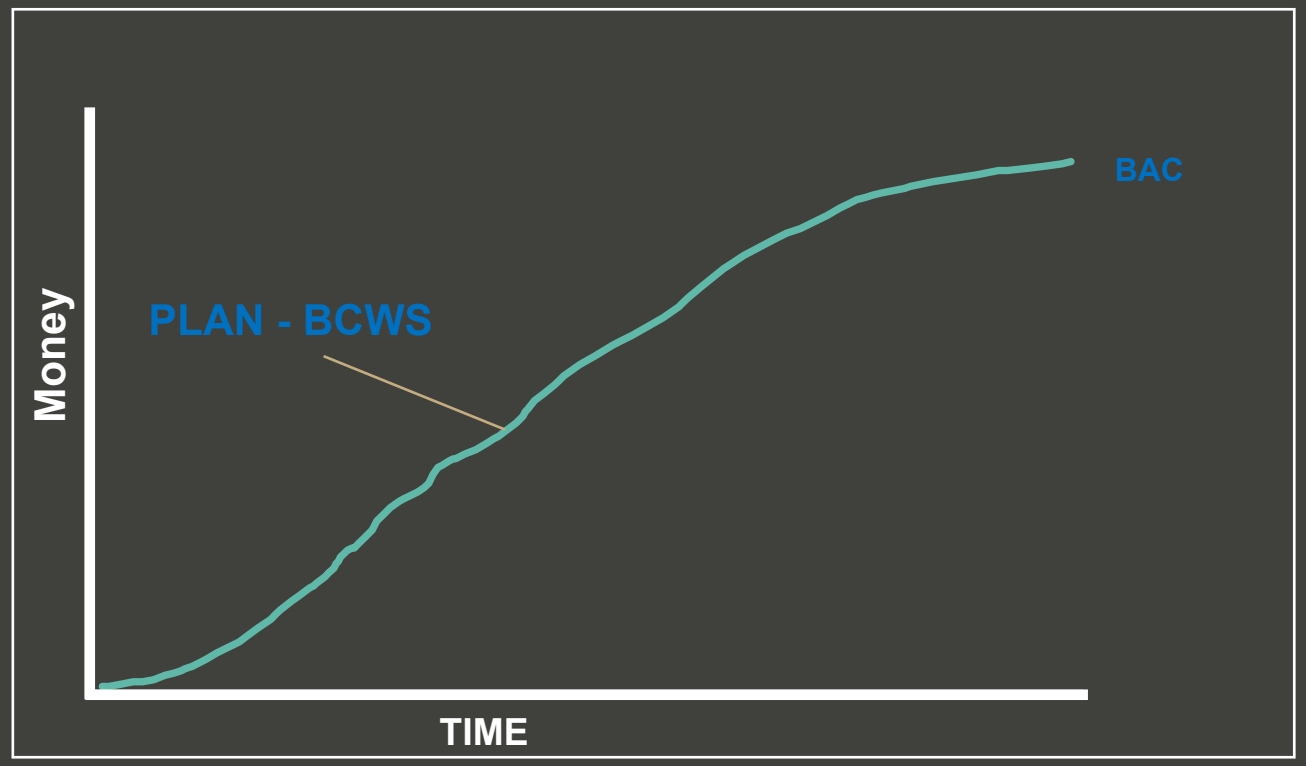
Evaluating EVM

January 13, 2016

EVM Issues and Opportunities

- EVM Basics
- EVM Issues
- EVM ETC and EAC Calculations
- EVM Cost and Schedule Value Calculations
- CPI and SPI vs Cost and Schedule Variance
- EVM and Alternate Lifecycle models
- Summary

