Rotor Wake Survey

Overview
The airflow underneath helicopter rotors is incredibly complex. One method of characterizing this flow is through measuring the air pressure distribution underneath the rotor. However, current testing techniques for a helicopter rotor in hover do not allow for such pressure measurements to be made.

Objectives
The objective of this project is to measure the rotor wake of a helicopter below the rotor at a minimum of eight azimuthal angles, three heights and five radial positions. The local pressures will be measured using a pressure probe and then passed to a computer for data reduction and visual representation. The Boeing Company is supplied a rotor test stand to build the solution around.

Approach
In following with successful design firms such as IDEO the team began prototyping early in the process. This output driven design process resulting in 3 iterations of design and building with subsequent communication of the design through reports.

- Gather customer input
- Weigh customer needs
- External search
- Establish Metrics and Target Specifications
- Generate concepts and select concepts based on customer needs
- System Level design with back of hand calculations and general sketches and primitive models
- Detailed design of sub systems
- Testing and Evaluation of Systems

Outcomes
The product is capable of:

- Pressure Range: 0 to 0.13 psi
- Sensor Accuracy: 5% for 10 ft/s to 135 ft/s
- Azimuthal Range: 15 deg to 345 deg
- Radial Range: 9 in to 45 in
- Vertical Range: 13.5 in to 31.5 in

With this product Boeing will be able to profile the behaviour of a rotor wake, test design changes, and validate computer simulations.