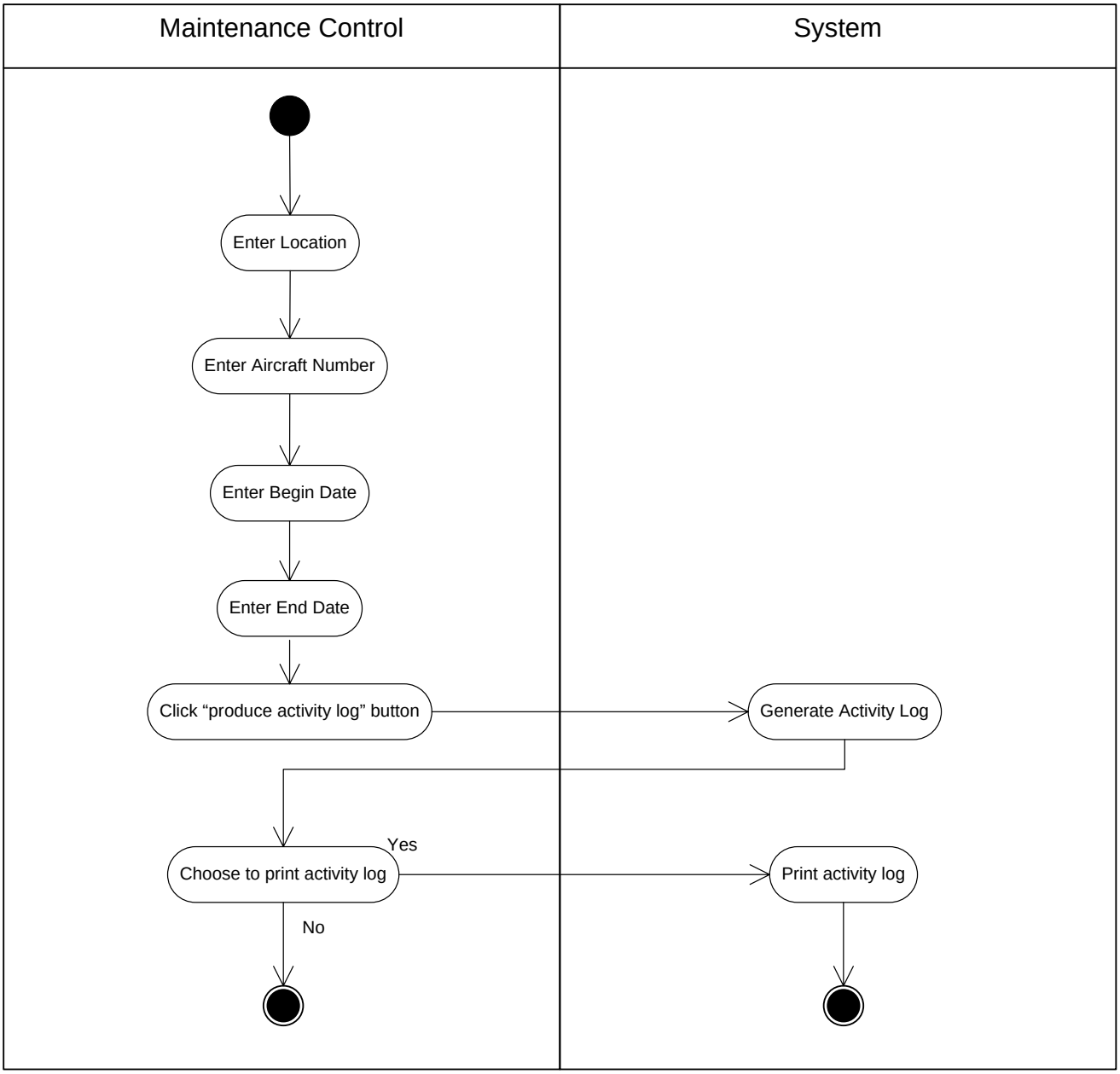


Figure 40 Activity Diagram for Produce Filtered Activity Log

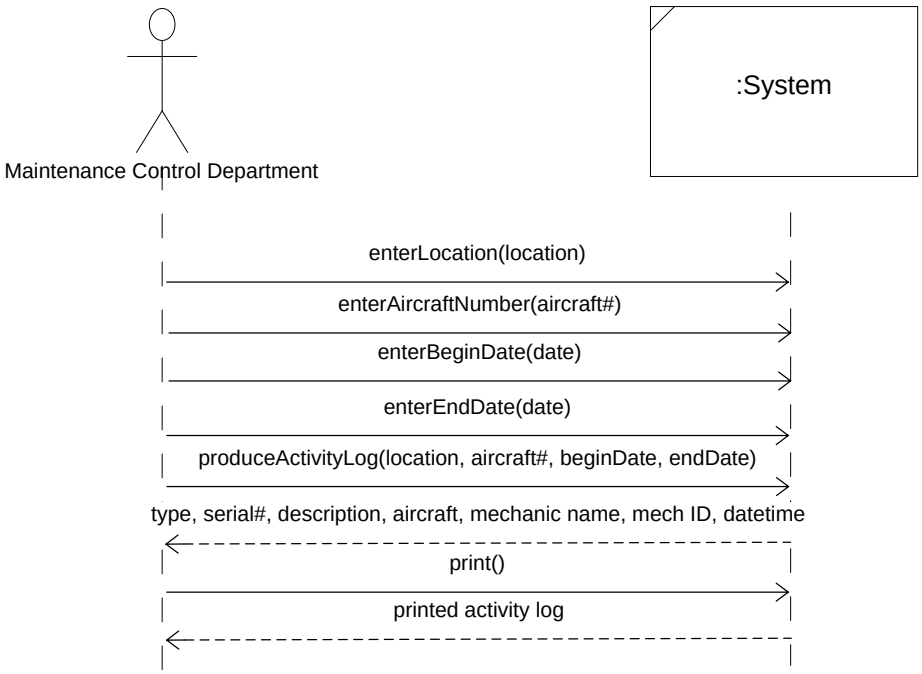


Figure 41 System Sequence Diagram for Produce Filtered Activity Log

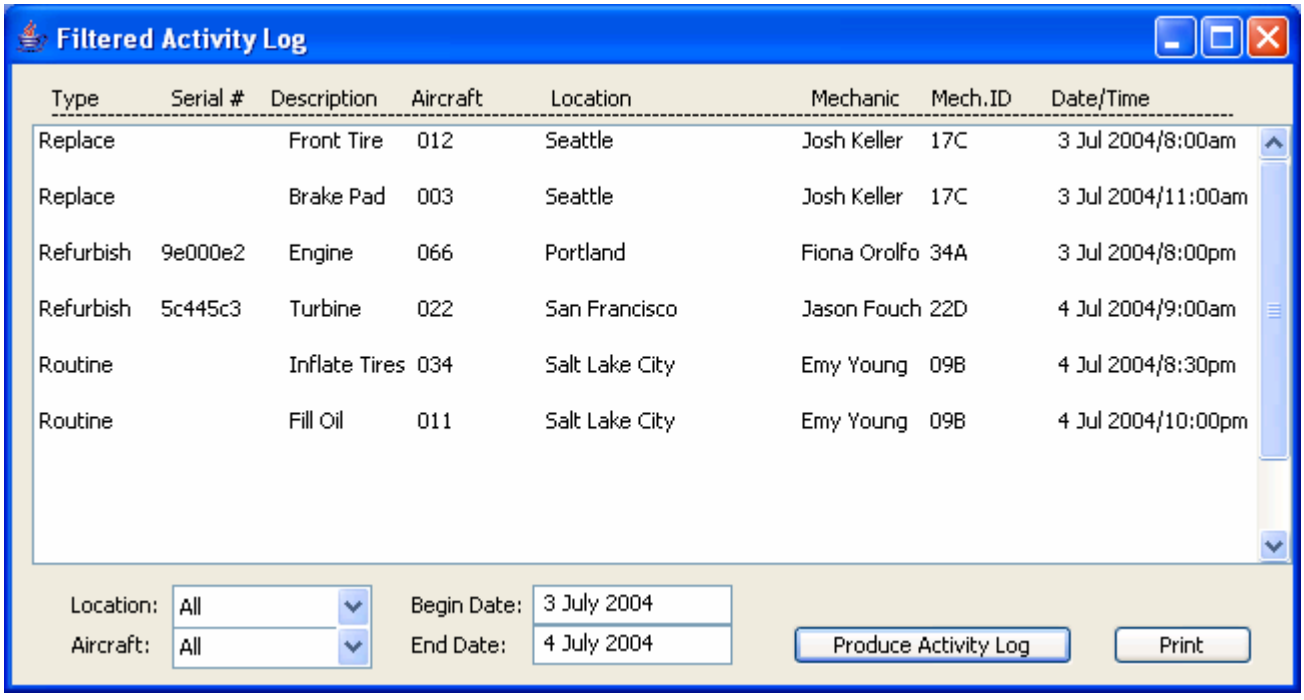


