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Proposal for A Student Project for Winter Ice Parks for Cross Country Skiing

Based on: https://dspace.mit.edu/handle/1721.1/46275

Original Impetus: Generating and storing winter ice to meet water demands and cooling in the summer

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Cross Country Skiing Snowmaking Park Concept

Fundamental principle:

- ✓ Evaporative Cooling: Spraying water from a high altitude increases the "hang time" of the droplets. This allows for more extensive convective cooling and evaporative cooling as the droplets interact with the ambient air.

- ✓ Production Rate: The rate of snow production is proportional to the height from which the water is released, as greater height increases airflow and enhances heat and mass transfer rate within the control volume.

For complete analysis click and click again on **download**.

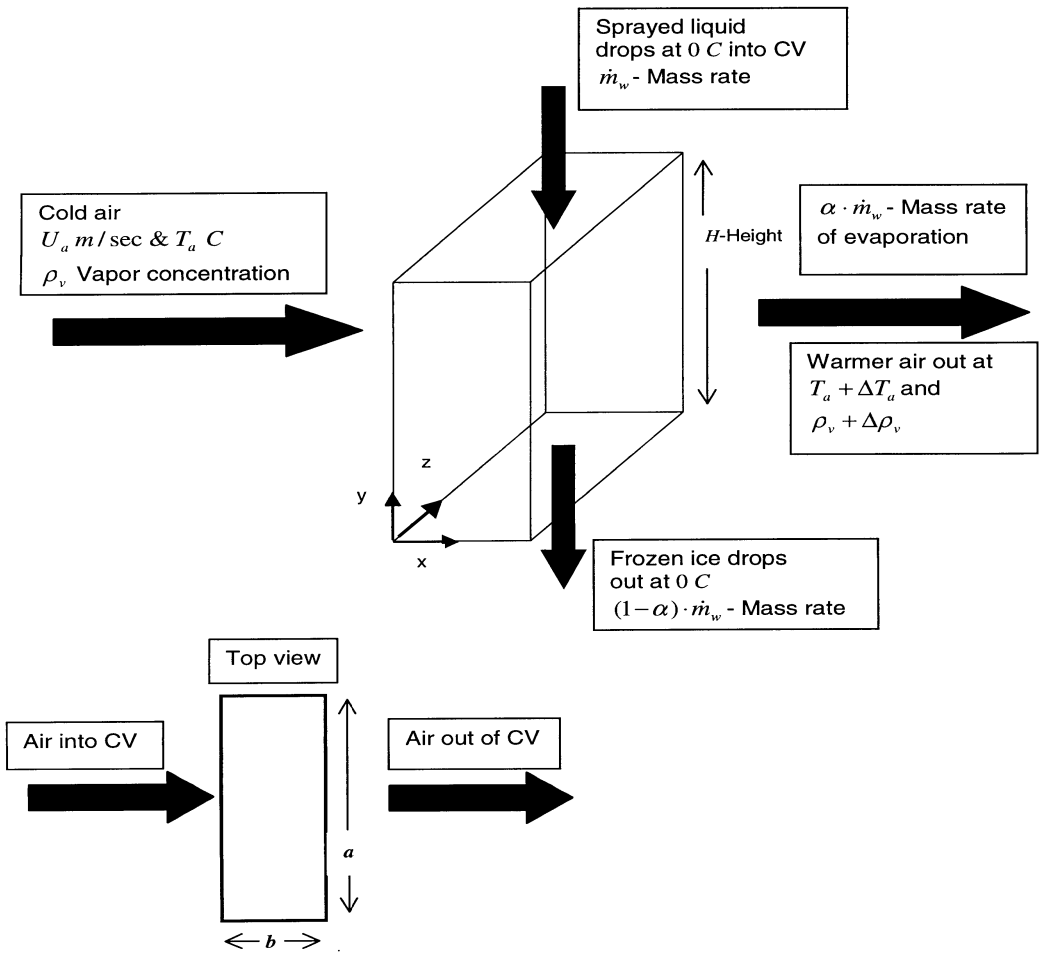

Figure 6.1: Control volume for winter ice manufacture

Proposal for a Student Project for Snow Making for Recreational Cross-Country Skiing

- ✓ Multi-Semester Project
- ✓ A hands-on, design-focused initiative involving the selection and integration of specialized equipment.
- ✓ The project engages students from mechanical, civil, and environmental engineering disciplines in a collaborative, interdisciplinary effort.
- ✓ Snowmaking equipment will be loaned by participating snowmaking engineering firms in Vermont, as well as by industry vendors willing to support the educational initiative.

- ✓ Pumping water to elevations of thousands of feet for snowmaking on ski slopes requires large, high-power, and expensive pumps.

- ✓ We are seeking a solution to pump water to a height of 40–60 feet.

Scope of First Student Project

- ✓ Selection of an off-the-shelf pump
- ✓ Selection of piping and pipe supports and design of the spraying nozzle
- ✓ Selection of an industrial vibrator and determination of the appropriate frequency to attach to the pipe in order to prevent pipe freezing
- ✓ System testing could be done prior to the winter season

Summary & Discussion

- ✓ Providing fun and enthusiasm for students
- ✓ Modular, portable equipment
- ✓ Scalable design (can be expanded or reduced as needed)
- ✓ Collaboration with the Boston Parks and Recreation Department
- ✓ Funding in small, affordable increments
- ✓ Creating long-term entrepreneurial opportunities for students
- ✓ Establishing Northeastern as a pioneer in new applications

Long Term Academic R&D

- ✓ Nucleation of supercooled water drops, (Snomax, **dry ice** Pseudomonas syringae, ice-nucleating proteins, INPs)
- ✓ Desalination prospects
- ✓ Noise reduction - exploring mist production systems

Orbit Irrigation Basic Misting Cooling Kit, Walmart $19.97