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Introduction

This conference was the second SPIE conference dedicated to the sharing of key optical lessons learned. Nearly all optical engineers, scientists, researchers, or managers have dealt with the unexpected. Many of these situations in hindsight are quite funny, and have buried within them key optical lessons learned. The problem with simply listing lessons learned is that as a simple listing, they are clearly hard to remember. Thus history repeats itself much to our collective detriment. This conference was configured to allow for adding a bit of humor into the mix. By presenting a collection of small interesting stories or optical parables, it helped us all remember the important takeaways. Though we allowed each presentation to be somewhat embellished by the author (within editorial limits), with names, places, and dates sometimes changed to protect the guilty, this year there was a greater emphasis on hard truths. Please note that even when humor was used, all presentations had a basis in truth as self-avowed by the author and devil's advocated by the chair, and all talks included at least one, if not more than one, lesson learned, that had serious optical content.

Papers were specifically requested on past, current, and/or evolving optically related systems that satisfied the following somewhat all-inclusive criteria:

- have been subject to surprises, anomalies, and/or unanticipated business factors which, in hindsight, are funny and which have a key optical lesson learned/takeaway
- where (optically related) specifications went terribly wrong
- any aspect of the build-cycle could be included be it in conceptualization, design, development, fabrication (any somewhat optically related process), test, or end-use
- any discipline could be included if/as it ties to optics (e.g., project management, principal investigator roles, optomechanics, thermo-optics, electro-optics, optical-physics, etc.)
- any personnel problem could be included if/as it relates to an optical truth (this could include hiring, training, or the lack thereof)
- any optically related piece-parts could be included, from raw materials to heat treats to coatings, to mechanisms, etc.
- any optical environment was acceptable, e.g., from underwater to outer-space to child-proof toys to shot-from-a-gun)
- any size was acceptable, e.g., from nano/MEMS, to deployable multi- meter optics)
- any unusual scheduling problem was acceptable as long as it was optically driven
- aspects that tied to IP, patents, and/or other legalities

- inter-company relationships and/or relationships with clients, suppliers, and/or vendors could be included (if the author so dared and could sanitize the text to avoid liability, and as long as there was a key optically related take-away, though these could be in an optical business-based sense).

Of special interest were stories where, despite any humor, the optically related lessons learned were serious and would help to form a body of knowledge that could grow and be used, as an evolving checklist, for other ongoing or future optically related adventures.

We won't trivialize the punch lines by doing a simple summary here. The authors' papers deserve serious attention and a set of crib-notes doesn't do these sometimes complex subjects justice. It's not so much that the concepts are so terribly complex, it's that the situations that lead to some of the lessons learned have slippery-slope contextual aspects that are relatively subtle, or there are logical short circuits that come into play. Just one past example would be from HST. End-to-end testing was eliminated to save money. The presumption was that as long as two totally different piece-part tests agreed, all would eventually be well. But then schedules got tight, logic gave way to what folks knew in their hearts was right—that the reflecting null corrector used to finalize the primary mirror was all that really mattered, and that the supposedly less accurate refracting null could be ignored. Of course in ignoring the refracting null's test results the initial premise was violated that required two different tests which had to agree, and agree should mean quantitatively match up accounting for the respective tests' tolerance bands. (As we know, although on paper the reflecting null corrector was better than the refractive null corrector which was used to rough-in the primary mirror, the reflecting null corrector was not built to specifications.)

By not shorting out your need to examine the papers presented, we're actually invoking a lesson learned. Simple summary charts often can lead to a false sense of understanding. But with that stated, we do intend to keep tabs on the various lessons learned, and this may well become a future rolling scorecard, albeit with a somewhat intentional time-delay to encourage the real-time readers to delve into the details and find the devil that's hiding in wait for them.

I extend a personal thank you to Mr. Richard W. Dyer of G-N Corporation who helped the presenters keep to their timeline. (I also like the good-guy/bad-guy aspect that comes along with these roles, though he has been told that the shoes don't really fit.)

I would also like to provide a special thank you to NASA's WISE-"Guys" and to Mr. William Irace, the WISE Program Manager (WISE is NASA's Wide-field Infrared Survey Explorer which is currently on-station, and is just now successfully completing its intended mission). The WISE team drilled down discipline-by-discipline, through both PI and project management as well, to lay out the lessons learned that surfaced throughout the project. This was quite an undertaking, and SPIE extends its thanks to Bill and to the entire WISE team for its work in trying to help future adventures go smoothly.

Papers from the WISE sessions included:

- Dr. Peter Eisenhardt of Jet Propulsion Laboratory (who presented for Prof. Edward L. Wright, University of California, Los Angeles) covered lessons learned from the perspective of the principal investigator (PI)
- Mr. John Elwell of Space Dynamics Laboratory (who presented for Dr. Mark F. Larsen) covered lessons learned in the design of the WISE payload
- Ms. Martha Kendall of Ball Aerospace & Technologies Corporation presented various aspects tied to the image quality error budget
- Dr. Fengchuan Liu of Jet Propulsion Laboratory discussed the overall integration and test of the payload
- Mr. Deepak Sampath of L-3 Communications SSG-Tinsley discussed design choices and hardware results for the telescope and scanner
- Mrs. Stacy Masterjohn of DRS Sensors & Targeting Systems, Inc. discussed lessons learned in light of the successful work done to produce the WISE focal plane module
- Dr. Roy W. Esplin of Space Dynamics Laboratory covered lessons that came out of work on the beamsplitter assembly
- Mr. Brett Lloyd of Space Dynamics Laboratory covered lessons learned in the work done on the solid hydrogen cryogenic support system
- Mr. Joel Cardon of Space Dynamics Laboratory discussed ground characterization challenges and accomplishments
- Ms. Valerie G. Duval of Jet Propulsion Laboratory covered the WISE satellite development: managing the risks and the opportunities.