Figure 42 Graphical User Interface for Produce Filtered Activity Log

Appendix

- Class Diagram
- Relational Table Schema
- Crud Analysis
- Event Table
- Use Case Diagram
- Work Break Down Structure
- Assumptions List

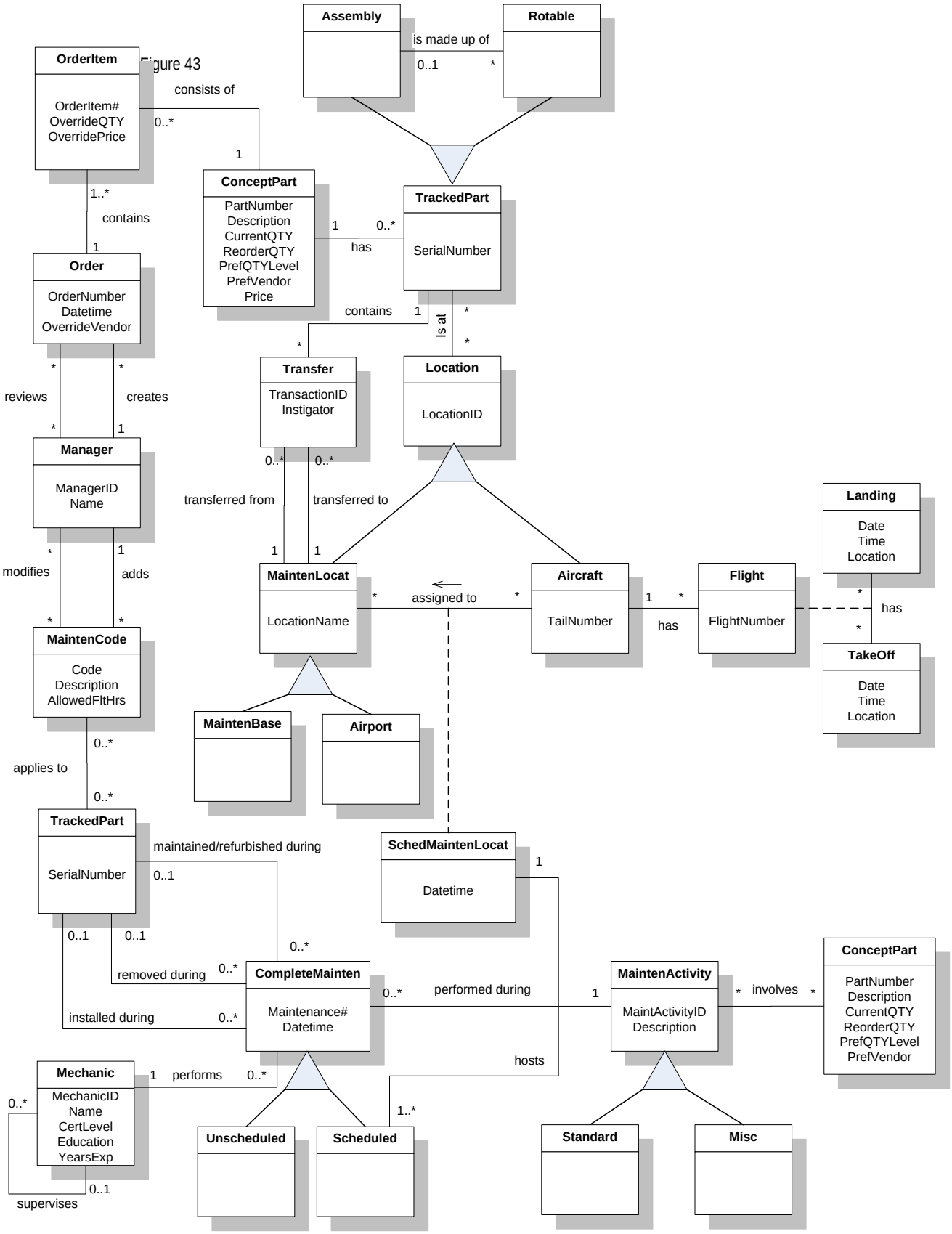


Figure 43 Class Diagram

Relational Database Schema

OrderItem(**OrderItem#**, OrderNumber, PartNumber, OverrideQTY, OverridePrice)
FK: OrderNumber references Order
FK: PartNumber references ConceptPart

