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Editors

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Transportation Security
An Overview and Perspective

Daniel Lehrfeld, President/CEO
Photonic Products Group, Inc., 181 Legrand Avenue, Northvale, NJ 07647

ABSTRACT

This overviews the Transportation Security session and places it in the context of the mission of the Optics and Photonics in Global Homeland Security III technical group. An excellent group of papers are presented regarding the scope and status of the U.S. Department of Homeland Security's counter-MANPADS (i.e. MAN-Portable Air Defense Systems) systems technology demonstration and development program for commercial aircraft, the European Union's counter-MANPADS program, and component technology work relevant to air transportation security.

Keywords: Homeland Security, Counter-MANPADS, Man-Portable Air Defense Systems, commercial aircraft protection, explosive detection, Raman spectroscopy, explosive screening.

OVERVIEW AND PERSPECTIVE

Good morning and welcome to Session 4 of this year's Optics and Photonics in Global Homeland Security conference.

We have an excellent group of papers in this morning's session; the fourth year in which we have assembled a session on this subject within SPIE. I'd like to take just a few minutes before we begin to share some thoughts on the threats to security in our world and on what we have been working to accomplish within this technical group. I promise to come back to the dates on my opening slide (**Figure 1**) and place them in the context of this session in a few minutes.

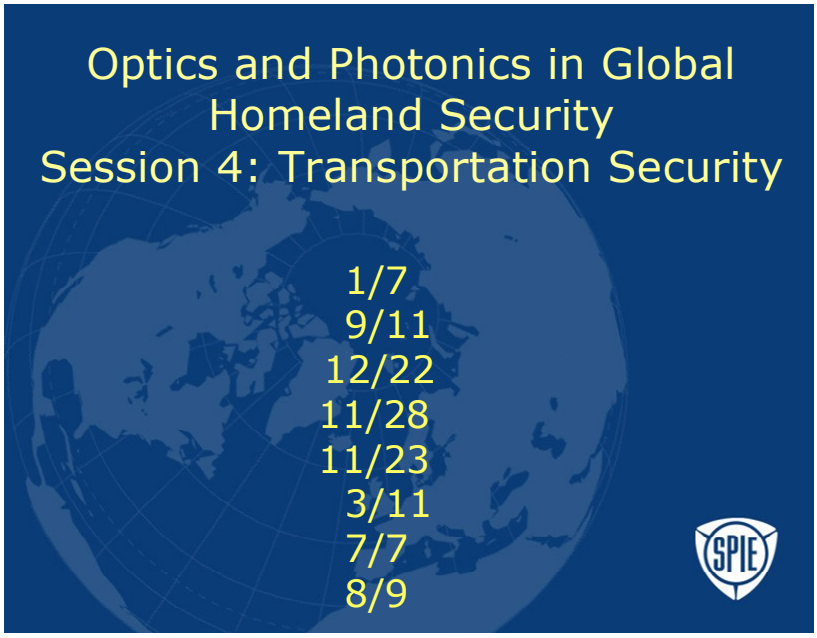

Figure 1

At this week's symposia we have here gathered several thousand scientists, engineers, and technologists from government, industry, and academia from all over the world. I find myself reflecting on how far mankind's understanding of the physical world and universe has progressed, at an ever accelerating rate, over the past century or two. Along with that growing understanding of our planet and its evolution there has emerged a sobering awareness that there are potential threats that at the very least can endanger the lives of large subsets of our populations, or of entire societies, and in some cases even the continued existence of mankind itself. I divide those threats to mankind into two categories: threats from nature, and threats from man (**Figure 2**).

