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### Letter of Recommendation for Mr. Kshitij Anand

I have the pleasure of writing this letter of recommendation in support of Mr. Kshitij Anand's Ph.D. study application for the Joint Doctoral Program at the Indian Institute of Technology Kharagpur and the University of Manchester. My association with Kshitij as a project supervisor has started recently in the autumn semester of the final year of his graduate study. I met with Kshitij to discuss about his queries regarding the manufacturing of RC aircrafts, on the recommendation of one of my laboratory members. Having supervised several students on various prototyping projects at the M. N. Faruqi Innovation Centre (MNIFIC - c/o Department of Mechanical Engineering) I was sceptical about the feasibility of the proposed project and its timeline. However, the clarity and vividness of thought I observed in his pitch presentation on development of a fixed-wing and a transitional aircraft was highly reassuring. On observing his background and previous research experiences, I found that he mitigated the absence of hardware facilities during the two years of COVID-19 lockdown by strengthening his fundamental concepts and software skills, and now wanted to improve his hardware and prototyping skills in a bid to gain end-to-end knowledge in robotics. He put his Aircraft Design and Optimization concepts to work and formulated the conceptual design of a manually controlled fixed wing surveillance aircraft. He designed the complete model in SolidWorks to validate the feasibility of his design. Followed by which he identified materials for construction of various parts keeping in mind the available resources at our disposal. Once confident on his design, he got down to manufacturing the aircraft. In this process, he had to learn Design of Manufacturing and various practical skills related to woodworking (spar, rib and airfoil cutting), optimization of 3D printed structures for weight and strength, and detailed internal structure design for desired weight distribution. His swift ability to solve the numerous small hurdles encountered during the assembly of the aircraft with the help of collaborative guidance was exemplary, resulting in the creation of the aircraft base model within the span of a mere two and half months ready for its first test flight.

Kshitij maintains a good balance of time between exhausting his knowledge and available resources in the bid to solve a problem or resolve a query, and validate the solution with guidance from his supervisor and lab members. He has the capability to envisage an idea, predict the roadblocks in the realizing the idea, organize various steps of the idea into a project and continuously update his action plan in a timely fashion with inputs from his experience and guidance from others. His admiration for manufacturing skills and the importance of prototyping is something I believe a doctoral student must possess in the current-day scenario where the impact of a research project on the common mass is of high importance.

As a team member and a fellow student, Kshitij has always been supportive of others, positively contributed to discussions and never hesitated to ask about any new technology he comes across. He is a disciplined, diligent and pragmatic student who not only strives to improve his scientific knowledge and skills, but also makes several efforts to inculcate admiration for science and developing technological solutions amongst his peers and juniors. I strongly recommend considering his Ph.D. study application at your university. I am confident that he will be highly productive in bringing out an excellent Ph.D. dissertation.

I wish him the very best in his future endeavour. If you require more information about Kshitij, you may please write to me at [aditya@mech.iitkpp.ac.in](mailto:aditya@mech.iitkpp.ac.in).

With regards,



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