



Images courtesy of ThinkKom Solutions, Inc.

CUSTOMER:

**ThinKom Solutions, Inc.**

INDUSTRY:

**Mobile Broadband Electronics**

PROJECT NAME:

**Thermal and Structural Design and Analysis Support of X/Ka Antenna System**

CUSTOMER LOCATION:

**Torrance, California**

**OVERVIEW**

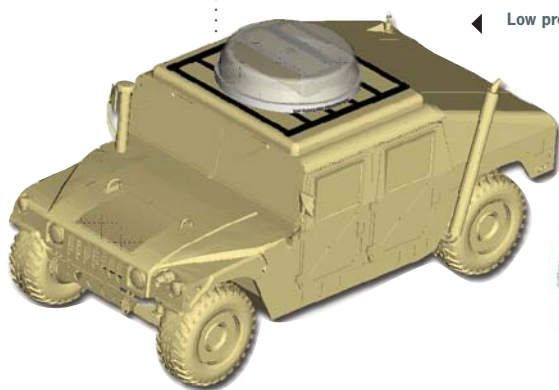
ThinKom Solutions, Inc., a provider of compact antenna solutions for aeronautical, on-the-move, and portable applications, contracted ATA to provide design and analysis support for a compact dual-band antenna system. The X/Ka-band antenna system mounts on the roof exterior of a military ground vehicle. The system is subjected to the dynamic environments of the vehicle, including vibration, shock, and thermal excursions. Because the electronics for the system are completely self-contained under a radome, an integrated cooling system is required to ensure components do not exceed allowable operating temperatures.

ATA supported ThinKom's design efforts by providing electronics cooling analysis support for multiple design configurations of the antenna system. A thermal distortion analysis was performed to assess possible interferences in the bearing systems. Finally, ATA investigated the system response to dynamic environments, including random vibration and shock loading.

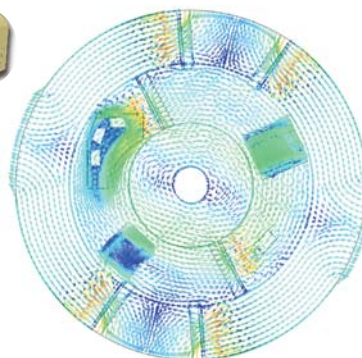
During the thermal design phase, multiple thermal management strategies were utilized to meet stringent performance requirements and give ThinKom's design a competitive edge. ATA's models include the effects of radiation, forced and natural convection, multiple cooling fans, extended surfaces, and thermoelectric coolers.

**ATA SUPPORT INCLUDED:**

- ▷ Applied thermal principles to size cooling channels and select fans.
- ▷ Used a detailed thermal/fluid model of the antenna to investigate best placement of hot components and fans and complete the detailed design of the structures in the conduction path.
- ▷ Using analysis, enhanced the cooling design with thermoelectric coolers to meet the stringent temperature requirements of select components.
- ▷ Performed thermal distortion analysis at rotating interfaces with close tolerances to ensure no interference.
- ▷ Used finite element analysis to validate performance under prescribed dynamic environments.



◀ Low profile SATCOM concept mounted on HMMWV roof



▲ Flow vectors from fluid/thermal simulation used to aid design of electronics cooling system



▲ CAD geometry of SATCOM electronics compartment