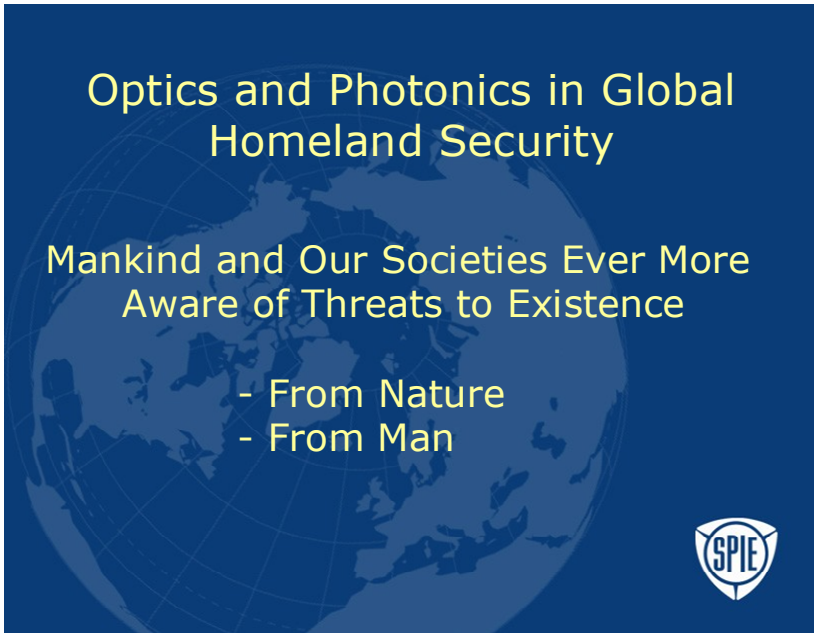

Figure 2

The threats from nature are not "new". They have been a part of life on this planet since long before the emergence of our species (**Figure 3**). What is new is our awareness of their existence and potential for wholesale destruction. We now know that natural disasters such as asteroid impacts and major violent geologic events have lead in the past to rapid and drastic changes in climate and even to the extinction of species.

Whether concern is the next pandemic, or the next "killer" asteroid, we can take some degree of comfort in the belief that with our awareness of such threats, we have begun to apply our science, our technologies, and societal planning, to the detection, countering, and at least the mitigation of their impact. I find it even more comforting that the most dire among these natural phenomena may not occur for millions of years. But should we assign the highest priority to our finite resources to addressing these threats? I think not.

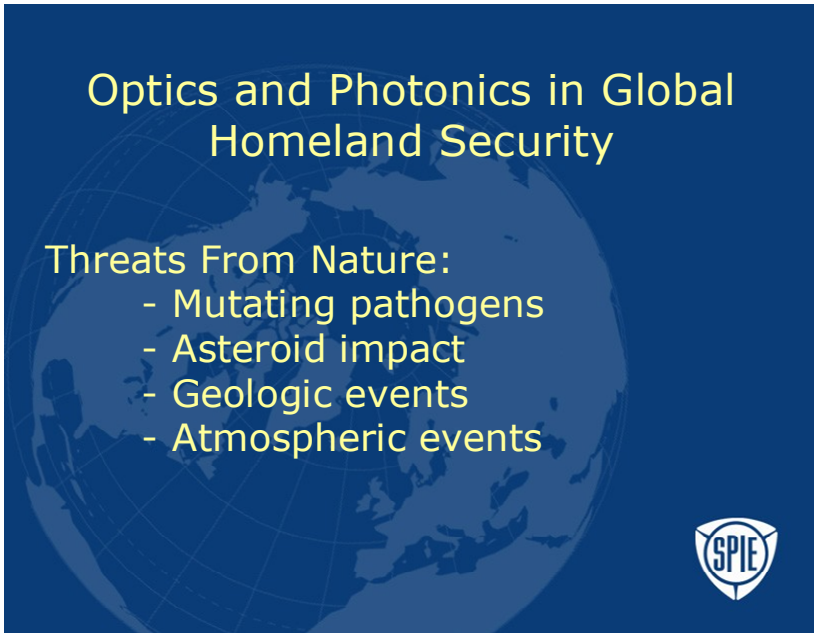

Figure 3

It is the threats from man that are more imminent, even more challenging, and potentially equally destructive.

I ran across some fascinating data recently on the subject of the world's human population (**Figure 4**). According to the best scientific experts on the subject, the entire world population two thousand years ago, at the beginning of the "common era", was approximately 170 million. By the year 1000, it is estimated to have grown by less than a factor of two, to approximately 270 million. Currently, a thousand years later, our population has grown twenty-fold to approximately 6700 million people.

