ViVID workstream deliverables

ViVID programme management

Dissemination, implementation and exploration opportunities
Report that contains the definition and execution of a plan for dissemination and exploitation which include the delivery of a final showcase

ViVID programme management

ADAS
Integration of vehicle and system models into the simulator, provide simulation best practices, develop scenarios for virtual and physical testing, carry out tests and investigate the correlation between the two

Dynamics
Integration of validated chassis and suspension model to provide accurate representation of vehicle dynamics behaviour within the simulator environment

Simulation model optimisation for simulator
Optimisation of real-time simulation models to enable effective driver feedback and data analysis during subjective assessment on the simulator

Driver in the loop
Definition and development of strategies to maximise the benefits and optimise the performance of the integrated features (ADAS, HMI and transmission calibration) via a driver in the loop simulator

XiL – X in the Loop

Powertrain-in-the-loop
Development of XiL methodology to conduct vehicle feature and attribute calibration and validation, such as OBD, ADAS, HMI and wiring harness, driveability assessments and virtual drive-cycles, reducing the reliance on physical vehicle level testing

Electrical / powertrain / ADAS integration
Implementation of XiL methodology for the integration of software, Driver Assist Technologies (e.g. sensor fusion) and E/E into powertrain development. This will include the creation of a HiL (Hardware-in-the-Loop) test rig to allow demonstration of the interaction between vehicle dynamics models in the loop with the physical powertrain

Chassis acceletrated development
Definition and implementation of a process that allows Model-Based Shift-Left testing of the Steering and Brakes functions

Simulation

ADAS
Identify and develop simulation ADAS use cases required for functional verification and validation in Commercial Vehicle applications and generate adequate, interchangeable models (e.g. Radar, LKA, AEB)

NVH
Create a process to model and characterise electric motor efficiency, thermal behaviour, control for current ripple reduction, NVH (Noise, Vibration and Harshness), mechanical and electrical operating limits

Flexible body dynamics
Develop a process to generate simulation models for incorporating a flexible body & dynamic suspension into the full vehicle simulation of an electric vehicle with the aim of fine-tuning ride/handling dynamics

Battery modelling
Create a process to model/characterise battery recharge performance, degradation and thermal behaviour for parameter identification and system validation

Energy management
Develop a thermal simulation for the whole vehicle to address battery pack temperature, heat dissipation from powertrain/electronics and passenger cabin/payload area temperature, ultimately exploring optimal control strategies to improve both range and performance

Importing environment
Support integration of all generated models with the IPG Carmaker software and deployment on a dynamic simulator

Model order reduction
Develop an Automated Model Order Reduction process (AMOR) and demonstrate its application in the simulation of selected components such as batteries, motors

Platooning
Develop and validate a simulation process for the creation and run of realistic convoy driving situations to produce an optimal control strategy under conflicting requirements such as safety, space usage, aerodynamic drag and efficient use of batteries for range and degradation

Model build process

Virtual GPDS
Define a strategic framework that highlights how transform the Global Product Development System (GPDS) utilised by Ford, making Model-Based System Engineering (MBSE) centric to it and how it's implementation could significantly reduce and ultimately negate the need for physical prototypes in the early-stage of vehicle programs

Model fidelity vs GPDR
Define a methodology and workflow to utilise the 'Purpose Driven Fidelity' approach in the product development process, i.e. mapping the right model fidelity at the right time in the development process.

Model build process

Car Maker training
Deliver CarMaker trainings to project partners to familiarise with the software

IPG support
Roll out and support form IPG Automotive UK of Ford Dunton workforce on enhancement and use of specific CarMaker functionalities to accelerate product development

Digital engineering (MsC)
Integration of ViVID specific research topics into existing Loughborough University modules thought in the Aeronautics and Automotive Engineering Department

Workshop series
Deliver three workshops in which the project partners will share their latest research through case study demonstration and an open interaction with attendees to capture ideas, comments and suggestions for improvement

Loughborough training
To ensure that Ford UK retains the relevant skills to engineer future products, learning modules will be developed and delivered by Loughborough University to Ford engineers to assist in the transformation of capability in electrification and autonomy