

FD Equipment Review 2011



REVIEW OF FD HULL, EQUIPMENT & SAILOR CHARACTERISTICS in 2011 Based on data collected from the 130 FDs from 22 Nations which raced in the **FD World Championships 2011 on Lake Garda**



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PREFACE

To ensure fair play during FD racing, a substantial amount of voluntary time and effort is expended by the Class Measurers and the IFDCO Technical Committee to ensure that the Class Rules are kept up to date and to ensure that boats comply with the Class Rules at major events.

It has been the custom of the FD Class for very many years to inspect boats and equipment prior to each major championship. This activity used to be carried out by Cle Jeldes who was for many years the FD Chief Measurer. After each event Cle analysed the data and published it in the FD Bulletin together with the detailed results of each Championship.

In recent years the FD Championship equipment inspection team led by the FD Chief Measurer, under the guidance of IFDCO VP Technical, Peter Hinrichsen, has continued to ensure that boats and equipment are inspected and data is collected and recorded.







As a keen FD sailor I always looked forward to studying this information. In preparing this review I hope that the tradition of producing and publishing this analysis continues.

I apologise in advance for any errors or omissions and would welcome any feedback so that the next FD Equipment Review can be improved.

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-  All the competitors at the FD Worlds in 2011 who provided the data about themselves and their boats, sails and equipment which forms the basis of this review.
-  Peter Hinrichsen, John Best, Paul Hemker and the dedicated team of volunteers who worked heroically to inspect 130 boats at the FD Worlds 2011 and to gather the data.
-  Catherine Best for collating the data, inputting it into a spreadsheet and making the spreadsheet available to me so that I could analyse it and produce this review.
-  The Fraglia Vela Malcesine Race Management team for producing and publishing the race results which I have correlated to the equipment data
-  Susan Burgess for granting permission to use the photographs on the front cover.
-  IFDCO for publishing this review at www.sailfd.org www.sailifdco.com

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FDs racing on Lake Garda at the FD World Championship 2011 - Photos © Susan Burgess
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INTRODUCTION

This document highlights key information about the physical attributes of FD sailors and their choice of equipment based on the information gathered from the sailors competing in the FD World Championship on Lake Garda, Italy in July 2011.

The 130 FDs from 22 Nations together with their equipment and sails were inspected during the three days prior to the start of the Championship and key data including the builders, foil manufacturers and sail makers was recorded. The age of the boats at the Championship has been calculated based on the date recorded as the building date.

The weights and heights of helms and crews were also recorded together with their date of birth. The ages of the helm and crew on the first day of racing has been calculated.

The data has been analysed and the highlights are summarised herein together with various charts so that the information can be shared with the FD sailing community.

The information may be used as a source of reference for those who are interested in sailing statistics or who are looking at the possibility of adopting the FD at local or national level.

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SUMMARY - KEY ATTRIBUTES

Helm/Crew

The FD can be sailed by a very wide range of sailors of different weights, heights and ages. At the Worlds in 2011 ages ranged from 19 to 71 years old and combined age of teams from 43 to 136 years; heights ranged from 160cm to 200cm with combined heights of teams ranging from 262cm to 390cm; weights ranged from 60kg to 120kg and combined weights of helm and crew from 140kg to 210kg

Hulls

FDs built since 1984 remain competitive at top international level. This is due primarily to the introduction of carbon fibre and reduction of tolerances in 1980 which substantially extended the competitive hull life from a few years to over 25 years. During the 1980s Leonhard Mader developed FDs that could win races out of the box. Mader continues to be the dominant boat builder of top quality FDs although in recent years Bogumil has made impressive progress.

Sails

Over the years a very large range of sailmakers have supplied FD sails with varying degrees of success. With the introduction of larger spinnakers and carbon masts, there has been scope for sail development. Many of the old tried and tested successful FD sailmakers barely feature amongst the sails chosen by sailors in 2011.

Boysen Moller, who has won the FD World Championship many times, produced the sails for many of the most successful FD sailors in 2011. Koenig, another FD sailor, also produces many FD sails as does North Sails - both were chosen by sailors in the top 20. Ullman and Bellotti, whilst having relatively few sails within the fleet were chosen by some of the most successful sailors. One Sail spinnakers had some success.

Masts

Most of the fleet has now changed to carbon masts; only one boat in the top 20 had an aluminium mast. Carbon masts continue to evolve and are being produced for FD sailors by a range of suppliers. Whilst Avant Garde and Proctor/Selden masts have the highest numbers within the fleet, there were 6 different mast makers amongst the top 10 boats with Pauger being chosen by the World Champion. SuperSpar and C-Tech each had two boats in the top 20.

Booms

Most of the fleet use Mader, Proctor, SuperSpar or Avant Garde booms. However, Pauger, Selden, Fiberwork were used by a significant proportion of the top 20 boats. SuperSpar had no boats in the top 20 and Proctor only one boat. This would suggest that there is a significant amount of experimentation with booms by the top sailors.

Centreboards

The dimensions of the FD centreboard are constrained and the maximum thickness limits development. Over the years there have been many modifications to the construction of centreboards which are crucial to FD performance. Well over half the fleet use Mader centreboards. Each of the other board makers were used by 10% or less of the fleet. Bogumil boards were used by 20% of the top 20 boats. TEB was used by two boats in the top 20 including the World Champions, the second boat overall used a home made board and half the top 20 used a Mader board.

Rudders

The shape and weight of rudders is controlled. Mader supplied the bulk of the rudders with nobody else supplying more than 10% of the fleet. Within the top 10 boats, Bloodaxe was used by the World Champions and the third placed boat. Mader supplied four boats, Bogumil supplied two boats and FES and Lindsay rudders were used by one boat each.

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Appendix 1

HULLS

FD World Championships 2011

Summary (T10 = Top 10 Overall)

Builders

The main current builders are **Leonhard Mader** and **Bogumil**.

Planatech, a new FD builder, is planning to have an FD at the Worlds in 2012.

Weight

The minimum weight for an FD is 130kg - 24% (T10 - 30%) of hulls were at minimum weight.

The average weight of the fleet was 132.5kg (T10 - 132.26kg)

The heaviest hull was 147.3kg (T10 - 138.3kg)

Age of Hulls

The average age of hull for the fleet was 13.2 years (T10 - 7.4).


32% of the fleet (T10 - 80%) was under 6 years old.


45% of the fleet (T10 - 20%) was over 15 years old.


The oldest boat competing was 34 years old (T10 - 27).


BUILDERS


Builders In Top 30 - Total in Fleet - best overall result

 **Leonhard Mader** - 88 boats (68% of fleet) - 1st and 2nd


 **Bogumil** - 13 boats (10% of fleet) - 3rd, 4th & 5th

 **Steingross** - 5 boats - 7th

 **Vels** - 2 boats - 20th

 **D MacKay** - 1 boat - 26th.

Current Builders


 **Leonhard Mader** - 88 boats (68%) - evenly spread throughout the fleet (T10 - 60% incl 1st & 2nd overall)

 **Bogumil** - 13 boats 10% of the boats (T10 - 30% incl 3rd, 4th & 5th overall).


All the Bogumil boats were under 6 years old and finished in the top 70.

Past Builders (Best result - age of boat)


3 boats or more in fleet


 **Steingross** - 5 boats (7th - 5 years old) - **Moulds now owned by Bogumil.**


 **KDV** built 5 of the boats - (42nd - 21 years old) - all KDV's were between 21 and 26 years old.


 **Hans Mader** built 4 of the boats - (19th in Silver fleet 75th overall - 21 years old) - All were between 21 and 26 years old.

2 boats in fleet

 **Vels** (20th - 15 years old),


 **Haselgrove** (36th - 11 years old)

 **Lindsey** (50th - 26 years old)

 **FES** (55th - 23 years old)

1 boat in fleet

 **D McKay** (26th - 23 years old),

 **Speedwave** (24th Silver Fleet - 20 years old),

 **Herman** (28th Silver Fleet - 13 years old)

 **Cookson** (45th Silver Fleet - 23 years old),

Undertified builders

Eigenbouw (Home made) (57th - 6 years old) and 2 boats in the Silver Fleet

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Appendix 1

Hulls

Summary of Hull Ages & Weights at FD World Championship 2011

Boat Position	Hull Average Age - Years	Hull Newest Age Years	No under 6 years old	No over 15 years old	Oldest Years	Average Hull Weight Kg	Heaviest Hull	Hulls at Min Weight	Mader Hulls	Bogumil Hulls
Top 10	7.4	1	8	2	27	132.26	138.3	3	6	3
11 to 20	6.7	0	6	1	25	131.7	133.1	3	8	1
21 to 30	10.2	2	3	3	23	131.75	134.9	0	8	1
31 to 40	8.6	0	5	2	23	130.8	133	5	6	2
41 to 50	13.9	0	3	6	26	132.25	137	3	6	2
51 to 60	7.9	0	6	2	23	131.8	137	2	6	2
61 to 70	13.0	0	4	6	23	132.09	137.5	2	5	2
71 to 80	10.3	1	3	2	26	132.05	134.5	3	8	1
81 to 90	19.0	5	1	7	26	133.85	137	1	6	0
91 to 100	17.9	1	1	6	27	133	138.5	3	6	0
101 to 110	17.5	5	1	7	26	133.16	147.3	2	8	0
110 to 120	18.1	4	1	5	27	134.09	137	2	6	0
121 to 130	21.0	8	0	8	34	133.45	144.5	2	9	0
Average	13.2	2.1	3.2	4.4	26	132.5	137.7	2.4	6.8	1.1

Age of Hulls

The average age of the fleet was 13.2 years.

