

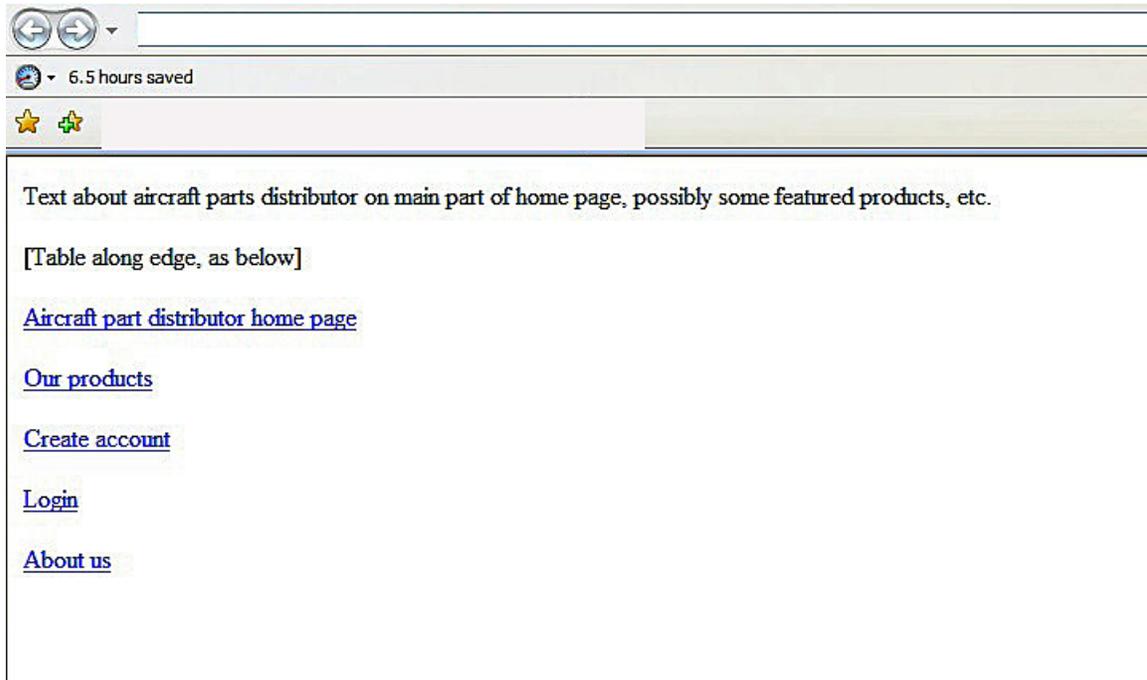
This is a sample solution; yours will vary based on your understanding of the business. The key point is that this is a narrative or discussion, so everyone gets a sense of the principles of the system. This is the original document that I wrote, before building the system, so it will need to be modified and corrected as I go forward, just as yours will be.

A subset of the Web pages is included in the solution, and they are not a complete implementation of the text narrative. This sample solution is an example of the scope and general approach to the problem; it is not a complete solution. It doesn't have all the options for browsing the catalog or carriers, etc.

A. Customer and order placement requirements

This Web site allows the customer (airline or private balloonist) to order replacement aircraft parts from us. A customer will:

- 1) Access the home page on the Web site and, from there, be able to browse our catalog, including pricing, which will be public.
 - i. If we need to offer discounts or not show pricing, that's in the next release
 - ii. We may show whether items are out of stock in the next release
 - iii. A customer cannot order balloon and aircraft parts in the same order.



- 2) Create an account if she wants to order from us:

- i. On a Web page, she can enter or update her name, address, contact info, payment info and username/password
- ii. Customers cannot delete their account; only we can do that, manually in the database in release 1.
- iii. We will set variables in the Customer table with the username and password and purchase order ok. Only one username per company.

The screenshot shows a web browser window with a form for updating customer information. The browser's address bar is empty, and the status bar indicates "6.5 hours saved". The form contains the following fields and options:

- Company name
- Address
- City
- State
- Zip
- Phone
- Username
- Password
- Payment type:
 - Credit card
 - Purchase order
-

[This page is reached without login. A similar page is reached after login, with customer data already filled in, to allow customers to edit their data.]

[Customers cannot delete themselves.]



