U.S. DEPARTMENT OF ENERGY | Office of Science

Community of Interest (on Future Scientific Methodologies) Curated Unconference

Richard Carlson
ASCR Program Manager
Richard.Carlson@science.doe.gov

Welcome

Purpose

This curated unconference is focused on you and your peers putting aside your day-to-day job and instead exploring what Computing in the DOE Lab complex might look like in 2050

Why are you Here?

- **Goals or Objectives**
  - Strategic Thinking about possible futures
  - Multiple Ideas and possible technologies
  - Explore each idea in depth
- **Non Goals or Objectives**
  - Tactical Thinking about solving todays problems
  - Basic Research Needs or Priorities
  - Technologies that will have short term impact

Examples: Ideas that required 30+ years

- **In 1874 the idea that man would fly was not widespread**
  - Yet Balloons had been used for almost a century
  - By 1883 Several scientists and engineers were studying the problem
    - Octave Chaunte
    - Otto Lilienthal
    - Louis Bleriot
  - On December 17, 1903 the Wright Brothers made 4 powered flights
- **In 1939 few thought man would walk on the moon**
  - Yet rockets had been around for centuries
  - Jules Verne wrote “From the Earth to the Moon: A Direct Route in 97 Hours, 20 Minutes” in 1865
  - By 1938 Robert Goddard had successfully developed a liquid-fueled rocket
  - On July 20, 1969 Apollo 11 – Eagle landed on the moon

I want/need an Airplane – Day 1

- **I'm going to expand on the previous slide to give the group some additional thoughts on how to make this workshop productive.**

1. **Each breakout group needs to identify a 30 year goal or objective for something that does not exist yet. In this example in 1874 the ask is:**

I want an Airplane capable of carrying a human over some distance!

2. **The next step is to identify some implications of that device, technology, object, methodology. Some potential implications of a workable airplane are:**
   - People can travel long distances in a single day (international meetings)
   - Packages and goods can move long distances (Oranges delivered to AK in winter)

I want/need an Airplane – Day 2

- **Now that we know what the goal is, and the implications of that, Day 2 starts getting into more details. How do we know that progress is being made towards reaching that goal?**

1. **The next step is to develop a timeline with signposts that allow us to track progress (think about interstate signs that tell you which major city is x miles away:**
   - 20 years out the materials being used to build the airplane need to be readily available
   - 20 years out the skilled craftsman need to be able to shape this material into structures
   - 10 years out the math required to define the coefficient of Lift and Drag need to be experimentally verified
   - 5 years out the ability to build an engine with enough power and low weight needs to exist
2. **The next step is to rank order these signposts and determine how likely they will be meet in the required timeframe:**
   - The airplane structure will be wood (spruce) with a fabric covering. Highly probable that the material and knowledge to fabricate the airplane will exist when needed
   - Engine performance and weight needs to be improved, applied research is required
   - Wind tunnel experiments and kite flying experiments produce different results, requiring basic research

I want/need an Airplane – Day 3

- **Now that we have the overall goal and some idea of what research activities are needed (but not specifics on how to do that), Day 3 explores how things could fail horribly or succeed beyond your wildest dreams.**

1. **Now think about the possible pitfalls and roadblocks that could stymie your progress:**
   - The engine is not powerful enough to push the plane forward fast enough to allow it go generate enough lift
   - The shape of the propeller is wrong so it doesn't provide the right amount of thrust
   - Inadequate funding prevents the PI from conducting experiments.
2. **Lastly, how can success be measured. Not just the final product, but incremental milestones that can show we will have a workable airplane in 30 years, also consider spin-off technologies that are used in other places/ways:**
   - We have an airplane that can take-off, land, and is controllable in flight
   - Engines are used in cars as well as airplanes
   - The postal service uses airplanes to ship mail around the country in days not months

Make no little plans. They have no magic to stir men's blood