The average age of the top 10 boats was 7.4 years.

The top 50 boats included 14 boats over 15 years old and 25 boats under 6 years old.

26 (20%) of the fleet was under 4 years old - 17 finished in the top 50.

23 boats were between 4 and under 8 years old - 13 finished in the top 50

30 boats were between 20 and under 24 years old - 8 finished in the top 50

44% of the fleet was over 15 years old including two boats in the top 10

10% of the fleet was over 25 years old including one boat in the top 10

The 2 boats over 30 years old were in the last ten boats.

There is no need to have a hull under 5 years old to achieve a top 10 position - 6 of the top 10 boats were older.

The more competitive sailors may tend towards having boats less than ten years old for various reasons..such as lower maintenance, more reliable fittings/control systems or psychological factors “newer must be better” and also the top sailors always know somebody who wants to buy a winning boat.

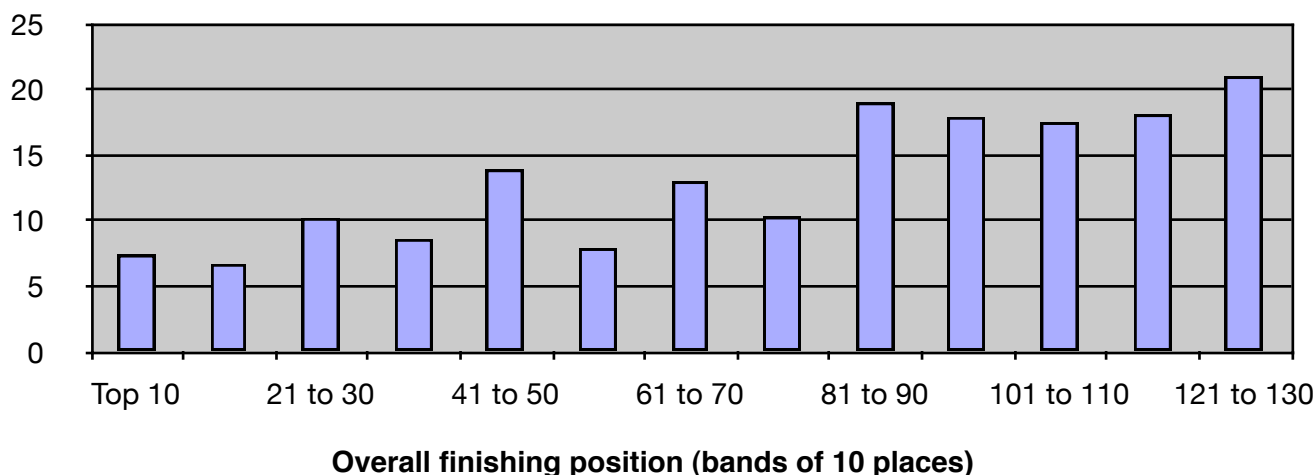
Buying a boat under 5 years old will not bring immediate success - 6 such boats were in the Silver fleet.

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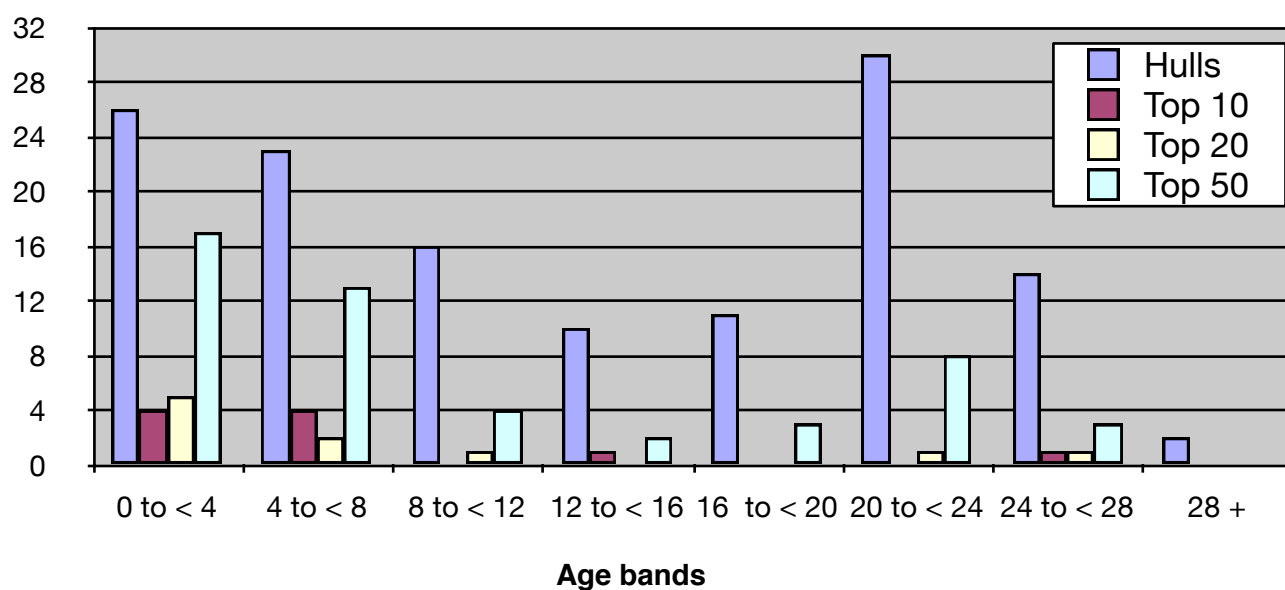
Appendix 1

Hulls

Average Age of Hulls at FD World Championship 2011



Number of Hulls in 4 year age bands at FD World Championship 2011



Weight of Hulls

The average weight of the fleet was 132.5kg (Top 10 - 132.26kg). The minimum weight of a hull is 130 kg.

24% (T10 - 30%) of hulls in the fleet were at minimum weight (130kg) some with correctors.

Nearly all the hulls were under 135kg. The heaviest hull in the top 10 was 138.3kg and the heaviest in the fleet was 147.3kg

There appears to be no significant difference in the performance of the boats based on their hull weight although it would be better to keep under 133kg.