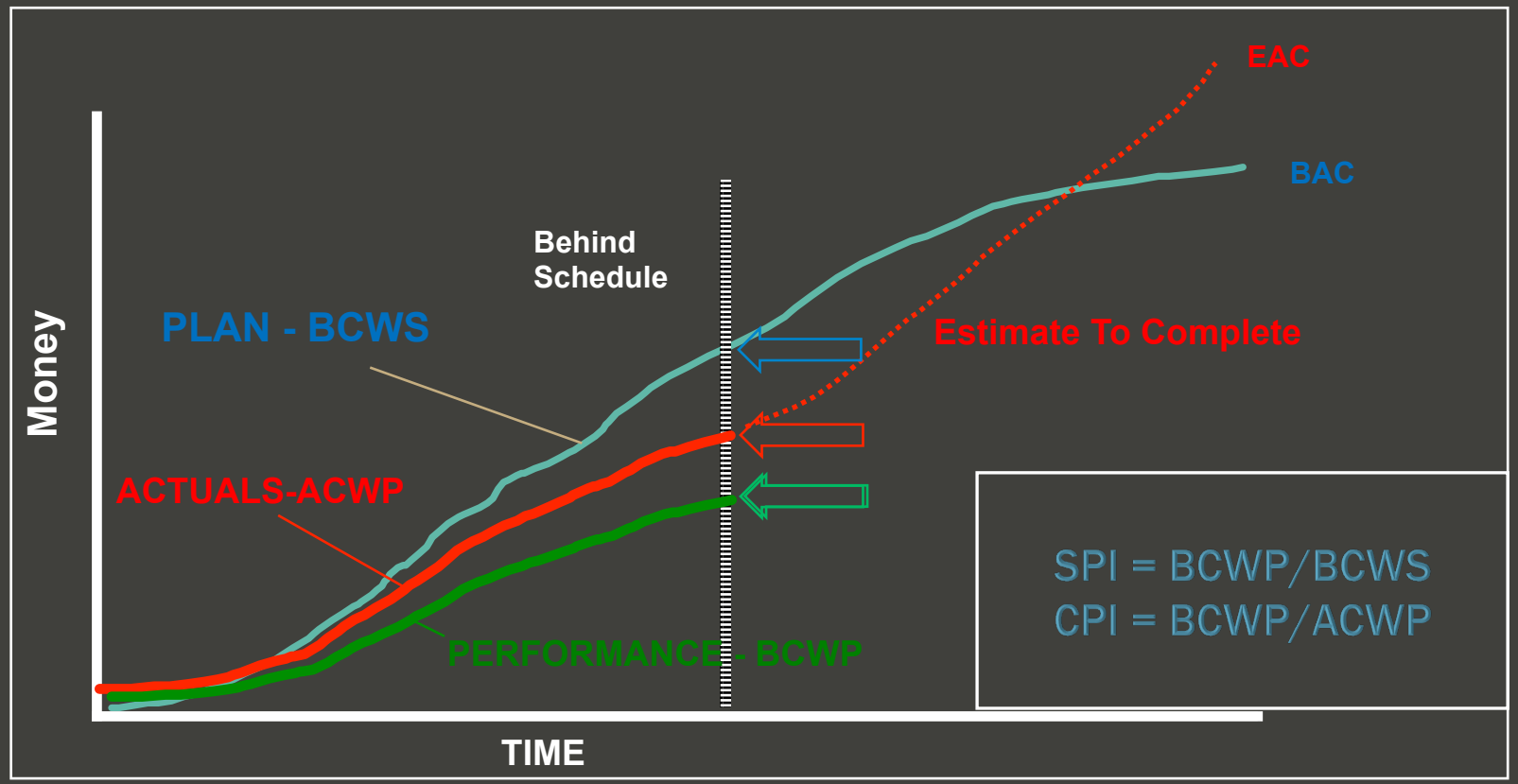
EVM Basics: Planning



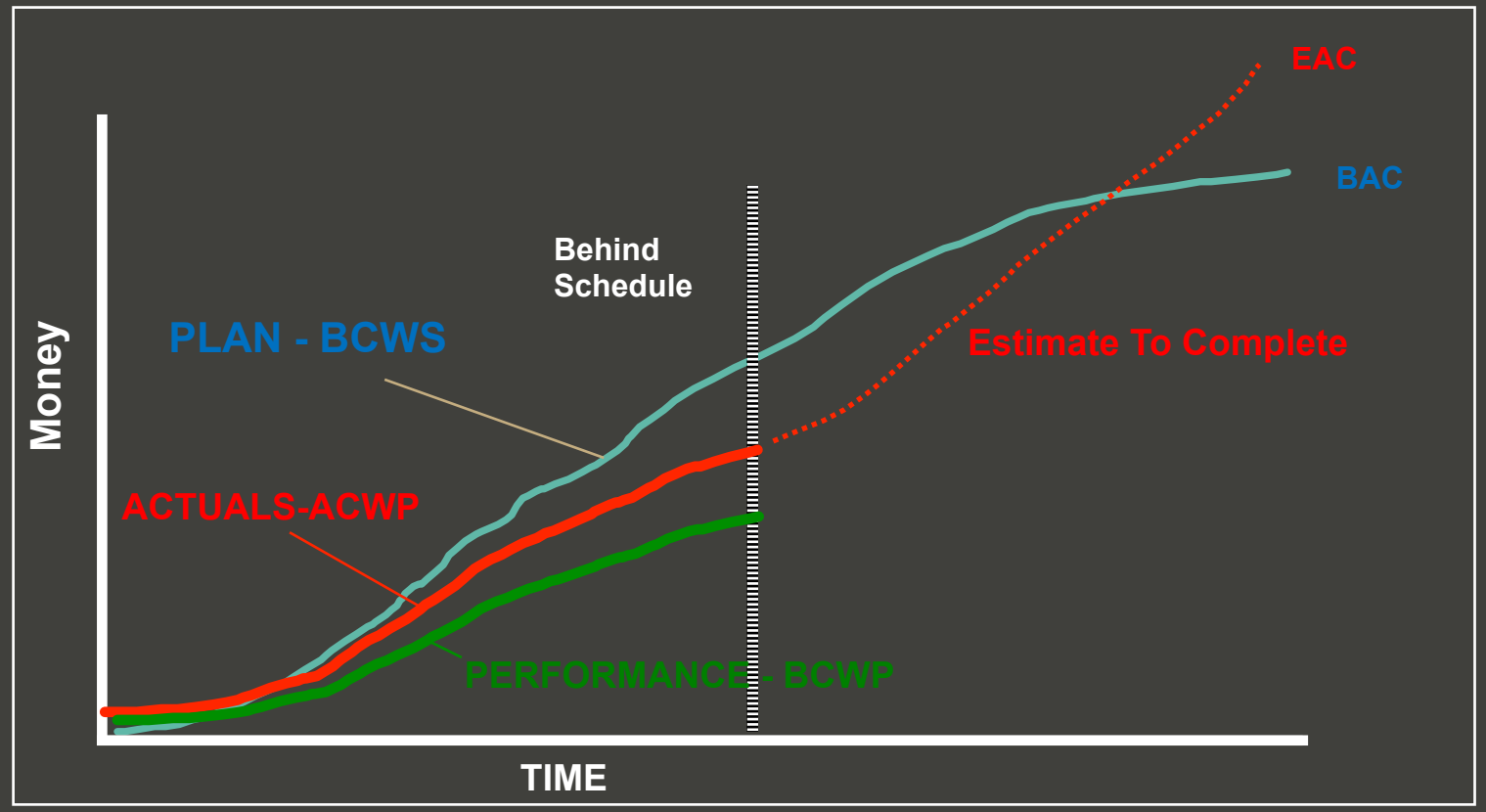
- Establish a Baseline across manageable units of time
  - What was planned to get done for the time
  - What was planned to get done for the money
  - Baseline or Budgeted Cost of Work Scheduled BCWS
- Risk Assessment and Reality Check
  - Is this what you promised would happen?
  - Is it possible without divine intervention?
- At the start, and only then EAC=BAC

