Committee for Engineering Focused Narrative Television Series

Report on the 20-21 November 2008 meeting

2 February 2009

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I. Introduction

This letter report summarizes the outcome of a workshop sponsored by The National Science Foundation (NSF). It includes conclusions and recommendations by the workshop committee based on ideas and information shared during the workshop. The purpose of the workshop was to explore development of a television series in which engineering would be featured in a positive light. The workshop was held at the Luxe Hotel Sunset Boulevard in Los Angeles on November 20 and 21, 2008. Participants in the workshop are listed in Appendix A.

The NAE report *Changing the Conversation: Messages for Improving the Public Understanding of Engineering* {National Academy of Engineering 2008 #10} states that while hundreds of millions of dollars are spent annually to improve the public image of engineers and the engineering profession, the public generally and K-12 teachers and students in particular have very little understanding of what engineering is or what engineers do to help meet basic human needs and advance societal goals such as improved quality of human life and health, enhanced national and global economic development, and strengthened personal, national, and international security. Engineering was perceived as sedentary, computer-driven career that offers limited contact with other people; but which requires intelligence much above the self-perceived level of many high school students. The report recommends a coordinated campaign of tested messages to change the public perception.

One possible approach was suggested in 1992 by NAE member and former chairman of Lockheed Martin, Norman R. Augustine {Augustine 1992 #2200}. He suggested the creation of a television series "LA Engineer" (as a play on the then popular television series "LA Law") could help bring the contributions of engineers and engineering into the public consciousness. While the that concept or similar ones have been proposed over the years, little progress has been made in the achievement of a prime-time narrative drama on network or cable television that highlights the role of engineers and engineering.

On October 10, 2007, CASEE held a half-day panel on "Engineering and the Media." This meeting brought together science and engineering academics to identify factors to be considered in the development of an engineering-focused television series. For purposes of discussion, we envisioned a straw person concept of a narrative television show called *NTSB Engineering*. The concept features a multi-ethnic, mixed gender team of engineers from the National Transportation Safety Board that investigates a broad range of engineering failures with root causes that, variously, involve every branch of engineering and computer science. (Note, as with the short-lived "NIH" series, which was really about the CDC, the NTSB agency was chosen for

its public name recognition rather than the accuracy of the asserted responsibilities.) The concept was very much like the NBC drama *CSI* except that rather than dead bodies, it had dead engineering systems. The panel used the concept as a departure point for a broad discussion. Those observations motivated a desire for a more in-depth examination by professionals in the television industry.

Through support from the NSF, NAE built upon the October 2007 workshop by convening the workshop described in this report.

II. Key questions:

The project committee posed 11 questions to workshop participants to inform the implementation of a "prime-time" commercial television series that highlights the positive roles of engineers in modern society. In the following section the committee summarizes participant feedback to provide brief answers to these questions in outline form.

a. What factors influence audience demand and commercial potential?

i. Audience demand – Obviously if there were a "pat" text book answer to this question all TV shows would be successes. Interaction with the highly experienced entertainment media players advising the committee did identify several characteristic that are highly desirable in the plot/characters that contribute to audience loyalty:

1. Character development must be central to the stories developed.
2. The viewers must care about the characters because their lives are "messy" with aspects of their personal and professional lives conflicting.
3. There should be conflicts that drive the overall narrative (character versus character, character versus events, character versus self, character versus nature, etc.)
4. Given the image of engineers as being hyper serious, it might be good to also inject touches of humor into the characters.

ii. Commercial Potential - Successfully marketing a television series to a distribution agent depends on defining a plausible audience to your network audience. An audience aged 18-25 is the key demographic that is of interest to advertisers and therefore to the television networks.