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Appendix 2

SPARS

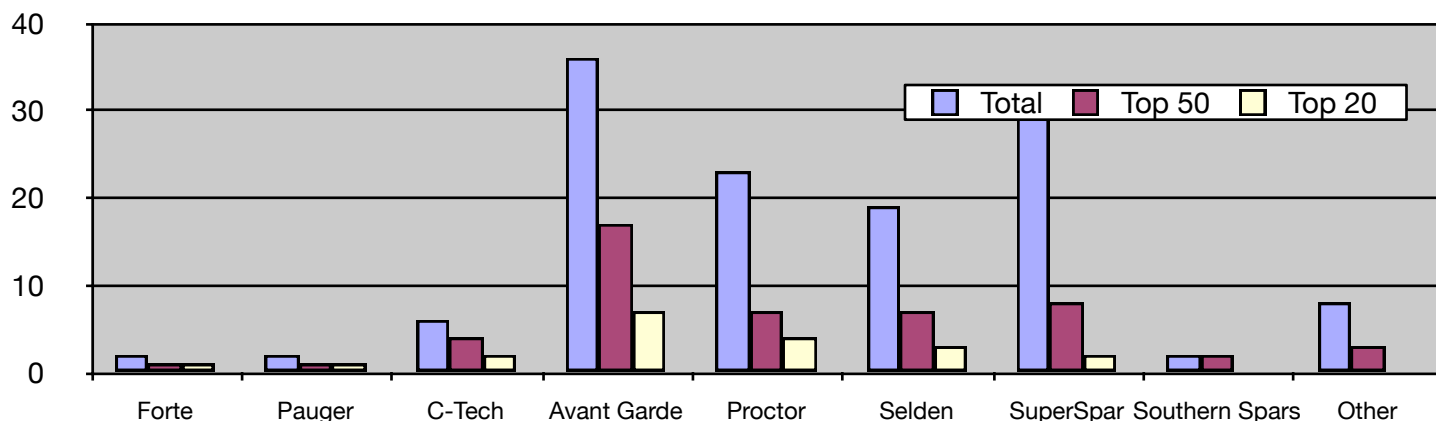
FD World Championship 2011

Masts	Total	Top 50	% Top 50	Top 20	% Top 20	A	B	C	D	E	F	G	H	J	K	L	M	N
Forte	2	1	50.0	1	50.0	0	1	0	0	0	0	0	0	0	1	0	0	0
Pauger	2	1	50.0	1	50.0	1	0	0	0	0	1	0	0	0	0	0	0	0
C-Tech	6	4	66.7	2	33.3	1	1	0	1	1	0	1	0	0	0	1	0	0
Avant Garde	36	17	47.2	7	19.4	4	3	2	5	3	5	4	3	1	1	2	1	2
Proctor	23	7	30.4	4	17.4	1	3	2	0	1	1	2	3	3	3	2	1	1
Selden	19	7	36.8	3	15.8	2	1	1	3	0	1	0	1	1	2	3	2	2
SuperSpar	32	8	25.0	2	6.3	1	1	2	1	3	2	3	3	4	3	1	5	3
Southern Spars	2	2	100.0	0	0.0	0	0	1	0	1	0	0	0	0	0	0	0	0
Other	8	3	37.5	0	0.0	0	0	2	0	1	0	0	0	1	0	1	1	2
Total	130	50	38.5	20	15.4	10	10	10	10	10	10	10	10	10	10	10	10	10
Booms																		
Pauger	2	2	100.0	2	100.0	1	1	0	0	0	0	0	0	0	0	0	0	0
Selden	3	1	33.3	1	33.3	1	0	0	0	0	0	0	0	1	0	0	1	0
Other	20	10	50.0	5	25.0	1	4	2	0	3	1	2	2	0	2	0	3	0
Mader	26	16	61.5	6	23.1	3	3	5	2	3	2	1	2	0	0	4	0	1
Fiberwork	11	6	54.5	2	18.2	1	1	1	3	0	1	1	2	0	0	1	0	0
Avant Garde	20	5	25.0	3	15.0	2	1	1	1	0	4	3	2	2	1	1	0	2
Proctor	27	4	14.8	1	3.7	1	0	1	1	1	1	2	0	5	6	2	2	5
SuperSpar	17	4	23.5	0	0.0	0	0	0	2	2	1	1	2	2	1	1	3	2
Forte	2	1	50.0	0	0.0	0	0	0	0	1	0	0	0	0	0	0	1	0
C-Tech	2	1	50.0	0	0.0	0	0	0	1	0	0	0	0	0	0	1	0	0
Total	130	50	38.5	20	15.4	10	10	10	10	10	10	10	10	10	10	10	10	10

Notes:

% Top 50 and % Top 20 shows the percentage of masts of the specified manufacturer that were in the Top 20/Top 50
Column A is number of Boats in Top 10 overall, B is boats placed 11-20, C21-30 etc

Masts used at FD World Championships 2011



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Appendix 2

SPARS FD World Championship 2011

MASTS

Most of the competitors at the Worlds and nearly all the Gold Fleet have swapped from aluminium to carbon masts.

The two boats in the Gold fleet that used Aluminium masts were 20th and 47th.

There were two Aluminium masts in the top 6 of the Silver fleet and a further 19 were spread through the Silver Fleet. This would suggest that for most Club racing on lakes there remains no significant advantage in carbon - other factors are at least if not more important

However, the evolution of carbon masts and matched sails is reaping benefits at the top end of the Gold fleet where the competition is most intense and very small gains in recovery and acceleration in gusty conditions particularly in waves can be crucial to success.

The chart on the previous page shows the number of masts supplied by various manufacturers and the number of boats in the top 20 and top 50 that used their masts. The manufacturers are listed from left to right by percentage of their masts in the top 20 with Forte and Pauger each having 50% but their total numbers are very small.

There was no dominant mast manufacturer as development of carbon masts continues. Seven mast manufacturers were represented in the top 20 boats and six of these were represented in the top 10 boats. Pauger developed a mast for the World Champions.

Established Suppliers

Avant Garde who produced masts for 36 boats of which 17 finished in the top 50 (7 in the Top 20) has emerged as a leading supplier of carbon masts.

Proctor was a very long established mast manufacturer and supplied 23 masts including some of the first batches of carbon masts but no longer exists as the business was taken over by **Selden** who supplied 19 masts. Each company had 7 in the top 50 including a total of 7 in the Top 20.

Superspar has also been a very long term producer of FD masts and supplied 32 of the masts and had 8 in the top 50 of which 2 were in the Top 20.

Suppliers to watch

C-Tech had four of its six masts in the Top 50 and two in the Top 20.

Pauger and **Forte** each had two masts and in each case one of them was chosen by a top sailor

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SPARS

Appendix 2

Booms used at FD World Championship 2011



Booms

The chart above shows the number of booms supplied by various manufacturers and the number of boats in the top 20 and top 50 that used their booms. The manufacturers are listed from left to right by percentage of their booms in the top 20. See also the table on the first page of this Appendix.

The situation with boom suppliers is even more wide open than masts with a significant number of sailors building their own carbon booms or using other suppliers. Some boats continue to use Aluminium booms but this was not recorded on the spreadsheet so the analysis of boom suppliers needs to be treated with caution

Home Made/Other

25% of the booms in the top 20 were home made or one off booms suggesting that as with masts development of carbon booms is continuing. It might alternatively suggest that booms are not critical to performance but this is not likely to be the case as performance of the main suppliers varies significantly across the fleet.

Proctor was the largest supplier with 27 booms. However, as Proctor no longer exists, these are not recent booms and it is indicative that only four were in the Top 50 including one in the Top 20. **Selden** has supplied three booms one of which reached the Top 20.

Mader is the second largest supplier with 26 booms and highest number in the Top 20 with 6 boats.

Avante Garde has emerged as a significant supplier of booms with 20 booms in the fleet and 3 in the Top 20.

Fiberwork has also emerged as a significant supplier with 11 booms, 6 in the Top 50 - 2 of which were in the Top 20.

SuperSpar used to be a major supplier of booms and 17 boats (none in the Top 20) used them.

Pauger was chosen by the World Champion and one other boat in the Top 20.

Forte and **C-Tech** were less successful with their booms than masts

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Appendix 3

FOILS - FD World Championships 2011

Centreboards	Total	Top 50	% Top 50	Top 20	% Top 20	A	B	C	D	E	F	G	H	J	K	L	M	N
Vels	3	2	66.7	1	33.3	0	1	0	0	1	0	1	0	0	0	0	0	0
Bogumil	13	9	69.2	4	30.8	3	1	1	3	1	1	2	0	1	0	0	0	0
Other	10	5	50.0	2	20.0	1	1	2	1	0	0	0	1	1	1	1	1	0
TEB	12	4	33.3	2	16.7	1	1	1	1	0	2	1	0	1	3	0	1	0
Mader	77	26	33.8	10	13.0	4	6	5	5	6	4	4	8	4	6	9	7	9
Homemade	12	3	25.0	1	8.3	1	0	0	0	2	2	2	0	3	0	0	1	1
Waterat	1	1	100.0	0	0.0	0	0	1	0	0	0	0	0	0	0	0	0	0
FES	1	0	0.0	0	0.0	0	0	0	0	0	1	0	0	0	0	0	0	0
KDV	1	0	0.0	0	0.0	0	0	0	0	0	0	0	1	0	0	0	0	0
Total	130	50	38.5	20	15.4	10	10	10	10	10	10	10	10	10	10	10	10	10
Rudders																		
FES	1	1	100.0	1	100.0	1	0	0	0	0	0	0	0	0	0	0	0	0
Lindsey	1	1	100.0	1	100.0	1	0	0	0	0	0	0	0	0	0	0	0	0
Bloodaxe	5	4	80.0	3	60.0	2	1	1	0	0	1	0	0	0	0	0	0	0
Bogumil	11	7	63.6	3	27.3	2	1	0	3	1	1	2	0	1	0	0	0	0
Mader	82	29	35.4	11	13.4	4	7	7	6	5	4	4	8	3	8	9	7	10
Other	11	4	36.4	1	9.1	0	1	1	1	1	0	1	2	2	0	1	1	0
Homemade	11	2	18.2	0	0.0	0	0	0	0	2	3	2	0	3	0	0	1	0
TEB	7	1	14.3	0	0.0	0	0	1	0	0	1	1	0	1	2	0	1	0
Waterat	1	1	100.0	0	0.0	0	0	0	0	1	0	0	0	0	0	0	0	0
Total	130	50	38.5	20	15.4	10	10	10	10	10	10	10	10	10	10	10	10	10

Note: Col A is Top 10 overall, B is 11-20 etc

Centreboards

Some, but not many, FD sailors have changed their centreboards from that supplied by the boat builder.

