



# Unified - Systems and Labs

## Requirements, Teamwork, Competition

### Spring Semester 2004

## SP2 Lecture

## 16.030-040 Unified Engineering

Prof. Charles P Coleman

Col. Pete Young

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16.030/040 Unified Engineering  
System Problems and Labs



# Lecture Overview

Importance of Requirements – Case Study Harrier

Teamwork

Project Management

Competition

SP2 and Team Assignments



# Systems

- People
- Product
  - Hardware
  - Software
- Process
  - Procedures

U.S. Airways

McDonald's

AWACS

Global Positioning System



# CDIO

## **Groups of people:**

- **Conceive**
- **Design**
- **Implement and**
- **Operate**

**systems**



# CDIO

**Getting** groups  
of people to:

- **Conceive**
- **Design**
- **Implement and**
- **Operate**

**systems is...not easy**



# Teamwork

MIT - The Collaboration Toolbox

<http://web.mit.edu/collaboration/>

## Systems Problem 1:

- 1.1 Formulate a Team Mission and Vision Statement
- 1.2 Create Team Management Plan
- 1.3 Minutes of Meeting #1
- 1.4 Agenda for Meeting #2
- 1.5 List of Action Items



# When it's good...

- When we started the project, our main goals (printed or not) were to complete the parts of the project the best we could in the time allowed. Winning the competition was certainly not a main goal. The finished product performed **WAY** beyond what we expected and we could not be more pleased.



# When it's good...

- I believe that as a team we worked extremely well together. We were tolerant with each other, always trying to maintain constructive criticism and respect each other's opinion, in every situation. We learned to depend on each other very much and had to pull each other "out of the hole"...



# When it's bad...

- There were frustrating moments... The dynamic of my group when we sat together to do a System Problem did not work the way I like. Basically it was a disorganized meeting, with everybody giving ideas but without really reaching a consensus. We could spend 1 or 2 hours without doing any productive work...



# When it's bad...

- When we had to divide up the work on the design problems, it seemed like we all just did our stuff and attached it in one ugly mess to turn in...Another period of unorganization” was building the plane. We never knew exactly when we were going to meet....I guess that's more of a problem of **communication**, though...



# When it's bad...

- Trying to get our group together to work on the plane/assignments earlier than the Thursday night before it was due. Nobody was willing to work on Friday night (especially me). Saturday's were filled with other commitments people had such as sports, sleep, etc. Sunday, we worked on the Unified problem set, which took all of that day and Monday. Tuesdays were always shot because of a 16.070 problem set due the next day. Wednesdays were usually used to study for the usual Unified test on Thursday. This left Thursday nights to complete the entire assignment.



# Keys to Success

## Design

- Process
- Analysis

## Tools:

- FRDIARRC

## Project Mgmt

- Time
- Resources
- Risk

## Tools:

- WBS
- Gantt Chart

## Teamwork

- Communication
- Coordination
- Roles & Responsibilities
- Motivation!

## Tools:

- Mission/Vision
- Management Plan
- Roles & Resp
- Effective Mtgs



# Teamwork – Mission & Vision Statements

## Mission Statement

- Describes current state
- Defines **Purpose** and **Values**

## Vision Statement

- Describes a desired future state
- **Measurable**, **actionable**, and **achievable** goals

***Clear, simple, precise language***



# Teamwork – Mission & Vision Statements

## Pros

- Establishes framework for **ethical behavior**
- Defines performance standards
- **Communicates** common focus and goals

## Cons

- Unrealistic goals
- Insufficient resources allocated to support plan
- “Business as usual” after introduction
- *Lack of support and commitment*

[www.bain.com/bainweb/expertise/tools/mtt/mission\\_value.asp](http://www.bain.com/bainweb/expertise/tools/mtt/mission_value.asp)

[www.libertysystems.net/missionandvisionworkshops.html](http://www.libertysystems.net/missionandvisionworkshops.html)

[wi.essortment.com/writemissionvi\\_rvld.htm](http://wi.essortment.com/writemissionvi_rvld.htm)



# Teamwork – Mission & Vision Statements



US Dept of Labor Women's Bureau

## Mission Statement

- To promote profitable employment opportunities for women, to empower them by enhancing their skills and improving their working conditions, and to provide employers with more alternatives to meet their labor needs by advocating for equitable employment standards, policies, and programs.

