Comment Response Document
NPA 22E,F &G 70

After circulation of the NPA, 9 commenters supplied the NPA comment form:

Comments received

- ACG Austria
- CAA Denmark
- CAA Monaco
- CAA United Kingdom
- DGAC/SFACT France
- FAI
- FOCA Switzerland
- GAMTA
- LBA Germany

Review of comments

- ACG Austria, GAMTA, CAA Monaco, CAA Denmark, DGAC/SFACT France and LBA Germany had no comments to offer. They agreed or accepted the proposal.

- CAA UK comments:

1. Layout

The commenter mentioned that the labelling of paragraphs as JAR 22.XX1,.XX2 etc. suggested that water ballast issues are to be lumped together, whereas other proposals suggest integration into existing paragraphs.
The SG accepted the comment. The labelling was amended ("XX" is numbered "89") to fit into the JAR-22 system.

The commenter felt that any limitations should not be included in Subpart H, as this subpart gives a specimen layout for the Flight Manual, . If specific procedures or limitations are to be required, they should be stated in Subpart G.
The SG accepted the comment. The SG discussed how specific the limitations / requirements would have to be and finally decided to word a general requirement under subparagraph JAR 22.1583 (k) that will read:
"Any limitation associated with the carriage of water ballast necessary for safe operation must be furnished."

2. JAR 22.891, Damage due to overpressure during filling

The commenter recommended adding the following paragraph:
"All parts of the water ballast system including the tank, that are subject to filling pressures, must have a proof pressure of 1.33 times, and an ultimate pressure of 2.0 times, the maximum pressure likely to occur during filling."

The SG felt that providing filling procedures were explicit enough, for example specifying funnel filling systems would not be a problem but use of gravity and pump systems could possibly result in tank damage. As a result 22.891 will read "... loads from filling procedures and structural loads ...".

In this context, the SG discussed whether the value of 0.25 bar in 22.892 was a proof or ultimate load condition.
Consulting OSTIV (Mr. Cedric Vernon), the following information was supplied:
The purpose of 22.892 is to define a minimum test pressure for the water ballast tanks. The requirement was drafted with reference to JAR 22.965 Fuel Tanks. The value used in JAR 22.965 for gasoline has to be adapted to the specific weight of water, which gives a multiplier of 1.4.
Water ballast tanks, either integral tanks or bags installed into the wing, are supported by the sailplane structure. So, the value of JAR 22.965 (b), test pressure 0.14 bar for fuel tanks, has been multiplied by 1.4, which gives a minimum test pressure of 0.2 bar for water ballast tanks. This value is a design test value, as stated in JAR 22.965 (b).

3. JAR 22.893 Water Ballast Tank Installation

CAA suggested renumbering (b)(3) as (c), since it deals with integral tanks.
This was accepted by the Study Group.

4. Treatment of ballast asymmetry

The commenter proposed the following amendment to paragraph 22.23(a), taking into account asymmetric load conditions:

(a) The ranges of weight and c.g. within which the sailplane may be safely operated must be established **[**and must include the range for lateral c.g. if possible loading conditions can result in significant variation**]**. Compliance must be shown **[**over the lateral c.g. range and**]** over a **[**longitudinal**]** c.g. range between the foremost limit of the c.g. and 1% of the standard mean chord or 10 mm, whichever is greater, aft of the aftmost limit of the c.g.

AMC 22.23
Significant variations of lateral c.g. are only likely to occur on sailplanes equipped for the carriage of expendable ballast in the wings. Such variations may result from any permitted intentional asymmetric loading or from levels of asymmetric loading which might realistically be expected to occur unintentionally, particularly if flight is permitted with partly-filled tanks. In this case, the range of lateral c.g. considered must not be less than the greater of:-

(1) Any intentional asymmetric loading that is permitted; and

(2) The level of asymmetry that might realistically be expected to occur inadvertently, taking account of the design of the system and the likely accuracy of loading. In the absence of a more rational analysis to establish any greater or lesser value, an asymmetry of 10 litres, or 10% of the combined capacity of each symmetrical pair of tanks, whichever is the greater, may be assumed.

The SG generally agreed with this proposal but felt that it would be a significant change and it might be necessary to call for a further consultation process.

5. Stalling and Spinning

The commenter proposed the following amendment to paragraph 22.201(g), taking into account asymmetric load conditions:

"(g) For sailplanes equipped to carry water ballast, it must be shown that it is possible to regain level flight without encountering uncontrollable rolling or spinning tendencies in the stall demonstration of sub-paragraph (a) of this paragraph with the asymmetry that may result from any single malfunction of the system."