Mader supplied 77 of the centreboards, these are likely to be the boards supplied with the boat or a replacement. There were 88 Mader hulls in the Fleet so at least 11 chose to use a different make of centreboard even though 5 of the Top 10 boats used a Mader board.

Bogumil supplied 13 centreboards and there were 13 Bogumil hulls in the Fleet including 3rd, 4th and 5th.

TEB supplied 7 boards (no hulls) and was chosen by the World Champion and one other in the top 20 - both were sailing in Mader hulls.

Vels supplied 3 boards (2 hulls) with highest in 20th in a Vels Hull.

Waterat supplied 1 board (0 hulls) and this was in the Top 30 (but not Top 20) in a Mader Hull.

FES; KDV each supplied one board but none were in the top 50

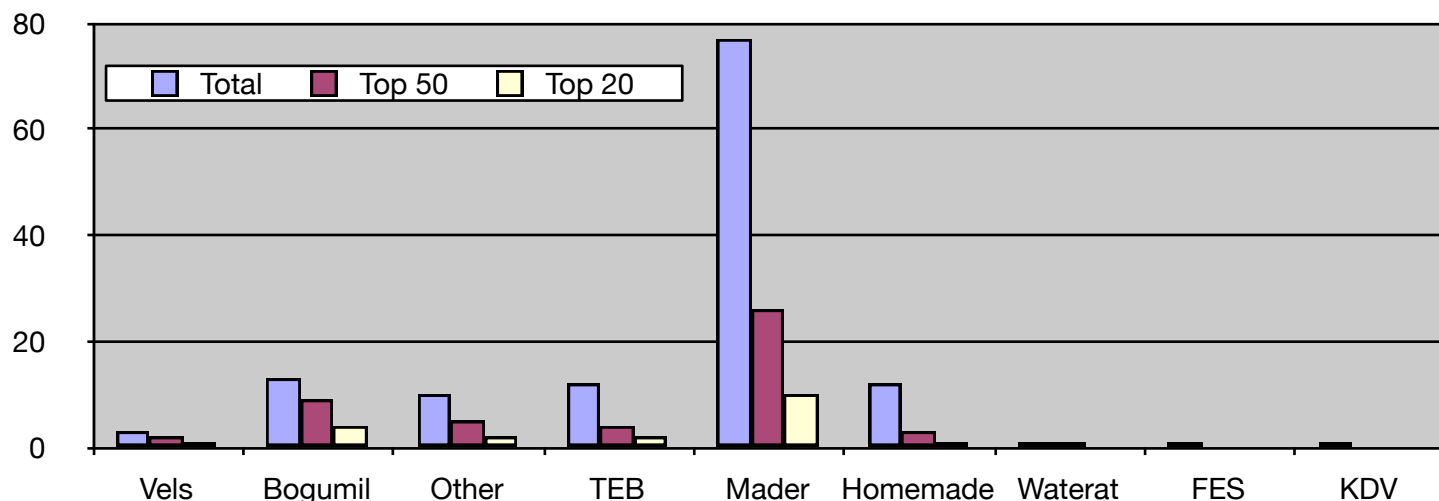
Home made and other suppliers were used by 22 competitors, 3 of which were in the Top 20.

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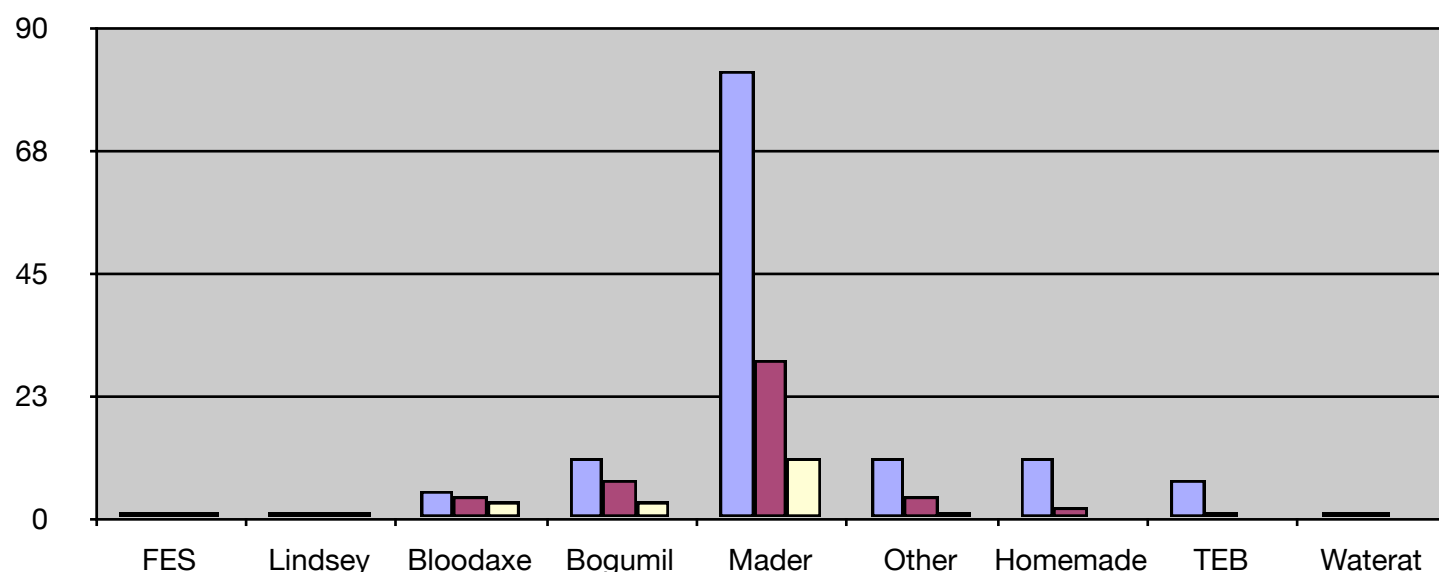
Appendix 3

FOILS

Centreboards used at FD World Championship 2011



Rudders used at FD World Championship 2011



Rudders

Rudder shape and weight is tightly controlled and most FD sailors use fixed rather than lifting rudders. Very few FD sailors have changed their rudder from the original hull supplier. However, within the top 20 boats there has been successful experimentation with other makes.

Mader is clearly the dominant supplier and 11 of the Top 20 boats used a Mader rudder.

Bogumil rudders were used in 11 boats including 3 of the 4 Bogumil boats in the Top 20.

Bloodaxe rudders were chosen by 5 competitors including the World Champion; 3rd and 18th team.

FES and Lindsey rudders were chosen by one boat each in the Top 10.

TEB and **Waterat** rudders were also used in 8 boats with one each in the Top 50.

Homemade or **other** makes of rudder were used in 22 boats - 8 of which were in the Top 50.

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Appendix 4

SAILS

FD World Championship 2011

Main	Total	Top 50	Top 20	% Top 20	A	B	C	D	E	F	G	H	J	K	L	M	N
Ullman	7	3	2	28.6	1	1	1	0	0	0	2	0	0	0	1	0	1
BM	37	16	10	27.0	5	5	2	0	4	2	3	4	3	2	1	4	2
Bellotti	5	4	1	20.0	0	1	0	2	1	0	0	0	0	0	1	0	0
Koenig	25	10	4	16.0	3	1	1	2	3	3	2	3	3	1	2	1	0
Other	10	1	1	10.0	0	1	0	0	0	1	0	0	3	2	0	1	2
North	31	13	2	6.5	1	1	3	6	2	2	0	2	0	5	3	2	4
One Sail	6	1	0	0.0	0	0	1	0	0	1	1	1	1	0	0	1	0
VM	9	2	0	0.0	0	0	2	0	0	1	2	0	0	0	2	1	1
Total	130	50	20	15.4	10	10	10	10	10	10	10	10	10	10	10	10	10
Genoa *	* 2 per boat																
Ullman	13	7	4	30.8	2	2	1	0	2	0	3	0	0	0	1	1	1
BM	74	36	22	29.7	11	11	5	4	5	2	5	7	7	2	2	7	6
Belotti	8	6	2	25.0	0	2	0	2	2	0	0	1	0	0	1	0	0
Koenig	43	16	6	14.0	5	1	2	3	5	6	4	6	2	3	3	2	1
North	54	24	5	9.3	1	4	5	8	6	4	3	1	1	8	7	3	3
VM	30	6	1	3.3	1	0	4	1	0	3	3	1	4	2	4	3	4
Other	27	2	0	0.0	0	0	1	1	0	3	0	4	4	5	2	2	5
One Sail	11	3	0	0.0	0	0	2	1	0	2	2	0	2	0	0	2	0
Total	260	100	40	15.4	20	20	20	20	20	20	20	20	20	20	20	20	20
Spinnaker																	
Bellotti	3	3	1	33.3	0	1	0	2	0	0	0	0	0	0	0	0	0
Ullman	10	6	3	30.0	1	2	1	1	1	1	2	0	0	0	0	0	1
One Sail	5	2	1	20.0	0	1	1	0	0	1	1	0	1	0	0	0	0
BM	46	18	9	19.6	5	4	3	2	4	2	3	6	5	1	5	3	3
Koenig	24	9	4	16.7	3	1	1	2	2	4	2	3	3	1	0	1	1
VM	8	2	1	12.5	1	0	1	0	0	1	0	0	1	1	2	1	0
North	20	8	1	5.0	0	1	3	2	2	1	2	0	0	3	2	2	2
Other	14	2	0	0.0	0	0	0	1	1	0	0	1	0	4	1	3	3
Total	130	50	20	15.4	10	10	10	10	10	10	10	10	10	10	10	10	10