EVMS Basics: Execution

- Measure
  - What did get done in that time?
  - How much did you spend to get it?
- Risk Assessment and Reality Check
  - Is this what you promised would happen?
  - Is everything just the way you thought it would be?



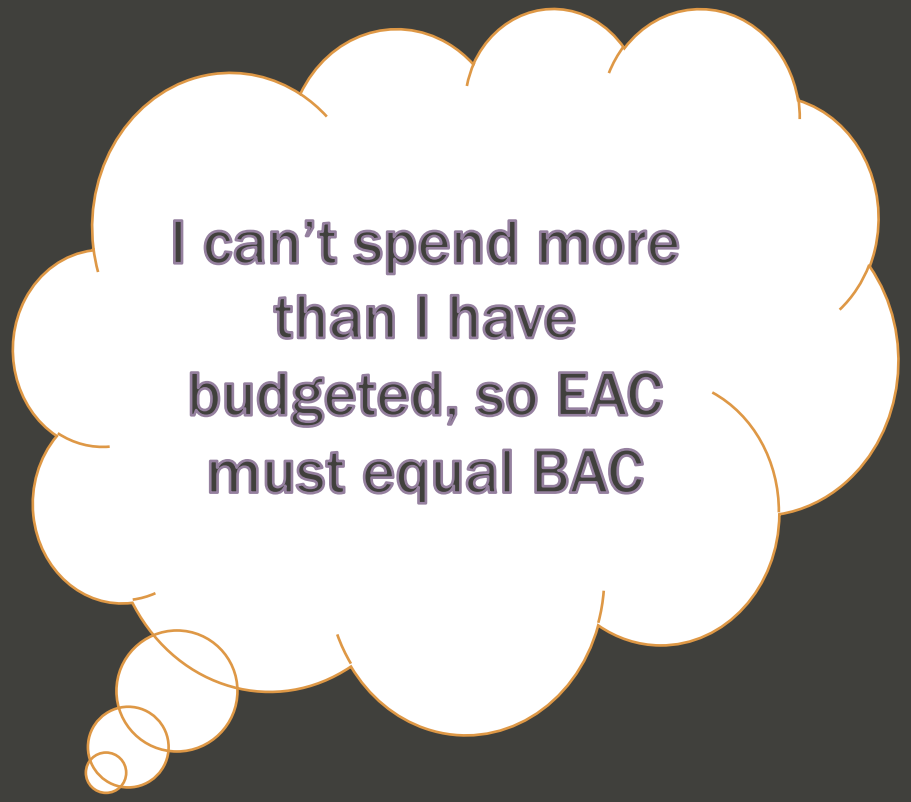
EVM Basics: Forecasting



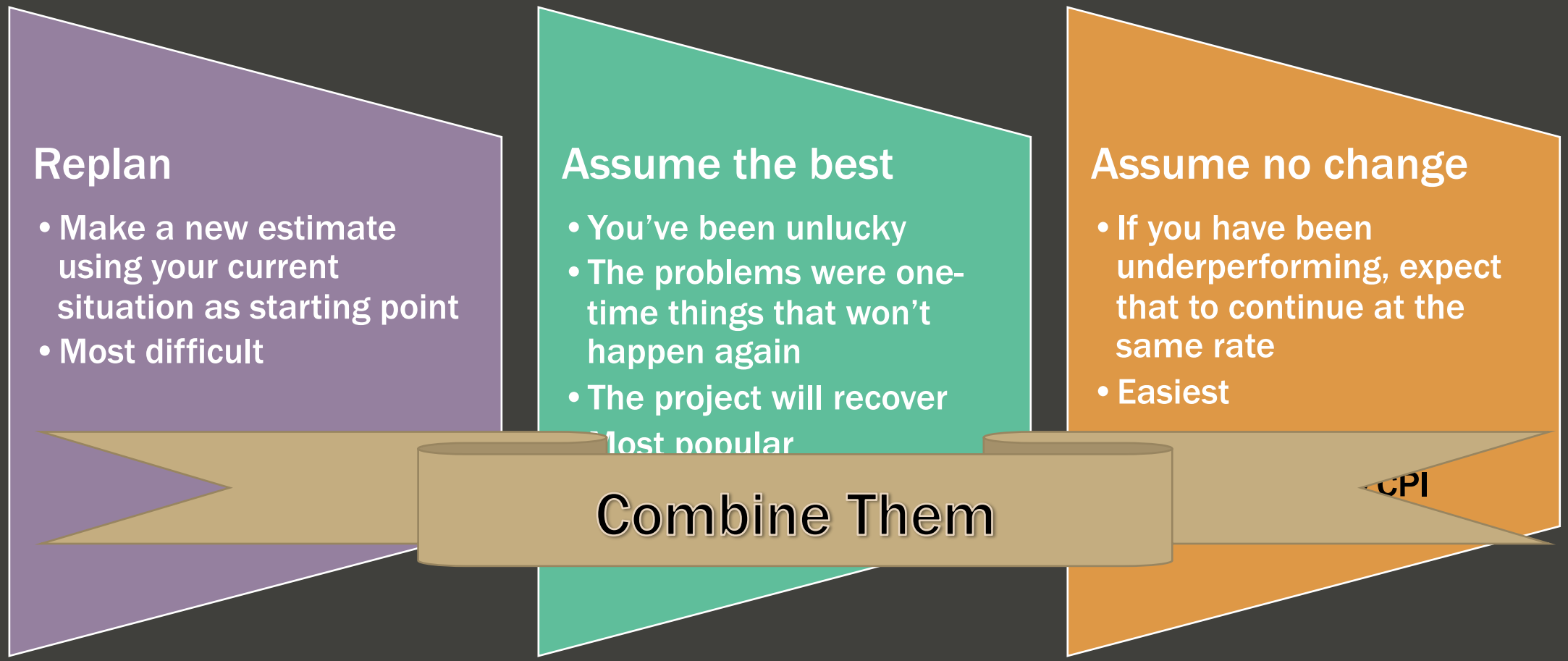
- Basic Predictions
- If you've been spending too much for the work so far, it is likely to continue
- If you aren't finishing the work on time, it is likely to continue
- Estimate To Complete = the amount you have to spend to get done on time
- Estimate At Complete = The total amount you will have spent at the end, that is, Actual Cost + ETC.

EVM Issues

- Does not work right if you don't do it right
  - There are choices to make on calculations
- Not easy, takes training, time, and schedule to execute
- Some smart people have a real mental block about it



EVM Basic Issues : ETC calculations



EAC Calculations

Assumption	Example Formula
Future cost performance will be performed at the budgeted rate	EAC = AC + (BAC−EV) Data Example: EAC = 48 + (150 − 32) = 166
Future cost performance will be the same as all past cost performance	EAC = AC + [(BAC−EV)/CPI] = BAC / CPI Data Example: EAC = 48 + [(150 − 32)/0.67] = 150/0.67 = 225
Future cost performance will be the same as the last three measurement periods (i, j, k)	EAC = AC + [(BAC − EV) / ((EV_i + EV_j + EV_k) / (AC_i + AC_j + AC_k)]
Future cost performance will be influenced additionally by past schedule performance	EAC = AC + [(BAC – EV) / (CPI x SPI)] Data Example: EAC = 48 + [(150 − 32) / (0.67 x 0.80)] = 269.3
Future cost performance will be influenced jointly in some proportion by both schedule and cost indices	EAC = AC + [(BAC – EV) / (0.8 CPI + 0.2 SPI)] Data Example: EAC = 48 + [(150 − 32) / (0.8 x 0.67) + (0.2 x 0.80)] = 218.2

EVM Cost Management Issues

- Different situations need to be measured differently.
- Need to examine at a lower level of the WBS, but not too low
- Special cases
  - LOE activities, e.g. Project Management. If Actual != Plan then you planned to a different model.
  - Discrete allocation of large costs . If you have a bunch of money going out at once, even if it planned, it will mess up your calculations. Picture the graph.
- If you choose to allocate Earned Value 25% on task start, and 75% at completion, but your Planned Value curve assumes even distribution, you will get meaningless variances.
- Using Actual money out instead of Actual Costs Incurred.