And to amend the second paragraph of JAR 22.221 (a) to read as follows:

"For sailplanes equipped to carry water ballast, the demonstrations of sub-paragraphs (b) to (g) must also be made for the most critical water ballast asymmetry that might occur due to any single malfunction or due to lateral accelerations during a spin."

During SG Meeting No. 48 it was decided to address the CAA comments to 22.201 and 22.221 by introducing them into the NPA and to „state, in the CRD, that it is not intended to carry out the tests with full asymmetry, but with a degree of asymmetry that would be noticed by the pilot and stopped (valves closed). This compromise accepts the additional 1996 CAA words but does not require stalling and spinning tests with full lateral imbalance.“What was the r

6. JAR 22.895(a)(3)

The commenter stated that this paragraph requires the c.g. to remain within the limits established under JAR 22.23 with any single malfunction. It is understood that this refers to longitudinal c.g. in the case of sailplanes which carry ballast in the tail area. This should be stated more clearly to avoid any confusion over treatments of longitudinal and lateral c.g.

The Study Group agreed that paragraph 22.895(a)(2) (was former (a)(3)) should read "... not allow the longitudinal centre of gravity ....."

7. Run-back icing

The commenter proposed to add a further requirement to JAR 22.895(b)(2) to read as follows:

"(2) Consideration must be given to the risk of water released from a ballast tank running back and freezing where it could jam a control surface, or affect mass balancing of controls."

There was considerable discussion on this item over an extended period. Members of the group argued that the requirement for an outside air temperature gauge could be discarded, if the CAA proposal was accepted. Taking into account service experience of water ballast systems over a number of years, as well as the requirement for an air temperature gauge, freezing of control surfaces was not considered to be a high safety risk. The proposal was rejected.

8. 22.1583 Operating limitations

The commenter stated that subparagraph (j) already exists. The additional paragraph should be (k). It was recommended that this reads:

"(k) (1) Any outside temperature/time limitation associated with the carriage of water ballast, including the effect of permitted additives."

Generally, the Study Group accepted the comment. This was already taken care off under item no. 1 of the CAA comments. The Study Group decided to word a general requirement under subparagraph JAR 1583 (k) that will read:
"Any limitation associated with the carriage of water ballast necessary for safe operation must be furnished."

9. Typing errors

The typing errors were accepted by the Study Group. The typing errors were corrected.

– FAI comments

The commenter proposed amending the test pressure value to 0.14 bar to line up with the fuel tank requirement.

Consulting OSTIV (Mr. Cedric Vernon), the following information was supplied:
The purpose of 22.892 is to define a minimum test pressure for the water ballast tanks. The requirement was drafted with reference to JAR 22.965 Fuel Tanks. The value used in JAR 22.965 for gasoline has to be adapted to the specific weight of water, which gives a multiplier of 1.4.
Water ballast tanks, either integral tanks or bags installed into the wing, are supported by the sailplane structure. So, the value of JAR 22.965 (b), test pressure 0.14 bar for fuel tanks, has been multiplied by 1.4, which gives a minimum test pressure of 0.2 bar for water ballast tanks. This value is a design test value, as stated in JAR 22.965 (b).

The commenter proposed to delete JAR 22.895(a)(2), renumber JAR 22.895(a)(3) as JAR 22.895(a)(2) and to amend JAR 22.221 (a) to read:

"Compliance with the following requirements must be shown in all configurations, including the critical imbalance determined under JAR 22.895(a)(1), and ...".

It was agreed that a good solution would be to delete 22.895(a)(2) and renumber JAR22.895(a)(3) and add a suitable IEM after the new paragraph 22.895(a)(2).

- FOCA comments

The commenter assumed that, if the maximum landing weight is less than the maximum take off weight, or if there are certain ballast configurations requested for any specific manoeuvres (e.g. landing), the corresponding limitations must be given on a placard.

JAR 22 does not differentiate between maximum take off weight and maximum landing weight. There is no provision in JAR 22 to cover maximum landing weight. The proposal was rejected.

The next comment concerned the ability of a pilot to detect asymmetry after dumping of water ballast. The commenter recommended requiring a tank indicator to JAR 22.1303(d) or another appropriate safety feature.

The Study Group felt that the tank indicator would be beneficial but not vital as the pilot would normally feel any asymmetry after dumping ballast through the control stick. The proposal was therefore rejected by the group.