Note: A = Top 10 overall, B=11th - 20th C - 21st to 30th etc

Boysen Moller (BM) was the most popular sailmaker supplying **157sails** - 37 Mainsails, 74 Genoas and 46 Spinnakers and was also the most successful with 5 boats in the top 10. All the top 5 boats used BM Genoas and all except the fourth boat used BM mainsails and spinnakers.

Koenig supplied **92 sails** - 25 Mainsails, 43 Genoas and 24 Spinnakers with 3 boats in the top 10 using Koenig mainsails, two using Koenig genoas and two using Koenig spinnakers - the 4th boat had a Koenig Mainsail and a Koenig Spinnaker.

Vogel Meyer (VM) supplied **47 sails** - 9 mainsails, 30 genoas and 8 spinnakers with the 6th boat measuring in a VM genoa.

Ullman supplied **30 sails** - 7 mainsails, 13 genoas and 10 spinnakers. The 7th and 13th boat overall used Ullman sails

North was the second largest supplier with **105 sails** - 31 mainsails, 54 genoas and 20 spinnakers - the highest placed boat was 10th - using all North sails and two more were in the Top 20 although one of these did not use a North mainsail.

Belotti supplied **18 sails** - 5 mainsails, 8 genoas and 3 spinnakers. The highest placed was 16th - using all Belotti sails.

One Sail supplied **21 sails** - 6 mainsails, 11 genoas and 5 spinnakers with one of the spinnakers being used by a top 20 boat and the 23rd boat had all One Sail sails.

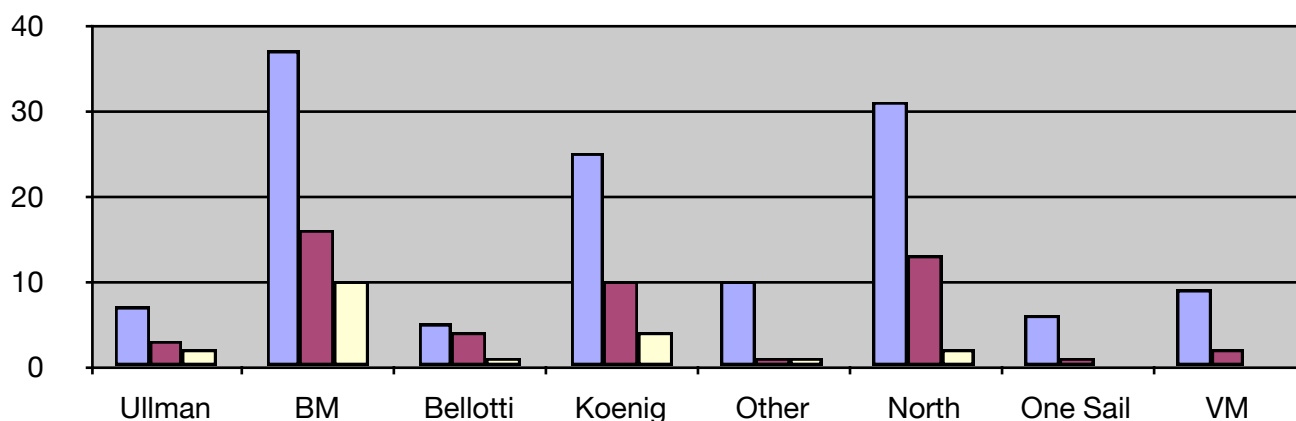
FD Equipment Review 2011

SAILS

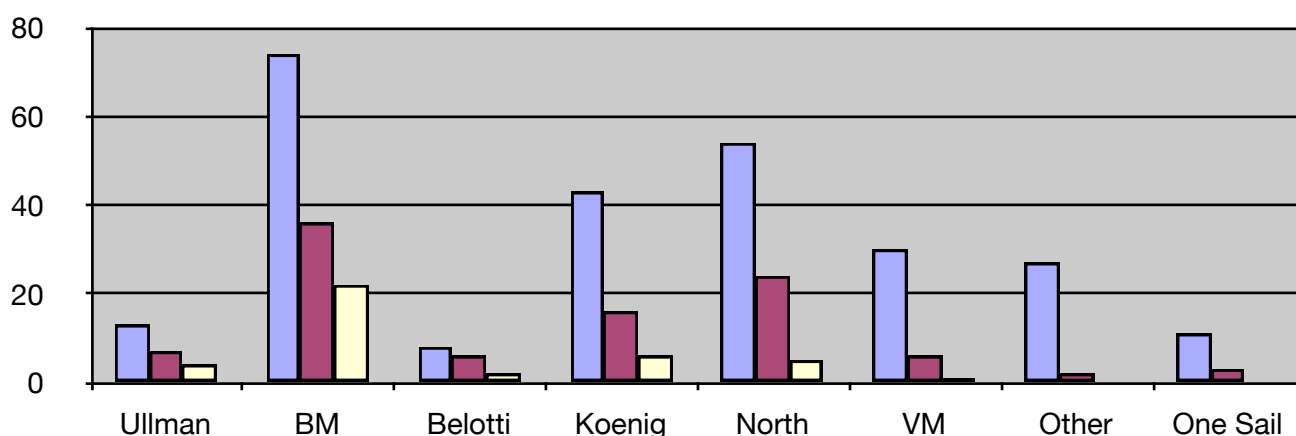
Appendix 4



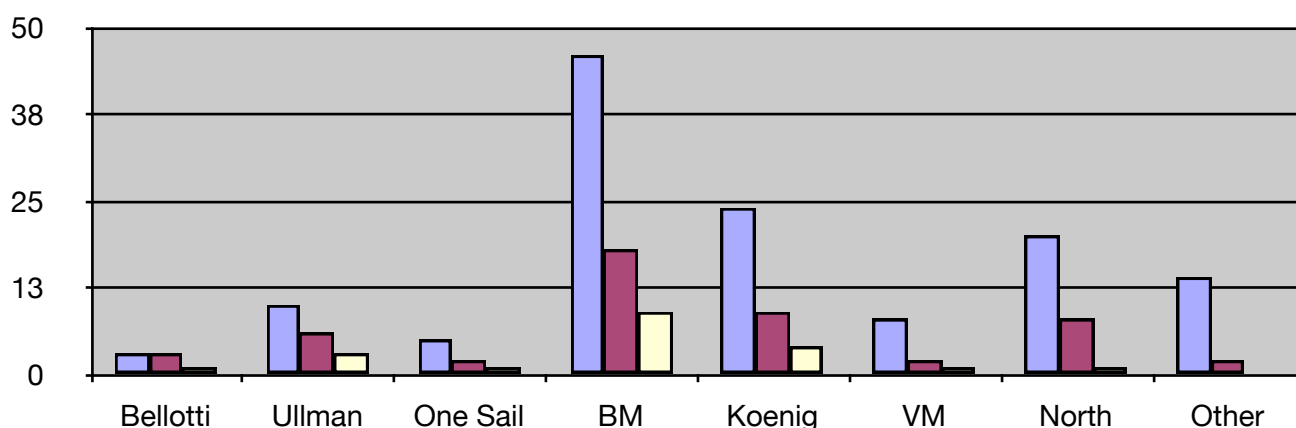
Mainsails used at FD Worlds 2011



Genoas measured in at FD Worlds 2011 (2 per boat)



