The Thermal Propulsion Capture System concept for ground testing of a nuclear powered engine involves capturing the engine exhaust to be cooled and condensed before being stored. The hydrogen exhaust is injected with liquid oxygen and burned to form steam. That steam must be cooled to saturation temperatures before being condensed into liquid water. A crossflow heat exchanger using water as a working fluid will be designed to accomplish this goal.

- **Introduction** -

The Thermal Propulsion Capture System concept for ground testing of a nuclear powered engine involves capturing the engine exhaust to be cooled and condensed before being stored. The hydrogen exhaust is injected with liquid oxygen and burned to form steam. That steam must be cooled to saturation temperatures before being condensed into liquid water. A crossflow heat exchanger using water as a working fluid will be designed to accomplish this goal.

- **Objectives** -

Design a cross flow heat exchanger for the Thermal Propulsion Capture System testing which:

- Eliminates the need for water injection cooling
- Cools steam from 5800°F to saturation temperature
- Is efficient and minimizes water requirement

- **Outcomes** -

- Cross section: 15.0 ft. x 15.0 ft.
- Length: 14.0 ft.
- Tube Size: 1.0 in.
- Total Flow Rate: 150,000 gpm

- **Nuclear Engine Concept** -

Concept Schematic of a mono-propellant, regeneratively cooled nuclear thermal engine

- **Thermal Propulsion Capture System** -

Schematic of the Thermal Propulsion Capture System shows where heat exchanger would replace water injection

- **Heat Exchanger Model** -

Representative AutoCAD® model of a crossflow, 4 stage heat exchanger done by Richard Wear

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