Customer account verification [page is shown after 'submit' on new customer form if customer (company) found in database]

Company name	XYZ Aircraft Maintenance
Address, etc. (city, state, zip-separate lines)	11 Main St, Atown, MA 02139
Certificate number	052399943
Modes available (may put each on separate line)	Highway, air
Aircraft model groups serviced	DC-9, DC-10, MD80
Username	xyzkid
Password	gsdfsss (may need to mail it, like ATM PIN?)
Payment type	Credit card
Phone	123-654-4324

Please print this page for your records

- 3) If the customer has an account, she logs in with a password.
 - i. There are no password hints or help in this simple system.

File Edit View Favorites Tools Help

Address

Login page

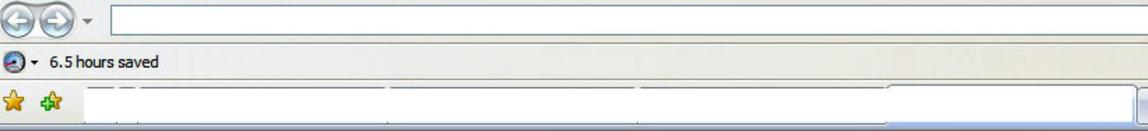
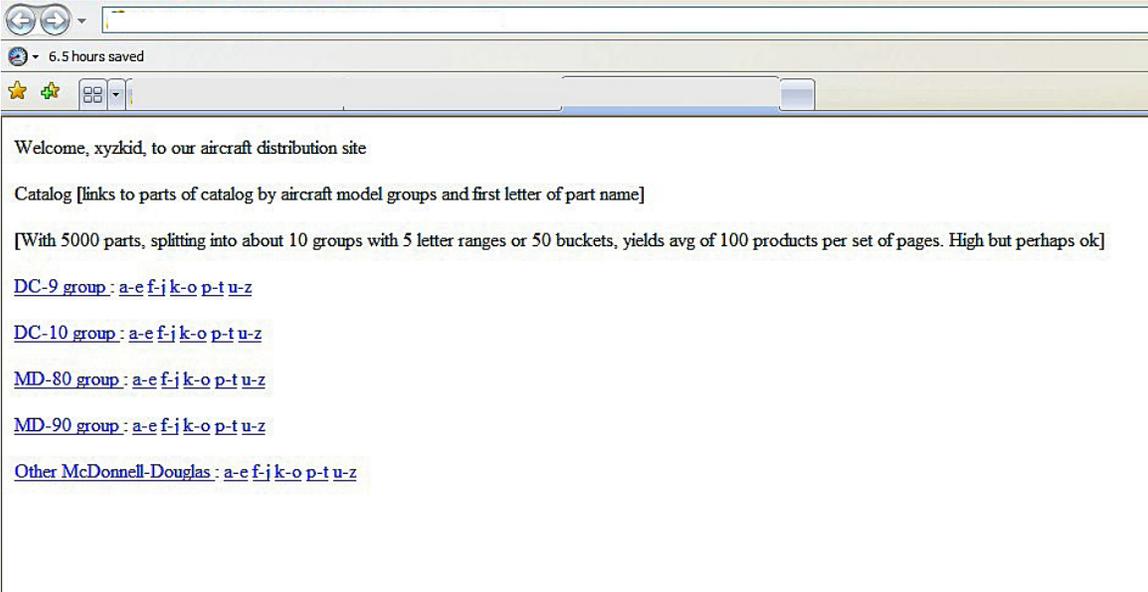
Username

Password

(Any legal stuff needed)

- 4) Customer selects 'Place New Order' from customer Web page. This enters the order header info (customer name, address, date, etc.)
 - i. Customer cannot edit name, address, etc. on an order. These can only be edited on the customer page displayed after login, and this will update the info on all orders for the customer.

- 5) Customer can browse the parts catalog from this Web page and start building an order by clicking on parts and entering quantities.
 - i. She can choose the aircraft model to search, which will show a table of parts for that aircraft, or she can enter the original part number



Name	Aircraft Model	Part Number	Price	In stock	Additional info
Bearing	DC-10	NA195644	5.00	Yes	Info [link to certification info, etc]
Etc.					

[Part name is a hyperlink; when customer clicks it, he or she goes to order page]

[Need to decide where customer enters quantity, and where we check that we have that quantity in stock]

[Catalog page is similar for non-customers (not logged in) except it has no links to the order page]

- 6) If the amount of a part ordered is more than the quantity on hand, show the amount on hand and ask if ok.
 - i. Tell user to place another order for remaining quantity of parts in a few days (a very simple approach to backorders)
 - ii. If we can't ship what was ordered due to error in inventory count, staff will edit the order to reflect what is shipped, and send email manually to the customer or call the customer. Add comments fields to note this.
- 7) Show the order line items as they are added in Web page.
 - i. When customer hits 'Done' button, show summary, including sales tax and total price. We exclude transportation charges in this system.
 - ii. Summary has a delete or change button next to each line that allows changes.