There were also many other compelling talks:

- Prof. Robert D. Gehrz of the University of Minnesota, Twin Cities discussed the lessons learned that came from the successful design and build of the Spitzer Space Telescope
- Dr. James Fanson of Jet Propulsion Laboratory covered lessons learned from both the Kepler Mission and from space telescope management
- Dr. H. Philip Stahl of NASA Marshall Space Flight Center talked about the lessons that were learned in the mirror technology development done for JWST
- Prof. H. John Caulfield of Alabama A&M University covered some consequences of compromise in his talk, “When good enough is best”
- Dr. Kevin P. Thompson of Optical Research Associates noted how assumptions in engineering can often be traced to the root cause of a disaster (in engineering)

- Ms. Linda Usher of Executive Search Group treated various aspect of timely hiring
- Dr. Bruce A. Horwitz of TechRoadmap Inc. talked about how to get smart about intellectual property
- Mr. Alson E. Hatheway of Alson E. Hatheway, Inc. covered stable platforms (and the difficulties involved in making that true)
- Dr. David A. Thomas of The Aerospace Corporation spoke on the causes of major failures in complex EO sensor programs.

As part of the opening remarks to the daily set of sessions there were award presentations made based on presentations made at the 2008 Lessons Learned conference.

Jim Harvey of the University of Central Florida/CREOL won the Lessons Learned Technical Award for his spur of the moment treatise on the sine condition. Jim's award was a lessons learned t-shirt with a telescope—that violated the sine condition for good and valid reasons—oriented so that light goes from right to left (see Figure 1), which we all know is clearly impossible. ☺

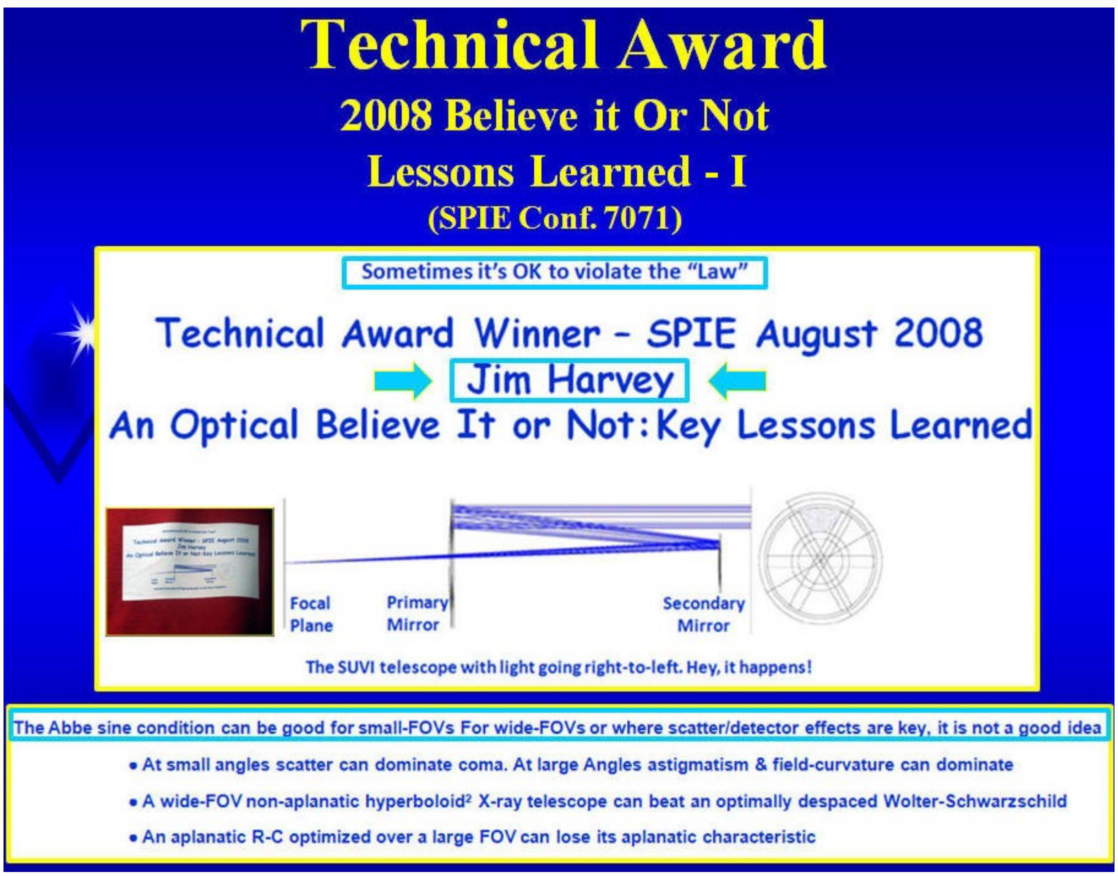

Figure 1

Alan DeCew of MIT Lincoln Laboratory won the Lessons Learned Management Award for his story about corporate short-sightedness in zeroing-out engineering budgets and the resultant aftermath. (The author was sufficiently familiar with this story, that he recessed himself from voting.) Alan's award consisted of a Managerially Irreverent t-shirt and a trophy/plaque that sports a doll with its head removed and placed at a new location within the doll's body ☺; see Figure 2.

Figure 2

Current plans call for us to deepen and expand this Lessons Learned conference in 2012 (alternating years with the Optical Modeling and Performance Predictions conference), and to emphasize, even more heavily, the managerial aspects which are key to success.

Mark A. Kahan