RCloud Tasking Form – Part B: Statement of Requirement (SoR)

Title of Requirement	Controlling Droplet Penetration in Textiles
Requisition No.	1000166847
SoR Version	**0.1**

1.	Statement of Requirements
1.1	**Summary and Background Information**

The aim of this project is to expand our understanding of the physics of droplet impact on to structured surfaces (including fabrics). The objective is to develop new ways to avoid liquid penetration within fabrics and/or force liquids to spread over the fabric surface. Additionally, we also look at studying the impact of liquids on to structured surfaces. In this project, we aim to design, construct and test experimental rigs to carry out well-controlled experiments where the dynamics of liquid droplets impacting upon a variety of substrates are obtained by high-speed high-resolution imaging in terms of the substrate and droplets characteristics.

REDACTED protective clothing consists of two layers, an outer fabric with an oil and water repellent finish (currently based on fluorocarbons) and an inner carbon based layer to adsorb any chemical vapour that passes through the suit. With increasing environmental changes around the use of fluorinated materials in this manner there is a desire to investigate other ways of providing liquid repellency at textile surfaces. This could include structuring the textile to modify the interaction of the liquid with the surface.

Previous work undertaken by REDACTED has shown that droplets of liquid are able to penetrate fabrics regardless of the liquid repellent finish applied if sufficiently rapid droplets fall on it. Properties of the fabric which effected the penetration of liquid include

- pore size,
- droplet diameter,
- speed of impact.

Droplet impact can also lead to bouncing or to the droplet remaining "captured" within the fabric structures. Indeed, the dynamics of impacting droplets are known to depend on substrate characteristics such as roughness, heterogeneities, and chemistry, and on the liquid properties at the relevant microsecond time scales.

1.2	**Requirement**

- Design, construct and test experimental rigs to carry out well-controlled experiments where the dynamics of liquid droplets impacting a variety of substrates are obtained by high-speed high-resolution imaging in terms of the substrate and droplets characteristics.
- Expand understanding of the physics of droplet impact on to structured surfaces (including fabrics).
- Develop new ways to avoid liquid penetration within fabrics and/or force liquids to spread over the fabric surface.
- Study the impact of liquids on to structured surfaces.

Payment Plan

Progress payment 1: end of PhD Year 1 (proposed end Sept 2022)

Progress payment 2: end of PhD Year 2 (proposed end Sept 2023)

Milestone 1: PhD Thesis – on completion of PhD Year 3 (proposed end Sept 2024)

NOTE: Payment will be annually in arrears, and upon satisfactory completion of all deliverables at the end of each PhD Year.

Additional Definitions

"PHD Year"   A consecutive twelve (12) Month period during the Term, commencing on the date that the Authority formally confirms approval of the student in writing.

Research Workers

Supervisor – REDACTED

Student – REDACTED

1.3	**Options or follow on work** *(if none, write 'Not applicable')*
	N/A

1.4	**Contract Management Activities**
	N/A

1.5	**Health & Safety, Environmental, Social, Ethical, Regulatory or Legislative aspects of the requirement**
	Work is expected to be carried out in line with REDACTED requirements and good laboratory practice.

1.6	Deliverables & Intellectual Property Rights (IPR)					
Ref.	Title	Due by	Format	Expected classification (subject to change)	What information is required in the deliverable	IPR Condition
I - 1	Quarterly Progress and Technical Review (QPTR 1)	Quarterly	Presentation (.pptx) or written report	Official	Presentation pack to include but not limited to: • Update on technical progress • Risks/issues.	Default RCloud Agreement Terms and Conditions shall apply
D - 1	Final PhD Thesis	T0+3 years	PDF or similar	Official	Final copy of thesis after approval by external examiners and the university	Default RCloud Agreement Terms and Conditions shall apply

1.7	**Deliverable Acceptance Criteria**
	Production of a PhD thesis at a standard recognised by the university and relevant external examiners.

2	**Evaluation Criteria**	
2.1	Method Explanation	
	Evaluating this based on technical compliance and affordability	Pass/Fail
2.2	Technical Evaluation Criteria	
	Does the bid fully meet the Statement of Requirement.	Pass/Fail
2.3	Commercial Evaluation Criteria	
	Tenderer has submitted a commercially compliant bid. Firm priced version submitted within budget Labour rates and price as per rates uploaded to R Cloud Completion of Research Workers Forms Completion of Statement Relating to Good Standing	Pass/Fail Pass/Fail Pass/Fail Pass/Fail