Deutscher Ultraleichtflugverband e. V. | www.dulv.de

Tel. 07192 - 930 14 0 | Fax 930 14 39 | info@dulv.de

Type Certification – Information for applicants

This document provides basic information about the Type Certification process and answers the most frequent asked questions. It does not contain any acceptable means of compliance or detailed information about methods used in the certification process yet.

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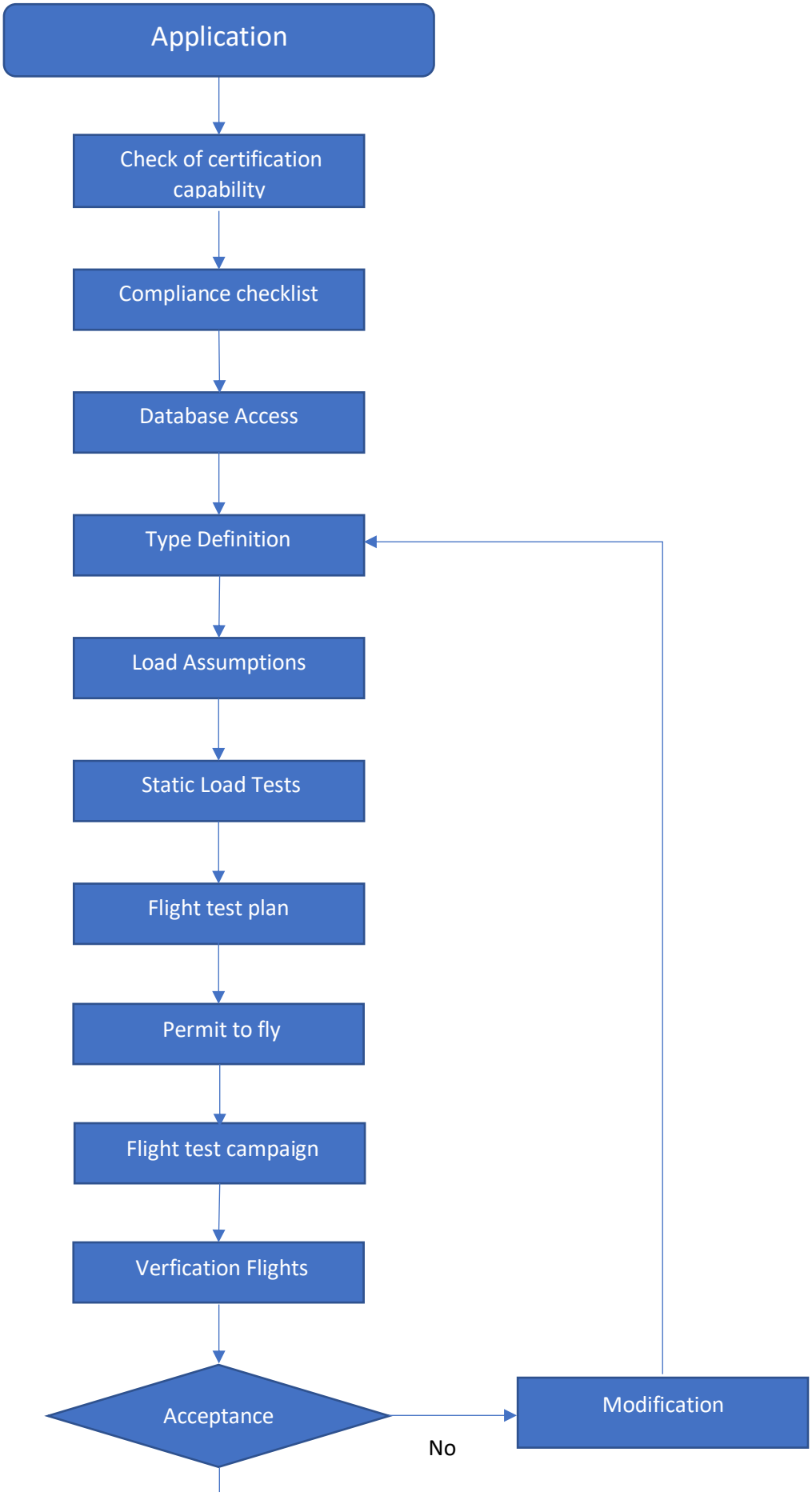
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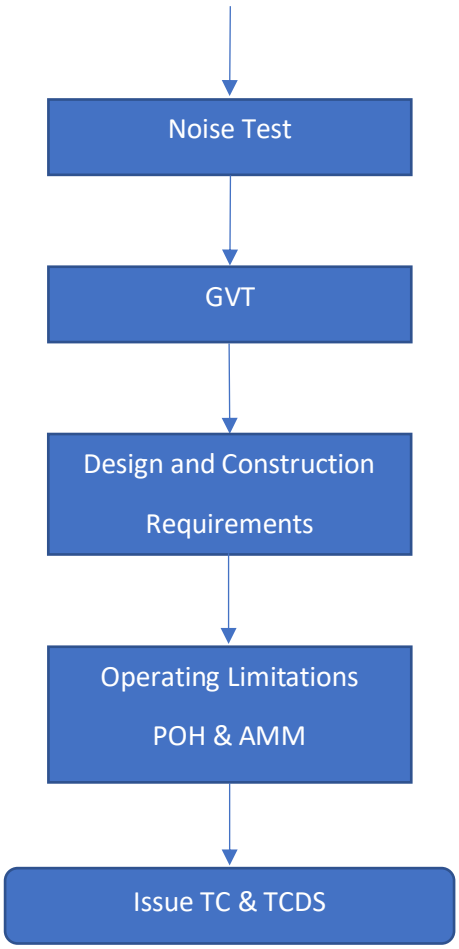
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1 List of Revisions

