National Aeronautic and Space Administration

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The Starlite Invention

“Starlite” was accidentally discovered by British citizen Maurice Ward in the early nineties after many years of experimentation as an amateur inventor. The material has remarkable properties that had not been exhibited by any other man-made substance until the time and have not since. After Starlite was demonstrated to the world through a flurry of press interest, most notably the British research establishment, NASA and Boeing attempted to validate the reports.

To this day not one large company has worked with Ward to commercialize the invention. A number of smaller companies with technologies in niche application spaces have and continue to try to license the discovery from Ward. The inventor is not interested in limited applications or licensing agreements. He understands the value of his invention and wants to work with a company that can explore the limitless possibilities of Starlite.

In 1993 a magazine article described a material called “Starlite” invented by British citizen, Maurice Ward, reported to have remarkable fire and thermal resistance properties and understood only within that context. At the time, Starlite was alleged to have withstood temperatures well beyond the capabilities of existing materials, but subsequent “proof of concept” tests conducted by the scientific establishment revealed additional properties of the material that to the best of our knowledge remain unmatched by current science.

The British press had reported that Starlite could withstand not only flames, but the intense heat of a nuclear blast. In tests performed at the British Atomic Weapons Establishment, Starlite was exposed to seventy-five nuclear flashes in a row with no apparent change to the material. Detailed results of tests performed by the British Aerospace engineering (BAe Military) are available. The material was said to have the potential to revolutionize contemporary warfare, modern industry, commercial transportation, even the space program.

NASA thus became involved in 1994 after reviewing the results of the UK tests, and by 1997 a series of "proof of concept" tests were performed by Boeing on a variety of Starlite formulations and targeting a broad range of aerospace applications. These tests continue till November of 2001.

Interest in Starlite in the US first came from NASA as a possible solution to address the need for creating a thermal barrier in the space shuttle that would withstand the 2000-degree heat of re-entry. That need was recently reiterated when a deep gouge was discovered on the Endeavour's heat shield, again putting our space program at risk.

Naranjo, who was the program manager in the chief engineer's office at NASA Headquarters in the early nineties, was the assigned point of contact for Starlite and for Maurice Ward. Naranjo has personally witnessed the results of all the tests performed on Starlite by NASA and Boeing: he is familiar with the technical details of the results; and, he firmly believes that the Starlite material has not been emulated by current science.

NASA alerted its major subcontractor for the Space Program, the Boeing Corporation, to perform tests on Starlite. Boeing also saw Starlite as a possible solution to address the need for materials to act as a thermal barrier to protect components of the Air Force Joint Strike Fighters. A synopsis of these tests and the results obtained follows.

Radiation tests and results

Laser testing was done by the Boeing High Energy Laser Laboratory in St. Louis, Missouri using an Nd:YAG laser and CO_2 laser, duplicating earlier testing done in the UK, but including tactical threads. Experts defined the parameters for the tests. The military laser test plans specified power densities ranging from under 10 W/cm2 for two seconds. These tests had absolutely no effect on Starlite, therefore, unplanned higher power densities were applied, but no specific power values that might have been applied were provided in the reports. From conversations with Ward we now know that the Nd:YAG laser was applied at 3.6 Giga-Watts and the CO_2 laser was applied at 3750 W/cm2 for six minutes, but Starlite could not be destroyed.

Additional tests were designed to attempt to replicate odd and unusual results obtained from tests performed by the UK Defense Research Agency on samples of Starlite that had been exposed to laser irradiation. In those tests Starlite had survived power densities of over 6600 MW/cm2 with little evidence of melting around the impact point. These tests conducted at Boeing were made as an attempt to replicate a phenomenon observed in the UK tests and showed that at a fluence of 290 J/cm2 the Starlite material exhibited evidence of "self-healing."

A wide variety of Starlite formulations were found to satisfy the objectives of the tests and to additionally provide excellent resistance to CO2 laser irradiation. The "self-healing" behavior as seen by Boeing was described as follows: "undamaged material from the periphery of the irradiated area flowing into the impact area between pulses, thus giving a fresh surface for the next pulse and delaying the onset of burnthrough." All the tests confirmed the results of the earlier UK tests, where Starlite withstood seventy-five nuclear flashes in a row with no apparent change to the material, except for the "self-healing" effect.