EVM Cost Management Issues

- Retroactive Adjustments
  - Cost data arrives late. Have a consistent and mathematically valid process.
- Scope Changes
  - If you add stuff to scope you need to replan
  - If you take stuff out because work packages are cancelled, you need to make an alternate plan, maybe more than one.
- Done wasn’t really done
  - If you don’t plan for rework you will re-open closed tasks and mess up your EV.
- Divide by zero – see the next section

EVM Schedule Management Issues

Boundary Conditions

- Time marches on, and you reach the end date whether or not you are done.

SPI = 1 when work is complete

SPI = 1 when the baseline completion date is reached.

Obviously, you need to work around this problem. This problem is mostly ignored in US practice.

SPI = EV/PV, CPI = EV/AC and 0

- Time passed, nothing happened aka late start 0/0 = ?
- Time passed, people charged to the contract, but didn't accomplish anything 0/PV = 0, 0/AC = 0
- Some work shows up as done in activities not started EV/0 = ?

EVM and Alternate Lifecycle Models

EVM Intended for Waterfall Model

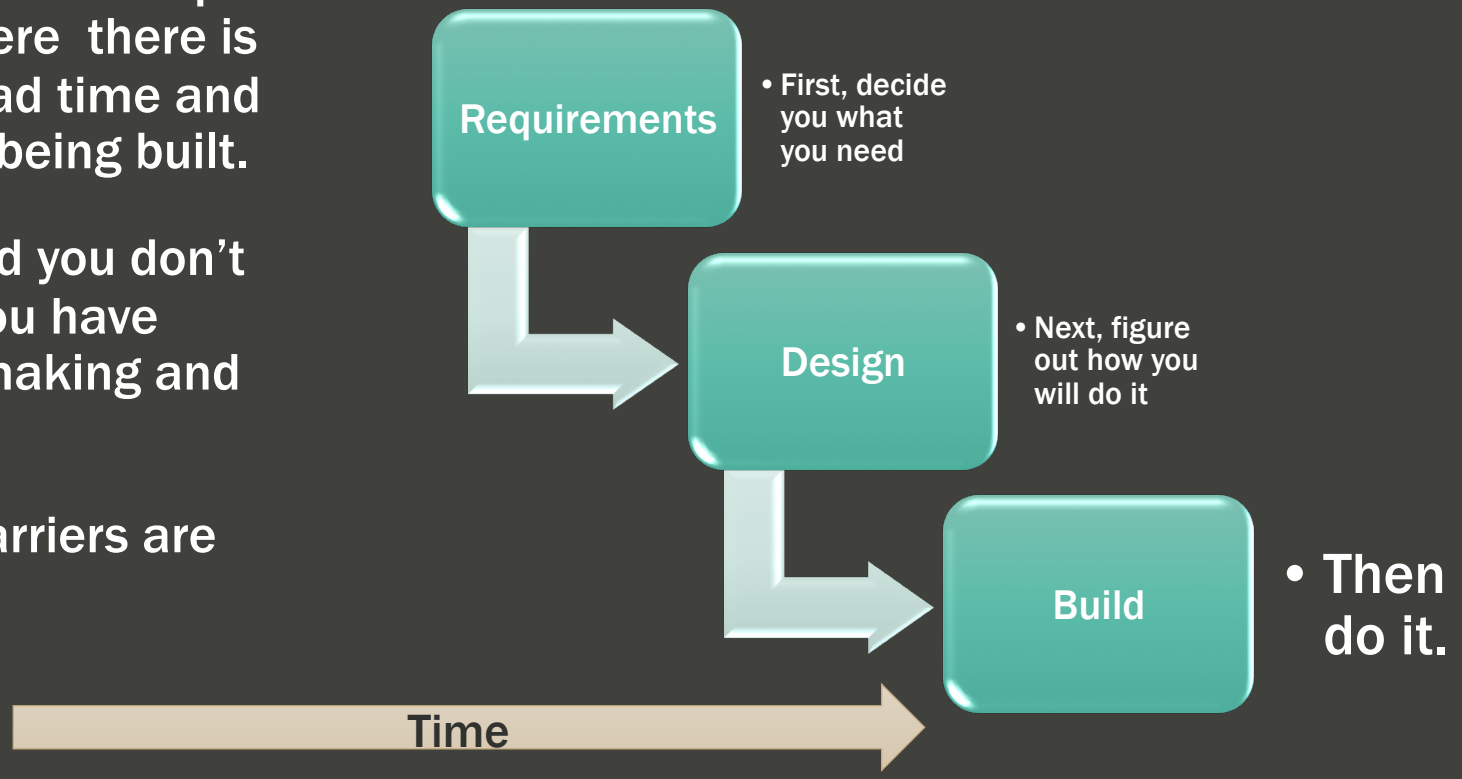
- All planning up front in Waterfall
- Requirements are defined early in project, so if it looks like the project plan is unrealistic after the requirements phase you can rebaseline.
- You define the completion state and can tell if you are making progress towards it.

