
 CEMILAC	<p style="text-align: center;"><b>Type Approval Data Sheet of</b>  <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b>,  “FR-AGS- Mk-VI-MG-01-00 to 05”</p>	<p><b>Appendix A to</b>  <b>TA No.: XXXX</b></p> <hr/> <p><b>Page 1 of 13</b></p>
---	---	---

Sl. No.	Description	Details/ Document Reference
1	<b>Product Name</b>	FR –ANTI ‘G’ SUIT Mk-VI (PU bladder) (for 5 variants)
2	<b>Part number<sup>1</sup></b>	FR-AGS-Mk-VI (PU)-MIG-01-00 TO -05-00 FR-AGS-Mk-VI (PU)-JAG-01-00 TO -05-00 FR-AGS-Mk-VI (PU)-MIR-01-00 TO -05-00 FR-AGS-Mk-VI (PU)-SU30-01-00 TO -05-00 FR-AGS-Mk-VI (PU)-HK-01-00 TO -05-00
3	<b>Name &amp; address of Design &amp; Development Agency<sup>2</sup></b>	Defence Bioengineering & Electromedical Laboratory (DEBEL), Bangalore-560093
4	<b>Name and Address of the Manufacturing agency<sup>3</sup></b>	M/s Arnaf Futuristic Technologies (P) Ltd., H-43,Cannaught Circus, New Delhi-110001
5	<b>Brief Product end use application (about 10 words)</b>	To provide protection from +Gz forces during combat manoeuvres throughout the flight envelope of the aircraft.
6	<b>Technical Specification<sup>4</sup></b>	DEBEL/64 Rev 4 & DEBEL/50 Rev 4 dt May 2017
7	<b>Drawing Applicability List (DAL) / Master Drawing Index (MDI) and Bill of Materials (BOM)<sup>5</sup></b>	MDI: DBL/MDI/6/FR AGS Mk-VI(PU) dt. 23 <sup>rd</sup> Aug 19 <b>(Enclosed at Annexure-4.3)</b> BOM:DBL/BOM/6/FR AGS Mk-VI(PU) dt. 23 <sup>rd</sup> Aug 19 <b>(Enclosed at Annexure-4.4)</b>
8	<b>Standard of Preparation (SOP)/ <a href="#">Approved Component Build Standard (ACBS)</a><sup>6</sup></b>	DBL/ACBS/6/FRAGS Mk-VI(PU) dt. 23 <sup>rd</sup> Aug 19 <b>(Enclosed at Annexure-4.5)</b>
9	<b>Qualification Test Schedule (QTS)<sup>7</sup></b>	DEBEL/TS/25/FR AGS Mk-VI pu Rev 4/May 2017 <b>(Enclosed at Annexure-4.7)</b>
10	<b>Qualification Test Report (QTR)<sup>8</sup></b>	DBL/SOC-02/FR AGS Mk-VI (PU)/2015 dt. July 2015 <b>(Enclosed at Annexure-4.8)</b>
11	<b>Provisional Clearance &amp; renewals / extensions (PC)<sup>9</sup></b>	<b>(Enclosed at Annexure-4.13)</b>
12	<b>Any other relevant information</b>	

 CEMILAC	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , “FR-AGS- Mk-VI-MG-01-00 to 05”	<b>Appendix A to</b> <b>TA No.: XXXX</b> <hr/> <b>Page 2 of 13</b>
---	---	--


### Qualification Test Schedule Compliance Statement

(As per QTS Reference No. DEBEL/TS/25/FR AGS Mk-VI PU Rev 4/May 2017, Issue-Nil, dt.: May 2017)


