

## System Synthesis

- Generate many feasible solutions
- Feasibility issues:
  - technological: can it be done in timeframe?
  - constraints: does it violate any?
  - are subsystems compatible?
  - does it address at least some of the needs?
- Other than feasibility, withhold judgment here
- Examine the ideal solution. What would have to change to make it feasible?
- Look for analogues
- Chinese menu approach:  
Disassemble problem, solve subproblems, put solutions together

## System Synthesis Questions

- What are the alternative approaches for achieving each objective?
- How is each alternative approach described?
- How do we measure attainment of each alternative approach?

## Objective-based Alternative Generation

- For each objective, identify some alternative concepts that address the objective and also address at least some of the other objectives
- Select from this set those that appear to have the best chance of addressing all of the objectives
- These alternatives are carried forward into Systems Analysis

## System-Element or Subsystem Chinese Menu Approach

- For each system element or subsystem, identify alternative approaches to providing the relevant functions
- Generate alternatives by selecting one item from each list
- Omit alternatives which
  - have incompatible subsystems
  - are infeasible
  - are inferior to other alternatives in every function

## Example Chinese Menu

| Orbit            | ADCS                        | Power Generation      | Energy Storage |
|------------------|-----------------------------|-----------------------|----------------|
| Single LEO s/c   | Spin-stabilized             | Body-fixed cells      | NiCd batteries |
| Multiple LEO s/c | Gravity-gradient stabilized | Single solar panel    | NiH2 batteries |
| Single GEO s/c   | Momentum wheels             | Two solar panels      | Flywheels      |
| Multiple GEO s/c | CMGs                        | Nuclear reactor       |                |
|                  | Thrusters                   | Electrodynamic tether |                |