# Project name: RENATA: RESEARCH ON NANOTUBE TECHNOLOGY APPLICATION

## End date: 2008

**Participating countries:** Italy and Czech Republic

**Who was there:** The RENATA project was carried out by a consortium of leading European industrial and academic partners from Alenia Aeronautica, Centro Sviluppo Materiali and Military Technical Institute of Protection (VOP-026 Sternberk s.p./VTUO Brno division).

### Summary

The objectives of the project consisted of the study and development of thin coating able to reduce the radar signature of a target turning to nanotechnology features, particularly carbon nano-tube (CNT).

### In detail

To design a multilayered structure able to reduce the radar cross-section (RCS) of a target, a Salisbury Screen (SS) was considered.

The important innovation of this research project is that the lossy sheet consists of composite materials filled with carbon nanotubes. In particular during the activities two different kind of SS multilayered structures were designed and manufactured, the first one based on the epoxy resin and the second one based on thermoplastic matrix.

This multilayered structure that has shown the best electromagnetic (EM) performances has the following scheme: a CNTs composite (lossy sheet) film consisting of nanocharged epoxy resin with 0,5 % wt of Multi-Walled Carbon NanoTubes (MWCNTs), while the material chosen for spacer, among those produced and tested in this project, is the titanium alloy $Al_2O_3$-$TiO_2$ for the high electrical permittivity. This ceramic material was deposited on carbon steel by means of Air Plasma Spray (APS) deposition process. The coating surface was grinded, both to reduce surface roughness and to obtain the desired coating thickness.

The obtained results demonstrated that the new Radar Absorbing Materials (RAM) prototypes are characterized by EM performances competitive with product available on the market.


Example of multilayered structure that presents the best EM performances

From the chosen basic mechanical tests point of view a good behaviour of the developed samples was confirmed.

## CONCLUSIONS

The best EM performances are obtained with the panel constituted by a lossy sheet made with the thermo-hardening resin (epoxy resin) filled with MWCNTs at 0.5% wt. In fact, the composite made with the epoxy resin has better EM performances than the one made with the thermoplastic one.

The obtained results demonstrate that the new RAM prototypes are characterized by EM performances competitive with product available on the market.

From the chosen basic mechanical tests point of view it is possible to confirm a good behaviour of the developed samples.