Technion-Israel Institute of Technology
Faculty of Mechanical Engineering

הטכניון-מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ד׳ 26.04.17 (ל׳ בניסן, תשע״ז), בניין דן-קאהן, קומה 0, אודיטוריום 1 , 13:30.

יצה: רן עמיאל

מנחה: ד״ר לאוניד טרטקובסקי

על הנושא:

Knock phenomenon in UAV spark-ignition engines and mitigation strategies

The seminar will be given in Hebrew

להלן תקציר ההרצאה:

The knock phenomenon is a limiting factor in the development of spark ignition (SI) internal combustion engines (ICE), and various ways for knock detection, prevention and mitigation have been suggested over the years to deal with this problem. Knock is an abnormal combustion in the cylinder of SI ICE. This phenomenon caused by undesired auto ignition of unburned fuel-air mixture pockets formed inside the cylinder during combustion phase, in addition to the flame initiated from the spark plug. It results in decrease of engine power output and durability, increase in pollutant emissions and can lead to total destruction of the engine in the worst cases.

Aerial platforms experience environmental conditions that can change drastically in a short period of time and affect power output and knock occurrence and intensity. In addition, turbocharged SI engines of aircrafts suffer from intake temperature rising due to increase of the compressor **pressure ratio as the air density drops.** Therefore, it is important to be aware of the combined effects of altitude, initial ground temperature, humidity, flight velocity etc. on the emergence of knock and the effect on brake power following takeoff.

For the analysis of influence of flight conditions on knock occurrence and brake power, a simulation model of UAV engine was developed and calibrated based on the gained experimental data. Suitable methods of in-flight knock mitigation, like water injection, retarded ignition, EGR and intercooling were investigated and analyzed. .

Using the aforementioned model, a set of equations for full-load regimes was developed to describe the mutual influence of various environmental condition and engine's operating parameters on the knock tendency and the brake power output. Such equations can be used prior to takeoff for knock risk evaluation based on flight plans, as well as during the flight as a "knock sensor", even prior to its occurrence, in order to initiate knock avoidance measures.

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בברכה,

פרופ״א שמואל אוסובסקי
מרכז הסמינרים