Rev.	Date	Description	Author(s)	Affected Sections/pages
00	15.03.2022	DRAFT	Benedikt Glock	all

2 Certification Process – Flow chart




Noise Test
GVT
Design and Construction Requirements
Operating Limitations POH & AMM
Issue TC & TCDS

3 Description of the several steps of the certification process

3.1 Application

To start the certification process please fill in the application you may find on the DULV Website in German1 and English2 language:

1) https://www.dulv.de/sites/default/files/Downloads/musterzulassung_24.PDF

2) https://www.dulv.de/sites/default/files/Downloads/musterzulassung%20englisch%2016.pdf

The filled in application form can be provided to the DULV via mail or E-Mail to info@dulv.de or directly to the responsible technician Benedikt Glock (bglock@dulv.de).

In combination with the application please provide some general information about the project and the company.

3.2 Check of certification capability

The DULV is interested to perform a successful certification process with the goal to issue a type certificate. For this the DULV want to make sure that a positive outgoing of the process is likely and possible to avoid producing costs without positive results. Please check the following key points which describe some of the main obstacles which might occur during a certification process:

- the certification costs caused by the DULV are between 10.000 € and 30.000 € depending on the necessary working hours of the DULV engineer and travel costs.
- during the static load test campaign one complete aircraft structure may be destroyed because of the necessity of ultimate load tests
- the certification process requires personal which is experienced in certification work, preparing load assumptions, testing and documentation
- the aircraft might not comply with all requirements of the LTF-UL (German airworthiness requirements for ultralight aircrafts) causing design changes, repetition of tests and extension of the certification process
- previous certification process took between 4 and 12 months

3.3 Compliance Checklist

The applicant must hand in a compliance checklist to start the certification. The compliance checklist provides the authority an overview and is a guideline throughout the whole certification process. The basis of this checklist is the LTF-UL 2020 and describes how each requirement will be proven. To describe the means of compliance the MOC-List published by the EASA can be used:

TYPE OF COMPLIANCE	MEANS OF COMPLIANCE		ASSOCIATED COMPLIANCE DOCUMENTS
ENGINEERING EVALUATION	MoC 0	Compliance Statement	
	MoC 0.1	Reference to Type Design documents	*Type Design documents*
	MoC 0.2	Election of methods, factors	*Recorded Statements*
	MoC 0.3	Definition	
	MoC 1	Design review	*Descriptions, Drawings*
	MoC 2	Calculation / analysis	*Substantiation*
	MoC 3	Safety Assessment	*Safety Analysis*
TESTS	MoC 4	Laboratory Tests (samples and A/C sub-assemblies)	*Tests Programmes*
	MoC 5	Ground Tests on A/C (Static & Dynamic tests)	*Test Report*
	MoC 6	Flight Test	*Test Interpretations*
	MoC 8	Simulation	*Mathematic models*
INSPECTION	MoC 7	Inspections	
	MoC 7.1	Conformity Inspection	*Inspection Records*
	MoC 7.2	Aircraft Inspection	
EQUIPMENT QUALIFICATION	MoC 9	Equipment Qualification	*Equipment qualification is a process which may include all previous means of compliance*

Any other method to describe the means of compliance is acceptable. Please prepare this list, containing every paragraph of the LTF-UL 2020, also those which might not be applicable on your aircraft. In this case add the note “not applicable” and an explanation. The compliance checklist must be provided in PDF.