Adapt EVM to Agile Models

- The plan is to figure out what you are doing as you go along.
- Functional and performance end states are not defined
- Incremental, Evolutionary, and Spiral models all require adjustments.

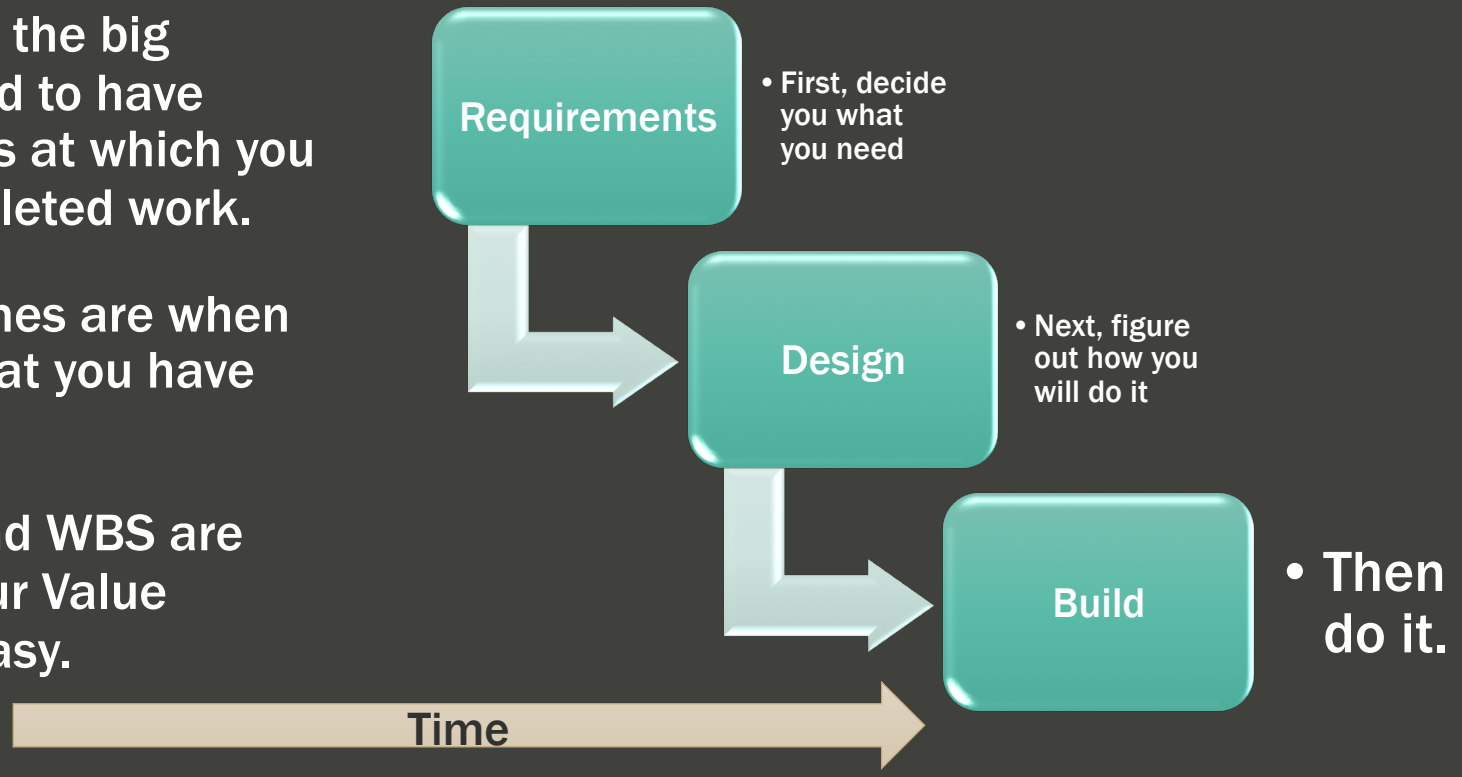
Waterfall Lifecycle Model

- Waterfall lifecycle models developed for large scale items where there is potentially significant lead time and expense for the product being built.
- Steps are sequential, and you don't make something until you have specified what you are making and how you will do it.
- Satellites and Aircraft Carriers are built this way.