Spinnakers used at FD Worlds 2011

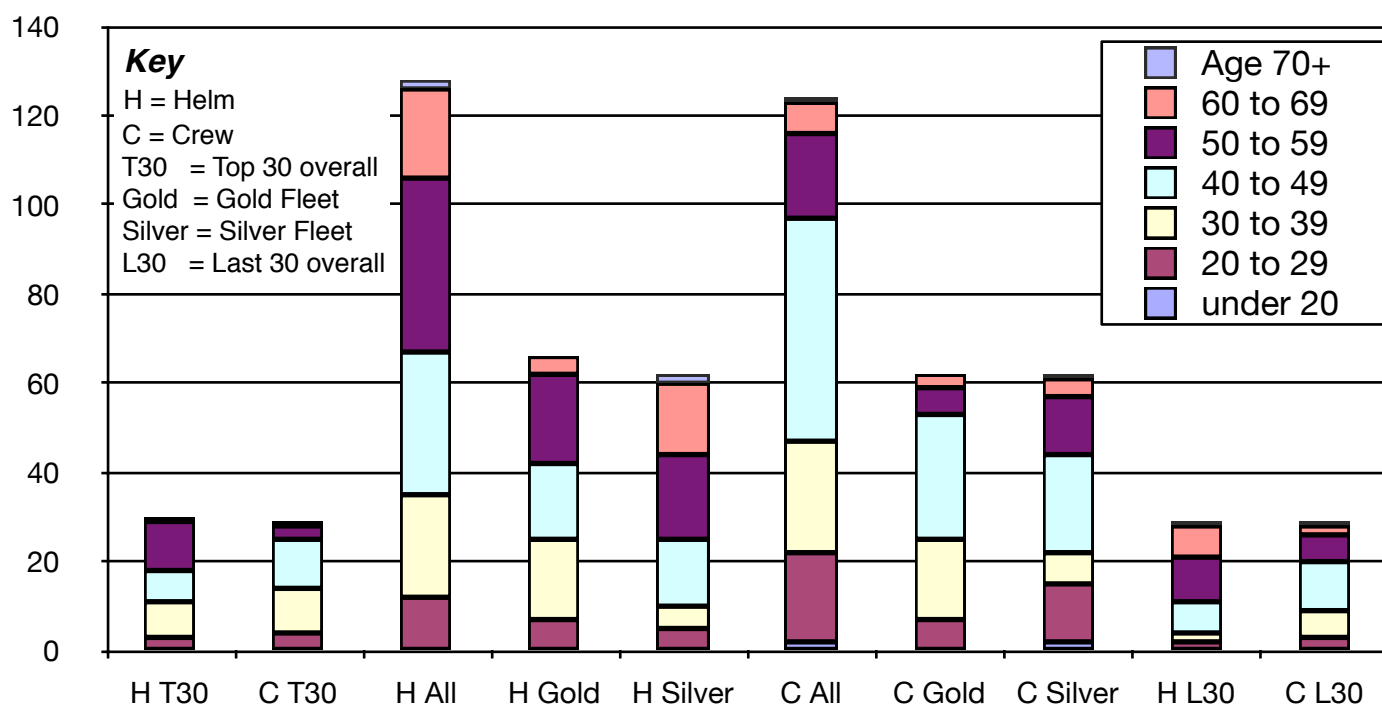


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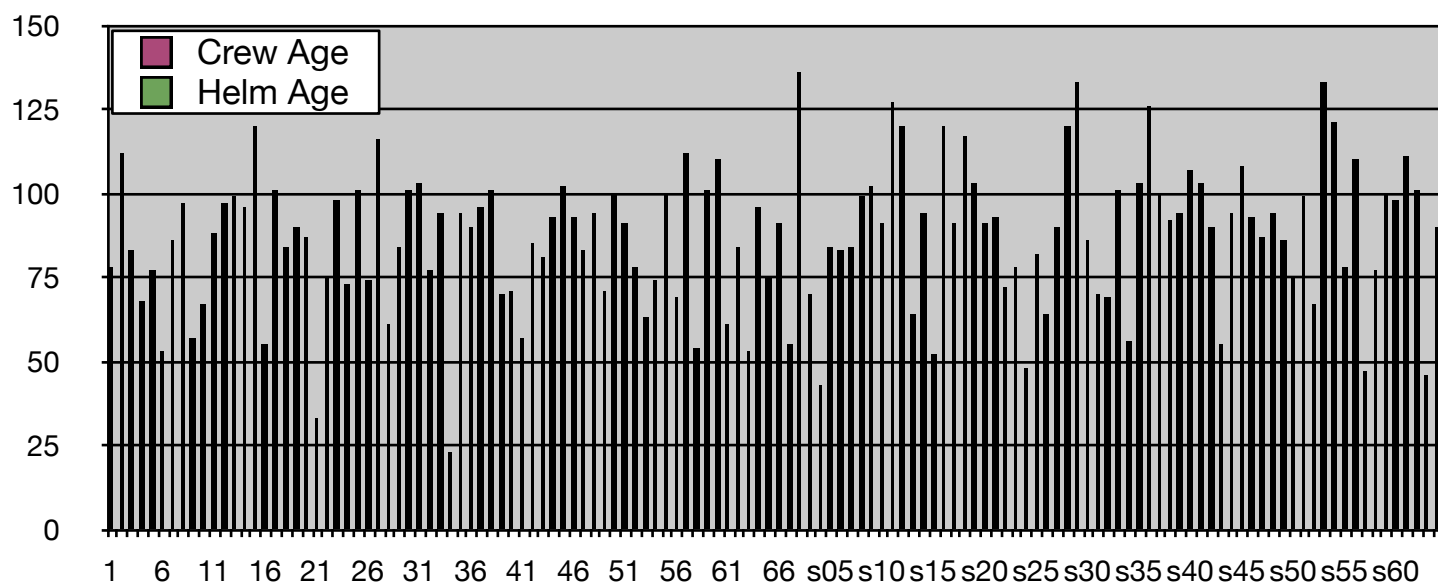
Appendix 5

FD SAILORS

AGES OF HELMS & CREW - FD World Championships 2011



Ages of Helm & Crew - FD World Championship 2011



Overall Finishing Position for each team (s=silver fleet)

Age - Helm

Age is not a significant factor in determining a helm's ability to sail an FD or to perform well at a World Championship. Most FD helms are spread fairly evenly between the ages of 25 and 65 and there are both younger and older participants. 50 year olds represent the largest decade in the Top 30, Gold Fleet and overall. However, within the silver fleet, helms in the forties, fifties and sixties are fairly even in numbers.