3.4 Data base access

DULV uses a data base to prepare basic load assumptions and archiving compliance documents. You will receive an online access to fill in basic performance data and geometric dimensions of your aircraft. One base of those aircraft parameters DULV will prepare simplified load assumptions to verify the load assumptions by the applicant.

3.5 Type Definition

The aircraft design, structure including control system and each necessary part, must be defined with part lists and corresponding drawings. For Wing, fuselage, tail unit and the control system assembly plans must be provided. Composite structures must be described detailed with layer plans and productions description. The type definition is an ongoing process during the certification and doesn´t have to be delivered by the beginning of the process but must be defined the latest, when the load tests campaign has started. The authority can permit exceptions.

Note: The defined type design is the basis of the type certificate. Without a detailed design definition, a type certification process is useless. During the whole certification process, design changes must be recorded and evaluated with regards to the impact on previous and following tests. This procedure must be continued also after the type certificate is issued to maintain the certificate which is always based on one specific type design.

3.6 Load Assumptions

The applicant must provide load assumptions as a basis for the proof of strength of the aircraft structure. The loads must be calculated according to the requirements of the LTF-UL. For the most part of the load requirements LTF-UL doesn’t provide specific methods to calculate the loads why the applicant has to freedom to use suitable recognized methods as the AMC of European and US-American airworthiness requirements unless these methods result in lower loads than required in

the LTF-UL. Details will be evaluated by the DULV. The decision of acceptance of the load calculations, methods and assumption belong to DULV.

Note: To enable the DULV engineer the evaluation of the load calculation, aircraft parameter, descriptions of the methods and the detailed calculations you do to reach the loads which will be applied on the aircraft structures must be shown in the document. The document must be provided in PDF.

Under 3.6.1 you can find all applicable load calculation requirements. Those requirements which are not applicable on your aircraft must be also part of the compliance document and marked as “not applicable”

3.6.1 Applicable Requirements

- LTF-UL 23
- LTF-UL 25
- LTF-UL 29
- LTF-UL 301
- LTF-UL 321
- LTF-UL 331
- LTF-UL 333
- LTF-UL 335
- LTF-UL 337
- LTF-UL 341
- LTF-UL 345
- LTF-UL 361
- LTF-UL 363
- LTF-UL 395
- LTF-UL 397
- LTF-UL 399
- LTF-UL 405
- LTF-UL 411
- LTF-UL 421
- LTF-UL 423
- LTF-UL 425
- LTF-UL 427
- LTF-UL 441
- LTF-UL 443
- LTF-UL 444
- LTF-UL 447
- LTF-UL 455
- LTF-UL 471
- LTF-UL 473
- LTF-UL 479
- LTF-UL 481
- LTF-UL 499
- LTF-UL 561
- LTF-UL 597

- LTF-UL 659
- LTF-UL 785
- LTF-UL 787
- LTF-UL 965

Applicable LTF-UL Appendices must be checked for load requirements:

- LTF-UL Appendix I
- LTF-UL Appendix II
- LTF-UL Appendix III
- LTF-UL Appendix IV

3.6.2 Certification procedure for engines

Different to what its common procedure in certifying aircrafts with EASA ultralight aircraft must not be equipped with a certified engine. The certification of the engine itself and corresponding engine periphery is part of the general certification process. The basic requirements for the engine are described in LTF-UL 901 and LTF-UL 903.

3.7 Test plan for static load tests

After the acceptance of the load calculation these loads must be used to prepare the load test program, which describes which loads will be tested and which safety factors and additional safety factors will be used. The proper use of the factors is described in LTF-UL 303. The test loads described in the load test program must be referred to the load calculation document, especially if more load cases are possible. In addition to this the load test program must contain information about the test equipment, as scales, weights, and measurement tools, as well as the exact description how the tests will be performed and the pictures or sketches of the experimental setup. Functional tests described in LTF-UL 655 and LTF-UL 683 must be part of the load test program.

Note: The load test program must be accepted by the DULV. Load tests performed without the release by the DULV can classified as invalid afterwards.