1. Because of their interest to advertisers and the desire to maximize commercial interest in the series, this demographic is selected as the primary target for the envisioned television series.
2. The actual "pitch" should be a fusion of everything—social context, funding, coalition of investors, emerging audiences, coalition of interested stakeholders who can feed new stories—all to make the case that this is going to make the studio a lot of money so it merits their investment.

b. What type of series (i.e., comedy, drama, etc.) might be most commercially viable and best serve to highlight positive role models?

i. Given the desire to highlight the various domains in which engineers operate (e.g., design, systems, structural, biomedical, environmental, and manufacturing), the various engineering disciplines, and various diverse populations who operate as engineers (gender, ethnicity, disability, age, etc.), a series featuring an ensemble cast that addresses a variety of situations is desirable. A *Mission:Impossible* type show lends itself to this.

ii. The engineering characters should be seen as "problem definers" and "problem solvers." "They want the problems others can't solve."

iii. A new variation on an established theme would probably be most successful (studios don't want to get too far out of the box, but they do want the next big thing). The style of the show needs to be fresh and new, ideally with mostly unknown talent (cheaper and less baggage), but with a name actor to drawn an audience. Possible models include

1. Babylon 5
2. ER
3. LA Law
4. Heroes
5. Grey's Anatomy
6. House

c. What types of story lines might work to best to highlight the positive roles of engineers?

i. The team may operate as a secret society, as a government agency, or as a non-profit non-government organization, or as a for-profit entity.

ii. An effective vehicle to illustrate the important ethical considerations and values of engineering might be tensions between the team members and between the team and the governing committee.

1. Further character complexity may be introduced by having finances and mission assignments controlled by a shadowy governing committee which may have competing factions within it (some with good motives and some not).
2. Corrupting and other influences could also operate on or within this governing committee.
3. A useful plot vehicle might be to have an audience stand-in who can, within the context of the story ask why certain things are being done; this might be a representative of the governing committee who overseas budget, etc. (e.g. the Bosley character from Charlie's Angels).

iii. Envision a multi-gender, multi-expertise, and multi-ethnic team that addresses problem-solving challenges that range from national security (e.g., stopping a pirate attack on an oil supertanker) to humanitarian (e.g., going in after a man-made/natural disaster to provide food, shelter, and clothing in short order or to prevent the worst effects of an anticipated

man-made/natural disaster) to combinations of the two (e.g., the terrorists successfully attack the tanker, and now the effect of the oil spill has to be minimized).

iv. The show title may emerge from the story line or can be derived from
- Location (e.g., 30 Bridge Street – logo could be a stylized Roman aqueduct, ref "21 Jump Street")
- Profession (e.g., The Engineers, ref "The Doctors")
- Common Name of Profession (e.g., Vulcan's Children[1] or The E-Team)
- Role (e.g., The Protectors, or The Sentinels, ref "The Defenders")
- Action (e.g., Asylum Engineering)

v. One technology which would lend itself to exploring alternate plot scenarios would be a virtual environment (VE) which uses virtual reality to aid problem definition and to explore the viability of alternate solution strategies. Such a VE could be central hook that allows complex visualizations within the show that would not normally be possible (it also allows extensive use of blue screen technology which might save on location shooting, but raise the computer generated imagery budget).

vi. The characters and engineering must be kept real by allowing situations in which the problem can't be solved neatly, can't be solved to the satisfaction of all involved, or simply can't be solved. To this end, it might be useful to have NAE supply a team of technical advisors to the show.

vii. Setting could be the near future which would allow some flexibility with the technologies showcased.

d. Should the effort target cable or network television?

i. A broadcast network (ABC, CBS, NBC, Fox) is less likely to offer a positive response than a cable network (USA, TNT, CW, etc.), but it offers a larger audience and the likelihood of a higher production budget.

ii. Networks want more creative control

1. It's highly unusual to go to Networks with a pilot already finalized (script, talent, or even already filmed). The Networks want input to the development process. Typically they want a significant stake in the venture (e.g., approx 50%) as a means to enforce their "say so" on the project
2. Once you license your show to a network, you've probably surrendered creative control which means they get final say on story, characters, etc. unless you've written such control into your contract (unusual unless you're bringing significant cash to the enterprise).
3. If the decision is made to go with a network, given the importance of the core idea of showcasing engineering and engineers to this venture, it will be highly desirable to bring significant funding to

[1] VULCAN = the ancient Roman god of fire and metalworking, identified with the Greek Hephaestus.

the venture to insure this core idea emerges at the end of the process.

e. What expertise is required to pursue the endeavor?