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Appendix 5

FD SAILORS

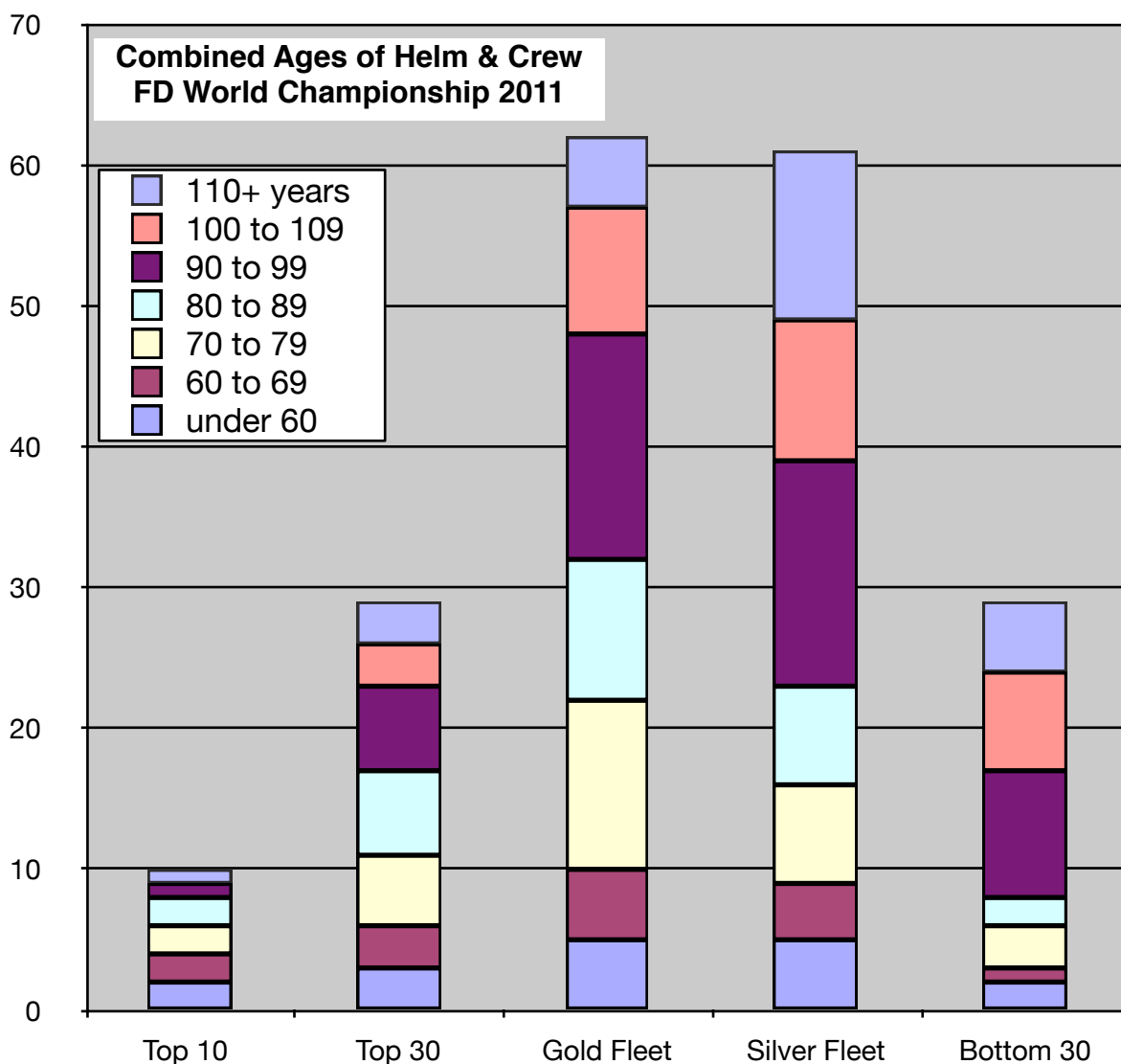
Age - Crew

Age of crew is not a significant indicator of performance ability within the FD Class. Within the Top 10 the youngest crew was 29 years old and the oldest 55 years old. This range extends to 25 to 61 years old in the Top 30, and 19 to 70 years old for the whole fleet. The average age of crews for the fleet is 42.2 years and this is similar across the whole fleet. Indeed, crews in their forties represent the largest decade throughout the fleet although crews in their thirties are equally well represented in the Top 30.

There is a similar proportion of crew over 50 as under 30 in the Top 30 and this is also the case in the Gold and Silver fleets. The main difference between the Gold & Silver fleets is that there are significantly more 30 and 40 year olds in the Gold Fleet than the Silver Fleet.

Combined Ages - Helm and Crew

As the chart below shows teams with combined ages between under 60 years and over 110 years finished in the Top 10 of the overall results out of 130 FDs at the World Championships in 2011. The average of age of helm+crew for a top 10 boat was 77.8 years, for Top 30 - 85.4, Top 50 - 86.1, Top 100 - 87.0. Total Team age is clearly not a critical factor in doing well! Ability, strength, experience and fitness are more important than age!

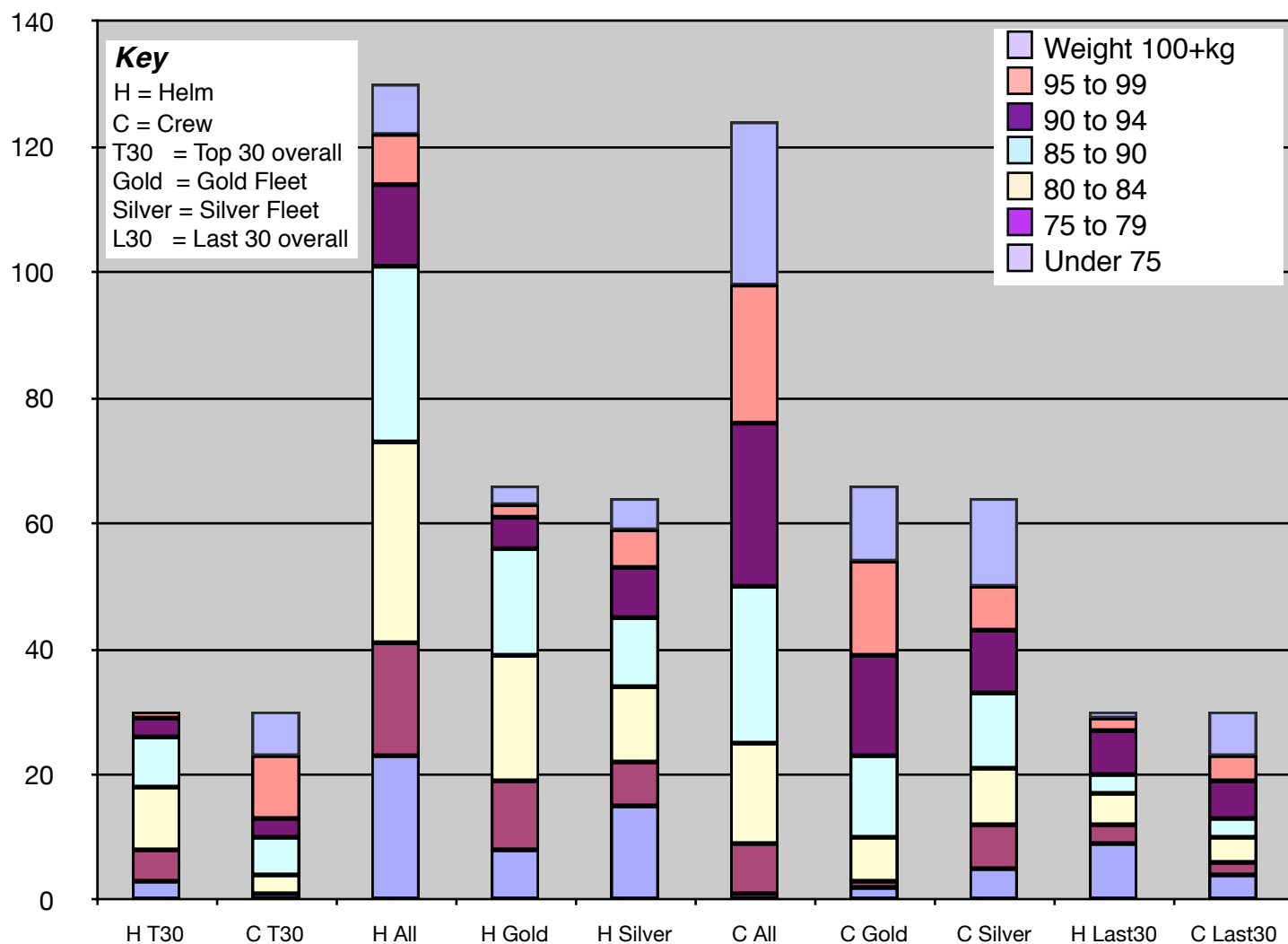


FD Equipment Review 2011

Appendix 5

FD SAILORS

WEIGHT - Helms & Crew - FD World Championship 2011



WEIGHT - Helms

Weights of helm ranged from 60kg (Top 10 - 70kg) to 110kg (Top 10 - 88kg) with an average of 83kg (Top 10 - 81kg). Whilst there is a very wide range of helm weights, there is little variation in the average weight of helms throughout the fleet.

The majority of helms are between 80 and 90kg and within the Top 30 and Gold Fleet there is greater proportion in this weight range. However within the silver fleet the weights of helms are more evenly distributed with a significant number of under 75kg.

Thus it would appear that whilst there may be some advantage in helms being over 75kg and under 95kg, being outside this range is not a barrier to being in the Top 30 at a World Championship.