3.8 Load test campaign

The calculated loads must be applied on the aircraft structure, as described in the load test plan. Most of the load tests are supervised by an DULV engineer – details about which tests can be performed without the supervision will be discussed between applicant and DULV individual for each project. The load tests must be documented with pictures, videos and measurement records if available. The rules for testing are described in LTF-UL 305 and LTF-UL 307. The structure, especially for limit load tests, must be checked for deformation and documented with pictures. The load test results must be provided to the DULV in an additional document. Videos can be sent separately.

Note: In general, the proof of strength for all of the calculated loads is demonstrated by means of a static load test. The acceptance of FEM or stress analysis will be evaluated for every individual case.

3.9 Flight test plan & Permit to fly

When the structural test campaign has been completed successfully the applicant can apply for a permit to fly to perform the flight tests. The applicant can decide to perform the load tests only until limit load to use the prototype for the flight tests, since the ultimate load tests might destroy the

structure. This procedure can cause additional costs as the complete load test program must be repeated for ultimate loads. It is only recommended if the applicant can only provide one structure for the certification process.

To apply for the permit to fly fill in the application form you may find to download from the DULV website via the link:
https://www.dulv.de/sites/default/files/Downloads/antrag_vvz_Erprobung_15_0.pdf

This application form right now is only available in German language. Please note, that with this PTOF only experienced pilots are allowed to be on board. All persons who are listed on the application form must have a German ultralight licence and more than at least 100 flight hours. At this stage of the certification process no customers or investors are allowed at board.

Before the flight test campaign can be started a flight test plan must be handed in, following the same procedure as for the load test campaign. Test methods, test equipment and test descriptions must be described in the flight plan. The flight test plan must be approved by the DULV. 3.8.1 lists up the requirements which must be proven by flight tests. Always refer the specific LTF-UL requirement to the specific test.

3.9.1 Flight test requirements

- LTF-UL 1
- LTF-UL 23
- LTF-UL 25
- LTF-UL 29
- LTF-UL 45
- LTF-UL 49
- LTF-UL 51
- LTF-UL 61
- LTF-UL 143
- LTF-UL 145
- LTF-UL 147
- LTF-UL 155
- LTF-UL 161
- LTF-UL 171
- LTF-UL 173
- LTF-UL 177
- LTF-UL 181
- LTF-UL 201
- LTF-UL 203
- LTF-UL 207
- LTF-UL 233
- LTF-UL 234
- LTF-UL 251
- LTF-UL 629
- LTF-UL 671
- LTF-UL 771
- LTF-UL 773
- LTF-UL 857
- LTF-UL 901

- LTF-UL 903
- LTF-UL 959
- LTF-UL 1041
- LTF-UL 1091
- LTF-UL 1149
- LTF-UL Appendices I - IV

3.10 Flight test campaign

When the flight test plan is accepted by the DULV the flight tests can be performed accordingly. The flight test results must be handed in PDF including all information and measurement data collected in the flight test campaign. All flight tests must be video taped and handed in with the flight test result document. Horizon, pilot action and instruments must be visible in the video. It is important to cut the videos properly to avoid to big files and to name the videos with comprehensible names.

3.11 Verification Flights

The flight test results will be checked by an DULV engineer together with the videos. To verify the flight test results a verification flight will be carried out. The scope of the test is individual, depending on the complexity of the aircraft and the experience of the flight test pilot of the applying aircraft manufacturer. The verification flights will be performed by a DULV flight test pilot normally on an airfield in Germany. The costs of this flights must be carried by the aircraft manufacturer. It is recommended that the responsible flight test pilot and/or engineer is on board during the verification flights. The results will be reported to the applying company.

3.12 Modification

During the certification flights it can happen that the aircraft doesn´t show the required flight behaviour. Structural modifications or limitations of the operational range of the aircraft can be possible. These changes must be carried out to move on with the certification. Structural changes require a revaluation of the load calculation and may require additional load tests. After the revaluation those specific flight tests, where the aircraft did not comply with the requirements, can be performed by manufacturer and reported to the DULV again. Additional verification flights might be necessary.

3.13 Noise Test

To receive the German type certification the aircraft must also comply with the noise requirements. To comply, noise tests must be performed at a certified noise test house in Germany. Please note, that these noise test houses are under the scope and supervision of the German CAA (LBA). DULV does not have any impact on the process, appointments and costs. Also the acceptance of other foreign EASA certified noise test house must be discussed with the CAA of Germany.