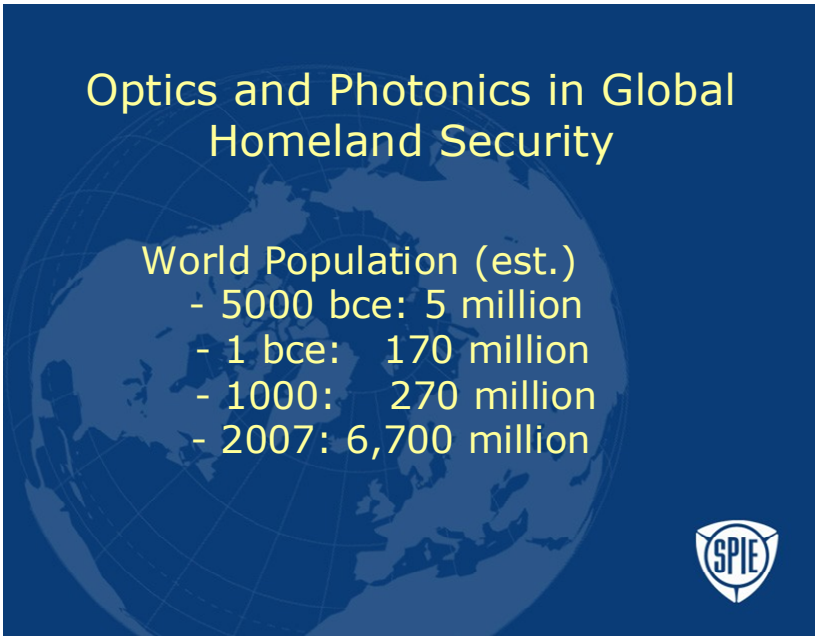

Figure 4

In recent years we have become ever more aware and concerned that mankind has the potential to destroy itself, along with thousands of other species on this planet. The explosive growth in human population, and the blistering pace of development of human scientific knowledge, industrialization, and technology, have created the capability of our species to wreak havoc on a greater scale that ever before (**Figure 5**). Man himself, wittingly or unwittingly is the most dangerous vector for spreading the pathogen responsible for the next pandemic. The threat from the use of nuclear weapons of mass destruction has been with us for over five decades, and we are reminded that with their proliferation the scenario of the "nuclear winter" on earth (to borrow a phrase from the cold-war era) is perhaps more real that ever before. Our growth in numbers as a species and lack of coordination throughout the globe has apparently created the threat, some believe present reality, of permanent and irreversible damage to the ecosystems that support our life on planet earth.

A most deadly ingredient in this mix of threats from man is the fact that in today's highly advanced technological world, there remain ideologies based on intolerance, isolation, and ignorance that appear intent to wield political, social, and economic power in the hopeless cause of world domination. Such ideologies have always lead to conflict and mass destruction in the past, and armed with today's technological toolkit and global inter-dependence, the potential magnitude of resulting destruction is simply unacceptable for mankind to bear.

It is the recognition of this latter threat that triggered the formation of the Department of Homeland Security in the USA, and that deserves the undivided attention and close cooperation of concerned individuals and societies throughout the world. If as societies we can apply some of our scientific and technological focus to mitigating destruction and recovery from disasters from asteroids, volcanoes, tsunamis, hurricanes, and bird flu, we should do so. But our main focus should be on securing ourselves from the dangers we face from man. In doing so, we

address the more imminent concerns and it is likely that the majority of solutions devised in averting and recovering from disasters in that arena will have collateral applicability to disasters from nature.