## Vision Statement

- We will empower women to enhance their potential for securing more satisfying employment as they seek to balance their work-life needs.

<http://www.dol.gov/wb>

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# Expectations

- We expect from each member not only to put in the required amount of work each week but to follow through with what they say they will do, respect team members, and be able to trust each member of the team.
- We decided as a team that winning isn't everything, we will give winning a fair shot, but do not expect to stay up nights, and burn ourselves out in order to win.



# Teamwork – Mission & Vision Statements

## **Mission Statement**

- We are a group of Unified Engineering students respectful of each other, committed to putting in our fair share of time on system problem assignments, and willing to follow through on our commitments.

## **Vision Statement**

- We aspire to give winning a fair shot, but will not burn ourselves out in order to win.



# Expectations-Mission/Vision?

- We decided we'd try doing without a "facilitator", "time-keeper", and "note-taker" for now and see how it goes. If meetings aren't being productive, we can always add them in later, but we don't think we'll need them for now.
- The main expectation/assumption we came up with was that everyone should show up on time to our meetings.



# Teamwork – Management Plan

## Roles & Responsibilities

- Who is doing what?
- Facilitator, note taker, pilot, integrator, team slacker?

## Ground Rules

- How do we interact with each other?
- How are we going to treat each other?
- Any undisclosed assumptions about behavior?
- How would I like for you to communicate with me?
  - Roles decided at beginning of meeting
  - Be on time for arrival and breaks
  - Be prepared for discussion and decisions
  - Don't shoot the messenger
  - Turn your cellular phone off



# Ground Rules in Action

- *Communication...*

“You’re ugly.”

“I feel that you are communicating in an insulting manner.”

“Okay, I **feel** that you are ugly.”

“That’s much better.”



# Teamwork – Management Plan

## Communication Plan

- Where is everyone?
- How can I contact you?
- What is the best way to contact you?
- When are you available?
- How are we all going to keep in touch?
- Where is our project information going to be stored?



# Teamwork – Effective Meetings

## Effective Meetings

- Never meet without an agenda!
- If you are meeting w/o an agenda make one up first thing!
- Try *facilitation*.
- Assign *facilitator*, *note taker*, and *timekeeper* for every meeting.
- Rotate responsibilities!
- Keep it simple!!



# Teamwork – Effective Meetings

## Sample Agenda

- Assign facilitator, time keeper, note keeper.
- List everyone's locations.
- List everyone's contact information.
- Find out the best way to contact each team member.
- List team member expectations and assumptions.
- Decide how you are going to schedule second team meeting.
- Create second team meeting agenda.
- Adjourn.



# Project Management - WBS

## Work Breakdown Structure

- Graphical tool for communicating and tracking project deliverables.
- Can sometimes be readily generated from strategy and functional requirements.
- **Keep it simple!**
- **Blocks define *what not how***  
**!!!**



