



TITLE OF PROGRAMME

**DESIGN, BUILT AND TESTING
FIBRE REINFORCED POLYMER
(FRP) COMPOSITE BODY
STRUCTURE FOR HEAVY DUTY
VEHICLE**





PUSKOM UTM

CONCEPTUAL DESIGN

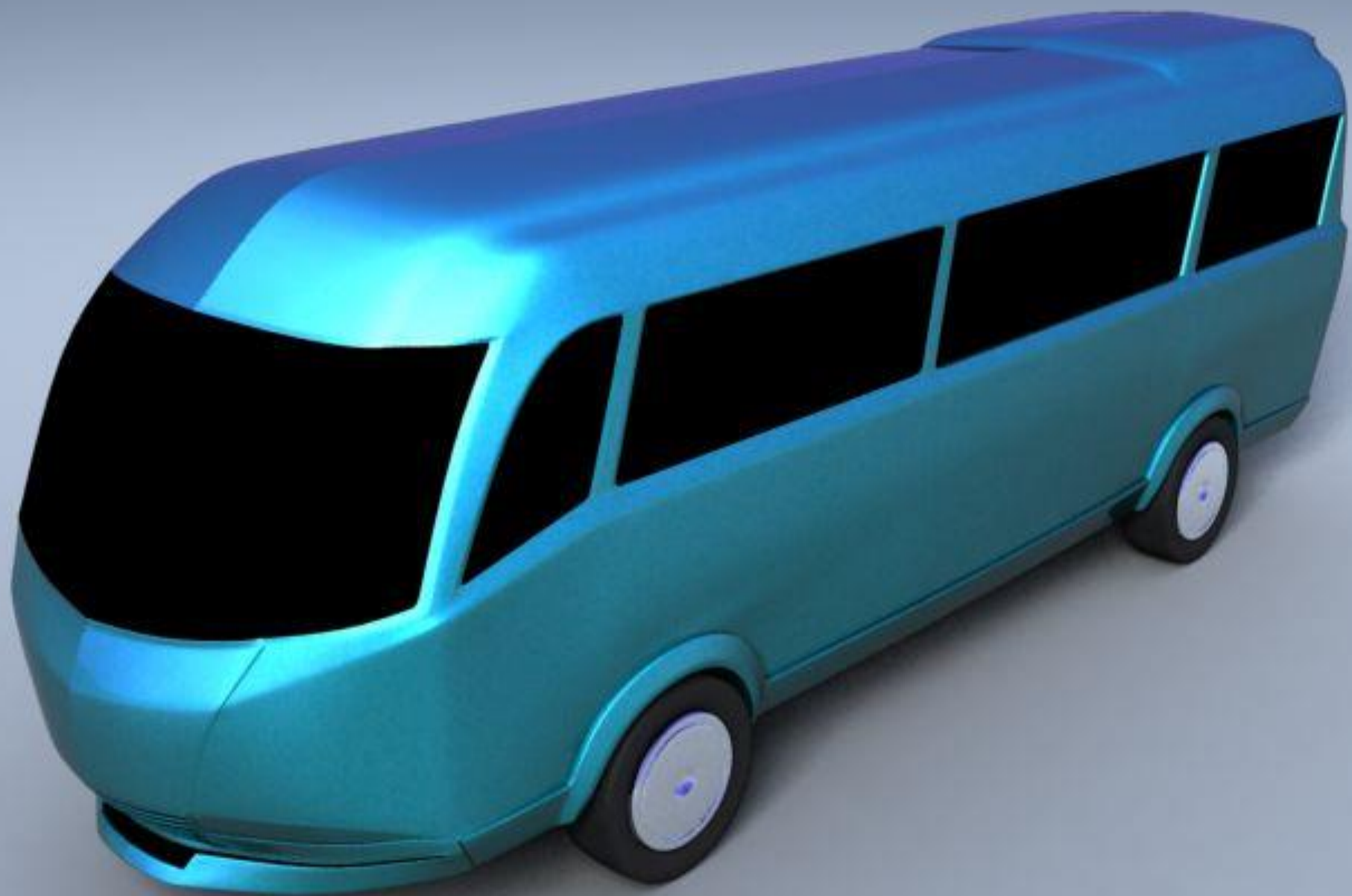






PUSKOM UTM







LIST OF PROJECTS

- 1.** Exterior and Interior Ergonomics Design Concepts for FRP Heavy Duty Vehicle (UTM) – Project Leader (*Mr. Idris Ishak*)
- 2.** Design of GFRP Sandwich Composite Body Structure Stiffened with CFRP Plate using FEA (UTM). – Project Leader (*Dr. Nazri Kamsah*)
- ☐ **3.** FRP Materials, Joining and Processing for GFRP Body Structure (UNISEL) – Project Leader (*Prof. Dr. Mohd Nasir Zainal Arif*)
- 4.** Overall Structural Performances of GFRP Body Structure under Roll Over Test (UTM). – Project Leader (*Assc. Prof. Dr. Amran Ayob*)



OBJECTIVES

- ❑ To design and produce a full scale prototype of an ergonomically designed heavy vehicle interior and exterior for driver's and user's compartment
- ❑ To design, built and test a full scale GFRP sandwich composite body structure stiffened with CFRP plate
- ❑ To develop a national standard of practice for design and testing of FRP heavy duty vehicle body structures



PROGRAMME SCOPES

The overall scopes of the project will covered the following items ;

- Literature study on various conventional design of heavy duty vehicle body structures.
- Parametric data collection such as overall vehicle dimensions, technical specifications and regulations.
- FRP composite database development i.e. through big scale testing programme and through established publications of FRP materials database.
- Establishment anthropometric data for Malaysian population.
- Design development and ergonomic study of selected FRP body structure i.e. body bus structure.
- FEA on selected FRP body bus structure by focusing on numerous aspects such as structure deformations, stresses and mode shapes.



- Study on the method of construction that also will involved testing on adhesive joint, bonded/bolted and sandwich construction.
- Construction on full scale FRP body bus structure that complete with mechanical drive and power system.
- Test rigs design and fabrication, instrumentation and measurement selection for roll-over and impact test.
- Roll-over test and impact test on full scale prototypes.
