SYSTEMS ENGINEERING AND THE SOFTWARE LAWS OF THERMODYNAMICS

Dr. Thomas F. Christian Jr.
Director of Engineering
ACSSW, WPAFB OH
26 Oct, 2005

SYSTEMS ENGINEERING

- Systems Engineering is the disciplined application of tools and principles to achieve a complex goal
- Software Engineering is part of Systems Engineering
- Systems Engineering must obey the Fundamental Laws of Physics

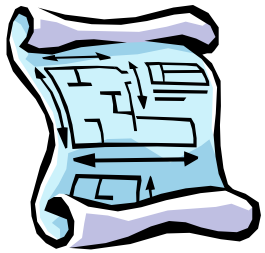
THE LAWS OF PHYSICS

- But what are the fundamental laws of physics?
- F=MA?

- Earlier seminal work at SSTC 2005 said “Yes” – Newton’s Laws of Motion govern Software Engineering

THE LAWS OF METAPHYSICS

- "I think therefore I code"
- No, No!!
- Even EEs understand Inertia but, could there be some law even more fundamental than that?



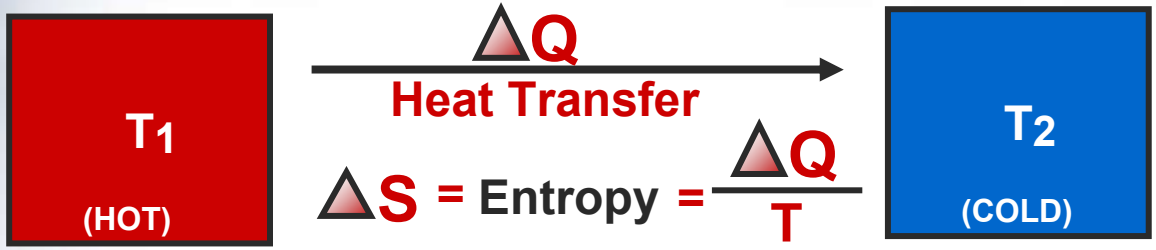
THE LAWS OF NATURAL PHILOSOPHY

-- YES --

THERMO

The unexplainable

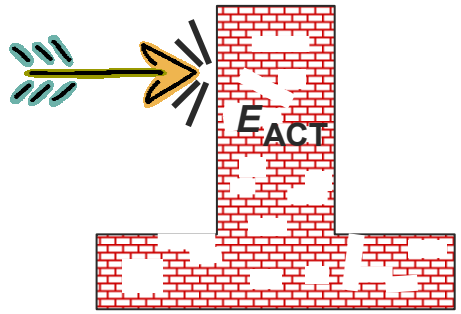
1ST LAW – CONSERVATION OF ENERGY



"If the state of a system is changed by applying work or heat or both, then the change in the energy of the system must equal the energy applied"

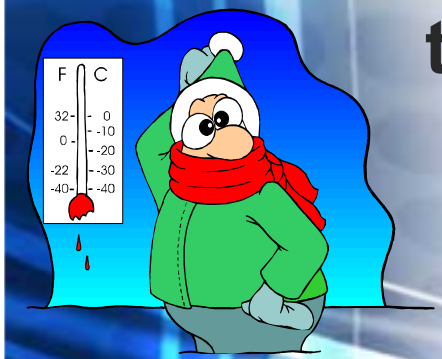
2nd LAW – TENDENCY TOWARD EQUILIBRIUM

"It is impossible to move heat, by cyclical process from something at lower temperature to something at higher temperature unless work is added to the system"



3rd LAW – ABSOLUTE ZERO

"If the entropy of each element at absolute zero can be taken as zero, then all elements above absolute zero must have a finite, positive entropy; however, because entropy cannot be reduced to zero by finite means (as per the Second Law), no system can reach absolute zero"



Since we are Systems Engineers - Not Physicists – Let's put them into System Engineering - Speak

- 1st Law: You Can't Win – Just Break Even
- 2nd Law: You Can Only Break Even at Absolute Zero
- 3rd Law: You Can't Reach Absolute Zero

THE SOFTWARE LAWS OF THERMODYNAMICS

- Optimizing software quality, cost, schedule require proper processes, planning, and people
- Proper processes, planning and people requires time to do it right
- There is NEVER time to do it right

"RASSA'S LAW" 

- "No one can resist the temptation to edit another's work or start coding on the first day of a program"