#### HIGH PERFORMANCE META-ARAMID FABRIC USED FOR OUTER GARMENT

Nature of Material : Meta-aramid      Colour : Sage green / as agreed by user

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
1.	Para 13/ sl.1 (Appendix 1)	Weight	180 gsm $\pm$ 5 %	Complied
		Breaking strength (i) Warp (ii) Weft	1600N (163.1kgf) min. 1300N (132.5kgf) min.	Complied
		Tongue Tear strength (i) Warp (ii) Weft	100N (10.2kgf) min. 90N (9.2kgf) min.	Complied
		Air permeability	2.5 cc/cm <sup>2</sup> /sec, min	Complied
		Weave	2/2 twill	Complied
		Colour fastness to 1. <u>Light</u> ii) <u>Washing</u>	Rating : 5 or better	Complied
		1. Change shade in 2. Staining on cotton  iii) <u>Perspiration</u> a) Change in shade	Rating 4 and above Rating 4 and above  Rating 4 and above (Acid and alkaline)	

 CEMILAC	<p align="center"><b>Type Approval Data Sheet of</b>  <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b>,  “FR-AGS- Mk-VI-MG-01-00 to 05”</p>	<p><b>Appendix A to</b>  <b>TA No.: XXXX</b></p> <hr/> <p><b>Page 3 of 13</b></p>
---	--	---

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
		b)Staining on cotton	Rating 4 and above (Acid and alkaline)	
		Flammability a) Char length b) After Glow c) After flame	89mm, max. 7 s, max. Nil s	Complied

 <p>CEMILAC</p>	<p style="text-align: center;"><b>Type Approval Data Sheet of</b>  <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b>,  “FR-AGS- Mk-VI-MG-01-00 to 05”</p>	<p><b>Appendix A to</b>  <b>TA No.: XXXX</b></p> <hr/> <p><b>Page 4 of 13</b></p>
---	---	---

### PU COATED NYLON FABRIC USED FOR INFLATABLE BLADDER SYSTEM

Base material: Nylon 6 / 66      Coating material : PU on one side

Colour of coated fabric : Yellow or as agreed by user




CEMILAC

**Type Approval Data Sheet of**  
**“FR ANTI 'G' SUIT Mk-VI(PU bladder)”**,  
 “FR-AGS- Mk-VI-MG-01-00 to 05”

**Appendix A to**  
**TA No.: XXXX**

**Page 5 of 13**

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13/ sl.2 (Appendix 2)	Weight	7.26 oz/sq yd =245g/m <sup>2</sup> ± 5%	Complied
		Breaking strength One direction Other direction  After humid ageing, One direction Other direction	200 lb/inch =35.71 kg/cm, min 170 lb/inch =30.35 kg/cm, min  160 lb/inch=28.56 kg/cm, min 136 lb/inch=24.27 kg /cm , min	Complied
		Tearing strength One direction Other direction	25 lb/inch=4.46 kg /cm, min 20 lb/inch=3.57 kg /cm, min	Complied
		Coating adhesion	200 lb/inch, =35.71 kg/cm, min	Complied
		Colour fastness 1. To light a)change in colour	R5, min	Complied
		2. To water a)Change in colour b)Degree of staining	R5, min  R5, min	Complied
		Blocking	Scale rating - 2	Complied
		Low temperature effect	No cracking, flaking or separation after the test	Complied
		Bond strength (bladder)	not less than 40 pounds (18.2kg)	Complied

 CEMILAC	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , “FR-AGS- Mk-VI-MG-01-00 to 05”	Appendix A to TA No.: XXXX  Page 6 of 13
---	---	---

### BASE FABRIC USED FOR PU COATING


Nature of Material : Nylon 6 / 66

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13/ sl.3 (Appendix 2)	Weave	Plain	Complied
		Weight	4.22 oz/sq yd = 140g/m <sup>2</sup> ±5%	Complied
		Breaking strength  One direction  Other direction	94lb/inch=16.78 kg/cm, min  144 lb/inch= 25.71 kg/cm, min	Complied
		Tear strength  One direction  Other direction	22 lb / inch= 3.92 kg/cm, min  19 lb / inch= 3.39 kg/cm, min	Complied

### NYLON SLOTTED TAPE

Nature of Material : Nylon 6 / 66

Colour: OG / Sage green / as desired by user

 <b>CEMILAC</b>	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , <b>“FR-AGS- Mk-VI-MG-01-00 to 05”</b>	<b>Appendix A to</b> <b>TA No.: XXXX</b> <hr/> <b>Page 7 of 13</b>
--	--	--