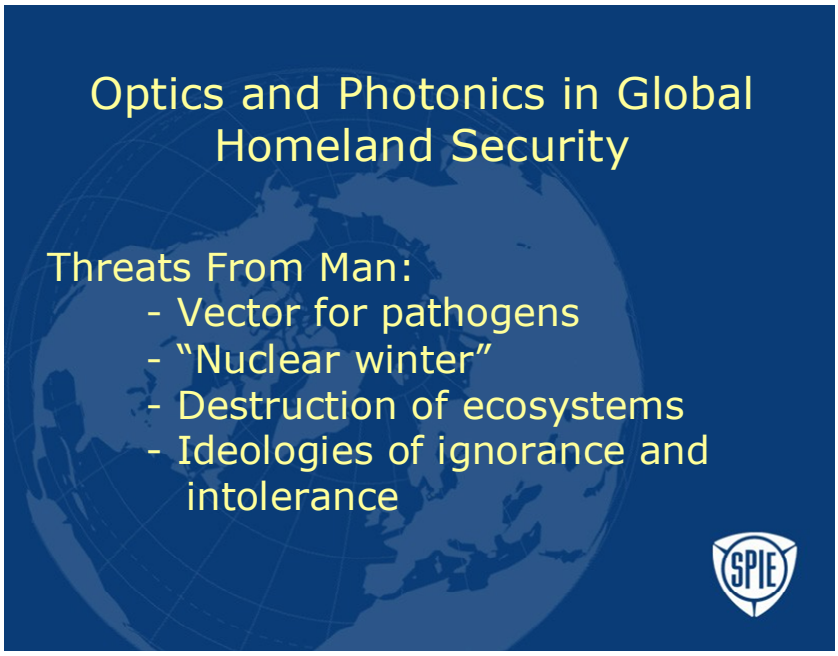

Figure 5

As scientists and engineers we can provide insights into the possible, and we can devise potential solutions to specific technical problems. We can analyze likely scenarios and in coordination with experts in intelligence gathering and psychology assign risk probabilities to future events. But we do not set priorities, nor should we. We are not able to select, implement, and deploy system solutions alone to make our homelands more secure. Implementation requires political will and support, and the collective concurrence of many people in government tasked to set priorities and develop and find suitable solutions. We cannot do it alone.

It has been the aim of this technical group since its founding by Ted Saito in the immediate aftermath of 9/11, to work to bring together concerned individuals from government, from industry, and from academia to exchange information on needs, priorities, near-term options, and longer-term options related to potential solutions to problems in homeland security.

With that said, let's turn our attention to the subject of security in our transportation systems.

Let me comment on the dates listed on my first slide (**Figure 6**). In January of 1995 the government of the Philippines uncovered hard evidence of a plot to hijack 12 trans-pacific airliners for attacks on targets in the USA. September 11, 2001 needs no comment. In December of 2001, passengers and crew subdued the infamous "shoe-bomber" in mid-flight over the Atlantic. In November 2002, a coordinated attack using shoulder-launched, man-portable ground to air missiles fortunately missed its target of a commercial airliner in Kenya. In November of

2003 a similar attack outside of Baghdad succeeded in severely damaging a DHL cargo plane, whose destruction would have been certain if not for extraordinary skill on the part of the pilot. On March 11, 2004 we saw the coordinated and deadly attack using explosives against four commuter trains in Madrid. July 7, 2005 saw a similar coordinated attack against London's public transport systems. In August of 2006, authorities in the UK uncovered and thwarted a plot targeting the simultaneous explosion in mid-air of multiple commercial airplanes while en route to the USA.

Figure 6

My point is that the highest priority focus for the jihadist-Islam terrorists has been, and will likely with good reason remain, our transportation systems (**Figure 7)**. The terrorist objective (or "doctrine" to borrow a term from the military) is to cost effectively orchestrate death and destruction in a manner that will maximize the total economic cost to the targeted societies. The shock and fear resulting especially from destruction of aircraft in flight or of trains en route, the disruption of normal travel and commerce, the certainty of widespread publicity amplifying anxiety, collectively can lead to costs measured in the tens or even hundreds of billions of dollars just from individual incidents.

Figure 7

In today's session, summarized in **Figure 8**, we have an outstanding collection and cross-section of papers focusing on the topic of securing transportation by air. In keeping with our philosophy, this session brings together individuals representing the governmental perspective, the perspective of systems developers, and of component technology developers. I wish to thank James Tuttle and the Department of Homeland Security's Counter-MANPADS and Air Transportation Security Program Office and his deputy Mr. Kerry Wilson who is here today, for their team's participation in today's session. In Mr. Wilson's invited paper we will hear of the status of their present program, and related technology development needs. We are also appreciative of the participation today of all of our other authors and presenters. They represent three industry systems development teams, both in the USA an in the EU, advancing the development and application of airborne missile warning and countermeasure systems optimized for the protection of commercial aircraft. In the components technology arena, we will hear about strategies for deploying expendable countermeasures in aircraft protection systems. We will also hear about an exciting new development in the field of Raman spectroscopy applied to explosives detection.