i. Part of the pitch team should be someone who understands engineering, is dedicated to the NAE and NSF goals of this project, and understands Hollywood (e.g., Denee).
ii. Serious and high stakes negotiation with networks and their production companies is going to require equal or better expertise on the NAE/NSF side of the table.

f. What marketing efforts are needed to attract sponsors and viewers?

i. Having contacts with studio executives appears to facilitate one's chances of getting in the door to make a pitch.
ii. Before you get in the door, you have to have a fleshed out product concept, and it helps to have key talent committed to the project (key actor/actress, behind the scenes producer, etc.).
iii. Having a big name associated with multiple roles in production (actor, producer, director) such as Tom Hanks or Will Smith is a big plus.

g. What are the potential project costs?

i. A story outline can cost on the order of $5,000 - $10,000.
ii. "Treatments" (defined below) cost on the order of $30,000. [Target a 2-hour script for a television pilot, that way even if the series is not bought, you still have a movie in hand.]
iii. A full 2-hour script and filmed pilot for a high production values show can be costly. A 2-hour pilot runs on the order of $4-$6M (regular show is between $2-$3M), intensive use of computer graphics could easily double that figure. So $10M would be a good planning number.

h. What support services are required?

i. A strong agent or manager will be required.

i. What core planning and personnel are required?

i. Because of the levels of investment involved, it is important to register the basic story idea with the Writers' Guild of America.
ii. It may also be prudent to set up a legal entity production company to "own" the idea and facilitate negotiations with others (i.e., writers, producers, agents, managers, studios, etc.).

j. What other pertinent issues should be considered?

i. In thinking about story concepts, it is important to think about cross-platform tie-ins to other popular media outlets that complement television (e.g., internet, cell phones, videogames, game systems, etc.).
    1. For example, one may want to extract a sub-story from an episode for broadcast over the web or via cell phone.

2. There may be a featured scenario and technology that lend themselves to use within a videogame (which itself can be standalone, web-based, or cell phone based).
3. One should also be open to product marketing opportunities.

ii. It may also be possible to link the story (via a demonstration proof within the story) or an associated part to a larger context such as new approaches to education (ref: Engineering Grand Challenge on personalized learning).

k. What are next steps in moving forward?

i. The first step on the path to show development is a 1-2 page story outline.
ii. This would then be developed into a 10-30 page "treatment" that fleshes out the basic story and characters. It can take approximately 2 months to get a treatment done.
iii. "Pitch season" when new show ideas are considered by the networks is in June/July, so having a script completed by then would be good timing.

III. Necessary future work product

a. Plan for moving the script forward in a Hollywood context.
b. Plan for building a coalition of interested parties from the engineering and education communities.
c. Develop a follow-on proposal to NSF in support of next steps– suggest a summit reporting on progress to date

IV. Series Concept

Overview: Workshop participants moved quickly toward a series concept that seemed versatile and rich with opportunities to present engineers as interesting people who offer much to society. Especially in the eyes of the writers and producers, the concepts discussed presented opportunities for conflict and drama.

Summary: In the year 2015, an elite team of individuals, each equipped with exceptional talents in their particular discipline of engineering (environmental, systems, structural, biomedical, design & manufacturing, computer science, etc.) are banded together by a common thread, "Save one, Save the world." Independently funded by an unnamed source (a "Charlie type" character), the team, consisting of competing factions motivated by contradicting ideals, is assigned the duty of averting or mitigating potential disastrous scenarios ranging from natural disasters, to catastrophic man made mistakes, to national security dangers, and humanitarian issues. In a race against the clock, the team uses a unique virtual environment to simulate the outcome of these potential disasters, explore the viability of alternate solution strategies, and attempt to stop the danger from working its web of disaster. Much like the "Holodeck" of the series "Star Trek" this virtual environment not only allows the team to simulate current events but also to travel back in time to re-live events of the past in attempts to learn from past mistakes and take advantage of lost and misunderstood technologies. A "Mission:Impossible" level of challenges will allow the audience to peer into the true definition of engineers and dispel the mythical "engineer" representation of the mainstream media. Each of the team members has a story to tell of why

they joined; and their individual moral choices give a human element to their stoic title of "engineer".