ConceptPart(**PartNumber**, Description, CurrentQTY, ReorderQTY, PrefQTYLevel, PrefVendor, Price)

Order(**OrderNumber**, ManagerID, Datetime, OverrideVendor)
FK: ManagerID references Manager

Manager(**ManagerID**, Name)

Manager_ receives_Order(**ManagerID**, **OrderNumber**)
FK: ManagerID references Manager
FK: OrderNumber references Order

MaintenCode(**Code**, ManagerID, Description, AllowedFltHrs)
FK: ManagerID references Manager

Manager_modifies_MaintenanceCode(**ManagerID**, **Code**)
FK: ManagerID references Manager
FK: Code references MaintenCode

TrackedPart(SerialNumber)

CompleteMainten(**Maintenance#**, SerialNumber, Datetime, MechanicID, maintenanceActivityID)
FK: SerialNumber references TrackedPart
FK: MechanicID references Mechanic
FK: MaintenanceActivityID references MaintenActivity

Mechanic(**MechanicID**, SupervisorID, Name, CertLevel, Education, YearsExp)
FK: SupervisorID references Mechanic

Schedule(**Maintenance#**, LocationName, TailNumber, LocationID)
FK: Maintenance# references CompleteMainten
FK: LocationName, TailNumber, LocationID references SchedMaintenLocation

MaintenanceActivity(**MaintenActivityID**, Description)

ConceptPart(**PartNumber**, Description, CurrentQTY, ReorderQTY, PrefQTYLevel, PrefVendor)

MaintenActivity_involves_ConceptPart(**MaintActivityID**, **PartNumber**)
FK: MaintActivityID references MaintActivity
FK: PartNumber references ConceptPart

MaintenLocat(**LocationName**, **LocationID**)
FK: LocationID references Location

Aircraft(**LocationID**, **TailNumber**)
FK: LocationID references Location

SchedMaintenLocat(**LocationID**, **LocationName**, **TailNumber**, Datetime)
FK: LocationID references MaintenLocat and/or Aircraft
FK: LocationName references MaintenLocat
FK: TailNumber references Aircraft

Flight(**Landing#**, **TakeOff#**, LocationID, TailNumber, FlightNumber)
FK: Landing# references Landing
FK: TakeOff# references TakeOff#
FK: LocationID, TailNumber references Aircraft

Landing(**Landing#**, Date, Time, Location)

TakeOff(**TakeOff#**, Date, Time, Location)

Transfer(**TransactionID**, LocationName, SerialNumber)
FK: LocationName references MaintenLocat
FK: SerialNumber references TrackedPart

TrackedPart(**SerialNumber**, PartNumber)
FK: PartNumber references ConceptPart

TrackedPart_isAt_Location(**SerialNumber**, **LocationID**)
FK: SerialNumber references TrackedPart
FK: LocationID references Location

Assembly(**SerialNumber**)
FK: SerialNumber references TrackedPart

Rotable(**SerialNumber**, $\text{SerialNumber}_{\text{Assembly}}$)
FK: SerialNumber references TrackedPart
FK: $\text{SerialNumber}_{\text{Assembly}}$ references Assembly

