Larry W. Brown

Member, Defense Nuclear Facilities Safety Board

Address to

DOE Facilities Representative Workshop

May 12, 2009

Good Morning:

I appreciate the opportunity to participate in this, the 16th Annual Facility Representative Workshop. It is quite an honor for me, since this is the second year I've been invited to speak. I would like to thank Glenn Podonsky for his keynote address. I would also like to extend my compliments to James Heffner, Steve Lawrence and their teams for coordinating the workshop and providing this opportunity.

Let me also extend my congratulations to the nominees for the 2009 Facility Representative of the Year award. I understand that the recipient of this award will be announced later this morning. Nomination for the Facility Representative of the Year is a tremendous honor and although there may only be one award, in my opinion all the candidates are winners. You are the front line for safety in the DOE complex, and I thank you for your service.

This annual workshop is an important forum for you and your colleagues to exchange experiences and lessons learned. I'm confident that this workshop will help you expand lines of communication with your colleagues in the DOE complex.

What I'd like to do is divide my talk this morning into three parts. First I'd like to briefly discuss a high consequence non-nuclear event that most of you are familiar with, then make some observations as they may relate to Facility Representatives, and finally ask for your thoughts on a safety issue.

The high consequence event I would like to discuss happened on April 15. I'm not talking about the financial crisis that some of us face on that day each year. The anniversary I'm recalling is that of the R.M.S. TITANIC. Ninety-seven years ago on her maiden voyage the R.M.S. TITANIC struck an iceberg just before midnight, and two and a half hours later slipped beneath the waves with 1,500 of her passengers and crew.

The demise of the "unsinkable" TITANIC on her maiden voyage is what we now call a low probability – high consequence event and is set apart from nearly all others by the number books, plays, and movies it has generated. There are even several websites devoted to that disaster.

How many of you saw the movie? About six weeks ago I watched TITANIC on the American Movie Classics channel. It was the 1953 black and white version with Barbara

Stanwick and Robert Wagoner. The plot was a little different than the recent Leonardo Di-Caprio version, but not that much. Poor boy falls in love with rich girl, ship hits iceberg, girl escapes in lifeboat and boy dies tragically.

Now why did that movie connect with my preparations for this DOE facility rep conference? What caught my imagination was the movie's portrayal of TITANIC's lookouts. In the year 1912, there was no radar, no satellite navigation or satellite weather, and the Atlantic sea lanes were crowded with passenger and cargo ships. And apparently there were no small number of icebergs. Lacking modern electronics, lookouts were relied upon as the eyes and ears of the ship. The lookouts could have saved the ship that night – but didn't. Why didn't they??

Of course in the movies the lookouts were portrayed as irresponsible youths who let their attention wander. Who were these guys? With a little internet research, I learned some things about them that I find interesting, if not relevant – at least from my perspective - to Facility Reps. You – of course - can draw your own conclusions.

You see I think of FacReps as the eyes and ears of the Department of Energy. Now, clearly, FacReps have a broad range of other responsibilities that go far beyond simply watching for hazards and alerting line supervisors. And there is simply no comparison between the skill and training of a FacRep and that of a ship's lookout. But there are seven observations I have about the TITANIC's lookouts that may be relevant.

Now, lets not get too carried away with the analogy to the TITANIC? Let me be clear – In no way am I suggesting that the DOE complex is on a collision course with a major hazard. To the contrary – the work that Facility Reps are doing is part of the labyrinth of defense in depth that makes any such analogy highly unlikely.

The lesson I want to emphasize is that we must mine all the data from the past so we don't repeat its lessons.

First let me provide some background. TITANIC was on her maiden voyage from England to New York. She was 882 feet long with a beam of 92 feet – nearly the size of F or H canyon at Savannah River, or T plant in Hanford. Her gross tonnage was 46,000 tons, she had 29 boilers, and 162 furnaces and had a max speed of 24 knots. There were about 800 members of the crew, and about 1500 passengers. At the time of the collision, it was a moonless but starry night, 28 degrees F, and relatively calm seas. TITANIC had received six radio warnings of icebergs in the area but chose to travel at nearly maximum speed essentially ignoring the warnings.

There are seven observations I'll make about TITANIC's Lookouts. Lacking other means for detecting hazards, the ship's safety depended upon a very high standard of performance from the ship's lookouts. The lookouts had a complex environment. They were – unreasonably - expected to see through fog and haze. They had little operational control over their environment. In my opinion there were too few of them. They were not paid what they were worth. And management failed in their responsibility for their training and equipment.

