



2016 Conference on Systems Engineering Research

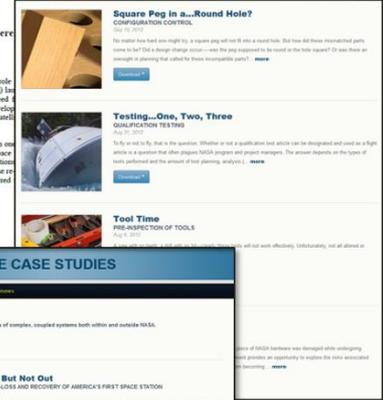
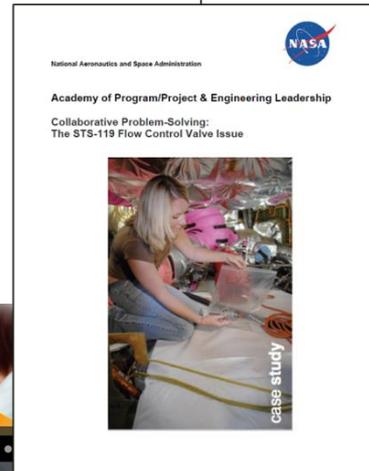
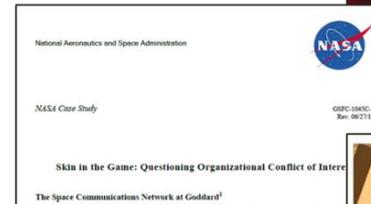
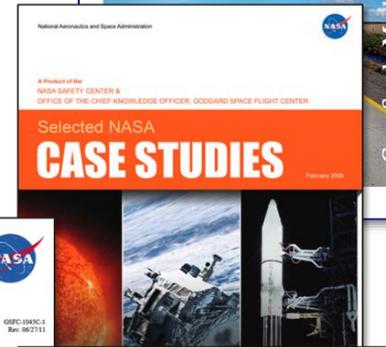
Enhancing systems engineering education through case study writing

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Agenda

- Case Study Writers Workshop
- SE educational need
- Improvement with Subject Area Knowledge
- Future Research



Make a Case for Marshall Success

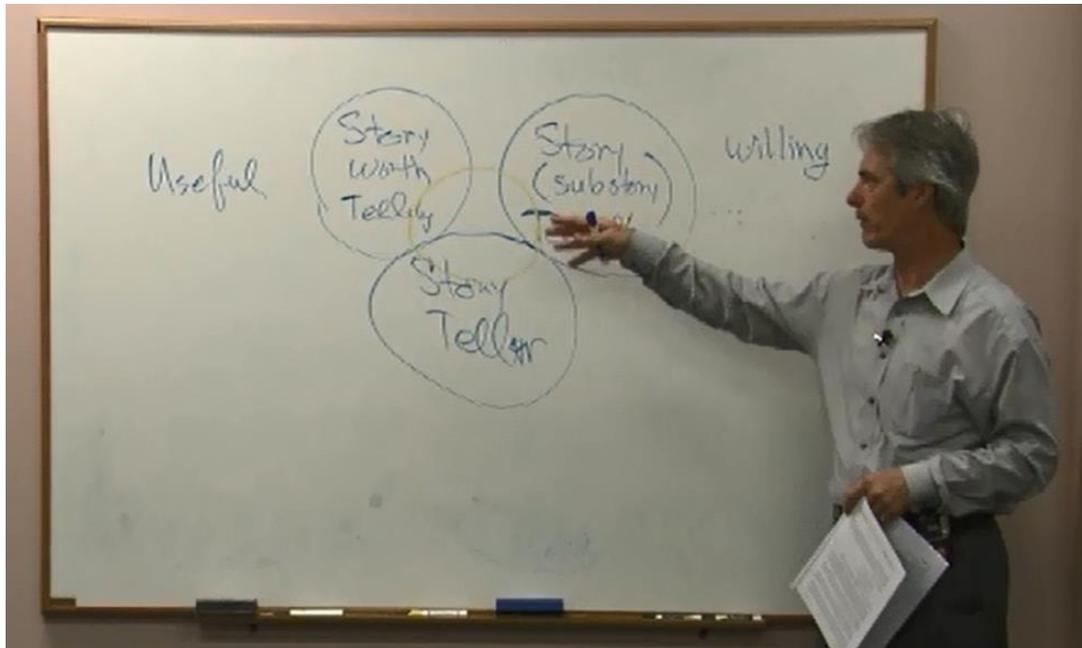


Write a NASA Case Study
Sign up in SATERN for April 6-7 Case Study Workshop. Learn more...



Why Case Study Writing?

- Wide variety of styles for a plethora of purposes
 - Advertising ←————→ Academic Research
 - Focus on teaching, instructional case studies, and decisional (~3-10 pages)



Learning from case studies “stretches your mind for 30 minutes.
It won’t go back exactly to the shape it was before”

Ed Rogers, GSFC Chief Knowledge Officer



SE skills

Case Study Writing

Case Study Writer's Experience

- Interviews with people who *know*
- Finding the story in the quagmire of information
- Concept mapping to connect the story
- Balancing viewpoints
- Being comfortable with non-closure
- Structured process, on schedule
- Editing out nice but not necessary
- Opportunity to present at RWMMS*
- Interviewing/inquiry skills
- Appreciation emotional content of work environment
- Deep contextual knowledge about a *real world* event or situation

Behaviors of Good Engineers

(Gentry Lee, JPL)

- Intellectual curiosity
- Sees Big Picture view
- Sees connections
- Comfortable with change
- Comfortable with uncertainty
- Proper paranoia
- Tracks margins and resources
- Communication skills
- Self-confidence and energy
- Appreciation for process
- Personality
- Add to the knowledge of the world