Use Case	Order Item	Order	Manager	Maintenance Code	Tracked Part	Conceptual Part	Assembly	Rotable	Location	Transfer	Maintenance Location	Aircraft	Flight	Takeoff	Landing	Mechanic	Maintenance Activity	Completed Maintenance	Scheduled Maintenance Location
Track Flight Times																			
Import flight log													CRUD	CRUD	CRUD				
Display flight log													R	R	R				
Maintenance Forecasts																			
Produce filtered forecast				R	R						R	R					R		R
Automatically assign plane to location for maintenance				R	R						R	R	R	R	R				C
Modify maintenance location for aircraft				R	R						R	R	R	R	R				RU
Maintenance Control																			
Enter tracked part replacement				R	R						R	R				R	R	C	
Enter tracked part refurbishment				R	R						R					R	R	C	
Enter completed standard activity				R	R	R					R	R				R	R	C	
Enter completed misc. activity				R	R	R					R	R				R	R	C	
Add standard activity						R											C		
Remove standard activity						R											C		
Modify standard activity						R											C		
Add aircraft									C			C							
Remove aircraft									D			D							
Modify aircraft									RU			RU							
Add maintenance code				C															
Remove maintenance code				D															
Modify maintenance code				RU															
Display maintenance codes				R															
Display previous maintenance code modifications			R	R															
Add maintenance location									C		C								
Remove maintenance location									D		D								
Modify maintenance location information									RU		RU								
Display mechanic credentials																			
Produce filtered activity log					R	R	R	R	R	R	R	R				R	R		
Parts																			
Modify tracked part serial number																			
Add rotable part					C	C	C	C											
Remove rotable part					D	D	D	D											
Add new assembly					C	C	C												
Remove assembly					D	D	D												
Modify assembly					U	U	U												
Add conceptual part						C													
Remove conceptual part						D													
Modify conceptual part						U													
Adjust inventory						RU													
Display up part info					R	R	R	R											
Produce tracked part maintenance history					R		R	R	R		R	R				R	R		
Produce tracked part location history					R		R	R	R	R	R	R							
Transfer tracked part to new location					R		R	R	R	R	R								
Notify of new automaticallly-created purchase order	C	C				R													
Modify/override/print automatically-created purchase order	CRUD	RUD	R			R													
Create purchase order by manual creation	CRUD	CRUD	R			R													
Display previous vendor overrides	R	R	R			R													
Miscellaneous																			
Import HR info			CRUD													CRUD			
Look up mechanic ID																R			
Look up activity ID																	R		
Look up conceptual part number						R													

Figure 44 Crud Analysis

	Event	Trigger	Source	Use Case	Response	Destination
	Track Flight Times					
1	Flight control system sends flight log for importing	Log sent	Flight control system	Import flight log		
2	Planning wants to view flight log	Flight log inquiry	Maintenance Planning	Display flight log	Flight log	User
	Maintenance Forecasts					
3	Planning requests filtered maintenance forecast	Request for filtered maintenance forecast	Maintenance Planning	Produce filtered forecast	Filtered maintenance forecast	Maintenance Planning
4	Automatically assign aircraft to location for maintenance	Part maintenance code threshold reached		Automatically assign aircraft to location for maintenance		
5	Planning modifies maintenance location for aircraft	Request to modify maintenance location for aircraft		Modify maintenance location for aircraft		
	Maintenance Control					
6	Control enters tracked part replacement	Tracked part replacement submitted	Maintenance Control	Enter tracked part replacement		
7	Control enters tracked part refurbishment	Tracked part refurbishment submitted	Maintenance Control	Enter tracked part refurbishment		
8	Control enters completed standard activity	Completed standard activity submitted	Maintenance Control	Enter completed standard activity		
9	Control enters completed misc. activity	Completed misc. activity submitted	Maintenance Control	Enter completed misc. activity		
10	Control adds standard activity	Request to add standard activity	Maintenance Control	Add standard activity		
11	Control removes standard activity	Request to removes standard activity	Maintenance Control	Remove standard activity		
12	Control modifies standard activity	Request to modifies standard activity	Maintenance Control	Modify standard activity		
13	Control adds aircraft	Request to add aircraft	Maintenance Control	Add aircraft		
14	Control removes aircraft	Request to remove aircraft	Maintenance Control	Remove aircraft		
15	Control modifies aircraft	Request to modify aircraft	Maintenance Control	Modify aircraft		
16	Maintenance management adds maintenance code	Request to add maintenance code	Maintenance Management	Add maintenance code		
17	Maintenance management removes maintenance code	Request to remove maintenance code	Maintenance Management	Remove maintenance code		
18	Maintenance management modifies maintenance code	Request to modify maintenance code	Maintenance Management	Modify maintenance code		
19	Control views maintenance codes	Request to view maintenance codes	Maintenance Control	Display maintenance codes	Maintenance codes	Maintenance Control
20	Maintenance management views previous maintenance code modifications	Request to view previous maintenance code modifications	Maintenance Management	Display previous maintenance code modifications	Previous maintenance code modifications	Maintenance Management
21	Control adds maintenance location	Request to add maintenance location	Maintenance Control	Add maintenance location		
22	Control removes maintenance location	Request to remove maintenance location	Maintenance Control	Remove maintenance location		
23	Control modifies maintenance location information	Request to modify maintenance location	Maintenance Control	Modify maintenance location information		
24	Control looks up mechanic credentials	Request for mechanic credentials	Maintenance Control	Display mechanic credentials	Mechanic credentials	Maintenance Control
25	Control requests filtered activity log	Request for filtered activity log	Maintenance Control	Produce filtered activity log	Filtered activity log	Maintenance Control