- Overall performance evaluation and final report.





PROJECT COSTS (Project No. 1)

A. Staff Costs (Please include the yearly staff costs of the project. For Computation, use the Staff Cost Estimation Form in Appendix D. Numbers in parentheses refer to expense codes)

Staff Category	YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
■ Salaried personnel (11100)	80,000.00	80,000.00	80,000.00			240,000.00
■ Temporary & contract personnel (J400)	120,000.00	120,000.00	120,000.00			360,000.00
Sub-total staff costs	200,000.00	200,000.00	200,000.00			<u>600,000.00</u>

B. Direct Project Expenses (Please include the yearly direct expenses of the project. For computation, use the Direct Expenses Estimation Form in Appendix E. Numbers in parentheses refer to expense codes)

Expense Category	YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
■ Travel & transportation (J500)	110,000.00	110,000.00	110,000.00			330,000.00
■ Rentals (J600)	-	36,000.00	36,000.00			72,000.00
■ Research materials & supplies (J700)	305,000.00	305,000.00	305,000.00			915,000.00
■ Minor modifications & repair (J800)	20,000.00	20,000.00	20,000.00			60,000.00
■ Special services (J900)	10,000.00	10,000.00	10,000.00			40,000.00
■ Special equipment & accessories (J1000)	1,000,000.00	500,000.00	300,000.00			1,800,000.00
Sub-total direct expenses	1,445,000.00	986,000.00	786,000.00			<u>3,217,000.00</u>

C. Total Cost (Please add the sub-totals of A & B)

YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
1,645,000.00	1,186,000.00	986,000.00			<u>3,817,000.00</u>



PROJECT COSTS (Project No. 2)

A. Staff Costs

(Please include the yearly staff costs of the project. For Computation, use the Staff Cost Estimation Form in Appendix D. Numbers in parentheses refer to expense codes)

Staff Category	YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
■ Salaried personnel (11100)	80,000.00	80,000.00	80,000.00			240,000.00
■ Temporary & contract personnel (J400)	120,000.00	120,000.00	120,000.00			360,000.00
Sub-total staff costs	200,000.00	200,000.00	200,000.00			<u>600,000.00</u>

B. Direct Project Expenses

(Please include the yearly direct expenses of the project. For computation, use the Direct Expenses Estimation Form in Appendix E. Numbers in parentheses refer to expense codes)