# McDonald's Systems

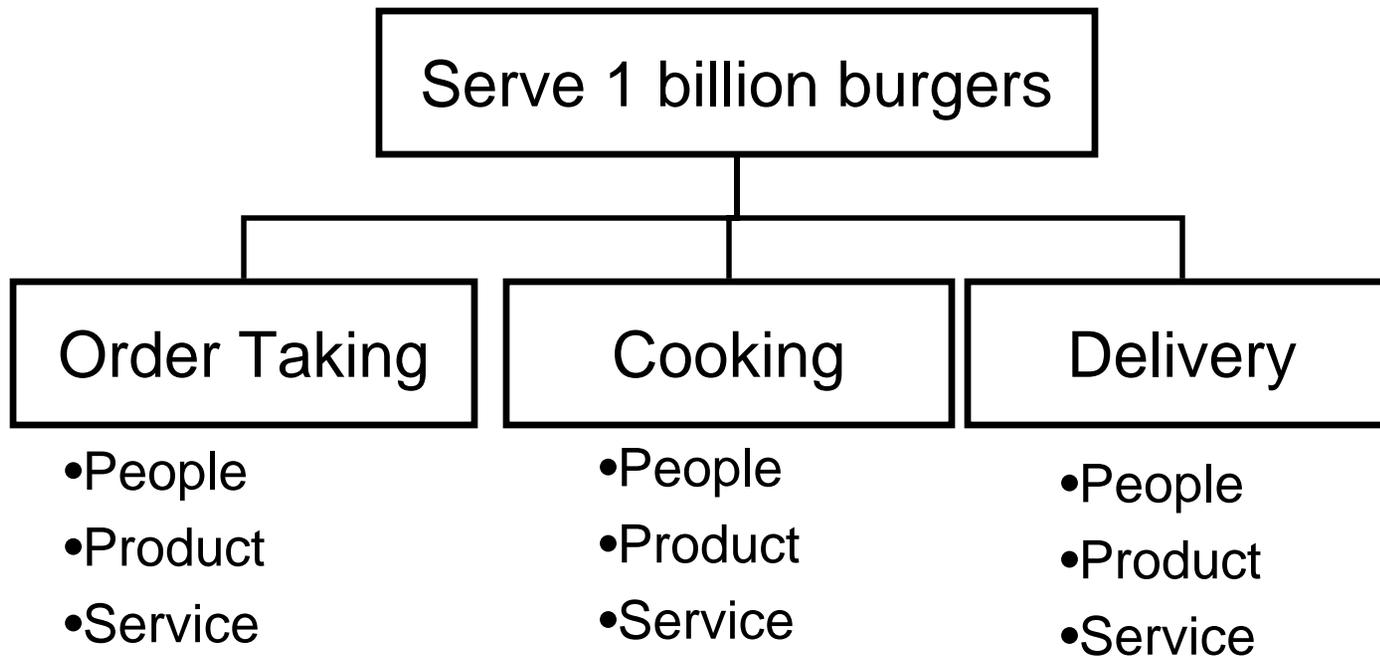
Functional Requirements	Design Idea	Analysis
Take orders		
Cook burgers		
Deliver burgers		