V. Story Lines

Workshop participants identified a number of potential story lines for the proposed series. These include:

a. Pirates
    i. Hijack an oil tanker carrying 4 million barrels of crude worth $100 million and threaten to scuttle it which would result in both an economic and environmental catastrophe, the team has to develop means to disable the hijackers and mitigate a spill (possibly through use of autonomous vehicles)
    ii. Will shoot a missile at a tanker and the team has to develop a means to stop it.

b. A war is imminent unless it can the actual source of an attack can be determined ("24" did this when a Middle Eastern country was held liable for an attack launched by terrorists). The team must identify the actual source of the attack using forensic engineering.

c. Something involving use of exoskeletons like Ironman, but this would be the real ones that are almost on the market.

d. Solution strategies can be drawn from the past to inform current and future action
    i. Development a treatment for cancer that minimizes skin damage by making lots of small laser attacks from multiple directions just as Roman soldiers invaded a town with lots of small entry bridges only able to carry small loads. Visualization of soldiers and laser beams in VE rom.
    ii. Katrina-like disaster averted by adapting repair strategy used in the Egyptian pyramids to the levees –OR- Looking at the design of the pyramids to develop a re-design of the Louisiana levees.

e. The team must take action to impede a viral outbreak -- modeling in the VE shows the possible spread of the disease.

f. SARs-like outbreak mitigated without fatality in US by wide availability of ventilators.

g. Earthquake causes a dam to form on a large river by landslide in China, and the race against time to dig and blast a spillway before the dam suddenly collapsed or the need to move hundreds of thousands of people.

h. A winter earthquake occurs in Pakistan, the team must provide food, shelter, and clean water under adverse conditions.

i. Team must avert collapse of national/global financial market as a result of malicious or naïve system models and computer programming.

VI. Character Ideas

The team should be made of 5-6 characters, diverse in ethnicity, age, gender and ability. The following is a proposed outline of character types:

Systems Engineer: 45-55, Caucasian male, disabled, retired military, detail-oriented, focused, distinguished gentleman with a possible dark tie to the group's funding agency. He is the team's leader, the man who can interpret the ideas of the overly technical in language all can understand.

Design & Manufacturing Engineer: 25-30, African American female, sexy, smart, sassy, and sometimes abrasive. Her exceptional skills have always made her the outcast. Suffering from abandonment issues, and longing for love, her connection to the group can seem at times a crippling contribution

Computer Science Engineer: 16-18, Asian American male, a geek on the surface, but attractive. One of the greatest computer hackers of his time. Discovered by the government for breaking into DARPA's high tech defense system. Still a high school student, his young sensibility is often questioned by the older members of the group.

Bio-Medical Engineer: 35-40, Latina, single mother, strong and confident. Joined the team for alternative reasons, her child has a debilitating disease and she hopes to use the resources afforded her to find a cure. Possible love interest vis-à-vis the environmental engineer.

Environmental Engineer: 30-40, Caucasian male, extremely attractive, beach body, typical jock physique, with a brilliant mind. Ex-football player turned "nerd". Cocky, opinionated.

Structural/Civil Engineer: 20-25 African American male, extremely intelligent, a kid from the rough side of town, grew up in the streets but determined to beat the statistics. Witnessed his mother die from the cruel disease of cancer and vowed to make a difference, bottled up aggression is also his driving force.

VII. Implications of Series Concept, Story Lines, and Character Ideas

The series concept, story line, and character ideas are broadly consistent with the major recommendations of the NAE report *Changing the Conversation: Messages for Improving the Public Understanding of Engineering* {National Academy of Engineering 2008 #10}. The report's first recommendation is that outreach efforts should emphasize as a key theme that engineers make a positive difference. The focus of the proposed series is on engineers saving lives through the prevention of human-made and natural disasters. The report's second recommendation offered four candidate messages. Among these were "Engineers are creative problem solvers." The series concept clearly shows engineers solving problems using creative concepts. The report's third, fourth, and fifth recommendations address specific enabling aspects of developing a national campaign and are not relevant to this effort.