Permit me to explain:

1. The importance of lookouts to TITANIC's safety was recognized in the investigations that took place in both Britain and the United States after the event. As a result, international regulations were adopted for Safety of Life at Sea known as SOLAS, and currently known as the ColRegs that require, among other things that qualified lookouts having no other duty be stationed when a vessel is underway. This remains true today – even with modern electronics.

2. Situational complexity was an occupational norm. Lookouts were not sheltered from the weather. The wind, rain, clouds, sun, moon, stars, fog, haze, and temperature affected their ability to do the job. The ship's speed and course-changes affect the relative motion of the hazards but they had no display showing ship's speed or course and were left to rely upon their innate sense of motion. Compounding their problem was the density of shipping or other hazards to navigation. The two TITANIC lookouts, Frederick Fleet age 25 and Reginald Robinson Lee age 41, were stationed in a crow's nest forward of the bridge open to the weather. It was an inhospitable environment that required a scarf over a portion of their face to keep the skin from freezing. Their watch was limited to two hours in length to help them stay focused on their job. But they only had four hours rest between watches.

3. The lookouts were expected to see through fog and haze. That's the only conclusion that I can draw from the fact that the ship's officers never sought feedback from the lookouts on visibility, nor was the ship slowed to a speed that would have effectively permitted an avoidance maneuver within the space before the visible horizon? There was a lack of concern by "management" whether or not the lookouts observation was obstructed. TITANIC's lookouts testified that there was a haze on the water that night. Those of you that have stood bridge watch on a ship know how difficult it is to estimate distance when looking out over water, particularly when the horizon is obscured by fog, rain or haze. At the lookout's height of eye in the crow's nest, on a clear night they should have been able to see an object on the horizon at 11.2 nautical miles; 20 miles if the object on the horizon had a height of 60 feet. However, on <u>that</u> night, the lookouts did not report the iceberg until it was a half a mile ahead, and too late to avoid even with immediate action by the ship.

4. Lookouts have little control over the circumstances in which they work; they must deal with the given circumstances. It was not the lookouts choice that the ship continued to barrel ahead at nearly maximum speed of 23 knots after receiving six iceberg warnings. At 9:30PM the bridge watch had told the lookouts to be alert for "growlers and bergs." But after the watch changed at 10:00PM, and Able Seaman Fleet and Lee assumed the watch, the bridge failed to communicate that heightened concern to them. And it was Fleet and Lee who made the report at 11:40PM, "Iceberg dead ahead." Having chosen to increase the hazard by steaming at high speed in a known iceberg area at night – the bridge should have compensated with more lookouts or slower speed, or as a minimum displayed greater concern by frequent checks with their lookouts – but the bridge failed to take any of those actions.

5. There were too few lookouts. The TITANIC had a crew of over 700, yet there were only six designated lookouts. These were stationed in pairs, standing two hour watches, with four hours rest in between. Considering the lack of alternative means for detecting hazards, the speed that

the ship was going, the icy cold temperatures, the haze and reported icebergs in the area, one has to ask if two sets of eyes were adequate.

6. Considering the importance of their work the lookouts earned their pay, but were not paid what they were worth. On the TITANIC crew pay ranged from a low of 3 pounds per month to that of thirty-five pounds per month for the Captain. The six lookouts were each paid 5 pounds per month, and three of the six earned an extra ten shillings for their experience. That was one pound less per month than each of the 100 fellows shoveling coal in the fireroom. Clearly, in retrospect, the rate of coal being shoveled into the boilers was more important than detecting floating hazards to navigation.

7. Whether the lookouts were properly equipped for the task was dependent upon, and the responsibility of, line management. The same applies to training and qualification. On the TITANIC there was a basket in the crow's nest for binoculars, but the basket was empty. The lookouts had to depend upon their naked eyes. During his testimony before the U.S. Senate, Fredrick Fleet stated he could have averted the disaster had he been equipped with field glasses. The lookouts had requested field glasses earlier in the journey, but the Officer in charge of the key to the lookouts binocular drawer had been reassigned to another ship just days before the maiden journey and had taken the key with him. The binoculars were onboard – just not available to the men who needed them.

All of the discussion about this collision might have been moot if – what we now refer to as the engineered controls – had worked. After all – the TITANIC's highly advanced compartmentation and the automatic damage control doors failed to perform as imagined, and in this event did not make the ship "unsinkable." Management threw caution to the wind, put their faith solely upon the engineered controls, and failed to adequately assess the risk and properly mitigate it.