Additional comments were provided by the Industry, during the dicussion of the NPA. It was stated by DG Flugzeugbau, that

„the wording „any single malfunction„ under 22.895 (a) (1) and (2) must be understood that the safety requirement for waterballast system are much higher than for all other flight controls.
A single malfunction of the elevator control would cause uncontrollability of the glider which is more severe than a damaged control of e.g. the fin tank system.„

The SG felt that the elevator control is designed in such a safe way that a malfunction has not to be regarded. (This was also the reason for introducing the automatic hook up into JAR 22 for the elevator control, to make it as safe as possible.) Double failures are not considered , so the SG felt that the changes requiring consideration of a single malfunction are adequate.

Braunschweig, 9. October 2000

The NPA had been redistributed after substantial changes. The comments following were received:

- ACG Austria
- CAA Denmark
- CAA Malta
- LBA Germany
- Segelflyget (Swedish Soaring Foundation)
- Verband Deutscher Segelflugzeughersteller e.V.
- EGU
- CAA UK

Review of comments

- The comments were discussed during meeting no. 48 of the S&PS SG. ACG Austria, CAA Denmark and CAA Malta had no comments to offer. They agreed or accepted the proposal.

- **LBA comments:**

(i) If fin water ballast is used to compensate the nosedown moment produced by wing water ballast, or pilot mass, due to safety reasons up to now not more than 80% of the nosedown moment may be compensated. This item is not included in the NPA.

(ii) The demand to operate all valves simultaneously in order to jettison the water ballast cannot be found. (One handle operation; for example as ACJ)

(iii) The Requirement that jettisoning of the fin water ballast must be faster in comparison to the wing water jettisoning could not be found in the NPA (for example as ACJ).

The SG felt that fin water ballast is included in the NPA by implication in 22.895 (a) and the adjacent IEM. The NPA should not be too prescriptive. However, the SG felt that the LBA comments (ii) and (iii) could be added as IEM material to 22.895(a).

If water ballast is carried in more than one tank:

(i) simultaneous release of water ballast should be achieved by a single lever operation.

(ii) the rate of jettison of water ballast shall not result in the centre of gravity moving outside the limitations established under JAR 22.23.

- Segelflyget comments:

Regarding 22.895 (a)(2), the commenter felt that „the requirement is harder than the ones for control systems or locking of the main rigging pins. To fulfill this paragraph, for a fin tank installation, the valve with mechanism and the OAT-gauge must be doubled.„ The commenter proposed to delete the paragraph.

The SG felt that OAT gauge failure does not lead to an unsafe situation per se. However, the comment regarding the single failure of the dump valve is partially true. The point is made that this requirement is 'more stringent than the requirement for the elevator control', which is regarded as the most safety-critical control. The SG felt that the significance of 'single malfunction' needs to be explained. If consequences of failure are catastrophic, then redundancy will be needed. If it can be shown that the failure of the valve results in degraded handling characteristics then this might be acceptable. The SG decided to delete 22.895(a)(2) and change (a)(1) to a single paragraph 22.895 (a):

JAR 22.895 (a) The water ballast control and jettison system shall be designed so that any single malfunction will not produce a lateral or longitudinal movement of the centre of gravity that prevents continued safe flight and landing.

- **Verband Deutscher Segelflugzeughersteller e.V. comments**

The comments address the issue of 'single malfunction' and ask whether a fail-safe design is implied. The comments cover 22.201 and 22.221(a) as well as 22.895(a).

The SG stated that the words of 22.201 and 22.221 were as a result of CAA UK comments made in 1996. It was proposed by the SG that 22.201 and 22.221 should be addressed by leaving the wording of the NPA as it is and state, in the CRD, that it is not intended to carry out the tests with full asymmetry, but with a degree of asymmetry that would be noticed by the pilot and stopped (valves closed). So, the additional 1996 CAA words are accepted but do not require stalling and spinning tests with full lateral imbalance. JAR 22.895 covers the fin tank failure and the continued safe flight and landing in this case. 201 and 221 were intended to cover lateral CG only; the word 'asymmetry' is used in both cases.

Regarding the comments on 22.895 (a) („any single malfunction„), the response given on the comments of „Segelflyget„ was considered to also cover the concerns of the „Verband Deutscher Segelflugzeughersteller e.V.„.

- CAA UK comments

The commenter felt that, although some variation of the load distribution with carriage of water ballast is likely, no reference to the effects of the re-distribution on the flutter/aeroelastic properties of the aircraft is made.

The SG felt that, regarding JAR 22.629, the wording „each configuration„ addresses possible variations, so the comment is considered to be covered by the actual wording in JAR 22.

- EGU comments

During meeting no. 48 of the S&PS SG, Mr Olsson accepted that the EGU comments have been addressed in the comments above.

Braunschweig, July 10th 2002