Figure 45a Event Table

	Event	Trigger	Source	Use Case	Response	Destination
	Parts					
26	Parts modifies tracked part serial number	Request to modify tracked part serial number	Parts	Modify tracked part serial number		
27	Parts adds rotable part	Request to add rotable part	Parts	Add rotable part		
28	Parts removes rotable part	Request to remove rotable	Parts	Remove rotable part		
29	Parts adds assembly	Request to add assembly	Parts	Add new assembly		
30	Parts removes assembly	Request to remove assembly	Parts	Remove assembly		
31	Parts modifies assembly	Request to modify assembly	Parts	Modify assembly		
32	Parts adds conceptual part	Request to add conceptual part	Parts	Add conceptual part		
33	Parts removes conceptual part	Request to remove conceptual part	Parts	Remove conceptual part		
34	Parts modifies conceptual part	Request to modify conceptual part	Parts	Modify conceptual part		
35	Parts adjusts inventory	Request to adjust inventory	Parts	Adjust inventory		
36	Parts requests part info	Request part info	Parts	Display part info	Part info	Parts
37	Parts requests tracked part maintenance history	Request for tracked part maintenance history	Parts	Produce tracked part maintenance history	Tracked part maintenance history	Parts
38	Parts requests tracked part location history	Request for tracked part location history	Parts	Produce tracked part location history	Tracked part location history	Parts
39	Parts transfers tracked part to new location	Request to transfer tracked part to new location	Parts	Transfer tracked part to new location		
40	Notify of new automatically-created purchase order	Low quantity for part		Notify of new automaticallly-created purchase order	Notification	Parts management
41	Parts modifies/overrides/prints automatically-created purchase order	Request to modify/override/print automatically created purchase order	Parts Management	Modify/override/print automatically-created purchase order	Purchase order	Parts management
42	Parts creates purchase order by manual creation	Request to create purchase order	Parts management	Create purchase order by manual creation	Purchase order	Parts management
43	Parts requests previous vendor overrides	Previous vendor overrides request	Parts management	Display previous vendor overrides	Vendor overrides	Parts management
	Miscellaneous					
44	HR management system sends HR info for importing	HR info sent	Human resource management system	Import HR info		
45	User looks up mechanic ID	Request mechanic ID	Parts, main. planning, main. control, main. management	Look up mechanic ID	Mechanic ID	User
46	User looks up activity ID	Request activity ID	Parts, main. planning, main. control, main. management	Look up activity ID	Activity ID	User
47	User looks up conceptual part number	Request conceptual part number	Parts, main. planning, main. control, main. management	Look up conceptual part number	Part number	User