In discussions preceding the workshop there was active consideration of whether or not a show focused on a systems failure or natural disaster (an engineering analog to the deaths that are the

starting point for series such as "CSI") might excessively associate engineers with "cleaning-up failures" rather than as designers and problem solvers. It was suggested that an alternate approach might be to open with a "failure" and then spend the balance of the narrative on designing new solutions prevent other failures. It was from this discussion that the idea of a "Mission: Impossible" team arose. As the series scenario concept was developed, a human or natural disaster occurs which implies a failure and the task of the engineering team is to significantly mitigate the harm which might result through creative work.

VIII. Next Steps

The writers were extremely enthusiastic about the ideas surrounding the series, they were inspired by the depth of character they could derive from a true engineer. They were given a deadline of February 2009 to produce a treatment that would be used to "pitch" the series concept to the networks. Cable and mainstream networks are each in consideration for the potential carrier for the series.

The committee urges NAE and NSF to seek out the intellectual property rights of what was developed. The development of a production entity is necessary to ensure that the content and integrity of the show is maintained once the project is sold. Cross marketing ideas such as internet and video games should be enveloped in the overall business plan. Partnering with allies that can aid in moving the project forward is also recommended. The following list was suggested by workshop participants:

1) Will Smith and Overbrook Entertainment
2) Strange Fruit Films
3) Tom Hanks

The writing team should also be re-evaluated to ensure that a diverse perspective is shown throughout the series. Specifically, the committee is concerned that although a diverse set of characters are displayed, they still appear to conform to certain stereotypes (e.g., the African American female is "sassy," the computer scientists is a "geek," the African-American male structural engineer is aggressive and from the "rough" side of town. The concerns were reinforced by the treatment that was received. The committee hopes that a more diverse writing team might be able to avoid, or at least better balance, such stereotypes.

NAE should build on the foundation lain in this workshop by (a) identifying a professional management to represent the interests of NAE as a proxy for the engineering community as a series is developed, (b) expanding the treatment received into a full two-hour movie script as a series pilot, (c) solicit network interest in broadcasting the pilot and optioning the on-going production of a television series, (d) determining broadcast network interest in the production of a series based upon the pilot, (e) building a coalition of funders to produce the series, and (f) build a coalition of supporters in the engineering community.

Appendix A – Workshop Participants

COMMITTEE MEMBERS

Denee Busby, is a 1999 graduate of UCLA with dual bachelor's degrees in electrical and mechanical engineering. She currently works as a contractor with the Encino, California Office of Go Engineering, a consulting firm headquartered in Salt Lake City. She is also an actress who has appeared in the 2004 film *The Cookout* as well as episodes of "Eve" and "Charmed" in 2003. In 2007, she toured with the hit musical *Whatever She Wants.*

Woodie Flowers, (NAE) is the Pappalardo Professor Emeritus from the Mechanical Engineering Department at MIT. He is a member of the NAE. His experience includes hosting the PBS series Scientific American Frontiers for three years. He also received a Regional EMMY Award for a television show he hosted on using engineering design as a vehicle for teaching science and technology. He taught at MIT for 40 years,

Roger McCarthy, **Chair** (NAE), is Chairman Emeritus of Exponent, Inc. (formerly Failure Analysis Associates). He and his firm served as technical advisors for the televisions series "What Happened?" which aired on NBC television in 1992. The series investigated man-made and natural disasters to see what really happened. The producers used computer simulation and film analysis and featured actor re-creations of events. Dr. McCarthy has appeared in numerous television episodes on the National Geographic Channel, The History Channel, and Mythbusters.

NAE STAFF

Norman Fortenberry, Director, Center for the Advancement of Scholarship on Engineering Education (CASEE)

Elizabeth Cady, Associate Program Officer

PRINCIPAL CONSULTANTS

Laurie Arent has been a television writer and producer in Los Angeles for almost a decade. As a writer on **"**Cold Case**"**, her work helped launch the show as a hit for CBS and as a staff writer and story editor on "Boomtown**"**, her work helped that show become a critical darling in its short life on NBC. Her most recent work as a writer and supervising producer has been on the acclaimed NBC hit drama, "LIFE**"**. Other notable writing credits include episodes of "E-Ring", "The Mountain", and "Thieves".

