age pattern, mesh sensitivity, numerical strategy and computational efficiency. The simulated results for damage growth will be shown in the presentation as well.

Lunch

13:30 p.m. - 15:00 p.m. Room A

SMS-V: SMART MATERIALS AND STRUCTURES, NDE

SMS-27: Environmental Tests on a Reinforced Concrete with Embedded FBG Sensors
A. BROZU, D. COLONNA, F. FELLI, A. PAOLOZZI, I. PERONI, University of Rome; M.A. CAPONERO, ENEA Research Center Frascati,
E-mail: ffelli@metal1.ing.uniroma1.it

FBG sensors are optical strain gages that offer many advantages over the conventional ones such as a long term stability. This long term stability of the sensor has to be accompanied by durable contact with the structure. For instance when the sensors are used for monitoring a bridge of a highway the glue used to attach the sensor on the metallic reinforcement may be spoiled by the severity of the environment. In this paper a specimen of a reinforced concrete with an FBG sensor glued on the metallic reinforcement has been subjected to thermal cycles. Tensile tests have been performed on the specimen while reading the FBG response. The wavelength shifts of the sensors compared with the readings of the pulling machine has given information on the quality of the adhesion of the sensor to the specimen and consequently on the effect that the environment had on the glue.

SMS-29: Coupling Deformation Properties of Various Anti-Symmetrical Laminate Composites
M. HOJO, R. HASHIMOTO, A. OGAWA, Japan Aerospace Exploration Agency,
E-mail: hojo222@chofu.jaxa.jp

Anti-symmetrical laminate composites have the coupling effect between tensile stress and twisting deformation, and are very attractive as blade materials of aircraft engines. Blades made by anti-symmetrical laminate composites can automatically adjust a stagger angle to better aerodynamic condition with change of rotational speed. Thus, aerodynamic efficiency and stability of aircraft engines can be greatly improved. In this paper, the coupling deformation properties of anti-symmetrical laminate composites were evaluated by tensile tests. Two kinds of tensile-test specimens fabricated by carbon/epoxy laminate composites with difference in anti-symmetrical stacking sequence were tested. On the basis of the tensile-test results, the anti-symmetrical laminate composites were applied for blade materials. The coupling deformation properties of the test blades at high-speed rotating conditions were evaluated by spin tests and FEM. It was demonstrated that test blades twist about 4 deg at 10,000 rpm.

SMS-30: Fabrication of Highly Reliable Advanced Grid Structure
H. TAKEYA, T. OZAKI, Mitsubishi Electric Corporation; N. TAKEDA, The University of Tokyo,
E-mail: Takeya.Hajime@wrc.melco.co.jp

There is a growing demand for weight reduction of aircraft structure to achieve energy and cost saving. Composite materials such as CFRP are promising candidates to meet this demand. Composite materials, however, have not been fully applied to the aircraft structures especially in commercial area, because extremely high level of reliability is required. A structural health monitoring system is the most effective technology to solve such problem. The authors have been developing new lightweight grid structures with health monitoring systems using FBG sensors for future aircraft applications. The strain data of the rib in a grid structure are to be easily obtained by the embedded FBG sensors since the grid structure has very simple load path. In the present report, A fabrication technique to embed FBG sensors into the grid structure was studied, first. A new apparatus to laminate CFRP prepregs and optical fibers was