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13/ sl.3 (Appendix 3)	Width	25±1 mm	Complied
		Breaking strength	300 kgf, min	Complied
		Distance between slots	1-1.5 cm	Complied
		Length of slot opening	1-1.5 cm	Complied
		Breaking strength of weft threads strip between the slot opening	65 Kgf, min	Complied
		Colour fastness to  1. Light  ii) Washing  iii) Perspiration	Rating 4 and above  Rating 4 and above  Rating 4 and above	Complied

**(a) LDPE SPIRAL**

**SEPARATOR IN THE INFLATABLE BLADDER BODY PORTION**

( for thigh and calf bladders )

Material : LDPE



CEMILAC


**Type Approval Data Sheet of**  
**“FR ANTI 'G' SUIT Mk-VI(PU bladder)”**,  
“FR-AGS- Mk-VI-MG-01-00 to 05”

Appendix A to  
TA No.: XXXX

Page 8 of 13

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13/ sl.4 (Appendix 4)	Outer diameter	1.0±0.05 cm	Complied
		Thickness of spiral	2.0 ±0.05 mm	Complied
		Tensile strength	150 kg/cm <sup>2</sup> , min	Complied
		Elongation at break	350 %,min	Complied
		Accelerated aging for 72 hrs at 70°C temperature	1. Change in tensile strength not more than 20% from original. 2. Change in elongation at break not more than 25% from original.	Complied
		Resistance to cold	The rubber sheet shall withstand a bending test around a steel pin of 6.0 mm in diameter without cracking after an exposure of 5 hours at (minus) -35°±10°C	Complied



 <b>CEMILAC</b>	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , “FR-AGS- Mk-VI-MG-01-00 to 05”	<b>Appendix A to</b> <b>TA No.: XXXX</b> <hr/> <b>Page 9 of 13</b>
--	---	--

**(b) METALLIC SPRING**

**IN THE INFLATABLE BLADDER HOSE PORTION**

( one end connected to LDPE spiral and other end to connector )

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13/ sl.4 (Appendix 4)	Material and dimensional requirements	As per specification No. DEBEL/64 Rev 4 Issue 'C'.	Complied

**FR ZIPPERS ( SLIDE FASTENERS )**

The specification of zippers shall conform to **BS:3084** and the FR performance shall meet the requirements given in the table below:


Tape material : Meta-aramid

Tape colour: Sage green / as desired by user

Teeth & Slider colour: Antique finish or as agreed by user

Variety : No.5 zippers for thigh pockets and No.10 zippers ( LH / RH ) for all others

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13/ sl.5 (Appendix 5)	Flame Retardancy  Char Length Avg. After flame After Glow	85 mm, max  Nil s, max  7 s, max	Complied

 <b>CEMILAC</b>	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , “FR-AGS- Mk-VI-MG-01-00 to 05”	<b>Appendix A to</b> <b>TA No.: XXXX</b> <hr/> <b>Page 10 of 13</b>
--	---	---

### FR HOOK & LOOP FASTENER (VELCRO)

The specification of Hook and Loop fastener shall conform to **IS 8156** and the flame Retardance performance shall meet the requirements given in the table below:


Colour: Sage Green / as desired by user

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13.1/ sl.6 (Appendix 6)	Flame Retardancy		
		(a) <b>Hook</b>		
		Char Length, Avg.	89 mm, max	
		After flame	Nil, s	
		After Glow	7s, max	Complied
		(b) <b>Loop</b>		
		Char Length, Avg.	89 mm, max	
		After flame	Nil s	
		After Glow	7s, max	

### TAPE NYLON 19mm

Material : Nylon 6 / 66

Colour: OG / Sage green / as desired by user

 CEMILAC	<p align="center"><b>Type Approval Data Sheet of</b>  <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b>,  “FR-AGS- Mk-VI-MG-01-00 to 05”</p>	<p><b>Appendix A to</b>  <b>TA No.: XXXX</b></p> <hr/> <p><b>Page 11 of 13</b></p>
---	--	--

