Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Effect of Different Ground Scenarios on Flow Structure of a Rotor At Hover Condition GOKTUG KOCAK, VOLKAN NALBANTOGLU, Turkish Aerospace Industries, Inc., MEHMET METIN YAVUZ, Middle East Technical University — The ground effect of a scaled model rotor at hover condition was investigated experimentally in a confined environment. Different ground effect scenarios including full, partial, and inclined conditions, compared to out of ground condition, were characterized qualitatively and quantitatively using laser illuminated smoke visualization and Laser Doppler Anemometry measurements. The results indicate that the presence of the ground affects the flow regime near the blade tip by changing the spatial extent and the path of the vortex core. After the impingement of the wake to the ground, highly unsteady and turbulent wake is observed. Both the mean and the root mean square of the induced velocity increase toward the blade tip. In line with this, the spectral power of the dominant frequency in the velocity fluctuations significantly increases toward the blade tip. All these observations are witnessed in all ground effect conditions tested in the present study. Considering the inclined ground effect in particular, it is observed that the mean induced velocities of the high side (mountain) are higher compared to the velocities of the low side (valley) in contrast to the general trend observed in the present study where the ground effect reduces the induced velocity.

Goktug Kocak
Turkish Aerospace Industries, Inc.

Date submitted: 27 Jul 2017 Electronic form version 1.4