Sydney (Syd) Field has been acclaimed as the "guru of all screenwriters" by CNN, and "the most sought after screenwriting teacher in the world," by the *Hollywood Reporter*. He is the internationally celebrated author of six books on screenwriting. His classic *Screenplay*, considered "the Bible" of the film industry, and *The Screenwriter's Workbook* are now in their 40th printing, published in 26 languages and used in more than 400 colleges and universities across the country. He is a faculty member at the prestigious masters of professional writing

program at University of Southern California and has taught at USC, UCLA, AFI, UC Berkeley, Harvard, Yale, Columbia, among others and has conducted screenwriting workshops all over the world. A screenplay consultant for 20th Century Fox, Touchstone Pictures, TriStar Pictures and Universal Studios, he has worked intimately with several prominent filmmakers on award winning films. Field was the first inductee into the prestigious Screenwriting Hall of Fame of the American Screenwriting Association in 2001 and is the recipient of the 2006 Final Draft Hall of Fame Award.

Martin Gunderson is professor of electrical engineering, physics, and astronomy at the University of Southern California. His research activities are in applied plasma science with applications to combustion, pollution control, and pulsed power; quantum electronics, semiconductor devices and physics, and biophysics. Dr. Gundersen was technical advisor to Tristar Pictures during production of the motion picture Real Genius and appeared in a bit role, The Lost World, and Congo, several television productions, and has worked with the American Film Institute on workshops for science fiction writers for television and motion pictures.

Gregg Hurwitz is the critically acclaimed, internationally bestselling author of *The Tower***,** *Minutes to Burn***,** *Do No Harm, The Kill Clause***,** *The Program***,** *Troubleshooter***,** *Last Shot*, and most recently, *The Crime Writer*, an instant international bestseller that has been nominated for best novel of the year by ITW, International Thriller Writers. His novels have been feature selections for all four major literary book clubs, chosen as Book Sense Picks, and translated into fifteen languages. He has written screenplays for Jerry Bruckheimer Films, Paramount Studios, MGM, and ESPN, developed TV series for Warner Studios, written issues of "Wolverine", "Punisher", and "Foolkiller" for Marvel, and published numerous academic articles on Shakespeare.

Andrew Plotkin was a television executive and a producer for Warner Bros. Television for five years. During that time, he developed and produced numerous successful television pilots and series, including "Without a Trace", "Cold Case", "Smallville", "The World According to Barnes, Related" and "Reunion."

Eric Reid is the Chief Operating Officer and a Director of the Lakeshore Entertainment Group. He has been with the company since its formation in 1995. He oversees all day-to-day business, finance and operational activities of the Lakeshore group of companies, as well as executive producing/producing the company's motion pictures. The Lakeshore films that Mr. Reid has executive produced include *Crank*, *The Last Kiss*, *Feast of Love*, *Untraceable*, *Pathology, Elegy*, *Henry Poole is Here*, and *The Midnight Meat Train*, and the upcoming films, *Underworld 3: Rise of the Lycans, The Ugly Truth, Crank 2: High Voltage,* and *Game*.

Alexander (Alex) Singer is a motion picture director of five feature films and over 280 television shows (mostly hour long dramatic) in all forms and genres, over four decades. The body of work includes some of the best dramatic TV series: "Profiles in Courage", "The Fugitive", "The Bold Ones", "Police Story", "Lou Grant", "Cagney and Lacy", "Hill Street Blues", "Star Trek: The Next Generation", "Deep Space Nine" and "Voyager".

He has both directed and lectured as well as taught production and directing at universities and institutions widely in the US and nine other countries. He has been the recipient of Emmy and Humanitas awards.

Judith (Judy) Singer is a novelist, short story author, and screenwriter, living in Los Angeles. She has two published novels: *Glass Houses* and *Threshold*. As a member of the Writers Guild of America she has written screenplays and treatments for television: "Santa Barbara"; "Loving Friends & Perfect Couples"; "Night Stalker". With her husband, Alex Singer, she wrote the screenplay of *Glass Houses* for Columbia Pictures; for the Coalition for Children and Television she wrote the play, "Boxed In". DARPA assigned her to write the script for the film *The Future of Augmented Cognition*.

Appendix B – Script Treatment