Waterfall Lifecycle Model

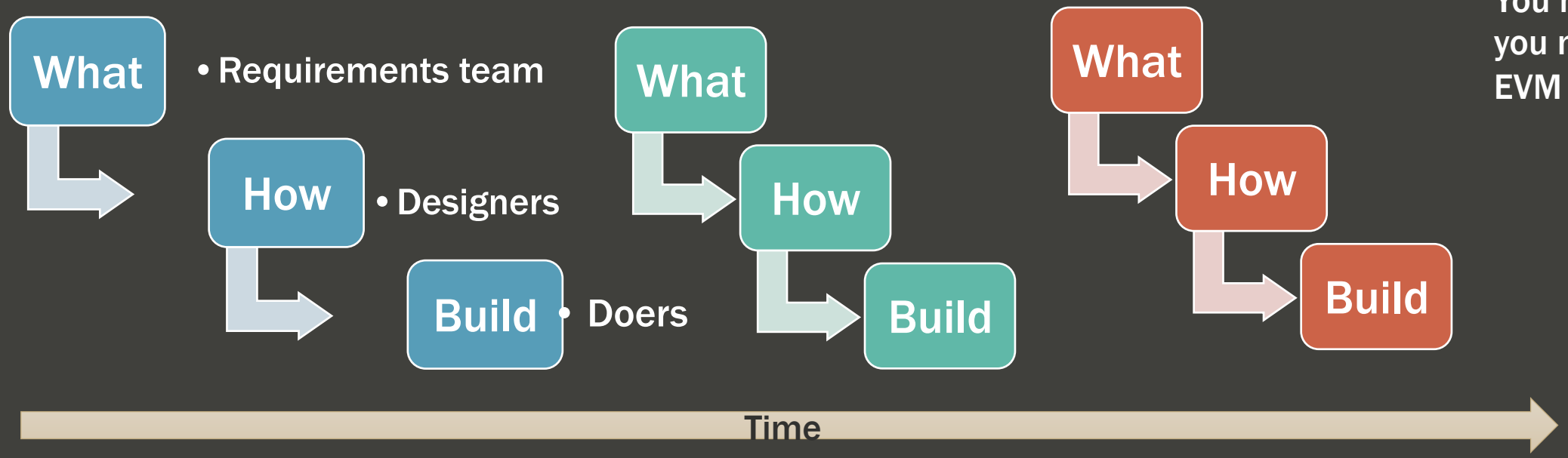
- Waterfall lifecycle models and EVMS work together easily. For the big projects you are expected to have clearly defined endpoints at which you can take credit for completed work.
- DoD Acquisition Milestones are when the customer accepts that you have completed the phase.
- Your project schedule and WBS are detailed enough that your Value determination is fairly easy.



Spiral Lifecycle (and parallel subsystems)

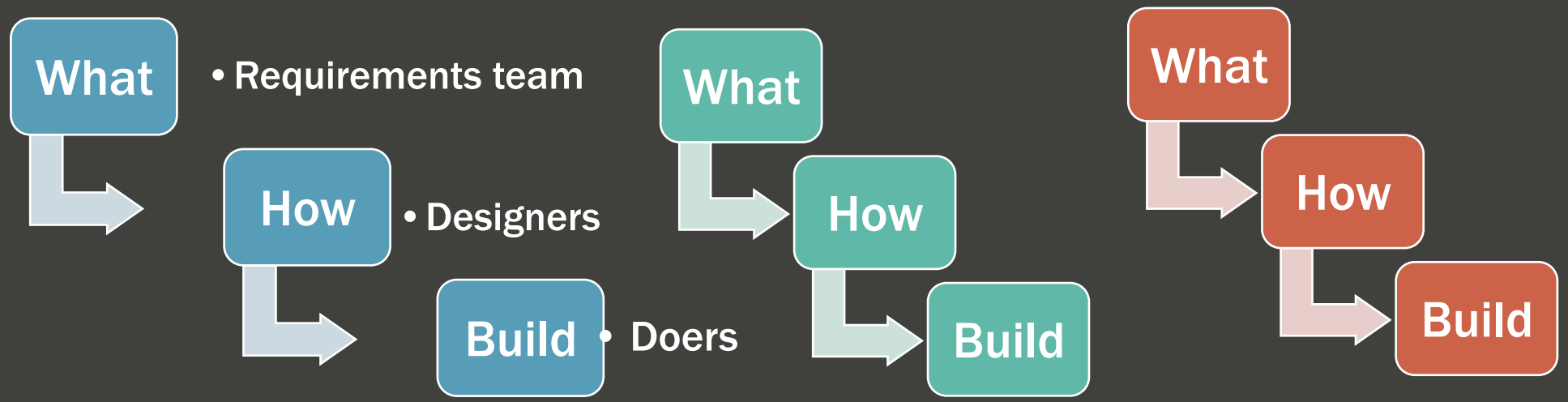
In the spiral model, the teams functional, rather than associated with a product. As a team finishes a product, they move on to apply their skills to the next product.

