

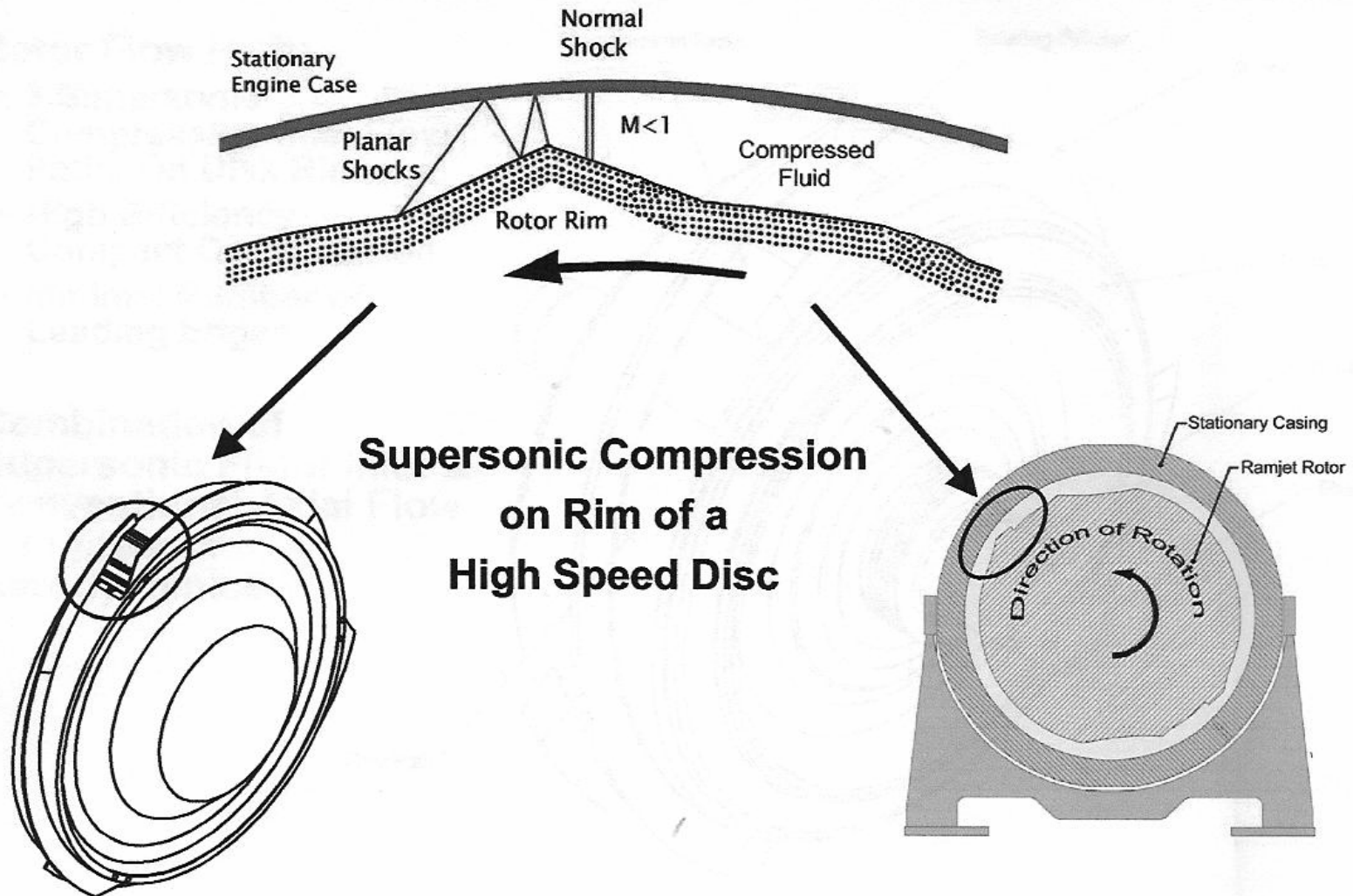
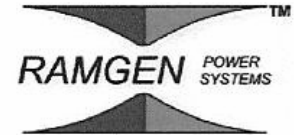
mae 422 GAS DYNAMICS Spring 2006  
DESIGN PROJECT 1

Ramgen Power Systems is attempting to develop and commercialize a compressor based on oblique and normal shock waves. Schematics of the compressor are attached. A rotor, contoured in a similar manner to the corners we have been considering, is rotated at high speed inside a stationary cylindrical housing. An oblique shock wave, varying in strength with the rotational speed of the rotor, forms at the corner and is followed by reflected shock waves..

Develop an opinion of the feasibility of such a compressor. Support your opinion with as detailed calculations as are possible with 1-D gas dynamics methods . Write a report detailing your calculations and discussing your opinion. Of particular interest are the efficiency, flow range, rotational speed of such a device and the gases for which the compressor would be most suitable.

Report due March 23.

# Rotating Supersonic Compression



mae 422 GAS DYNAMICS Spring 2006  
EXTRA CREDIT DESIGN PROJECT

Develop a method for calculating the 1-D isentropic flow properties of a real gas. Compare the results of using this method for air with the ideal gas properties of Table A.1 at conditions where the ideal gas law is an accurate model of the properties of air and at conditions where the ideal gas law is an inaccurate model of the properties of air. Compare the results of your method using the ideal 1-D equations ( Table A.1 is for air only) for a non-ideal gas such as water vapor at a pressure above 1 atm or a refrigerant. The SpreadsheetWorld property module, or any other real gas property module of your choice, can be used to obtain real gas properties.