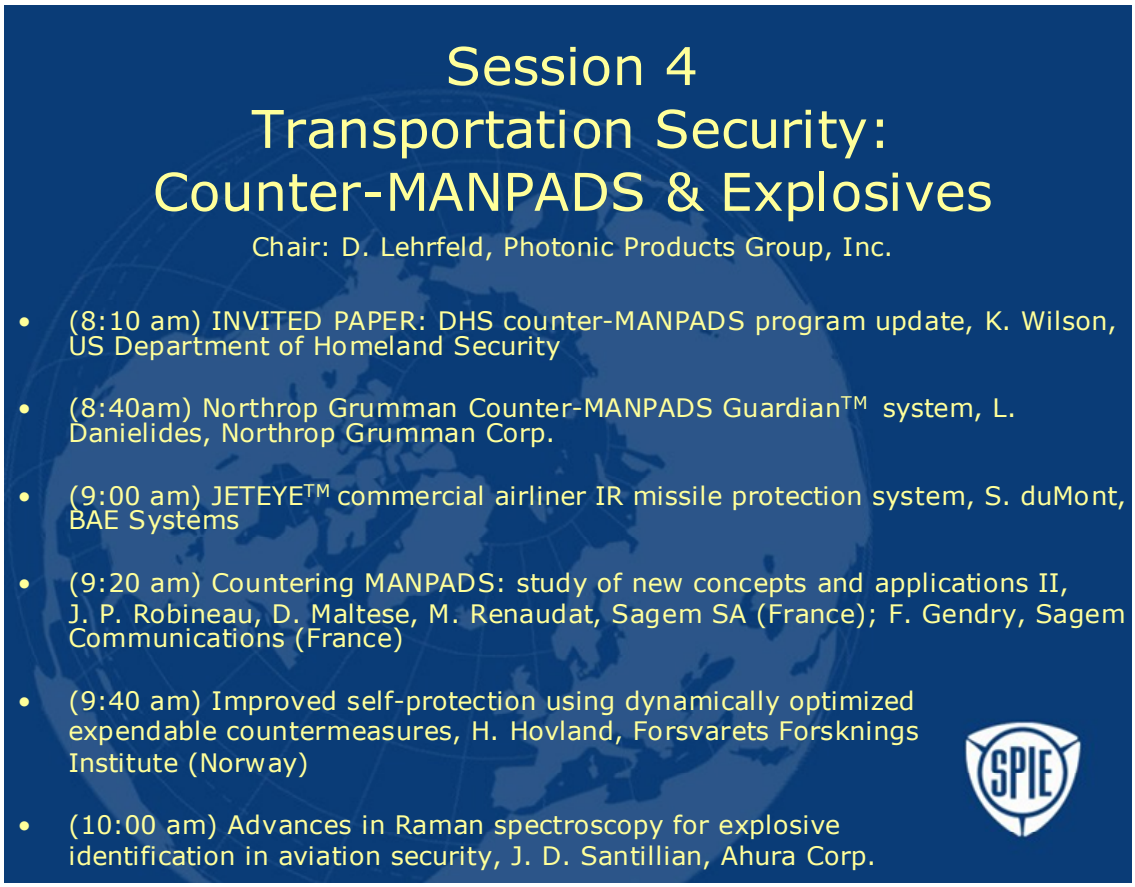
Session 4
Transportation Security:
Counter-MANPADS & Explosives
Chair: D. Lehrfeld, Photonic Products Group, Inc.
• (8:10 am) INVITED PAPER: DHS counter-MANPADS program update, K. Wilson, US Department of Homeland Security
• (8:40am) Northrop Grumman Counter-MANPADS Guardian™ system, L. Danielides, Northrop Grumman Corp.
• (9:00 am) JETEYE™ commercial airliner IR missile protection system, S. duMont, BAE Systems
• (9:20 am) Countering MANPADS: study of new concepts and applications II, J. P. Robineau, D. Maltese, M. Renaudat, Sagem SA (France); F. Gendry, Sagem Communications (France)
• (9:40 am) Improved self-protection using dynamically optimized expendable countermeasures, H. Hovland, Forsvarets Forsknings Institute (Norway)
• (10:00 am) Advances in Raman spectroscopy for explosive identification in aviation security, J. D. Santillian, Ahura Corp.
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Figure 8