

# World Center of Education and Research for Trans-disciplinary Flow Dynamics International Internship Program

Chae-hyoung, Kim  
School of Mechanical and Aerospace Engineering  
Seoul National University  
Seoul, Korea

**Research title:** A study of supersonic combustion and supersonic mixing using new mixers  
in supersonic combustor

**Supervisor:** Prof. Goro Masuya

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With the support of Institute of Fluid Science (IFS), I have conducted my research during the GCOE program. My research is on the development of the mixing device for supersonic combustion and mixing. It is difficult to understand the characteristics of the experimental results because the mixing model is first developed and introduced in the world. However, with the help of a professor G. Masuya, a professor K. Takita, an assistant T. Kouchi, and students in the laboratory, I could successfully conduct the experiments; as a result, within a short time, I could write some papers following below:

## Journal papers

1. Chae-hyoung Kim, et al., "Design and Experimental Verification of Two Dimensional Asymmetric Supersonic Nozzle," *Journal of the Korean Society for Aeronautical and Space Sciences (Korean version)*, 37(9), Sept. 2009, 899 - 905.
2. Chae-hyoung Kim, et al., "Flowfield Characteristics on a Vent Slot Mixer in Supersonic Flow," was submitted to the *Journal of Shock Waves*.

## Conference papers

1. Chae-hyoung Kim, et al., "A Study of Combustion Mode Transition using a New Supersonic Mixer in Dual-Mode Scramjet Engine," *22nd ICDERS* (Poster presentation) July 27-31, Minsk, Belarus.
2. Chae-hyoung Kim, et al., "Development of a New Supersonic Mixer for Dual-Mode Scramjet Engine Combustor," *16<sup>th</sup> AIAA/DLR/DGLR International Space Planes and Hypersonic Systems and Technologies Conference*, Oct. 19-22, Bremen, Germany.
3. Chae-hyoung Kim, et al., "Development of New Supersonic Mixer For Enhancement of Scramjet Engine," *6th International Conference on Flow Dynamics*, Nov. 4-6, Hotel Metropolitan Sendai, Japan.
4. Chae-hyoung Kim, et al., "The Effect of a Vent Slot Mixer with a Plasma Jet Torch in the Supersonic Combustion," the abstract was submitted to *the 46<sup>th</sup> AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, July 25-28, 2010, Tennessee, USA.
5. Chae-hyoung Kim, et al., "A Plasma Jet Assisted Combustion with a Backward-Facing Step by Fuel Injection Locations," the full paper was submitted to *the 33<sup>rd</sup> International Symposium on Combustion*, August 1-6, 2010, Beijing, China. (the *Proceeding of the Combustion Institute* is the SCI Journal)

Surely, I did not spend my all time only studying and researching during the internship program. Japanese students or friends kindly showed me various beautiful places, such as Matsushima, Mt. Zao, the spring pool, etc. With them, I could have beautiful memories in Sendai. Amazingly, Japanese students in Tohoku University liked drinking liquors and enjoying together, looked like Korean students. I heard that Japanese students had individualism before staying in Sendai, so it was interesting shock to me. Furthermore, the life style of students in laboratory was similar with that in

Seoul National University; i.e., they were studying and researching hard in everyday. Therefore, I think the Japanese students, particularly in the Masuya-Takita laboratory in Tohoku University, are very diligent, clever and kind friends; in future, if I have a chance, I would like to continue to work with them.



On excursion ship from Matsushima



Laboratory members after a party (No 1 in the world)



Tour in Matsushima



In front of the saint Bautista ship



October Festival in Sendai



In the laboratory