# Project Management - WBS

## Work Breakdown Structure

McDonald's





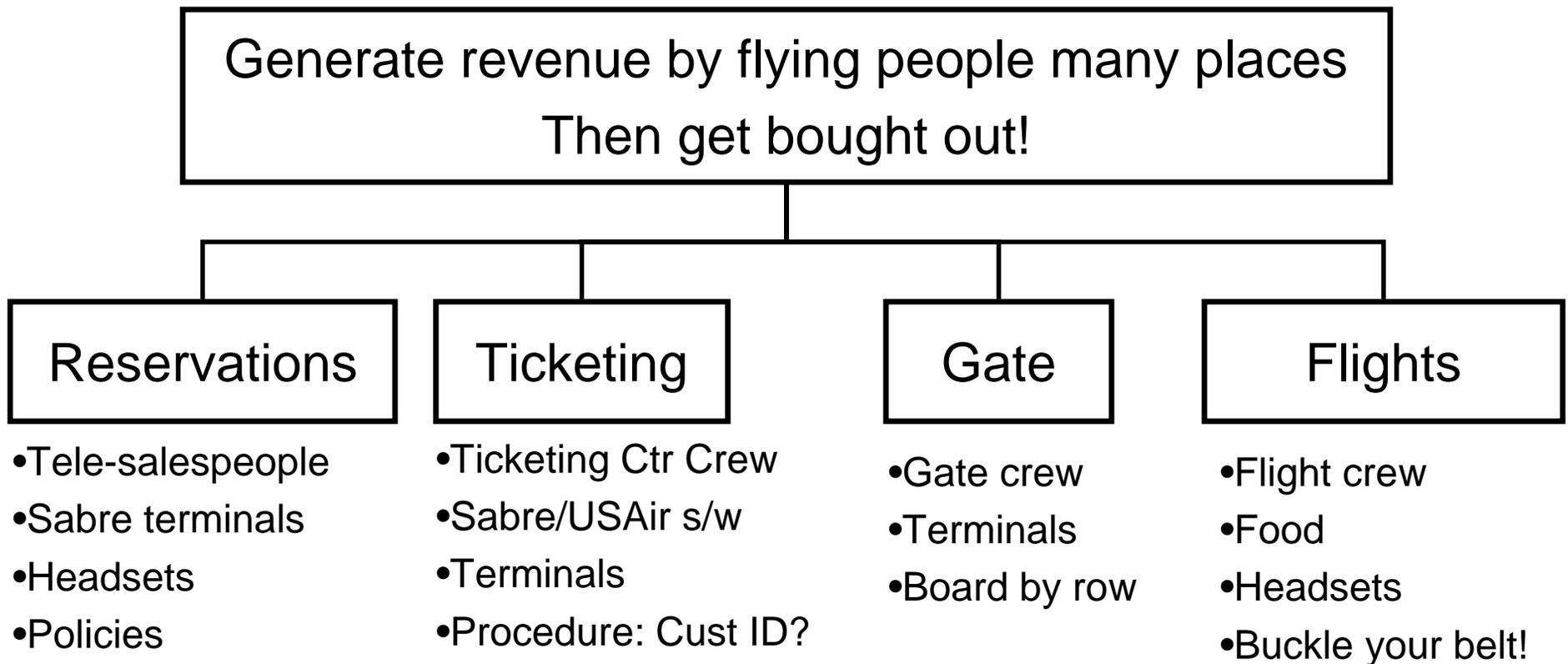
# U.S. Airways Systems

Functional Requirements	Design Idea	Analysis
Take reservations		
Give boarding passes		
Put people on plane		
Fly people long distance		



# Project Management - WBS

## Work Breakdown Structure U.S. Airways





Unified Aerial  
Competition 2002

# Systems

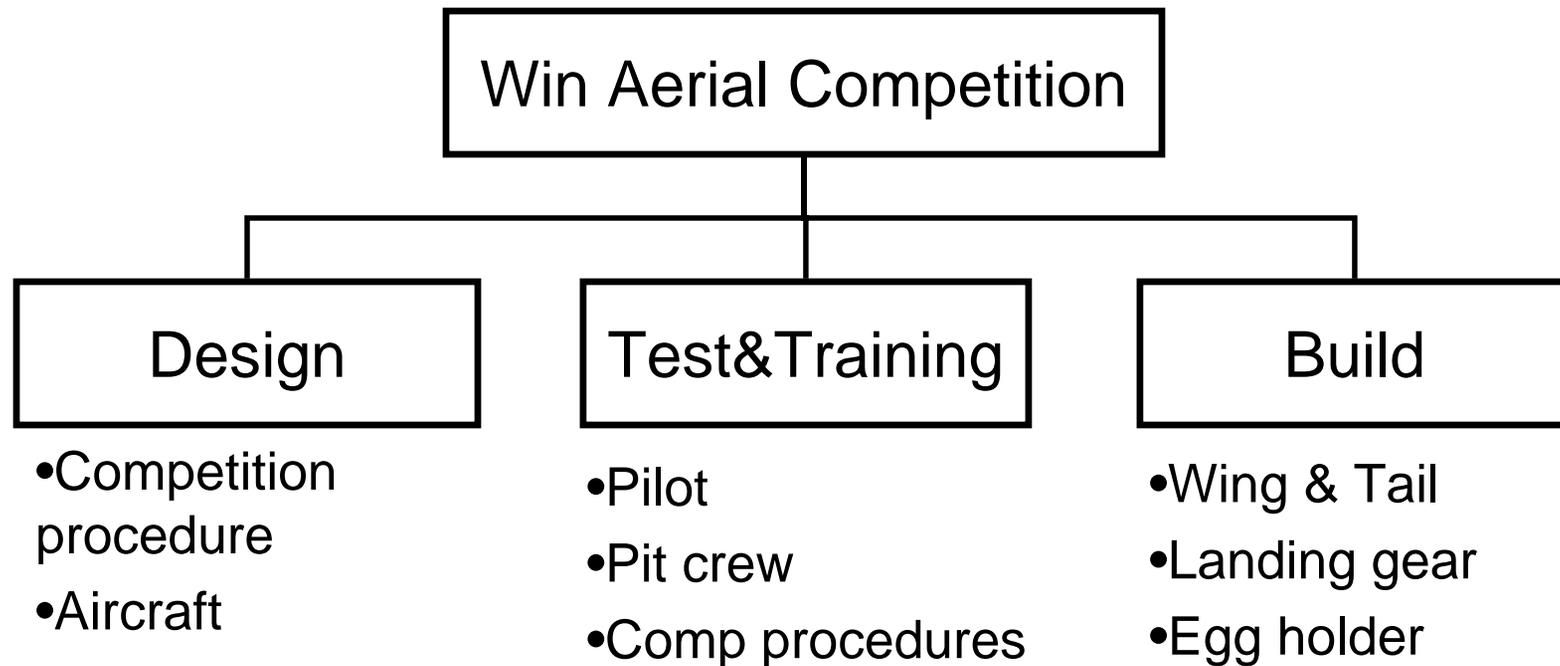
Functional Requirements	Design Idea	Analysis
Fly laps		
Load, carry, and don't break egg		