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13.1/ sl.7 (Appendix 7)	Width	19 ±1.0 mm	Complied
		Thickness	0.5 - 0.8 mm	Complied
		Mass	6 g/m, max	Complied
		Breaking strength (full width with 20cm between grips)	80kgf, min	Complied
		Elongation at break	35 - 45 %	Complied
		Dye fastness to i) Light  ii) Washing	5 or better  No colour bleeding on white cotton / white wool	Complied

TAPE NYLON 8mm

Material : Nylon 6 /66

Colour: OG / Sage green / as desired by user




CEMILAC

**Type Approval Data Sheet of**  
**“FR ANTI 'G' SUIT Mk-VI(PU bladder)”**,  
“FR-AGS- Mk-VI-MG-01-00 to 05”

Appendix A to  
TA No.: XXXX

Page 12 of 13

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13.1/ sl.8 (Appendix 8)	Width	8 -10 mm	Complied
		Thickness	1±0.2 mm	Complied
		Mass	620 g/100m, max	Complied
		Breaking load (full width with 20cm between grips)	200 kgf, min.	Complied
		Elongation at break	25-35%	Complied
		Weave	preferably rib weave or plain weave	Complied

 <b>CEMILAC</b>	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , <b>“FR-AGS- Mk-VI-MG-01-00 to 05”</b>	<b>Appendix A to</b> <b>TA No.: XXXX</b> <hr/> <b>Page 13 of 13</b>
--	--	---


### FR SEWING THREAD

Material: Aramid  
Colour: Sage Green / as desired by user


SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13.1/ sl.9 (Appendix 9)	Breaking strength	5000 gm	Complied
		Colour fastness to light grade	3	Complied
		Colour fastness to washing 1. Change shade in 2. Staining on cotton	4 or better 4 or better	Complied
		FR properties* 1. Melting 2. Dripping	Neither melt nor drip	Complied

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13.1/ sl.10	Adjustable lacing : Nylon braided cord	BS 68 kgf, min (IS:4437 Variety No.5)	Complied

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13.1/ sl.11	Hose connector assy compatibility	dimensions as per drawing & compatibility to the PEC of Hawk aircraft	Complied


 CEMILAC	<p style="text-align: center;"><b>Type Approval Data Sheet of</b>  <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b>,  “FR-AGS- Mk-VI-MG-01-00 to 05”</p>	Appendix A to TA No.: XXXX
		Page 14 of 13

SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
	Para 13.2.1	SOP	Dimensions as per drawings attached to specification No.DEBEL/50 Rev 4 dt May 2017 for FR anti G suit (PU) Hawk	Complied

 CEMILAC	<p style="text-align: center;"><b>Type Approval Data Sheet of</b>  <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b>,  “FR-AGS- Mk-VI-MG-01-00 to 05”</p>	Appendix A to TA No.: XXXX  Page 15 of 13
---	---	--

### **FUNCTIONAL TESTS**


SL No.	Type Test Schedule Clause No.	Name of The Test	Requirement	Compliance Status/ Remarks
1.	Para 13.3 (Appendix '10')	Leakage test	When the bladder of the Anti 'G' suit is inflated to a pressure of 12 psi, the bladder shall not lose more than 0.5 psi of air pressure in 60 seconds	Complied
	Para 13.3 (Appendix '11')	Inflation time test	With a free airflow of 10 cubic feet per minute and with a backpressure of 9 to 12 psi applied from the pressure source, the Anti 'G' suit shall inflate to a pressure of 8psi in not more than 3 seconds.	Complied
	Para 13.3 (Appendix '12')	Endurance test	When the Anti 'G' suit is inflated 1,000 times to a pressure of 15psi, the suit shall not develop any structural defects and shall meet the requirements of visual inspection, dimensional check and leakage test.	Complied
	Para 13.3 (Appendix '13')	Bond strength (bladder) test	The force required to separate the bonded bladder halves shall be not less than 40 pounds (18.2kg)	Complied

 CEMILAC	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , “FR-AGS- Mk-VI-MG-01-00 to 05”	<b>Appendix A to</b> <b>TA No.: XXXX</b>
		<b>Page 16 of 13</b>