To perform the noise tests please choose one of the certified noise test houses listed below:

dream srl Via Cardinal Prisco, 142 80042 Boscotrecase (NA) Italien dreamsrl747@gmail.com	**OUV - Oscar Ursinus Vereinigung e. V.** Schützenstr. 2 72511 Bingen-Hitzkofen Tel. +49 7571 62309 Fax +49 7571 62352	**DLR Braunschweig** **Institut für Entwurfsaerodynamik** **Abteilung Technische Akustik** Postfach 3267 38022 Braunschweig Tel. +49 531 295 2173 Fax +49 531 295 2320	**MT-Propeller Entwicklung GmbH** Flugplatzstr. 1 94348 Atting sales@mt-propeller.com www.mt-propeller.com Tel. +49 9429 94090 Fax +49 9429 8432	**RS Flight Systems GmbH** Oberer Lüßbach 29-31 82335 Berg contact@rs-flightsystems.com www.rs-flightsystems.com Tel. +49 8178 8681 300

Note: DULV can carry out the noise tests up to a take-off mass of 472,5 kg.

3.14 Ground Vibration Test

According to LTF-UL 629, aircrafts with a design speed (V_D) of more than 200 km/h must perform a Ground Vibration Test in addition to the flight flutter tests. It is highly recommended to perform the GVT (Ground Vibration Test) before the flight flutter tests are or other tests at high speeds are performed. Normally GVT´s are performed by institutes of universities and will be accepted by DULV but manufacturers can also perform those tests on their own if the manufacturer is capable of. Note, that structural changes may affect the results of the ground vibration test, why the GVT should not be performed before at least the static load test campaign has been performed successfully.

3.15 Design and Construction requirements

The LTF-UL also contains requirements in design and construction and other ones which can´t be proved by a load or flight test. Those requirements mostly can be proven by simple means like technical drawings, pictures and descriptions. In the following you can find all those requirements are listed up:

- LTF-UL 601
- LTF-UL 603
- LTF-UL 605
- LTF-UL 607
- LTF-UL 609
- LTF-UL 611
- LTF-UL 612
- LTF-UL 627
- LTF-UL 675
- LTF-UL 677
- LTF-UL 679
- LTF-UL 685
- LTF-UL 689
- LTF-UL 697
- LTF-UL 701
- LTF-UL 721
- LTF-UL 773
- LTF-UL 775
- LTF-UL 777
- LTF-UL 779
- LTF-UL 780
- LTF-UL 785
- LTF-UL 786
- LTF-UL 787
- LTF-UL 807
- LTF-UL 857
- LTF-UL 925
- LTF-UL 951
- LTF-UL 955
- LTF-UL 963
- LTF-UL 967
- LTF-UL 971
- LTF-UL 973

- LTF-UL 975
- LTF-UL 977
- LTF-UL 993
- LTF-UL 995
- LTF-UL 1011
- LTF-UL 1013
- LTF-UL 1015
- LTF-UL 1017
- LTF-UL 1091
- LTF-UL 1121
- LTF-UL 1141
- LTF-UL 1145
- LTF-UL 1191
- LTF-UL 1193
- LTF-UL 1301
- LTF-UL 1303
- LTF-UL 1305
- LTF-UL 1307
- LTF-UL 1321
- LTF-UL 1325
- LTF-UL 1337
- LTF-UL 1353
- LTF-UL 1365
- LTF-UL 1431
- LTF-UL 1917
- LTF-UL 1919
- LTF-UL 1923

All information necessary to proof those requirements should be provided in one PDF document. Use the list above as basis for this compliance document. The general compliance check list must include information about the means of compliance for the design and constructions requirements.

3.16 Operating Limitations, POH & AMM

On base of the flight test results and the experience of the certification process the aircraft manufacturer must set the operation limitations and provide this information in the pilots operating handbook. The minimum required information is described in chapter G and H of the LTF-UL. The operating handbook and maintenance manual must be provided to the DULV and is part of the certification. Please fill in the POH-checklist, you can find on our website.

3.17 Type Certificate and Datasheet

DULV will issue the Type Certificate and prepare together with the aircraft manufacturer the corresponding data sheet which will be published in the DULV website. After the final invoice for the certification is balanced the original of the type certificate will be sent to the applicant by registered mail.