Now, let me say again, I don't want to connect any dots or draw any comparisons between the TITANIC disaster and our work at defense nuclear facilities. Suffice it to say that in my opinion there are three characteristics needed in an individual upon whom we place responsibility to avoid high consequence - low probability disasters. They are Competence, Vigilance and Intolerance for deviations from standards and orders.

As I look across the complex at the Facility Representatives I see these qualities, particularly today in the nominees for the FacRep of the Year.

Intolerance:

Intolerance to poor standards implementation. Like Danny Yee, at Livermore, who has been active throughout the year in holding the contractor accountable to demonstrate adequate implementation of Conduct of Operations.

Intolerance to the "we've always done it that way attitude." Like Derek Wright of ORP who pressed the contractor to stop what had been a routine operation that could have released an uncontrolled radioactive aerosol in the environment.

Intolerance to a break down in procedural requirements. Like Julian Biggers of the Pantex Office who initiated notifications to security and the contractor and to DOE site office management when he observed a break down in two person control.

And intolerance to a lack of rigor. Like Joseph "Grey Wolf" Waring, Richland, whose high standard of review for Integrated Safety Management closure packages identified a lack of rigor in the contractor's Quality Assurance verification process.

Vigilance.

Vigilance of controls. Like Scott Ferrara, Idaho, who identified a calculation error that had been approved by the contractor management which could have resulted in a material transfer exceeding the 100 gram fissile material control limit.

Vigilence over the Safety Basis Requirements. Like Dave Stewart at LANL who recognized that a component temperature rating in the Safety Significant Fire Suppression System at WETF did not meet the requirements specified in the Safety Basis.

Vigilance over complex operations. Like Savannah River Operation Office's John Barnes whose inquisitiveness, understanding of facility systems, and keen awareness of safety throughout the complex were instrumental in enhancing the safety basis of the F and H Laboratory.

Vigilance of the hazards. Like Michael Brown, Sandia, when he identified significant areas of concern regarding the removal of the Sandia Pulsed Reactor fuel plates from the Nuclear Materials Storage Facility.

And, Competence.

Competence in maintaining SSO training. Like Don Seaborg, Nevada Site Office, reinvigorating the Facility Representative continuing training process.

Competence understanding the hazards. Like Robert Stroud, Oak Ridge, observing that the pre-conditions for hot work on a piping system containing residual oil had not been met and - had the work not been stopped - may very well have resulted in a fire.

Competence in procedural compliance. Like Savannah River Site Office's Edwin Deshong's assessment of the Inert Metallography Laboratory operations that led to improvements in procedural quality and compliance which have resulted in a safer operation.

Competence in hazard identification. Like Y-12's Stan Watkins who pointed out the potential explosive hazard of co-locating fire sprinklers in the exhaust ventilation in the DU/Binary Consolidation project.

These twelve men are not alone. They are backed up by a cadre of professionals across the DOE complex that are equally vigilant, competent and intolerant. Let me give you four examples.

Michelle Durham. Michelle is a Facility Representative for the Y-12 Site Office. Her primary responsibility is operations oversight of wet chemistry, reduction, and oxide conversion activities in the Enriched Uranium Operations Building. She frequently demonstrates an impressive knowledge of the operations within her area and has been diligent in identifying unexpected and deficient conditions. For example, in May 2008 she identified a single chain and lock that was being used to secure the alignment of two valves contrary to site requirements. In November 2008, Michelle identified an unexpected accumulation of dibutyl carbitol in an inactive (but in-service) organic reservoir for the primary extraction process. She also identified oils stored in B-1 Wing that were not being properly accounted for, which led B&W to declare a TSR violation.

John Krepps is a Facility Representative for the Los Alamos Plutonium Facility. Recently, he questioned the installation and adequacy of an oxygen monitor installed as a temporary modification for a facility glovebox. Subsequent investigation revealed that this monitor was not in compliance with a facility TSR specific administrative control. The oxygen monitor is credited to reduce the likelihood of a glovebox fire during pyrophoric operations. As a result of his inquiry and follow-up, there have been similar issues raised with other gloveboxes. Mr. Krepps identified a legacy transuranic waste container stored in the Plutonium Facility basement that did not have a filtered vent. The safety basis requires these containers to be vented. The facility declared a PISA based on identification of this condition.

Scott Nicholson is a Facility Representative at F Tank Farms at the Savannah River Site. During the DOE Validation of Mechanical Waste Removal, he identified a conduct of operations breakdown in the interface between the operations contractor and their subcontractor that the contractor Readiness Assessment team missed. In addition he identified issues that led the contractor to make procedural modifications, install equipment in the flushing water system, and implement improvements in the monitoring requirements for the temporary radiological shielding along the above ground transfer line.