Order

Customer name: XYZ Aircraft Maintenance

Address: 11 Main St , Atown, MA 02139

Etc. [cannot be edited]

Order number: 56

Part Name	Aircraft Model	UN Number	Price	In stock	Quantity ordered	Extended price
Bearings	DC-10	NA195644	5.00	Yes	40	\$200.00
Etc.						

Order subtotal	\$435.00
Sales tax (5%)	\$ 21.75
Order total	\$456.75

[Select carrier and mode](#) (or submit, or ok, or...)

[Back to catalog](#)

- 8) Customer browses the transportation carrier database.

- i. The customer will choose the mode (usually highway or air) and carrier. Show only the valid modes for that customer, based on the Customer table.

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Address

Carriers [select by first letter of name]

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0-9

[this generates, on this or next page, a table of all carriers starting with that letter]

Carrier	Address, City, State, Zip	Modes	Chem Groups	Certificate Number
Geseaco	33 Oak St, Btown, MA 02139	air, rail	A, B, C, D	5364532534
Etc,				

[pick one and the hyperlink takes you to the next page if carrier valid for all items; if not, go to error page]

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Back

Address

Carrier:

Mode: [only present valid options]

Air

Highway

Rail

Water

- 9) Customer places the order
 - i. Customer can enter comments in a comments field.

- ii. When everything is set, customer hits 'Place Order' button on summary page.
- iii. System assigns a unique order number and displays it for the customer.
- iv. System places date automatically on order.
- v. System displays the overall order and asks the customer to enter the payment method and information.
 - 1. We do not verify the payment information, per the homework instructions. We normally would, of course.
- vi. Reduce your inventory by the quantity of each part ordered.
- vii. Display a confirmation page after the order, including payment information, is placed.

Order

Date:

Customer name: XYZ Aircraft Maintenance

Address: 11 Main St , Atown, MA 02139

Etc. [cannot be edited]

Order number: 56

Carrier: Geseaco

Mode: highway

Part Name	Aircraft Model	Part Number	Price	In stock	Quantity ordered	Extended price
Bearings	DC-10	NA195644	5.00	Yes	40	\$200.00
Etc.						

Comments:

Order subtotal	\$435.00
Sales tax (5%)	\$ 21.75
Order total	\$456.75

[Submit order](#) (or submit, or ok, or...) [takes customer to payment page (not shown); enter credit card or purchase order number to complete order]
 [confirmation page then shown, with logout or browse catalog options]

10) Customer logs off

- i. There is no timeout in this version.

B. Order status

From the customer Web page after she logs in, in addition to a 'Place order' link there is an 'Order status' link. This will display all orders for this customer, ordered by the date each order was placed. This is very simple in your system; you don't need to show order status or shipping status, just the past orders.

Show all order detail: customer name and address, date, mode, carrier, each line item and quantity, sales tax, total cost.

C. General information reached from Web site home page

- 1) The home page of the Web site will, in addition to allowing users to log in, show links to:
 - i. General information about the company, its products and services, contact information
 - ii. Catalog (and allow queries)
 - iii. It will not allow the carriers to be queried.
- 2) Your homework solution should be more specific on the general info on the company, products, services, contacts, etc.

D. Exception cases

- 1) The homework statement tells us that most exceptions don't need to be handled:
 - i. No updates of parts inventory at warehouse from inbound shipments. No product changes.
 - ii. No changes in freight carriers.
 - iii. No price changes.
 - iv. No order changes.
- 2) Of the awkward cases mentioned in the homework, the decision is:
 - i. If items are out of stock, they cannot be ordered. There are no partial shipments; the customer must reduce the order quantity to the quantity on hand in the warehouse.
 - ii. Orders must be a single shipment; they cannot be split
 - iii. A single carrier and mode must be used for each shipment. The customer selects the carrier and mode.
 - iv. Shipments must go to a single address per customer. The customer can change it.
 - v. There is no error handling in the system. If any error or exception occurs, it is handled via email or phone and the database is changed manually by the manufacturer.