People resist planning each step. You need to plan if you need to use EVM



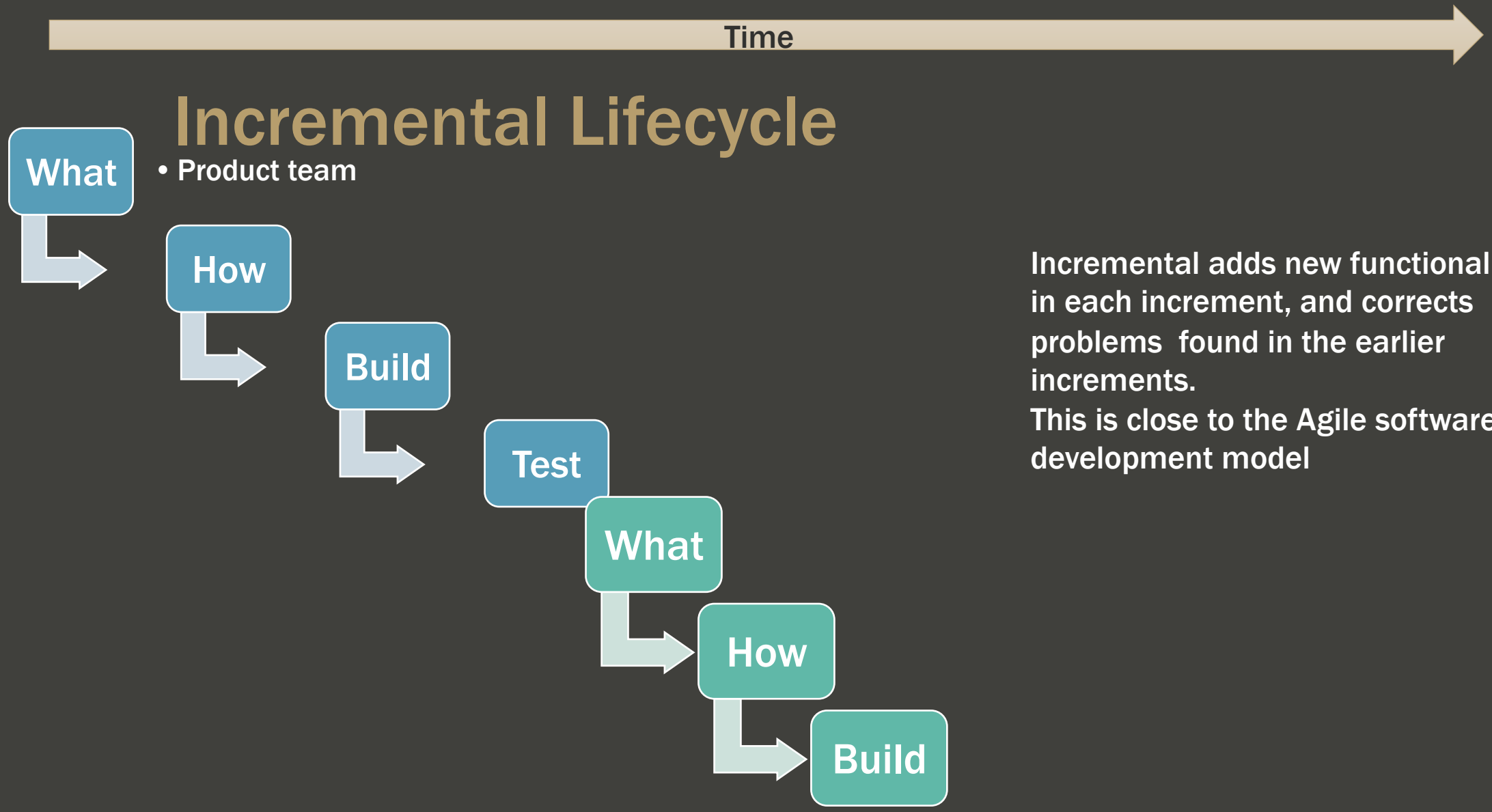
(Spiral Lifecycle and) parallel subsystems

Subsystems of the satellites and aircraft carriers are done in parallel, completing each phase at approximately the same time.



Value is determined like a mini waterfall, except the projects are not independent.

Incremental Lifecycle



Incremental adds new functionality in each increment, and corrects problems found in the earlier increments.
This is close to the Agile software development model

Summary

Questions?

- EVM ETC and EAC Calculations
  - Different methods available.
  - Combine them if needed to get the best results.
- EVM Cost and Schedule Value Calculations
  - Depend on the kind of contract and task
  - Depend also on how you want to define Value
- CPI and SPI vs Cost and Schedule Variance
  - Ratios and when you have a scale difference in your numbers.
- EVM and Alternate Lifecycle models
  - Adds complexity to the Cost and Schedule Value calculations