FD Equipment Review 2011

Appendix 5

FD SAILORS

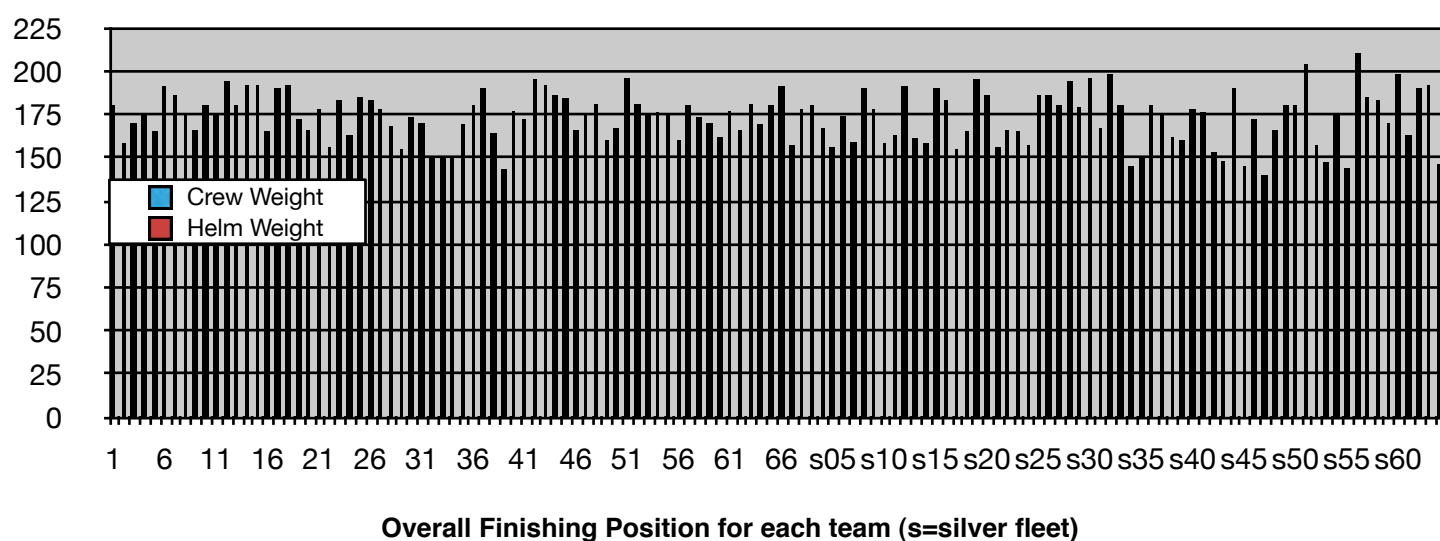
WEIGHT - Crews

Weights of crew ranged from 65kg (Top 10 - 85kg) to 120kg (Top 10 - 105kg) with an average of 91 kg (Top 10 - 94kg). Within the top 30 teams - crews are as light as 70kg and as heavy as 120kg. The average weight of crews shows a steady small decrease down the fleet with the average for the last 50 being 89.5kg.

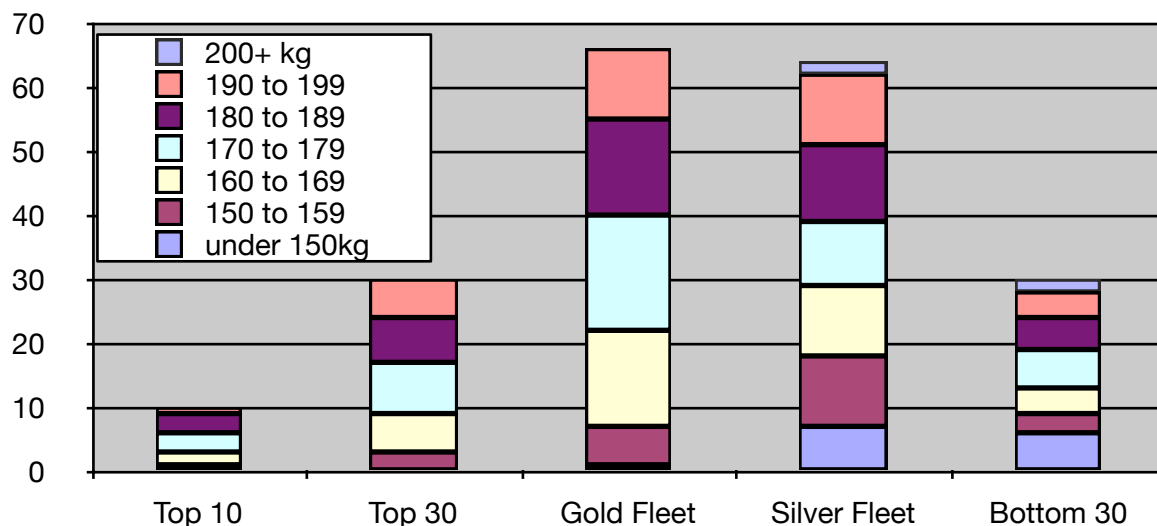
Strength, ability, fitness and experience are key requisites for a crew and with the use of raked rigs and carbon spars, an FD can be tuned to sail with a wide range of different crew weights.

WEIGHT - Helm + Crew

Weights of Helm & Crew (Kg) - FD World Championship 2011



The combined weight of helm and crew ranged from 140kg to 210kg (Top 10 - 158kg to 191kg). The average of the combined weight of helm and crew for the fleet was 173kg (Top 10 - 175kg; Top 30 - 176kg; Top 50 & Top 100 - 174kg). As can be seen from chart below, the proportion of combined weights in each 10kg band from 150 to 200kg is almost identical in the Top 10, Top 30 and Gold Fleet but in the Silver Fleet and bottom 30 the numbers in each band are more similar to each other and there are more teams outside these bands.

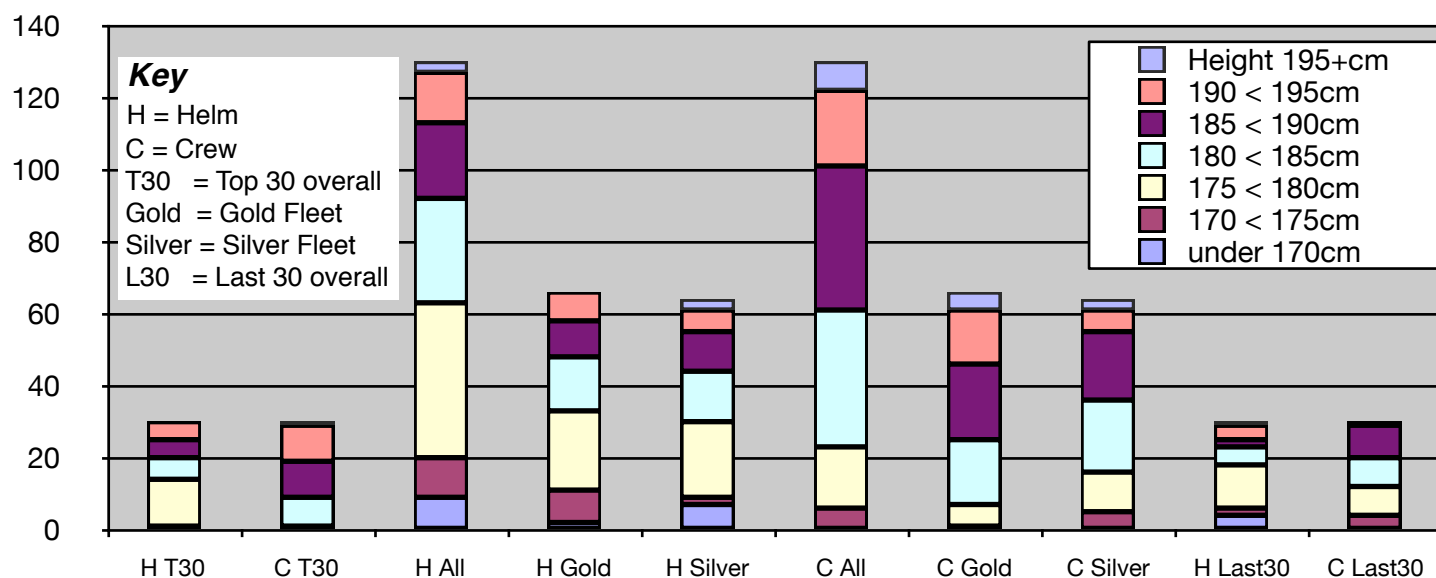


FD Equipment Review 2011

Appendix 5

FD SAILORS

HEIGHTS - Helm & Crew - FD World Championship 2011



HEIGHT - Helm

Heights of helms ranged from 160cm to 196cm (Top 10 -173 to 190cm; Top 50 - 162 to 194cm)

The average height of helms was 180cm (Top 10 and Top 30 -182cm; Top 50 - 180).

The majority of helms in the fleet were in the range of 175 to 185cm and this was true throughout the fleet

HEIGHT - Crew

Heights of crew ranged from 170 to 200cm (Top 10 - 180 to 194 cm; Top 50 - 175 to 200 cm)

The average crew height was 185cm (Top 10 - 189cm). The average height of crew decreased through the fleet to 182cm for the last 50.

The majority of crews were in the range of 175 to 195cm; however in the Gold fleet the predominant range was from 180 to 195cm range compared with the Silver Fleet which had more crew under 180cm and the Top 30 which had a larger proportion in the 190 to 195cm range.

HEIGHT - Combined Height of Helm & Crew

The combined height of Helm & Crew ranged from 340 to 390cm (Top 10 - 355 to 384cm) with an average of 365 cm (Top 10 - 371cm). The average combined height decreased through the fleet to 360cm for the last 50.

Helm heights and crew heights tend to be more similar to each other in the top 10 than the rest of the fleet and are within the range of the rest of the fleet. Extremes of height (either tall or short) in either helm or crew do not appear to give any advantage.

It would appear that it is not advantageous for either the helm or the crew to be under 170cm (5 feet 7 inches) nor over 195cm (6 feet 5 inches) although sailors outside these ranges do race FDs. Within these ranges helms and crew can successfully reach the Gold Fleet and will increase their chance of success if they partner a person so as to keep within or close to the total height and total weight range for the Top 30.