### **ENVIRONMENTAL TESTS**


<b>SL No.</b>	<b>Type Test Schedule Clause No.</b>	<b>Name of The Test</b>	<b>Requirement</b>	<b>Compliance Status/ Remarks</b>
1	Para 13.4 (Appendix '14')	Low temperature storage test	The Anti 'G' suit shall not be adversely affected by storage at a temperature of - 60°F (-50°C)	Complied
2	Para 13.4 (Appendix '15')	High temperature storage test	The Anti 'G' suit shall not be adversely affected by storage at a temperature of + 160°F (+70°C)	Complied
3	Para 13.4 (Appendix '16')	Mould growth test	There shall be no mould growth on the anti G suit when tested as per test method given ( adapted from JSS 55555, Test No. 21 Temperature - 29±1°C, RH – 90%, Period: 28 days).	Complied



 CEMILAC	<b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”</b> , “FR-AGS- Mk-VI-MG-01-00 to 05”	<b>Appendix A to</b> <b>TA No.: XXXX</b>  <b>Page 17 of 13</b>
---	---	---

### **Note**

1. Part number shall be unique to the product type approved (as in Provisional Clearance) and shall not be changed even if the product undergoes modifications in due course. In exceptional cases where the form, fit and function of the product is affected due to major modifications arising due to end use requirements, the modified product shall be taken up for supplementary type approval with a new part number. The extent of modification and the incremental qualification required for supplementary TA shall be evolved in consultation with RCMA and adequately documented as supplementary type record.
2. Generally, IPR rests with D&D agency and D&D agency(ies) shall be responsible for any Design changes, Modifications, Defect Investigations, Repair schemes, Lifting studies, etc., that may arise during the life cycle. Anything contrary to the above shall be explicitly captured in the TOT document duly approved by CEMILAC.
3. Manufacturer can be D&D agency itself or maybe a development partner during D&D phase or any other agency that may acquire manufacturing rights based on TOT from the D&D agency. Although multiple agencies may manufacture the type approved item with same part number, the product label should adequately capture the name and address of the manufacturer for traceability.
4. All technical specifications shall be approved and authenticated by RCMA. Partial compliance and Deviations to Technical specifications are generally NOT acceptable. However, in exceptional cases the product deviations to the technical specification shall be adequately captured and included in the type approval data sheet duly concurred by RCMA.
5. The DAL and MDI shall be updated whenever there are issue changes and/ or modifications to the product. The same shall be approved by RCMA and taken up for incorporation in the type record and TA certificate at the time of subsequent TA renewal.
6. The product build standard shall be completely defined in the SOP/ ACBS document incorporating the latest issues of the applicable DAL/ MDI and Modifications that may be approved during the product lifecycle. The mod leaflets duly approved by RCMA shall be the authority for incorporating such changes till the amendment cum renewal to the TA is issued.
7. QTS shall capture the type certification test requirements in totality and shall be approved by RCMA.
8. QTR shall adequately capture the Compliance to QTS requirements and shall be vetted by DGAQA. DGAQA to coordinate all the Test reports carried out as per the QTS. Any deviations to test procedures and results shall be addressed completely and accepted by RCMA before recommending for type approval.
9. The renewal and validity and PC shall comply with relevant CEMILAC directives. The Type Approval issued supercedes all earlier PCs issued to the product. Even if the product undergoes modification that warrant field evaluation feedback, fresh PC shall not be issued.
10. D&D agency shall follow suitable Configuration Control mechanism (Document reference number, Issue/ version numbers, Sections, Page numbers, dates) for easy identification and traceability of all the above documents and their subsequent updates from time to time.

 CEMILAC	<p style="text-align: center;"><b>Type Approval Data Sheet of</b> <b>“FR ANTI 'G' SUIT Mk-VI(PU bladder)”,</b> “FR-AGS- Mk-VI-MG-01-00 to 05”</p>	<p><b>Appendix A to</b> <b>TA No.: XXXX</b></p> <hr/> <p><b>Page 18 of 13</b></p>
---	---	---

\*\*\*\*\*