# Project Management - WBS

## Work Breakdown Structure

Unified Aerial  
Competition 2002





# Project Management – Gantt Chart

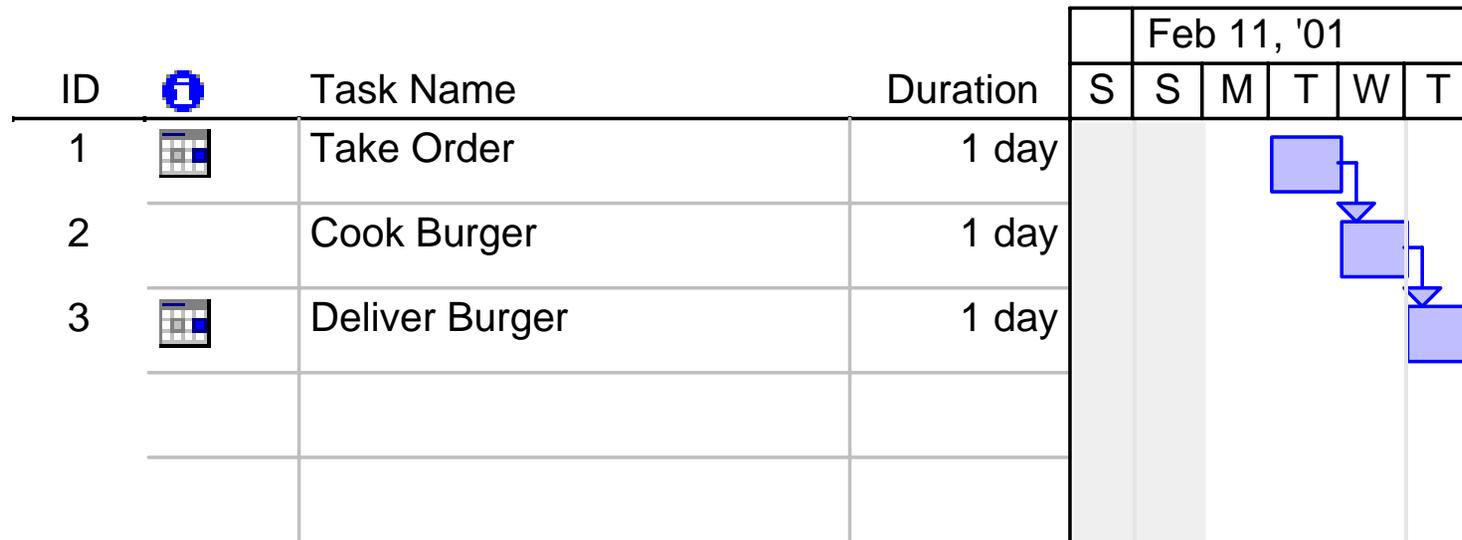
## Gantt Chart

- Popular tool for scheduling project deliverables
- Takes into account resources and constraints for delivery of project within timeframe and budget
- **Can often be generated using information in WBS**



# Project Management – Gantt Chart

## Gantt Chart





# 2004 Requirements and Resources

- Develop a system to participate in an aerial competition
- System must be ready by 29 April 2004
- Endurance flight with operations and egg payload (1-4 eggs)
- Don't crack or break egg during handling, loading, flight, landing
- 5 people, 9 weeks, 4hrs/person/week, kit, supplies, flight training



# Team Assignments

- Pick up a team assignment sheet
- Faculty has assembled teams based on:
  - some elements of randomness
  - similar to industry, can't always choose
- It is important that you have a first meeting soon