Case Study Writers Workshop

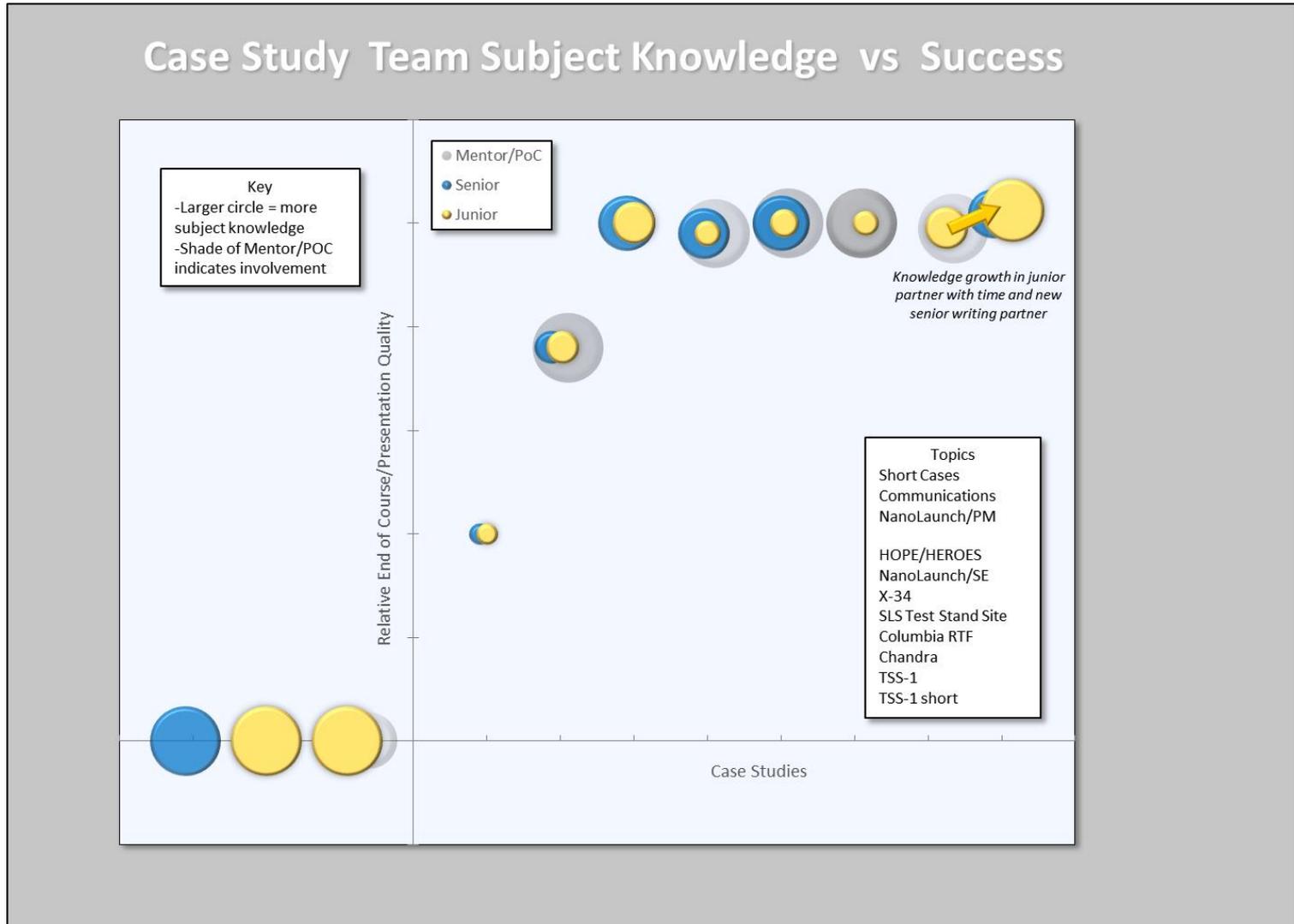
- Impact of subject knowledge to success in producing quality case study
 - Criteria for success: usable in the Real World Marshall Mission Success Course

Subject Area	Mentor (if any)	Senior Partner Subject Knowledge (range)	Junior Partner Subject Knowledge (range)	Relative Success	No. Pages
Government-contractor relationships (PM)		High	Medium	Well polished final draft	7
Launch decision - technical issue (SE)	High		None	Excellent	4
SE implementation small project (SE)	High	Medium	Medium	Well polished final draft	13
Small Project PI-led SE implementation		Low	Low	Good preliminary draft	11
Launch Decision - technical issue	High (detailed out)	Medium	Low	Excellent	16
Launch Decision - technical issue (PM)	High (detailed out)	-	Medium	Excellent	6
- modified/shorter		Medium	Medium	Excellent	3
Center Operations large facility decision	High	High	Low	Excellent	5
Small Project PM/PI conflict	High (detailed out)		High	Did not complete; Time	-
Communication supports mission success			High	Outline; Not paired; Time	
Center future challenges short cases		High		Did not start; Type of CS not desired by author	



Case Study Writers Workshop

- Success and progression of knowledge and writing capability





Future Research

- Future research options
 - Exploring the pedagogical benefits of using case study-based learning in the engineering classroom
 - Studying the impact of systems engineering skills improvement with intentionally-taught case study writing skills included in the curriculum
 - Identifying systems engineering research enhancements through rigorous case study-based qualitative research applied to systems engineering practice
 - Examining impact of case study-based learning and writing skills on increased knowledge of systems approach in traditional engineering curriculum
- Working on
 - Civil servant students partner with industry and government systems engineers to capture *real world* situations