E. Browsing the catalog and part information

The system allows customers (and anyone visiting the Web site) to browse the aircraft parts catalog. These capabilities can be accessed whether the user is logged in or not. The user can query the catalog by:

- i. Aircraft model
- ii. Part number
- iii. Part name, including wildcard search

All of these are displayed on the search screen, and can be used in combination.

The system will display one row per aircraft part, with the data in the parts table. If the user is logged in (that is, she is a customer), in each row there is a quantity to order box and an 'order' link. The customer types in the quantity and hits 'order'; this adds the part to her order.

F. Browsing carriers

The system allows customers (not general users) to browse the carrier database. The customer can query the carrier data by:

- 1. Certificate number
- 2. Carrier name, including wildcards
- 3. State

All of these are displayed on the search screen, and can be used in combination.

G. Size estimation

- 1) To estimate the size of the system, we count function points. I don't count static Web pages (e.g., home page), though they take some time to build. Some pages are both input and output; they can be counted as 2 pages (one for the input, one for the output). Most of the inputs are simple, so I count them as just an output page.

Web pages

Web page	Type	Complexity
Home page and login	Input	Low
Create/edit customer account (2 pages: create+edit)	Input	Medium
Place order: part search	Output	High
Place order: select quantity, check if in stock	Input	High
Order summary, without total or carrier	Output	High
Order summary, with tax, total, carrier	Output	High
Place order, payment info	Input	High
Order confirmation	Output	Medium
Order status	Output	Medium
Quantity on hand checks during order process	Output	High
Inventory reduction for ordered amount	Output	High
General company info (assume no development reqd)	-	-
Freight carrier choice	Input	Medium

General info: query catalog	Output	Low
General info: query carriers	Output	Low
General info: balloon users	Output	Medium

We estimate 20 tables for now; we will know that better in homework 4. We have no external interfaces, messages, etc. We assume they are medium complexity for now.

Thus, our function points are:

Program unit	Low	Medium	High
Web cust inputs	1 x 3 = 3	2 x 4 = 8	2 x 6 = 12
Web cust outputs	2 x 4 = 8	3 x 5 = 15	5 x 7 = 35
Web cust queries	0	0	0
Database tables	0	20 x 10 = 200	0
Total			281

2) Estimate lines of code.

Program unit	Tool	Lines/function point
Web cust inputs, outputs, queries	VWD/ASP.NET	10 (code generation)
Web staff inputs, outputs, queries	VWD/ASP.NET	10 (code generation)
Database	SQL Server	10 (code generation)

The total lines of code are approximately 2800. The assumptions are FAR too optimistic for a commercial product, but are reasonable for a class project using tools and not handling errors, special cases, etc.

3) Estimate person months.

Using table 8-10, Nominal Schedules for Business Products, the lowest entry is 10,000 lines of code, with 6 schedule months and 9 person months. With a system 28% this size, the person months will be less than 28% of 9 months. An estimate of 25% is reasonable, or about 2.2 person months.

4) Estimate schedule months.

Using table 8-10, the 6 schedule months for 10,000 lines will be reduced for a project of 2,800 lines, but not proportionally. Using an exponent of 0.4 (table 8-7), a project that is .28 of the effort should take about $(.28)^{0.4}$ time, or about 0.6 the time. The 6 schedule months thus becomes about 3.6 months. Any reasonable estimate where the time decrease is less than proportional to the size decrease is fine.

5) Team size

With 2.2 person months over 3.6 schedule months, the average team size is about .6 persons, or 24 hours/week. With a two person team, this would be consistent with the class effort. Unfortunately, the homework sets are scheduled over about a 2.5 month period, so this will be difficult. With this set of requirements, you could eliminate some features right now; you could implement improved process (efficient schedules), etc. For now, don't change anything, but we will reduce what your systems do in the Web app to match the resources better.

6) Ranges

At this point, we have an initial project definition. Our estimate of effort is between 0.25 and 4.0 times the point estimate, so it's between 0.6 and 8.8 person months. Our estimate of schedule is between 0.6 and 1.6 times the 3.6 schedule months of our point estimate, so the range is between 2 and 6 schedule months.

7) Conclusion.

Even at this level of detail, you should be concerned with the resources and schedule. We will reduce the work in this class from that defined in this solution, and you should have done the same in your requirements.

We will not implement a number of the requirements in the Web application, and we will not have as many database-related functions as a true commercial system would have.

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