Expense Category	YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
■ Travel & transportation (J500)	60,000.00	60,000.00	60,000.00			180,000.00
■ Rentals (J600)	-	12,000.00	12,000.00			24,000.00
■ Research materials & supplies (J700)	200,000.00	200,000.00	100,000.00			500,000.00
■ Minor modifications & repair (J800)	20,000.00	20,000.00	20,000.00			60,000.00
■ Special services (J900)	10,000.00	15,000.00	15,000.00			40,000.00
■ Special equipment & accessories (J1000)	200,000.00	100,000.00	100,000.00			400,000.00
Sub-total direct expenses	490,000.00	407,000.00	307,000.00			<u>1,204,000.00</u>

C. Total Cost

(Please add the sub-totals of A & B)

	YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
	690,000.00	607,000.00	507,000.00			<u>1,804,000.00</u>



PROJECT COSTS (Project No. 4)

A. Staff Costs

(Please include the yearly staff costs of the project. For Computation, use the Staff Cost Estimation Form in Appendix D.

Numbers in parentheses refer to expense codes)

Staff Category	YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
▪ Salaried personnel (11100)	120,000.00	120,000.00	120,000.00			360,000.00
▪ Temporary & contract personnel (J400)	120,000.00	120,000.00	120,000.00			360,000.00
Sub-total staff costs	240,000.00	240,000.00	240,000.00			<u>720,000.00</u>

B. Direct Project Expenses

(Please include the yearly direct expenses of the project. For computation, use the Direct Expenses Estimation Form in Appendix E. Numbers in parentheses refer to expense codes)

Expense Category	YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
▪ Travel & transportation (J500)	110,000.00	110,000.00	110,000.00			330,000.00
▪ Rentals (J600)	-	36,000.00	36,000.00			72,000.00
▪ Research materials & supplies (J700)	700,000.00	700,000.00	500,000.00			1,900,000.00
▪ Minor modifications & repair (J800)	20,000.00	20,000.00	20,000.00			60,000.00
▪ Special services (J900)	10,000.00	15,000.00	15,000.00			40,000.00
▪ Special equipment & accessories (J1000)	1,000,000.00	500,000.00	300,000.00			1,800,000.00
Sub-total direct expenses	1,840,000.00	1,381,000.00	981,000.00			<u>4,202,000.00</u>

C. Total Cost

(Please add the sub-totals of A & B)

YEAR 1 (2004)	YEAR 2 (2005)	YEAR 3 (2006)			TOTAL
2,080,000.00	1,621,000.00	1,221,000.00			<u>4,922,000.00</u>



LIST OF MATERIALS AND EQUIPMENTS – PROJECT NO.1

Item No.	List of Item	Estimated Cost (RM)
01	Solidworks 2001Plus (CAD)-for drafting and modelling	20,000
02	Composite Pro (Engineering software)-for low level composite design analysis	20,000
03	NASTRAN (Engineering software)-for high level composite structure analysis	100,000
04	Composite database handbooks	50,000
05	FRP samples (I.e. tensile, modulus,poisson ratio, shear modulus, etc)	150,000
06	Strain gauges and accessories	200,000
07	High level and heavy duty data logger	500,000
08	Measurement equipments and testing jigs	100,000
09	High speed camera	10,000
10	Computer i.e. High capability (5 units)	50,000
11	Notebook i.e. high capability	20,000
12	Photocopy machine	20,000
13	Printer i.e. heavy duty	20,000
14	Digital camera and video camera	20,000

LIST OF MATERIALS AND EQUIPMENTS – PROJECT NO.2

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LIST OF MATERIALS AND EQUIPMENTS – PROJECT NO.4

Item No.	List of Item	Estimated Cost (RM)
01	LVDT	100,000
02	NDT Ultrasonic scanner	500,000
03	Smart structure sensing system	500,000
04	Test rigs	500,000
05	Univesrsal testing machine 200 kN	300,000
06	Strain gauges and accessories	150,000
07	High level and heavy duty data logger	500,000
08	Impact machine	500,000
09	High speed camera (5 units)	100,000
10	Computer i.e. High capability (5 units)	50,000
11	Notebook i.e. high capability (2 units)	40,000
12	Photocopy machine	20,000
13	Printer i.e. heavy duty (2units)	20,000
14	Digital camera and video camera	20,000

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