In addition to these results, the Boeing tests revealed an unusual reaction of the material seen in all Starlite formulations tested against the CO2 laser: the formation of a tall ash cone. It was speculated that this represented an intumescent reaction like that exhibited by many coating materials exposed to heat. Intumescence is a swelling due to gas evolution through the thickness of a coating. The Starlite material, however, showed no such through-effect. The cone was created from the surface layer only with unaffected material underneath. What the tests revealed was an unusual formative substructure to the cone consisting of what, according to the reports, appeared to be drawn-out threads of ash reaching from the cone, down to the undamaged surface material. Additional oddities of this observed phenomenon are explained in the report and the experiments were documented with photos.

Measurement tables included in the Boeing report indicate that various Starlite formulations exceeded the resistance values, in terms of energy required to burn through a unit of mass of special shielding materials developed by the US Department of Energy (DoE). These special shielding materials had been previously found by Boeing to have superior laser resistance, but Starlite surpassed them.

Radiation tests and results

A series of fire and thermal barrier tests were done by the Boeing helicopter facility in Mesa, Arizona. Boeing used two types of heat sources for these tests, a commercial hot air gun capable of generating temperatures up to 700ºF and a propane air torch generating temperatures of about 2200ºF. The test measured the temperature differential between the side exposed to heat and the backside of the material protected by Starlite. One test was done on baseline aluminum. The tests produced very high temperature differential. During a continuous six-minute exposure to the 2200ºF propane torch flame on the front side of the specimen, the backside never rose above 200ºF. It was also desired to informally reproduce another unusual Starlite property that had been observed in previous video tapes showing people putting unprotected hands on the back side of Starlite panels opposite propane torches. According to the Boeing report, as the temperature fell through 340ºF observers were able to place unprotected fingers on the surface for several seconds at a time without being burned.

Cargo bay liner tests and results

Cargo bay liner testing was done in Long Beach, California. No prior tests had been done on Starlite-treated cargo bay liner material in the UK. Extensive testing has been done by Boeing on cargo bay liner material coated with DuPont Tedlar scuff-resistant coating. Tests were conducted as described in FAA regulation 14 CFR Chapter 1, Part 25 Appendix F. As in other tests, unusual effects were observed in the reaction of the Starlite material. Another notable unusual response of the Starlite material was the creation of air pockets on the upper surface that tended to coalesce and form a dome that would rise to a considerable height, estimated at six inches. These spontaneously occurring, insulating air pockets contributed to keeping the back side temperatures low.

In a departure from the test plans, Boeing extended the test times from five minutes to seven minutes, but the additional test time did not produce any further material failures. At the five-minute mark mandated by FAA rules and defined by the original test plans, the surface temperature was below the target 400ºF.

Recommendations made by Boeing

The Boeing scientific and technical team involved concluded with the following statement: "further development and testing of Starlite by Boeing is warranted".

In all the tests of various Starlite formulations, Boeing successfully or partially successfully demonstrated "proof of concept" for the various targeted applications. Significant interest was developed throughout the Boeing Corporation at large and applications were suggested from exhaust shields and rocket pod covers for helicopters, to hypersonic aircraft and missile structural components, and even nuclear flash shields for strategic aircraft.

In 1997, at the time of these tests, McDonnell Douglas had merged with Boeing and Dr. Allen Atkins became the Vice President—Technology and Define Process, for Boeing at Phantom Works in St. Louis, Missouri, where the first set of Starlite tests were performed. Dr. Atkins, who is very familiar with Starlite, wrote a memo in October of 2002, which he shared with Maurice Ward. Speaking of the feedback that Dr. Atkins received from the engineers who had conducted the tests, he states: "They certified the results and told me that they had never seen anything like Starlite before," Dr. Atkins adds: "We are wasting time; we are spending dollars looking for a solution that already exists. I have been around Starlite for four years; no one has yet shown or brought anything that can compare. As a nation, we will face direct energy in the future and we don't have a defense." Dr. Atkins concludes: "I don't want Boeing to lose a technological BREAKTHROUGH."