Lastly, Ron Ciola is a Facility Representative at the WTP Pretreatment Engineering Platform (PEP). Ron provided excellent oversight during the PEP testing where he noted the inferior conduct of operations that could have brought into question the integrity and hence the usefulness the test results.

Now I have intentionally spent a lot of time this morning mentioning the men and women that do the Safety System Oversight as DOE FacReps. That's because I believe FacReps are the eyes and ears that keep DOE nuclear facilities safe through their competence, vigilance AND intolerance for substandard performance. And it is the strict compliance with DOE standards that insulates the public from these hazards.

Success begins with people this vital resource is not always fully appreciated. Now I know that I am preaching to the choir, but permit me to discuss some of the data the Board tracks related to this topic. The Board recognizes that DOE's goal for all personnel in the Technical

Qualification Program is 80% fully qualified or on schedule for qualification and that Facility Representatives were at 89 percent according to the First Quarter 2009 Quarterly Report on Federal Technical Capability, dated 2 March 2009. However, only 70 percent of the required Facility Representatives were fully qualified. Moreover, looking back a year to the Second Quarter of 2008, the quarterly report indicated that 79 percent of the required Facility Representatives were fully qualified throughout DOE. In under a year there has been a nine percent reduction in fully qualified Facility Representatives. What has caused the reduction? During this period, the number of fully qualified Facility Representatives has decreased from 157 to 142. Comparing the 2008 to the 2009 quarterly report of "fully qualified or on schedule for qualification" we see a decline from 92 percent to 89 percent. Over the last year each milestone reported by the FTCP has seen a decline in percent of fully qualified to required capabilities needed. The Technical Qualification Program throughout DOE is down nine percent, Senior Technical Safety Managers are down eight percent, Nuclear Safety Specialists down nine percent, all of which are down since the First Quarter 2008. It's time for DOE to – as we used to say in the Navy – "take a round turn" on this deficiency and get it headed in the right direction.

I commend you for your vital role in ensuring safe operations are being conducted throughout the complex. I challenge you to ask yourself what is the hazardous condition, has the safety basis captured the hazard, do the workers have the talents and tools to complete this task. If you find a discrepancy, take prompt action to correct the issue. DOE may have a unique set of challenges; however, your technical understanding of the facility, using that technical knowledge to identify issues, and the resolve to follow through to corrective action will make for a success story. The Board continues to be impressed with the Facility Representative community and the contributions you are making to DOE. You work in unique, hazardous environments, with the challenge to strive for excellence both in your work and in the safety of the facilities you oversee.

Before I close I'd like to ask for your help. Since 2004 when it was part of the Board's Recommendation 2004-1, the Board has been pushing DOE with limited success to develop a safety research program. We believe there are cross cutting areas of fundamental safety research that simply don't get funded because the perceived cost benefit to individual DOE programs is too small. However, if looked at across programs and across the complex – the research could have substantial benefits. In the little time I have left let me give you one example of the costs of not doing nuclear safety research.

The Department of Energy's "Nuclear Air Cleaning Handbook" establishes a ten year life for HEPA filters. A conservative limit has been accepted "despite the difficulty of determining HEPA-filter life based on research data." In his report on "Maximum HEPA-filter Life," Werner Berman of the Lawrence Livermore National Laboratory (now with Washington River Project Solutions) said that "the age limits in this report are based on highly variable data, but more accurate age limits can be derived from controlled experiments in real time over 5 to 10 years using specific filter-media roll. Until such long-term studies are conducted, establishing a 5- and 10-year HEPA filter life for wet and dry ventilation systems, respectively, will ensure that most (although not all) filters will not suffer a significant loss in strength due to age." That report was written in June 1999.

What's the impact of that limit? The Board recently found HEPA filters in the Pu Finishing Plant (PFP) in Hanford that are twenty-two years old. At $8,000 per filter, the cost of replacing over a hundred filters in just one of the eleven PFP filter banks exceeds $800,000. It seems to me, considering DOE's widespread use of HEPA filters throughout the complex, that ignoring the cost-benefit of doing the research suggested in DOE's own "Nuclear Air Cleaning Handbook" is as they say – penny-wise and pound foolish.

What I am asking you to do is to tell the Board site reps when you see an area of safety that could materially benefit the Department – but the programs simply lack the interest in taking up the research project. Our site reps will relay your concerns to me as we attempt to stimulate DOE headquarters to undertake cross cutting safety research.

Keep up the great work. Thank you.