Figure 45b Event Table

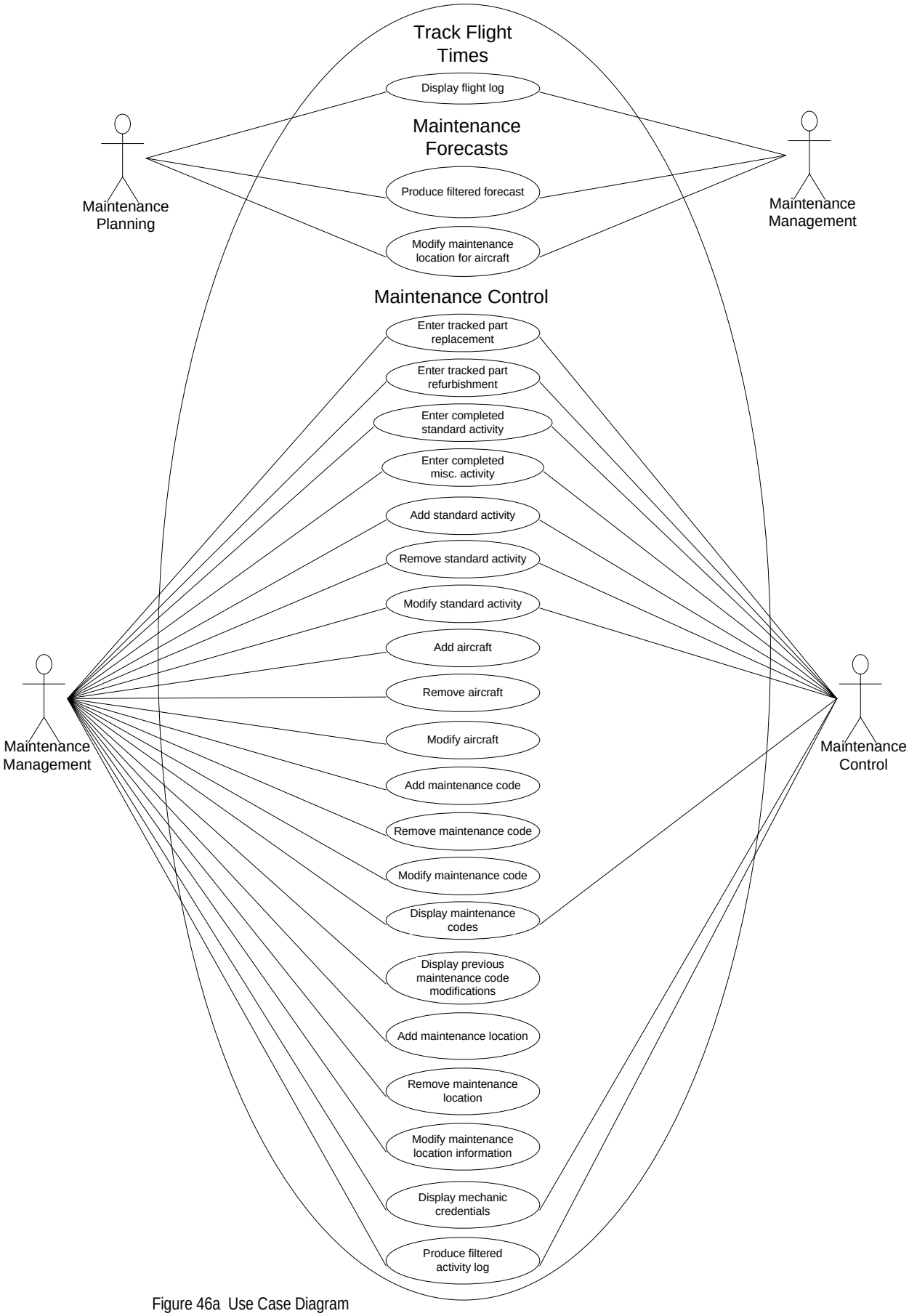


Figure 46a Use Case Diagram

Figure 46b Use Case Diagram

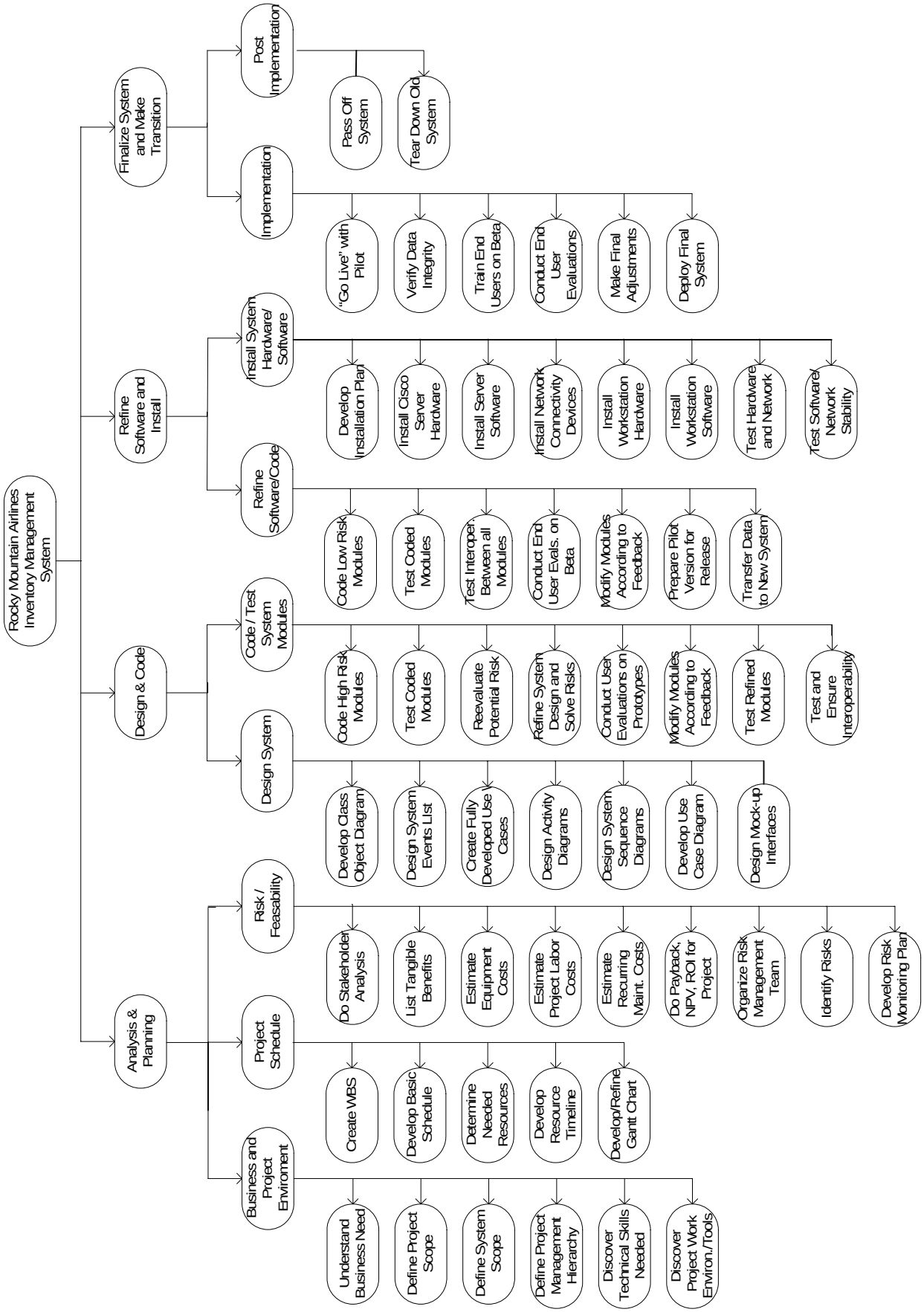


Figure 47 Work Breakdown Structure

Assumptions List

Throughout our analysis of the current Rocky Mountain Airlines systems and related company operations, several assumptions have been made. Further discussion with RMA management is needed to resolve any existing discrepancies. Assumptions made are as follows:

- Only one mechanic performs a single maintenance.
- A tracked part is not required to have a maintenance code
- When conceptual parts are entered into the system, a price, preferred vendor, and preferred quantity level are also provided for dynamic purchase order creation. A manager can later override the price, vendor, and reorder quantity on created purchase orders.
- Purchase orders only consist of parts already in the system. For manual purchase order creation, the conceptual part must already exist in the system.
- When a part is due for refurbishment, it is scheduled to be removed from the aircraft. The distinct act of refurbishing a part is a separate maintenance activity and is considered "unscheduled".
- In emergencies or other situations where an aircraft cannot be flown to a maintenance base, a mechanic can perform maintenance at the airport where the aircraft is stranded.
- The current "Flight Control" flight release system and "RMAS" human resource management system are capable of exporting relevant information in a reasonable format for importing into the new system.
- Rotable parts can at most be contained in one assembly at a time.
- We have maintained RMA management's belief that CASM will be reduced by .0005 dollars with the implementation of the new system.
- Additional revenues from the new system are not considered in future revenue projections, thus economic benefits portray current operating levels. Any additional revenues from the new system could potentially increase such benefits.
- With the departure of one employee currently performing secretarial functions pertaining to parts, RMA will save $35,000 per year. This may not reflect the employee's actual salary and benefits.
- Post-deployment system support will cost $45,000 per year to maintain. This will vary depending on the firm contracted for maintenance.
- Direct transition is an acceptable deployment measure for RMA management and the airline's operations.

To the grader: Specialization classes that do not include attributes or relations with other classes do not exist in the relational database. Similarly, classes that will never contain more than one record have not been included. In summary, we have conformed to Dr. Jackson's approach.